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(Aug. 5, 1968)

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STATUS REPORT

WORKINGS OF PALISADES WATER SAVINGS AGREEMENT

p. 8 Summary

U. S. Bureau of Reclamation

Boise, Idaho
August 5, 1968

STATUS REPORT
WORKINGS OF PALISADES WATER SAVINGS AGREEMENTS

This is a status report on important gains in the efficiency of total water use in the entire Upper Snake River Basin through the workings of Palisades water savings and exchange agreements that were entered into by some 57 water user entities as a part of the Palisades Dam Project authorization package.

The report also brings out (1) the complex nature of surface-ground water relationships existing in the entire Upper Basin, and (2) the necessity for evaluating individual project hydrologic operations as part of an integrated whole. The characteristics of the Upper Snake River hydrologic regimen are unique in Idaho, as well as the Northwest, and without consideration of the above-listed factors, certain indicated diversions for the purpose of manipulating ground water levels may appear to be excessive when related to irrigation diversion in the traditional manner.

The Palisades Project was initially authorized in 1941 as the Palisades Dam Project by the presentation to the President and the Congress of a report and findings of feasibility by the Secretary of the Interior on December 9, 1941 (H. Doc. No. 457, 77th Congress, 1st Session), under the provisions of section 9 of the Reclamation Project Act of 1939 (53 Stat. 1187). That finding incorporated the report of the Commissioner of Reclamation to the Secretary of the Interior, dated November 1, 1941. The supporting engineering and economic report of the Bureau of Reclamation was the product of investigations begun by the Bureau in 1932 to study means of providing urgently needed supplemental storage in the Upper Snake River Valley.

The report of the Commissioner of Reclamation to the Secretary of the Interior, noted above, stated that the success of the Palisades Reservoir would depend on the conservation of 135,000 acre-feet of water annually then being lost to the reservoir system because of winter diversions for stock and domestic purposes. The Bureau of the Budget, speaking for the President, approved the project with the reservation that submission of estimates of appropriations needed for construction be withheld until local interests had given satisfactory assurance to the Secretary of the Interior that winter diversions in certain areas above American Falls Dam would be eliminated.

A thorough investigation of water uses and requirements in the Upper Snake River Valley was made by the Bureau of Reclamation during the 1940's subsequent to the time the project was first authorized. The primary purpose of this investigation was to provide factual information to serve as a basis for the negotiation of agreements with water users of the Valley covering the elimination of water loss caused principally by winter operation of canals. An associated objective was to gather factual material from which to determine a proper distribution of the 433,593 acre-feet of reserved space in American Falls Reservoir. When the American Falls Reservoir, 120 miles downstream from Palisades, on the main stem of the Snake, was completed in 1927, the contemplated use of that space was for new land developments. For a number of years shortly following completion of American Falls Dam, the reservoir failed to fill because of an unprecedented drought. The reserved space was, therefore, leased to existing water users.

A report covering the results of the above investigation, entitled "Water Supply for Palisades Reservoir Project, Idaho" (Project Planning Report No. 1-5.17-1), was issued by the Bureau of Reclamation in October 1946. The report presented the results of extensive water supply studies of the Upper Snake River Valley, together with a proposed winter water-saving program and a plan for development of new land. After the issuance of this report, the Bureau of Reclamation carried on lengthy negotiations with the water users in an effort to obtain the maximum possible conservation of water and also to obtain agreement as to an equitable distribution of the reserved space in American Falls Reservoir.

The practice of diverting water into the canals in winter for stock and domestic purposes, established many years ago, was deep rooted and difficult to alter. Various proposals were made by the United States, out of which a compromise evolved. The compromise involved these principal points: (1) the elimination by the water users at their own expense of winter diversions in order to conserve water for storage in Palisades and American Falls Reservoirs; (2) the curtailment of the use of water for power generation at Minidoka Dam for the financial account of the Minidoka Project to conserve additional water for storage in American Falls, Island Park, and Palisades Reservoirs; (3) the coordinated operation of the reservoir system for maximum storage water yields; (4) the establishment of uniform storage holdover privileges in all reservoirs; (5) a permanent exchange of contract storage rights between American Falls and Jackson Lake Reservoirs to reduce storage delivery losses; (6) the distribution of American Falls Reservoir space as follows: 315,000 acre-feet to existing lessees, 47,593 acre-feet to the North Side Pumping Division of the

Minidoka Project, and 71,000 acre-feet to the Michaud area; (7) the recognition of existing rights to the diversions made during periods of flood flow; (8) the commitment of Palisades users to allow that reservoir to be pooled with the next 300,000 acre-feet of storage added to the system; and (9) the clarification of storage and diversion rights in connection with American Falls Reservoir.

The winter water-saving program involves the elimination of the long-standing practice of supplying domestic and stock water to farmsteads by operating irrigation canal systems throughout the year. A substantial portion of the water diverted into the canals during the winter percolates to the underlying groundwater reservoir which is not tributary to the Snake River above Milner Dam. Hence, the elimination of winter seepage losses from the canals in such nontributary areas increases the amount of water available for storage. State of Idaho water rights to divert water in winter for stock and domestic purposes were clearly established by actual use over many years. Reliance on the canals for domestic and stock water was continued for many years because of the high cost of drilling deep wells and pumping water from them and because it is more convenient to water livestock from canals than from wells. Furthermore, there was no real incentive to save water until Palisades Reservoir was constructed on the Snake River because the water would otherwise spill past Milner Dam. Since the water users involved in the winter water-saving program incurred considerable expense in equipping their farmsteads with wells and lost the convenience of watering livestock from canals, it was understood among all prospective participants that those water users who make possible the saving would be entitled to a special right to store the saved water to the extent required to fill their share of the storage capacity in American Falls and Palisades Reservoirs.

By coordinating the operation of all reservoirs in the system, the maximum volume of storage water can be carried over in the reservoir system from wet cycles to dry cycles. The amount of that carryover is substantially greater than would be the case if Palisades were operated independently from the existing system. Through this coordination, Jackson Lake can be operated primarily as a holdover reservoir, and only limited irrigation water is drawn from it until Palisades Reservoir has been emptied. The additional, usable return flow made available from application of this holdover storage will augment further the supply of irrigation water during drought periods. Operation studies of the reservoir system, taking account of these factors, show that storage in Palisades Reservoir and the elimination of winter diversions and curtailment of power at Minidoka Dam would have made enough additional water available to eliminate all shortages on existing projects during the past 79 years, except those in the extremely

dry years of 1934 and 1935. Even in those years, however, an appreciable reduction would have been made in the shortages.

Resolutions giving assurance that the water users would agree to water saving provisions which would satisfy the conditions of the authorizing document for Palisades Dam were obtained in 1949 from the governing bodies of the interested water user groups. On the basis of these resolutions some preliminary construction contracts were executed late in fiscal year 1949. In the early 1950's, these resolutions were confirmed by formal contracts with the water users. Over 50 contracts, generally referred to as the "Palisades Contracts," were negotiated over a period of several years. In addition to the annual water saving of 135,000 acre-feet, established as a prerequisite to the beginning of construction of Palisades Dam, these contracts provide a basis for possible maximum annual savings of 276,000 acre-feet by curtailment of winter diversions by canals diverting at Milner Dam.

Under the contracts each of 41 irrigation districts and companies agreed to eliminate winter diversions for a period of 150 consecutive days during the November 1 through April 30 period each year. The estimated average annual saving from such curtailment is 143,000 acre-feet, of which 135,000 acre-feet is attributable to curtailment by canals above American Falls Dam and 8,000 acre-feet by those diverting below that point. Under the contracts, such curtailment was to begin with the 1958-1959 storage season. Partial curtailment of winter diversions actually began 4 or 5 years prior to this time and increased gradually throughout this period. The full annual saving of 143,000 acre-feet has been accomplished each storage season, beginning with the 1958-1959 storage season.

In addition to the mandatory annual savings of 143,000 acre-feet above, the contracts provide a basis for an additional savings by curtailment of winter diversions by the North and South Side Twin Falls canals diverting at Milner Dam. The possible maximum annual savings is estimated to be 276,000 acre-feet. Although this water saving is exercised only at the option of the two companies, winter diversions have been substantially reduced each winter, beginning with the winter of 1960-61. It appears that the companies' decision to exercise this option during the 1960-61 storage season was prompted by the low storage levels in the reservoir system at the end of the 1960 irrigation season. This decision was indeed timely in view of the fact that streamflow in 1961 was much below normal, the reservoir system failed of filling by a substantial amount, and a number of areas experienced irrigation water shortages. Without Palisades Reservoir and winter water saving actually accomplished, the shortages would have

been much more severe. Had the curtailment of winter diversions at Milner Dam been started in 1959 the water shortages in 1961 would probably have been eliminated.

Winter diversions at Milner Dam have been substantially reduced each winter since 1961. The amount of the reduction varies from year to year, ranging from a maximum of 260,000 acre-feet in the winter of 1961-62 to a minimum of 198,000 acre-feet in the winter of 1965-66. In addition to the obvious benefits from saving water for storage in the reservoirs the maintenance of the canal system is more effective and less costly when the canals are shut off in winter. For this reason, it is expected that such savings will be increased in future years and eventually the maximum annual savings of 276,000 acre-feet will probably be realized with the canals shut off from November 1 to April 1 in all years.

Under the Palisades contracts the water saved by curtailment of winter diversions is first credited to the company or district making the saving until the reservoir space owned by the particular district or company is filled. When this occurs the saved water accrues to the remaining unfilled space in the reservoir system. Thus, the water saving program provides benefits to the entire irrigated area which has interests in the reservoir system.

The Palisades contracts have a third water saving feature. These contracts provide for limiting the use of water for power generation at American Falls and Minidoka Dams below the amounts that would accrue to rights for power production at these two dams. Such curtailment in the exercise of power rights at Minidoka Dam will result in a loss of generation of units 1 to 6 of that powerplant but will result in saving of water for storage for irrigation use. The water so saved is credited to American Falls, Island Park, and Palisades Reservoirs. In compensation for such losses in power generation, replacement power is provided to the Minidoka Power system, and, based on a moving average of the net annual amount of replacement power and energy required, the costs thereof are charged to the beneficiaries of the resultant water saving and the financial benefit is credited to the water users of the Minidoka Project. This provision for sharing the cost by water users actually benefited provided an equitable solution to a long-standing controversy.

The extent of water savings from curtailment of power rights varies from year to year. The saving is fully effective only during prolonged cycles of low streamflow when the available streamflow is insufficient to fill the reservoirs and the water can be stored and used. In a number of years there is enough streamflow to fill the reservoirs without any water saving.

During a prolonged cycle of low runoff such as occurred 1930-35, it is estimated that the effective saving from curtailment of power rights would be 2,700,000 acre-feet or an average of 450,000 acre-feet annually.

The water saving from curtailment of power rights actually overlaps the water savings from curtailment of winter diversions at Milner Dam to the extent that power releases can be used to satisfy diversion requirements at Milner Dam. Out of the estimated average annual saving of 450,000 acre-feet from curtailment of power rights during low runoff cycles up to a maximum of 276,000 acre-feet may be creditable to curtailment of winter diversions at Milner Dam. Thus, the net annual increase in storable water from curtailment of power rights is 174,000 acre-feet.

The Palisades contracts provide for maximum annual water savings during prolonged cycles of low streamflow as follows:

	<u>Acre-feet</u>
Elimination of winter diversions above American Falls Dam and at Minidoka Dam	143,000
Curtailment of winter diversions at Milner Dam	276,000
Curtailment of power rights at Minidoka Dam	<u>174,000</u>
Total annual savings	593,000

Thus, the potential savings for a six-year drought period such as occurred 1930-35 would be in excess of 3.5 million acre-feet.

It was recognized in the negotiations that led to the water savings and exchange arrangements necessary for the construction of Palisades Reservoir that these arrangements would require adjustments in the court decrees that govern the distribution of water in the Upper Snake River Valley, Water District 36. All the water users agreed to the arrangements on the basis that this would be accomplished and that all the compromises agreed to in the negotiations would be included in the resulting court decree.

Records of irrigation diversions in the Henrys Fork Valley indicate annual diversion rates in excess of 10 acre-feet per acre in many areas. To those not understanding Upper Snake River surface water-ground water relationships, these high diversion rates may appear unreasonable and imply poor management and inefficient application of water. It should be recognized that present practices evolved from past failures in attempting

to irrigate the area by conventional means and that so far subirrigation is the only method fully demonstrated to be practical in this area. If reuse of return flow and the use of groundwater in the nearby Mud Lake area is considered the overall diversion rate compares favorably with those elsewhere on the Snake River.

The present heavy use of water in the Henrys Fork Valley results from subirrigation of about 70,000 acres of land in that area. An additional 40,000 acres is irrigated by conventional surface irrigation. The practice of subirrigation was established during the early stages of development, after irrigation by customary surface methods proved a failure. A wide variety of crops is grown by maintaining the water table within reach of the plant roots during the summer instead of by spreading water on the surface of the ground in the usual manner. The hydraulic properties of the underground reservoir permit the raising and lowering of the water table by varying the flow of water in the canals. The canals must be operated at partial capacity during winter to hold the water table at a level from which it can be raised to the plant roots in the spring after the ice and snow in the canals have melted. Present schedules of annual diversion to the subirrigated lands have been evolved through the experience of over 60 years in manipulating the water table to give maximum crop production during the relatively short growing season in that area.

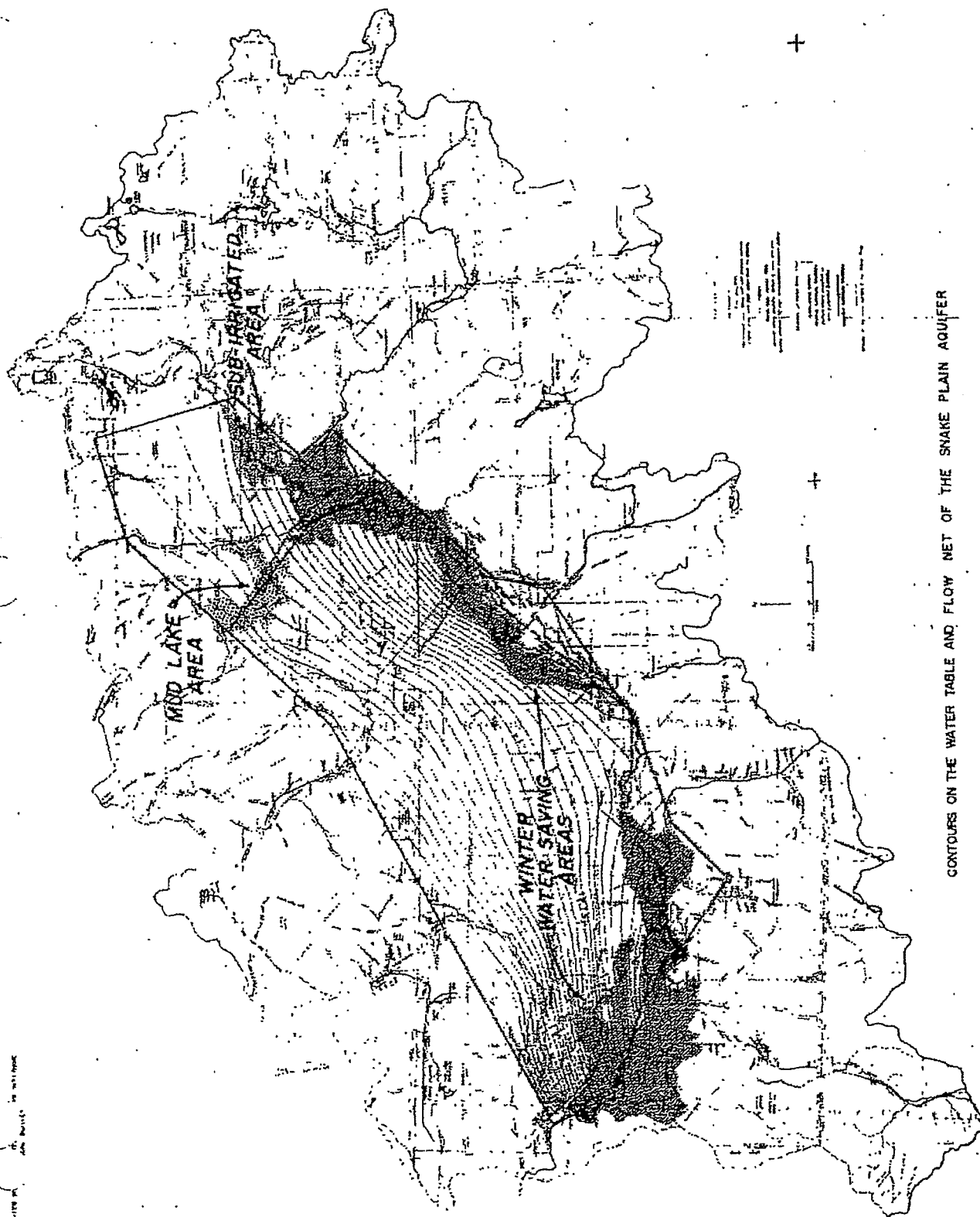
Hydrographic studies have shown that relatively large quantities of groundwater move westward toward Mud Lake as a result of maintaining high water tables in the Henrys Fork Valley. This is well illustrated by the attached chart, "Contours on the Water Table and Flow Net of the Snake Plain Aquifer." This groundwater movement has caused a phenomenal increase in the inflow to Mud Lake since 1900 and is the major source of supply for approximately 75,000 acres now irrigated in that area. If in addition to the approximately 110,000 acres actually irrigated in the Henrys Fork Valley credit is also given for the 75,000 acres irrigated in the Mud Lake area and for reuse of return flow in the Henrys Fork Valley, the overall diversion efficiency is comparable to that elsewhere on Snake River. For example, the total diversion from Fall River, Henrys Fork River, and Lower Teton River during 1967 was 1,017,000 acre-feet. The irrigation season return flow was 186,000 acre-feet. On this basis, the net diversion for 185,000 acres in the general area, including Mud Lake, was 4.35 acre-feet per acre. In view of these facts, any alteration in the present use of water in the Henrys Fork Valley would affect not only the established irrigation economy in that valley, but also that in the Mud Lake area.

Summary

From the very inception of Water District 36 (1916) and the Committee of Nine (1919) the area can be credited with many innovations of progressive water management which can best be summarized as a water banking operation. These include operation of storage reservoirs as a system rather than a collection of individual reservoirs. Although there is a strict paper accounting of water accruals to individual reservoirs by priority dates, advantage has been taken of the physical diversity of the system by holding carryover storage as far upstream as possible to the advantage of all. Much litigation was avoided and a smooth-running operation resulted from agreement on such factors as evaporation and conveyance losses and bank storage. The area pioneered water exchanges in Idaho, culminating in a future ground water-surface water exchange imbedded in the Lower Teton Project authorization. A continuation of this principle will be the salvation of the Salmon Falls, Oakley Fan, and other water-deficient areas in Upper Snake River Basin.

The elimination of winter water runs for stock and domestic use, the establishing of uniform storage water holdover privileges, the coordinated system-wide operation of reservoirs, the subordination of winter power production to conserve storage, and the exchange of storage space to effectuate its use closer to points of diversion, all have resulted in better distribution and utilization of the waters of Snake River. These water conservation practices will provide a water savings in excess of 600,000 acre-feet annually to augment dry-year supplies. This is a significant step in the direction of obtaining full use of the available water supplies in Snake River. In the future more needs to be done in water saving through added cooperation among all water users. These include additional reservoirs, canal lining programs, further water exchanges, including ground water, improved management of water distribution, and increased efficiency of on-farm application and use of water.

This is the situation as it exists today. However, as our technology of water use continues to expand and our available water supplies become more fully utilized, better and more efficient methods of irrigating the lands in the Snake River Valley can be developed. Certainly we should endeavor to make the most efficient use of all our natural resources and as new and better techniques are developed we should put them to their maximum use. The accomplishments so far have resulted from the cooperative effort of the entire area. Future developments for the conservation and use of Idaho's land and water resources will require similar mutual understandings and cooperation by all concerned parties.



CONTOURS ON THE WATER TABLE AND FLOW NET OF THE SNAKE PLAIN AQUIFER