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It is a privilege and pleasure to share in this panel on the Planning and Development of the Columbia River. My particular assignment concerns irrigation and recreational uses.

It is appropriate that a discussion of irrigation development before a Conference on Northwest History should take place here in Walla Walla. The earliest recorded irrigation water right in the Northwest is on Stone Creek for the irrigation of land on the Whitman Mission. This irrigation preceded the irrigation by the Mormon pioneers near Salt Lake City which is generally recognized as the first group irrigation enterprise by white settlers.

Irrigation in the Columbia River Basin has grown from that small beginning by Marcus Whitman some 120 years ago to the present total of some 5 million acres. In the beginning, irrigation developments were essentially individual efforts and consisted of the diversion of small streams for the irrigation of pastures, hay and gardens. As the available water supply in these small streams was rapidly over-appropriated, it became necessary to go to the larger streams and to construct larger and more complicated works.

This in turn resulted in costs which exceeded what an individual could finance so group enterprises came into operation. Such enterprises were subsequently followed by works constructed or financed by State and Federal agencies. Nearly all such developments prior to the start of Grand Coulee Dam in 1934 were planned as single-purpose irrigation projects. Any power, flood control, and recreation benefits which resulted from the developments during these early years were considered as more or less accidental and incidental to the primary purpose of irrigation. However, during the last twenty-five years a conscious effort has been made to make all developments as comprehensive and multi-purpose as possible.

The 5 million acres of land under irrigation in the Columbia River Basin at the present time represents only about one-third of the land that is suitable for irrigation. The irrigation of much of this additional land will be quite difficult, requiring high pump lifts, expensive storage developments, and complicated diversion works. It will also be necessary to work out exchange agreements whereby presently irrigated lands will be furnished water from substitute sources while the water presently being used on those lands will be diverted to irrigate lands farther upstream or at

higher elevations. This kind of thinking is relatively new in the Columbia River Basin and is pertinent only in parts of the basin.

The water supply in the basin as a whole is relatively abundant with some 180 million acre-feet wasting into the ocean in an average year. Even if all of the total potential of 15 million acres of land were irrigated, the outflow would be reduced less than ten percent. However, the situation is somewhat different in the Upper Snake River area. Irrigation development in the Upper Snake River Basin has reached the point where all of the water above Milner Dam on Snake River near Twin Falls can be fully controlled and used in a low run-off period such as occurred between 1929 and 1937. It is in areas such as this that expensive storage, high pump lifts and complicated water exchanges will be needed before any substantial additional development can take place.

The full use of the water resources of the Upper Snake River Basin will require heavy pumping of the vast ground-water reservoir north of the Snake River in years of low surface run-off to supplement the surface water supply and the recharge of that ground-water reservoir with surplus flood flows in years of above normal surface run-off. The recharging of ground-water reservoirs is not new as it has been practiced for some time in southern California. The

City of Walla Walla has also experimented, with some success, with the possibility of recharging the aquifer supplying the city wells by diverting surplus Mill Creek water into City Well #3 during the winter of 1957-1958.

Another factor which is equally important in future development of irrigation is the need to relieve the irrigators of a portion of the costs incurred in construction. Under Federal Reclamation law, all costs allocated to irrigation are reimbursable without interest. This means that when costs go beyond the ability of the irrigators to repay, if the project is to be built, some source of financial assistance must be found to repay that portion of the irrigation costs which the irrigators cannot repay. Power, where it is a part of the over-all project function as it is at Grand Coulee Dam on the Columbia Basin Project, provides the source of such financial assistance. However, many potential irrigation developments are not so fortunately situated with respect to a powerplant. In some instances, such as in connection with some developments near Wenatchee and Brewster, Washington, Congress has authorized the use of power revenues from a Corps of Engineers dam, Chief Joseph in this case, to provide the needed assistance. In other basins, such as the Missouri River Basin, Upper Colorado Basin, and in the Central Valley of California, financial assistance has

been authorized on a basin-wide basis. Such basin-wide assistance has been proposed for the Columbia River area but Congress has not as yet acted upon the proposal.

While the use of water for irrigation results in an annual reduction in the total water supply, most of this reduction is made during the spring flood period and reduces flood peaks. On the other hand, surplus water applied during the irrigation season percolates into the ground water and a large part of this excess water finds its way back into the streams during the winter low-flow period. The magnitude of this effect is best shown in studies made by the Water Management Subcommittee of the Columbia Basin Inter-Agency Committee on stream-flow depletions. The results of the studies are contained in the May 1957 report by the Subcommittee. The report shows flows at The Dalles, Oregon for three different conditions of depletion for the period 1928 through 1948.

The flows of the Columbia River as recorded during the October 1936-September 1937 period, represent the effect of some 3,690,000 acres of irrigation upstream. The committee then estimated the effects of depletions resulting from the irrigation of 5,120,000 acres expected to be in operation in 1960 and for 8,750,000

acres of irrigation in the year 2010. The report shows the flow as recorded in January 1937 was 42,400 cubic feet per second. With 1960 irrigation depletions and return flows, this would increase to 43,200 cubic feet per second and under 2010 irrigation conditions it would increase to 47,700, an increase of 5,300 cubic feet per second as a result of an increase of just over 5 million acres of irrigation, an apparent gain in minimum flows of about one cubic foot per second for each 1,000 acres of irrigation land added. Conversely, the peak flow in 1937 occurred in June and averaged 348,900 cubic feet per second. With anticipated 2010 irrigation conditions, this would be reduced to some 304,600 cubic feet per second or some 44,300 cubic feet per second. This would mean a reduction in flood flows of about one cubic foot per second for each 115 acres of additional irrigation.

The reduction in flood flows is due partly to direct diversions for irrigation use and partly to storage in reservoirs for later release for irrigation. An average of about 2 acre feet of storage is required for each acre of irrigated land in order to insure a full season supply of irrigation.

I might also mention that all irrigation development by the Bureau of Reclamation is made under provisions of state laws.

It is thus necessary that we work closely with the states in order to insure that any development plans we propose conform with state laws and that the development will not infringe on any existing water rights. It is this requirement for non-interference with existing water rights that necessitates the working out of voluntary agreements on exchanges of water supply. Naturally, this requirement, pending working out essential points, tends to slow down further developments in the water-short areas such as the Upper Snake Basin. We are confident that such agreements can and will be developed, but they take time since the holders of existing water rights are naturally cautious in exchanging known water supplies for supplies that are not fully proven as to quantity or quality.

I have devoted most of my discussion thus far to the irrigation aspects, so now I would like to devote a few minutes to recreation. Prior to about 1940, recreation was not included generally as a planned use in connection with Federal irrigation developments. Nevertheless, recreation has become a very important adjunct of many of our irrigation reservoirs, however incidental that use may be to the primary purpose of the reservoir. These recreational uses include fishing, boating, hunting, summer home sites, picnicking and swimming. On the older reservoirs where recreational use was not planned, the use, particularly where it involves pickn

picnicking--and I might add that picnicking of one sort or another is usually involved--has created rather serious problems for the operators of the reservoirs, be they irrigation districts, power companies, or the Federal Government. These problems include keeping the sites and shorelines in a clean and sanitary condition. Even where recreation is a planned use and sanitary and garbage disposal facilities are provided, they still remain problems.

In recent years in our multi-purpose planning for irrigation projects, we call on our sister agency of the Department of the Interior, the National Park Service, as a consultant on recreation development. That agency assesses the potential of the development for recreational use and recommends plans for such use that should be included in the over-all plan of development. The Park Service also determines whether the potential recreational use is essentially of a local or national scope. The scope of use then determines the extent and character of the facilities that should be provided and it also determines whether the facilities will be retained under Federal administration or turned over to state or local agencies for operation and maintenance. The Park Service retains recreational administration if the expected use is of national significance. Otherwise such administration is turned over to state or local organizations.

Even if the use is expected to be of only local significance, certain minimum basic facilities for the protection of the public are provided. Since recreational uses almost always involve picnicking, some picnic facilities such as stoves, tables, parking areas, and garbage facilities, are included. Sanitary facilities are also provided. Boat-launching ramps are usually needed as boating is becoming more and more important. Parts of a reservoir may be designated as a wildlife refuge or a waterfowl nesting area, reserved for hunting, water skiing, or fishing, while a beach area may be developed for swimming.

Since fishing is an important facet of recreation, we also consult with Fish and Wildlife Service of the Department of the Interior on these aspects of the project development. The recommendations by this agency concerning fish are usually of two kinds. One set of recommendations is aimed at preserving the fishery as it exists prior to the development while the other is aimed at improving the fishery resource. Facilities for achieving these aims usually include screening devices to keep the fish in the stream or in the reservoir, and frequently include facilities for maintaining a live stream below a reservoir and for the release of water of temperatures most suitable for optimum fishery development.

In some cases, poisoning of trash fish, restocking of the streams, or reservoirs, and hatchery operations are included among the facilities provided in the plan of development.

In closing, I would like to point out that all of these uses are not necessarily fully compatible. For example, boatmen and water skiers are happiest when water levels are relatively stable from about Memorial Day through Labor Day. However, an irrigation reservoir is provided primarily to supply irrigation water and as a result the reservoir water surface is progressively lowered and reduced in size as the season passes, and as a result by Labor Day there may be little if any water remaining in storage. Thus, boating activities must be materially reduced. There are also conflicts in recreational uses. Water skiers, for instance, are not especially welcome in an area where fishing has been good, nor are they desired near bathing beaches. Fly fishermen on streams are not happy when irrigation water is released, making their favorite stretch of stream unwadeable. However, we do our best in planning the construction and operation of a project to provide recreational opportunities and facilities to the maximum permissible extent.