An Opportunity for Profitable Aquiculture*

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To the scientist seeking a field for promising research, Central Washington has to offer two hundred and fifty miles of opportunity, extending from the Canadian Border, by way of the Columbia River, the Upper and Lower (Grand) Coulee, Moses Lake, Goose Lake, and back to the Columbia River at Beverly by way of Crab Creek. Changes inaugurated by completion of the Grand Coulee Dam and by watering 1,200,000 acres of land for agriculture besides establishing an enormous rural and urban population in the region, will create endless new situations favorable to aquatic and land communities of living creatures, both plant and animal, which if left to nature will slowly develop populations suitable to the environment.

However, to man bent on managing the processes of nature to his own advantage an unparalleled situation is presented. Near the southern border the "potholes" area of many square miles will be changed by waste water from irrigation, and by the rise of water level, from temporary to permanent ponds and lakes which with the development of aquatic vegetation will greatly extend and improve what has been described as a paradise for wild-fowl. Accompanying these wild-fowl, no doubt other aquatic life, as muskrat, beaver, and other furbearers, together with a land fauna of deer and possibly other wild game, can find vast areas for range with abundant food. All of these situations offer opportunities for proceeding in the most approved manner for development of proper plants for shelter, control of population of predators and food types of fish, introductions of crustacea and all that goes with the application of the science (if at such a stage it has arrived) of aquiculture. With fishable waters disappearing elsewhere by "improvements" of man, here the improvements seem to actually offer opportunity for improvement on nature. Crab Creek, flowing westward to the Columbia River, can scarcely escape becoming a sizable river. A possible river under biologic control for most of the factors governing its productivity!

Northward, in the Upper Coulee, an earth dam will retain in temporary storage the waters for irrigation pumped from above the dam in the Columbia River. Here possibilities are difficult to predict. The major purpose of this lake is like that of hundreds of other western irrigation reservoirs. Water, high in early summer, drawn down for irrigation by mid-August and remaining through the winter dry and frozen in the shore area which should be the main source of food for water birds and fish. With the spring melting of snows, flooded, and the creatures of the low-water line drowned, again decimating the food supply. If it can be included in the plan of conservation to refill this lake in autumn, or still better if the great pumps at the dam be utilized to keep its water level practically constant the possibilities of this lake are increased to enormous possible capacity for production, and commercial fisheries may add to the value of this great development.

But, it is the great lake above the Coulee Dam which offers most attractions to the conservationist. The lake itself is a great asset to a semi-arid region. It occupies a narrow valley which in itself now offers little productivity. It offers means of much needed transportation. From Little Falls on the Spokane River is a straight line distance

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of forty miles to the rail-head at the Dam. A similar measurement from the head of the lake at the Canadian border is ninety-five miles. The meandered distance between the latter points is one hundred and fifty-one miles. The shore-line approximates six hundred and fifty miles. Bench lands along the shore of this lake can be made productive of agircultural crops by pumping, with present prospects that it may be done with electric current at low cost. One envisions here a lake and region not unlike the Okanogan of not far distant British Columbia, which has charmed so many visitors. The growing population of central Washington will here escape the excessive temperatures of midsummer by cruising on the lake or living in summer homes on its shore.

But here is one of the most interesting circumstances: The irrigator of the Northwest likes a constant flow of about one second foot of water delivered at his headgate if he is farming eighty acres of land, through the irrigation season of four and one-half months. This gives a total depth of water of about thirty-six inches over 80 acres in the season. Perhaps none too much where evaporation is so rapid as here. The snow-melt in the mountains within the drainage basin of the Columbia River furnishes a quantity of water closely approximating the demands of the 15,000 eighty-acre farms within the proposed area to be irrigated. Since this melt comes about the date the farmers need the water, we have an unique thing in storage basins for irrigation. THERE WILL BE PRACTICALLY NO "DRAW-DOWN" of the water level above the dam!

This means then that there will be as nearly as possible ideal conditions —for the development of fish food, or food along shores for water-fowl, for transportation conditions, for irrigation of bench-lands, and, for summer homes and pleasure cruising. A possibility of a destructive "draw-down" in winter may develop if over-ambitious power developments below the big dam are permitted to utilize the water retained above the dam at time of mid-winter water scarcity. It is here that conservationists must stand together to resist such destruction. Until there is within our government a coordinating agency empowered to balance all values concerned, and, with power to prevent developments prejudicial to other interests, those who appreciate the values coming from full use of water will be obliged to stand together to repel private interests that have in the past placed private profit above interests of the general public.

Research Needed.

The student of hydrobiology or the worker in the developing field of "aquiculture" will see many reasons for an extended program of research prior to and after the completion of the great dam and the distributing canals. Few will deny the need but it may be difficult to find any agency ready to assume the burden of financing the program. Numbers of Federal and State agencies have direct interests but they are occupied with matters which seem more immediate. Their activities must of necessity be limited to the purposes for which appropriations have been made, and the appropriators of funds are not given to "the forward look." Science is still dependent upon efforts and sacrifices of its devotees for the most important of all research, not to prove or disprove disputed opinions but to advance into that area beyond the border of the known.

Some types of research cannot go forward without support of great resources. Fortunately some other types require little more than sufficient curiosity on the part of the investigator to

devote his spare time (and not infrequently his cash which he can ill spare) to satisfying curiosity. To most workers of this group research becomes a game of solitaire.

Funds for this type of worker are not wholly wanting, as witness the small sums annually disbursed for such purposes by the Trustees of Northwest Scientific Association. But the funds needed for a thorough survey of existing fauna, flora, physical and chemical conditions of waters in the areas to be affected by changes now in progress, though comparatively small are greater than our own organization is now able to provide. However, this offers a field for investment for returns in local betterment. Workers are not wanting who are willing to invest their spare time or vacation time if they can get equipment and unusual expenses paid. The opportunity is here and only the support of wealth is lacking. A part of the personnel of such a project can be recruited from graduate students seeking work which can be used to advance them toward preparation for life work in these fields of science. Others may be found among those with training, whose summer vacations permit field work of this character. Senior and graduate students in our colleges may find biological departments ready to recognize summer work in this field.

The field work of the U. S. Bureau of Fisheries, while directed chiefly, perhaps, in the direction of investigations looking to suitable conditions for planting fish for the sports fishermen, have prepared field instructions for lake and stream surveys which should serve as a basis for other field parties working in these lines, and could be adapted to special needs.

The Biology Section of Northwest Scientific Association, if it should interest itself in this field, could do much in the way of aiding in the correlation of the work of investigators, preservation of records of work done, aiding in unifying objectives sought, conserving the results in way of materials collected. It could also aid by interesting competent workers to give time to the work, and possibly in some instances secure funds to finance the purchase of equipment. A committee of competent workers accustomed to field work of the character involved could aid in outlining field plans and suggesting the nature of equipment needed. To many unaccustomed to field work mere suggestion of things they may be able to undertake may lead to successful work in unexpected ways. The conversion of a strictly laboratory scientist into a field investigator may at times be difficult, but if he is a good sport and looking for a new diversion for his vacation such an undertaking may bring happy surprises.

The Board of Trustees of the Association can serve well in caring for the proper expenditure of any funds which may be advanced for such work. By its wide field of selection of workers it insures quality of results to be expected. As its workers are on strictly volunteer basis and working without pay, happy to be able to secure enough to purchase certain needed items of equipment or possibly traveling expenses, a donor may feel that he is cooperating in advancement of science.

The great lake to be established is in several respects unusual. In the first place the river carries little sediment. It is a clear stream even at flood. As it flows swiftly from melted snows in high mountains the lake will be cold. Its population will be largely downstream migrants. For this reason the study of the fish population of upstream lakes may be important. Will migrants of suckers and squawfish or of predators like pickerel and muskelunge fill the lake and make impossible a popu-

lation of valuable food and game fish? Will the present stock of "sockeye" salmon find suitable environment in this lake as they have found in other deep inland lakes where under the name of "Silver Trout" they have been planted and found to thrive and even rival or surpass their sea-going ancestors? Or will it be possible to introduce the Great Lakes Whitefish with sufficient success to develop here a great fishing industry such as prevailed in the Great Lakes in earlier days?

Addenda.

Since the above paper was read there seems a developing interest in the research work here proposed. The writer has been pointedly told by one national scientific leader that this is a really important piece of research and that it is up to the scientific people of the Inland Empire to carry it out and that the natural agency to handle it is the Board of Trustees of Northwest Scientific Association. As it is not a mere summer's work, no time should be lost. An organization of volunteer workers needs to be developed, composed of those with training in some of the lines of work required, or desirous of obtaining experience in such work. Some funds not now in sight for this summer's work will be needed for purchase of equipment. Some items of such equipment require an absurd amount of time for their procurement. Anyone desiring to make contribution, of any amount, may send it to Dr. R. F. E. Stier, Chairman of Board of Trustees, Northwest Scientific Association, Paulsen Building, Spokane, Washington.

Until such time as a competent and willing director is found, communications from biologists, or students hoping to secure training in lines of field ecology, may be sent to the writer at East 1528 Eighteenth Avenue, Spokane. Fundamental training in botany, zoology, chemistry, physics or physiography are desirable. More or less knowledge of all of these would be best. Student conferences with college authorities, looking toward credit for college degrees may be desirable. Week-end field conferences from time to time through the spring may possibly be arranged where some idea of the areas to be worked and possibly some practical field experience may be obtained.

Important as the results of this tentative program may seem, it is well to make it clear that little can be done without some source of funds for equipment, if not for some portion of field expenses of volunteers, is found.

Unless competent direction for this enterprise should develop from among our Northwest colleges a major item of expense required for the success of this enterprise may be the salary of a leader, for whom we may need to look to the states where active work along the lines needed has been done: Wisconsin, Michigan, New York and Illinois.