



# **Mineral production and mining trends for selected non-fuel commodities in Idaho and Montana, 1905-2001**

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## **Abstract**

Idaho and Montana state mining statistics were obtained from historical mineral production records and compiled into a continuous record from 1905 through 2001. To facilitate comparisons, the mineral production data were normalized by converting the units of measure to metric tons for all included commodities. These standardized statistical data include production rates for principal non-fuel mineral commodities from both Idaho and Montana, as well as the production rates of similar commodities for the U.S. and the world for contrast. Data are presented here in both tabular and bar chart format. Moreover, the tables of standardized mineral production data are also provided in digital format as, commodity\_production.xls.

Some significant historical events pertaining to the mining industry are described as well. When taken into account with the historical production data, this combined information may help explain both specific fluctuations and general tendencies in the overall trends in the rates of mineral resource production over time.

## **Introduction**

We have compiled and standardized a continuous record of historical mineral production data for both Idaho and Montana covering a time period from 1905 through 2001. This data includes the primary mineral products and the quantity of major non-fuel minerals and metals produced from mines in both Idaho and Montana (together referred to herein as the “region”), as well as rates for U.S. and world production. From this data, a series of tables and illustrations are presented that show the regional mining production levels associated with each commodity, along with a statistical comparison between mining records from the region, the U.S., and the world. The illustrations provide a visual representation of the historical contributions of Montana and Idaho mineral production, which can help identify future trends in the regional mining industry.

The metals and industrial minerals summarized in this report were selected based on the availability of mining production data from U.S. Geological Survey and U.S. Bureau of Mines publications. Some regional commodities show near continuous records of mining production over the last century, while other minerals were only produced occasionally, or have very limited recorded data. Some commodities, such as molybdenum, have a substantial production history in the region though are not included in this report as data are largely withheld from publication. Other important commodities not addressed, such as cobalt, garnet, perlite, vermiculite, and zeolite may be important in terms of future potential for the regional mining industry; however, their historical contributions are either limited or unavailable, and are not useful for identifying industry trends.

In an attempt to explain some of the fluctuations in the rates of production exemplified in the various illustrations, we also include tables and descriptions of noteworthy historical events affecting both the regional and national mining industry for each commodity. These historical events and trends may help to identify causes for some of the more noticeable variances in production rates. However, this historical information should be treated as a starting place only, and is not intended to be a comprehensive account of all major and minor events relating to mining in Idaho and Montana, or the nation. The regional and national mining events are presented as supplemental information to the primary purpose of this report, which is to provide a normalization of mining statistics for the major commodities mined in Idaho and Montana over nearly a century of mining activity.

## Source of information

The mineral production information was compiled from the state mineral reports in U.S. Bureau of Mines (USBM) Yearbooks published annually from 1905-1996 and from U.S. Geological Survey (USGS) Minerals Yearbooks from 1997 to 2001. The USBM data was published in single volumes from 1905 to 1951, and in multiple volume sets from 1952 until the agency closed in 1996. Mining data for years inclusive of 1952 to 1962 were obtained from Volume III: Area Reports in the USBM yearbooks. Data were obtained for the years of 1963 to 1996 from Area Reports: Domestic, which was published as Volume II or Volume III. In 1997, the USGS assumed the responsibility of publishing yearly mineral and mining statistics. Data from 1997 to 2001 were obtained from USGS Minerals Yearbooks Volume II – Area Reports: Domestic. Digital versions of the USBM mineral yearbooks from 1935-1993 can be found on-line at: <http://minerals.usgs.gov/minerals/pubs/usbmmyb.html>. The USGS provides on-line Minerals Yearbooks from 1994 to present at: <http://minerals.usgs.gov/minerals/pubs/myb.html>.

## Methods

For this report, all units of measure were standardized to metric tons (Mt) to facilitate comparison. The conversion of units was necessary because record keeping methods have evolved over the years. For instance, early copper production was first recorded in pounds. In 1948, the units were changed to short tons, and today copper production is recorded in metric tons. The conversion factors used to normalize these data are listed in Appendix 1.

Tables of production for each commodity mined in Idaho and Montana list the production quantity from each state, as well as the quantity from both states combined. In addition to state production, U.S. and world commodity production and the percentage from each that was contributed by the study region is also included in the tables. Years of no recorded production are shown as a leader ( \_ \_ ), and proprietary data withheld from publication is denoted with the letter “W.” Furthermore, the Microsoft® Excel spreadsheet accompanying this report, commodity\_production.xls, contains digital versions of the production tables for all of the commodities. Similar to the report tables, all numerical data contained in the spreadsheet are provided in metric tons and share the same conventions, such as “W” for “withheld data” and “n.d.” for “no data”. Each production table in the spreadsheet is labeled by commodity and is included as a separate worksheet within the Excel file.

Care must be taken to avoid confusion when comparing the figures for regional production to national or world production. All regional mining production numbers are based on crude (raw) mine production; however, national and world mining production will vary by commodity. The figures for U.S. and world production may emphasize resources obtained from only domestic ores, or may represent refined domestic and imported ores. When available, mine production figures for U.S. and world commodities are used to allow for a more pragmatic comparison with regional values. Clarification of the individual methods of reporting is outlined within each commodity section. Further information about specific mineral reporting can be found in Kelly and others (2001). Secondary production, such as recycled scrap metals, is not included in this report.

## Illustrations

Production data are illustrated for every commodity in a series of bar charts. The annual production from Idaho and Montana is illustrated in the first two figures, respectively; combined production from both states is illustrated in the third figure for each commodity. U.S. production data is illustrated in the fourth figure. The annual percentage of the U.S. production and world production from Idaho and Montana combined is illustrated in the fifth and sixth figures, respectively. The seventh figure is

a line graph illustrating historical price per unit (tons) of the commodity in constant 1998 dollars. Some of these figures are not present for all commodities because information was not always available.

Each illustration is designed with a scale that most efficiently displays the production data. Usually, a y-axis scale was chosen which maximizes the vertical extent of the bars in the graph window. However, for similar illustrations such as the production of a commodity from Idaho, Montana, or the combined state production, a common y-axis scale is used for all three charts in order to allow direct visual comparison between them. The x-axis in each chart represents the range of years 1905 – 2001. Bars extending below the x-axis should not be confused as being negative production levels for that year, but instead represent years where data are withheld due to proprietary concerns. There is no numerical value associated with bars below the x-axis as it is only intended as a visual illustration that production has occurred; however, the data is not available.



# Commodities

## Antimony

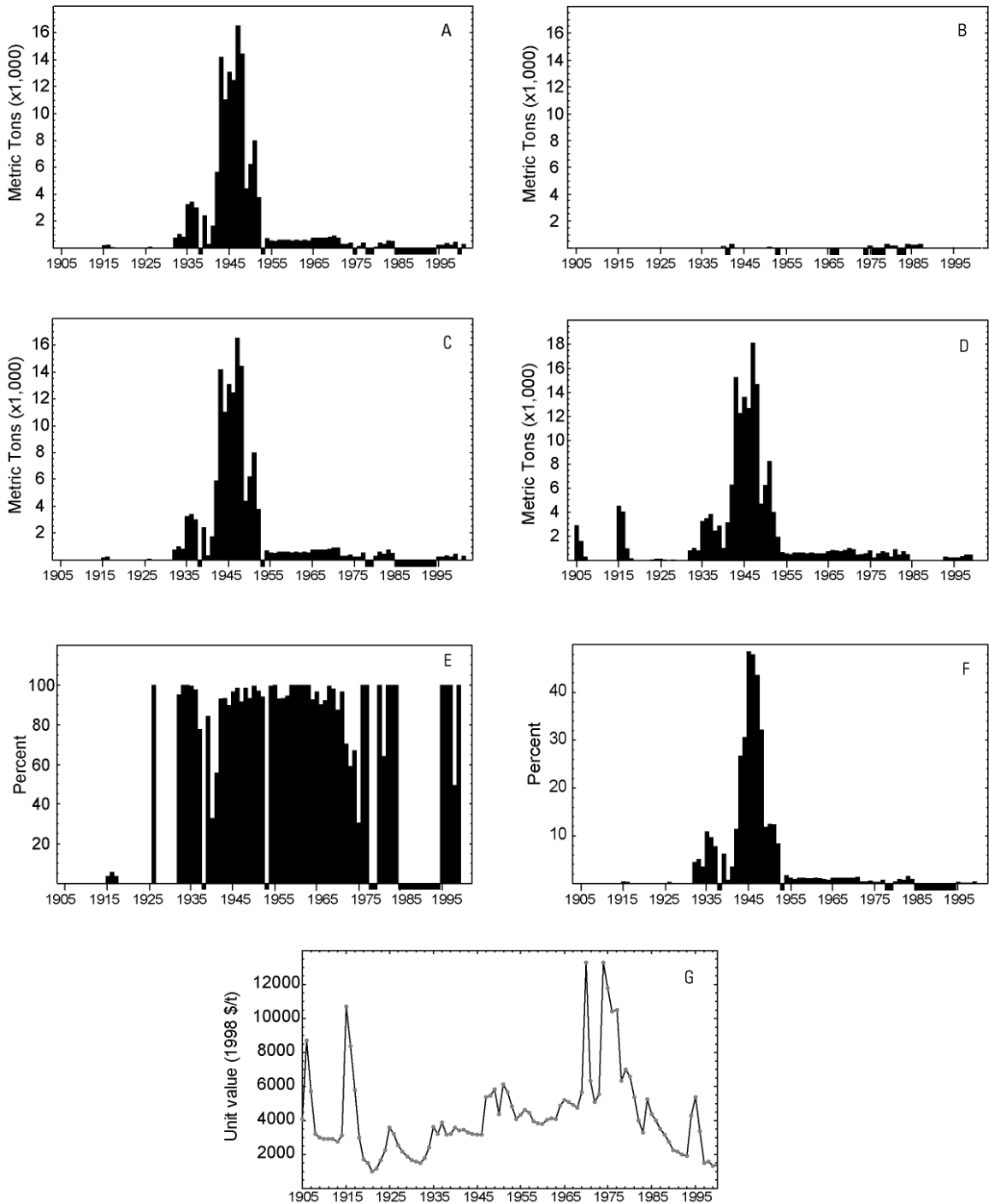
Very little antimony was produced in the region prior to the early 1930's (fig. 1). From 1942 until its closing in 1952, Idaho's Yellow Pine mine yielded the largest antimony production in U.S. history, peaking at over 16,500 metric tons in 1947 (fig. 1A). After World War II, production stabilized at 500 to 1000 metric tons per year. From 1953 until 2000, the primary, and often sole, antimony producer in Idaho was the Sunshine mine in the Coeur d'Alene mining district. Data withheld in the USBM minerals yearbook during this period was obtained from Sunshine Annual Reports. Montana has never been a significant producer of antimony (fig. 1B). The small amounts that have been recovered were from U.S. Antimony's Babbitt mine or as by-products from other mining activities (Kelly and others, 2001). Though domestic mine production of antimony in the U.S. has been relatively minor in recent years, the production figures show a close relationship with production from Idaho (fig. 1D). Beginning in the early 1930's, regional production proved to be critical to the national supply, as Idaho's mines have often contributed 90-100 percent of national production of antimony (fig. 1E). As a global antimony producer, the Idaho alone supplied nearly 50 percent of the world's antimony in 1945 and 1946 (fig. 1F). In the 50 years following the closure of the Yellow Pine mine, Idaho and Montana combined have averaged about 1 percent of world antimony production.

**Table 1.** Selected events affecting regional antimony production

Year	Event	Reference
1941	Yellow Pine mine opens in Idaho and becomes the largest antimony producer in the US during WWII	Miller, M.H., 1973
1952	Yellow Pine mine closes	Miller, M.H., 1973
1953	Sunshine electrolytic plant reactivated	this study
1970	US Antimony mine opened	this study
1972	Sunshine mine fire curtailed production	this study
1980	Sunshine production curtailed by strike	this study
1983	US Antimony's Thompson Falls Babbitt mine closed in favor of importing antimony ore for smelting.	this study

**Table 2.** Selected events affecting U.S. antimony production

Year	Event	Reference
1914-1918	WWI	
1939-1945	WWII	
1970	Antimony-based flame retardants developed	Kramer, undated
1994-1995	Flooding in China's mining districts causes severe short supply of antimony	Carlin, 1999



**Figure 1.** Antimony production information from 1905-2001. A, annual production from Idaho. B, annual production from Montana. C, Idaho and Montana combined production. D, annual U.S. antimony production of ores and concentrates. E, the proportion of regional production to U.S. mine production. F, the proportion of regional production to world mine production. G, the historical value of antimony in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 3.** Antimony production from Idaho and Montana, the U.S., and the world, 1905 – 2001

[The table also summarizes the proportions of Idaho and Montana production relative to the U.S. and the world as well as the price for antimony in constant 1998 dollars. Production figures for the U.S. reflect mine production of ores and concentrates; world production figures represent mine production in terms of antimony content. Data for state, US, and world production are given in metric tons; proportions of U.S. and world production by Idaho and Montana are given in percent; antimony value is in US dollars. W, withheld; n.d., no data; leaders ( \_ \_ ), no production]

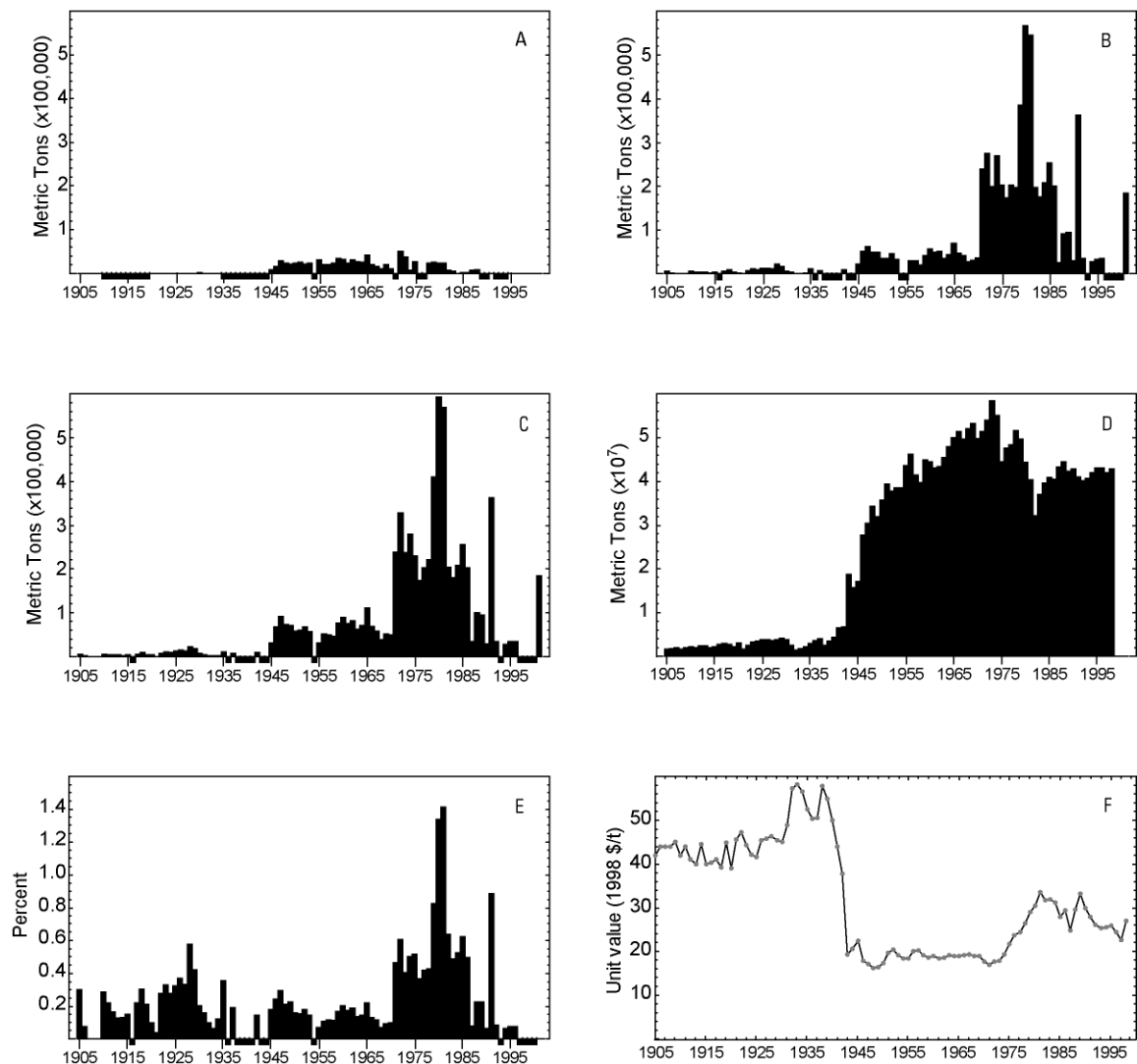
Year	Production			Proportion of Idaho and Montana production to:		Unit value (1998\$/t)		
	Idaho	Montana	Idaho and Montana combined	US	World			
1905	--	--	--	2,939	8,000	0	0	4,100
1906	--	--	--	1,602	14,500	0	0	8,700
1907	--	--	--	318	15,000	0	0	5,700
1908	--	--	--	--	16,000	0	0	3,200
1909	--	--	--	--	15,000	0	0	3,000
1910	--	--	--	--	15,000	0	0	2,900
1911	--	--	--	--	15,500	0	0	2,900
1912	--	--	--	--	24,200	0	0	2,900
1913	--	--	--	--	24,500	0	0	2,730
1914	--	--	--	--	23,600	0	0	3,130
1915	175	--	175	4,536	43,200	3.86	0.41	10,700
1916	235	--	235	4,082	81,600	5.76	0.29	8,360
1917	35	--	35	961	57,200	3.68	0.06	5,800
1918	--	--	--	172	30,800	0	0	3,010
1919	--	--	--	--	11,800	0	0	1,700
1920	--	--	--	--	29,000	0	0	1,520
1921	--	--	--	--	18,300	0	0	991
1922	--	--	--	18	18,900	0	0	1,170
1923	--	--	--	36	17,600	0	0	1,660
1924	--	--	--	103	17,500	0	0	2,270
1925	--	--	--	112	25,500	0	0	3,570
1926	90	--	90	90	29,000	100.00	0.31	3,220
1927	--	--	--	--	28,000	0	0	2,530
1928	--	--	--	78	28,500	0	0	2,160
1929	--	--	--	--	31,600	0	0	1,880
1930	--	--	--	--	23,600	0	0	1,660
1931	--	--	--	--	15,600	0	0	1,580
1932	778	--	778	816	17,300	95.33	4.50	1,480
1933	1,028	--	1,028	1,028	20,200	100.00	5.09	1,810
1934	814	--	814	814	22,600	100.00	3.60	2,400
1935	3,268	--	3,268	3,280	29,800	99.61	10.97	3,630
1936	3,436	--	3,436	3,508	35,300	97.93	9.73	3,190
1937	2,989	--	2,989	3,856	38,600	77.53	7.74	3,860
1938	W	--	W	2,477	33,900	W	W	3,160
1939	2,429	--	2,429	2,879	38,800	84.34	6.26	3,200
1940	274	63	337	1,020	46,300	33.01	0.73	3,590
1941	1,654	103	1,757	3,139	49,000	55.97	3.59	3,420
1942	5,647	254	5,901	6,332	51,400	93.19	11.48	3,440

1943	14,205	--	14,205	15,227	53,200	93.29	26.70	3,310
1944	11,007	--	11,007	12,248	36,000	89.87	30.58	3,220
1945	13,123	--	13,123	13,577	27,000	96.65	48.60	3,160
1946	12,458	--	12,458	12,666	26,000	98.35	47.91	3,180
1947	16,564	--	16,564	18,126	38,000	91.38	43.59	5,390
1948	14,462	--	14,462	14,670	45,000	98.58	32.14	5,470
1949	4,389	--	4,389	4,705	37,000	93.29	11.86	5,840
1950	6,231	--	6,231	6,249	50,000	99.71	12.46	4,380
1951	7,988	26	8,014	8,256	65,000	97.08	12.33	6,130
1952	3,786	--	3,786	4,023	44,500	94.11	8.51	5,680
1953	W	W	W	1,960	33,600	W	W	4,820
1954	693	--	693	695	39,900	99.74	1.74	4,070
1955	574	--	574	574	46,300	100.00	1.24	4,330
1956	498	--	498	535	53,500	93.05	0.93	4,620
1957	602	--	602	644	50,800	93.52	1.19	4,470
1958	614	--	614	650	46,300	94.55	1.33	3,960
1959	615	--	615	615	53,300	100.00	1.15	3,850
1960	576	--	576	576	53,300	100.00	1.08	3,790
1961	625	--	625	625	51,900	100.00	1.20	4,060
1962	572	--	572	572	53,700	100.00	1.07	4,120
1963	585	--	585	585	58,000	100.00	1.01	4,080
1964	531	--	531	573	63,000	92.62	0.84	4,890
1965	742	--	742	767	63,000	96.75	1.18	5,210
1966	757	--	757	841	61,400	89.96	1.23	5,080
1967	747	--	747	809	58,400	92.29	1.28	4,930
1968	774	--	774	777	61,500	99.59	1.26	4,740
1969	836	--	836	851	66,200	98.29	1.26	5,650
1970	901	W	901	1,030	70,000	87.46	1.29	13,300
1971	777	122	900	930	64,100	96.77	1.40	6,320
1972	313	W	313	444	68,100	70.49	0.46	5,070
1973	292	W	292	494	69,300	59.13	0.42	5,540
1974	404	W	404	600	70,500	67.28	0.57	13,300
1975	W	248	248	804	67,900	30.80	0.36	11,800
1976	121	136	257	257	69,200	100.00	0.37	10,400
1977	405	149	553	553	72,200	100.00	0.77	10,500
1978	W	W	W	724	68,800	W	W	6,350
1979	W	W	W	655	71,900	W	W	6,990
1980	75	236	311	311	67,200	100.00	0.46	6,590
1981	392	194	586	914	59,200	64.12	0.99	5,380
1982	267	190	456	456	53,800	100.00	0.85	3,990
1983	531	230	760	760	48,400	100.00	1.57	3,290
1984	505	--	505	505	53,400	100.00	0.95	5,230
1985	W	--	W	--	55,000	W	W	4,380
1986	W	--	W	--	59,900	W	W	4,000
1987	W	--	W	--	56,100	W	W	3,510
1988	W	--	W	--	64,400	W	W	3,160
1989	W	--	W	--	68,400	W	W	2,740
1990	W	--	W	--	60,400	W	W	2,250
1991	W	--	W	--	64,700	W	W	2,170
1992	W	--	W	--	76,000	W	W	2,020

1993	W	--	W	266	73,000	W	W	1,920
1994	W	--	W	215	106,000	W	W	4,310
1995	262	--	262	262	103,000	100.00	0.25	5,380
1996	242	--	242	242	156,000	100.00	0.16	3,370
1997	356	--	356	356	155,000	100.00	0.23	1,510
1998	242	--	242	489	117,000	49.49	0.21	1,580
1999	450	--	450	450	108,000	100.00	0.42	1,350
2000	W	--	W	--	118,000	0	0	1,360
2001	300	--	300	--	n.d	n.d	n.d	n.d

## Clay

Clay production values are reported in the amount of domestic material sold or used by producers, however abundant clay construction material was not included in this data before 1943 (Kelly and others, 2001). Prior to this time, the scanty clay production values from Idaho that were not withheld amounted to mere hundreds of tons (fig. 2A). Larger production years in Idaho followed, however they did not reach the levels of Montana. From 1970 until 1986, Montana saw an increase in clay production that eventually reached a maximum of nearly 600,000 metric tons (fig. 2B). The combined production from Idaho and Montana also shows the change in clay production reporting in the mid-1940s, as does the U.S. clay production, though the increase on the national scale was much more dramatic. Historically, annual clay mining in Idaho and Montana combined is less than 0.5 percent of what the U.S. has produced as a whole, although production in 1980 and 1981 spiked to approximately 1.4 percent (fig. 2E). Data for world clay production were unavailable.



**Figure 2.** Clay production information from 1905-2001. A, annual production from Idaho. B, annual production from Montana. C, Idaho and Montana combined production. D, annual U.S. clay production in millions of metric tons. E, the proportion of regional production to U.S. mine production. F, the historical value of clay in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 4.** Clay production from Idaho, Montana, and the U.S., 1905–2001

[The table also summarizes the proportions of Idaho and Montana production relative to the US as well as the price for clay in constant 1998 dollars. Data for state and US production are given in metric tons; proportion of US production by Idaho and Montana are given in percent; clay value is in US dollars. W, withheld; n.d., no data; leaders ( \_ \_ ), no production]

Year	Production			Proportion of Idaho and Montana production to:		Clay value (1998 \$/t)
	Idaho	Montana	Idaho and Montana combined	US	US	
1905	--	5,031	5,031	1,661,000	0.30	42.00
1906	--	1,465	1,465	1,868,000	0.08	44.00
1907	--	--	--	2,011,000	--	44.00
1908	--	--	--	1,591,000	--	44.00
1909	--	--	--	1,990,000	--	45.00
1910	W	6,360	6,360	2,197,000	0.29	42.00
1911	W	4,456	4,456	2,017,000	0.22	44.00
1912	W	3,810	3,810	2,325,000	0.16	41.00
1913	W	3,094	3,094	2,436,000	0.13	40.00
1914	W	2,702	2,702	2,042,000	0.13	44.50
1915	W	3,329	3,329	2,200,000	0.15	40.00
1916	W	W	W	2,722,000	W	40.30
1917	W	6,426	6,426	2,925,000	0.22	41.10
1918	W	8,544	8,544	2,777,000	0.31	39.30
1919	W	4,606	4,606	2,160,000	0.21	44.90
1920	792	2,342	3,134	3,091,000	0.10	39.00
1921	178	474	652	1,680,000	0.04	45.60
1922	357	6,680	7,037	2,528,000	0.28	47.20
1923	121	10,545	10,666	3,251,000	0.33	44.40
1924	517	9,319	9,836	3,510,000	0.28	42.10
1925	194	12,271	12,465	3,844,000	0.32	41.50
1926	516	13,595	14,111	3,811,000	0.37	45.50
1927	433	11,981	12,414	3,732,000	0.33	45.80
1928	448	22,265	22,714	3,913,000	0.58	46.40
1929	559	17,346	17,904	4,230,000	0.42	45.50
1930	1,421	6,563	7,983	3,900,000	0.20	45.10
1931	235	3,877	4,112	2,547,000	0.16	48.90
1932	414	1,088	1,501	1,470,000	0.10	57.30
1933	229	991	1,219	1,873,000	0.07	58.20
1934	256	2,427	2,683	2,184,000	0.12	56.50
1935	W	10,291	10,291	2,859,000	0.36	52.50
1936	W	W	W	3,641,000	W	50.40
1937	W	7,843	7,843	4,049,000	0.19	50.50
1938	W	W	W	2,632,000	W	57.80
1939	W	W	W	3,563,000	W	54.90
1940	W	W	W	4,398,000	W	50.00

1941	W	W	W	6,555,000	W	43.90
1942	W	9,914	9,914	6,847,000	0.14	37.70
1943	W	W	W	18,886,000	W	19.30
1944	W	W	W	15,690,000	W	20.60
1945	8,741	22,479	31,219	17,168,000	0.18	22.40
1946	16,961	51,187	68,148	27,727,000	0.25	17.90
1947	28,958	61,610	90,568	30,481,000	0.30	17.20
1948	23,587	49,896	73,483	34,226,000	0.21	16.30
1949	22,680	48,989	71,669	31,888,000	0.22	16.40
1950	23,587	34,474	58,061	35,726,000	0.16	17.40
1951	25,657	35,590	61,247	39,386,000	0.16	19.70
1952	21,349	46,543	67,892	37,801,000	0.18	20.40
1953	23,795	33,561	57,356	38,488,000	0.15	19.10
1954	W	W	W	38,560,000	W	18.50
1955	31,752	W	31,752	43,640,000	0.07	18.40
1956	20,866	29,938	50,803	46,061,000	0.11	20.10
1957	20,866	29,030	49,896	41,388,000	0.12	20.20
1958	24,494	20,866	45,360	39,689,000	0.11	19.20
1959	35,381	41,731	77,112	44,800,000	0.17	18.60
1960	32,659	57,154	89,813	44,515,000	0.20	18.90
1961	24,494	49,896	74,390	42,991,000	0.17	18.50
1962	31,752	50,803	82,555	43,361,000	0.19	18.70
1963	28,123	34,474	62,597	45,482,000	0.14	19.10
1964	26,309	44,453	70,762	48,033,000	0.15	18.90
1965	42,638	68,947	111,586	50,009,000	0.22	19.00
1966	20,866	48,082	68,947	51,449,000	0.13	19.20
1967	17,237	41,731	58,968	49,590,000	0.12	19.40
1968	10,886	27,216	38,102	52,025,000	0.07	18.90
1969	20,866	30,845	51,710	53,246,000	0.10	18.90
1970	11,794	37,195	48,989	49,762,000	0.10	17.72
1971	W	239,501	239,501	51,407,000	0.47	16.99
1972	51,710	275,789	327,499	53,938,000	0.61	17.65
1973	38,102	198,677	236,779	58,378,000	0.41	17.83
1974	8,165	270,346	278,510	55,153,000	0.50	19.27
1975	27,216	202,306	229,522	44,495,000	0.52	21.72
1976	W	174,182	174,182	47,527,000	0.37	23.80
1977	W	203,213	203,213	48,259,000	0.42	24.48
1978	24,494	196,862	221,357	51,548,000	0.43	26.54
1979	25,402	384,653	410,054	49,613,000	0.83	29.04
1980	24,494	567,907	592,402	44,262,000	1.34	30.55
1981	23,587	545,227	568,814	40,260,000	1.41	33.55
1982	7,258	197,770	205,027	32,064,000	0.64	31.80
1983	5,443	175,997	181,440	37,066,000	0.49	31.88
1984	907	207,749	208,656	39,646,000	0.53	31.16
1985	1,814	253,109	254,923	40,908,000	0.62	27.90
1986	1,814	201,398	203,213	40,580,000	0.50	29.44
1987	8,114	26,199	34,313	43,234,000	0.08	24.83
1988	8,519	91,802	100,321	44,515,000	0.23	29.59



1989	W	95,743	95,743	42,254,000	0.23	33.19
1990	W	29,741	29,741	42,900,000	0.07	29.89
1991	967	362,635	363,602	41,000,000	0.89	27.87
1992	W	35,000	35,000	40,200,000	0.09	26.06
1993	W	W	W	40,700,000	W	25.32
1994	W	28,000	28,000	42,000,000	0.07	25.57
1995	1,000	33,000	34,000	43,100,000	0.08	25.86
1996	--	34,000	34,000	43,100,000	0.08	24.50
1997	--	W	W	41,989,000	W	22.59
1998	--	W	W	42,934,000	W	27.02
1999	--	W	W	n.d.	n.d.	n.d.
2000	--	W	W	n.d.	n.d.	n.d.
2001	--	185,000	185,000	n.d.	n.d.	n.d.

## Copper

Although Idaho has occasionally produced around 5000 metric tons of copper per year (fig. 3A), its production is relatively insignificant compared to Montana, specifically the Butte area. Though small yearly fluctuations in production from Montana existed, vein mining at Butte produced roughly 100,000 to 120,000 metric tons per year and reached a peak in 1916 of 160,000 (fig. 3B). The dominance of regional copper production coming from Montana is exemplified in figure 3C where the combined production from Idaho and Montana is nearly identical to the production values in figure 3B. In the early 20th century, Idaho and Montana contributed nearly 35 percent of the national copper production (fig. 3E). However, with the development of open-pit mining of porphyry deposits elsewhere in the U.S. and contribution to a steady growing trend in national copper production, the proportion from Idaho and Montana declined to where it contributed less than five percent of the national production in the late 1990s (Cox and others, 1973). Figure 3F shows a similar decreasing trend in the role of Idaho and Montana in world copper production when, in 1905, they combined for more than 20 percent of world production, but today are less than 1 percent. When vein production began waning in the early to mid-1940s, Butte began transitioning to new methods of extracting ore. Block caving saw greater use in the early 1950s when the Kelley Project came on-line; however by the late 1950s block caving was beginning to be replaced with open pit mining. The Berkeley Pit was started in 1955, which gave the region a boost that persisted through the early 1980's (fig. 3B), though Montana only accounted for about 7 percent of the U.S. copper production (fig. 3E) and 2 to 2.5 percent of world production (fig. 3F).

**Table 5.** Selected events affecting regional copper production

Date	Event	Reference
1907–1908	Drop in copper prices force layoffs and shutdowns	Everett, 2002
1914	Rioting at Miner's Union Day parade in Butte	Everett, 2002
1917	Fire at Granite Mountain mine killed 168 men, workers strike in response	Everett, 2002
1919	Strike over \$1/day wage cuts.	Everett, 2002
Apr. 1921 – Jan. 1922	Butte mines shut down because of the low price of copper	Everett, 2002
Summer 1934	Butte miners strike	Everett, 2002
1946	6-month strike	Edelstein, 1999
1955-82	Butte's Berkeley Pit in operation	Montana Mining Properties, unpub. data, 2003
Aug. 1959 – Feb. 1960	Butte strike lasting 181 days	Everett, 2002
July 1967 – Mar. 1968	Longest strike in Butte's history – 8 ½ months	Everett, 2002
1977	Butte strike	Everett, 2002
1980	4 ½ month strike in Butte	Everett, 2002
1980	Anaconda smelter closes	Everett, 2002
1982-1993	Montana's Troy mine years of operation	this study
1985	Montana Resources acquires Continental Pit, production values withheld	Montana Mining Properties, unpub. data, 2003
1986	East Berkeley Pit reopened by Montana Resources	Montana Mining Properties, unpub. data, 2003
2000	Continental mine suspends operations	this study

**Table 6.** Selected events affecting U.S. copper production

Date	Event	Reference
1906	Large-scale open-pit mining developed on porphyry deposits	Cox and others, 1973
1906	Froth flotation comes into widespread use	Kramer, undated
1913	Introduction of selective flotation process	Cox and others, 1973
1914-18	WWI – high demand	

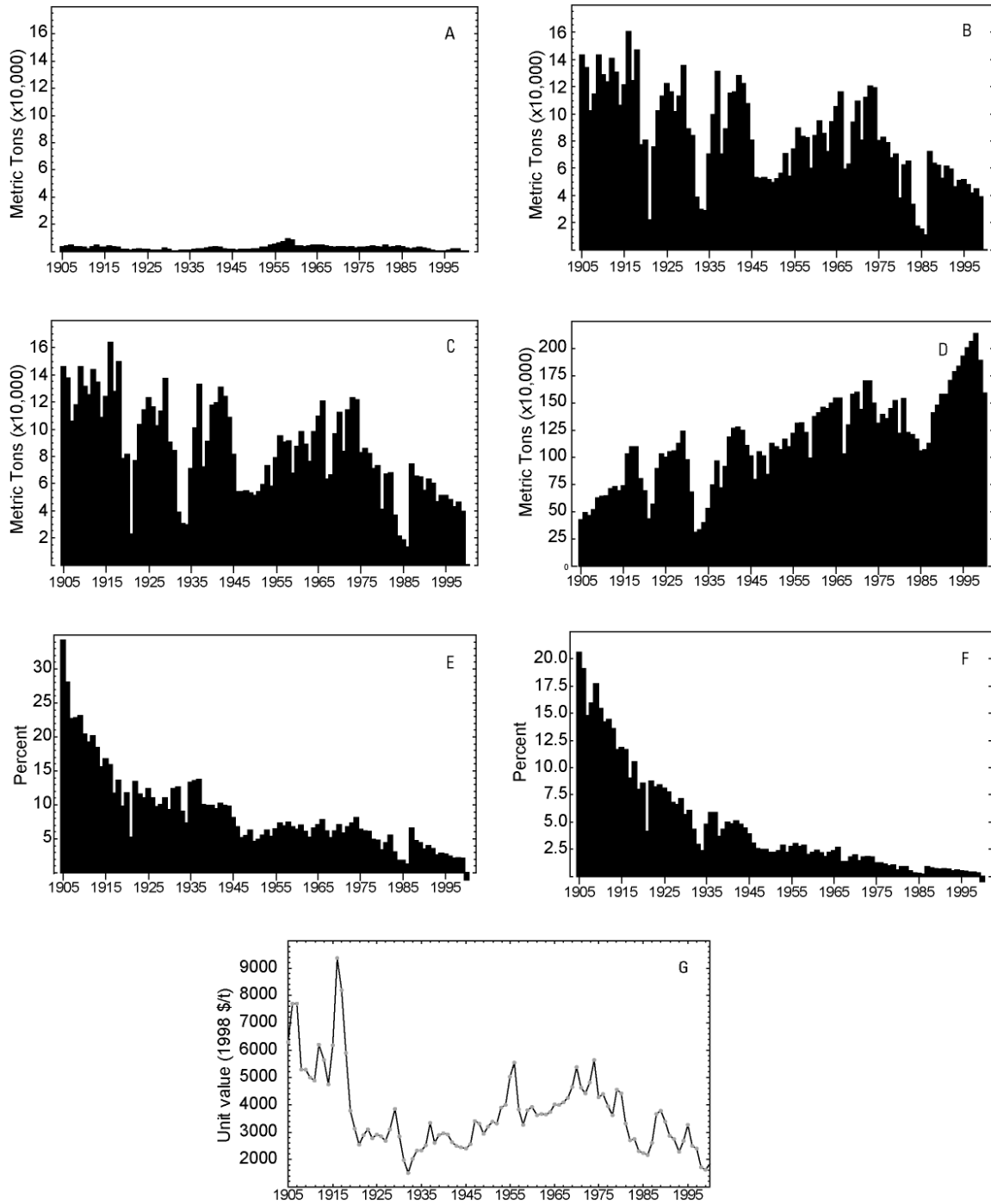
1921	Economic recession	Cox and others, 1973
1929	Panic buying	Cox and others, 1973
1930-39	Great Depression	
1939-45	WWII – high demand	
1954-56	Boom after Korean War	Cox and others, 1973
1968	Electrowinning process to recover copper begins	Kramer, undated
1970-73	High demand on account of the Vietnam War	Edelstein, 1999
1976	First flash copper smelter commissioned in U.S.	Kramer, undated
1982-86	Cutback in capacity at U.S. mines; production sharply curtailed	Edelstein, 1999

The USBM lists copper production data from Montana as “withheld” from 1985 to 2000. Most of the copper production in Montana came from the ore deposits at Butte. After the privately owned Montana Resources acquired the Continental deposit in 1985, copper production data were no longer published in the state commodity reports. The limited amount of production data found in ASARCO annual reports is summarized in table 7. From 2000 to 2003, mining was suspended at the Continental mine because of high energy costs. Recorded production in the ASARCO annual reports is similar to the last reported value for copper in Montana in 1985.

**Table 7.** Copper production, in metric tons, from the Continental mine, 1995 to 1999 (ASARCO, 1999)

	1995	1996	1997	1998	1999
Montana Resources (Continental deposit)	51,170	47,540	41,500	44,600	38,700

Mining activities began in Montana in the early 1880’s; however copper production data for the region prior to 1905 is not included in this report. Figure 4 shows a non-detailed line chart illustrating early copper production values.



**Figure 3.** Copper production information from 1905-2001. A, annual production from Idaho. B, annual production from Montana. C, Idaho and Montana combined production. D, annual U.S. copper production. E, the proportion of regional copper production to U.S. primary production. F, the proportion of regional copper production to world mine production. G, the historical value of copper in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

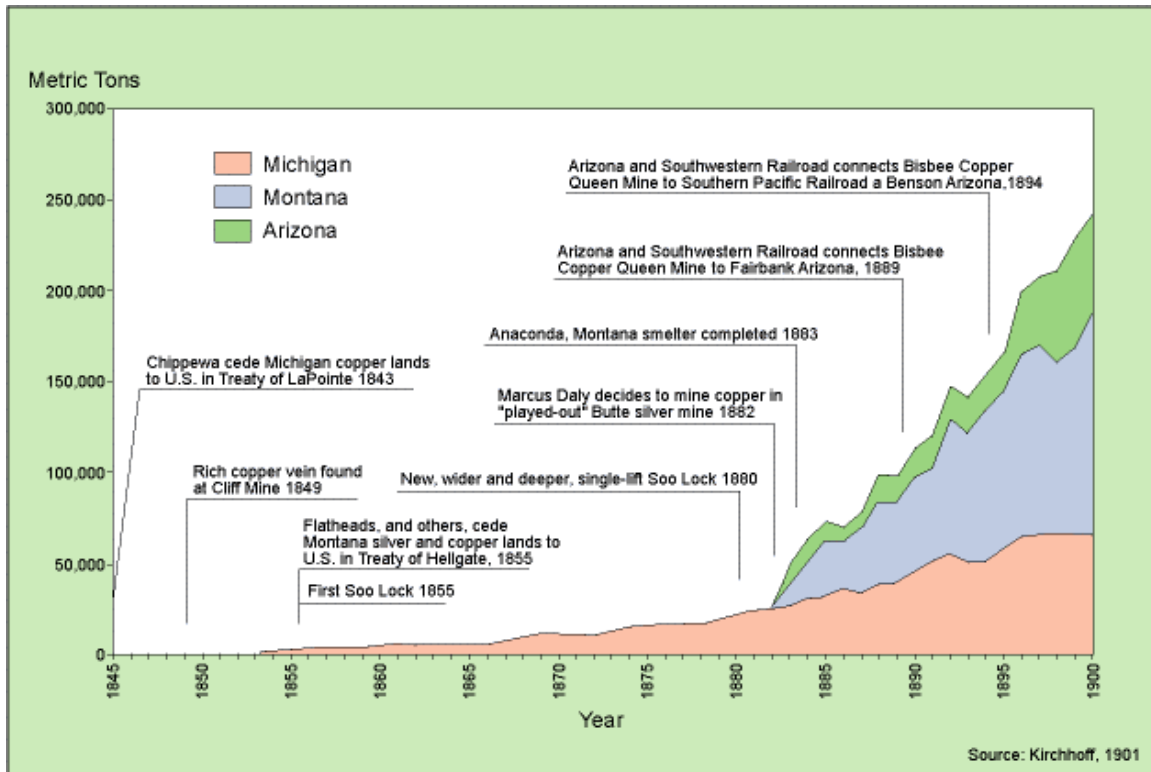


Figure 4. Nineteenth century copper production and associated events (from Goonan, 2002)

Table 8. Copper production from Idaho and Montana, the U.S., and the world, 1905–2000

[The table also summarizes the proportions of Idaho and Montana production relative to the US and the world as well as the price for copper in constant 1998 dollars. National copper production data represent total refined domestic and imported copper produced from ore, concentrate, or precipitate. Data for state, US, and world production are given in metric tons; proportions of US and world production by Idaho and Montana are given in percent; copper value is in US dollars. W, withheld]

Year	Production			Proportion of Idaho and Montana production to:		Copper value (1998\$/t)		
	Idaho	Montana	Idaho and Montana combined	US	World			
1905	3,321	142,771	146,092	426,000	713,000	34.29	20.49	6,300
1906	3,891	133,676	137,567	489,000	724,000	28.13	19.00	7,700
1907	4,403	101,726	106,129	468,000	721,000	22.68	14.72	7,700
1908	3,291	114,536	117,827	516,000	744,000	22.83	15.84	5,300
1909	3,219	142,820	146,039	631,000	828,000	23.14	17.64	5,300
1910	3,120	128,404	131,524	645,000	858,000	20.39	15.33	5,000
1911	2,048	123,295	125,343	650,000	890,000	19.28	14.08	4,900
1912	3,398	140,498	143,896	711,000	1,000,000	20.24	14.39	6,200
1913	4,351	130,559	134,910	733,000	996,000	18.41	13.55	5,630
1914	2,924	105,793	108,717	696,000	938,000	15.62	11.59	4,760
1915	3,166	121,216	124,382	741,000	1,060,000	16.79	11.73	6,180
1916	3,846	160,088	163,934	1,030,000	1,420,000	15.92	11.54	9,360
1917	3,551	124,496	128,047	1,100,000	1,430,000	11.64	8.95	8,190

1918	2,964	146,592	149,556	1,100,000	1,430,000	13.60	10.46	5,890
1919	1,416	77,104	78,520	803,000	994,000	9.78	7.90	3,780
1920	1,151	80,314	81,465	692,000	959,000	11.77	8.49	3,140
1921	766	21,818	22,583	431,000	558,000	5.24	4.05	2,540
1922	1,489	75,186	76,675	569,000	884,000	13.48	8.67	2,900
1923	1,805	101,663	103,468	898,000	1,270,000	11.52	8.15	3,100
1924	1,242	113,015	114,258	1,030,000	1,360,000	11.09	8.40	2,790
1925	1,496	121,978	123,474	1,000,000	1,530,000	12.35	8.07	2,920
1926	607	115,837	116,444	1,050,000	1,510,000	11.09	7.71	2,840
1927	986	101,376	102,362	1,060,000	1,520,000	9.66	6.73	2,690
1928	940	112,612	113,552	1,130,000	1,730,000	10.05	6.56	3,110
1929	2,328	135,049	137,376	1,240,000	1,950,000	11.08	7.04	3,850
1930	1,411	88,991	90,402	978,000	1,610,000	9.24	5.62	2,860
1931	519	83,714	84,234	681,000	1,400,000	12.37	6.02	1,980
1932	519	38,487	39,005	309,000	909,000	12.62	4.29	1,520
1933	709	29,700	30,409	336,000	1,050,000	9.05	2.90	2,020
1934	695	28,697	29,392	404,000	1,280,000	7.28	2.30	2,330
1935	951	70,289	71,239	534,000	1,500,000	13.34	4.75	2,330
1936	1,340	99,378	100,718	746,000	1,720,000	13.50	5.86	2,520
1937	2,025	131,116	133,141	968,000	2,290,000	13.75	5.81	3,350
1938	1,941	70,048	71,988	719,000	1,990,000	10.01	3.62	2,610
1939	2,283	88,749	91,031	916,000	2,130,000	9.94	4.27	2,900
1940	3,038	114,662	117,700	1,190,000	2,400,000	9.89	4.90	2,960
1941	3,285	116,154	119,439	1,270,000	2,480,000	9.40	4.82	2,930
1942	3,112	128,091	131,203	1,280,000	2,590,000	10.25	5.07	2,650
1943	2,108	122,041	124,149	1,250,000	2,620,000	9.93	4.74	2,500
1944	1,531	107,222	108,753	1,110,000	2,460,000	9.80	4.42	2,450
1945	1,404	80,293	81,697	1,010,000	2,110,000	8.09	3.87	2,410
1946	942	53,054	53,996	797,000	1,780,000	6.77	3.03	2,580
1947	1,488	52,527	54,015	1,050,000	2,130,000	5.14	2.54	3,420
1948	1,473	52,846	54,320	1,010,000	2,210,000	5.38	2.46	3,320
1949	1,305	51,357	52,662	842,000	2,140,000	6.25	2.46	2,940
1950	1,911	49,422	51,334	1,130,000	2,380,000	4.54	2.16	3,210
1951	1,960	52,079	54,038	1,100,000	2,490,000	4.91	2.17	3,400
1952	2,915	56,199	59,114	1,070,000	2,570,000	5.52	2.30	3,310
1953	2,845	70,414	73,259	1,170,000	2,600,000	6.26	2.82	3,910
1954	4,380	53,841	58,221	1,100,000	2,640,000	5.29	2.21	4,000
1955	5,097	73,975	79,072	1,220,000	2,900,000	6.48	2.73	5,040
1956	6,038	89,292	95,330	1,310,000	3,200,000	7.28	2.98	5,540
1957	7,178	83,020	90,197	1,320,000	3,300,000	6.83	2.73	3,840
1958	8,932	82,268	91,200	1,230,000	3,190,000	7.41	2.86	3,280
1959	7,904	59,794	67,699	996,000	3,430,000	6.80	1.97	3,820
1960	3,817	83,437	87,254	1,380,000	3,940,000	6.32	2.21	3,920
1961	3,926	94,349	98,275	1,410,000	4,090,000	6.97	2.40	3,630
1962	3,503	85,296	88,799	1,460,000	4,220,000	6.08	2.10	3,670
1963	3,785	72,360	76,145	1,450,000	4,290,000	5.25	1.77	3,640
1964	4,233	94,173	98,406	1,500,000	4,450,000	6.56	2.21	3,750
1965	4,663	104,772	109,435	1,550,000	4,660,000	7.06	2.35	4,020
1966	4,501	116,177	120,678	1,550,000	4,580,000	7.79	2.63	3,990
1967	3,819	59,406	63,225	1,030,000	4,630,000	6.14	1.37	4,100

1968	3,198	63,032	66,230	1,300,000	5,010,000	5.09	1.32	4,260
1969	3,023	93,726	96,749	1,580,000	5,520,000	6.12	1.75	4,649
1970	3,277	109,238	112,515	1,600,000	5,900,000	7.03	1.91	5,375
1971	3,426	80,361	83,786	1,440,000	5,940,000	5.82	1.41	4,623
1972	2,669	111,685	114,354	1,700,000	6,540,000	6.73	1.75	4,420
1973	3,289	120,173	123,462	1,700,000	6,920,000	7.26	1.78	4,811
1974	2,577	118,962	121,539	1,500,000	7,100,000	8.10	1.71	5,631
1975	2,896	79,796	82,692	1,310,000	6,740,000	6.31	1.23	4,285
1976	3,050	82,656	85,706	1,400,000	7,260,000	6.12	1.18	4,393
1977	3,676	78,202	81,878	1,360,000	7,420,000	6.02	1.10	3,960
1978	3,888	67,325	71,213	1,450,000	7,280,000	4.91	0.98	3,625
1979	3,618	69,854	73,472	1,520,000	7,350,000	4.83	1.00	4,565
1980	3,103	37,749	40,852	1,220,000	7,200,000	3.35	0.57	4,419
1981	4,245	62,485	66,730	1,540,000	7,690,000	4.33	0.87	3,328
1982	3,074	64,951	68,025	1,230,000	7,580,000	5.53	0.90	2,711
1983	3,556	33,337	36,893	1,210,000	7,610,000	3.05	0.48	2,761
1984	3,701	17,237	20,938	1,170,000	7,810,000	0.32	0.05	2,313
1985	3,551	15,092	18,643	1,060,000	7,990,000	1.76	0.23	2,238
1986	2,501	10,955	13,456	1,070,000	7,940,000	1.26	0.17	2,165
1987	2,020	72,404	74,425	1,130,000	8,240,000	6.59	0.90	2,609
1988	2,269	63,190	2,269	1,410,000	8,720,000	0.16	0.03	3,662
1989	2,950	61,834	2,950	1,480,000	9,040,000	0.20	0.03	3,797
1990	2,520	52,435	54,955	1,580,000	9,200,000	3.48	0.60	3,383
1991	1,793	61,326	63,118	1,580,000	9,330,000	3.99	0.68	2,885
1992	1,001	59,421	60,421	1,710,000	9,470,000	3.53	0.64	2,751
1993	368	46,085	46,453	1,790,000	9,490,000	2.60	0.49	2,278
1994	375	50,893	51,268	1,840,000	9,500,000	2.79	0.54	2,692
1995	332	51,165	51,497	1,930,000	10,000,000	2.67	0.51	3,262
1996	943	47,536	48,480	2,010,000	11,000,000	2.41	0.44	2,498
1997	1,623	41,458	43,081	2,070,000	11,400,000	2.08	0.38	2,395
1998	1,670	44,634	46,304	2,140,000	12,100,000	2.16	0.38	1,734
1999	561	38,646	39,207	1,890,000	12,700,000	2.07	0.31	1,638
2000	463	W	463	1,590,000	13,200,000	W	W	1,841

## Fluorspar

Regional fluorspar production is limited to the contribution from Montana as the fluorspar industry in Idaho was small and sporadic throughout the 20<sup>th</sup> century. The Crystal Mountain open pit mine in the Bitterroot Valley of Montana was historically one of the world's largest fluorspar mines and was the primary source of fluorspar coming out of Montana in the 1950's. Montana was an abundant fluorspar producer from 1952 until 1977, shipping between 10,000 and 60,000 metric tons in the years from 1952-1961 before production reporting was withheld in subsequent years (fig. 5A). Prior to Montana's involvement in the fluorspar industry, production within the U.S. increased during the early thirties, owing to an expansion in the use of freon as a refrigerant (Kramer, undated). In the 1950's, Montana represented a large proportion of the national production, contributing nearly 20 percent in 1957 (fig. 5C). The large output from Montana during that decade similarly amounted to a large proportion of the world's production of fluorspar. Throughout the 1950's, between 1 and 3 percent of the world's fluorspar production originated in the state of Montana (fig. 5D). However, this positive trend reversed in the late 1960's, and Montana's production has declined ever since. The Montreal Protocol, introduced in 1987, called for the phasing out of fluorocarbons (Kramer, undated). This prompted a drastic decline in the price of fluorspar, which saw a 2/3 devaluation of its near high value of the early 1980s (fig. 5E). The price of the commodity never recovered, and the last U.S. fluorspar mine suspended operations in 1995 (Kramer, undated).

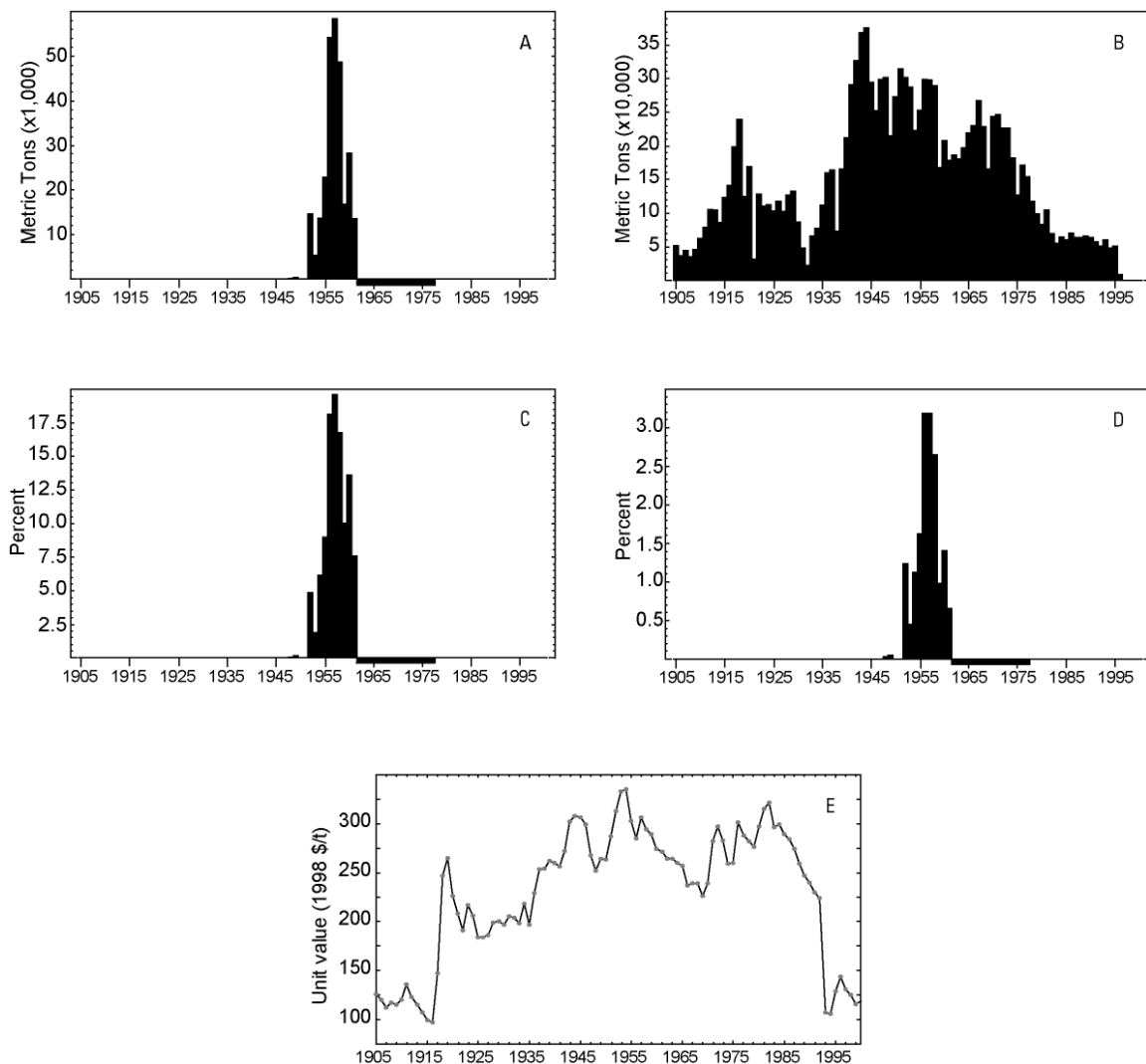
**Table 9.** Selected events affecting regional fluorspar production

<b>Year</b>	<b>Event</b>	<b>Reference</b>
1941	Crystal Mountain deposit discovered	this study

**Table 10.** Selected events affecting U.S. fluorspar production

<b>Year</b>	<b>Event</b>	<b>Reference</b>
1914-18	WWI – high demand	
1931	Synthetic refrigerant freon first produced	Kramer, undated
1939-45	WWI – high demand	
1987	Montreal Protocol adopted. Phase out of chlorofluorocarbons	Kramer, undated
1995	Last US fluorspar mine closes	Kramer, undated





**Figure 5.** Fluspar production information from 1905-2001. A, annual production from Montana. B, annual U.S. fluspar production. C, the proportion of Montana fluspar production to U.S. production. D, the proportion of Montana fluspar production to world production. E, the historical value of fluspar in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 11.** Fluspar production from Idaho and Montana, the U.S., and the world, 1905–2000

[The table also summarizes the proportions of Idaho and Montana production relative to the US and the world as well as the price for fluspar in constant 1998 dollars. Data for state, US, and world production are given in metric tons; proportions of US and world production by Idaho and Montana are given in percent; fluspar value is in US dollars. W, withheld; leaders ( \_ \_ ), no production; n.d., no data]

Year	Production			Proportion of Montana production to:		Fluspar value (1998\$/t)
	Montana	US	World	US	World	
1905	--	52,000	n.d.	--	--	126
1906	--	37,000	n.d.	--	--	120
1907	--	44,800	n.d.	--	--	112

1908	--	35,100	n.d.	--	--	117
1909	--	46,000	n.d.	--	--	115
1910	--	63,000	n.d.	--	--	120
1911	--	78,900	n.d.	--	--	136
1912	--	106,000	n.d.	--	--	123
1913	--	105,000	171,000	--	--	115
1914	--	86,300	121,000	--	--	107
1915	--	124,000	163,000	--	--	99
1916	--	141,000	201,000	--	--	97
1917	--	198,000	279,000	--	--	147
1918	--	239,000	313,000	--	--	247
1919	--	125,000	196,000	--	--	265
1920	--	169,000	264,000	--	--	226
1921	--	31,700	92,500	--	--	208
1922	--	128,000	208,000	--	--	191
1923	--	110,000	215,000	--	--	217
1924	--	113,000	255,000	--	--	206
1925	--	103,000	263,000	--	--	184
1926	--	117,000	310,000	--	--	184
1927	--	102,000	317,000	--	--	186
1928	--	127,000	345,000	--	--	199
1929	--	133,000	376,000	--	--	200
1930	--	86,900	291,000	--	--	197
1931	--	48,400	166,000	--	--	205
1932	--	22,900	128,000	--	--	204
1933	--	66,100	229,000	--	--	198
1934	--	77,700	286,000	--	--	218
1935	--	112,000	340,000	--	--	197
1936	--	160,000	455,000	--	--	229
1937	--	164,000	519,000	--	--	253
1938	--	72,900	456,000	--	--	254
1939	--	166,000	577,000	--	--	262
1940	--	212,000	616,000	--	--	260
1941	--	291,000	698,000	--	--	256
1942	--	327,000	883,000	--	--	272
1943	--	368,000	1,040,000	--	--	302
1944	--	375,000	1,040,000	--	--	308
1945	--	294,000	674,000	--	--	306
1946	--	252,000	524,000	--	--	299
1947	--	299,000	655,000	--	--	268
1948	288	301,000	795,000	0.10	0.036	252
1949	383	215,000	710,000	0.18	0.054	264
1950	37	273,000	844,000	0.01	0.004	263
1951	--	315,000	1,030,000	--	--	287
1952	14,660	301,000	1,180,000	4.87	1.242	313
1953	5,382	288,000	1,210,000	1.87	0.445	333
1954	13,701	223,000	1,220,000	6.14	1.123	335
1955	22,882	254,000	1,410,000	9.01	1.623	303

1956	54,228	299,000	1,700,000	18.14	3.190	285
1957	58,368	298,000	1,830,000	19.59	3.190	306
1958	48,675	290,000	1,840,000	16.78	2.645	294
1959	16,821	168,000	1,720,000	10.01	0.978	289
1960	28,371	208,000	2,020,000	13.64	1.404	274
1961	13,522	179,000	2,060,000	7.55	0.656	271
1962	W	187,000	2,150,000	W	W	264
1963	W	181,000	2,150,000	W	W	264
1964	W	197,000	2,460,000	W	W	260
1965	W	219,000	2,770,000	W	W	257
1966	W	230,000	2,840,000	W	W	237
1967	W	268,000	3,170,000	W	W	239
1968	W	229,000	3,640,000	W	W	239
1969	W	166,000	3,890,000	W	W	226
1970	W	244,000	4,190,000	W	W	239
1971	W	247,000	4,760,000	W	W	282
1972	W	227,000	4,530,000	W	W	297
1973	W	226,000	4,580,000	W	W	283
1974	W	182,000	4,860,000	W	W	259
1975	W	127,000	4,520,000	W	W	260
1976	W	171,000	4,320,000	W	W	301
1977	W	154,000	4,380,000	W	W	288
1978	--	117,000	4,670,000	--	--	282
1979	--	99,200	4,610,000	--	--	276
1980	--	84,000	5,010,000	--	--	297
1981	--	105,000	5,100,000	--	--	315
1982	--	69,900	4,530,000	--	--	321
1983	--	55,300	4,230,000	--	--	296
1984	--	65,300	4,830,000	--	--	299
1985	--	59,900	4,980,000	--	--	289
1986	--	70,800	4,850,000	--	--	284
1987	--	63,500	4,600,000	--	--	274
1988	--	63,500	5,280,000	--	--	259
1989	--	66,000	5,560,000	--	--	247
1990	--	63,500	5,120,000	--	--	240
1991	--	58,000	4,300,000	--	--	230
1992	--	51,000	4,120,000	--	--	224
1993	--	60,000	4,180,000	--	--	107
1994	--	49,000	3,750,000	--	--	106
1995	--	51,000	4,170,000	--	--	129
1996	--	8,200	4,040,000	--	--	144
1997	--	--	4,170,000	--	--	131
1998	--	--	4,370,000	--	--	125
1999	--	--	4,420,000	--	--	116
2000	--	--	4,520,000	--	--	119

## Gold

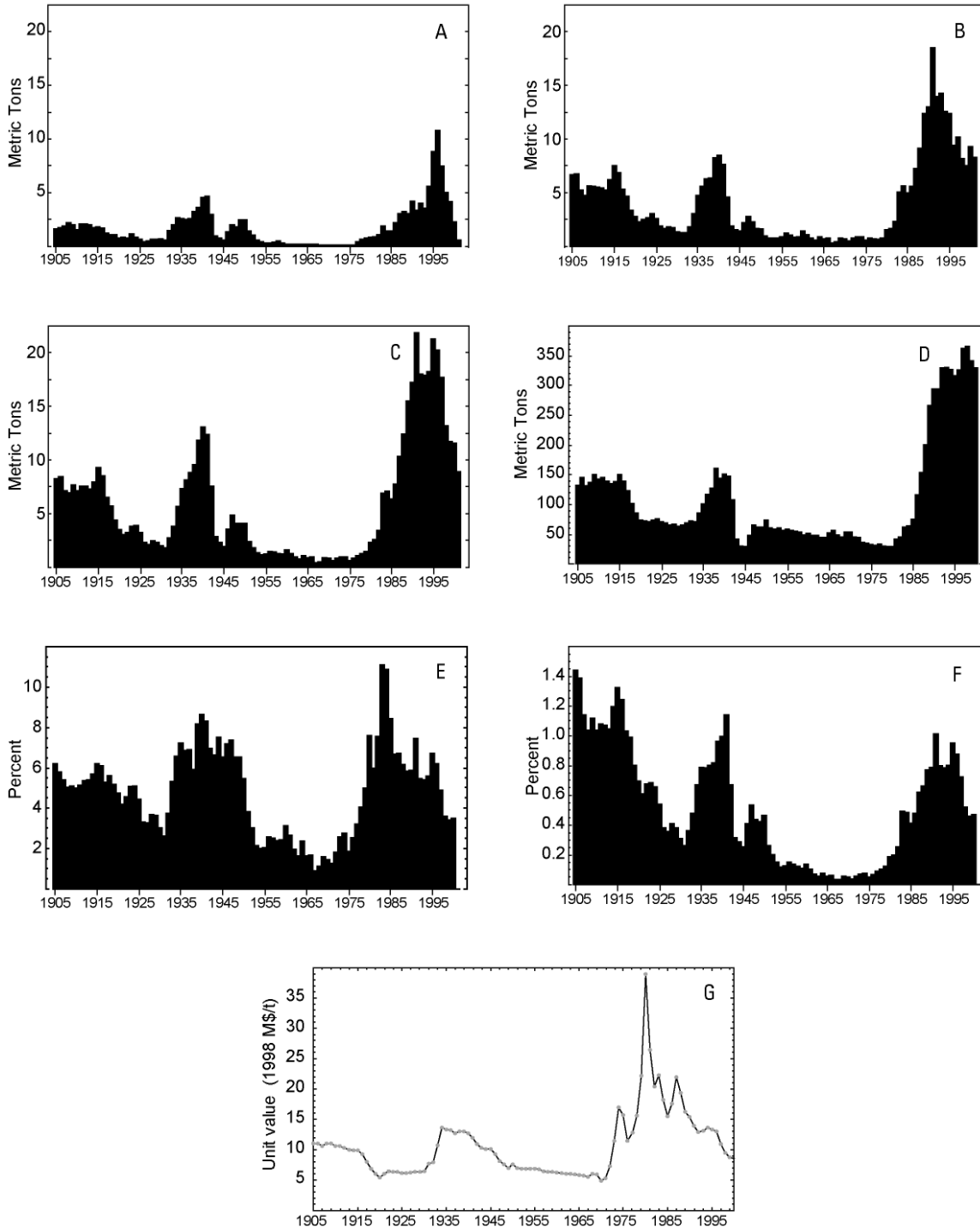
Gold mining in Idaho, Montana, and the U.S. over the last century show similar trends that are closely tied to price. The production of gold in both Idaho (fig. 6A) and Montana (fig. 6B) began increasing in the early 1930's until the demand for copper miners during World War II forced the closure of many non-essential gold mines (Kramer, undated). Though gold production in Montana and Idaho were similarly affected by the war, historic production levels from Montana have exceeded the production from Idaho by a factor of about three. By 1946, when restrictions on mining had been lifted, production in Idaho had decreased to less than 0.5 metric tons per year and in Montana to about one metric ton per year. This was much lower than pre-war production levels when Idaho and Montana combined production was more than 13 metric tons in 1940 (fig. 6C). In 1980, the price of gold ballooned to \$850 per ounce, which coincided with an increase in U.S. gold production, as well as an increase from both Idaho and Montana (Kramer, undated). These two peaks in production (around 1940 and again in the early eighties) each accounted for more than eight percent of the U.S. gold production (fig. 6E). The 1940 and 1980 peaks also figure prominently in world production (fig. 6F); however the largest proportion from Idaho and Montana came much earlier, in the beginning of the 20<sup>th</sup> century. Historically, production of gold in Idaho, Montana, and the U.S., has varied with value, showing a close link between production and price (fig. 6G).

**Table 12.** Selected events affecting regional gold production

<b>Year</b>	<b>Event</b>	<b>Reference</b>
1931	Gold Hill plant and mill destroyed in forest fire	this study
1942-46	Boise Basin shut down during war	this study
1979-98	Montana's Zortman-Landusky mine in operation	this study
1998	Montana passes law banning use of cyanide in all future mining	this study
1999	Beartrack mine in Idaho closes	this study
2000	Continental mine in Montana suspends operations	this study

**Table 13.** Selected events affecting U.S. gold production

<b>Year</b>	<b>Event</b>	<b>Reference</b>
1934	Gold reserve act of 1934 enacted	Kramer, undated
1939-1945	WWII - Most gold mining curtailed when miners were needed for critical minerals such as copper	Kramer, undated
1946	Gold mining resumed	Kramer, undated
1980	Gold price peaks at \$850 per ounce	Kramer, undated
1981	Development of low-grade Carlin-type and hot spring gold deposits in Nevada, along with improved heap leach recovery technology led to increased national production.	this study



**Figure 6.** Gold production information from 1905-2001. A, annual production from Idaho. B, annual production from Montana. C, Idaho and Montana combined production. D, annual U.S. domestic mine production. E, the proportion of regional gold production to U.S. mine production. F, the proportion of regional gold production to world production. G, the historical value of gold in constant 1998 dollars.

**Table 14.** Gold production from Idaho and Montana, the U.S., and the world, 1905–2000

[The table also summarizes the proportions of Idaho and Montana production relative to the US and the world as well as the price for gold in constant 1998 dollars. Data for state, US, and world production are given in metric tons; proportions of US and world production by Idaho and Montana are given in percent; gold value is in millions of US dollars per ton. W, withheld; n.d., no data]

Year	Production					Proportion of Idaho and Montana production to:		Gold value (1998 M\$/t)
	Idaho	Montana	Idaho and Montana combined	US	World	US	World	
1905	1.62	6.65	8.27	133	575	6.22	1.44	11
1906	1.73	6.72	8.45	146	608	5.79	1.39	11
1907	1.89	5.22	7.11	132	623	5.39	1.14	10.6
1908	2.17	4.75	6.93	138	668	5.02	1.04	11
1909	2.02	5.64	7.67	150	687	5.11	1.12	11
1910	1.56	5.60	7.16	143	689	5.00	1.04	10.6
1911	2.04	5.49	7.53	146	699	5.16	1.08	10.6
1912	2.08	5.45	7.53	140	705	5.38	1.07	10.3
1913	2.02	5.26	7.28	135	694	5.39	1.05	10
1914	1.73	6.20	7.93	139	663	5.70	1.20	9.9
1915	1.78	7.53	9.30	150	704	6.20	1.32	9.89
1916	1.68	6.85	8.53	140	685	6.09	1.24	9.3
1917	1.21	5.29	6.50	123	631	5.29	1.03	8
1918	1.06	4.67	5.73	102	578	5.62	0.99	6.87
1919	1.07	3.35	4.43	85.6	550	5.17	0.81	6.04
1920	0.73	2.79	3.52	74.1	507	4.74	0.69	5.37
1921	0.82	2.23	3.05	72.9	498	4.18	0.61	6.03
1922	0.75	2.49	3.25	71.3	481	4.55	0.68	6.49
1923	1.15	2.65	3.80	74.8	554	5.08	0.69	6.35
1924	0.84	3.04	3.88	76.0	592	5.11	0.66	6.34
1925	0.65	2.55	3.20	71.8	591	4.46	0.54	6.18
1926	0.43	1.88	2.31	69.4	602	3.32	0.38	6.11
1927	0.48	1.67	2.14	65.5	597	3.27	0.36	6.24
1928	0.65	1.81	2.46	66.8	603	3.69	0.41	6.33
1929	0.63	1.70	2.33	64.0	609	3.65	0.38	6.31
1930	0.67	1.35	2.02	66.5	648	3.04	0.31	6.47
1931	0.57	1.25	1.82	69.2	695	2.63	0.26	7.74
1932	1.46	1.26	2.72	72.5	754	3.75	0.36	7.94
1933	2.01	1.80	3.81	71.7	793	5.31	0.48	10.7
1934	2.64	3.03	5.67	86.4	841	6.56	0.67	13.6
1935	2.61	4.70	7.31	101	924	7.23	0.79	13.3
1936	2.50	5.61	8.10	118	1,030	6.87	0.79	13.2
1937	2.55	6.29	8.84	128	1,100	6.90	0.80	12.7
1938	3.22	6.32	9.54	161	1,170	5.93	0.82	13
1939	3.63	8.22	11.85	145	1,230	8.17	0.96	13
1940	4.56	8.48	13.03	151	1,310	8.63	1.00	12.7
1941	4.66	7.67	12.33	148	1,080	8.33	1.14	12
1942	2.96	4.57	7.52	108	1,120	6.97	0.67	10.9
1943	0.96	1.85	2.81	42.4	896	6.63	0.31	10.3
1944	0.78	1.56	2.33	31.1	813	7.50	0.29	10.1

1945	0.55	1.39	1.94	29.7	762	6.53	0.25	10.1
1946	1.34	2.19	3.53	49.0	860	7.20	0.41	9.32
1947	2.02	2.80	4.82	65.6	900	7.35	0.54	8.15
1948	1.82	2.27	4.09	62.7	932	6.53	0.44	7.56
1949	2.42	1.64	4.06	62.0	964	6.55	0.42	6.97
1950	2.48	1.61	4.09	74.5	879	5.49	0.47	7.56
1951	1.40	0.95	2.35	61.6	883	3.82	0.27	7.01
1952	1.03	0.75	1.78	58.9	868	3.02	0.20	6.83
1953	0.55	0.77	1.32	60.9	864	2.17	0.15	6.83
1954	0.41	0.74	1.15	57.1	965	2.01	0.12	6.83
1955	0.33	0.87	1.20	58.5	947	2.06	0.13	6.86
1956	0.29	1.19	1.47	56.8	978	2.59	0.15	6.75
1957	0.38	1.02	1.40	55.8	1,020	2.51	0.14	6.51
1958	0.49	0.81	1.30	54.1	1,050	2.41	0.12	6.36
1959	0.33	0.89	1.21	49.9	1,130	2.43	0.11	6.31
1960	0.19	1.43	1.62	51.8	1,190	3.13	0.14	6.24
1961	0.18	1.10	1.28	48.2	1,230	2.65	0.10	6.16
1962	0.18	0.76	0.94	48.0	1,290	1.96	0.07	6.09
1963	0.17	0.58	0.75	45.2	1,340	1.65	0.06	6.01
1964	0.18	0.91	1.08	45.3	1,390	2.39	0.08	5.93
1965	0.16	0.71	0.87	53.0	1,440	1.63	0.06	5.84
1966	0.16	0.78	0.94	56.1	1,450	1.67	0.06	5.68
1967	0.15	0.30	0.45	49.3	1,420	0.92	0.03	5.53
1968	0.10	0.42	0.52	46.0	1,440	1.12	0.04	6.04
1969	0.11	0.75	0.86	53.9	1,450	1.59	0.06	5.94
1970	0.10	0.70	0.80	54.2	1,480	1.47	0.05	4.92
1971	0.11	0.49	0.60	46.5	1,450	1.28	0.04	5.34
1972	0.09	0.74	0.83	45.1	1,390	1.84	0.06	7.34
1973	0.08	0.86	0.95	36.6	1,350	2.59	0.07	11.5
1974	0.09	0.88	0.97	35.1	1,250	2.76	0.08	17
1975	0.08	0.54	0.62	32.7	1,200	1.88	0.05	15.7
1976	0.09	0.75	0.83	32.6	1,210	2.56	0.07	11.5
1977	0.40	0.70	1.10	34.2	1,210	3.21	0.09	12.8
1978	0.64	0.62	1.26	31.1	1,210	4.05	0.10	15.6
1979	0.75	0.75	1.50	30.0	1,210	5.00	0.12	22.2
1980	0.79	1.50	2.29	30.2	1,220	7.60	0.19	39
1981	0.87	1.69	2.56	42.9	1,280	5.97	0.20	26.5
1982	1.10	2.34	3.44	45.6	1,340	7.54	0.26	20.4
1983	1.89	5.02	6.91	62.3	1,400	11.09	0.49	22.3
1984	1.41	5.64	7.05	64.9	1,460	10.86	0.48	18.2
1985	1.38	4.98	6.36	75.5	1,530	8.43	0.42	15.5
1986	2.19	5.56	7.75	116	1,610	6.68	0.48	17.6
1987	3.04	7.29	10.33	154	1,660	6.71	0.62	22
1988	3.22	9.17	12.39	201	1,870	6.17	0.66	19.4
1989	3.06	12.43	15.49	266	2,010	5.82	0.77	16.2
1990	4.22	13.01	17.23	294	2,180	5.86	0.79	15.4
1991	3.35	18.51	21.86	294	2,160	7.44	1.01	14
1992	4.04	13.99	18.03	330	2,260	5.46	0.80	12.9
1993	3.53	14.33	17.85	331	2,280	5.39	0.78	13.1
1994	5.60	12.60	18.20	327	2,260	5.57	0.81	13.6

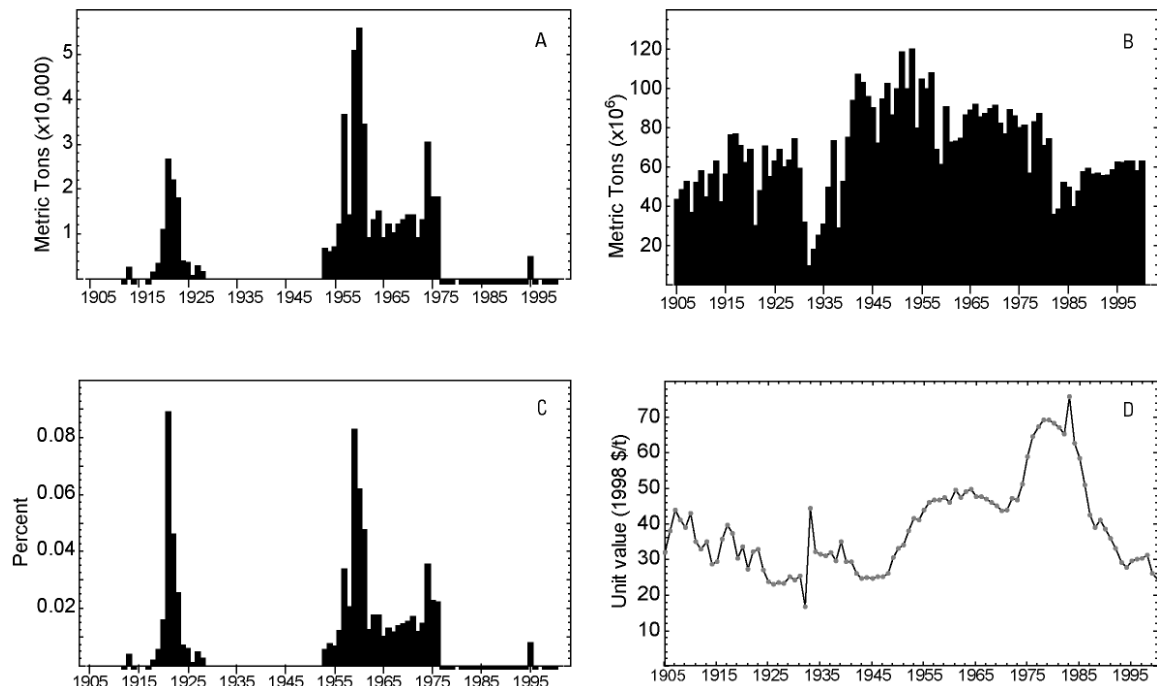
1995	8.85	12.40	21.25	317	2,230	6.70	0.95	13.3
1996	10.80	9.44	20.24	326	2,300	6.21	0.88	13
1997	7.49	10.20	17.69	362	2,450	4.89	0.72	10.9
1998	4.99	8.20	13.19	366	2,520	3.60	0.52	9.49
1999	4.17	7.54	11.71	341	2,540	3.43	0.46	8.78
2000	2.26	9.31	11.57	330	2,450	3.51	0.47	8.59
2001	0.59	8.28	8.87	n.d.	n.d.	W	n.d.	n.d.

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## Iron

Iron ore production from Montana was limited and often sporadic and there is no recorded production of iron from Idaho. From 1905 to 2001, there were two periods of activity when iron ore mining operations increased in Montana (fig. 7A). Iron ore production began in 1914 and had increased to over 26,000 metric tons by 1921. However, a long period of inactivity occurred between 1929 and 1952. The most prolific year for Montana's iron ore industry was 1960, when nearly 56,000 metric tons of iron ore were shipped. Iron production records in Montana were mostly withheld after 1976. Like Montana, U.S. iron production levels also varied widely by year, but national trends do not show the sharp production peaks that are seen in the trends from Montana (fig. 7B). The minor role of Montana in U.S. iron production is shown in figure 7C where Montana accounts for less than 0.1 percent in any given year. Because of the very small numbers associated with Montana iron production as a percentage of the world's production, a chart was not produced for this data.



**Figure 7.** Iron production information from 1905-2001. A, annual production from Montana. B, annual U.S. production. C, the proportion of regional iron production to U.S. production. D, the historical value of iron in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 15.** Iron production from Montana, the U.S., and the world, 1905–2000

[The table also summarizes the proportions of Montana production relative to the US and the world as well as the price for iron in constant 1998 dollars. Data for state, US, and world production are given in metric tons; proportions of US and world production by Montana are given in percent; iron value is in US dollars. W, withheld; leaders ( \_ \_ ), no production; n.d., no data]

Year	Production			Proportion of Montana production to:		Iron value (1998 \$/t)
	Montana	US	World	US	World	
1905	_ _	43,209,000	115,567,600	_ _	_ _	32.00

1906	--	48,516,000	--	--	--	38.00
1907	--	52,551,000	--	--	--	44.00
1908	--	36,561,000	--	--	--	41.00
1909	--	51,976,000	--	--	--	39.00
1910	--	57,803,000	160,074,200	--	--	43.00
1911	--	44,581,000	130,974,700	--	--	35.00
1912	W	56,056,000	149,053,100	W	W	33.00
1913	2,515	62,975,000	180,419,900	0.004	0.001	34.90
1914	W	42,105,000	115,739,600	W	W	28.60
1915	--	56,418,000	139,304,500	--	--	29.40
1916	--	76,374,000	141,959,100	--	--	35.80
1917	W	76,497,000	126,849,200	W	W	39.70
1918	1,438	70,776,000	110,411,180	0.002	0.001	37.40
1919	3,493	61,944,000	124,085,500	0.006	0.003	30.20
1920	10,976	68,690,000	124,085,500	0.016	0.009	33.70
1921	26,594	29,964,000	104,230,200	0.089	0.026	27.30
1922	22,075	47,885,000	132,067,900	0.046	0.017	32.20
1923	18,036	70,465,000	129,711,400	0.026	0.014	32.80
1924	3,976	55,138,000	151,267,000	0.007	0.003	27.00
1925	3,731	62,902,000	154,903,000	0.006	0.002	23.80
1926	736	68,708,000	171,300,000	0.001	0.000	23.10
1927	2,883	60,158,000	171,380,000	0.005	0.002	23.40
1928	1,666	63,195,000	199,500,000	0.003	0.001	23.30
1929	--	74,200,000	178,400,000	--	--	25.20
1930	--	59,346,000	118,780,000	--	--	24.20
1931	--	31,631,000	118,780,000	--	--	25.30
1932	--	9,639,200	76,200,000	--	--	16.80
1933	--	17,835,000	91,200,000	--	--	44.30
1934	--	24,982,000	120,100,000	--	--	32.20
1935	--	31,030,000	140,900,000	--	--	31.60
1936	--	49,572,000	170,000,000	--	--	31.10
1937	--	73,251,000	211,000,000	--	--	32.00
1938	--	28,904,000	162,000,000	--	--	29.60
1939	--	52,562,000	200,000,000	--	--	35.10
1940	--	74,879,000	203,600,000	--	--	29.30
1941	--	93,893,000	219,540,000	--	--	29.30
1942	--	107,220,000	235,000,000	--	--	26.10
1943	--	102,870,000	231,000,000	--	--	24.70
1944	--	95,628,000	203,000,000	--	--	24.90
1945	--	89,795,000	162,000,000	--	--	24.70
1946	--	71,980,000	154,000,000	--	--	25.10
1947	--	94,586,000	187,000,000	--	--	25.10
1948	--	102,620,000	219,000,000	--	--	26.20
1949	--	86,301,000	223,000,000	--	--	30.50
1950	--	99,619,000	294,272,000	--	--	33.20
1951	--	118,370,000	297,295,300	--	--	34.00
1952	--	99,490,000	338,103,800	--	--	38.10
1953	6,817	119,890,000	305,762,000	0.006	0.002	41.50

1954	6,096	79,383,000	305,762,000	0.008	0.002	41.00
1955	7,112	104,660,000	369,248,700	0.007	0.002	44.00
1956	12,193	99,448,000	394,511,700	0.012	0.003	46.00
1957	36,578	107,850,000	433,523,800	0.034	0.008	46.80
1958	14,225	68,796,000	398,740,000	0.021	0.004	46.70
1959	50,802	61,243,000	432,182,000	0.083	0.012	47.40
1960	55,883	90,209,000	513,926,000	0.062	0.011	45.90
1961	34,546	72,474,000	494,604,000	0.048	0.007	49.60
1962	9,144	72,982,000	499,710,000	0.013	0.002	47.40
1963	13,209	74,780,000	515,135,000	0.018	0.003	49.00
1964	15,241	86,198,000	573,449,000	0.018	0.003	49.80
1965	9,144	88,842,000	611,187,000	0.010	0.001	47.70
1966	12,193	91,594,000	625,799,000	0.013	0.002	47.70
1967	10,160	85,530,000	612,820,000	0.012	0.002	47.00
1968	12,193	87,243,000	668,142,000	0.014	0.002	45.90
1969	13,209	89,746,000	701,495,000	0.015	0.002	45.13
1970	14,225	91,201,000	757,013,000	0.016	0.002	43.62
1971	14,225	82,058,000	774,677,000	0.017	0.002	43.96
1972	9,144	76,645,000	765,465,000	0.012	0.001	47.12
1973	13,209	89,076,000	832,343,000	0.015	0.002	46.77
1974	30,481	85,709,000	881,244,000	0.036	0.003	51.24
1975	18,289	80,132,000	901,551,000	0.023	0.002	58.89
1976	18,289	81,277,000	855,098,000	0.023	0.002	64.60
1977	W	56,645,000	827,816,000	W	W	67.26
1978	W	82,892,000	833,274,000	W	W	69.32
1979	W	87,092,000	888,789,000	W	W	69.16
1980	--	70,730,000	877,152,000	--	--	68.22
1981	W	74,348,000	844,606,000	W	W	67.14
1982	W	36,002,000	768,566,000	W	W	65.33
1983	W	38,165,000	728,247,000	W	W	75.78
1984	W	52,092,000	860,556,000	W	W	62.66
1985	W	49,533,000	863,650,000	W	W	58.47
1986	W	39,486,000	902,737,000	W	W	50.88
1987	W	47,648,000	967,218,000	W	W	42.52
1988	W	57,515,000	1,013,383,000	W	W	39.04
1989	W	59,032,000	983,000,000	W	W	41.18
1990	W	56,400,000	955,618,000	W	W	38.54
1991	W	56,761,000	924,887,000	W	W	36.03
1992	W	55,593,000	953,316,000	W	W	33.21
1993	W	55,676,000	991,858,000	W	W	29.11
1994	W	58,454,000	991,858,000	W	W	27.67
1995	5,000	62,581,000	1,034,539,000	0.008	0.000	29.66
1996	W	62,083,000	1,018,436,000	W	W	30.03
1997	--	62,971,000	1,068,727,000	--	--	30.39
1998	W	62,931,000	1,050,688,000	W	W	31.16
1999	W	57,749,000	1,019,051,000	W	W	26.19
2000	W	63,089,000	1,061,148,000	W	W	24.44
2001	--	n.d.	n.d.	n.d.	n.d.	n.d.

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## Lead

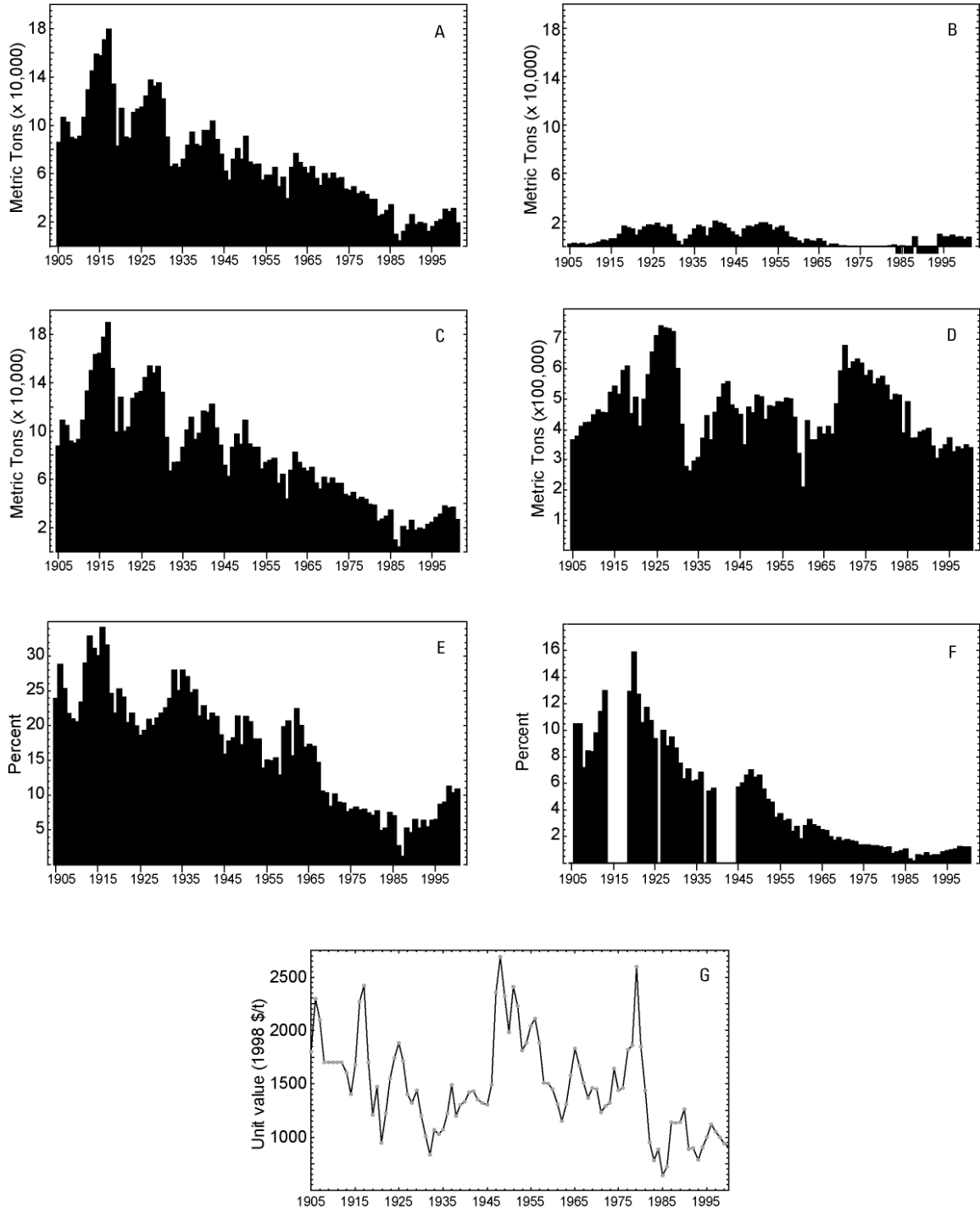
Historically, Idaho has been a prominent lead producing state, specifically from the Coeur d'Alene mining district. The most abundant year for Idaho production was 1917 when nearly 180,000 metric tons of lead were refined (fig. 8A). Production rates overall have steadily declined in Idaho after the peak achieved early in the 20<sup>th</sup> century. The average production of lead from Montana has been much lower than the average from Idaho, with Montana showing recorded production of less than 25,000 metric tons per year (fig. 8B). Together, Idaho and Montana have experienced somewhat cyclical waxing and waning in annual production; however, the overall trend has decreased over the last century (fig. 8C). A reduction in the use of lead in paint caused lower demand in the early 1950's; however, the decline in the national lead production (fig. 8D) was largely aided in 1973 when governmental regulations began phasing out lead in gasoline and all but banned it's use in indoor paint (Kramer, undated). In the early part of the 20<sup>th</sup> century, Idaho and Montana combined to provide nearly 35 percent of the nation's lead supply (fig. 8E). After recognition of the toxic effects of lead, laws were enacted to limit commercial use, and production began to decline. By 2001, the proportion of the U.S. production from Idaho and Montana had dropped to less than 3 percent. Similarly, almost 16 percent of the world's lead production once originated in Idaho and Montana, though that has dropped to less than 0.5 percent in recent years (fig. 8F). An upturn in the price of lead in the 1990's (fig. 8G) was attributed to an increase in the demand for lead acid batteries; however, this has not translated into significant production increases for Idaho or Montana as a result (Smith, 1999).

**Table 16.** Selected events affecting regional lead production

Year	Event	Reference
1917	Bunker Hill Smelter begins operation	Chapman, 1994
1925	Most mills now use flotation	Bookstrom, 2004 written commun.
1930	Severe curtailment of mining operations due to collapse of metals prices	this study
1937	Bunker Hill last mine to convert to all-through flotation	Bookstrom, 2004 written commun.
1942	Expansion of mining operations for war effort	this study
1945	Production drops off due to wartime labor shortage	this study
1949	Strike at Bunker Hill caused smelter shutdown for 15 days, after 50 years continuous production	Chapman, 1994
1955	Lucky Friday mine opened	Box, 2004 written commun.
1960	200-day long strike at Bunker Hill; other mines closed by strikes	Chapman, 1994
1981	Bunker Hill mine, mill, and smelter closed	Chapman, 1994
1982	Star-Morning mine closed	Box, 2004 written commun.
1983	Bunker Hill smelter listed on EPA's NPL	Bookstrom, 2004 written commun.
1997	Hecla begins production from Gold Hunter via Lucky Friday mine	this study

**Table 17.** Selected events affecting U.S. lead production

Year	Event	Reference
1906	Froth flotation comes into widespread use	Kramer, undated
1917	Lead used in lead-acid batteries	Kramer, undated
1960	Production begins at Viburnum Trend	Kramer, undated
1961-69	Lead and Zinc Mining Stabilization Program in effect	Smith, 1999
1962	Prolonged labor strike; production curtailed	Smith, 1999
1973	Lead in paint banned; phase-out of leaded gasoline	Kramer, undated
1976-79	Post-Vietnam War boom	Smith, 1999
1992-96	Increasing demand for lead-acid batteries	Smith, 1999



**Figure 8.** Lead production information from 1905-2001. A, annual production from Idaho. B, annual production from Montana. C, Idaho and Montana combined production. D, annual U.S. production. E, the proportion of regional lead production to U.S. production. F, the proportion of regional lead production to world production. G, the historical value of lead in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 18.** Lead production from Idaho and Montana, the U.S., and the world, 1905–2001

[The table also summarizes the proportions of Idaho and Montana production relative to the US and the world as well as the price for lead in constant 1998 dollars. Primary US production data represent the amount of refined lead. World production data for the years 1905-54 represent smelter production, while data for 1955-2000 represent mine production. Data for state, US, and world production are given in metric tons; proportions of US and world production by Idaho and Montana are given in percent; lead value is in US dollars. W, withheld; n.d., no data; leaders ( \_ \_ ), no production]

Year	Production					Proportion of Idaho and Montana production to:		Lead value (1998 \$/t)
	Idaho	Montana	Idaho and Montana combined	US	World	US	World	
1905	85,346	1,902	87,248	366,000	n.d.	23.84	n.d.	1,800
1906	106,249	2,254	108,503	378,000	1,040,000	28.70	10.43	2,300
1907	102,123	1,846	103,969	410,000	993,000	25.36	10.47	2,100
1908	89,327	2,105	91,431	422,000	1,280,000	21.67	7.14	1,700
1909	88,164	1,248	89,413	426,000	1,060,000	20.99	8.44	1,700
1910	90,651	1,624	92,275	449,000	1,100,000	20.55	8.39	1,700
1911	106,287	2,267	108,554	465,000	1,110,000	23.34	9.78	1,700
1912	128,907	3,378	132,284	457,000	1,160,000	28.95	11.40	1,700
1913	144,187	4,961	149,147	455,000	1,150,000	32.78	12.97	1,600
1914	158,091	4,380	162,471	524,000	n.d.	31.01	n.d.	1,400
1915	156,946	6,240	163,185	544,000	n.d.	30.00	n.d.	1,680
1916	170,137	6,167	176,304	517,000	n.d.	34.10	n.d.	2,270
1917	178,519	9,957	188,476	597,000	n.d.	31.57	n.d.	2,420
1918	133,674	16,845	150,519	611,000	n.d.	24.63	n.d.	1,700
1919	82,710	15,621	98,331	452,000	764,000	21.75	12.87	1,210
1920	113,223	14,177	127,400	506,000	804,000	25.18	15.85	1,470
1921	90,026	9,238	99,264	412,000	783,000	24.09	12.68	945
1922	88,830	13,503	102,333	501,000	972,000	20.43	10.53	1,220
1923	109,933	16,305	126,238	581,000	1,080,000	21.73	11.69	1,550
1924	112,924	17,906	130,830	657,000	1,220,000	19.91	10.72	1,740
1925	114,780	17,024	131,803	711,000	1,410,000	18.54	9.35	1,880
1926	123,824	19,190	143,014	744,000	n.d.	19.22	n.d.	1,710
1927	137,004	16,283	153,288	736,000	1,540,000	20.83	9.95	1,400
1928	131,837	15,314	147,151	735,000	1,680,000	20.02	8.76	1,320
1929	134,896	17,787	152,684	724,000	1,610,000	21.09	9.48	1,440
1930	121,617	9,664	131,282	603,000	1,520,000	21.77	8.64	1,200
1931	90,144	4,019	94,163	419,000	1,260,000	22.47	7.47	1,010
1932	65,425	979	66,404	278,000	1,050,000	23.89	6.32	833
1933	67,462	5,971	73,433	263,000	1,040,000	27.92	7.06	1,070
1934	64,705	9,077	73,782	295,000	1,200,000	25.01	6.15	1,030
1935	71,687	14,142	85,829	308,000	1,380,000	27.87	6.22	1,070
1936	82,863	17,290	100,153	371,000	1,470,000	27.00	6.81	1,220
1937	94,087	16,291	110,377	447,000	n.d.	24.69	n.d.	1,490
1938	83,623	8,461	92,084	367,000	1,700,000	25.09	5.42	1,200
1939	82,538	15,019	97,557	457,000	1,740,000	21.35	5.61	1,300
1940	95,105	20,898	116,004	508,000	n.d.	22.84	n.d.	1,330
1941	95,178	19,286	114,464	551,000	n.d.	20.77	n.d.	1,420
1942	103,338	18,189	121,528	558,000	n.d.	21.78	n.d.	1,430
1943	87,506	14,809	102,315	481,000	n.d.	21.27	n.d.	1,350

1944	75,778	11,889	87,667	470,000	n.d.	18.65	n.d.	1,320
1945	62,095	9,071	71,166	450,000	1,250,000	15.81	5.69	1,300
1946	54,420	7,512	61,932	350,000	1,030,000	17.69	6.01	1,490
1947	71,618	14,613	86,231	474,000	1,310,000	18.19	6.58	2,360
1948	80,327	16,702	97,030	455,000	1,380,000	21.33	7.03	2,690
1949	71,940	16,326	88,266	515,000	1,370,000	17.14	6.44	2,320
1950	90,743	17,797	108,539	510,000	1,640,000	21.28	6.62	1,980
1951	69,594	19,325	88,919	434,000	1,600,000	20.49	5.56	2,410
1952	66,878	19,304	86,182	478,000	1,810,000	18.03	4.76	2,230
1953	67,686	18,098	85,784	477,000	1,870,000	17.98	4.59	1,810
1954	54,706	13,445	68,151	493,000	2,000,000	13.82	3.41	1,880
1955	58,209	15,448	73,656	490,000	2,010,000	15.03	3.66	2,040
1956	58,352	16,912	75,264	504,000	2,400,000	14.93	3.14	2,110
1957	64,989	12,066	77,055	502,000	2,380,000	15.35	3.24	1,880
1958	48,629	7,651	56,280	441,000	2,350,000	12.76	2.39	1,510
1959	56,605	6,960	63,565	321,000	2,320,000	19.80	2.74	1,500
1960	38,925	4,426	43,351	210,000	2,390,000	20.64	1.81	1,450
1961	64,843	2,398	67,241	430,000	2,390,000	15.64	2.81	1,310
1962	76,257	5,553	81,810	366,000	2,510,000	22.35	3.26	1,150
1963	68,729	4,536	73,265	366,000	2,560,000	20.02	2.86	1,310
1964	64,694	4,117	68,811	408,000	2,530,000	16.87	2.72	1,580
1965	60,425	6,333	66,758	385,000	2,700,000	17.34	2.47	1,830
1966	65,621	4,000	69,621	410,000	2,850,000	16.98	2.44	1,670
1967	55,690	815	56,505	386,000	2,870,000	14.64	1.97	1,510
1968	49,705	1,696	51,402	487,000	3,010,000	10.55	1.71	1,370
1969	59,510	1,590	61,100	594,000	3,240,000	10.29	1.89	1,460
1970	55,531	904	56,434	677,000	3,390,000	8.34	1.66	1,450
1971	60,429	558	60,987	604,000	3,490,000	10.10	1.75	1,230
1972	55,708	260	55,969	625,000	3,450,000	8.96	1.62	1,290
1973	56,014	160	56,174	633,000	3,490,000	8.87	1.61	1,320
1974	46,918	140	47,057	620,000	3,490,000	7.59	1.35	1,640
1975	45,718	186	45,904	579,000	3,440,000	7.93	1.33	1,440
1976	48,659	83	48,742	596,000	3,690,000	8.18	1.32	1,460
1977	42,872	96	42,968	552,000	3,410,000	7.78	1.26	1,820
1978	44,761	132	44,893	568,000	3,460,000	7.90	1.30	1,860
1979	42,636	258	42,894	578,000	3,510,000	7.42	1.22	2,600
1980	38,607	295	38,902	548,000	3,520,000	7.10	1.11	1,850
1981	38,397	194	38,591	498,000	3,350,000	7.75	1.15	1,440
1982	24,617	661	25,278	517,000	3,450,000	4.89	0.73	949
1983	25,893	1,163	27,056	515,000	3,350,000	5.25	0.81	782
1984	29,182	W	29,182	389,000	3,200,000	7.50	0.91	885
1985	33,707	846	34,553	494,000	3,390,000	6.99	1.02	638
1986	9,951	W	9,951	370,000	3,240,000	2.69	0.31	721
1987	4,126	W	4,126	373,000	3,430,000	1.11	0.12	1,140
1988	12,287	8,266	20,553	392,000	3,420,000	5.24	0.60	1,130
1989	17,957	W	17,957	396,000	3,400,000	4.53	0.53	1,140
1990	25,895	W	25,895	404,000	3,370,000	6.41	0.77	1,260
1991	17,967	W	17,967	346,000	3,260,000	5.19	0.55	884
1992	19,356	W	19,356	305,000	3,200,000	6.35	0.60	899
1993	18,121	W	18,121	335,000	2,900,000	5.41	0.62	788



1994	12,269	9,940	22,209	351,000	2,800,000	6.33	0.79	902
1995	15,839	8,350	24,189	374,000	2,710,000	6.47	0.89	998
1996	20,179	7,970	28,149	326,000	2,920,000	8.63	0.96	1,120
1997	21,656	9,230	30,886	343,000	3,010,000	9.00	1.03	1,050
1998	30,580	7,310	37,890	337,000	3,100,000	11.24	1.22	999
1999	28,210	7,950	36,160	350,000	3,020,000	10.33	1.20	942
2000	30,972	6,020	36,992	341,000	3,100,000	10.85	1.19	910
2001	19,036	7,290	26,326	n.d	n.d	n.d	n.d	n.d

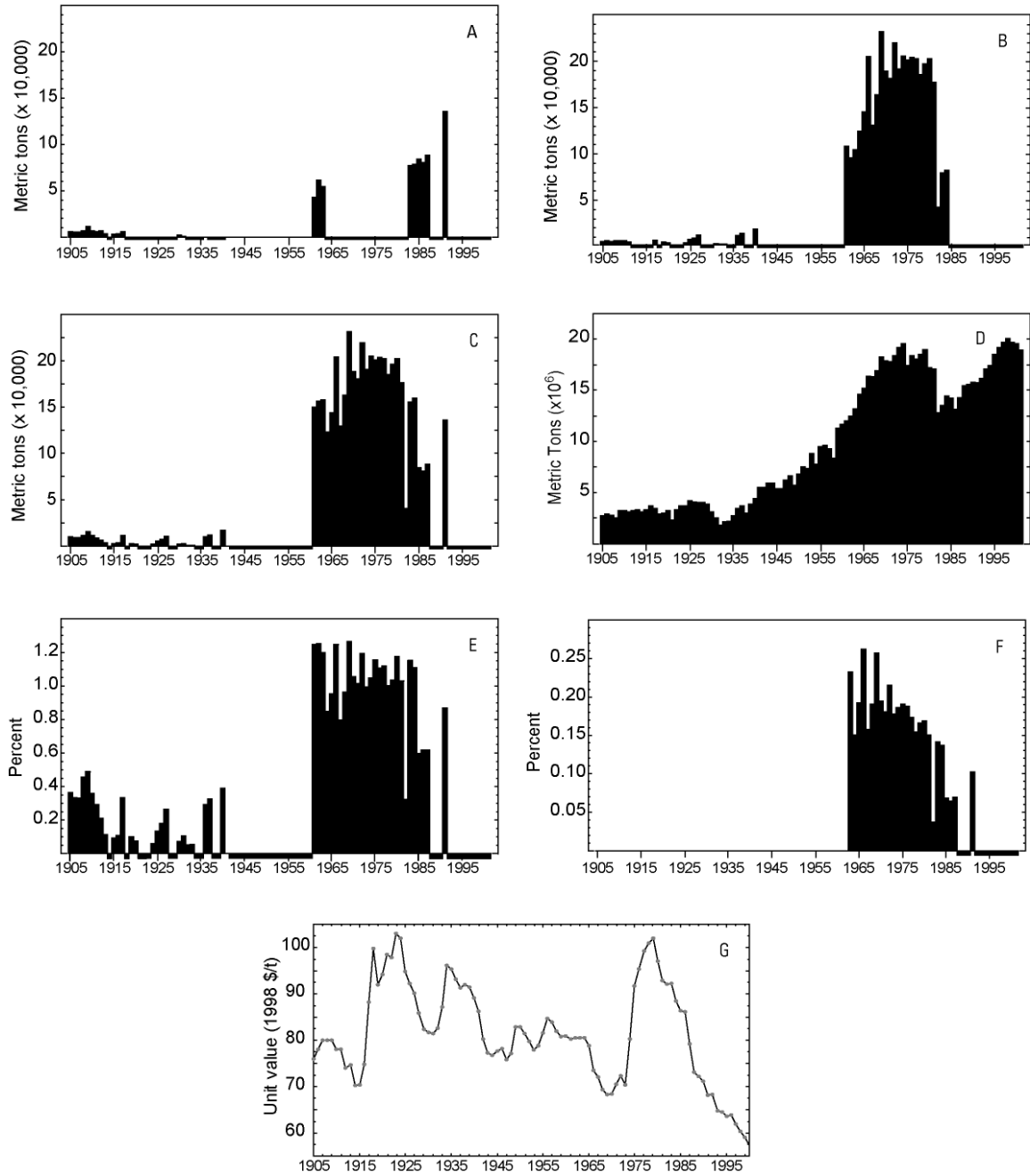
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## Lime

Lime production in Idaho is largely withheld, though the few years that the commodity was reported after 1961 show production between 50,000 and 100,000 metric tons, with a peak in 1991 of 136,000 metric tons (fig. 9A). Montana shows an overall greater production capability by year, though much of the data is also withheld from publication (fig. 9B). When taken together, the Idaho and Montana charts provide a greater range of reporting years; however, because there are so many years of withheld information, the combined production is not accurately portrayed (fig. 9C). A change in lime production reporting was implemented in 1953 to include all captive lime but was not fully accomplished until 1961 (Kelly and others, 2001). As a result, lime production appears to double, even though no significant increases in production occurred. Figure 9D illustrates the increasing importance of lime based on rising production in the United States, especially in recent years. However, these trends are not observed in Idaho and Montana recorded production; the two states rarely exceed 1.2 percent of U.S. lime production (fig. 9E) and .25 percent of world production (fig. 9F). Furthermore, the value of lime has declined rapidly since 1979 and is currently at its lowest point of the last hundred years (fig. 9G).

**Table 15.** Selected events affecting U.S. lime production

<b>Year</b>	<b>Event</b>	<b>Reference</b>
1955	First steel production by basic-oxygen furnace	Kramer, undated
1970	Clean Air Act introduced. Control of SO <sub>2</sub> leads to large market for lime	Kramer, undated



**Figure 9.** Lime production information from 1905-2001. A, annual production from Idaho. B, annual production from Montana. C, Idaho and Montana combined production. D, annual U.S. production in millions of metric tons. E, the proportion of regional lime production to U.S. production. F, the proportion of regional lime production to world production. G, the historical value of lime in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 20.** Lime production from Idaho and Montana, the U.S., and the world, 1905–2001

[The table also summarizes the proportions of Idaho and Montana production relative to the US and the world as well as the price for lime in constant 1998 dollars. Data for state, US, and world production are given in metric tons; proportions of US and world production by Idaho and Montana are given in percent; lime value is in US dollars. W, withheld; n.d., no data; leaders ( \_ \_ ), no production]

Year	Production				Proportion of Idaho and Montana production to:		Lime value (1998 \$/t)	
	Idaho	Montana	Idaho and Montana combined	US	World	US		World
1905	6,073	3,695	9,768	2,700,000	n.d.	0.36	n.d.	76.00
1906	5,382	4,305	9,686	2,900,000	n.d.	0.33	n.d.	78.00
1907	5,411	3,826	9,236	2,800,000	n.d.	0.33	n.d.	80.00
1908	6,689	4,646	11,335	2,500,000	n.d.	0.45	n.d.	80.00
1909	11,459	4,119	15,578	3,200,000	n.d.	0.49	n.d.	80.00
1910	7,343	4,064	11,407	3,200,000	n.d.	0.36	n.d.	78.00
1911	6,177	2,812	8,989	3,100,000	n.d.	0.29	n.d.	78.00
1912	6,715	W	6,715	3,200,000	n.d.	0.21	n.d.	74.00
1913	3,749	W	3,749	3,300,000	n.d.	0.11	n.d.	74.60
1914	W	W	W	3,100,000	n.d.	W	n.d.	70.20
1915	3,045	W	3,045	3,300,000	n.d.	0.09	n.d.	70.40
1916	3,982	W	3,982	3,700,000	n.d.	0.11	n.d.	74.80
1917	6,557	4,791	11,348	3,400,000	n.d.	0.33	n.d.	88.20
1918	W	W	W	2,900,000	n.d.	W	n.d.	99.80
1919	W	3,030	3,030	3,000,000	n.d.	0.10	n.d.	92.00
1920	W	2,393	2,393	3,200,000	n.d.	0.07	n.d.	94.20
1921	W	W	W	2,300,000	n.d.	W	n.d.	98.50
1922	W	W	W	3,300,000	n.d.	W	n.d.	97.80
1923	W	W	W	3,700,000	n.d.	W	n.d.	103.00
1924	W	2,154	2,154	3,700,000	n.d.	0.06	n.d.	102.00
1925	W	5,687	5,687	4,200,000	n.d.	0.14	n.d.	94.90
1926	W	7,347	7,347	4,100,000	n.d.	0.18	n.d.	92.20
1927	W	10,530	10,530	4,000,000	n.d.	0.26	n.d.	90.20
1928	W	W	W	4,000,000	n.d.	W	n.d.	85.80
1929	W	W	W	3,900,000	n.d.	W	n.d.	82.30
1930	2,234	W	2,234	3,100,000	n.d.	0.07	n.d.	81.70
1931	798	1,840	2,638	2,500,000	n.d.	0.11	n.d.	81.40
1932	W	922	922	1,800,000	n.d.	0.05	n.d.	82.60
1933	W	1,135	1,135	2,100,000	n.d.	0.05	n.d.	87.10
1934	W	W	W	2,200,000	n.d.	W	n.d.	96.10
1935	W	W	W	2,700,000	n.d.	W	n.d.	95.30
1936	--	9,945	9,945	3,400,000	n.d.	0.29	n.d.	93.20
1937	W	12,061	12,061	3,700,000	n.d.	0.33	n.d.	91.30
1938	W	W	W	3,000,000	n.d.	W	n.d.	92.00
1939	W	W	W	3,900,000	n.d.	W	n.d.	91.40

1940	W	17,053	17,053	4,400,000	n.d.	0.39	n.d.	89.10
1941	109	W	109	5,500,000	n.d.	0.00	n.d.	86.20
1942	--	W	W	5,500,000	n.d.	W	n.d.	80.20
1943	--	W	W	5,900,000	n.d.	W	n.d.	77.30
1944	--	W	W	5,900,000	n.d.	W	n.d.	76.80
1945	--	W	W	5,400,000	n.d.	W	n.d.	77.70
1946	--	W	W	5,400,000	n.d.	W	n.d.	78.20
1947	--	W	W	6,200,000	n.d.	W	n.d.	75.80
1948	--	W	W	6,600,000	n.d.	W	n.d.	77.10
1949	--	W	W	5,700,000	n.d.	W	n.d.	82.80
1950	--	W	W	6,800,000	n.d.	W	n.d.	82.90
1951	--	W	W	7,500,000	n.d.	W	n.d.	81.40
1952	--	W	W	7,300,000	n.d.	W	n.d.	79.80
1953	--	W	W	8,800,000	n.d.	W	n.d.	77.90
1954	--	W	W	7,800,000	n.d.	W	n.d.	78.80
1955	--	W	W	9,500,000	n.d.	W	n.d.	81.50
1956	--	W	W	9,600,000	n.d.	W	n.d.	84.70
1957	--	W	W	9,300,000	n.d.	W	n.d.	83.90
1958	--	W	W	8,400,000	n.d.	W	n.d.	81.90
1959	--	W	W	11,300,000	n.d.	W	n.d.	80.80
1960	--	W	W	11,700,000	n.d.	W	n.d.	80.90
1961	42,638	107,050	149,688	12,000,000	n.d.	1.25	n.d.	80.20
1962	61,690	94,349	156,038	12,500,000	n.d.	1.25	n.d.	80.50
1963	54,432	103,421	157,853	13,200,000	68,000,000	1.20	0.23	80.50
1964	W	123,379	123,379	14,600,000	82,000,000	0.85	0.15	80.50
1965	W	144,245	144,245	15,200,000	75,000,000	0.95	0.19	78.80
1966	W	204,120	204,120	16,400,000	78,000,000	1.24	0.26	73.50
1967	W	129,730	129,730	16,300,000	82,000,000	0.80	0.16	72.10
1968	W	162,389	162,389	16,900,000	85,000,000	0.96	0.19	69.30
1969	W	231,336	231,336	18,300,000	90,000,000	1.26	0.26	68.30
1970	W	188,698	188,698	17,900,000	97,000,000	1.05	0.19	68.40
1971	W	180,533	180,533	17,800,000	100,000,000	1.01	0.18	70.50
1972	W	219,542	219,542	18,400,000	102,000,000	1.19	0.22	72.30
1973	W	190,512	190,512	19,200,000	107,000,000	0.99	0.18	70.40
1974	W	205,027	205,027	19,600,000	110,000,000	1.05	0.19	80.20
1975	W	200,491	200,491	17,400,000	105,000,000	1.15	0.19	91.70
1976	W	203,213	203,213	18,400,000	108,000,000	1.10	0.19	95.30
1977	W	202,306	202,306	18,100,000	117,000,000	1.12	0.17	99.30
1978	W	185,069	185,069	18,500,000	120,000,000	1.00	0.15	101.00
1979	W	195,955	195,955	19,000,000	118,000,000	1.03	0.17	102.00
1980	W	202,306	202,306	17,200,000	120,000,000	1.18	0.17	97.00
1981	W	175,997	175,997	17,100,000	117,000,000	1.03	0.15	92.90
1982	W	40,824	40,824	12,800,000	109,000,000	0.32	0.04	92.10
1983	77,112	78,019	155,131	13,500,000	110,000,000	1.15	0.14	92.20
1984	78,926	80,741	159,667	14,400,000	117,000,000	1.11	0.14	88.50
1985	84,370	W	84,370	14,200,000	123,000,000	0.59	0.07	86.40
1986	80,741	W	80,741	13,100,000	124,000,000	0.62	0.07	86.10
1987	87,998	W	87,998	14,300,000	127,000,000	0.62	0.07	79.20

1988	W	W	W	15,500,000	134,000,000	W	W	73.10
1989	W	W	W	15,600,000	139,000,000	W	W	72.20
1990	W	W	W	15,800,000	136,000,000	W	W	71.20
1991	136,080	W	136,080	15,700,000	133,000,000	0.87	0.10	68.20
1992	W	W	W	16,200,000	133,000,000	W	W	68.30
1993	W	W	W	17,100,000	123,000,000	W	W	64.75
1994	W	W	W	17,400,000	118,000,000	W	W	64.50
1995	W	W	W	18,500,000	120,000,000	W	W	63.60
1996	W	W	W	19,200,000	121,000,000	W	W	63.89
1997	W	W	W	19,700,000	118,000,000	W	W	61.95
1998	W	W	W	20,100,000	117,000,000	W	W	60.30
1999	W	W	W	19,700,000	116,000,000	W	W	59.09
2000	W	W	W	19,600,000	118,000,000	W	W	57.36
2001	W	W	W	18,900,000	118,000,000	W	W	56.42

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## Mercury

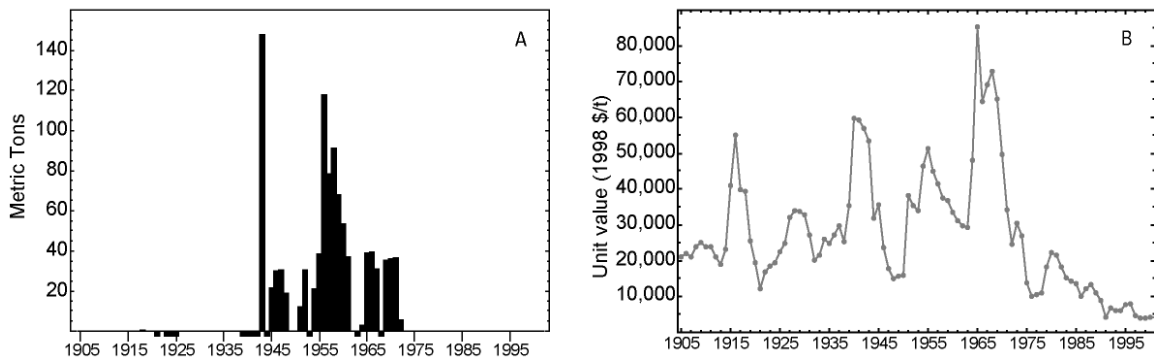
Idaho has had a volatile record of mercury production, which began in 1917 and ended in 1972 (fig. 10A). Idaho's Hermes mine produced 148 metric tons of mercury in 1943 to meet the high demand during WWII. Abundant mining operations remained after the war; however, production levels diminished and mercury mining was suspended after the commodity was declared a hazardous substance by the U.S. Environmental Protection Agency in 1971 (Kramer, undated). Idaho's last operating mercury mine, the Idaho-Almaden mine, shut down early in 1972. There has been no recorded mercury production in Idaho since the Idaho-Almaden mine closure. The state of Montana has never been a significant producer of mercury, and no production was reported in the USBM Yearbooks. Furthermore, no charts were produced for the proportion of regional mercury mining production to U.S. or world mercury production, due to the very small numbers involved.

**Table 21.** Selected events affecting regional mercury production

Year	Event	Reference
1942-1968	Years of operation of Hermes mine	this study
1955-1972	Years of operation of Idaho-Almaden mine	this study

**Table 22.** Selected events affecting U.S. mercury production

Year	Event	Reference
WWI & WWII	High demand leads to increased prices	Reese, 1999
1971	Environmental Protection Agency declares Mercury a hazardous substance	Kramer, undated
1990	Last US primary mercury mine closed	Kramer, undated



**Figure 10.** Mercury production information from 1905-2001. A, annual production from Idaho. B, the historical value of mercury in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 23.** Mercury production from Idaho, the U.S., and the world, 1905–2001

[The table also summarizes the proportions of Idaho production relative to the US and the world as well as the price for mercury in constant 1998 dollars. Figures for national mercury production reflect domestic mine production and the mercury byproduct recovered from gold, copper, and zinc mining. Production data for the world represent mine production of mercury. Data for state, US, and world production are given in metric tons; proportions of US and world production by Idaho are given in percent; mercury value is in US dollars. W, withheld; n.d., no data; leaders ( \_ \_ ), no production]

Year	Production			Proportion of Idaho production to:		Mercury value (1998 \$/t)
	Idaho	US	World	US	World	
1905	--	1,040	3,340	--	--	21,000
1906	--	887	3,860	--	--	22,000
1907	--	733	3,310	--	--	21,000
1908	--	672	3,300	--	--	24,000
1909	--	717	3,230	--	--	25,000
1910	--	701	3,690	--	--	24,000
1911	--	723	4,250	--	--	24,000
1912	--	853	4,160	--	--	21,000
1913	--	688	4,050	--	--	19,100
1914	--	563	3,740	--	--	23,100
1915	--	716	3,890	--	--	41,100
1916	--	1,020	3,500	--	--	55,100
1917	0.17	1,230	3,970	0.00	0.00	39,800
1918	0.76	1,120	3,420	0.00	0.00	39,300
1919	--	729	3,100	--	--	25,600
1920	--	456	2,910	--	--	19,400
1921	W	216	2,130	W	W	12,100
1922	--	217	3,170	--	--	16,800
1923	W	270	3,210	W	W	18,600
1924	W	343	3,070	W	W	19,500
1925	W	312	3,560	W	W	22,600
1926	0.21	260	4,000	0.00	0.00	24,800
1927	--	384	5,170	--	--	32,000
1928	--	616	5,140	--	--	34,100
1929	--	816	5,610	--	--	33,700
1930	--	743	3,760	--	--	32,700
1931	--	860	3,420	--	--	27,100
1932	--	435	2,850	--	--	20,100
1933	--	333	2,060	--	--	21,600
1934	--	532	2,650	--	--	26,100
1935	--	604	3,460	--	--	24,800
1936	--	571	4,270	--	--	27,300
1937	--	569	4,590	--	--	29,700
1938	--	620	5,170	--	--	25,300
1939	W	642	4,830	W	W	35,400
1940	W	1,300	7,130	W	W	59,700
1941	W	1,550	9,170	W	W	59,400
1942	W	1,750	8,990	W	W	57,000
1943	147.86	1,790	7,870	0.08	0.02	53,400



1944	W	1,300	5,330	W	W	31,800
1945	21.76	1,060	4,180	0.02	0.01	35,600
1946	30.12	874	4,960	0.03	0.01	23,700
1947	30.74	801	5,360	0.04	0.01	17,700
1948	18.84	496	3,260	0.04	0.01	15,000
1949	--	342	4,160	--	--	15,800
1950	--	156	4,940	--	--	15,900
1951	12.39	251	5,060	0.05	0.00	38,300
1952	30.78	433	5,190	0.07	0.01	35,400
1953	W	494	5,510	W	W	34,100
1954	21.13	639	6,180	0.03	0.00	46,500
1955	38.41	653	6,380	0.06	0.01	51,400
1956	117.77	833	7,620	0.14	0.02	45,100
1957	78.42	1,190	8,260	0.07	0.01	41,400
1958	91.09	1,310	8,490	0.07	0.01	37,500
1959	68.05	1,080	7,710	0.06	0.01	36,900
1960	53.37	1,150	8,340	0.05	0.01	33,600
1961	37.23	1,090	8,260	0.03	0.00	31,200
1962	--	906	8,430	--	--	29,800
1963	W	659	8,260	W	W	29,200
1964	2.88	488	8,800	0.01	0.00	48,100
1965	38.83	675	9,230	0.06	0.00	85,300
1966	39.35	759	9,140	0.05	0.00	64,400
1967	31.16	820	8,000	0.04	0.00	69,200
1968	W	995	8,950	W	W	72,900
1969	35.12	1,020	9,970	0.03	0.00	65,140
1970	36.02	941	9,790	0.04	0.00	49,660
1971	36.68	616	10,400	0.06	0.00	34,150
1972	5.59	253	9,620	0.02	0.00	24,680
1973	--	76.8	9,250	--	--	30,460
1974	--	75.5	8,880	--	--	27,010
1975	--	254	8,700	--	--	13,900
1976	--	797	8,090	--	--	10,080
1977	--	974	6,580	--	--	10,590
1978	--	833	6,250	--	--	11,110
1979	--	1,020	6,010	--	--	18,320
1980	--	1,060	6,810	--	--	22,350
1981	--	962	7,270	--	--	21,520
1982	--	888	6,820	--	--	18,170
1983	--	864	6,230	--	--	15,310
1984	--	657	6,740	--	--	14,310
1985	--	570	6,140	--	--	13,670
1986	--	483	7,780	--	--	10,040
1987	--	34	5,530	--	--	12,300
1988	--	379	6,840	--	--	13,410
1989	--	414	6,750	--	--	10,980
1990	--	562	4,100	--	--	9,019
1991	--	58	2,540	--	--	4,250
1992	--	64	1,960	--	--	6,787
1993	--	n.d.	1,730	--	--	6,106

1994	--	n.d.	1,960	--	--	6,203
1995	--	n.d.	3,190	--	--	7,676
1996	--	n.d.	2,560	--	--	7,887
1997	--	n.d.	2,410	--	--	4,700
1998	--	n.d.	1,580	--	--	4,057
1999	--	n.d.	1,310	--	--	3,973
2000	--	n.d.	1,350	--	--	4,256
2001	--	n.d.	1,490	--	--	4,138

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## Platinum Group Elements (PGE)

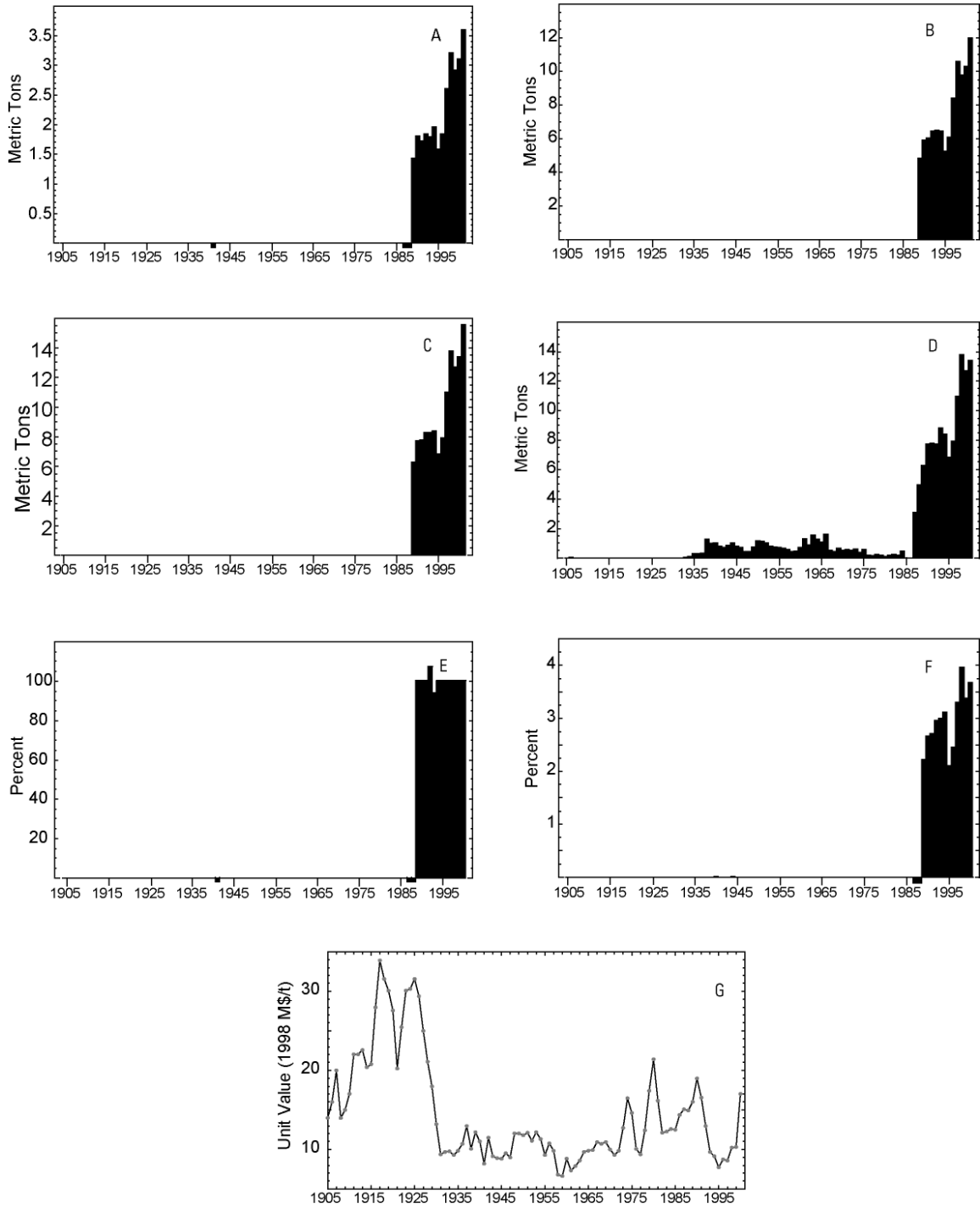
The Stillwater mine in Nye, Montana began operations in 1986 and became the nation's first major PGE mine (Kramer, undated). Early platinum production at Stillwater was 1.5 to 2 metric tons per year, but production increased to more than 3.5 metric tons by 2001 (fig. 11A). Palladium mining has had similar trends in production, though the more plentiful metal has been produced at a rate of about three times that of platinum (fig. 11B). Combined platinum and palladium production in Montana has greatly increased from 1997 to 2001, nearly doubling from earlier production rates (fig. 11C). Prior to the opening of the Stillwater mine in Montana, the U.S. produced between one-half and 2 metric tons of PGE minerals each year from placer platinum deposits in Alaska (fig. 11D). In 1950, national production reporting began to include the PGE minerals obtained as byproducts of gold and copper smelting (Kelley and others, 2001). Moreover, the large contribution of PGE commodities from Montana supplied between two and four percent of the world's PGE production every year since 1987 (fig. 11F). The Stillwater mine was the only PGE mine in the U.S. from 1987 to 2002 when the East Boulder mine began operations on the PGE deposit as well. Montana platinum and palladium production equals that reported for the U.S. after 1986; however, PGE production reported for Montana in USBM yearbooks and reported for the U.S. in Kelly and others (2001) do not agree for the years 1992 and 1993, where 100 percent of the nation's PGE minerals should have originated in Montana.

**Table 24.** Selected events affecting regional PGE production

Year	Event	Reference
1986	Stillwater mine in Mont. opens. 1987 first year of production	Kramer, undated
2002	East Boulder mine opens	this study

**Table 25.** Selected events affecting U.S. PGE production

Year	Event	Reference
1923	Platinum lodes discovered in Transvaal, Republic of South Africa	Page and others, 1973
1924	Bushveld Complex discovered	Page and others, 1973
1924	Platinum placers discovered in Alaska – becomes 5 <sup>th</sup> largest producer in world by 1934.	Page and others, 1973
1957-1958	Drop in demand by domestic petroleum refineries	Hilliard, 1999a
1975	Catalytic converters required in autos	Kramer, undated
1988	Ford Motor Company announces platinum-free catalytic converter	Hilliard, 1999a



**Figure 11.** PGE production information from 1905-2001. A, annual platinum production from Montana. B, annual palladium production from Montana. C, combined platinum and palladium production. D, annual U.S. PGE production. E, the proportion of regional PGE production to U.S. production. F, the proportion of regional PGE production to world production. G, the historical value of platinum in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 26.** PGE production from Montana, the U.S., and the world, 1905–2001

[The table also summarizes the proportions of Montana production relative to the US and the world as well as the price for PGE in constant 1998 dollars. Data for state, US, and world production are given in metric tons; proportions of US and world production by Idaho and Montana are given in percent; PGE value is in US dollars. W, withheld; n.d., no data; leaders ( \_ \_ ), no production]

Year	Production			Proportion of Montana production to:		PGE value (1998 M\$/t)		
	Montana			US PGE	World PGE			
	Palladium	Platinum	Platinum and palladium					
1905	---	---	---	0.01	6.24	---	---	14
1906	---	---	---	0.04	6.59	---	---	16
1907	---	---	---	0.01	9.65	---	---	20
1908	---	---	---	0.02	8.00	---	---	14
1909	---	---	---	0.02	8.45	---	---	15
1910	---	---	---	0.02	8.89	---	---	17
1911	---	---	---	0.02	9.74	---	---	22
1912	---	---	---	0.03	9.77	---	---	22
1913	---	---	---	0.02	8.31	---	---	22.6
1914	---	---	---	0.02	8.11	---	---	20.4
1915	---	---	---	0.02	4.45	---	---	20.8
1916	---	---	---	0.02	2.80	---	---	28
1917	---	---	---	0.02	2.59	---	---	33.9
1918	---	---	---	0.02	1.96	---	---	31.6
1919	---	---	---	0.02	2.11	---	---	30.1
1920	---	---	---	0.02	2.30	---	---	27.6
1921	---	---	---	0.03	1.84	---	---	20.2
1922	---	---	---	0.03	2.17	---	---	25.5
1923	---	---	---	0.02	2.56	---	---	30.1
1924	---	---	---	0.01	3.56	---	---	30.3
1925	---	---	---	0.01	3.23	---	---	31.6
1926	---	---	---	0.01	4.42	---	---	29.4
1927	---	---	---	0.00	4.64	---	---	25
1928	---	---	---	0.02	4.31	---	---	21.1
1929	---	---	---	0.02	4.84	---	---	18
1930	---	---	---	0.02	4.75	---	---	13.2
1931	---	---	---	0.03	8.94	---	---	9.39
1932	---	---	---	0.03	6.53	---	---	9.68
1933	---	---	---	0.04	6.77	---	---	9.8
1934	---	---	---	0.12	12.9	---	---	9.33
1935	---	---	---	0.28	12.1	---	---	9.86
1936	---	---	---	0.30	14.2	---	---	10.7
1937	---	---	---	0.34	14.8	---	---	13
1938	---	---	---	1.27	16.8	---	---	10.1
1939	---	---	---	1.01	16.9	---	---	12.2
1940	---	0.001	0.001	1.05	14.5	0.09	0.007	11
1941	---	W	W	0.82	14.9	W	---	8.22
1942	---	---	---	0.72	16.9	---	---	11.5

1943	--	--	--	0.85	19.6	--	--	9.16
1944	--	0.0003	0.0003	1.05	16.0	0.03	0.002	8.93
1945	--	--	--	0.83	30.0	--	--	8.83
1946	--	--	--	0.71	17.9	--	--	9.5
1947	--	--	--	0.43	15.6	--	--	8.98
1948	--	--	--	0.43	16.3	--	--	12
1949	--	--	--	0.77	17.9	--	--	12
1950	--	--	--	1.18	18.7	--	--	11.8
1951	--	--	--	1.15	21.0	--	--	12.1
1952	--	--	--	1.07	21.8	--	--	11.1
1953	--	--	--	0.81	24.1	--	--	12.2
1954	--	--	--	0.75	29.2	--	--	11.3
1955	--	--	--	0.72	33.9	--	--	9.33
1956	--	--	--	0.67	34.5	--	--	10.8
1957	--	--	--	0.58	41.1	--	--	9.83
1958	--	--	--	0.45	27.7	--	--	6.78
1959	--	--	--	0.48	32.8	--	--	6.65
1960	--	--	--	0.73	39.7	--	--	8.85
1961	--	--	--	1.35	41.8	--	--	7.32
1962	--	--	--	0.89	50.5	--	--	7.89
1963	--	--	--	1.55	63.4	--	--	8.56
1964	--	--	--	1.26	79.2	--	--	9.68
1965	--	--	--	1.09	92.3	--	--	9.84
1966	--	--	--	1.60	94.5	--	--	9.95
1967	--	--	--	0.51	98.8	--	--	10.9
1968	--	--	--	0.46	106	--	--	10.7
1969	--	--	--	0.68	107	--	--	10.9
1970	--	--	--	0.54	132	--	--	10
1971	--	--	--	0.56	127	--	--	9.3
1972	--	--	--	0.53	133	--	--	9.83
1973	--	--	--	0.62	163	--	--	12.7
1974	--	--	--	0.39	179	--	--	16.5
1975	--	--	--	0.59	178	--	--	14.6
1976	--	--	--	0.19	194	--	--	10.1
1977	--	--	--	0.17	203	--	--	9.41
1978	--	--	--	0.26	200	--	--	12.4
1979	--	--	--	0.22	202	--	--	17.4
1980	--	--	--	0.09	213	--	--	21.4
1981	--	--	--	0.22	216	--	--	16.2
1982	--	--	--	0.25	200	--	--	12.1
1983	--	--	--	0.19	203	--	--	12.3
1984	--	--	--	0.47	238	--	--	12.6
1985	--	--	--	--	247	--	--	12.5
1986	--	--	--	--	260	--	--	14.4
1987	--	W	W	3.11	271	W	W	15.1
1988	--	W	W	4.97	280	W	W	14.9
1989	4.85	1.43	6.28	6.28	282	100.00	2.23	16
1990	5.93	1.81	7.74	7.74	291	100.00	2.66	19

1991	6.05	1.73	7.78	7.78	287	100.00	2.71	16.6
1992	6.47	1.84	8.31	7.74	280	107.36	2.97	13
1993	6.5	1.8	8.3	8.83	276	94.00	3.01	9.66
1994	6.44	1.96	8.4	8.40	269	100.00	3.12	9.16
1995	5.26	1.59	6.85	6.85	326	100.00	2.10	7.7
1996	6.1	1.84	7.94	7.94	324	100.00	2.45	8.72
1997	8.4	2.61	11.01	11.0	333	100.00	3.31	8.59
1998	10.6	3.22	13.82	13.8	348	100.00	3.97	10.2
1999	9.8	2.92	12.72	12.7	376	100.00	3.38	10.3
2000	10.3	3.11	13.41	13.4	365	100.00	3.67	17
2001	12	3.6	15.6	n.d.	n.d.	n.d.	n.d.	n.d.

## Phosphate

Phosphate rock was discovered in the Western Phosphate Field in 1889 and commercial production began in Idaho in 1906. Following a national trend, phosphate production in Idaho saw significant production increases during the late 1940s when open pit mining replaced underground mining, lowering production costs (Jasinsky and others, 2004). Idaho increased annual production from 125,000 metric tons in 1945 to 1,000,000 metric tons in the early 1950's. Idaho production continued to increase, reaching a maximum of 6,200,000 metric tons in 1999 (fig. 12A). Phosphate rock production in Montana began in 1929; however the transition to open pit mining was not feasible as in other states because the phosphate-bearing rocks were not amenable to open-pit methods. Phosphate rock mining in Montana eventually ceased in 1993 due to the high costs of underground mining (Jasinsky and others, 2004). U.S. phosphate production increased rapidly during the 1940s similar to the Idaho trends; however, this trend ended after 1980 (fig. 12D). The price of the commodity began to fall in 1976, and national production decreased (Kramer, undated). Nevertheless, production in Idaho remained strong, accounting for 8 to 14 percent of the U.S.'s phosphate rock production (fig. 12E) and nearly six percent of the world's production (fig. 12F). Despite the overall increased production in both the region and the U.S. over the course of the century, the average value of the commodity remained mostly constant at about \$20 to \$40 per ton, with the exception of anomalous spikes in about 1908 and again in 1976 (fig. 12G).

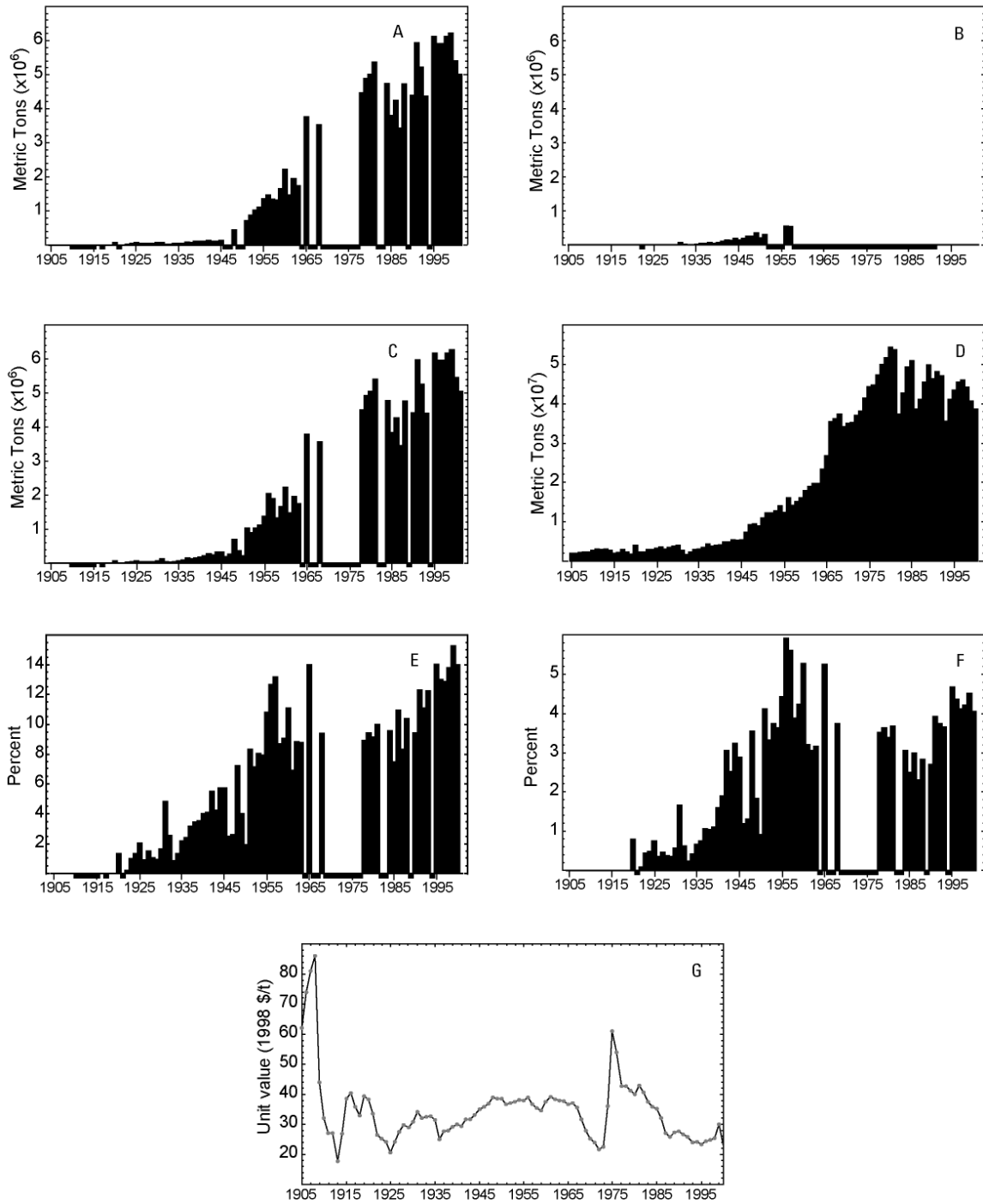
**Table 27.** Selected events affecting regional phosphate rock production

<b>Year</b>	<b>Event</b>	<b>Reference</b>
1889	Discovery of Western Phosphate Field	Jasinsky and others, 2004
1906	Phosphate rock production begins in Idaho	Jasinsky and others, 2004
1929	Phosphate mining begins in Mont.	Jasinsky and others, 2004
1940s	Transition to open pit from underground mining	Jasinsky and others, 2004
1946 -93	Gay mine in Idaho years of operation	Jasinsky and others, 2004
1960	Montana only remaining state using underground mining	Jasinsky and others, 2004
1993	Production ends in Montana due to high cost of underground mining	Jasinsky and others, 2004

**Table 28.** Selected events affecting U.S. phosphate rock production

<b>Year</b>	<b>Event</b>	<b>Reference</b>
1928	Flotation first used to process phosphate ore	Kramer, undated
1979	Phosphate mining ends in Wyoming	Kramer, undated





**Figure 12.** Phosphate rock production information from 1905-2001. State production data is shown in millions of metric tons and US production is shown in tens of millions of metric tons. A, annual production from Idaho. B, annual production from Montana. C, Idaho and Montana combined production. D, annual U.S. production. E, the proportion of regional phosphate rock production to U.S. production. F, the proportion of regional phosphate rock production to world production. G, the historical value of phosphate rock in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 29.** Phosphate rock production from Idaho and Montana, the U.S., and the world, 1905–2001

[The table also summarizes the proportions of Idaho and Montana production relative to the US and the world as well as the price for phosphate rock in constant 1998 dollars. Data for state, US, and world production are given in metric tons; proportions of US and world production by Idaho and Montana are given in percent; phosphate rock value is in US dollars. W, withheld; n.d., no data; leaders ( \_ \_ ), no production]

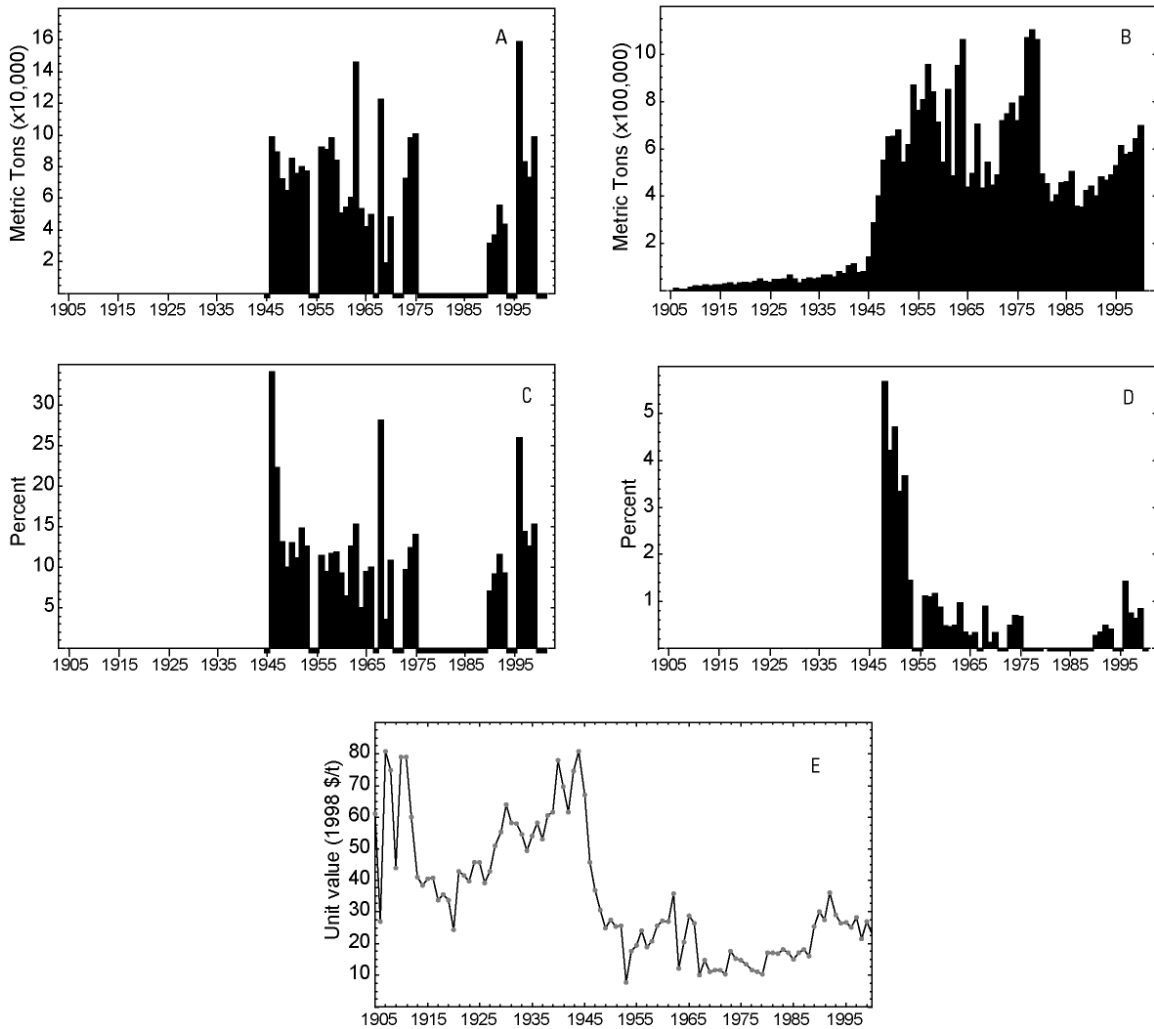
Year	Production					Proportion of Idaho and Montana production to:		Phosphate rock value (1998 \$/t)
	Idaho	Montana	Idaho and Montana combined	US	World	US	World	
1905	--	--	--	1,980,000	3,850,000	--	--	62.00
1906	--	--	--	2,110,000	4,190,000	--	--	74.00
1907	--	--	--	2,300,000	4,720,000	--	--	81.00
1908	--	--	--	2,420,000	5,380,000	--	--	86.00
1909	--	--	--	2,380,000	4,950,000	--	--	44.00
1910	W	--	W	2,700,000	5,430,000	W	--	32.00
1911	W	--	W	3,100,000	5,940,000	W	--	27.00
1912	W	--	W	3,020,000	6,730,000	W	--	27.00
1913	W	--	W	3,160,000	7,230,000	W	--	17.80
1914	W	--	W	2,780,000	5,420,000	W	--	26.80
1915	W	--	W	1,970,000	4,120,000	W	--	38.50
1916	--	--	--	2,200,000	4,830,000	--	--	40.40
1917	W	--	W	2,900,000	4,710,000	W	--	35.90
1918	--	--	--	2,320,000	4,190,000	--	--	33.00
1919	--	--	--	1,880,000	4,150,000	--	--	39.30
1920	54,596	--	54,596	4,040,000	6,870,000	1.31	0.79	38.30
1921	W	--	--	2,470,000	5,430,000	W	W	33.50
1922	4,553	W	4,553	2,370,000	5,940,000	0.19	0.08	26.50
1923	30,568	--	30,568	2,990,000	7,120,000	0.99	0.43	25.20
1924	37,420	499	37,919	2,890,000	7,780,000	1.31	0.49	24.10
1925	66,992	--	67,491	3,310,000	8,900,000	2.04	0.76	20.70
1926	33,644	--	33,644	3,650,000	9,380,000	0.92	0.36	24.20
1927	45,986	--	45,986	3,070,000	9,990,000	1.50	0.46	27.50
1928	38,078	--	38,078	3,580,000	10,100,000	1.06	0.38	29.80
1929	36,475	41	36,516	3,880,000	10,400,000	0.94	0.35	29.00
1930	60,894	6,101	66,995	4,020,000	11,800,000	1.67	0.57	30.90
1931	61,957	68,982	130,939	2,710,000	7,860,000	4.83	1.67	34.20
1932	23,544	20,412	43,956	1,730,000	7,110,000	2.54	0.62	32.10
1933	20,068	500	20,568	2,400,000	8,900,000	0.86	0.23	32.60
1934	37,747	2,119	39,867	2,950,000	9,510,000	1.35	0.42	32.70
1935	42,467	27,938	70,405	3,210,000	10,500,000	2.19	0.67	31.40
1936	47,869	36,600	84,469	3,520,000	11,300,000	2.40	0.75	25.10
1937	84,775	51,650	136,425	4,330,000	12,900,000	3.15	1.06	27.70
1938	67,073	67,558	134,631	3,920,000	12,900,000	3.43	1.04	28.00
1939	96,983	45,096	142,079	4,050,000	12,800,000	3.51	1.11	29.10
1940	100,678	65,270	165,948	4,130,000	10,300,000	4.02	1.61	29.90
1941	98,835	106,795	205,630	5,000,000	10,800,000	4.11	1.90	29.40
1942	115,910	152,815	268,725	4,900,000	8,800,000	5.48	3.05	31.70
1943	110,664	121,686	232,350	5,460,000	9,250,000	4.26	2.51	31.70

1944	114,371	189,426	303,797	5,280,000	9,330,000	5.75	3.26	33.10
1945	125,319	153,279	278,598	5,490,000	10,900,000	5.07	2.56	35.00
1946	W	182,832	182,832	7,280,000	15,300,000	2.51	1.19	35.80
1947	W	240,020	240,020	9,260,000	18,300,000	2.59	1.31	36.80
1948	437,916	252,996	690,912	9,540,000	19,400,000	7.24	3.56	38.90
1949	W	360,697	360,697	9,020,000	19,700,000	4.00	1.83	38.60
1950	W	213,370	213,370	10,900,000	23,400,000	1.96	0.91	38.60
1951	704,250	308,878	1,013,128	12,200,000	24,600,000	8.30	4.12	36.70
1952	880,232	W	880,232	12,300,000	26,400,000	7.16	3.33	37.10
1953	1,018,047	W	1,018,047	12,700,000	27,200,000	8.02	3.74	37.40
1954	1,110,539	W	1,110,539	14,000,000	30,500,000	7.93	3.64	38.10
1955	1,351,342	W	1,351,342	12,500,000	30,500,000	10.81	4.43	38.00
1956	1,461,075	566,954	2,028,030	16,000,000	34,200,000	12.68	5.93	38.90
1957	1,327,973	542,569	1,870,542	14,200,000	33,200,000	13.17	5.63	36.60
1958	1,311,717	W	1,311,717	15,100,000	33,700,000	8.69	3.89	35.50
1959	1,635,836	W	1,635,836	16,100,000	38,400,000	10.16	4.26	34.50
1960	2,211,934	W	2,211,934	17,800,000	41,800,000	12.43	5.29	37.50
1961	1,463,108	W	1,463,108	18,900,000	45,500,000	7.74	3.22	39.10
1962	1,942,682	W	1,942,682	19,700,000	63,300,000	9.86	3.07	38.40
1963	1,727,309	W	1,727,309	19,700,000	54,600,000	8.77	3.16	38.00
1964	W	W	W	23,300,000	63,700,000	W	W	37.70
1965	3,759,375	W	3,759,375	26,900,000	71,400,000	13.98	5.27	36.70
1966	W	W	W	35,400,000	84,500,000	W	W	37.10
1967	W	W	W	36,100,000	87,300,000	W	W	35.70
1968	3,519,029	W	3,519,029	37,400,000	94,100,000	9.41	3.74	31.70
1969	W	W	W	34,200,000	92,100,000	W	W	27.90
1970	W	W	W	35,100,000	95,100,000	W	W	25.20
1971	W	W	W	35,200,000	94,000,000	W	W	23.90
1972	W	W	W	37,000,000	101,000,000	W	W	21.70
1973	W	W	W	38,200,000	111,000,000	W	W	22.40
1974	W	W	W	41,400,000	123,000,000	W	W	36.13
1975	W	W	W	44,300,000	109,000,000	W	W	61.07
1976	W	W	W	44,700,000	109,000,000	W	W	53.97
1977	W	W	W	47,300,000	121,000,000	W	W	42.76
1978	4,461,000	W	4,461,000	50,000,000	127,000,000	8.92	3.51	42.68
1979	4,880,000	W	4,880,000	51,600,000	134,000,000	9.46	3.64	41.31
1980	4,991,000	W	4,991,000	54,400,000	147,000,000	9.17	3.40	40.00
1981	5,361,000	W	5,361,000	53,600,000	145,000,000	10.00	3.70	42.84
1982	W	W	W	37,400,000	129,000,000	W	W	40.59
1983	W	W	W	42,600,000	143,000,000	W	W	37.40
1984	4,722,000	W	4,722,000	49,200,000	154,000,000	9.60	3.07	35.83
1985	3,784,000	W	3,784,000	50,800,000	151,000,000	7.45	2.51	35.19
1986	4,235,000	W	4,235,000	38,700,000	141,000,000	10.94	3.00	32.08
1987	3,411,000	W	3,411,000	41,000,000	147,000,000	8.32	2.32	27.08
1988	4,706,000	W	4,706,000	45,400,000	166,000,000	10.37	2.83	25.76
1989	W	W	W	49,800,000	163,000,000	W	W	27.29
1990	4,380,000	W	4,380,000	46,300,000	162,000,000	9.46	2.70	27.80
1991	5,921,000	W	5,921,000	48,100,000	150,000,000	12.31	3.95	26.66
1992	5,208,000	--	5,208,000	47,000,000	139,000,000	11.08	3.75	25.89
1993	4,355,000	--	4,355,000	35,500,000	119,000,000	12.27	3.66	24.02

1994	W	--	W	41,100,000	127,000,000	W	W	24.23
1995	6,100,000	--	6,100,000	43,500,000	130,000,000	14.02	4.69	23.26
1996	5,900,000	--	5,900,000	45,400,000	135,000,000	13.00	4.37	24.31
1997	5,900,000	--	5,900,000	45,900,000	143,000,000	12.85	4.13	24.78
1998	6,100,000	--	6,100,000	44,200,000	144,000,000	13.80	4.24	25.46
1999	6,200,000	--	6,200,000	40,600,000	137,000,000	15.27	4.53	29.90
2000	5,400,000	--	5,400,000	38,600,000	133,000,000	13.99	4.06	22.86
2001	5,000,000	--	5,000,000	n.d.	n.d.	n.d.	n.d.	n.d.

## Pumice

Montana is not a significant producer of pumice; therefore no data regarding production from that state are included in this report. Pumice production in Idaho began in 1945, but annual production has varied considerably from year to year (fig. 13A). Idaho pumice production has ranged from less than 20,000 metric tons in 1969 to as much as 159,000 tons in 1996, although the production information was withheld for the period of 1976-89. U.S. production increased substantially after 1945 and has similarly varied drastically by year (fig. 13B). Idaho accounted for nearly 35 percent of the national pumice production in 1946, while the annual production in 1968 and 1996 was over 25 percent of national production (fig. 13C). Idaho generally averages 5 to 15 percent of the nation's production of pumice and 0.25 to 1 percent of the world's production (fig. 13D). However, the figures for world pumice production include abundant resources in the form of volcanic cinders, which are not included in the production from Idaho. This difference in the method of pumice production reporting tends to marginalize U.S. production when compared to global production. For the last 50 years, the value of pumice has ranged between \$10 and \$30 per ton. Values had been as high as \$80 per ton prior to pumice production in Idaho (fig. 13E).



**Figure 13.** Pumice production information from 1905-2001. A, annual production from Idaho. B, annual U.S. production. C, the proportion of Idaho pumice production to U.S. production. D, the proportion of Idaho pumice production to world production. E, the historical value of pumice in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 30.** Pumice production from Idaho, the U.S., and the world, 1905–2001

[The table also summarizes the proportions of Idaho production relative to the US and the world as well as the price for pumice in constant 1998 dollars. World pumice production data includes volcanic cinders. Data for state, US, and world production are given in metric tons; proportions of US and world production by Idaho are given in percent; pumice value is in US dollars. W, withheld; n.d., no data; leaders ( \_ \_ ), no production]

Year	Production			Proportion of Idaho production to:		Pumice value (1998 \$/t)
	Idaho	US	World	US	World	
1905	--	1,660	n.d.	--	n.d.	61.00
1906	--	11,100	n.d.	--	n.d.	27.00
1907	--	7,360	n.d.	--	n.d.	81.00
1908	--	9,590	n.d.	--	n.d.	75.00
1909	--	13,700	n.d.	--	n.d.	44.00
1910	--	21,100	n.d.	--	n.d.	79.00
1911	--	19,700	n.d.	--	n.d.	79.00
1912	--	24,600	n.d.	--	n.d.	60.00
1913	--	22,300	n.d.	--	n.d.	41.00
1914	--	25,000	n.d.	--	n.d.	38.50
1915	--	25,100	n.d.	--	n.d.	40.50
1916	--	30,200	n.d.	--	n.d.	40.70
1917	--	32,000	n.d.	--	n.d.	33.80
1918	--	27,800	n.d.	--	n.d.	35.50
1919	--	32,700	n.d.	--	n.d.	33.70
1920	--	38,000	66,000	--	--	24.50
1921	--	33,700	47,600	--	--	42.80
1922	--	41,100	240,000	--	--	41.60
1923	--	51,300	275,000	--	--	39.80
1924	--	39,600	157,000	--	--	45.80
1925	--	36,600	166,000	--	--	45.60
1926	--	48,900	n.d.	--	n.d.	39.20
1927	--	48,400	n.d.	--	n.d.	42.90
1928	--	52,100	n.d.	--	n.d.	51.00
1929	--	67,000	n.d.	--	n.d.	55.30
1930	--	51,600	n.d.	--	n.d.	63.90
1931	--	35,000	n.d.	--	n.d.	58.10
1932	--	48,300	n.d.	--	n.d.	58.00
1933	--	55,500	n.d.	--	n.d.	54.50
1934	--	50,900	n.d.	--	n.d.	49.50
1935	--	54,400	n.d.	--	n.d.	54.10
1936	--	66,100	n.d.	--	n.d.	58.20
1937	--	64,400	n.d.	--	n.d.	53.10
1938	--	59,600	n.d.	--	n.d.	60.70
1939	--	80,900	n.d.	--	n.d.	61.60
1940	--	74,800	n.d.	--	n.d.	77.90
1941	--	106,000	n.d.	--	n.d.	69.70
1942	--	115,000	n.d.	--	n.d.	61.50
1943	--	77,200	n.d.	--	n.d.	74.70

1944	--	80,500	n.d.	--	n.d.	80.90
1945	W	142,000	n.d.	W	n.d.	67.00
1946	98,746	290,000	n.d.	34.050	n.d.	45.60
1947	89,466	401,000	n.d.	22.311	n.d.	36.80
1948	72,055	551,000	1,270,000	13.077	5.6736431	30.70
1949	64,750	650,000	1,540,000	9.961	4.2045185	25.00
1950	85,268	653,000	1,810,000	13.058	4.7109242	27.60
1951	75,777	680,000	2,270,000	11.144	3.3381763	25.30
1952	79,911	542,000	2,180,000	14.744	3.665629	25.60
1953	77,315	615,000	5,350,000	12.572	1.4451442	7.74
1954	W	868,000	5,620,000	W	W	17.50
1955	W	764,000	6,530,000	W	W	19.50
1956	92,534	805,000	8,350,000	11.49	1.11	24.00
1957	90,720	957,000	8,260,000	9.48	1.10	18.80
1958	97,978	839,000	8,440,000	11.68	1.16	20.80
1959	84,370	711,000	9,710,000	11.87	0.87	25.70
1960	50,803	545,000	10,800,000	9.32	0.47	27.30
1961	54,432	849,000	11,900,000	6.41	0.46	27.10
1962	60,782	484,000	12,400,000	12.56	0.49	35.90
1963	146,059	953,000	15,100,000	15.33	0.97	12.20
1964	53,525	1,060,000	15,200,000	5.05	0.35	20.40
1965	41,731	438,000	14,900,000	9.53	0.28	28.90
1966	49,896	498,000	14,700,000	10.02	0.34	26.50
1967	W	704,000	14,000,000	W	W	10.00
1968	122,472	436,000	13,600,000	28.09	0.90	14.70
1969	19,051	543,000	14,700,000	3.51	0.13	11.06
1970	48,082	445,000	14,300,000	10.80	0.34	11.68
1971	W	490,000	14,800,000	W	W	11.51
1972	W	717,000	15,600,000	W	W	10.22
1973	72,576	748,000	14,900,000	9.70	0.49	17.73
1974	97,978	792,000	14,000,000	12.37	0.70	15.31
1975	100,699	717,000	14,700,000	14.04	0.69	14.75
1976	W	822,000	15,800,000	W	W	13.35
1977	W	1,070,000	15,500,000	W	W	11.65
1978	W	1,100,000	17,800,000	W	W	11.03
1979	W	1,060,000	17,700,000	W	W	10.28
1980	W	493,000	n.d.	W	n.d.	17.13
1981	W	453,000	12,800,000	W	W	17.07
1982	W	377,000	11,700,000	W	W	16.77
1983	W	407,000	10,700,000	W	W	18.02
1984	W	455,000	12,200,000	W	W	16.98
1985	W	461,000	11,000,000	W	W	14.97
1986	W	503,000	10,400,000	W	W	17.01
1987	W	356,000	10,700,000	W	W	18.11
1988	W	353,000	10,800,000	W	W	16.12
1989	W	424,000	12,300,000	W	W	25.48
1990	31,333	443,000	11,000,000	7.07	0.28	30.09
1991	36,868	401,000	10,800,000	9.19	0.34	27.41

1992	55,525	481,000	11,100,000	11.54	0.50	36.01
1993	43,438	469,000	11,000,000	9.26	0.39	28.97
1994	W	490,000	11,400,000	W	W	26.51
1995	W	529,000	10,800,000	W	W	26.74
1996	159,000	612,000	11,100,000	25.98	1.43	25.13
1997	83,100	577,000	11,200,000	14.40	0.74	28.33
1998	73,400	583,000	11,500,000	12.59	0.64	21.59
1999	98,600	643,000	11,600,000	15.33	0.85	27.09
2000	W	697,000	12,000,000	W	W	22.98
2001	W	n.d.	n.d.	W	n.d.	n.d.

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## Silver

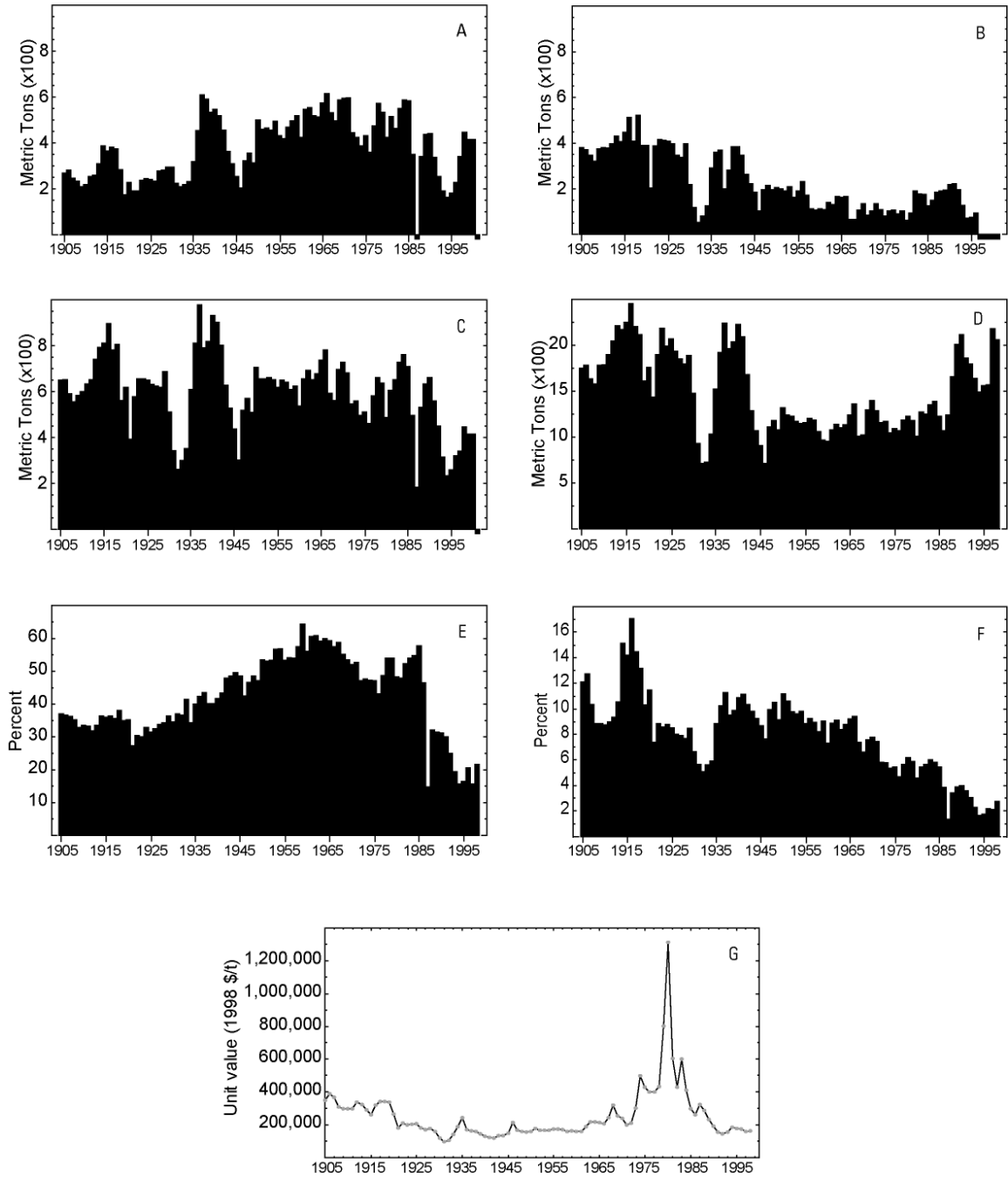
Numerous silver mines were developed throughout Idaho in the latter half of the 19<sup>th</sup> century; however, in 1934-35 the state saw a substantial increase in silver production when the Idaho Silver Belt in the Coeur d'Alene district began major production (Heyl and others, 1973). High-grade ore from the Sunshine mine contributed to the largest production year for Idaho in 1937 with over 600 metric tons. Since then, Idaho has consistently been an important producer of silver, often producing well over 400 metric tons per year. Montana was a significant silver producer as well in the early 20<sup>th</sup> century; however by the 1970's, Montana's silver industry decreased to about 100 metric tons per year (fig. 14B). This declining trend reversed in 1982 when the Troy mine began operation, but by 2000, three of Montana's top silver producing mines, the Troy, Zortman, and Continental mines had all closed or suspended operations. Combined, Idaho and Montana consistently produced more than 500 metric tons of silver, though recent production rates for the region have dropped below 400 metric tons per year (fig. 14C). In contrast, US silver production has risen in recent years to more than 2000 metric tons per year (fig. 14D). In 1960, silver mining in Idaho and Montana was responsible for more than 60 percent of the nation's production, although by 1998 the proportion had decreased to about 20 percent (fig. 14E). Idaho and Montana accounted for 17 percent of the world's silver production during World War I, but their contribution dropped below 3 percent by 1998 (fig. 14F; Heyl and others, 1973). Production data for Montana are withheld after 1996.

**Table 31.** Selected events affecting regional silver production

Year	Event	Reference
1921	Ore found on Yankee Boy vein by Sunshine Mining Co., builds small mill	this study
Apr. 1921 – Jan. 1922	Low copper price closes Butte mines	Everett, 2002
1930	Severe curtailment of mining operations due to collapse of metals prices	this study
1939	Mineral Point mine developed, expanding Silver Belt production	this study
1945	Production decreases due to wartime labor shortage	this study
1952	Galena mine development begins	this study
1956	Sunshine mine strike	Kiilsgaard, 1964
July 1967 – Mar. 1968	Longest strike in Butte's history – 8 ½ months	Everett, 2002
May 1972	Fire at Sunshine mine kills 91 men and closes mine for 7 months	Heyl and others, 1973
1976	Couer mine placed in production	this study
1982-1993	Montana's Troy mine years of operation	this study
1979-1998	Zortman-Landusky mine in Mont. Years of operation	this study
2000	Continental mine in Mont. suspends operation	this study
2001	Sunshine mine in Idaho closed	this study

**Table 32.** Selected events affecting U.S. silver production

Year	Event	Reference
~1915	Peak production owing to coinage demand of WWI allies	Heyl and others, 1973
1918	Pittman Act to convert silver dollars to bullion	this study
WWII era	Technological advances during the war in electronics and photography lead to increased consumer demand after WWII	Hilliard, 1999b
1960	Production begins at Viburnum Trend	Kramer, undated
1963	Silver Purchase Act repealed	Hilliard, 1999b
1965	Coinage act of 1965 eliminates silver from most US coins	this study
1980	Price of silver sets record high	Kramer, undated
1985	US mint began minting silver bullion coin	Hilliard, 1999b



**Figure 14.** Silver production information from 1905-2001. A, annual production from Idaho. B, annual production from Montana. C, Idaho and Montana combined production. D, annual U.S. domestic mine production of silver. E, the proportion of regional silver production to U.S. production. F, the proportion of regional silver production to world production. G, the historical value of silver in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 33.** Silver production from Idaho and Montana, the U.S., and the world, 1905–2001

[The table also summarizes the proportions of Idaho and Montana production relative to the US and the world as well as the price for silver in constant 1998 dollars. Data for state, US, and world production are given in metric tons; proportions of US and world production by Idaho and Montana are given in percent; silver value is in US dollars. W, withheld; n.d., no data]

Year	Production					Proportion of Idaho and Montana production to:		Silver value (1998 \$/t)
	Idaho	Montana	Idaho and Montana combined	US	World	US	World	
1905	270	380	650	1,750	5,360	37.16	12.13	350,000
1906	281	373	653	1,780	5,130	36.69	12.73	390,000
1907	245	346	592	1,630	5,730	36.29	10.32	370,000
1908	235	322	557	1,580	6,320	35.27	8.82	310,000
1909	210	374	584	1,780	6,600	32.83	8.86	300,000
1910	219	382	601	1,790	6,900	33.55	8.70	300,000
1911	255	378	633	1,900	7,040	33.31	8.99	300,000
1912	258	396	654	2,050	6,980	31.90	9.37	340,000
1913	311	430	741	2,210	7,010	33.51	10.56	323,000
1914	388	405	793	2,170	5,240	36.54	15.13	292,000
1915	366	447	813	2,250	5,730	36.15	14.19	263,000
1916	383	513	896	2,450	5,250	36.56	17.06	322,000
1917	374	408	782	2,200	5,420	35.57	14.44	344,000
1918	285	522	808	2,120	6,140	38.10	13.16	341,000
1919	174	390	564	1,610	5,490	35.01	10.27	339,000
1920	228	391	619	1,760	5,390	35.18	11.49	267,000
1921	189	204	393	1,440	5,330	27.30	7.38	184,000
1922	189	388	577	1,900	6,530	30.37	8.84	213,000
1923	239	416	655	2,190	7,650	29.90	8.56	200,000
1924	242	413	656	1,990	7,450	32.95	8.80	205,000
1925	241	409	650	2,070	7,650	31.41	8.50	206,000
1926	235	397	632	1,940	7,890	32.59	8.01	184,000
1927	277	348	625	1,850	7,900	33.80	7.91	172,000
1928	280	338	617	1,800	8,020	34.30	7.70	177,000
1929	293	396	688	1,890	8,120	36.42	8.48	162,000
1930	293	219	512	1,480	7,740	34.62	6.62	119,000
1931	225	119	344	929	6,080	37.00	5.65	99,800
1932	209	52	261	712	5,130	36.71	5.09	107,000
1933	217	83	300	725	5,340	41.39	5.62	142,000
1934	230	125	355	1,030	5,990	34.43	5.92	188,000
1935	319	290	609	1,520	6,890	40.03	8.83	244,000
1936	452	361	813	1,920	7,920	42.34	10.26	170,000
1937	609	367	977	2,240	8,640	43.60	11.30	164,000
1938	591	199	790	1,960	8,320	40.30	9.49	160,000
1939	536	283	818	2,040	8,300	40.11	9.86	147,000
1940	546	384	930	2,230	8,570	41.72	10.86	131,000
1941	519	385	904	2,090	8,140	43.25	11.10	125,000
1942	456	348	803	1,680	7,780	47.83	10.33	122,000

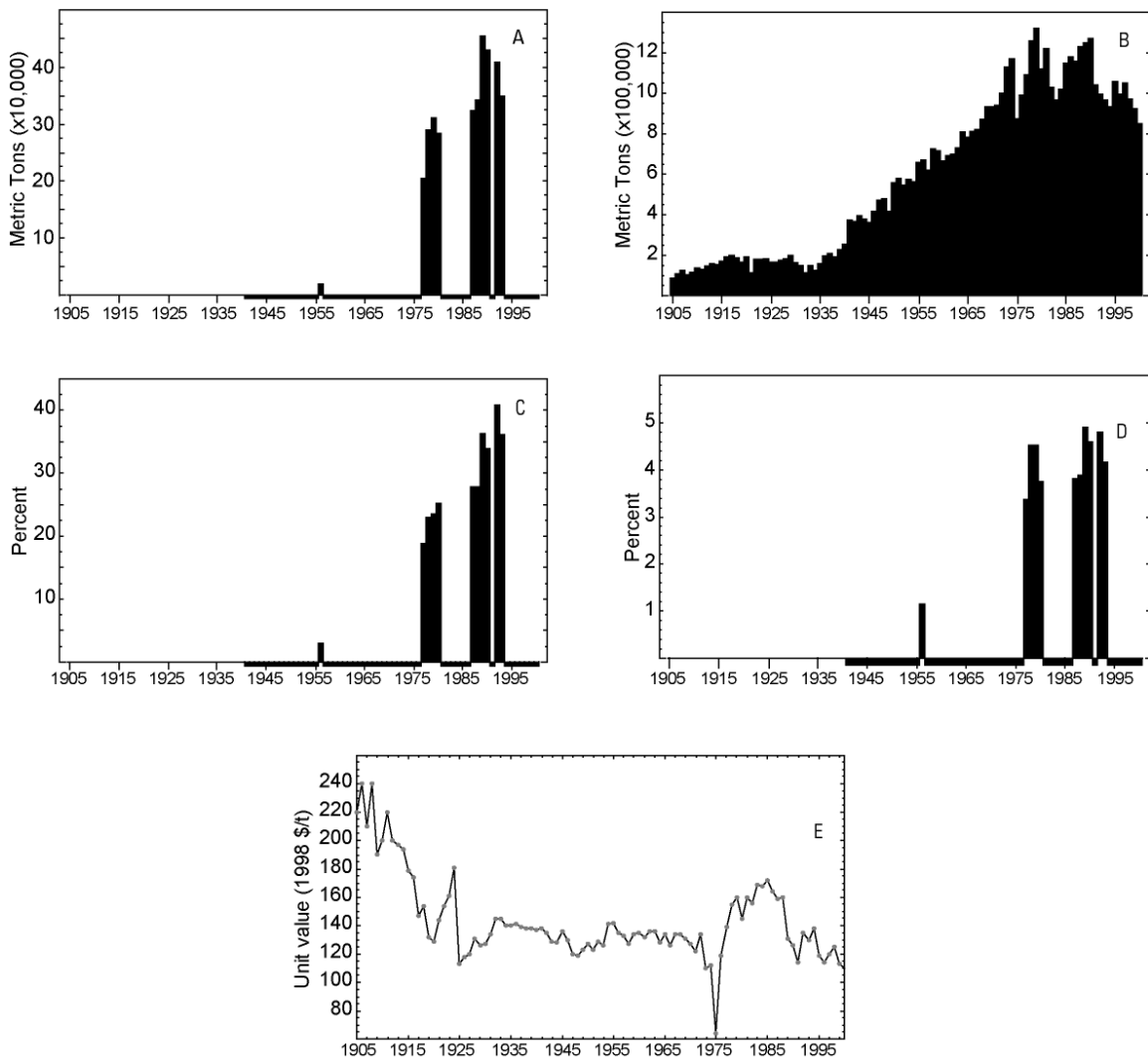
1943	364	263	627	1,290	6,380	48.59	9.82	136,000
1944	309	221	530	1,070	5,740	49.49	9.23	134,000
1945	253	185	438	903	5,040	48.51	8.69	151,000
1946	202	102	304	713	3,970	42.59	7.65	215,000
1947	322	197	519	1,110	5,220	46.72	9.93	169,000
1948	356	216	572	1,180	5,440	48.45	10.51	161,000
1949	313	197	509	1,080	5,570	47.16	9.14	158,000
1950	501	205	706	1,320	6,320	53.46	11.16	161,000
1951	459	199	658	1,240	6,210	53.04	10.59	180,000
1952	464	191	655	1,230	6,700	53.26	9.78	168,000
1953	455	208	663	1,170	6,900	56.70	9.61	167,000
1954	494	161	655	1,150	6,670	56.92	9.81	166,000
1955	430	189	619	1,160	7,000	53.39	8.85	174,000
1956	419	230	649	1,200	7,020	54.06	9.24	176,000
1957	469	173	642	1,190	7,190	53.91	8.92	170,000
1958	496	113	609	1,060	7,430	57.46	8.20	161,000
1959	517	106	624	970	6,910	64.31	9.03	164,000
1960	424	112	537	957	7,320	56.08	7.33	161,000
1961	547	109	655	1,080	7,370	60.67	8.89	161,000
1962	553	142	695	1,140	7,650	60.93	9.08	189,000
1963	520	132	652	1,100	7,780	59.25	8.38	219,000
1964	513	165	677	1,130	7,730	59.93	8.76	218,000
1965	574	162	736	1,240	8,010	59.36	9.19	214,000
1966	615	165	781	1,360	8,300	57.40	9.40	208,000
1967	530	64	594	1,010	8,030	58.82	7.40	243,000
1968	496	66	563	1,020	8,560	55.17	6.57	322,000
1969	589	107	695	1,300	9,200	53.50	7.56	255,900
1970	595	134	728	1,400	9,360	52.03	7.78	238,900
1971	595	85	681	1,290	9,170	52.77	7.42	200,600
1972	443	103	547	1,160	9,380	47.13	5.83	210,500
1973	424	135	559	1,170	9,700	47.77	5.76	301,900
1974	387	109	496	1,050	9,260	47.24	5.36	500,600
1975	431	81	513	1,090	9,430	47.04	5.44	430,500
1976	360	102	462	1,070	9,840	43.14	4.69	400,500
1977	476	105	580	1,190	10,300	48.77	5.63	399,600
1978	572	91	662	1,230	10,700	53.85	6.19	433,800
1979	533	103	636	1,180	10,800	53.89	5.89	800,900
1980	426	63	489	1,010	10,700	48.41	4.57	1,312,000
1981	515	93	608	1,270	11,200	47.84	5.43	606,200
1982	461	192	653	1,250	11,500	52.25	5.68	431,700
1983	550	178	728	1,350	12,100	53.89	6.01	601,900
1984	587	176	763	1,390	13,100	54.87	5.82	410,800
1985	586	125	710	1,230	13,100	57.75	5.42	299,200
1986	349	148	497	1,070	13,000	46.45	3.82	261,500
1987	W	185	184	1,240	14,000	14.84	1.31	323,300
1988	340	192	532	1,660	15,500	32.05	3.43	289,300
1989	439	194	633	2,010	16,400	31.49	3.86	232,500
1990	442	220	662	2,120	16,600	31.23	3.99	193,300

1991	337	222	559	1,860	15,600	30.05	3.58	155,400
1992	254	197	451	1,800	14,900	25.06	3.03	147,200
1993	190	127	317	1,640	14,100	19.33	2.25	156,000
1994	162	71	233	1,490	14,000	15.64	1.66	187,000
1995	182	76	258	1,560	14,800	16.54	1.74	177,100
1996	229	94	323	1,570	14,900	20.57	2.17	173,400
1997	341	W	341	2,180	16,000	15.64	2.13	159,700
1998	447	W	447	2,060	16,400	21.70	2.73	164,000
1999	416	W	416	n.d.	n.d.	n.d.	n.d.	n.d.
2000	416	W	416	n.d.	n.d.	n.d.	n.d.	n.d.
2001	W	W	W	n.d.	n.d.	n.d.	n.d.	n.d.

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## Talc

Montana talc mining began in 1941 and became one of the nation's leading talc-producing states; however, much of the production data are proprietary and have been withheld from publication. Montana produced between 200,000 and 450,000 metric tons of talc per year in the years for which data are available (fig. 15A). U.S. production increased significantly from their previously stagnant levels once production of Montana talc began in the early 1940's. Prior to Montana's contribution to the talc industry, national production rarely topped 200,000 metric tons; however by 1979, U.S. talc production rose to 1,300,000 metric tons per year (fig. 15B). The significance of Montana's talc industry was highlighted in the late-1980s and early-1990s when the states production contributed as much as 40 percent to the nation's total (fig. 15C), and nearly 5 percent to the world's total (fig. 15D). No talc production is reported from Montana after 1993. There is no record of talc production from Idaho.



**Figure 15.** Talc production information from 1905-2001. A, annual production from Montana. B, annual U.S. domestic production of talc. E, the proportion of Montana talc production to U.S. production. F, the proportion of Montana talc production to world production. G, the historical value of talc in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 34.** Talc production from Montana, the U.S., and the world, 1905–2000

[The table also summarizes the proportion of Montana production relative to the US and the world as well as the price for talc in constant 1998 dollars. National talc production figures for the years 1905-1920 represent talc and soapstone produced and sold in the U.S., but also include pyrophyllite from 1921-1940. National figures from 1941-1971 include talc, soapstone, and pyrophyllite produced from domestic mines, though after 1971 soapstone is not included. Data for state, US, and world production are given in metric tons; proportions of US and world production by Montana are given in percent; talc value is in US dollars. W, withheld; leaders ( \_ \_ ), no production]

Year	Production			Proportion of Montana production to:		Talc value (1998 \$/t)
	Montana	US	World	US	World	
1905	--	87,700	124,000	--	--	220
1906	--	109,000	151,000	--	--	240
1907	--	127,000	191,000	--	--	210
1908	--	106,000	160,000	--	--	240
1909	--	118,000	178,000	--	--	190
1910	--	137,000	202,000	--	--	200
1911	--	130,000	208,000	--	--	220
1912	--	144,000	171,000	--	--	200
1913	--	160,000	279,000	--	--	197
1914	--	156,000	213,000	--	--	194
1915	--	170,000	224,000	--	--	179
1916	--	193,000	257,000	--	--	174
1917	--	199,000	266,000	--	--	147
1918	--	189,000	252,000	--	--	154
1919	--	168,000	255,000	--	--	132
1920	--	191,000	322,000	--	--	129
1921	--	111,000	207,000	--	--	144
1922	--	180,000	353,000	--	--	154
1923	--	178,000	336,000	--	--	161
1924	--	185,000	375,000	--	--	181
1925	--	165,000	398,000	--	--	113
1926	--	165,000	344,000	--	--	118
1927	--	174,000	431,000	--	--	120
1928	--	184,000	389,000	--	--	131
1929	--	199,000	421,000	--	--	126
1930	--	163,000	364,000	--	--	127
1931	--	149,000	384,000	--	--	134
1932	--	112,000	331,000	--	--	145
1933	--	151,000	430,000	--	--	145
1934	--	126,000	399,000	--	--	140
1935	--	157,000	424,000	--	--	140
1936	--	196,000	472,000	--	--	141
1937	--	209,000	515,000	--	--	139
1938	--	193,000	420,000	--	--	138
1939	--	230,000	488,000	--	--	138
1940	--	255,000	664,000	--	--	137

1941	W	376,000	840,000	W	W	138
1942	W	366,000	1,170,000	W	W	135
1943	W	396,000	1,120,000	W	W	129
1944	W	379,000	1,010,000	W	W	128
1945	W	364,000	840,000	W	W	136
1946	W	418,000	950,000	W	W	130
1947	W	469,000	1,060,000	W	W	120
1948	W	479,000	1,300,000	W	W	119
1949	W	417,000	1,280,000	W	W	123
1950	W	559,000	1,430,000	W	W	127
1951	W	581,000	1,570,000	W	W	123
1952	W	545,000	1,410,000	W	W	129
1953	W	573,000	1,480,000	W	W	126
1954	W	562,000	1,470,000	W	W	141
1955	W	659,000	1,620,000	W	W	142
1956	20,137	670,000	1,750,000	3.01	1.15	135
1957	W	621,000	2,010,000	W	W	133
1958	W	724,000	1,910,000	W	W	127
1959	W	718,000	2,350,000	W	W	134
1960	W	666,000	2,520,000	W	W	135
1961	W	691,000	2,710,000	W	W	132
1962	W	700,000	2,670,000	W	W	136
1963	W	729,000	2,990,000	W	W	136
1964	W	807,000	3,520,000	W	W	128
1965	W	783,000	3,570,000	W	W	134
1966	W	812,000	3,710,000	W	W	126
1967	W	819,000	3,960,000	W	W	134
1968	W	869,000	4,350,000	W	W	134
1969	W	933,000	4,680,000	W	W	131
1970	W	933,000	4,820,000	W	W	127
1971	W	941,000	4,740,000	W	W	122
1972	W	1,000,000	4,830,000	W	W	134
1973	W	1,130,000	5,400,000	W	W	110
1974	W	1,170,000	5,810,000	W	W	112
1975	W	875,000	4,900,000	W	W	64.0
1976	W	991,000	5,270,000	W	W	119
1977	205,027	1,090,000	6,090,000	18.81	3.37	139
1978	289,397	1,260,000	6,400,000	22.97	4.52	155
1979	311,170	1,320,000	6,870,000	23.57	4.53	160
1980	283,046	1,120,000	7,540,000	25.27	3.75	145
1981	W	1,220,000	7,270,000	W	W	160
1982	W	1,030,000	7,060,000	W	W	156
1983	W	967,000	7,060,000	W	W	169
1984	W	1,020,000	7,570,000	W	W	168
1985	W	1,150,000	7,830,000	W	W	172
1986	W	1,180,000	7,760,000	W	W	164
1987	323,173	1,160,000	8,470,000	27.86	3.82	159
1988	342,730	1,230,000	8,810,000	27.86	3.89	160



1989	453,978	1,250,000	9,240,000	36.32	4.91	131
1990	430,125	1,270,000	9,370,000	33.87	4.59	126
1991	W	1,040,000	9,060,000	W	W	114
1992	407,657	997,000	8,500,000	40.89	4.80	135
1993	349,559	968,000	8,420,000	36.11	4.15	130
1994	W	935,000	8,260,000	W	W	138
1995	W	1,060,000	8,490,000	W	W	119
1996	W	994,000	9,880,000	W	W	114
1997	W	1,050,000	11,100,000	W	W	120
1998	W	971,000	10,100,000	W	W	125
1999	W	925,000	10,000,000	W	W	113
2000	W	851,000	9,640,000	W	W	110

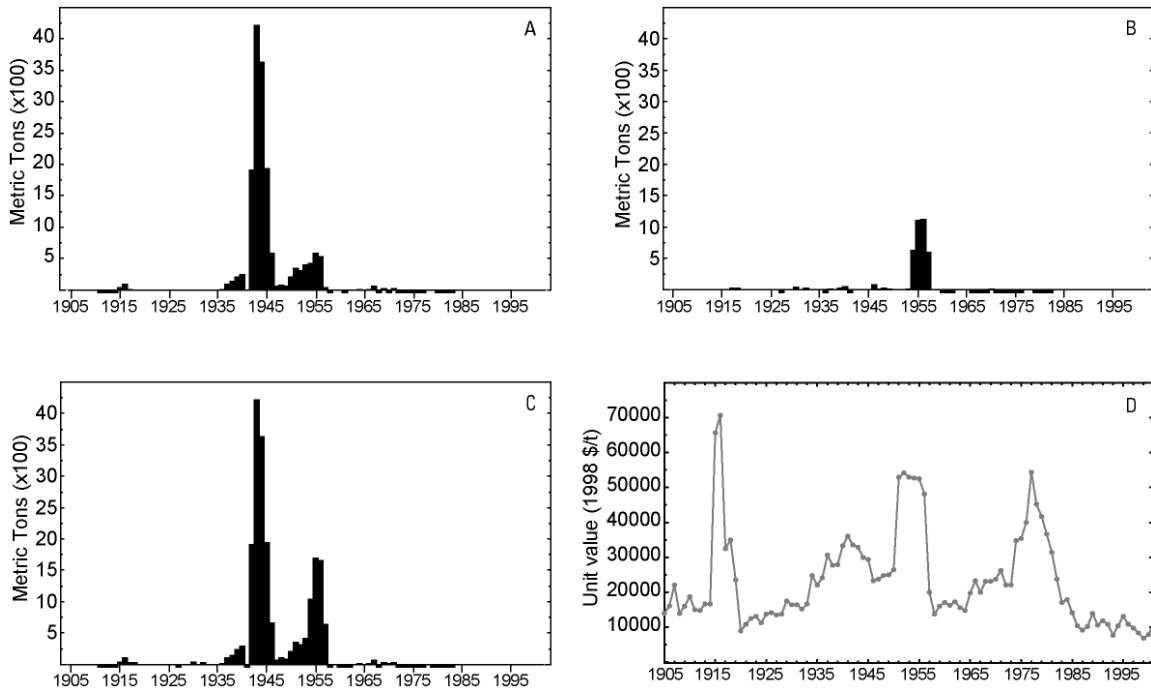
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## Tungsten

Idaho tungsten production began in 1911; however, significant production was limited to four years from 1942 through 1945 (fig. 84). Over 4,200 metric tons were produced in 1943 alone; however, this was the only period of abundant tungsten mining in Idaho. A second, though much smaller, period of production during the early- to mid-1950's coincided with a U.S. government strategic materials stockpile program (Kramer, undated). Significant production in Montana was limited to the period between 1954 and 1957; however, the maximum quantity produced in Montana amounted to only one-fourth that of Idaho's most prolific years (fig. 85). Together, Idaho and Montana contributed over 1,600 metric tons of tungsten per year in the mid-1950's (fig.86). Production from both Idaho and Montana decreased when the U.S. government terminated the strategic materials program (Shedd, 1999). Tungsten mining in the region ended in 1983, though data are withheld for both states after 1972. No charts were produced for the proportion of regional tungsten mining production to U.S. or world tungsten production, due to the very small numbers involved.

**Table 35.** Selected events affecting U.S. tungsten production

Year	Event	Reference
Early 1950's	US Government begins program of stockpiling tungsten after Korean conflict	Shedd, 1999
1964	Increase in US production due to decreased imports from communist countries	Shedd, 1999



**Figure 16.** Tungsten production information from 1905-2001. A, annual production of tungsten concentrates from Idaho. B, annual production of tungsten concentrates from Montana. C, Idaho and Montana combined production. D, the historical value of tungsten in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 36.** Tungsten (60-percent concentrate) production from Idaho and Montana, the U.S. and the world, 1905–2001

[The table also summarizes the proportion of Idaho and Montana production relative to the US and the world as well as the price for

tungsten in constant 1998 dollars. The regional production figures represent tungsten concentrate containing 60-percent tungsten trioxide. Primary U.S. production of tungsten concentrates include domestically mined, imported, or stockpiled ore. Data for state, US, and world production are given in metric tons; proportions of US and world production by Idaho and Montana are given in percent; tungsten value is in US dollars. W, withheld; leaders ( \_ \_ ), no production]

Year	Production					Proportion of Idaho and Montana production to:		Tungsten value (1998 \$/t)
	Idaho	Montana	Idaho and Montana combined	US	World	US	World	
1905	--	--	--	347	1,700	--	--	14,000
1906	--	--	--	401	1,900	--	--	16,000
1907	--	--	--	708	2,600	--	--	22,000
1908	--	--	--	290	1,800	--	--	14,000
1909	--	--	--	699	2,500	--	--	16,000
1910	--	--	--	786	3,300	--	--	18,700
1911	W	--	W	492	3,200	W	W	15,000
1912	W	--	W	574	4,200	W	W	14,800
1913	W	--	W	664	3,900	W	W	16,600
1914	W	--	W	427	3,500	W	W	16,600
1915	29.0	--	29.0	1,010	5,200	0.03	0.01	65,700
1916	91.6	0.9	92.5	2,560	10,000	0.04	0.01	70,600
1917	1.8	14.5	16.3	2,650	12,300	0.01	0.00	32,600
1918	--	20.0	20.0	2,180	15,200	0.01	0.00	34,900
1919	--	--	--	141	7,000	--	--	23,600
1920	--	--	--	93.2	5,500	--	--	8,890
1921	--	--	--	0	2,300	--	--	10,900
1922	--	--	--	0	3,000	--	--	12,600
1923	--	--	--	104	3,300	--	--	13,200
1924	--	--	--	244	2,900	--	--	11,200
1925	--	--	--	514	4,900	--	--	13,700
1926	--	--	--	596	5,800	--	--	14,200
1927	--	W	W	503	4,400	W	W	13,500
1928	--	--	--	522	5,500	--	--	13,800
1929	--	--	--	358	7,500	--	--	17,400
1930	--	28.1	28.1	303	7,900	0.09	0.00	16,500
1931	--	--	--	606	6,400	--	--	16,400
1932	--	27.2	27.2	171	3,200	0.16	0.01	15,200
1933	--	--	--	386	5,900	--	--	16,700
1934	0.9	--	0.9	885	7,800	0.00	0.00	24,700
1935	--	--	--	1,030	10,700	--	--	22,100
1936	10.0	W	10.0	1,130	11,800	0.01	0.00	24,200
1937	89.8	12.7	102.5	1,510	18,500	0.07	0.01	30,700
1938	139.7	--	139.7	1,310	17,800	0.11	0.01	27,800
1939	206.8	20.9	227.7	1,850	20,100	0.12	0.01	27,900
1940	235.9	45.4	281.2	2,300	20,700	0.12	0.01	33,400
1941	--	W	W	2,830	23,900	W	W	36,100
1942	1912.4	--	1912.4	4,030	24,100	0.47	0.08	33,500
1943	4216.7	--	4216.7	5,160	28,600	0.82	0.15	32,900
1944	3633.3	--	3633.3	4,440	23,400	0.82	0.16	30,100

1945	1932.3	--	1932.3	2,390	10,900	0.81	0.18	29,300
1946	581.5	76.2	657.7	2,240	9,040	0.29	0.07	23,400
1947	55.3	3.6	59.0	1,340	13,700	0.04	0.00	23,800
1948	78.0	25.4	103.4	1,740	17,800	0.06	0.01	24,700
1949	59.9	8.2	68.0	1,190	15,800	0.06	0.00	25,100
1950	201.4	--	201.4	2,080	18,300	0.10	0.01	26,500
1951	342.0	0.9	342.9	2,710	24,800	0.13	0.01	53,000
1952	302.1	--	302.1	3,290	32,700	0.09	0.01	54,100
1953	400.1	12.7	412.8	4,140	34,400	0.10	0.01	53,000
1954	427.3	615.1	1042.4	5,910	33,800	0.18	0.03	52,800
1955	582.4	1098.6	1681.0	7,080	35,700	0.24	0.05	52,400
1956	528.0	1115.9	1643.8	6,360	35,800	0.26	0.05	48,200
1957	31.8	599.7	631.4	2,380	29,100	0.27	0.02	20,000
1958	W	--	W	1,640	24,200	W	W	13,800
1959	--	--	--	1,580	26,400	--	--	16,000
1960	--	W	W	3,160	31,200	W	W	17,100
1961	W	W	W	3,560	33,000	W	W	16,200
1962	--	W	W	3,640	31,300	W	W	17,300
1963	--	--	--	2,440	27,100	--	--	15,700
1964	10.0	--	10.0	3,990	28,100	0.00	0.00	14,800
1965	--	--	--	3,430	27,000	--	--	19,700
1966	1.8	W	1.8	3,250	28,600	0.00	0.00	23,300
1967	61.7	W	61.7	3,560	28,500	0.02	0.00	20,000
1968	W	W	W	4,100	31,000	W	W	23,200
1969	24.5	W	24.5	3,590	32,500	0.01	0.00	23,200
1970	W	8.2	8.2	4,220	32,400	0.00	0.00	23,700
1971	21.8	W	21.8	3,100	35,400	0.01	0.00	26,200
1972	W	W	W	3,200	38,500	W	W	22,100
1973	W	W	W	3,200	37,900	W	W	22,000
1974	W	W	W	3,550	37,600	W	W	34,800
1975	W	W	W	2,490	38,300	W	W	35,400
1976	W	W	W	2,660	38,000	W	W	40,100
1977	W	--	W	2,730	41,100	W	W	54,300
1978	--	--	--	3,130	46,100	--	--	45,300
1979	--	W	W	3,010	48,600	W	W	41,600
1980	W	W	W	2,740	52,000	W	W	36,600
1981	W	W	W	3,550	50,300	W	W	31,500
1982	W	W	W	1,580	47,000	W	W	23,700
1983	W	--	W	1,020	40,900	W	W	17,000
1984	--	--	--	1,170	46,200	--	--	17,900
1985	--	--	--	983	46,600	--	--	14,100
1986	--	--	--	817	43,500	--	--	10,500
1987	--	--	--	34	42,500	--	--	9,110
1988	--	--	--	--	50,900	--	--	10,300
1989	--	--	--	--	51,000	--	--	13,900
1990	--	--	--	--	51,900	--	--	10,600
1991	--	--	--	--	48,200	--	--	11,800
1992	--	--	--	--	42,900	--	--	10,800
1993	--	--	--	--	34,300	--	--	7,690
1994	--	--	--	--	34,000	--	--	10,400

1995	--	--	--	0	38,500	--	--	13,200
1996	--	--	--	0	34,700	--	--	10,800
1997	--	--	--	0	33,200	--	--	9,810
1998	--	--	--	0	37,000	--	--	8,300
1999	--	--	--	0	37,700	--	--	6,920
2000	--	--	--	0	44,000	--	--	7,840
2001	--	--	--	0	45,300	--	--	11,500

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## Zinc

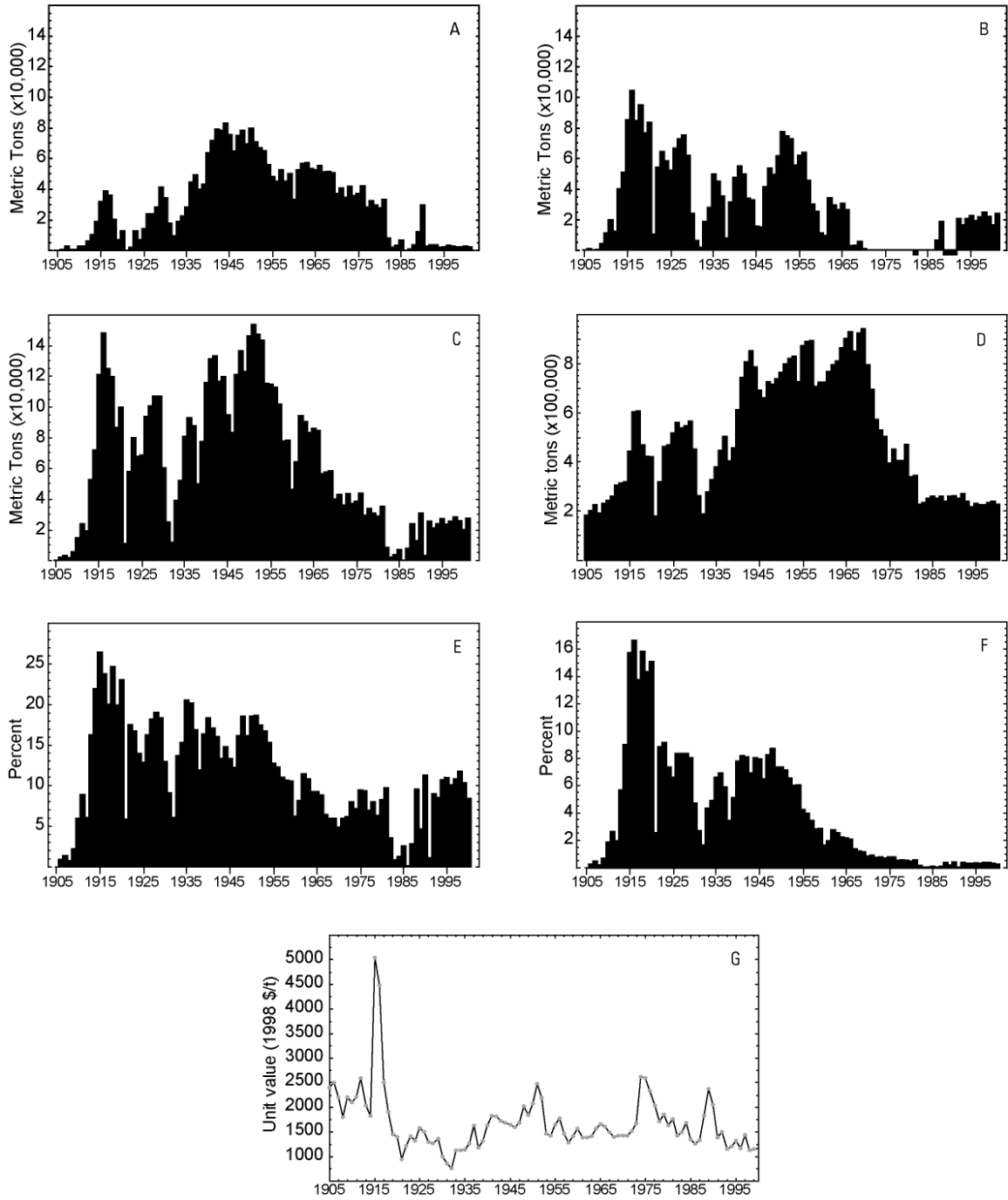
The discovery and implementation of flotation as a more efficient method of recovering ore brought renewed interest in zinc mining to the region in the early 1900s. After two sharp declines in zinc production in 1921 and 1932 due to low prices, Idaho doubled its earlier output records and rose to around 80,000 metric tons of zinc per year (fig. 17A). Zinc production in Idaho decreased after 1950 and has been relatively insignificant since 1981. Montana also has shown abundant zinc resources, most notably in the Butte area where zinc has historically been the second most common commodity produced after copper (Miller, R.N., 1973). Montana's zinc industry peaked in 1916 when it produced 104,000 metric tons, while production rates in the years following have seen considerable fluctuations (fig. 17B). The highly variable production from the 1920s through the 1960s typically ranged from 10,000 to 80,000 metric tons; however, this declined to just dozens of tons after zinc mining ceased in Butte in 1966 (Miller, R.N., 1973). In 1987, Montana Tunnels mine began operations and the state has consistently produced about 20,000 metric tons per year. Together, Idaho and Montana show a varied production history, though the overall amount of refined zinc has stabilized in recent years at about 20,000 to 25,000 metric tons, down from the peak production in 1951 of 148,000 metric tons (fig. 17C). Large decreases in U.S. production, down from 900,000 to about 200,000 metric tons, show similar trends on a national scale to that of the region (fig. 17D). Idaho and Montana together have produced as much as 26 percent of the nation's zinc (fig. 17E) and 16 percent of the world's zinc (fig. 17F), though in recent years, their percentage has declined to 10 percent and less than 0.3 percent, respectively.

**Table 37.** Selected events affecting regional zinc production

Year	Event	Reference
1906	Success mine begins recovery of zinc concentrate by gravity methods	this study
1910	Morning mill begins experiments with flotation to recover zinc	this study
1917	Bunker Hill Smelter begins operation	Chapman, 1994
1917	Great Falls electrolytic zinc plant opens	Miller, R.N., 1973
1921	Butte mines temporarily shut down because of low copper prices	Everett, 2002
1928	Sullivan Mining Company opens electrolytic zinc plant	this study
1930	Severe curtailment of mining operations due to collapse of metals prices	this study
1937	Bunker Hill last mine to convert to all-through flotation	Art Bookstrom, 2004 written commun.
1945	Production decreases due to wartime labor shortage	this study
1949	Strike at Bunker Hill caused smelter shutdown for 15 days	Chapman, 1994
1955	Lucky Friday mine opened	this study
1959	Strike results in the closure of Anselmo mine near Butte	Showers and others, 1991
1960	200 day-long strike at Bunker Hill	Chapman, 1994
1962-67	Block cave mining for low-grade ore in the Badger mine	Miller, R.N., 1973
1966	Butte zinc mining discontinued because of low price, high costs	Miller, R.N., 1973
1981	Bunker Hill mine, mill, and smelter closed	Chapman, 1994
1987	Montana Tunnels mine opens	this study
1997	Hecla begins production from Gold Hunter via Lucky Friday mine	this study

**Table 38.** Selected events affecting U.S. zinc production

Year	Event	Reference
1906	Froth flotation comes into widespread use	Kramer, undated
1960	Production begins at Viburnum Trend in Missouri	Kramer, undated
1971-73	Price controls keeps value down	Plachy, 1999
1973	Price controls removed, price of zinc increases dramatically	Plachy, 1999
1982	Introduction of zinc penny	Plachy, 1999



**Figure 17.** Zinc production information from 1905-2001. A, annual production from Idaho. B, annual production from Montana. C, Idaho and Montana combined production. D, annual U.S. primary production of zinc. E, the proportion of regional zinc production to U.S. production. F, the proportion of regional zinc production to world production. G, the historical value of zinc in constant 1998 dollars. Bars extending below the x-axis represent data withheld from publication.

**Table 39.** Zinc production from Idaho and Montana, the U.S., and the world, 1905–2001

[The table also summarizes the proportions of Idaho and Montana production relative to the US and the world as well as the price for zinc in constant 1998 dollars. Data for state, US, and world production are given in metric tons; proportions of US and world production by Idaho and Montana are given in percent; zinc value is in US dollars. W, withheld; n.d., no data; leaders ( \_ \_ ), no production]

Year	Production					Proportion of Idaho and Montana production to:		Zinc value (1998 \$/t)
	Idaho	Montana	Idaho and Montana combined	US	World	US	World	
1905	--	--	--	185,000	660,000	n.d.	n.d.	2,400
1906	520	1,284	1,804	204,000	704,000	0.88	0.26	2,500
1907	3,182	--	3,182	227,000	738,000	1.40	0.43	2,200
1908	527	816	1,344	191,000	723,000	0.70	0.19	1,800
1909	817	4,287	5,104	232,000	775,000	2.20	0.66	2,200
1910	3,133	11,257	14,390	244,000	810,000	5.90	1.78	2,100
1911	2,885	20,063	22,948	260,000	895,000	8.83	2.56	2,200
1912	6,308	12,210	18,518	307,000	971,000	6.03	1.91	2,600
1913	10,512	40,223	50,734	314,000	915,000	16.16	5.54	2,030
1914	19,057	50,613	69,669	320,000	795,000	21.77	8.76	1,830
1915	31,822	84,889	116,711	444,000	760,000	26.29	15.36	5,050
1916	39,239	103,992	143,231	606,000	882,000	23.64	16.24	4,480
1917	36,222	84,488	120,709	607,000	901,000	19.89	13.40	2,500
1918	20,485	94,919	115,405	470,000	747,000	24.55	15.45	1,900
1919	7,255	76,551	83,806	423,000	598,000	19.81	14.01	1,450
1920	12,670	83,616	96,286	420,000	655,000	22.93	14.70	1,400
1921	15	10,558	10,573	182,000	428,000	5.81	2.47	945
1922	1,864	54,010	55,874	321,000	647,000	17.41	8.64	1,220
1923	12,679	64,166	76,845	463,000	858,000	16.60	8.96	1,410
1924	6,958	58,277	65,235	469,000	910,000	13.91	7.17	1,320
1925	14,170	52,307	66,477	520,000	1,030,000	12.78	6.45	1,580
1926	23,866	66,862	90,727	561,000	1,110,000	16.17	8.17	1,500
1927	24,293	72,786	97,079	538,000	1,190,000	18.04	8.16	1,290
1928	28,362	75,143	103,505	547,000	1,270,000	18.92	8.15	1,270
1929	41,436	61,849	103,286	567,000	1,320,000	18.22	7.82	1,360
1930	34,155	23,969	58,124	452,000	1,260,000	12.86	4.61	990
1931	17,753	6,121	23,874	265,000	904,000	9.01	2.64	857
1932	9,301	1,993	11,294	188,000	709,000	6.01	1.59	762
1933	19,022	18,801	37,823	279,000	892,000	13.56	4.24	1,120
1934	22,498	27,870	50,368	330,000	1,060,000	15.26	4.75	1,120
1935	28,171	49,697	77,869	382,000	1,210,000	20.38	6.44	1,140
1936	44,544	45,103	89,647	446,000	1,330,000	20.10	6.74	1,270
1937	49,169	35,533	84,703	505,000	1,470,000	16.77	5.76	1,630
1938	39,944	8,023	47,967	405,000	1,420,000	11.84	3.38	1,180
1939	43,136	31,570	74,706	460,000	1,500,000	16.24	4.98	1,320
1940	64,049	47,707	111,756	613,000	1,470,000	18.23	7.60	1,630
1941	71,745	55,076	126,821	746,000	1,590,000	17.00	7.98	1,830
1942	79,159	49,637	128,796	809,000	1,630,000	15.92	7.90	1,820
1943	78,661	34,116	112,777	855,000	1,670,000	13.19	6.75	1,720



1944	82,893	32,774	115,667	789,000	1,470,000	14.66	7.87	1,690
1945	75,718	15,788	91,506	694,000	1,180,000	13.19	7.75	1,650
1946	64,871	15,214	80,085	661,000	1,260,000	12.12	6.36	1,600
1947	75,360	41,440	116,800	728,000	1,450,000	16.04	8.06	1,690
1948	78,261	53,611	131,872	715,000	1,550,000	18.44	8.51	2,020
1949	69,451	49,166	118,616	739,000	1,660,000	16.05	7.15	1,840
1950	79,734	61,397	141,131	765,000	1,970,000	18.45	7.16	2,070
1951	70,871	77,612	148,483	800,000	2,140,000	18.56	6.94	2,480
1952	67,420	74,558	141,979	821,000	2,230,000	17.29	6.37	2,190
1953	65,457	72,822	138,279	831,000	2,360,000	16.64	5.86	1,460
1954	55,818	55,296	111,114	728,000	1,880,000	15.26	5.91	1,430
1955	48,366	62,223	110,589	874,000	2,660,000	12.65	4.16	1,650
1956	44,962	63,976	108,937	892,000	2,810,000	12.21	3.88	1,780
1957	52,464	45,832	98,296	894,000	2,900,000	11.00	3.39	1,460
1958	45,111	30,154	75,264	709,000	2,730,000	10.62	2.76	1,280
1959	50,530	25,264	75,794	725,000	2,740,000	10.45	2.77	1,410
1960	33,386	11,386	44,772	725,000	2,790,000	6.18	1.60	1,570
1961	52,885	9,310	62,195	768,000	3,250,000	8.10	1.91	1,390
1962	57,031	34,181	91,213	798,000	3,410,000	11.43	2.67	1,380
1963	57,396	29,884	87,280	810,000	3,490,000	10.78	2.50	1,410
1964	53,795	26,362	80,157	866,000	3,690,000	9.26	2.17	1,570
1965	52,648	30,651	83,299	902,000	3,950,000	9.23	2.11	1,660
1966	55,336	26,418	81,754	930,000	4,080,000	8.79	2.00	1,610
1967	51,282	3,031	54,313	852,000	4,130,000	6.37	1.32	1,490
1968	51,935	3,427	55,363	926,000	4,630,000	5.98	1.20	1,400
1969	50,712	5,573	56,285	944,000	4,970,000	5.96	1.13	1,430
1970	37,242	1,322	38,564	796,000	4,830,000	4.84	0.80	1,420
1971	40,895	327	41,222	695,000	4,740,000	5.93	0.87	1,430
1972	35,061	11	35,071	574,000	5,130,000	6.11	0.68	1,520
1973	41,828	66	41,894	529,000	5,330,000	7.92	0.79	1,670
1974	35,806	123	35,930	504,000	5,610,000	7.13	0.64	2,620
1975	37,128	100	37,228	397,000	5,010,000	9.38	0.74	2,600
1976	42,263	58	42,321	453,000	5,610,000	9.34	0.75	2,340
1977	28,121	79	28,200	408,000	5,810,000	6.91	0.49	2,040
1978	32,353	79	32,432	407,000	5,880,000	7.97	0.55	1,710
1979	29,660	104	29,764	472,000	6,260,000	6.31	0.48	1,850
1980	27,722	71	27,793	340,000	6,050,000	8.17	0.46	1,630
1981	33,667	25	33,692	347,000	6,080,000	9.71	0.55	1,760
1982	8,108	W	8,108	228,000	5,890,000	3.56	0.14	1,430
1983	1,970	--	1,970	236,000	6,250,000	0.83	0.03	1,490
1984	3,330	--	3,330	253,000	6,530,000	1.32	0.05	1,680
1985	6,707	--	6,707	261,000	6,790,000	2.57	0.10	1,350
1986	351	--	351	253,000	6,690,000	0.14	0.01	1,250
1987	897	6,533	7,430	261,000	7,020,000	2.85	0.11	1,330
1988	3,972	18,935	22,907	241,000	7,160,000	9.50	0.32	1,830
1989	12,204	W	12,204	260,000	7,240,000	4.69	0.17	2,380
1990	29,518	W	29,518	263,000	7,180,000	11.22	0.41	2,050
1991	2,870	W	2,870	253,000	7,310,000	1.13	0.04	1,390
1992	3,820	20,588	24,408	272,000	7,260,000	8.97	0.34	1,500
1993	3,978	16,371	20,349	240,000	7,360,000	8.48	0.28	1,150

1994	2,205	21,000	23,205	217,000	7,330,000	10.69	0.32	1,200
1995	2,721	22,700	25,421	232,000	7,280,000	10.96	0.35	1,320
1996	3,314	19,400	22,714	226,000	7,480,000	10.05	0.30	1,170
1997	2,874	21,500	24,374	226,000	7,530,000	10.78	0.32	1,440
1998	2,402	24,900	27,302	234,000	7,690,000	11.67	0.36	1,130
1999	2,654	22,200	24,854	241,000	8,040,000	10.31	0.31	1,150
2000	2,819	16,400	19,219	228,000	8,730,000	8.43	0.22	1,160
2001	2,538	24,000	26,538	n.d.	n.d.	n.d.	n.d.	n.d.

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# Appendix 1

## Conversion Factors

All units in production tables in this report are reported as metric tons. The original data from USBM and USGS were reported in a variety of units depending on the commodity and standards for the time period when production was reported. The conversion factors to standardize the data used in this report vary by commodity.

Tons, short (0.9072) = tons, metric (Mt)

Pounds/2000 = tons, short

Tons, long (1.0160469) = tons, metric

Troy oz (0.0311035) = kilograms (kg)

Kilograms/1000 = tons, metric

Flask (.0347) = tons, metric