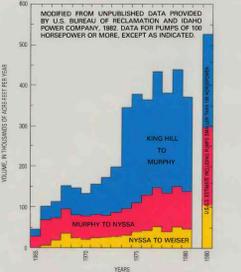


SURFACE WATER

SURFACE-WATER DEVELOPMENT

Pumpage from rivers and reservoirs is an important source of irrigation water, especially on the western plain. Early gravity diversions of surface water were concentrated on the eastern plain and in the Boise River valley. The first pumping stations withdrew water from rivers to supplement gravity diversions to canal networks by 1905, pumping plants on the Snake River helped irrigate about 80,000 acres (Hoyt, 1955). In the late 1950's, pumpage from rivers became increasingly more attractive as a result of improved pump technology and availability of low-cost power. By that time, most surface water on the eastern plain was appropriated and networks of canals served by gravity diversions were already in place. Consequently, most new pumpage added after the 1950's were on the western plain.

PUMPAGE FROM SNAKE RIVER BELOW KING HILL



After 1960, pumpage from the Snake River between King Hill and Weiser increased steadily. River pumping facilities made water in entrenched river reaches available for irrigation of adjacent uplands. From 1965 to 1975, pumpage from the Snake River between King Hill and Weiser increased about eightfold. Since 1975, annual pumpage from this reach has been fairly uniform.

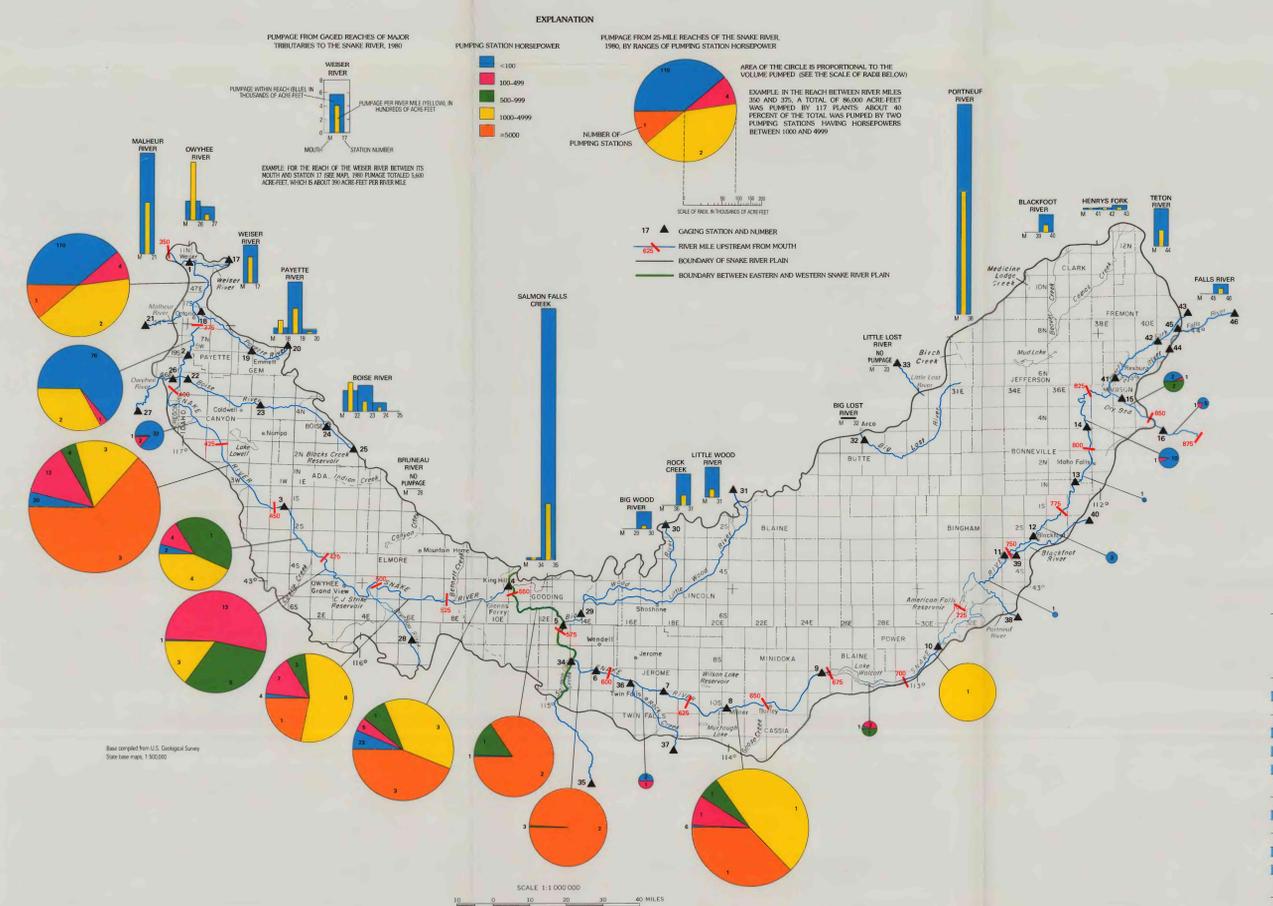
METHOD OF ESTIMATING PUMPAGE

The estimation technique for surface-water pumpage is essentially the same as described for ground-water pumpage (see sheet 1). Pumpage was estimated for each river pumping station by using the equation shown below:

$$Q = KWh (TH) (3)$$

where terms are as defined on sheet 1. Power consumption for each plant was supplied by utility companies. The K factor of 1.69 and estimated irrigation system pressure heads are the same as those used for ground-water estimates. Pumping lift is altitude at the point of discharge minus altitude of the river stage at the point of withdrawal. All altitudes were interpolated from topographic maps. Most river pumpage was observed in the field to verify location and type of distribution system. Estimates of pumpage from the Snake River were summed over 25-mile reaches and between U.S. Geological Survey gaging stations. Estimates of pumpage from major tributaries were summed between gaging stations.

ESTIMATED SURFACE-WATER PUMPAGE



EXPLANATION
PUMPAGE FROM GAGED REACHES OF MAJOR TRIBUTARIES TO THE SNAKE RIVER, 1980
PUMPAGE FROM 25-MILE REACHES OF THE SNAKE RIVER, 1980, BY RANGES OF PUMPING STATION HORSEPOWER
AREA OF THE CIRCLE IS PROPORTIONAL TO THE VOLUME PUMPED (SEE THE SCALE OF RADII BELOW)
EXAMPLE: IN THE REACH BETWEEN RIVER MILES 200 AND 226, A TOTAL OF 80,000 AC-FEET WAS PUMPED BY 17 PLANTS, ABOUT 40 PERCENT OF THE TOTAL WAS PUMPED BY TWO PUMPING STATIONS HAVING HORSEPOWERS BETWEEN 100 AND 499

SNAKE RIVER PUMPAGE BY GAGED REACH

Station No. on map	Gaging station number	Number of pumping plants	Total pumpage during irrigation season (ac-feet)	Pumpage as a percentage of total stream gage (May 1 through September 30)	Pumpage as a percentage of total flow at upstream gage (September 30)
1	1329900	32	10,100	—	—
2	13213100	153	112,800	100	3
3	13172500	116	176,800	100	6
4	13154500	88	256,800	80	8
5	13155000	6	53,000	100	2
6	13094000	5	46,900	100	3
7	13090000	3	1,600	0	<5
8	13086000	0	0	0	0
9	13081500	10	114,900	5	3
10	13077000	4	1,960	<5	<5
11	13069500	2	29,800	34	1
12	13065000	3	1,120	2	<5
13	13060000	1	80	<5	<5
14	13057150	0	0	0	0
15	13038500	12	6,000	1	<5
16	13037500	10	3,420	1	<5
Total Average	—	445	806,100	—	15.8

Modified from U.S. Geological Survey, water contours, 1980; U.S. Geological Survey, 1978

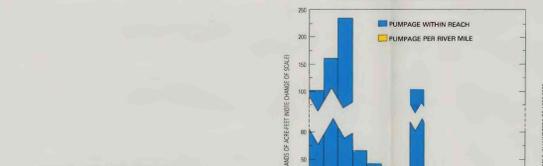
Pumpage accounts for about 90 percent of total irrigation diversions (pumped plus gravity) from the Snake River on the western plain and about 3 percent on the eastern plain. Gravity diversions are the principal means of surface-water withdrawal on the eastern plain. Both the history of surface-water development for irrigation and the amount of river withdrawal account for differences in the importance of pumpage on various reaches of the Snake River. With two exceptions, pumped withdrawals for irrigation were less than 10 percent of the total volume flowing into each reach during the irrigation season (May 1 through September 30). The exceptions were the Portneuf River and the upper reach of Rock Creek where pumpage exceeded 25 percent of total flow.

TRIBUTARY PUMPAGE BY GAGED REACH

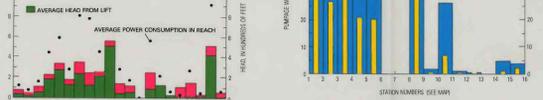
Station number on map	Gaging station number	Number of pumping plants	Total pumpage during irrigation season (ac-feet)	Pumpage as a percentage of total stream gage (May 1 through September 30)	Station number on map	Gaging station number	Number of pumping plants	Total pumpage during irrigation season (ac-feet)	Pumpage as a percentage of total flow at upstream gage (September 30)
17	13266000	16	5,640	2	Little Lost River	Mouth	0	0	0
18	12911000	4	890	1	Salmon Falls Creek	Mouth	1	160	<5
19	13250000	12	7,760	1	33	13194000	1	160	<5
20	13249500	5	660	<5	35	13101500	6	37,800	2
21	13233000	27	15,100	2	36	13065000	7	37,960	2
22	13184000	13	2,690	4	37	13060000	8	4,700	27
23	13183000	25	4,580	2	38	13055000	2	31,400	29
24	13213000	12	2,940	<5	39	13065000	8	2,600	2
25	13210500	2	1,280	<5	40	13066000	8	2,620	2
26	13205000	0	0	0	41	13056000	2	150	<5
27	13200000	0	0	0	42	12950000	1	500	1
Total	27	7,850	—	—	43	13046000	4	750	—
28	13168000	0	0	0	44	13050000	5	5,100	1
29	13155000	3	2,590	1	45	13045000	0	0	0
30	13142500	3	2,590	1	46	13045000	16	1,440	<5
31	13148500	6	5,170	5	Total	16	1,440	—	
32	13132500	1	7	<5					

U.S. Geological Survey (1980); field data.

SNAKE RIVER PUMPAGE BETWEEN U.S. GEOLOGICAL SURVEY GAGING STATIONS



AVERAGE POWER CONSUMPTION AND HEAD ALONG 25-MILE REACHES OF THE SNAKE RIVER



Seventy percent of surface-water pumpage on the Snake River Plain is from the Snake River between the U.S. Geological Survey gaging stations near Bluff (station number 6) and at Weiser (station number 1). Topography varies from steep canyon walls summited by plateaus one hundred to several hundred feet above the river to gently rolling land that rises gradually from the river. River pumping is particularly important along deeply entrenched reaches where gravity diversions are not possible.

An estimated 940,000 acre-ft of water were withdrawn from the Snake River and its major tributaries by 621 river pumping stations. Surface-water pumpage and gravity diversions combined to irrigate 2.0 million acres on the plain. About 70 percent of pumped surface-water withdrawals were on the western plain.

Pumps powered by electrical motors of less than 100 hp accounted for about 12 percent of total surface-water pumpage on the plain. Previous surface-water pumpage estimates did not include pumpage from these pumping stations.

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- Malheur Power Company
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- Other State and Federal agencies

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SUMMARY

Ground and surface-water pumpage for irrigation in 1980 on the Snake River Plain was estimated from electrical power consumption data to provide input for ground-water flow models and data for water managers. An estimated 2.3 million acre-ft of ground water were pumped from about 5,300 wells to irrigate 1.0 million acres on the plain. More than 80 percent of ground-water pumpage was on the eastern plain. Ground-water pumpage equals about one-fifth of total annual recharge to the ground-water system.

An estimated 940,000 acre-ft of water were withdrawn from the Snake River and its major tributaries by 621 river pumping stations. Surface-water pumpage and gravity diversions combined to irrigate 2.0 million acres on the plain. About 70 percent of pumped surface-water withdrawals were on the western plain.

Pumps powered by electrical motors of less than 100 hp accounted for about 12 percent of total surface-water pumpage on the plain. Previous surface-water pumpage estimates did not include pumpage from these pumping stations.

POWER COMPANY SERVICE AREAS



WATER WITHDRAWN FOR IRRIGATION IN 1980 ON THE SNAKE RIVER PLAIN, IDAHO AND EASTERN OREGON

By
B. B. Bigelow, S. A. Goodell, and G. D. Newton