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LOW HEAD HYDRO IMPACTS

Interest in low head hydroelectric development is very high in Oregon and elsewhere. A three-year study has begun at OSU to attempt to predict the impact of such projects on the fish population of the Willamette River watershed.

Fifty sites within the Willamette drainage have been identified for their potential hydroelectrical generation through low head dams. Possible impact on the fisheries in the drainage has not been assessed. Several approaches to habitat assessment have been recently proposed especially for the purpose of inexpensive, but accurate evaluation of impact. However, none of the approaches has been tested in complex systems. The researchers propose to test these approaches as part of the process of impact assessment of the proposed dams. In the process of model verification they will examine undisturbed and impounded sites in the Willamette. Thus through site comparisons of the patterns of distribution, and

LOW HEAD HYDRO IMPACTS (Continued)

through behavioral studies they check the accuracy of the models and assess impact on a limited number of sites independent of the reliability of the models used.

The results of this research are expected to direct persons interested in impact assessment to the most desirable or appropriate model, warn them of potential weaknesses of each model, and point to the corrections which may overcome weaknesses in the model. The assessment of impact itself will be of interest to all state agencies and federal agencies responsible for natural resource management in the Northwest. The proposed scenario should be similar for all Northwestern states because the distribution of water, industries, and fauna are similar. This project will be of direct interest to the Oregon Department of Fish and Wildlife, as the Willamette drainage is within their jurisdiction. Secondary users of this information will be water districts, public utilities, power interests, and commercial fishery interests. Additional users of the information will be the modeling groups in the U.S. Fish and Wildlife Service, and the U.S. Forest Service.

Principal investigators in the study are Hiram W. Li and Carl B. Schreck of the Oregon Cooperative Fishery Research Unit and Richard Tubb of the Department of Fisheries and Wildlife. The project is being funded by the Office of Water Research and Technology (USDI) through the Institute.

SEWAGE SLUDGE TEST

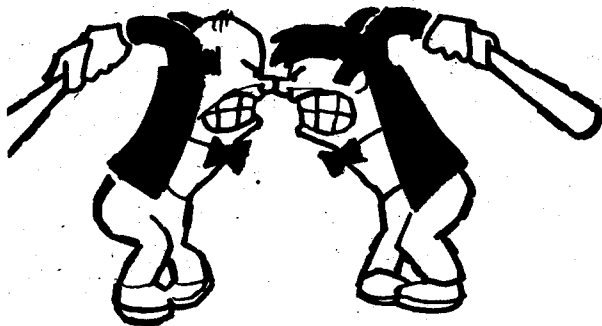
A research project was completed this year to determine the extent of potential health hazards associated with the land application of anaerobically-digested sewage sludge. The project was funded by the Water Resources Research Institute. This study was restricted to the microbiological aspects and complemented an Oregon State Agricultural Experiment Station project which has examined heavy metal accumulation and other non-biological hazard possibilities. The principal justification of the research presented in the final report was due to concerns as to whether the cool, wet, climate which occurs in the Willamette Valley over much of the fall, winter, and spring months would extend the survival times of fecal bacteria, applied in sewage sludge, to such a degree that ground or surface waters could become significantly contaminated. This was an important consideration because of the continued expansion of land disposal of sludges by municipalities in western Oregon.

The major research findings include: 1) The fecal streptococci were found to be unsuitable as indicators of recent pollution in soil. These organisms must be used with great caution, if at all, when monitoring fecal contamination in the environment; 2) fecal coliform bacteria were mostly filtered out within the top 100 cm of soil, and only a few cells reached this depth even at two sites which contained perched water tables near the soil surface for extended periods; 3) the expected prolonged survival of coliform bacteria during the winter was not observed, and the winter die-off rates resembled those obtained for the summer sampling; 4) based on the research data obtained in this study it would seem that undue constraints on the year-round application of sewage sludge to Willamette Valley soils, in proper amounts, would not be warranted as far as the transmission of bacterial disease agents is concerned. (From "Potential Health Hazards Associated with the Disposal of Sewage Sludge on Agricultural Soils in Western Oregon", by Charles Hagedorn, Oregon State University. WRR-67, June 1980.)

WETLANDS THREATENED

Oil spill cleanup and wetlands determination have become strange bedfellows under a bill pending before the House of Representatives. In an attempt to void a decision by the U.S. Attorney General, which gave the Environmental Protection Agency final say on what constitutes a wetland, the House Public Works and Transportation Committee tacked onto an unrelated oil-spill liability-proposal an amendment giving that judgment authority to the Army Corps of Engineers instead. At stake: more than a million acres of hardwood bottomland in the lower Mississippi Valley, plus "potholes" in the northern prairie states and western intermittent streams, which would not come under the Corps' wetlands definition.

Bill passage would open these areas to development, which has already destroyed half of all U.S. wetlands. Wetlands are important for fish spawning and feeding, water purification and recharge, wildlife refuges, and they serve as buffer zones against flooding, erosion and storm damage. Conservationists are torn between supporting the important oil cleanup bill, or opposing it because of its wetlands amendment. The protagonists are gearing up for the battle. (From "International Wildlife", September-October 1980.)



COLUMBIA RIVER AGENCIES

The salmon and steelhead populations of the Columbia River system contribute greatly to the offshore commercial and sport fisheries of Alaska, Washington, Oregon, California and British Columbia, as well as to the inland, or freshwater, commercial and sport fisheries of the region. Since these fisheries cover a wide territory, their management is subject to a number of agencies and political jurisdictions. In addition, fisheries management is the concern of many special interest groups with varying functions and often dissimilar focuses.

The Pacific Northwest River Basins Commission (PNRBC) has prepared a volume detailing the complex structure of concern over this fish resource.

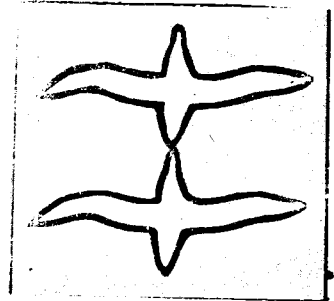
This document is an effort to briefly identify the various agencies, entities and interest groups involved with anadromous fisheries management in the Pacific Northwest. The report was prepared under the direction of the Fish and Wildlife Committee of the Commission which coordinates regional water-related planning activities. One major element is the consideration of water requirements for the maintenance and enhancement of anadromous fish in the Columbia River system. The Commission's approved regional planning report, "Water--Today and Tomorrow," documents the present condition of Columbia River salmon and steelhead resources, and the water-related problems and issues associated with the protection and enhancement of those resources. (From "Agencies, Organizations and Interests Affecting Columbia River Anadromous Fish". PNRBC, April 1980.)

STURGEON LAKE RESEARCH

A cooperative study is underway to diagnose problems affecting Sturgeon Lake. Involved in the study with the Institute are OSU's Fisheries and Wildlife Department, the West Multnomah Soil and Water Conservation District, the Oregon Department of Fish and Wildlife, the Oregon State Soil and Water Conservation Commission, and the Oregon Department of Environmental Quality. EPA funds have been granted with matching amounts to be provided by several of the participating agencies.

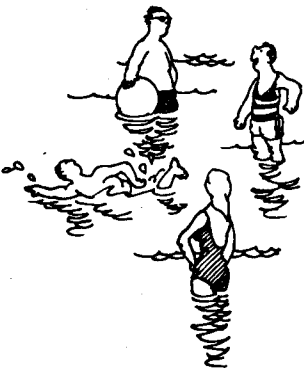
Sturgeon Lake is a large shallow lake on Sauvie Island, which is located at the confluence of the Willamette and Columbia Rivers. Approximately 15,000 acres (6,100 hectares), including all of Sturgeon Lake, is managed by the Oregon Department of Fish and Wildlife as a waterfowl wintering area. Sauvie Island is a major stopover and wintering area for birds migrating along the Pacific Coast. Approximately half of the waterfowl that winter in the Willamette Valley spend the winter on Sauvie Island. Peak winter waterfowl populations average about 250,000 ducks and geese.

The principal attraction to water birds at Sauvie Island is Sturgeon Lake. Without Sturgeon Lake, relatively small numbers of water birds would utilize Sauvie Island and the recreation associated with them, both on public and private land, would be greatly reduced. The closest water bird habitat comparable to Sauvie Island occurs in the Klamath Basin in Southern Oregon. Sturgeon Lake is also a popular warm-water fishing site. The lake supports one of the most diverse fish communities in Northern Oregon.



Natural processes of sedimentation aggravated by human activity on the Columbia and Willamette Rivers are resulting in heavy deposition of silt in Sturgeon Lake. Consequently, the lake is becoming shallower and smaller as willows invade exposed shorelines. The Oregon Department of Fish and Wildlife and private landowners surrounding the lake have repeatedly expressed concern that as a result of siltation, Sturgeon Lake will lose its attractiveness to wildlife.

Formerly, water from the Columbia and Willamette Rivers entered Sturgeon Lake via several channels and during overtopping of the island by spring freshets. The resulting flushing action probably minimized the accumulation of silt in the lake. Construction of flood protection levees on the island and reduced levels of spring freshets as a result of operation of up-stream dams eliminated all but one channel as a source of water from the lake. Silt laden water from the rivers now enters via a single channel. Upon encountering the still waters of the lake, much of the suspended silt is deposited on the bottom of the lake. Some internal drainage from the island also occurs and may contribute to silt deposition in Sturgeon Lake.



The problem, then, consists of apparent high rates of accumulation of silt and subsequent invasion of the lake bed by terrestrial vegetation. The net result is reduced

STURGEON LAKE (Continued)

quantity and quality of habitat for aquatic organisms and water birds.

The principal goals of the diagnostic study are to determine the severity of the problem and to develop recommendations for managing silt deposition and maintaining attractiveness of Sturgeon Lake for fish and wildlife. These goals will be attained by developing a hydrologic model of water and silt movement patterns from a specific research project on the lake. Using this model, a set of recommendations will be devised and evaluated in terms of their potential benefit and impact on the lake environment.

SOCIAL CHANGE

Conservation of water to be truly effective must be preceded by changes in our living patterns. The factor of prestige is a vital one to consider in planning for any change. People do not like to be forced into behavior they feel is inappropriate for them. For example, young Latin American architects and urban planners who were being taught in Bogota, Colombia, by the Organization of American States (OAS), were encouraged to have first-hand knowledge of construction methods. The staff believed it was important for them to mix mortar, lay bricks, and to engage in the manual labor required for building construction. However, the prevailing attitude in the Latin American culture is that working with one's hands is not dignified. They were accustomed to hiring peons to do menial work. Therefore, this part of the curriculum was not successful until someone hit upon the idea of supplying white laboratory coats to the students. This seemed to give them the more professional status of

laboratory technicians and the students were content to do the chores they had formerly resisted.

Competition is one way to take advantage of the need for social status, and those attempting to direct cultural change should not ignore it. A case in India is cited in which a rival threatened an established leader by building the first latrine in the village. "Only by building a bigger and better latrine was the latter able to maintain his position".

Since the beginning of this century, a large number of bathrooms in a house has been a source of prestige or social status. Conservationists must work to reverse this value, and to make water-saving devices the prestigious things to have. Education and exposure to the need for change might bring about a competitive spirit in conservation instead of the competition to consume which is the current mode.

WILLAMETTE RIVER EVALUATION

Basinwide secondary treatment of municipal and industrial waste waters has resulted in a dramatic increase of summertime dissolved-oxygen concentrations in the Willamette River. Rates of carbonaceous decay are low (0.03 to 0.06 per day), and point-source carbonaceous biochemical oxygen demand loadings now account for less than one-third of the satisfied oxygen demand. Nutrition is now the dominant cause of dissolved-oxygen depletion. Future achievement of dissolved-oxygen standards will require continued low-flow augmentation in addition to pollution control.

A minimum summertime streamflow of 6,000 cubic feet per second at Salem

WILLAMETTE RIVER EVALUATION (Continued)

gage will be needed even with increased removal of oxygen-depleting materials. The greatest immediate incremental improvement in dissolved oxygen can be made through reduction in point-source industrial ammonia loading. The pros and cons of upgrading treatment efficiencies for carbonaceous biochemical oxygen demand removal would best be determined after the ammonia loading has been reduced. For the foreseeable future, there is no need for municipal advanced waste treatment to protect dissolved-oxygen levels in the Willamette River.

These are the conclusions stated in a recent publication of the U.S. Geological Survey entitled "Evaluation of Planning Alternatives for Maintaining Desirable Dissolved-Oxygen Concentrations in the Willamette River, Oregon" (1980). This is part of a circular series which presents a case history of an intensive river-quality assessment of the river.

LAND USE AND WILDLIFE

A report prepared for the U.S. Army Engineers Institute for Water Resources sets forth the results of Phase I of a two-phase project on wildlife - land use relationships. The overall objective is to facilitate the evaluation of the influence of water resource development actions by the Corps on land use and terrestrial wildlife populations. Inasmuch as habitat is dependent on land use, the project approach to the investigation of wildlife - land use relationships is by way of habitat evaluation.

This report includes (1) a review of the literature, (2) a review of current data gaps in habitat

evaluation and in wildlife studies, (3) a summary assessment of available habitat evaluation methods, and (4) a proposed plan for testing and comparing selected habitat evaluation methods under field conditions.

The literature review has resulted in the identification of 21 methods for evaluating wildlife habitat.

The review of current data gaps indicates that the state-of-the-art for quantifying wildlife-habitat relationships and for evaluating wildlife habitat is poorly developed from a scientific standpoint. However, the available habitat evaluation methods can be of varying practical use for meeting the environmental goals and objectives of the Corps.

Based on the review of current habitat evaluation methods and the scientific data base pertaining to wildlife-habitat relationships, it is concluded that several evaluation methods have a high potential for application to the needs of the Corps. The proposed plan for Phase II focuses on the field testing and comparison of two specific methods which have been selected on the basis of their high potential for practical application to the Corps' projects throughout the Nation. (From "Investigation of the Relationship Between Land Use and Wildlife Abundance". Volume I, July 1980).

With agriculture, industry, and municipal water systems competing for the same water supplies, alternatives in sources and management systems must be sought to insure that fresh water not be wasted on functions which do not require fresh water. It is especially important when those functions consume water, making it unavailable for reuse.

WATER IN INDUSTRY

In 1977, over 200,000 people, or nearly 20 percent of Oregon's 1977 employed labor force, worked in the field of manufacturing. A large portion of these jobs were in industries relying on water as an industrial tool or as a raw material. These industries include lumber and wood products, paper products, food products, metals and others.

Water is used in almost all industries. To make one automobile, 100,000 gallons of water are needed; 65,000 gallons of water help produce one ton of paper pulp; and 2.5 gallons of water are required to make one phonograph record.

Industry relies on water in a number of ways. One important use is as a raw material. Water is reacted with chemicals to produce other chemicals, and is used in aqueous solutions of chemicals. Water is also used for producing drugs and in the food and beverage industries.

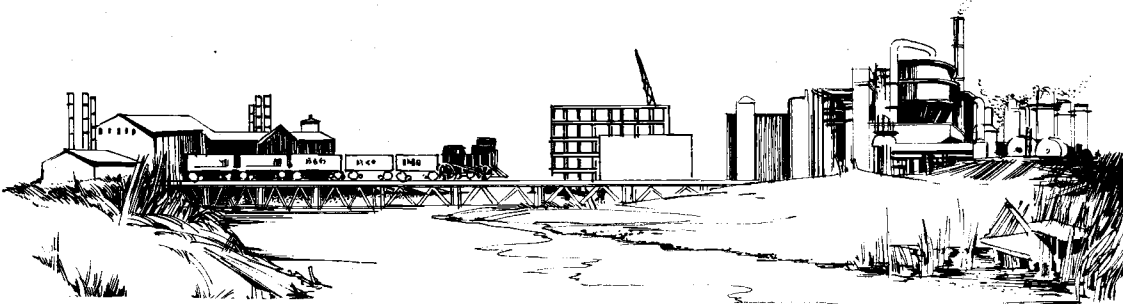
In the food processing industry, water is useful for washing and cleaning. It is also used for cleaning equipment in many industries for reasons of safety, cleanliness and efficient production. Water also helps clean dust from the air in air conditioners.

Many industries use water for transportation. In the pulp and paper industry, water conveys pulp in its various stages of production. Certain mining operations use water to dissolve the minerals and transport it to the surface for removal. The food processing industry uses water to transport fruit and vegetables between various steps in processing.

Despite its fluid properties, water is used as a powerful tool in the form of high-pressure water jets. These are used to separate bark from wood and separate minerals from soil. The Georgia-Lockheed Company uses a pressurized stream of water with a cutting force of over 27 tons to slice slabs of plastic, asbestos, foam and other non-metallic materials. That system is able to cut 200 inches of material per minute.

Steam is used in many industries to drive machinery or to generate electricity. These industries use fuel to convert water to steam. Many industries condense the used steam and reuse it.

Water is a good industrial tool because it is relatively inexpensive, abundant, and universally available. It evaporates easily and can be recycled if used in a closed system. Its heat properties allow it to be used as a coolant or in the form of steam. If other mediums besides water were substituted, higher manufacturing costs would result. (From "Water Works", Oregon Water Resources Department, Vol. 3, No. 5, September 1979)



DRIP IRRIGATION

Description: Drip irrigation is a method for watering plants used in agriculture in the U.S. since 1969. In contrast to methods in which water is applied by flooding or spraying, drip irrigation applies water frequently but slowly. The basic system consists of a hose or plastic tubing, and emitters. The emitters apply the water, as the name implies, in a slow dripping manner. The water is drawn down through the soil by capillary action. In comparison to other irrigation methods drip irrigation reduces the amount of surface area that is dampened in relation to the quantity of water which reaches the root zone, thus reducing surface evaporation.

Drip irrigation generally improves plant growth and reduces water consumption. Since the soil is only dampened the plant roots receive the desired balance between moisture, oxygen and minerals. Methods which flood the soil at infrequent intervals create an environment of feast or famine which is not best for plant growth. When flooded, the roots are burdened with excess water which does not allow them to receive adequate oxygen. When the soil dries out the roots lack sufficient moisture for maximum plant growth.

Drip irrigation is not ideal for all planting materials. Since the water is applied in "spots", drip irrigation does not suit large turfed areas. It is best applied to shrubbery, trees and other plants which have stems and radiating root structures. The hose or tubing is placed near the plants to be watered and an emitter is fitted for each plant. Emitters are also available which have two or more small tubes leading from them which can be directed at several plants. The emitters are connected by punching a hole into the hose or tubing and then either screwing them in or strapping them on. If the system is to be permanently installed the tubing can be buried but the emitters still should be above ground.

Because of the small diameter holes used in the emitters the water must be filtered to reduce clogging. Some emitters are fitted with integral screen or other filtration devices. Other systems require a filter at the source. Since most residential water is municipally filtered the large sand and gravel filters used in agriculture are not needed. Another fundamental feature of the system is pressure reduction. Municipal water is delivered to the home at up to 100 psi; drip irrigation systems operate in the 2 to 30 psi range. Some emitters incorporate pressure reducers integrally while others require that a pressure reducer is fitted at the source.

Water Consumption: The length and frequency of watering necessary are dependent on the quality of the soil, whether it is sandy or clay, and the planting material. Water savings of between 20 percent and 50 percent over other irrigation methods have been reported by agricultural users of the system (Sunset Magazine, 7/75). As with the lawn sprinklers mentioned previously, timer activated controls would likely increase the water savings available by drip irrigation to their maximum. (From "Residential Water Conservation", by Murray Milne, Report No. 35, March 1976, California Water Resources Center, University of California/Davis)
