

## Appendix J

### Annotated Bibliography List

#### CAPACITY

##### Reference List

Lukesh, G. R. 1930. The Columbia river system. *Military Engineer* 22 (124): 328-335.

Abstract: Author provides an excellent historical, geographical, hydraulic (gradient, navigability, etc.) synopsis of the Columbia river system (and the Snake river basin) from its sources to the mouth. Discusses the potential for power (includes tables illustrating Streams, Condition of Flow, Kilowatts Available, and Installed Capacity, etc.) and irrigation developments in the Columbia river system- pp. 328-335.

Pacific Fisherman. 1903. Columbia River review. *Pacific Fisherman* I(6): 6. Seattle, Washington and Vancouver, B.C. complete p.

Abstract: Notes the policy of Fish Commission Kershaw, of the State of Washington, to double the output of the Chinook, Kalama, and Wind River hatcheries; the estimated capacity of these facilities will approximate 50 million fry, at \$7,000 per year. Article also mentions the commissioner's (Mr. Kershaw) to open up new and extensive hatchery on the Grays River, near its headwaters.

#### CHINOOK

##### Reference List

Gaumer, Tom, Demory, Darrell, and Osis, Laimons. 1973. 1971 Columbia River Estuarine estuary resource use study. Fish Commission of Oregon, Division of Management and Research, Portland, Oregon.

Abstract: Authors provide information regarding fish species (invertebrate and vertebrate) harvested and observed in the recreation harvest from the seaward end of the south jetty upstream to the area adjacent to Jetty Sands parking lot, from 1 March through 31 October 1971. Figures and tables temporally and spatially illustrate the species and catch statistics for this harvest.

Griffin, L. E. 1935. Certainties and risks affecting fisheries connected with damming the Columbia River. *Northwest Science* IX(1): 25-30 (February, 1935).

Abstract: Author discusses 1) the economic importance of anadromous and resident fish species, and the effects on dam construction on said species; 2) the importance and distribution of salmon harvest in the Columbia basin; 3) the certainties associated with current state of technology of fish passage systems, and risks associated with designs and plans to be incorporated at the Bonneville project; 4) recommended actions to reduce risks associated with current fish passage technology; 5) certainties and risks associated with sedimentation and submergence of fish habitat (sloughs and shallows) in the Bonneville impoundment; 6) the certainties and risks of power plants to migration of young salmon; and 7) turbine designs and devices to reduce the risks associated with hydropower operation. Author alludes to a hypothesis that the Columbia impoundments (e.g. Bonneville) may present risks to the importance of the sloughs and shallow ponds contiguous to the river, as being very important as a food source to young salmon during their downstream migration.

Oregon State. 1896. 3rd and 4th Annual Reports of the State Fish and Game Protector of the State of Oregon 1895-1896. State of Oregon, Salem, Oregon. W.H. Leeds, State Printer, 1896. 10,53 p.  
Abstract: The Protector (Hollister D. McGuire) discusses failure of the last legislature to enact laws for more effectual regulation and protection related to such topics as concurrent regulations with the state of Washington, protection of salmon through construction of fishways, and harvest limitations on the Columbia River, page 5. Mentions that Oregon has an 1878 statute on the books requiring fishway construction at barriers to salmon, but his predecessors showed no willingness to enforce the statute. He lists the fishways that have been put in under his direction. pages 8-9. He discusses Indian fishing (Warm Spring Indians) and the earliest date of chinook salmon spawning in vicinity of the upper Clackamas River at its junction with a warm spring where thousands of salmon naturally spawn; this date is July 20th. page 10. Notes that a dam and operation of fishing in the lower Clackamas River (four miles below the hatchery) prevent salmon from ascending to the hatchery racks in 1893 and 1894; mentions that dam was removed last spring 1895. page 31. Mentions that \$10,000 was appropriated by the 1893 Oregon legislature for work to construct a fishway on the Willamette River at the falls at Oregon City, and notes that fishway work is completed but not adequate (except during high water stage) for the March and April migration of chinook at Oregon City falls, and that another \$4000 is necessary to effect this passage. pages 50-52. Recommends that a provision in the law should mandate that fish screens constructed at mill races, irrigation ditches, or canals, taking or receiving water from any river, creek, stream or lake having food fish; his attention to the need for such law was derived from a letter of Dr. C.H. Gilbert (Stanford University) who noted that water diverters on the Wallowa River killed thousands of young chinook and bludback salmon by diversion of them into irrigated fields. page 53. Notes that an Oregon law of 1893 and reenacted in 1895 created the office of the Fish & Game Protector. page 83.

Oregon State. 1907. Annual Report of the Department of Fisheries of the State of Oregon for year 1907 to the legislative assembly, twenty-fourth regular session (1907). State of Oregon, Salem, Oregon. W.S. Duniway, State Printer, 1907. 78-79 p.  
Abstract: The Master Fish Warden (H.G. Van Dusen) states that "in view of the fear that the salmon of the Columbia River was not being rehabilitated through the medium of the system of artificial propagation, I am very pleased to be able to chronicle...that there has been a considerable increase in salmon produced by the Columbia River this year over last year..." This increase was for Chinook and steelhead in both Washington and Oregon. He mentions that chinook and steelhead over past five years, but decreases in silversides and bluebacks; and says that artificial propagation has been of assistance in the increase of chinook and steelhead. Page 7. Notes that hatcheries select to use large and strong fish (males) for egg fertilization, and do not use small males; attributes this selective practice to maintaining the 25 lb. average weight of chinook over the past seasons. Page 8. Notes that egg collection at facilities in Snake and Wallowa Rivers was very unsatisfactory, even though the fish racks were operated early, few fish go upstream this far, and those that did were three males to one female. But the eggtake at federal and state hatcheries (Oregon and Washington) below Celilo Falls the eggtake was good. page 13. Notes an inspection of the Santiam River (Willamette tributary) in regards to sites for artificial propagation activities. pages 17-18. Mentions that the first contract for the construction of the fishway over the falls of the Willamette River at Oregon City was completed and accepted by the state engineer on November 29, 1904. Mentions that as the Willamette Pulp and Paper Company completed a concrete dam at the falls, this dam caused water hydraulic problems in the fishway (upper pools) - the gradient of the upper portion of the fishway was too steep. This situation caused problems for the spring chinook migration over the falls. Surveys were conducted to make recommendations and provide cost estimates to remedy the fishway problem. Pages 20-24. Notes that hatchery station was established and operated on the McKenzie River at a site situated a couple of miles below Gates Creek; mentions that they took spawn of the early variety of chinook from August 15 to October 15th. States that liberated approximately 1.5 million fry of this 1905 brood year into the McKenzie River in the immediate vicinity of the station during the months of

January and February 1906. Pages 75-76. Notes that Wallowa Hatchery station did not secure any sockeye salmon spawn during the 1905 BY - (note: appears that this BY cycle is extinct or some lower river blockage prevented sockeye from upper area). page 78. Notes that by leaving racks of the Wallowa Hatchery in the river late, they discover a late run of silversides that passed the racks in the month of November, but were unable to hold them to spawning due to severe cold weather conditions. page 78. Notes that the Ontario hatchery station (Snake River at Swan Falls) left their rack in river late (until November 23rd) in hopes of collecting late running silversides, but none appeared. Page 84. Mentions the 1901 law passed by the Oregon State legislature that prohibited fishing above tide water and established fishing deadlines on all coast streams. page 129. Notes that fishway for the falls of the Willamette River at Oregon City provides excellent passage for early chinook in 1906, Page 132. Mentions request for two special deputy fish wardens to enforce laws regarding water diversions and dam obstructions that are causing mortality of young migrants going to sea; notes causes due to extensive development of power/mill dams across streams and irrigation projects that are taking water for irrigation purposes. Pages 134-135. Notes the needs for laws that assure better escapement to the spawning ground in the Columbia River; infers that hatcheries alone will not solve the problem of diminishing harvest to fishermen in the Columbia River. page 137. Notes that 1906 BY salmon returns (chinook and sockeye) in northeastern Oregon (Wallowa and Ontario Hatcheries) were poor; and that salmon runs in the lower Columbia River below Celilo Falls appeared to have been successful in running the gauntlet of net fishermen in the lower Columbia, Page 139. Mentions that he must secure eggs in order to assure shortage of Snake River stock (at Ontario Hatchery) four to five years hence, based on "...theory that Salmon return to the stream of their nativity to spawn..." Page 140.

Oregon State. 1951. Biennial report of the Fish Commission of the State of Oregon to the governor and forty-sixth legislative assembly, 1951. Fish Commission of the State of Oregon; Salem, Oregon, State Printing Office, 1951.

Abstract: Notes that (1) Fish commission has particular interest in the study of logging effects on salmon production, page 3. (2) On June 1948, the states of Oregon, Washington, and Idaho, and Federal Government (Fish & Wildlife Service, Department of Interior) consummated agreement of the provision of funds for the rehabilitation of the lower tributaries of the Columbia River, under the Lower Columbia River Salmon Rehabilitation Program, page 10. (3) A fishway is installed at a diversion dam (owned by the Vancouver Plywood Company) on Rock, a tributary of the North Santiam River, this reopened considerable area for steelhead spawning. page 12. (4) A new concrete fishway is constructed at the Powerdale Dam (owned by Pacific Power and Light Company) on the Hood River, page 13. (5) A fish screening and by-pass system is completed in the Marmot Dam Canal (Marmot Dam project, owned by Portland General Electric Company) on the Sandy River, page 13. (6) Columbia River investigations are studying five different problems; (a) extension of reduction in productivity of the Columbia River Basin by the encroachment of man, (b) harvest practices, stock timing/migration/distribution; (c) knowledge of growth and survival and limiting factors of young salmon in freshwater, (d) effect contemplated water development projects on Columbia River salmon, and (e) studies on sturgeon. page 15. (7) A need for the development of cheap and nutritional diets alternative to the liver based diets. page 18.

Pollock, C. R. 1930. Fishery conditions in the state of Washington: Puget Sound appears healthy, but Columbia River shows decline. Pacific Fisherman Annual Statistical Number, Vol. 28, No. 2, January 25, 1930, pages 110-111. Seattle, Washington.

Abstract: Supervisor of Fisheries states that there was a shortage of escapement in the Columbia River district. Mentions that there is little hope of increasing spring chinook run until adequate screening installations have been completed on irrigation ditches. Says that summer and fall chinook runs must be looked to as the source of harvest for the fishing industry in the Columbia River district. Also provides a report on hatchery operations in the Columbia River district during 1929.

Washington State. 1921. 30th and 31st annual reports of the state fish commissioner to the governor of the state of Washington: April 1, 1919 to March 31, 1921. State of Washington Department of Fisheries and Game, Olympia, Washington. Frank M. Lamborn, Public Printer, 1921.

Abstract: The commissioner (L.H. Darwin) discusses: 1) the actions and impacts of the 1921 legislative action to create the State Fish Commission, with respect to Washington fisheries resource management, in the context of state and international (Canada) benefits (p. 8-10); 2) discusses "Wastefulness of Natural production," in the context of justifying increased harvest rates through use of efficient fish artificial propagation. NOTE: this reference may be the premise for Washington state fisheries policy over the next 60 years (p. 18-19); 3) Notes negotiations with Northwestern Electric Company to provide mitigation monies for construction of a new hatchery at Chinook, WA (replacement of the old Chinook Salmon Hatchery) in lieu of upgrading and operating the existing fishway over their hydroelectric dam on the Big White Salmon River. Mentions that dam is 160 ft. in height, and that adult steelhead trout are the only species that transcend this dam upstream (p. 24); 4) extensive discussion of the Indian fishing privileges at Prosser Dam, and the fate of salmon resources in the Yakima River, based on the prognosis of irrigation/water developments in the Yakima basin - states that within the next 10 years salmon will not exist in the Yakima (p. 27-29).

## DAMS

### Reference List

Andrew, F. J., Kersey, L. R., and Johnson, P. C. 1955. An investigation of the problems of guiding downstream migrant salmon at dams. International Pacific Salmon Fisheries Commission, Bulletin VIII.

Abstract: A comprehensive treatment of criteria and design of electric devices for guiding downstream salmon migrants; notes behavior of migrants in terms of response to electric fields and migration rates observed for sockeye and coho during experiments.

Baxter, R. M. 1977. Environmental effects of dams and impoundments. Annual Review of Ecology and Systematics 8: 255-283.

Abstract: Author provides 1) a general history and background of the impoundments, 2) Morphology and physical and chemical limnology of man-made lakes, 3) biology of reservoir ecosystems, 4) downstream effects of impoundments, 5) other consequences of impoundments, 6) summary and conclusions, and 6) a comprehensive listing of references on the subject.

Bell, M. C. 1954. Salmon fisheries versus power development. World Fishing 3(11): 392-396, 421-422 (November 1954).

Abstract: Author provides a short synopsis of the Columbia River basin and its conflict between water users (dams and irrigation) and salmon fisheries resources; notes data regarding some Columbia River dam projects, number fish screen projects, and sockeye run size.

Bixby, W. H. 1912. Rivers and harbors improvement: Progress and needs in the United States, 1911. Professional Memoirs Vo. IV, No. 13: 114-128. Corps of Engineers, US Army, and Engineer Department at Large,

Abstract: Author notes the General Dam Act of June 23, 1910, which recognized the fact that ownership of power developed by dams constructed wholly at private expense is a matter for control by individual states and not by the federal government. In accordance with this Act, which must be compiled with before riparian owners can build dams in navigable waters, the US is empowered to require the dam owner to furnish the US free of cost such water and such locks, log sluices, fishways, and other auxiliary constructions as are necessary in the interest of navigation and the fisheries... p. 125-126.

Bixby, William H. 1912. Rivers and harbors improvement: progress and needs in the United States, 1911. Professional Memoirs Vol IV, No. 13: Corps of Engineers, United States Army, and Engineer Department at Large, 114-128 p.

Abstract: Author notes the General Dam Act of June 23, 1910, which recognized the fact that ownership of power developed by dams constructed wholly at private expense is a matter for control by individual states and not by the federal government. In accordance with this Act, which must be complied with before riparian owners can build dams in navigable waters... the US is empowered to require the dam owner to furnish the U.S free of cost such water and such locks, log sluices, fishways, and other auxiliary constructions as are necessary in the interest of navigation and the fisheries...p. 125-126.

Bristow, M. P., D.H. Bundy, C.M. Edmonds, P.E. Ponto, B.E. Frey, and L.F. Small. 1985. Airborne laser fluorosensor survey of the Columbia and Snake Rivers; simultaneous measurements of chlorophyll, dissolved organics, and optical attenuation. International Journal of Remote Sensing 6: 1707-1734.

Abstract: Author reports on the use and applicability of airborne laser fluorosensor surveys in determination of chlorophyll-a profiles of the lower Columbia and Snake Rivers. Profiles of chlorophyll-a collected during peak discharges suggest the existence of subsurface chlorophyll-a maxima in the reservoirs formed by the eight dams of Columbia-Snake Inland Waterway.

Craig, J. A. 1935. The effects of power and irrigation projects on the migratory fish of the Columbia River. Northwest Science IX(1): 19-24 (February, 1935).

Abstract: Author discusses the effects of human land and water uses (logging, mining, power, and irrigation) on fisheries resources in the Columbia basin. Provides examples of habitat alterations imposed by these human uses. Briefly discusses life history and ecology of all anadromous salmonid species inhabiting the Columbia River basin. Discusses how the use of streams for power and irrigation purposes affect migratory salmon species: 1) obstacles that obstruct or delay migration of adult upstream to natal streams; and 2) injurious or delay impediments to downstream juvenile migration. Presents fishways and screening as mechanisms to protect fish, and the use of artificial propagation in the case of high dams.

Davidson, F. A. 1935. Research projects of the US Bureau of Fisheries in the Northwest. Northwest Science IX(1): 15-18.

Abstract: Author provides a synopsis of the US Bureau of Fisheries research projects that it has undertaken in the Northwest region. These projects are generally categorized as: A. Program for Study of Columbia River Salmon Fisheries, that includes 1) Statistical study of the Columbia River salmon fisheries, 2) Study of the protection of migratory fish at power dams and in irrigation canals in the Columbia River system, & 3) Biological study of the Columbia River salmon fisheries; B. Coho Salmon Investigation; and C. Puget Sound Sockeye Salmon Investigation.

Evergreen. 1993. The mighty Columbia I am life. Evergreen 23 pp. p.

Abstract: Author provides a concise history and chronology of events/activities (early 19<sup>th</sup> century to present) in the Columbia basin, with respect to exploration & settlement and development of commerce & exploitation of natural resources in the basin. Many references and comments regarding the fisheries resources of the basin are provided.

Chronology of events/activities:

- (1) 1859- the first large scale irrigation project is completed in the Walla Walla river valley; p. 3
- (2) 1880- between 1880 and 1910, loggers build more than 100 splash dams in the Columbia river basin, in order to transport logs; p. 3
- (3) 1915- the Columbia Gorge Highway is completed on the Oregon side of the Columbia river; p. 3
- (4) 1939- the Bonneville Power Administration signs its first industrial sales contract, with the

Aluminum Company of America; ALCOA constructs a smelter on the Columbia, a few miles downstream of Vancouver; p. 3

(5) 1941- September 28 th, Grand Coulee Dam begins operation; p. 4

(6) Congress authorizes construction of Hungry Horse Dam, on the South Fork of the Flathead River in Montana; this dam was the first of many upstream dams to control summer and winter flows for maximum power generation by downstream dams; p. 4

(7) 1945- the US Congress authorizes construction of five dams: McNary, Ice Harbor, Lower Monumental, Little Goose, and Lower Granite; p. 4

(8) 1946- the US Congress authorizes construction of Chief Joseph Dam; p. 4

(9) 1950- the US Congress ratified the River and Harbor Flood Control Act, authorizing four more dams: The Dalles and John Day on the mainstem Columbia; Albeni Falls and Pend Oreille in northeast Washington; and Libby Dam on the Kootenai in northwest Montana; p. 4;

(10) 1955- the Federal Power Commission grants Idaho Power Company a 50 year license to build three dams in Hells Canyon on the middle Snake River; p. 4 and

(11) 1968- construction begins on eight hatcheries to compensate for chinook and steelhead losses from four federal dams on the lower Snake River; p. 4

Foerster, R. E. 1951. Forum: Fish and Power. Transactions of Fourth British Columbia Natural Resources Conference, Victoria BC, pages 128-140.

Abstract: Authors discuss and provide references for the following topics associated with Fraser and Columbia rivers, in terms of a historical chronology: 1) Homing tendency of Pacific salmon, 2) catch to escapement ratios, 3) spawning potential 4) natural propagation, 5) treatment of obstructions, 6) effect of power installation, 7) power dams as obstructions, 8) fish ladders over low dams, 9) importance of collecting devices, 10) high dam problems, 11) influence of the reservoir area on adult migration and spawning, 12) quality of water in reservoir, 13) descent of migrating salmon, 14) alternative or replacement salmon production projects, 15) collection and removal of adult salmon to other streams, 16) artificial propagation, 17) a working policy 18) extension of salmon producing areas, 19) conclusions, and 20) literature cited. NOTE: Excellent synopsis of power and fisheries related interactions.

Fuhrer, Gregory J., Tanner, Dwight Q., Morace, Jennifer L., McKenzie, Stuart W., and Skach, Kenneth A. 1996. Water quality of the lower Columbia River Basin: analysis of current and historical water-quality data. Water-Resources Investigations Report 95-4294. US Department of the Interior, Portland, Oregon.

Abstract: The lower Columbia River Basin includes the river basins draining into the Columbia River below Bonneville Dam—the largest of which is the Willamette River. This report presents the results of a study by the U.S. Geological Survey, done in cooperation with the Lower Columbia River Bi-State Water-Quality Program, to describe the water-quality conditions in the lower Columbia River Basin by interpreting historical data collected and data collected in 1994. Historical water-quality data spanning more than 50 years and comprising more than 200 parameters were collated for interpretation in this report. The U.S. Geological Survey, the Oregon Department of Environmental Quality, and the Washington Department of Ecology collected water-quality data at 10 sites in the lower Columbia River Basin from January to December of 1994. Water-quality constituents measured in 1994 were screened against U.S. Environmental Protection (EPA) and State guidelines.

Arsenic, a human carcinogen, was detected in 15 of 16 samples in the lower Columbia River, but was not detected in any of the sampled tributaries. All 15 arsenic detections had concentrations that exceeded both the EPA human-health advisories for drinking water. Chromium was detected at all four Columbia River sites—most frequently in the Columbia River at Hayden Island. None of the chromium concentrations detected, however, exceeded water-quality criteria or guidelines.

Measurements of suspended trace-element concentrations (trace-element concentrations associated with the suspended-sediment fraction) showed that the suspended form is the dominant transport phase for aluminum, iron, and manganese, whereas the dissolved form is the dominant transport phase for arsenic, barium, chromium, and copper. On the basis of tributary loads during summer low-flow months, sources of suspended silver, nickel, aluminum, and antimony exist in the lower Columbia River Basin, whereas the sources of suspended zinc and arsenic exist outside of the lower basin.

Twenty organic compounds were detected of the 47 compounds analyzed for this study. None of the organic compounds measured exceeded EPA's ambient water-quality criteria or drinking-water guidelines. The Willamette River at Portland had the largest number of detections, and all 20 compounds were detected at one time or another at that site. The largest concentrations of the agricultural pesticides, atrazine, metolachlor, and simazine were detected in the Willamette River, where they were detected in 93, 86, 93 percent, respectively, of the samples collected. The highest concentrations of atrazine in the Willamette River were associated with the spring application and fall runoff periods.

Both historical and current data showed that the highest water temperatures in the lower Columbia River Basin are present during August. For water years 1977-81 in the Columbia River at Bradwood (river mile 38.9), 75 percent of the daily mean water temperatures during August exceeded 20 degrees Celsius, a "special condition" criterion for the State of Washington. The special condition criterion was exceeded at four sites on the lower Columbia River during July and August, 1994—a period coinciding with season-high air temperatures and low streamflow. Trend tests using data from 1974 to 1994 showed significant ( $p < 0.05$ ) upward trends for water temperature at the Columbia River at Warrendale and the Willamette River at Portland.

Concentrations of dissolved oxygen and total dissolved gas were above saturation levels during high stormflows in the lower Columbia River and the Willamette River during 1994. The high concentrations of total dissolved gas in the Columbia River exceeded Oregon and Washington State standards of 110 percent of saturation and were caused by spilling water at the Columbia River dams. Aquatic life in the lower Columbia River Basin was not subjected to low dissolved-oxygen concentrations. Comparison of dissolved-oxygen concentrations in the Willamette River from 1949—58 to 1972—94 showed a significant increase in dissolved-oxygen concentrations during the low-streamflow months of summer.

Trend tests showed significant ( $p < 0.05$ ) downward trends from 1973 to 1994 for three constituents at the Columbia River at Warrendale: phosphorus in unfiltered water, total dissolved solids, and specific conductance. These trends may be a consequence of more conservative agricultural practices in the area upstream from Warrendale.

Gangmark, H. A. 1957. Fluctuations in abundance of Columbia River chinook salmon, 1928-54. Special Scientific Report Fisheries No. 189, 21 pages. US Fish and Wildlife Service, Department of Interior, Washington, DC.

Abstract: Notes general history of fishing seasons in late 1800s through 1940s (eg 1877, weekend closures of fishing were established.) A discussion of the influence of water use projects on chinook salmon in the Columbia River; mentions that dams influence migration routes and habitats of downstream migrants. Briefly discusses relative abundance of chinook juvenile migrants at Bonneville since 1938.

Idaho State. 1921. Eighth biennial report of the Fish & Game Warden of the State of Idaho, 1919-1920. Otto M. Jones, State Game Warden; Boise, Idaho.

Abstract: (1) Note that in 1910 Sunbeam Dam (Custer County), owned by the Sunbeam Dam Company, was constructed on the Salmon River, and was an absolute barrier to fish trying to reach the spawning grounds of small tributaries and lakes in the upper Salmon River (Stanley Basin District); and ineffective wooden fish ladder was constructed shortly after dam completion, but the first high water demolished the structure. (2) In 1920, State Game Warden ordered that a permanent fish ladder be constructed at Sunbeam Dam, and ready for operation by mid-summer. pages 45-47. (3) Notes a visit to the Grangeville Power & Light Company Dam on the Clearwater River, and consultations with the dam owners to devise a plan for the fishway over the dam. By November, the fishway had not been fully completed; the dam manager surmised that salmon could ascend the fishway in its current condition during high water, pages 47-48. (4) Notes on fishway and fish screen construction activities at the Deer Flat Reservoir and tributaries thereof (Boise River Basin area) page 49. (5) Notes on visit and observations of diversion dams in the Weiser and Payette Basin; observes the fishway at the Black Canyon Dam on the Payette River, and salmon passage effectiveness is questioned, but it is stated that considerable numbers of salmon were caught in upper water of the Payette river in 1920, pages 53-56. (6) Notes an estimate of five hundred ditches on the Lemhi River and its tributaries, page 58.

Idaho State. 1923. Ninth biennial report of the Fish & Game Warden of the State of Idaho, 1921-1922. Otto M. Jones, State Game Warden; Boise, Idaho.

Abstract: (1) Photographs of sections of the upper Salmon River below the Middle Fork are illustrated on pages 16 and 17. (2) Notes and describes problem of constructing fishways at dams used for flooding/water release purposes of ponding and flushing logs downstream. State policy appeared to allow the watershed to be logged off using these dams as log transport mechanisms; fishways were not used during this watershed use phase (logging) because continuous stream flow was not available, page 36. (3) Notes on a photograph of the fishway that was installed by the Idaho Power Company at the Swan Falls Dam on the upper Snake River, during the 1921-1922 biennium, pages 36-38. (4) Note that during the 1921-1922 biennium, 58 dams were inspected, 25 fishways were constructed, and 11 dams were removed., page 38. (5) Notes that Idaho Fish & Game laws provide the department an ideal fish screen law, and describes the law, pages 38-39. (6) Photographs of the Sunbeam Dam and fishway project are illustrated on pages 40-41.

Idaho State. 1925. Tenth biennial report of the Fish & Game Warden of the State of Idaho, 1923-1924. R.E. Thomas, State Game Warden; Boise, Idaho.

Abstract: (1) Notes that the year 1924 was marked with extreme drought of water supplies (streams, lakes, reservoirs), page 24. (2) Note that the Black Canyon Dam (US Bureau of Reclamation project) on the south fork of the Payette River is completed, and no facilities for fish passage is provided. Mentions that experiments of other states show that it is not practical to construct fishways at dams over 50 feet in height, page 27. (3) Notes that the policy of states, like California, require that a power company or private enterprise shall operate a fish hatchery, at its own expense, in lieu of building a fish ladder, page 27. (4) Note that desirable fish species were for the first time planted in waters of the Payette, Boise, Challis, Selway, Clearwater, and Nez Perce National Forests - a cooperative effort of the Forest Service and Idaho Fish & Game, page 95. (5) Note that the Middle Fork of the Salmon River is rugged and variable in character, and is a beautiful stream wholly within timbered areas of the National Forests, page 38. (6) Notes/table of fish plantings in the Middle Fork of the Salmon River, page 100. (7) Notes that redbfish (kokanee?) were successfully planted in Big Redfish Lake in 1921, page 101. (8) Note on the establishment of a small summer fish hatchery on the North Fork of the Payette River near Cascade, Idaho, page 116. (9) Notes that the Grangeville hatchery is established by the Commercial Clum of Grandeville (per Idaho Fish & Game Department) on Clearwater River near Grangeville, Idaho; eggs will be collected in the Clearwater and Lochsa basin, page 117. (10) Notation that small numbers of chinook salmon fingerlings are handled at Sandpoint and Hayspur Hatchery facilities, page 119. (11) Note of policy that every lake and stream is entirely

different in characteristics, and must be treated in an individual manner, page 126.

Jaske, R. T. and J.B. Goebel. 1967. Effects of dam construction on temperatures of the Columbia River. *Journal of the American Water Works Association* 59: 935-942.

Abstract: Author analyzes and correlates water temperature data/measurements (perhistorical records 1933-1965) of Columbia River dam projects (Priest Rapids, Rocky Reach, Rock Island, and Grand Coulee) to determine effects of dams on water temperature in Columbia River. Concludes that (1) erection of low head reservoirs on the mainstem Columbia has not produced significant change in average temperature of the river, (2) the erection of Grand Coulee Dam on Lake Roosevelt has resulted in a 30 day delay in the transport of water through the reservoir system, and (3) the erection of dams and reservoirs decreases expected variance in water temperature.

Johansen, Dorothy and Gates, Charles. 1967. *Empire of the Columbia - a history of the Pacific Northwest*. Second Edition; Harper & Row Publishers, New York, Evanston, and London 654 pages.

Abstract: The authors provide a comprehensive history of the Columbia River basin in terms of its native inhabitants, early exploration and settlement, natural resources exploitation, industries/commerce development, politics and socio-economic policies. The following historical notes of historical milestones and fisheries/natural resources information were derived: 1) On 3 December 1805, Lewis and Clark camp in a primitive log shelter on the south side of the Columbia River at the mouth of the Lewis and Clark River, and call the camp site Fort Clatsop after the Indians in the vicinity; p. 78; 2) In 1808, Finan McDonald (North West Company) built a temporary depot at Kootenai Falls; p. 89; 3) In September 1809, David Thompson (North West Company) selected the site for Kullyspel House on the eastern shore of Lake Pend d'Oreille; p. 89; 4) In the fall 1809, David Thompson (North West Company) built Saleesh House near Thompson Falls on the Clarke Fork River, p. 89; 5) In 1810 or 1811, Finan McDonald and Jacques (Joco) Finlay of the North West Company built Spokane House near the present city of Spokane, WA; p. 89; 6) In 1811, David Stuart (expedition of Astorians-Pacific Fur Company) established Fort Okanogan at the confluence of the Okanogan and Columbia rivers; p. 102; 7) In December 1813, the North West Company takes possession of Fort Astoria, which was sold involuntarily by the Pacific Fur Company (John Jacob Astor) and it is renamed Fort George; p. 105; 8) In 1818, Donald McKenzie (North West Company) built Fort Nez Perce (REVIEWER's NOTE: later operated by the Hudson Bay Company and called Fort Walla Walla) as a trade center for the Nez Perce Indians, and a supply depot to the vast area explored and trapped by the north West Company; p. 107; 9) In 1819, Donald McKenzie (North West Company) ascended the Snake River from the mouth of the Clearwater River to the Burnt River in a boat ("bateau") p. 107; 10) In the summer of 1818, Fort George (Fort Astoria) was restored to possession of the US (per the Treaty of Ghent, 1814), and the North West company remained in charge of the post as a concession of John B Prevost (special agent of the US Government); p. 111; 11) In the fall of 1818, the US and Great Britain agree to the convention of 1818 which established the boundary between the US and Canada at the 49th parallel from the Pacific to the Rockies; p. 112; 12) In 1838, a small water-powered sawmill, located about five miles east of Fort Vancouver (operated by John McLoughlin, Hudson bay company), employed six to ten saws and twenty-five men, and produced lumber for rebuilding the Fort; p. 133; 13) In 1828, John McLoughlin and George Simpson (Hudson Bay Company) selected a site at Willamette Falls, where Simpson reported that "whole Forests of Timber can be floated into a very fine Mill Seat...[and] Saws enough could be employed to load the British Navy." Author notes that in 1831 timbers for a mill were cut at the spot, and the project was abandoned; p. 133; 14) Author notes farming activity of the John McLoughlin's operation (Hudson Bay company) in the lower Columbia: a) in 1839, the plows broke heavy sod at cowlitz Farms..., b) farming was taking place in the Tualatin and Willamete valleys, cattle grazing on the Tualatin prairies, and c) in 1833, eight families formed the nucleus of farming community called French Prairie; p. 135; 15) In 1832, Capt. Nathaniel J. Wyeth established Fort Hall on the Snake River at the mouth of the Portneuf above American Falls; p. 146; 16) In 1832,

Capt. Nathaniel J. Wyeth established Fort William at Wappatoo (Sauvies ) Island at the mouth of the Willamette River, in order to fish and pack salmon; p. 147; 17) In September 1835, Capt. Nathaniel J. Wyeth's company abandons Fort Hall on the Lewis River (Snake River); p. 147; 18) In spring 1836, Capt. Nathaniel J. Wyeth's company abandons the fishing and packing operation at Wappatoo (Sauvies) Island at the mouth of the Willamette River, due to Hudson Bay Company competition; sails with a half cargo of fish; p. 147; 19) In 1839, Captain Edward Belcher, in command of a British naval squadron, arrived in the Columbia River to survey the river's bar, channel, and inner anchorages, in anticipation of increased trade; p. 183; 20) In the summer of 1841, Lieutenant Charles Wilkes, commander of the US Exploring Expedition (1838-42) enters the Columbia River with two vessels; p. 185; 21) In 1848, the US Congress passes the Organic Act that created the Territory of Oregon; p. 299; 22) Author notes that gold strikes were reported in the Santiam and John Day Rivers (circa early 1850s) p. 265; 23) Author notes that herds of cattle and strings of horses move north through the Cowlitz, Yakima, Wenatchee, and Okanogan valleys to supply the mining camps (circa late 1850s) p. 265; 24) In 1860, the Oregon Steam Navigation Company (OSN) was organized (through a merger of small boat companies) to transport freight between Portland (OR) and the mining region of Idaho; p. 279; 25) In 1862, the Oregon Steam Navigation Company (OSN) built a six-mile railroad at the Cascades on the Washington side of the Columbia River and a fourteen-mile road running from The Dalles to beyond Celilo falls; p. 279; 26) Author notes land allocations to Land Grant Railroads (Northern Pacific, Central Pacific, and Union Pacific) in the Northwest, where they were subsidized with lands from the public domain; each was to receive a 200 foot right-of-way and sections of land to help finance construction (p. 305-315). Examples of these grants are: a) Northern Pacific had a grant of lands of alternate sections through the Columbia River and Cowlitz River Valley of 2,000,000 acres of timber (estimated at \$100 million) to build the Kalama to Tacoma railway (p.308), and b) Oregon Central Railroad (later part of the Northern Pacific, eventually merged with the Great Northern Railroad) was granted 5,000,000 acres in the Willamette, Umpqua, and Rogue River Valleys (p. 309) to connect Portland to California; 27) In 1902, the US Congress passes the Newlands Act, under which the US Reclamation Service is created; the purposes of the Newlands Act was threefold: a) plan and construct major improvements by a federal agency, b) design and carry out each project so as to provide maximum benefits for the entire area in which it is located, and c) make federally financed projects self-liquidating; p. 392; 28) In 1923, the US Reclamation Service is renamed the US Reclamation Bureau; p. 392; 29) Author notes that private ownership of Pacific Northwest forest lands in 1913 as follows: a) Weyerhaeuser Timber company 26.1% of timberland in Washington, b) Weyerhaeuser Timber Company and Northern Pacific Railroad - 45.7% in Washington, c) Weyerhaeuser Timber company and Southern Pacific Railroad - 22.4% in Oregon; p. 402; 30) Author notes that before 1911 skid logging (by oxen, horses, mechanical donkey) was done on the ground, p. 403; 31) Author describes in 1918 two plans for development of water in the Columbia Basin for irrigation were proposed: a) gravity system bringing water for Lake Pend d'Oreille (Idaho) to the Columbia Basin (series of canals, pumps, siphons), and b) dam and storage reservoir in the Grand Coulee area: politics, multiple purpose benefits, and economic costs dictated the final decision for the Grand Coulee plan; p. 514-517; 32) In 1907, President Theodore Roosevelt appointed the Inland Waterways Commission to study the whole question of river development; and in 1908, the Inland Waterways Commission submitted its report that emphasized the need for federal policy to emphasize multiple use projects instead of single purpose projects; p. 516; 33) In 1925, the US Congress authorized House Document Number 308 for the Corps of Engineers to conduct river surveys covering matters such as flood control, power development, irrigation, navigation, and domestic water supplies; p. 516; 34) In 1932, the Corps of Engineers submitted their report on the Columbia River, referred to as the "308 Report," to the US Congress; this report essentially recommended proceeding with the Grand Coulee project; and development of system of 10 multiple purpose dams on the Columbia River between the Canadian border and tidewater (Grand Coulee, Foster Creek, Chelan, Rocky Reach, Rock Island, Priest Rapids, Umatilla Rapids, John Day Rapids, The Dalles, and Bonneville); p. 516-517; 35) In 1932(?), the Washington

State Legislature set up the Columbia Basin commission to promote the Grand Coulee project and state, under this authorization state relief funds were used to do some preliminary work at the project site; p. 517; 36) In March 1933, federal monies in the amount of \$60 million were channelled through the Public Works Administration, created by President Franklin Roosevelt, to build a low head dam at Grand Coulee; p. 517; 37) In 1935, the US Congress passed the Rivers and Harbors Act, which included the formal approval of work on the Grand Coulee Dam project, that thus far had been carried out under presidential order of funds under the FERA and WPA programs; p. 519; 38) In 1930, the Washington State Legislature passed the Public Utility District Law, that allowed an otherwise unincorporated area to organize as a utility district (PUD) to build dams and to generate, purchase, and distribute power; p. 521; 39) In 1920, the US Congress passed the Federal Power Act, under which the Federal Power Commission was created to license companies constructing facilities on navigable waters (which by definition came under federal jurisdiction); p. 521; 40) In 1937, the US Congress passed the Bonneville Administration Act that a) the Bonneville Dam facilities be operated by the Corps of Engineers, b) the Grand Coulee Dam be managed by the Bureau of Reclamation, and c) a civilian administration, appointed by the Secretary of Interior, be charged with the marketing of energy produced at both Bonneville and Grand Coulee dams; p. 527; 41) Author notes that in 1902 a raging fire devastated 700,000 acres of timber in Lewis County, Washington (known as the Yacolt burn); p. 544; 42) In 1949, the Washington State legislature declared the lower Columbia River watershed a sanctuary for the special purpose of building up native fish stocks; p. 557; 43) In 1955, the City of Tacoma started construction of the Mayfield Dam project on the Cowlitz River, under authorization of the US Federal Power Commission; and the State of Washington instituted court action on behalf of the Washington State fisheries agencies, p. 57; 44) In 1958, the US Supreme Court rules against the instituted court action of the State of Washington on behalf of the Washington State fisheries agencies regarding the Mayfield Dam project on the Cowlitz River, p. 557; 45) In 1965, the City of Tacoma started construction of the Mossy Rock Dam project on the Cowlitz River, under authorization of the US Federal Power Commission; p. 557; 46) In 1948, the US Fish & Wildlife Service, the Washington Department of Fisheries, and the Oregon Fish Commission enter a 20 year cooperative agreement, the Lower Columbia Fisheries Compensation Program, of fisheries research and development in the lower Columbia River watershed, p. 558.

Lelbhardt, Barbara. 1990. Law, environment, and social change in the Columbia basin: the Yakima Indian Nation as a case study, 1840-1933. Dissertation for Doctor of Philosophy in Jurisprudence and Social Policy, University of California at Berkeley, 1990, 488 pages.

Abstract: A. Author provides a comprehensive history and legal premise of water rights and fishing issues of the Yakima Indian Nation within the Yakima and Columbia rivers basin; includes an extensive bibliography. Documents the social and economic dependence of the Yakima Indians on fisheries resources; provides some insight of salmon, water, and habitat of the Yakima Basin prior to and during development of fisheries and agricultural industries in the Yakima basin. The following historical notes of historical milestones and fisheries resources information were derived: 1) In 1850, the US Congress passes the Land Donation Act which provided for the appropriation of lands from the public domain in the territories (e.g. Oregon Territory); p. 104; 2) In 1873, the Washington Territorial legislature passed an act that allowed Yakima County farmers, miners, manufacturers- or anyone that could use water for "beneficial purposes" to construct diversion works necessary to convey water onto their non-riparian lands (An Act Regulating Irrigation and Water Rights in the County of Yakima, Washington Territory, 13 November 1873, Washington Laws 520-522), p. 245; 3) In 1890, the Washington State Legislature passed a statute that provided for the appropriation of any unclaimed waters 'from any natural streams or lakes in the state' for irrigation and permitted the condemnation of rights of ways for ditches to carry water 91890 Washington laws 706, paragraph 1), p. 246; 4) In 1917, Washington State Legislature passed a law adopting an administrative water code that recognized prior appropriation as the only means by which an individual could acquire water rights (Riparian and Appropriation Rights, Washington laws 447-68), p. 247; 5) Around 1867, the

Meninick/Shumit Ditch on Simcoe Creek (tributary to the yakima River) was constructed on the Yakima Indian Reservation; p. 250; 6) In 1906, the US Congress passed the Jones Act, that provided for funding the on-reservation portion of the US Reclamation Service's larger yakima irrigation project by allowing each Indian allottee to sell 60 acres of his or her allotment for bring water to the remaining twenty acres under the project; p. 254-255; 7) In 1891, the Northern Pacific, Yakima, Kittitas Irrigation Company, who filed on 1000 cfs of Yakima River water (in 1890) began construction of the Sunnyside irrigation project, and in that year built an adjustable dam (at the old Yakima dance house site) that was believed to have the capability to appropriate virutally the entire low flow when the river was at its lowest point; p. 258; 8) In 1892, the first 25 miles of the Sunnyside irrigation project is dedicated; p. 259; 9) In 1893, the Northern Pacific Railroad (owner of the Northern Pacific, Yakima, Kittitas Irrigation Company) declares bankruptcy during the Panic of 1893; p. 259; 10) In 1894, the US Congress passed the Carey Act which allowed states to choose up to one million acres of arid land for irrigation development; p. 260; 11) In 1895, the Washington State legislature set up the Arid Lands Commission to investigate the possibility of developing lands between the Yakima and Columbia Rivers, above the Sunnyside irrigation project; p. 260; 12) Up to and through the 1890s individuals, farmers cooperatives, and ditch companies invested in their own small scale irrigation systems; p. 260; 13) In 1902, the US Congress passed the Newlands Act which created the Reclamation Service with the US Department of Interior; the Reclamation Service was empowered to provide planning, engineering, and financial assistance for irrigation projects; p. 261; 14) In 1906, the US Reclamation Service purchases the Sunnyside irrigation project from the Northern Pacific, Yakima, Kittitas Irrigation company, p. 241; 15) In 1908, the US Supreme Court issued its decision on the Winters vs US, where the court held that Indians reserve water rights even when their treaties made no express mention of water; p. 270; 16) In 1905, the Washington irrigation Company, on their attorneys' advice blew up the dam of Union Gap irrigation Company at Lake Cle Elum when insufficient water thretened to destroy the crops on the Sunnyside Project; . p. 272; 17) In 1889, the Ahtaneum Creek (tributary of the Yakima River) was virtually drained of water by irrigators on the north side of stream where it bordered the Yakima Indian Reservation; p. 275; 18) In 1891, the Ahtaneum Creek (tributary of the Yakima River) was virtually drained of water by irrigators on the north side of stream where it bordered the Yakima Indian Reservation; . p. 275; 19) In 1892, (a dry summer), the US Bureau of Reclamation attempted to re divert water of Ahtaneum Creek, virtually drained of water by irrigators on the north side of stream where it bordered the Yakima Indian Reservation, but the north-side irrugation users brought suit against the Bureau's action; . p. 276; 20) In 1905 the US Secretary of Interior allocated 2065 cfs and 147 cfs of yakima River water respectively to the white water users and Yakima Indian water users; p. 292; 21) J.H. Lynch (in 1901) noted that the more water flowed in the Ahtaneum Creek (tributary of the Yakima River) in the early days than at present, and the runoff was also later, coming mostly after July 1st; he said " the watershed had not been burned off nor grazed excessively by sheep, hence more water". ; p. 310; 22) In 1908, the Washington State Fish Commissioner asked the Reclamation Service to include fish ladders at Yakima project dams, but was told that fish ladders were not feasible, nor was the Reclamation Service responsible for meeting state fishery laws; p. 310-311; 23) The Washington State Fish commissioner (Mr. Darwin) closed the Klickitat River to food fishing (white commercial and Indian fishing) - not sport fishing - between 1915 and 1917, p. 373.

Moore, M., K. McLeod, and D. Reed. 1960. Conservation of fisheries resources in the Columbia River Basin. Fisheries, Volume III, Washington Department of Fisheries, 344 pages.

Abstract: Volume III is comprised of revised editions of Volumes I and II, plus additional material. A general synopsis of water developments in the Columbia River basin, and the resulting salmon declines are noted; illustrates scope of water developments and their impacts on access to upstream areas, using a schematic for dams completed, under-construction, and planned (p. 122-123). discusses contribution of Columbia River stocks to coastal and inshore fishing areas. A historical review of hatcheries in the State of Washington is presented (pages 331-344); major phases of salmon

hatcheries in Washington are noted as: Phase One 1890-1905: Period of concentration on the taking of large numbers of eggs with fry releases and very limited or no rearing and feeding. Phase Two: 1906-1936: Period of large egg taking and short-term rearing. Phase Three: 1937-1945: Period of smaller egg takes, intensive rearing in ponds, migratory and disease studies. Phase Four: 1945-1949: Expansion and modernization of hatchery system with new stations, rebuilding of old stations and institution of the Columbia River Fisheries Development Program. Phase Five: 1957-to date(1960): Period of initiation and development of fish farms in conjunction with hatcheries with goal of maximum use of all available fresh and saltwater areas possible for salmon production at reduced cost. Page 333.

Needham, P. R. 1939. Migratory fishes and dam construction in west coast rivers. Transactions of the 4th North American Wildlife Conference 1939: pages 300-304.

Abstract: Author provides synopsis of man-induced activities (railroad construction, hydraulic mining, irrigation, domestic use) and their impacts on migratory salmonids in West coast rivers. Dam construction (Bonneville and Grand Coulee Dams) is used as a particular of current activities that threaten anadromous salmonids; mentions that the Grand Coulee salvage operation at Rock Island Dam, and provides fish counts at Rock Island (1934-1937). Short discussion is given regarding dam construction activities and the purposes of the Sacramento-San Joaquin water plan. Recommends that mandatory fish investigations should be conducted for at least 5 years prior to actual start of construction of dams in waters affecting runs of migratory fish.

Netboy, Anthony. 1958. Salmon of the Pacific Northwest: fish versus dams. Binford & Mort, Publishers, Portland, Oregon. 122 pages.

Abstract: Author discusses: (1) Life history and migrations of Pacific species in the Columbia River; (2) Indian fisheries and methods prior to and after the settlement of white men in the Columbia basin; (3) Historical and contemporary alterations of the Columbia River (e.g. land use, pollution, and dams); (4) Fish passage, management, and propagation methods to overcome the human alterations in the Columbia River.

Netboy, Anthony. 1980. The Columbia River salmon and trout; their fight for survival. University of Washington Press, Seattle and London. 180 pages.

Abstract: Author documents and describes (1) the pristine Columbia River; (2) The Columbia River Indian fishery; (3) life history of Columbia River salmon and steelhead trout species; (4) Intrusive alterations (e.g. irrigation, pollution, dams) of the watershed and consequences (e.g. decline of Pacific salmon species); (5) Fishery compensation programs in the Columbia River; and (6) Endanger species. Contains a comprehensive bibliography of Columbia River related historical and contemporary references.

O'Malley, H. 1935. Some problems which confront the fishery experts in the construction of dams in the Inland Empire. Northwest Science IX(1): 23-24 (February, 1935).

Abstract: Author presents the problems of dam construction in the Columbia River as 1) successful passing of adults over dams, 2) getting small fish and steelhead kelts back to the sea, and 3) the complex problem of changed conditions brought about by the dams and artificial lakes. Mentions the four commissions that control the destiny of commercial and game fishes in the States of Washington and Oregon; the annual value and employment associated with the fishing industry; the budget and employment figure projected for construction of the Bonneville dam; fishways associated with the Rock Island dam; and the impassability of Grand Coulee dam. Discussion of the biological effects on native fish species, based on experiences in New England and other parts of the US; generalizes and predicts the ecological changes of the habitat and species resulting from water impoundments on the Columbia River. Briefly mentions the requirement for proper screening of power intakes and immediate steps to combat pollution, due to industrialization of the Inland Empire.

Oregon Master Fish Warden. 1909. Report of Oregon Master Fish Warden. Pacific Fisherman Annual Review, February 1909, pages 32-37. Seattle, Washington.

Abstract: Author provides an extensive report on the status of the Oregon fish resource. Highlights of this article are: 1) irrigation ditches present a serious problem to young salmon due to the lack of prevention in diversion to fields; mentions that most of the diversion dams have fishways that provide passage for adult salmon. 2) Passage of laws banning fishing above the Sandy River, and restriction of lower Columbia River commercial fishing; extensive discussion of needed legislation, and closed areas/seasons. 3) Boundary problems between Oregon and Washington, in terms of fishing activities and enforcement of regulations. 4) Hatchery activities in the Columbia River (District No. 6).

Oregon State. 1907. Annual Report of the Department of Fisheries of the State of Oregon for year 1907 to the legislative assembly, twenty-fourth regular session (1907). State of Oregon, Salem, Oregon. W.S. Duniway, State Printer, 1907. 78-79 p.

Abstract: The Master Fish Warden (H.G. Van Dusen) states that "in view of the fear that the salmon of the Columbia River was not being rehabilitated through the medium of the system of artificial propagation, I am very pleased to be able to chronicle...that there has been a considerable increase in salmon produced by the Columbia River this year over last year..." This increase was for Chinook and steelhead in both Washington and Oregon. He mentions that chinook and steelhead over past five years, but decreases in silversides and bluebacks; and says that artificial propagation has been of assistance in the increase of chinook and steelhead. Page 7. Notes that hatcheries select to use large and strong fish (males) for egg fertilization, and do not use small males; attributes this selective practice to maintaining the 25 lb. average weight of chinook over the past seasons. Page 8. Notes that egg collection at facilities in Snake and Wallowa Rivers was very unsatisfactory, even though the fish racks were operated early, few fish go upstream this far, and those that did were three males to one female. But the eggtake at federal and state hatcheries (Oregon and Washington) below Celilo Falls the eggtake was good. page 13. Notes an inspection of the Santiam River (Willamette tributary) in regards to sites for artificial propagation activities. pages 17-18. Mentions that the first contract for the construction of the fishway over the falls of the Willamette River at Oregon City was completed and accepted by the state engineer on November 29, 1904. Mentions that as the Willamette Pulp and Paper Company completed a concrete dam at the falls, this dam caused water hydraulic problems in the fishway (upper pools) - the gradient of the upper portion of the fishway was too steep. This situation caused problems for the spring chinook migration over the falls. Surveys were conducted to make recommendations and provide cost estimates to remedy the fishway problem. Pages 20-24. Notes that hatchery station was established and operated on the McKenzie River at a site situated a couple of miles below Gates Creek; mentions that they took spawn of the early variety of chinook from August 15 to October 15th. States that liberated approximately 1.5 million fry of this 1905 brood year into the McKenzie River in the immediate vicinity of the station during the months of January and February 1906. Pages 75-76. Notes that Wallowa Hatchery station did not secure any sockeye salmon spawn during the 1905 BY - (note: appears that this BY cycle is extinct or some lower river blockage prevented sockeye from upper area). page 78. Notes that by leaving racks of the Wallowa Hatchery in the river late, they discover a late run of silversides that passed the racks in the month of November, but were unable to hold them to spawning due to severe cold weather conditions. page 78. Notes that the Ontario hatchery station (Snake River at Swan Falls) left their rack in river late (until November 23rd) in hopes of collecting late running silversides, but none appeared. Page 84. Mentions the 1901 law passed by the Oregon State legislature that prohibited fishing above tide water and established fishing deadlines on all coast streams. page 129. Notes that fishway for the falls of the Willamette River at Oregon City provides excellent passage for early chinook in 1906, Page 132. Mentions request for two special deputy fish wardens to enforce laws regarding water diversions and dam obstructions that are causing mortality of young migrants going to sea; notes causes due to extensive development of power/mill dams across streams and irrigation projects that are taking water for irrigation purposes. Pages 134-135. Notes the needs for laws that

assure better escapement to the spawning ground in the Columbia River; infers that hatcheries alone will not solve the problem of diminishing harvest to fishermen in the Columbia River. page 137. Notes that 1906 BY salmon returns (chinook and sockeye) in northeastern Oregon (Wallowa and Ontario Hatcheries) were poor; and that salmon runs in the lower Columbia River below Celilo Falls appeared to have been successful in running the gauntlet of net fishermen in the lower Columbia, Page 139. Mentions that he must secure eggs in order to assure shortage of Snake River stock (at Ontario Hatchery) four to five years hence, based on "...theory that Salmon return to the stream of their nativity to spawn..." Page 140.

Oregon State. 1913. Biennial report of the Department of Fisheries of the State of Oregon to the legislative assembly, twenty-seventh regular session, 1913. State of Oregon, Salem, Oregon. Willis S. Duniway, State Printer, 1913.

Abstract: Master Fish Warden (R.E. Clanton) describes the enactment of a policy of feeding fry in retaining ponds, at Oregon state hatchery facilities, until they are a sufficient age and size to protect themselves against predators. pages 13-16. Mentions that the policy of retaining and feeding fish to a larger size necessitates the need for investigations and research for some other food, other than liver, that is equal in nutritive value and less expensive. page 16. Notes the acceptance by the Bonneville Hatchery of 1.5 million sockeye salmon eggs from the US Bureau of Fisheries that were source from Yes Bay in southeastern Alaska. page 18. Mentions that the construction of dams associated with irrigation projects on the streams east of the Cascade Mountains have practically destroyed all of the spring chinook spawning grounds, and forced the state to secure the spawn of this species from the Willamette River and its tributaries. page 63. Note that the operations of the Salmon River hatchery in the Sandy River basin was abandoned in the fall of 1910 due to lack of chinook spawned, but was operated in the spring of 1912 to secure steelhead spawn. page 71. Mentions that chinook and silverside spawn were taken at the Wallowa hatchery station in 1912, page 72. Mentions improvements to the fishway (south-side) at Spray Dam (irrigation dam operated by farmers) on the John Day River is in good condition, and recommends the construction of an additional fishway (north side). page 93-95. Notes the concept of constructing auxiliary retaining ponds on small streams near the Bonneville Central hatchery in order to rear salmon fry for release. Page 97-98. Notes on dietary/fish nutrition investigations for feeding fish different dietary mixture. pages 98-100. Discusses marking techniques and marking experiments to determine movements of salmon released from artificial propagation facilities. page 100-103. Mentions that the 1909 Oregon legislature appropriated \$1000 for the purpose of destroying seals and sea lions at the mouth of the Columbia River.

Oregon State. 1939. Biennial report of the Fish Commission of the State of Oregon to the governor and the fortieth legislative assembly, 1939. Fish Commission of the State of Oregon, 1939.

Abstract: Reports that an authentic effort has been made to record all barriers, such as dams and other barriers to salmonid fisheries resources, in the state of Oregon. Information includes the number, type, location, height, length, etc. of barrier. Records will be analyzed and obstructions classified as to types, purposes, and possible effects on spawning areas; and finally analyzed as to whether or not adequate passage ways for fish are provided at each. page 29. A report of the Department of Research for the biennium ending 1938 is provided by Willis H. Rich, the temporary director. The Fish Commission of Oregon formed this department in 1938, page 35. Notes the policy of transferring fish by truck from a station on one stream to another is undesirable since it disturbs the homing instinct of salmon; in the future, pending available funds, the policy will be to establish and operate small stations on such streams of the state as are suitable for salmon runs. page 41. Note that the Bonneville station has been developed further as an experimental station for the development of methods for improvement of hatchery practices. page 42. Tables are provided that illustrate no., size at release (length in inches), and age of salmon liberated from Oregon facilities in 1937 and 1938, page 49.

Oregon State. 1941. Biennial report of the Fish Commission of the State of Oregon to the governor and forty-first legislative assembly, 1941. Fish Commission of the State of Oregon; Salem, Oregon, State Printing Office, 1941.

Abstract: Notes the plans for a series of dams on the tributaries of the Willamette River, which poses a serious threat to the maintenance of some very important Columbia River salmon runs. At present (1940) projects have started on the Row, Coast Fork and Long Tom Rivers. page 38.

Oregon State. 1945. Biennial report of the Fish Commission of the State of Oregon to the governor and forty-third legislative assembly, 1945. Fish Commission of the State of Oregon; Salem, Oregon, State Printing Office, 1945.

Abstract: Notes (1) that Mr. Livingston Stone of the US Fish Commission employs the practice of artificial propagation of salmon on the Clackamas River near the mouth of Clear Creek in 1876, page 41. (2) Due to the construction of past and future dams on the Columbia River and its tributaries it generally agreed by scientists and others that the hope of maintaining and supporting the salmon runs in the Columbia Basin will rest largely upon artificial means of production. page 41. (3) That based on recent feeding experiments and observations of migratory habits of silver chinook and blueback salmon it has been determined necessary to feed these species for a period of 14 months at stations located onstreams in which the spawning areas are limited or destroyed. page 41. (4) The construction (proposed) of the Umatilla Dam on the Columbia will be much higher than Bonneville dam, and will constitute an insurmountable barrier for migration of salmon and salmon producing areas above the project will be lost for all time; thus it was decided to develop salmon production to the fullest extent in tributaries of Columbia below the proposed dam site. page 42.

Oregon State. 1949. Biennial report of the Fish Commission of the State of Oregon to the governor and forty-fifth legislative assembly, 1949. Fish Commission of the State of Oregon; Salem, Oregon, State Printing Office, 1949.

Abstract: Notes that (1) of the Engineering Division has added hundreds of miles of spawning area for natural production through removal of impassable barriers and emplacement of fish ladders at falls and dams; and removal of logging debris from streams. page 5. (2) The Hatchery Division has restocked areas, rehabilitated by the Engineering Division, with young fingerling salmon, page 5. (3) More factual information of fisheries resources have been obtained by the Research Division, page 5. (4) A new fishway was installed at the Bear Creek Lumber Company Dam on Bear Creek (tributary of the Salmon River in Lincoln County). page 13. (5) The fishway at Sherar Falls on the Deschutes River, which was started in 1945, is completed. Spring chinook, blueback salmon, and steelhead frequenting this stream are now able to readily pass this natural falls at all water levels. page 14. (7) A new concrete fishway is completed at the Mountain States Power Company diversion dam on the South Santiam River, near Lebanon, Oregon; a cooperative project of the Oregon Game and the Oregon Fish Commission. (8) Hatchery biology and various factors (fish diseases, diets, and best time of liberation) are currently being studied. page 17. (9) Fish Commission started a new series of publications titled "Fish Commission Research Briefs," on April 1948, page 18.

Pacific Fisherman. 1903. Dams jeopardize fish industry. Pacific Fisherman I(3): 5. Seattle, Washington and Vancouver, B.C.

Abstract: Notes the development of dams for power, irrigation and milling purposes are a jeopardy to the fishing industry due to their increasing number, and barrier to migration. Mentions that present law requires the construction of fishways at dams for salmon to ascend to areas above barriers; states immediate steps should be taken to remedy the matter.

Richardson, L. R. 1934. Observations on the effects of dams on lakes and streams. Transactions of the American Fisheries Society 64: 457-460.

Abstract: Notes that impoundments prevent migration of desirable species, and some physiographic

factors/alterations resulting from impounding waters.

Scheufele, Roy W. 1970. History of the Columbia Basin Inter-Agency Committee. Prepared under sponsorship of the Pacific Northwest River Basins Committee.

Abstract: A. Author presents a comprehensive details regarding the genesis, policy & objectives, actions, and chronology of meeting/events for the Columbia Basin Inter-Agency Committee, during the period of 1946-1967. Provides information regarding governmental legislation (laws) and policy framework, institutional relationships with other state and federal agencies in the Columbia basin, and accomplishments of the agency. NOTE: Reference is very important in terms of its description of policy and philosophy governing water and fisheries policy in the Columbia River basin during the period of 1946-1967. B. Genesis of Agency and Federal Action (pages 3-9): 1) In 1902, the US Congress passes the Reclamation Act; 2) In 1905, the US Congress establishes the US Forest Service; 3) In 1920, the US Congress passes the Federal Power Act; 4) In 1925, the US Congress passes a statute that directed the inventory of those streams in the US where power development appeared feasible and practical in combination with navigation, flood control, and irrigation; 5) In 1927, the US Congress passes the River and Harbor Act, which commenced the survey of Pacific Northwest streams, that were inventoried under the 1925 congressional statute; 6) In 1936, the US Congress passes the Flood Control Act; 7) In 1936 (?) the US Congress establishes the US Soils Conservation Service; 8) In 1943, the Pacific Northwest Regional Planning Commission, an arm of the National Resources Planning Board, is abolished by the US Congress; 9) In July 1943, the governors of the Pacific Northwest States establish the Northwest States' Development Association to coordinate and correlate plans of member states as they relate to unified development of all the resources of the Pacific Northwest; 10) In December 1943, the Northwest States' Development Association prepares a program and governing principles of emergency and immediate post-war projects for the development of the Columbia Drainage Basin; 11) In summer 1939, the US Departments of Interior, Agriculture, and War (Corps of Engineers) enter a tripartite agreement to coordinate their work, both in Washington DC and field regions; 12) In December 1943, the US Federal Power Commission joins the tripartite of the US Departments of Interior, Agriculture, and War (Corps of Engineers), and execute a quadripartite agreement that provided monthly meetings of these agencies to discuss results of studies/investigations, to adjust differences of opinions, and to promote ways/means for implementing other provisions of the agreement-representatives of these four Departments constituted the Federal Inter-Agency River Basin Commission (FIABRC); 13) In February 1946, the Columbia Basin Inter-Agency Committee, the second field committee of Federal Inter-Agency River Basin Commission, is established to facilitate progress on the multipurpose development projects presently authorized by congress (p. 7-9 provides details of conditions of the agreement.); 14) In 1965, the US Congress passes the Water Resources Planning Act; 15) In June 1967, the Pacific River Basins Commission takes over the functions of the Columbia Basin Inter-Agency Committee. C. A chronicle of agency meetings and general outcomes from these meetings is presented (pages 10-123) 1) In March 1947, the Assistant Secretary of Interior (Warner W. Gardner) sends a memorandum/recommendations to the Federal Inter-Agency River Basin Commission (FIABRC) that propose the construction of mainstem dams on the Columbia below Okanogan R. and on the Snake below the Salmon R., with the exception of the proposed McNary Dam, be postponed until 1958 (for 10 years) provided that alternate sources of power could be developed to meet Bonneville Power Administration load demands; this moratorium period would allow the US Fish & Wildlife Service and state fisheries agencies to determine remedial measures (per research, studies, and planning) that could be taken to preserve the Columbia River fishery; p. 22-23); 2) On 2 April 1947, the Assistant Secretary of Interior (Warner W. Gardner) memorandum was forwarded by the Federal Inter-Agency River Basin Commission (FIABRC) to the Columbia Basin Inter-Agency Committee for study, discussion, and recommendations; 3) On 23 July 1947 at the 11th meeting of the Columbia Basin Inter-Agency Committee, (a) Fred Foster (US Fish & Wildlife Service) outlined the Lower Columbia River Fishery Program, consisting of obstruction

removal, pollution abatement, diversion screening, fishway construction, hatchery construction and fish sanctuaries - a program estimated at a cost of \$20 million, and (b) a Fish & Wildlife subcommittee was established to coordinate and integrate fish and wildlife programs with water resource program; p. 25; 4) On 22 September 1947, the Fish & Wildlife Subcommittee (Columbia Basin Inter-Agency Committee) filed a report that summarized factual data relating to navigation, power, fish, irrigation, Indians, and National Defense, p. 26; 5) On 8 October 1947, at its 12 meeting, the Columbia Basin Inter-Agency Committee unanimously approved and forwarded a letter to the Federal Inter-Agency river basin Commission (FIABRC) recommending that a) Grand Coulee power installations proceed, construction of Hungry Horse, Foster Creek, Detroit, and McNary Dam proceed, etc. b) authorized dams on the Columbia River system not to be rescheduled, approval of the Lower Columbia River Fishery Program, and compensation of Treaty Indians, and c) upstream dams be authorized promptly and if authorized before 1958 they be constructed ahead of planned/unauthorized The Dalles, John Day and Arlington Dams unless the fish problem has been solved in the interim, etc., p. 26; 6) In 1950, the Columbia Basin Inter-Agency Committee establishes the Fisheries Steering Committee, and this subcommittee prepares a comprehensive program of research and construction (to cost 25-50 million dollars) and proposed to finance it by a tax of fifty cents per kilowatt year (note proposal failed and caused an outcry from power interests) p. 27; 7) On 17 September 1948, at its 21st meeting, the Columbia Basin Inter-Agency Committee authorized a Technical Subcommittee for Operating Plan to prepare an integrated and coordinated operating plan for the release and control of waters in connection with Columbia River development program (note plan was never consummated) p. 32; 8) On 10 November 1948 at its 22nd meeting of the Columbia Basin Inter-Agency Committee, the Corps of Engineers presented an eight volume "Review of the Columbia River and its Tributaries,": a report costing \$5 million; p. 33; 9) On 28 June 1950 at its 40th meeting, the Columbia Basin Inter-Agency committee approved an interim fishery research program (prepared by the Fish & Wildlife Subcommittee) that called for studies of fish passage at river obstructions, impoundment studies, artificial propagation, and studies of life history, trends and abundance, trout habitat and pollution, at an estimated \$600,000 per year - another \$500,000 was included for stream development and improvement; p. 46; 10) On 19 January 1955, the Columbia Basin Inter-Agency Committee directed the Fisheries Steering Committee to a) prepare an Upper Columbia River fishery program comparable to that in effect on the Lower Columbia River, b) a program of needed fishery research for the whole area, and c) explore ways and means of implementing/financing both programs; p. 83; 1) On 13 March 1957, the Columbia Basin Inter-Agency Committee accepted the Fisheries Steering Committee report with respect to a) prepare an Upper Columbia River fishery program comparable to that in effect on the Lower Columbia River, and b) a program of needed fishery research for the whole area - established research priorities and recommendations as to what agency would carry out specific studies recommended; p. 91; 12) On 13-14 November 1963, the Columbia Basin Inter-Agency Committee heard a panel of University of Washington academicians (James Crutchfield, W.F. Royce, D. Bevan, Robert Fletcher, R.C. Van Cleave, and R.W. Johnson) carry on extensive dialogues on "Fisheries in the Pacific Northwest - the academicians view this controversial issue," Don Bevan was very critical of fishery regulation; p. 114; 13) On 14 December 1965 at the 132 meeting of the Columbia Basin Inter-Agency Committee, the Executive Subcommittee presented its recommendations on seven fishery proposals (previously submitted by the Fisheries Steering Committee on 6 October 1965) summarized as follows: Proposal 1 - Greater Committee representation for salmon and steelhead, Proposal 2 - Reduction of the use of the Columbia River water for nuclear production to reduce heat pollution of the river, Proposal 3 - Establishment of working contract with Canada on Fishery problem, Proposal 4 - Development of small watersheds for power production should be discontinued, Proposal 5 - Assure proper attention to fish requirements in any inter-basin water transfer studies, Proposal 6 - Fishery research should be continued, the Proposal 7 - The Columbia River Fishery Development program should be retained; 14) On 29 September 1966 at its second Columbia-North Pacific study review, the Columbia Basin Inter-Agency Committee accepted the report of the Water Supply and Pollution Subcommittee

entitled "Columbia River - Water Temperature Conditions and Research Requirements" report stemmed from one of the seven fishery proposals (previously submitted by the Fisheries Steering committee on 6 October 1965; p. 21); (15) On 9 June 1967, the Columbia Basin Inter-Agency committee held its last meeting, and handed over its responsibilities, function and records to the new River Basins Commission, p. 122.

Smith, H. M. 1895. Notes on reconnaissance of the fisheries of the Pacific coast of the US in 1894. US Fish Commission Bulletin, vol. XIV, 1894 (1895), pp. 223-288. Washington, D.C.

Abstract: Author notes his observations of the lower Columbia River commercial fishery and cannery operation during spring 1893. Note regarding Oregon legislation to construct a fishway at Willamette Falls. Author mentions the necessity for law to mandate emplacement of fishways at existing dams, a prohibition of the construction of additional dams, and a limitation on salmon at dams. Provides a report on the causes of salmon destruction in the headwaters, and suggested actions to stop the destruction.

Taft, A. C. 1940. A summary of the present status of dams versus migratory fishes on the Pacific coast with special reference to problems in California. Stanford Ichthyological Bulletin 1(6): 205-208.

Abstract: The author states that few of the governmental and public agencies involved in the construction of dams in western US had any knowledge of the value or importance of fish as a natural resource; mentions that fisheries representation on boards was minimal. Use California laws and statutes as an example for the eleven western states to illustrate the legal machinery with which the fisheries administration has available in his dealings with water developers.

US Bureau of Fisheries. 1924. Report of the Commissioner of Fisheries for the fiscal year 1923 with appendices. Department of Commerce, Washington, DC: Government Printing Office.

Abstract: Note about important former spawning grounds of blueback salmon of the Columbia River basin being made inaccessible by construction of power and irrigation works, and in 1922 an investigation was made to locate spawning places remaining; mentions spawning run to Sunbeam Dam (Salmon River), and an improvement to the fishway to make better access for fish bound for the Redfish Lakes, Page 17. Appendix VII: Progress in biological inquiries, 1923. Report of the Division of Scientific Inquiry for the fiscal year 1923 (Document No. 956 issued February 2, 1924) by Willis H. Rich. Notes about sockeye mark, release, and adult returns of sockeye released at Herman Creek Hatchery (Oregon Fish Commission facility). Notes on Harlan B. Holmes; investigations of blueback spawning grounds in Columbia Basin, with mention to the large lakes of the upper Yakima, Wallowa, and Payette being rendered inaccessible by construction of dams and irrigation ditches, Pages 10-12. Appendix XIII: Propagation and Distribution of Food Fishes, fiscal year 1923 (Document No. 964 issued September 3, 1924) by Glen C. Leach notes operational activities of Clackamas, Upper Clackamas, Little White Salmon, Big White Salmon, Washougal, Sandy, and Salmon (Idaho) fish culture facilities, Pages 33-37. Note that salmon pack was lightest in history, that egg take at all facilities (state and federal) with exception of the Kalma facility was proportionately low, that the number of spawners reaching the vicinity of the stations was larger than expected, Page 33.

US Bureau of Fisheries. 1926. Report of the Commissioner of Fisheries for the fiscal year 1925 with appendices. Department of Commerce, Washington, DC: Government Printing Office.

Abstract: Note of policy for providing passage at dams, and screening of irrigation ditches to protect anadromous fishes, Page II. Mention of marking experiments from 1916 through 1924. Note of discovery of blueback salmon spawning ground in Okanogan River, Page XIX. Appendix III: Progress in Biological Inquiries, July 1 to December 31, 1924 (Document No. 990 issued October 24, 1925) by Willis H. Rich. Notes on marking experiments; mentions recapture of 14 five year old chinook (Little White Salmon Hatchery origin) in commercial fishery, Page 51. Note about discovery of blueback salmon spawning grounds in Okanogan River, Pages 51-52. Appendix IX: Propagation

and Distribution of Food Fishes, fiscal year 1925 (Document No. 999 issued March 29, 1926) by Glen C. Leach notes operational activities of Clackamas, Upper Clackamas, Little White Salmon, Big White Salmon, Washougal, Sandy, and Salmon (Idaho) fish culture facilities, Pages 464-466.

US Bureau of Fisheries. 1932. Report of the Commissioner of Fisheries for the fiscal year 1931 with appendices. Department of Commerce, Washington, DC: Government Printing Office.  
Abstract: Notes on Fish Screen and Fish Ladder Investigations; mentions fish ladders at Wapato and Sunnyside Dams on the Yakima River, Page XXIV. Appendix III: Progress in Biological Inquiries, 1930 (issued December 4, 1931) by Elmer Higgins. Notes on Columbia River marking experiments, Page 591. Appendix IV: Propagation and Distribution of Food Fishes, fiscal year 1931 (issued April 28, 1932) by Glen C. Leach notes operational activities of Clackamas, Upper Clackamas, Little White Salmon, Big White Salmon, and Salmon (Idaho) fish culture facilities, Pages 658-660.

US Bureau of Fisheries. 1936. Report of the US Commissioner of Fisheries for the fiscal year 1934 with appendices. Department of Commerce, Washington, DC: Government Printing Office.  
Abstract: Appendix III: Progress in Biological Inquiries, 1933 (issued September 26, 1934) by Elmer Higgins. Notes on investigations concerning the protection of migratory fish at power dams on the Columbia River; J.A. Craig and Harlan B. Holmes were detailed to conduct studies of the effects of Grand Coulee Dam. Mention of spawning survey of spawning streams between Rock Island and Grand Coulee, and recommendations from Fish Commissions of Oregon and Washington, Pages 347-348. Appendix IV: Propagation and Distribution of Food Fishes, fiscal year 1934 (issued June 7, 1935) by Glen C. Leach notes operational activities of Clackamas, Upper Clackamas, Little White Salmon, Big White Salmon fish culture facilities, Page 403.

US Department of Commerce. 1923. Spawning grounds of blueback salmon in the Columbia Basin. Fisheries Service Bulletin No. 92, Bureau of Fisheries, US Department of Commerce, Washington DC, January 2, 1923.  
Abstract: Notes the report of Harlan B. Holmes on his investigations of the spawning grounds of blueback salmon in the Columbia River during 1922. Mentions the following: 1) all of the well known areas formerly used by blueback have been rendered inaccessible by construction of dams and irrigation ditches, 2) the blueback spawning grounds in the Yakima Basin (Washington), Payette Lakes (Idaho), and Wallowa Lake (Oregon) are closed, 3) the investigation shows that a run of blueback pass up the Salmon River in Idaho at least as far as Sunbeam Dam, bound for the Red Fish lakes, and 4) evidence of blueback into Red Fish lakes justifies providing an efficient passage over Sunbeam Dam, p. 4-5.

US Department of Commerce. 1929. Improvements in fish screens for reducing losses in irrigation ditches. Fisheries Service Bulletin No. 164, Bureau of Fisheries, US Department of Commerce, Washington DC, January 2, 1929.  
Abstract: Notes: 1) Millions of salmon are lost to irrigation canals and ditches during their seaward migration; 2) The US Bureau of Fisheries secured Shirley Baker, an engineer of San Francisco, CA, to study devices in overcoming fish losses to irrigation canals/diversion; 3) Over 30 projects in Montana, Oregon, Idaho and Washington were visited; 4) Investigations disclosed that the mechanical screen type developed by the Oregon State Game Commission worked satisfactorily for smaller installations; 5) Much information for principles of screening designed resulted from studies of Professor F.O. Mullen, department of electrical engineering, Oregon Agricultural College; 6) T.H. Burkey of Pasadena, CA asked for the opportunity to demonstrate his screen design, and it worked well during a test on a 30 foot wide canal; 7) Investigators studied fish ladders for carrying fish over dams, and concluded that for dams over 100 feet or more no fish ladders or mechanical lifting devices were found in successful operation, p. 1-2.

US Department of Commerce. 1934. Bureau receives appropriation for Columbia River salmon work. Fisheries Service Bulletin No. 230, pages 1-2, Bureau of Fisheries, US Department of Commerce, Washington DC, July 1, 1934.

Abstract: Notes that the Emergency Appropriation Act for 1935 included a provision for further work by the US Bureau of Fisheries on the propagation of salmon in the Columbia River district - \$24,140 to conduct practical and scientific investigations and research relative to salmon fisheries, and \$9,650 for repairs and alterations of the Bureau's present hatcheries in the district. Three research projects are proposed for fiscal year 1935: 1) A statistical study of the Columbia River fishery to determine whether or not the fish populations are decreasing in abundance at such a rate that additional protective measures are needed and analysis of the component parts of the salmon runs; 2) A study of migratory fish at power dams and irrigation canals in the Columbia River system to determine the success of the various devices employed for passing the migratory species over these obstructions; and 3) A biological study of the Columbia River fishery that includes a biological survey of all tributaries of the Columbia River, which form the present and past spawning grounds for migratory species, to determine the total spawning areas in each tributary, the extent to which unavailable areas can be recovered, and the effect of pollution and other unfavorable factors reducing the success of natural production; it will also include observation of life histories of various species, and studies of methods of artificial propagation and transplanting of migratory species to determine the possibility of restoring depleted runs, of restocking tributaries that are now unproductive, and of improving the quality/ character of various runs of fish. p.1.

US Department of Commerce. 1934. Bureau receives appropriations for Columbia River salmon work. Fisheries Service Bulletin No. 230, p. 1-2. US Department of Commerce, Washington, DC.

Abstract: Describes the Emergency Appropriation Act for 1935 to further the work of the US Bureau of Fisheries on the propagation of salmon in the Columbia River district; provides the description of research work to be conducted during 1935 in the Columbia River: 1) statistical and relative abundance studies, 2) protection of migratory fish at Columbia River power dams and irrigation projects, and 3) biological survey of the Columbia River tributaries.

US Department of Commerce. 1935. Bureau participates in northwest scientific meeting. Fisheries Service Bulletin No. 237, p. 5. US Department of Commerce, Washington, DC.

Abstract: Note of attendance and presentations by F.A. Davidson, J.A. Craig, and H.B. Holmes at the Northwest Scientific Association at Spokane, Washington, on 28 and 29 December. Craig presented paper on influence of dams and irrigation on migratory fish species; H.B. Holmes presented paper on proposed methods and devices to pass fish over Bonneville Dam.

US Department of Commerce and Labor. 1917. The question of fishways. Economic Circular No. 24, Bureau of Fisheries, issued May 8, 1917.

Abstract: Author (R.E. Coker, assistant in charge of scientific inquiry) provides a paper regarding 1) the function of a fishway, 2) conditions governing the necessity for a fishway, 3) species of fish to be considered in connection with fishways, and 4) summary and general conclusion. Notes that Bureau of fisheries knows of no fishways in US "that successfully pass salmon over dams more than 20 feet in height, and doubtless there are few fishways successful for dams over 12 feet in height, even for salmon." p.4

US Fish and Wildlife Service. 1947. A program of rehabilitation of the Columbia River fisheries. Prepared jointly by State of Washington Department of Fisheries and State of Oregon Fish Commission, in cooperation with US Fish & Wildlife Service. 23 pages.

Abstract: An informational pamphlet that provides an historical synopsis of federal dam construction (Bureau of Reclamation dams) in the Columbia basin; includes a 3-page table that gives vital statistics of Bureau of Reclamation dams in the Columbia watershed (facility operation, date of fish screen

operation, and geographic location). Outlines a six-year work program (type of work and estimated costs) for salmon fisheries rehabilitation.

Ward, H. B. 1927. The influence of a power dam in modifying conditions affecting the migration of salmon. Proceedings of the National Academy of Sciences, Vol. 13, No. 12, December 15, 1927, pages 827-833.

Abstract: Author describes characteristics of Pacific Northwest streams that are inhabited by Pacific salmon species, and where water power/ dams projects are built. Discusses factors (biological and environmental) that affect migratory movement of salmon in streams- particularly water velocity and temperature; and the effects of dams on this migratory behavior, with respect to movement to and from the natal areas of salmon. Reports on effectiveness and associated problems of fish passage/handling devices to transport salmon to natal areas above a power project. Information and conclusions derived from author's investigations in the Baker River/ Lake Shannon (tributary to the Skagit River in Washington State); some conclusions based on Alaska sockeye investigations.

Ward, H. B. 1929. Further studies on the influence of a power dam in modifying conditions affecting the migration of salmon. Proceedings of National Academy of Science, Vol. 15, No. 1, January 15, 1929, pages 56-62.

Abstract: Author describes characteristics of Pacific Northwest streams, that are inhabited by Pacific salmon species, and where water power/dams projects are built. Discusses factors (biological and environmental) that affect migratory movement of salmon in streams - particularly water velocity and temperature; and the effects of dams on this migratory behavior, with respect to movement to and from the natal areas of salmon. Reports on effectiveness and associated problems of fish passage/handling devices to transport salmon to natal areas above a power project. Information and conclusions derived from author's current and previous investigations in the Baker River/Lake Shannon (tributary to the Skagit River in Washington State); some conclusions based on Alaska sockeye investigations.

Washington State. 1907. 16th and 17th annual reports of the state fish commissioner and game warden: 1905-1906. State of Washington Department of Fisheries and Game, Seattle, Washington. C.W. Corham, Public Printer, 1907.

Abstract: The commissioner (John L. Riseland) discusses the situation of fishing, fishing seasons, and disjointed regulations of Oregon and Washington in the lower Columbia River; expresses concern that if the early season is not shortened, the Royal chinook will further decline and lead to situation where packers will have to depend on fall season rather than early and mid seasons. Provides newspaper quotes from the Portland Oregonian that support his statements. pages 10-14. Provides a report on Washington salmon hatcheries in the Columbia basin; notes that the Wenatchee Hatchery is the only hatchery tributary to the Columbia that propagates Silverside salmon (coho). Also mentions that manager of the Colville Hatchery could only acquire 90,000 silverside salmon eggs in the stream (Colville River); and that the facility was deemed not to operate. Notes that the Klickitat hatchery was never completed, and was abandoned in 1902, pages 24-25. Notes that the Wind River Logging company, on the Wind River, flooded the Wind River, carrying all their logs into the Columbia River; this citation documents the use of crib dams to contain logs and flush logs down the Wind River, page 30. Notes that the Methow hatchery is the only remaining salmon hatchery (Colville, Little Spokane and Klickitat hatcheries are closed) on the east side of the Cascades to propagate silverside salmon; infers that Colville, Little Spokane and Klickitat Rivers have or had runs of coho salmon, pages 30-131. Provides letters that note run and habitat conditions on the Klickitat, Colville, Wenatchee, and Lewis Rivers, Page 39-42.

Washington State. 1911. 20th and 21st annual reports of the state fish commissioner and ex-officio game warden: 1909-1910. State of Washington Department of Fisheries and Game, Olympia, Washington.

E.L. Boardman, Public Printer, 1911.

Abstract: The commissioner (J.L. Riseland) reports: 1) State legislature appropriated \$1000 for the extermination of seals and sea lions in the Columbia River district; letter of 1910 number of seals and sea lions exterminated. page 4; (2) Legislature passed a bill appropriating \$5000 for repairing the Kalama hatchery buildings and building of rearing ponds, page 10; (3) The Walla Walla Trout hatchery was turned over to the state in early 1909, page 21; (4) The Lewis River Trout hatchery was constructed in early summer of 1909, located on Basket Creek in Clark County (about 20 miles from the city of Vancouver), page 21; (5) A review of activities at Columbia Basin Salmon hatcheries; a) mentions a logging crew putting logs into the Kalama River above the salmon hatchery, and causing damage to the hatchery racks; b) notes that logging and timber companies and state hatcheries operations (e.g. splash dams and log flushing) can coexist if arrangements similar to those of the state and the Wind River Logging Company can be agreed to page 26; and c) mentions that silverside salmon are the main species propagated at the Methow hatchery, and that irrigation ditches have always been a hardship to salmon from this facility.; (6) Note on experiments by Columbia River cannery men: One at Hamilton Slough on the lower Columbia River - captured 35 adult blueback and attempted to hold them, but they died; one at The Dalles, Oregon - adult chinook were captured with fish wheel, and held in lake-like impoundment, but fish died from fungus, and on pages 39-40 (7) Notes on investigation of chinook and silverside salmon in the Wenatchee River at Lamb-Davis Dam, at Leavenworth, where salmon were counted in the fishway (978 counted, and another 60 taken by Indians at dam) and some were retained for eggtake; took about 30,000 eggs (shipped to Kalama Hatchery) until accident from pile driver sunk the fishway, and salmon had to be released to continue their way upstream to spawn. page 41.

Washington State. 1916. 24th and 25th annual reports of the state fish commissioner to the governor of the state of Washington: April 1, 1913 to March 31, 1915. State of Washington Department of Fisheries and Game, Olympia, Washington. Frank M. Lamborn, Public Printer, 1916.

Abstract: The commissioner (L.H. Darwin) discusses: 1) fishway construction, and negotiations in regards to hydro-electric dams, both in western and eastern Washington (p.27-29); 2) appropriations and agreements on construction and operation of a new salmon and trout hatchery on the Wenatchee River near Leavenworth, WA (p. 30-31); 3) conflict in Oregon, Washington, and Idaho laws along the Columbia River (p. 34-35); 4) eyeing stations at several trout hatcheries in the Columbia Basin - Lake Chelan, Walla Walla, Lewis River, etc. (p. 45); 5) status of Columbia River district salmon hatcheries - questions the continued operation of the Methow hatchery (near Twisp) due to lack of spawn, improper location, and impact of irrigation on fry releases, etc. (p. 58-59); 6) acquisition of steelhead spawn in the upper Twisp River, instead of the lower river where fish are green (p. 58).

Washington State. 1924. 32nd and 33rd annual reports of the state supervisor of fisheries for the period: April 1, 1921 to March 31, 1923. State of Washington Department of Fisheries and Game, Olympia, Washington. Frank M. Lamborn, Public Printer.

Abstract: The State Supervisor (Ernest Seaborg) notes irrigation dams as a menace to anadromous fish in the Columbia River Basin (p. 11).

Washington State. 1925. 34th and 35th annual reports of the state supervisor of fisheries for the period: April 1, 1923 to March 31, 1925. State of Washington Department of Fisheries and Game, Olympia, Washington. Jay Thomas, Public Printer, 1925.

Abstract: The State Supervisor (Ernest Seaborg): 1) notes the activities and actions related to the application submitted by the Washington Irrigation and Development Company to construct a dam at Priest Rapids on the Columbia River (p. 11-12); 2) Notes that steelhead and silver salmon in the Methow River are doomed respectively because of 110% egg transfers from the Methow hatchery, and because of irrigation ditches and power dams (p. 27); 3) notes Wenatchee Hatchery efforts are failing due to irrigation and power dams being installed (p. 27); 4) notes that Klickitat, Spokane and

Colville hatcheries failed to secure salmon spawn in their respective stream systems (p. 28); 5) notes that nine of the thirty-five state hatcheries have proven unsuccessful as a direct result of irrigation ditches and dams, and one was unsuccessful due to depletion by the commercial fishery (p. 29).

Washington State. 1932. 40th and 41st annual reports of the state department of fisheries and game, division of fisheries, for the period April 1, 1929 to March 31, 1931, fiscal years 1929 and 1930. State of Washington Department of Fisheries and Game, Olympia, Washington. Jay Thomas, Public Printer, 1932.

Abstract: The Director of Fish and Game (Charles R. Maybury); 1) The Washington state legislature passes an act that abolishes the fisheries board, and transfers the duties to a Director of Fisheries and Game (p. 3-4); 2) Notes regarding activities and mitigation recommendations associated with water developments at Rock Island on the Columbia River and Ariel on the Lewis River (Inland Power and Light company of Portland, Oregon) p. 28-31; 3) Notes on fish ladder construction projects and facilities completions at Sunnyside, Wapato, and Prosser dams (p. 32).

## **DEGRADATION**

### Reference List

US Department of Commerce. 1932. Doctor Ellis demonstrates serious effects of mine pollution. Fisheries Service Bulletin No. 211, Bureau of Fisheries, US Department of Commerce, Washington DC, December 1, 1932.

Abstract: Notes the history and results of Dr. M.M. Ellis (US Bureau of Fisheries) who studied the pollution problem of Couer d'Alene River in Idaho, regarding wastes from silver, lead, and zinc mines. Survey extended from Montana to Spokane River in Washington. Provides extensive information on extent and type of habitat degradation to streams and lakes caused from mining wastes. Mentions that aquatic production of Couer d'Alene Lake was showing decline in the southern end from 1911, and species of trout were scarce, p. 3-4.

## **HABITAT**

### Reference List

Attwell, J. 1974. Columbia River gorge history, Volume One. Fourth Printing, Talkie Books, 34 Landing Road, Skamania, WA 98648, p. 151.

Abstract: A history of the Columbia River in its early days is provided with respect to early inhabitants (Indians, explorers, white settlers), industry/commerce activities. References regarding fisheries and habitat characteristics of this area in this era are lacking in this reference. The following notes are related to milestones/events; 1) 1825 Fort Vancouver was the first settlement in what is now the state of Washington; p. 41; 2) 1837 John McLoughlin had farms at Fort Vancouver on the Cowlitz River; p. 45; 3) In 1846, Joel Palmer established the Columbia River Pack Trail, down the south side of the river from The Dalles to the Sandy River, for cattle; p. 50; 4) In 1851, Frances A. Chenoweth established the Cascades Portage Railroad, the first railroad in the northwest, at the Cascades to portage cargo around the rapids on the Columbia River.

Bayha, Keith. 1974. Anatomy of a river Pacific Northwest River Basins Commission, 1 Columbia River, P.O. Box 908, Vancouver, Washington 98660, Vancouver, Washington.

Abstract: Authors present a comprehensive evaluation of water requirements for the Hell's Canyon reach of the Snake river, based on field surveys of March 1973. Surveys included collection of information regarding the time of travel of the stage wave and water mass, water quality, biological resources, etc. Includes photographs that illustrate the habitat (terrestrial and water) of this area.

Blanchard, R. E. 1977. Columbia River estuary physical alterations. Columbia River estuary, inventory of physical, biological and cultural characteristics 209-1 to-209-22. Columbia River Estuary Taskforce, Astoria, Oregon.

Abstract: The author discusses the man-induced physical alterations river bed, and adjacent riparian/upland areas of the Columbia river estuary, caused by following projects/activities (1) dredging & disposal for improvement and maintenance of river navigation (2) dikes & levees for flood control/protection, and (3) jetties/pile dikes for protection the river mouth entrance. Description of project histories, types, methods, and locations are discussed and supporting illustrations (tables and figures) are presented. Land disposal of dredging spoils are given with respect site, location (approximate river mile), habitat type, wildlife affected, and area size (in acres).

**Note:** Excellent reference for generally determining the location of projects by typed and general impacts.

Bottom, D. and Jones, K. K. 1990. Species composition, distribution, and invertebrate prey of fish assemblages in the Columbia River estuary. *Prog. Oceanogr.* 25: 243-270

Abstract: Authors note that seasonality of abundance and species in an estuary reflect the timing of migration and the reproductive cycles of marine and anadromous species. Composition of the fish community and dominant species in the Columbia river estuary are similar to many smaller estuaries in the Pacific Northwest; these similarities reflect the influence of the nearshore marine environment on the fish community structure, and considerable physiological tolerance of many euryhaline species. The distribution of fish assemblages in the Columbia river estuary is influenced by large seasonal variation in river discharge and salinity; and within large areas and salinity zones, species assemblages use different habitat and prey. The distribution of abundance and the stomach fullness of fishes vary directly with the density of potential prey; it is hypothesized that fish production may be limited by dynamic physical processes that control prey availability or the feeding efficiencies of predators in the highly turbid water.

Bryant, F. G. 1949. A survey of the Columbia River and its tributaries with special reference to the management of its fishery resources. 2. Washington streams from the mouth of the Columbia River to and including the Klickitat River (Area I). Special Scientific Report No. 62, US Fish and Wildlife Service, Department of Interior, Washington DC.

Abstract: Provides a comprehensive description and perspective of tributaries at period in time, in terms of habitat and water flow/temperature. 103 pages.

Bryant, F. G. and Parkhurst, Z. E. 1950. Survey of the Columbia and its tributaries 4. Area III Washington streams from the Klickitat and Snake Rivers to Grand Coulee Dam, with notes on the Columbia and its tributaries above Grand Coulee Dam. Special Scientific Report Fisheries No. 37, US Fish and Wildlife Service, Department of Interior, Washington, DC.

Abstract: Provides a comprehensive description and perspective of Columbia tributaries (within Washington State), above the Klickitat River (excluding the Snake River) at period in time, in terms of habitat and water flow/temperature.

Burner, C. J. 1951. Characteristics of spawning nests of Columbia River salmon. *Fisheries Bulletin* 52(61): 97-110. US Fish and Wildlife Service, Department of Interior, Washington, DC.

Abstract: Author describes spawning habitat and characteristics of chinook (spring, summer, fall) coho, chum, and sockeye, based on observations in Columbia tributaries (lower and upper).

Cobb, J. N. 1922. Protecting migrating Pacific salmon. *Transactions of the American Fisheries Society* 52: 146-153.

Abstract: Author gives extensive information on the Yakima Basin regarding habitat, fish, and water development projects (Kennewick, Wapato, Sunnyside, Prosser) Provides general design and adult

fish behavior (steelhead) at Sunnyside, Kennewick, and Prosser.

Columbia Basin Interagency Committee. 1957. Columbia River basin fishery program, part II: Inventory of streams and proposed improvements for the development of the fisheries resources. Fishery Steering Committee, Columbia Basin Interagency Committee, January 1957; 100 pages.

Abstract: Provide a comprehensive inventory and listing of proposed improvements of habitat/rehabilitation projects and considerations for major tributaries of the Columbia basin above McNary Dam. Notes basin descriptions for each tributary, in terms of flow, temperature (air and water). Includes maps of tributary/basins showing geographical orientation of streams and proposed improvements.

Craig, J. A. 1935. The effects of power and irrigation projects on the migratory fish of the Columbia River. Northwest Science IX(1): 19-24 (February, 1935).

Abstract: Author discusses the effects of human land and water uses (logging, mining, power, and irrigation) on fisheries resources in the Columbia basin. Provides examples of habitat alterations imposed by these human uses. Briefly discusses life history and ecology of all anadromous salmonid species inhabiting the Columbia River basin. Discusses how the use of streams for power and irrigation purposes affect migratory salmon species: 1) obstacles that obstruct or delay migration of adult upstream to natal streams; and 2) injurious or delay impediments to downstream juvenile migration. Presents fishways and screening as mechanisms to protect fish, and the use of artificial propagation in the case of high dams.

Davison, M. A. and Spencer, R. D. 1979. *Columbia river islands land status survey, Columbian White-Tailed Deer Study*. Project E-I, Study 2, Job 4, Section 4. Washington Department of Game, Olympia, Washington.

Abstract: Author provides information regarding the status of habitat and ownership for 28 islands, located within 107 mile section of the lower Columbia river between Bonneville Dam and Cathlamet, Washington. Provides information for each island, with respect to geographic location/acreage, ownership (deed abstract), floral communities/habitat, historical, present, future uses of island. Includes information regarding alterations in terms of dredging, fill, and forest removal, etc. **Note: Excellent Reference**

Downing, Alfred. 1980. The region of the upper Columbia River and how I saw it Ye Galleon Press, Fairfield, Washington.

Abstract: Author provide a general accounting of his adventures and trip with Lt. T. Symons (U.S. Army) during the expedition down the upper Columbia river. No substantive information regarding fisheries-related habitat and stock was derived from a review of this monograph. A listing of books and periods was derived as a source for additional reference candidates.

Downs, J. L., Tiller, B. L., Witter, M., and Mazaika, R. 1996. Monitoring and mapping selected riparian habitat along the lower Snake River. PNNL-10953/UC-702: Pacific Northwest National Laboratory, Richland, Washington.

Dunn, J., Hockman, G., Howerton, J., and Tabor, J. 1984. Key mammals of the Columbia River estuary. Columbia River Estuary Data Development Program, Astoria, Oregon. 116 p. p.

Abstract: Authors provide extensive information about key mammalian species occurring the Columbia river estuary, with respect to 1) habitat use, 2) period of birth, 3) relationship to other trophic levels, and 4) critical habitat. Extensive tables and graphics are provide to illustrate spatial and temporal occurrence and inhabitation of key mammals within the Columbia river estuarine zone.

Franchere, Gabriel. 1969. Journal of a voyage on the north west coast of North America during the years 1811, 1812, 1813, and 1814 The Champlain Society, Toronto. 78,82-83, 96-97, 100-101, 110-111, 142-143, 148-149, 152-157 p.

Abstract: Author provides an account of his observations and experiences during his travels in the Columbia river basin during the early 19th century. Briefly notes habitat, flora, and fauna at various points of travel up and down the Columbia river and its tributaries. General description of attributes for the Snake river mouth.

Glenn, John G. n.d. Diary of John G. Glenn, 1852 14-15 p.

Abstract: Author provides a brief description of the scenery and habitat of the Grand Ronde sub-basin.

Good, James W. 1977. Columbia river tidal marshes. Columbia River estuary, inventory of physical, biological and cultural characteristics, Sect. 302-1 to 302-19. Columbia River Estuary Data Development Program.

Abstract: The author identifies, describes, and enumerates the marsh habitat and communities of the Columbia river estuary. Provides illustrations (figures and tables) describing the location and area of tidal marsh habitat; and discusses each tidal marsh area with respect to community structure and alterations/impacts induced by human interventions (dredging, diking, etc.).

**Note:** Excellent reference for deriving a perspective of the estuarine habitat and associated communities prior to and after human intervention.

Good, James W. and Potter, George D. 1977. Columbia river estuary shoreline habitat and wildlife resources. Columbia River estuary, inventory of physical, biological and cultural characteristics, Sect. 303-1 to 303-33. Columbia River Estuary Data Development Program,

Abstract: The authors identify, describe, and enumerate the shoreline/riparian habitat and wildlife communities (waterfowl, birds, big game, furbearers, small mammals, reptiles, amphibians, and marine mammals) of the Columbia river estuary. Provide illustrations (figures and tables) describing the kinds, location and area of various wildlife and their associated habitat that presently occur within the estuarine zone of the Columbia river.

**Note:** Excellent reference for deriving a perspective of the estuarine habitat and associated wildlife communities occurring in the shoreline/riparian zone of the Columbia river estuary.

Griffin, L. E. 1935. Certainties and risks affecting fisheries connected with damming the Columbia River. Northwest Science IX(1): 25-30 (February, 1935).

Abstract: Author discusses 1) the economic importance of anadromous and resident fish species, and the effects on dam construction on said species; 2) the importance and distribution of salmon harvest in the Columbia basin; 3) the certainties associated with current state of technology of fish passage systems, and risks associated with designs and plans to be incorporated at the Bonneville project; 4) recommended actions to reduce risks associated with current fish passage technology; 5) certainties and risks associated with sedimentation and submergence of fish habitat (sloughs and shallows) in the Bonneville impoundment; 6) the certainties and risks of power plants to migration of young salmon; and 7) turbine designs and devices to reduce the risks associated with hydropower operation. Author alludes to a hypothesis that the Columbia impoundments (e.g. Bonneville) may present risks to the importance of the sloughs and shallow ponds contiguous to the river, as being very important as a food source to young salmon during their downstream migration.

Harden, Absolom B. 1847. Diary of Absolom B. Harden 1, 14-30 (incomplete) p.

Abstract: Author provides descriptions of his activities and the habitat in various sub-basins (e.g. Grand Ronde) of the Snake and Columbia river.

Hardesty, W. P. 1923. Drainage project on the Columbia adjoining Portland, Ore.: levees and pumping plant with three types of motor-driven pumps --new sluice gate --design --assessment system. *Engineering News-Record* 90(9): 395, 398.

Abstract: Reference discusses a drainage project on the Columbia river that encompasses the use of levees and a pumping plant for reclamation of 8,478 acres of low land in Multnomah County Drainage District No. 1 (near Portland, Oregon). The project affects the habitat characteristics of Columbia Slough and adjacent lands. An eleven mile levee borders and is set back 50-100 ft from the river; a fringe of willows and cottonwoods lies between the river and levee. The enlargement of the slough is considered for use as a dilution vehicle for municipal sewage. Includes a map illustrating the Columbia Slough/project area and its orientation with the Columbia river reach adjacent to the Vancouver/Portland area.

Hazel, C. R. 1984. Avifauna of the Columbia River estuary. *Columbia River Estuary Data Development*, Astoria, Oregon. 85 p. p.

Abstract: Author presents and describes information regarding key avian species and their associated habitat, key avian habitats and their avian species composition, and food habits of key avian species within the Columbia river estuary. Tables and graphics are used to illustrate the spatial and temporal distribution of key avian species, and their associated habitats and food habits.

Hines, H. K. 1893. *An illustrated history of the State of Washington*. The Lewis Publishing Company, Chicago. 933 pages.

Abstract: Author provides a very comprehensive history of the Washington and Oregon areas, during the pre-and post-Oregon Territory period (late 1770s to late 1880s); provides biographical sketches of principals of Washington state history. Limited notes regarding fisheries resources and habitat alternations are provided. NOTE: excellent reference for Washington and Oregon territorial history.

Idaho State. 1927. Eleventh biennial report of the Fish & Game Warden of the State of Idaho, 1925-1926. R.E. Thomas, State Game Warden; Boise, Idaho.

Abstract: (1) Photograph of the riparian zone of a section of the Selway River; near the junction with the Clearwater River, is illustrated on page 6. (2) The topography and status of lands of Idaho is generally described in terms of its habitat zones and types of development, page 7. (3) Photograph of the riparian zone of a section of the Middle Fork of the Salmon River is illustrated on page 18. (4) Photograph of the riparian zone near the junction of Camas Creek and the Middle Fork of the Salmon River is illustrated on page 28. (5) Description of the resident fish planting program in the Redfish Lake section of Idaho in 1925; this program illustrates the emphasis of the resident fishes management in lieu of anadromous species (e.g. Blueback salmon), page 47-48. (6) Photograph of the riparian zone of a section of the upper inlet to Redfish lake is illustrated on page 55. (7) Photograph of the Vernon and Edna Lakes area in the headwaters of the south fork of the Payette River is illustrated on page 58. (8) Note that a landlocked salmon, weighing slightly over six pounds was taken in the Salmon River a short distance below the outlet of Redfish Lake. NOTE: This fish may have been anadromous variety of blueback salmon? page 59. (9) Photograph of the riparian zone of a section (with a road along stream-side) of the Lochsa River, near Kooskia, Idaho County is illustrated on page 66.

Johnson, Overton and Winter, W. H. 1906. *Route across the Rocky Mountains with a description of Oregon and California, their geographical features, their resources, soil, climate, productions, etc.*, 1843. Chapters I & II. *The Quarterly of the Oregon Historical Society* VII(1): 62-63, 88-103 p.

Abstract: Authors provide descriptive information regarding the habitat, geology, and flora/fauna of Oregon Territory between the Blue Mountains and the coast. Provides general descriptions of riparian habitat in terms of flora. NOTE: Excellent reference to derive habitat status/description prior to significant alteration due to settlement and resources development.

Johnson, Overton and Winter, W. H. 1906. Route across the Rocky Mountains with a description of Oregon and California, their geographical features, their resources, soil, climate, productions, etc., 1843. Chapters III & IV. The Quarterly of the Oregon Historical Society VII(2): 163-165, 174-179 p.

Abstract: Authors provide descriptive information regarding the habitat, geology, and flora/fauna of Oregon Territory in the Willamette River valley region and the Columbia River estuarine area (p. 175-76). Provides general descriptions of riparian habitat in terms of flora. NOTE: Excellent reference to derive habitat status/description prior to significant alteration due to settlement and resources development.

Lancaster, Samuel C. 1915. The Columbia America's great highway. Press of Kilham Stationary and Printing Company, Portland, Oregon.

Abstract: Author provides a general history of the Columbia basin, in terms of the human activities along the Columbia river. Excellent color photographs of the various locations along the Columbia river, viewed from the old Columbia highway route, are presented; illustrates various morphological attributes, habitat structure, etc. of these locations, situated on the lower Columbia river (Cascades area to Astoria).

Leibhardt, Barbara. 1990. Law, environment, and social change in the Columbia basin: the Yakima Indian Nation as a case study, 1840-1933. Dissertation for Doctor of Philosophy in Jurisprudence and Social Policy, University of California at Berkeley, 1990, 488 pages.

Abstract: A. Author provides a comprehensive history and legal premise of water rights and fishing issues of the Yakima Indian Nation within the Yakima and Columbia rivers basin; includes an extensive bibliography. Documents the social and economic dependence of the Yakima Indians on fisheries resources; provides some insight of salmon, water, and habitat of the Yakima Basin prior to and during development of fisheries and agricultural industries in the Yakima basin. The following historical notes of historical milestones and fisheries resources information were derived: 1) In 1850, the US Congress passes the Land Donation Act which provided for the appropriation of lands from the public domain in the territories (e.g. Oregon Territory); p. 104; 2) In 1873, the Washington Territorial legislature passed an act that allowed Yakima County farmers, miners, manufacturers- or anyone that could use water for "beneficial purposes" to construct diversion works necessary to convey water onto their non-riparian lands (An Act Regulating Irrigation and Water Rights in the County of Yakima, Washington Territory, 13 November 1873, Washington Laws 520-522), p. 245; 3) In 1890, the Washington State Legislature passed a statute that provided for the appropriation of any unclaimed waters 'from any natural streams or lakes in the state' for irrigation and permitted the condemnation of rights of ways for ditches to carry water 91890 Washington laws 706, paragraph 1), p. 246; 4) In 1917, Washington State Legislature passed a law adopting an administrative water code that recognized prior appropriation as the only means by which an individual could acquire water rights (Riparian and Appropriation Rights, Washington laws 447-68), p. 247; 5) Around 1867, the Meninick/Shumit Ditch on Simcoe Creek (tributary to the yakima River) was constructed on the Yakima Indian Reservation; p. 250; 6) In 1906, the US Congress passed the Jones Act, that provided for funding the on-reservation portion of the US Reclamation Service's larger yakima irrigation project by allowing each Indian allottee to sell 60 acres of his or her allotment for bring water to the remaining twenty acres under the project; p. 254-255; 7) In 1891, the Northern Pacific, Yakima, Kittitas Irrigation Company, who filed on 1000 cfs of Yakima River water (in 1890) began construction of the Sunnyside irrigation project, and in that year built an adjustable dam (at the old Yakima dance house site) that was believed to have the capability to appropriate virutally the entire low flow when the river was at its lowest point; p. 258; 8) In 1892, the first 25 miles of the Sunnyside irrigation project is dedicated; p. 259; 9) In 1893, the Northern Pacific Railroad (owner of the Northern Pacific, Yakima, Kittitas Irrigation Company) declares bankruptcy during the Panic of 1893; p. 259; 10) In 1894, the US Congress passed the Carey Act which allowed states to choose up

to one million acres of arid land for irrigation development; p. 260; 11) In 1895, the Washington State legislature set up the Arid Lands Commission to investigate the possibility of developing lands between the Yakima and Columbia Rivers, above the Sunnyside irrigation project; p. 260; 12) Up to and through the 1890s individuals, farmers cooperatives, and ditch companies invested in their own small scale irrigation systems; p. 260; 13) In 1902, the US Congress passed the Newlands Act which created the Reclamation Service with the US Department of Interior; the Reclamation Service was empowered to provide planning, engineering, and financial assistance for irrigation projects; p. 261; 14) In 1906, the US Reclamation Service purchases the Sunnyside irrigation project from the Northern Pacific, Yakima, Kittitas Irrigation company, p. 241; 15) In 1908, the US Supreme Court issued its decision on the *Winters vs US*, where the court held that Indians reserve water rights even when their treaties made no express mention of water; p. 270; 16) In 1905, the Washington irrigation Company, on their attorneys' advice blew up the dam of Union Gap irrigation Company at Lake Cle Elum when insufficient water threatened to destroy the crops on the Sunnyside Project; . p. 272; 17) In 1889, the Ahtaneum Creek (tributary of the Yakima River) was virtually drained of water by irrigators on the north side of stream where it bordered the Yakima Indian Reservation; p. 275; 18) In 1891, the Ahtaneum Creek (tributary of the Yakima River) was virtually drained of water by irrigators on the north side of stream where it bordered the Yakima Indian Reservation; . p. 275; 19) In 1892, (a dry summer), the US Bureau of Reclamation attempted to re divert water of Ahtaneum Creek, virtually drained of water by irrigators on the north side of stream where it bordered the Yakima Indian Reservation, but the north-side irrigation users brought suit against the Bureau's action; . p. 276; 20) In 1905 the US Secretary of Interior allocated 2065 cfs and 147 cfs of yakima River water respectively to the white water users and Yakima Indian water users; p. 292; 21) J.H. Lynch (in 1901) noted that the more water flowed in the Ahtaneum Creek (tributary of the Yakima River) in the early days than at present, and the runoff was also later, coming mostly after July 1st; he said " the watershed had not been burned off nor grazed excessively by sheep, hence more water" . ; p. 310; 22) In 1908, the Washington State Fish Commissioner asked the Reclamation Service to include fish ladders at Yakima project dams, but was told that fish ladders were not feasible, nor was the Reclamation Service responsible for meeting state fishery laws; p. 310-311; 23) The Washington State Fish commissioner (Mr. Darwin) closed the Klickitat River to food fishing (white commercial and Indian fishing) - not sport fishing - between 1915 and 1917, p. 373.

Mattson, C. R. 1948. Spawning ground studies of Willamette River spring chinook salmon. Oregon Fish Commission, Research Briefs 1(2): 21-32.

Abstract: Provides extensive and comprehensive environment/habitat/distribution information for chinook salmon in the Willamette River and its tributaries.

May, Dean L. 1994. Three frontiers - family, land, and society in the American west, 1850-1900. Cambridge University Press, 313 pages.

Abstract: Author provides the history of settlement and development of the Willamette Valley region (Oregon), the Utah Valley region (Utah), and the Boise Valley region (Idaho) from the 1840-1900. He documents and illustrates agrarian development in these regions (during and after the mining era); provides a perspective of milestones/events affecting settlement and expansion of population in these regions. Note: an excellent documentation of mining and agriculture development in terms of habitat alteration of the Boise River basin/upper Snake river region of Idaho during the 1850-1900 era. The following notes are related to this development in Boise and Willamette basins: 1) An excellent description of the habitat surrounding the Boise River is provided by early explorers/settlers such as John C. Fremont (1843) and Basil Nelson Longworth (18 August 1853)p. 20-21; 2) Short description of the habitat in the region of the Santiam and Pudding Rivers region in the 1840s..."largely open prairie land begins to break into rolling hills...scattered thickets of Douglas fir, hemlock, spruce, incense cedar in the 1840s", p. 26; 3) Short description of the habitat in the Middleton region of the lower Boise River in 1863..."bottoms were wooded, covered with brush, and

often cut through with sloughs...and subirrigated by the low water table throughout the season." p. 37 (Map of Middleton area, and rivers, p. 36).

McClung, James S. 1862. Journal to Oregon, April 22nd 1862 1, 71-80 (incomplete) p.

Abstract: Author provides descriptions of habitat (e.g. forest/timber) and water resources (e.g. springs) in various sub-basins (e.g. Powder and Grande Ronde) to the Snake and Columbia Rivers.

McIntosh, B. A., J.R. Sedell, J.E. Smith, R.C. Wissmar, S.E. Clarke, G.H. Reeves, and L.A. Brown. 1994. Historical changes in fish habitat for select river basins of eastern Oregon and Washington. Northwest Science 68, Special Issue: 36-53.

Abstract: Authors compare the changes in and condition of fisheries habitat in a subset of historical surveyed streams (Tucannon, Asotin, Grande Ronde, yakima, Wenatchee and Methow basins) by comparing the US Bureau of Fisheries surveys (1934-1942) with resurveys of 1990-1992. Habitat information and analyses regarding pool habitat, substrate composition, and riparian zone are provided.

McIntosh, Bruce A. 1992. Historical changes in anadromous fish habitat in the Upper Grande Ronde River, Oregon, 1941-1990. Masters Thesis. Oregon State University, Corvallis, Oregon. 1-88 (complete) p.

McIntosh, Bruce A., Sedell, James R., Smith, Jeanette E., Wissmar, R. C., Clarke, S. E., Reeves, G. H., Brown, L. A., Hessburg, Paul F., and Everett, Richard L. Management history of eastside ecosystems: changes in fish habitat over 50 years, 1935 to 1992. General Technical Report PNW-GTR-321. US Department of Agriculture, Forest Service, Pacific Northwest Research Station in cooperation with Pacific Northwest Region, 8-25 p.

Merrel, T. R. 1951. Stream improvement as conducted in Oregon on the Clatskanie River and tributaries. Oregon Fish Commission, Research Briefs 3(2): 41-47.

Abstract: Provides information regarding the habitat of this river system, and associated recommendations for habitat improvements in tributaries/areas negatively impacted by logging activities 15 years previous.

Moore, Cecil R. 1939. The Willamette river project. Military Engineer 31(177): 208-211.

Abstract: Author provides a brief history, and geophysical, hydrologic, climatologic description of the Willamette river basin. Discusses and describes the Willamette basin plan that will include 1) navigation improvement from the mouth to upstream of Willamette Falls, 2) irrigation (seven storage projects of 335,000 acre ft) and stream purification projects. Mentions loss and mitigation of fish habitat and mitigating factors for this loss in terms of improved water flows and quality. Provides illustrative tables for reservoir projects and project costs- pp. 208-211.

Mudd, D., Boe, L., and Bugert, R. 1980. Evaluation of wildlife habitat developed on government project lands along Snake river in Washington. Washington Department of Game, Habitat Management Division, 62, maps p.

Abstract: Report provides a baseline of wildlife resources and habitat in areas of the lower Snake river affected by the Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dam projects.

Nielson, R. S. 1950. Survey of the Columbia and its tributaries, Part 5. Special Scientific Report Fisheries No. 38, US Fish and Wildlife Service, Department of Interior, Washington, DC.

Abstract: Provides a comprehensive description and perspective of the Deschutes, John Day, Umatilla and Walla Walla River systems at period in time, in terms of habitat and water flow/temperature.

O'Malley, H. 1935. Some problems which confront the fishery experts in the construction of dams in the Inland Empire. Northwest Science IX(1): 23-24 (February, 1935).

Abstract: Author presents the problems of dam construction in the Columbia River as 1) successful passing of adults over dams, 2) getting small fish and steelhead kelts back to the sea, and 3) the complex problem of changed conditions brought about by the dams and artificial lakes. Mentions the four commissions that control the destiny of commercial and game fishes in the States of Washington and Oregon; the annual value and employment associated with the fishing industry; the budget and employment figure projected for construction of the Bonneville dam; fishways associated with the Rock Island dam; and the impassability of Grand Coulee dam. Discussion of the biological effects on native fish species, based on experiences in New England and other parts of the US; generalizes and predicts the ecological changes of the habitat and species resulting from water impoundments on the Columbia River. Briefly mentions the requirement for proper screening of power intakes and immediate steps to combat pollution, due to industrialization of the Inland Empire.

Oregon State. 1903. Annual Reports of the Department of Fisheries of the State of Oregon to the legislative assembly, Twenty-second regular session, 1903. State of Oregon, Salem, Oregon. W.H. Leeds, State Printer, 1903. 14-21, 34-37, 64-79, 116-119 p.

Abstract: The Master Fish Warden (H.G. Van Dusen) provides detailed accounts for investigations of various waters/streams, such as the Salmon River (tributary to the Sandy River), Clackamas River, the McKenzie River (tributary to the Willamette River), Gate Creek and Blue River (tributary to the McKenzie River), Santiam River (tributary to the Willamette River), Molalla River (tributary to the Willamette River), Tanner and Eagle Creek (tributary to the Columbia River near Bonneville), Deschutes River (tributary to the Columbia River), Crooked River (tributary to the Deschutes River), John Day River (tributary to the Columbia River), Grande Ronde River and its tributaries including Wallowa lake (tributary to the Columbia River), Imnaha River (tributary to the Snake River), Powder River (tributary to the Snake River), Malheur River (tributary to the Snake River), Owyhee River (tributary to the Snake River), and Snake River. Includes notations of salmon species presence and timing, utilization, habitat/habitat alteration, etc. pages 10-21. Notes fish investigative/propagation activities at the Grande Ronde River Experimental Station at the mouth of the Wenaha River (tributary to Grande Ronde River at approximately RM 50); provides information on fish species passage to a fish rack across the Wenaha River; blueback pass this point between June 20th and July 20th, silversides begin showing on September 14th (silverside eggtake conducted mid-October into early December, summary table, Page 36. Notes during investigations/field work at the Swan Falls Experimental Station on the Snake River, that chinook salmon began to arrive at this point on September 1st, and fish were spawned from October 12th to November 13th. page 37. Notes that Oregon State passed a law in 1899 that required the licensing of the salmon and sturgeon industry (fishing and processing) some of funds derived from this licensing law were to be used for artificial propagation of fishes. page 88. Notes on the Grande Ronde River Hatchery Station: chinook salmon begin arriving immediately after rack is emplaced in the Wenaha River completed on July 4th. Holding rack enclosure is full by September 1st, and first eggs are taken on September 13th and completed October 31. First sockeye eggs were taken October 21st. Pages 116-118. Notes on the Ontario hatchery Station on the Snake River (lies on the left bank of the Snake River directly opposite Morton's Island, near Ontario Oregon); rack barrier is emplaced on August 25th, and next day 300 chinook salmon were already in the racks; run continued at this rate per day until last of September; eggtake was conducted from October 13th through November 8th. pages 119-121.

Oregon State. 1947. Biennial report of the Fish Commission of the State of Oregon to the governor and forty-fourth legislative assembly, 1947. Fish Commission of the State of Oregon; Salem, Oregon, State Printing Office, 1947.

Abstract: Notes that (1) the State of Oregon is entering a period of expansion and industrialization, and population increase where development of rivers will deplete fisheries resources; the early history

of the state saw the destruction of salmon spawning habitat. (2) the policy of the Oregon Fish Commission is (a) to study the causes and effects of decline of various fisheries, (b) to study methods of rehabilitation of species involved, and (c) to evaluate and increase efficiency of artificial propagation and to use hatcheries to supplant and rehabilitate, but not replace, natural spawning. (3) A new fishway is constructed by the Oregon Iron and Steel Company at their dam in the Tualatin River, tributary of the Willamette River, under the supervision of the Division of Engineering (Oregon Fish Commission) page 13. (4) A fishway at Eagle Creek Falls on Eagle Creek (tributary to the Clackamas River) is removed under the supervision of the Division of Engineering (Oregon Fish Commission), page 13. (6) A new dam is constructed by the Hines Lumber Company on the North Fork of the Willamette River, at Westfir (Oregon) construction of an adequate fishway will be completed by early summer 1947. page 14.

Parkhurst, Z. E. 1950. Survey of the Columbia and its tributaries, Part 6 Area V - Snake River system from mouth through Grande Ronde River. Special Scientific Report Fisheries No. 39, US Fish and Wildlife Service, Department of Interior, Washington, DC.

Abstract: Provides a comprehensive description and perspective of the Snake and Grande Ronde River systems at period in time, in terms of habitat and water flow/temperature.

Parkhurst, Z. E. 1950. Survey of the Columbia and its tributaries, Part 7 - Snake River from above the Grande Ronde River through the Payette River. Special Scientific Report Fisheries No. 40, US Fish and Wildlife Service, Department of Interior, Washington, DC.

Abstract: Provides a comprehensive description and perspective of the Snake above the Grande Ronde, Salmon, Weiser, and Payette Systems at period in time, in terms of habitat and water flow/temperature.

Parkhurst, Z. E. 1950. Survey of the Columbia and its tributaries, Part 8 Area VII - Snake River from above the Payette River to Upper Salmon Falls. Special Scientific Report Fisheries No. 57, US Fish and Wildlife Service, Department of Interior, Washington, DC.

Abstract: Provides a comprehensive description and perspective of the main Snake and its tributaries above the Payette River at period in time, in terms of habitat and water flow/temperature.

Parkhurst, Z. E., Bryant, F. G., and Nelson, R. S. 1950. Survey of the Columbia River and its tributaries - Part III. Special Scientific Report Fisheries No. 36, US Fish and Wildlife Service, Department of Interior, Washington, DC.

Abstract: Provides a comprehensive description and perspective of Columbia River tributaries in Oregon and the Willamette system at period in time, in terms of habitat and water flow/temperature.

Porter, Elizabeth Lee. 1864. Crossing the plains, a diary by Elizabeth Lee Porter 1864 1, 6-7 (incomplete) p.

Abstract: Author gives abbreviated diary of her activities and observations from Iowa to Oregon; some brief notes of climate and habitat of various sub-basins (e.g. Burnt, Powder and Grand Ronde) to the Snake and Columbia river.

Renshaw, Robert Harvey. 1851. Diary of Robert Harvey Renshaw 1, 24-35 (incomplete) p.

Abstract: Author notes his activities and habitat of various sub-basins (e.g. upper Snake tributaries, Burnt, Powder, and Grand Ronde) to the Snake and Columbia rivers. Gives brief mention to the timber and water of the Grand Ronde area.

Rich, E. E. 1950. Peter Skene Ogden's Snake country journals, 1824-25 and 1825-26 The Hudson's Bay Record Society, London. 92-93, 126-135, 166-171, 190-193 p.

Abstract: Author provides an account of his observations and experiences during his travels in the

Columbia river basin during the early 19th century. Briefly notes habitat, flora, and fauna at various points of travel in the various sub-basins (e.g. Bruneau, Payette, Malheur, Owyhee, etc.)of the Upper Snake river, and the Umatilla, John Day, Deschutes, Hood, and Willamette sub-basins of the Columbia river.

General description of attributes for the upper Snake river in the vicinity of the Payette river to the Burnt river (River Brule). - observation of dead salmon (carcasses) along the river.

General description of attributes for the upper Snake river in the vicinity of Burnt river (River Brule) to the Malheur River.

General description of attributes for the upper Snake river in the vicinity of Burnt river (River Brule) to the King Hill creek. - note of sturgeon present in this area during spring.

General description of attributes for the upper Snake river in the vicinity of the Payette river mouth.

General description of attributes for the upper Snake river in the vicinity of the Owyhee river mouth.

General description of attributes for the upper Snake river in the vicinity of the Owyhee river mouth to the Malheur river mouth-notes water flow (spring freshet condition).

General description of attributes for the upper Snake river in the vicinity above the Owyhee river mouth to the Bruneau river mouth.

General description of attributes for the upper Snake river in the vicinity of the Bruneau river mouth.

General description of attributes for the upper Snake river in the vicinity above the Owyhee river mouth to the Bruneau river mouth - notes seeing salmon ascending the stream.

General description of attributes for the upper Snake river in the vicinity above the Owyhee river mouth to the Bruneau river mouth - notes regarding Indian fishing success/salmon presence in the vicinity.

General description of attributes for the upper Snake river in the vicinity above the Bruneau river mouth to Alkali creek mouth.

General description of attributes for the upper Snake river in the vicinity of the Bruneau and Snake river confluence.

General description of attributes for the upper Snake river in the vicinity below Big Wood river to the Bruneau river.

General description of attributes for the upper Snake river in the vicinity of King Hill Creek.

Scheufele, Roy W. 1970. History of the Columbia Basin Inter-Agency Committee. Prepared under sponsorship of the Pacific Northwest River Basins Committee.

Abstract: A. Author presents a comprehensive details regarding the genesis, policy & objectives, actions, and chronology of meeting/events for the Columbia Basin Inter-Agency Committee, during the period of 1946-1967. Provides information regarding governmental legislation (laws) and policy framework, institutional relationships with other state and federal agencies in the Columbia basin, and accomplishments of the agency. NOTE: Reference is very important in terms of its description of policy and philosophy governing water and fisheries policy in the Columbia River basin during the period of 1946-1967. B. Genesis of Agency and Federal Action (pages 3-9): 1) In 1902, the US Congress passes the Reclamation Act; 2) In 1905, the US Congress establishes the US Forest Service; 3) In 1920, the US Congress passes the Federal Power Act; 4) In 1925, the US Congress passes a statute that directed the inventory of those streams in the US where power development appeared feasible and practical in combination with navigation, flood control, and irrigation; 5) In 1927, the US Congress passes the River and Harbor Act, which commenced the survey of Pacific Northwest streams, that were inventoried under the 1925 congressional statute; 6) In 1936, the US Congress passes the Flood Control Act; 7) In 1936 (?) the US Congress establishes the US Soils Conservation Service; 8) In 1943, the Pacific Northwest Regional Planning Commission, an arm of the National Resources Planning Board, is abolished by the US Congress; 9) In July 1943, the governors of the Pacific Northwest States establish the Northwest States' Development Association to coordinate and correlate plans of member states as they relate to unified development of all the

resources of the Pacific Northwest; 10) In December 1943, the Northwest States' Development Association prepares a program and governing principles of emergency and immediate post-war projects for the development of the Columbia Drainage Basin; 11) In summer 1939, the US Departments of Interior, Agriculture, and War (Corps of Engineers) enter a tripartite agreement to coordinate their work, both in Washington DC and field regions; 12) In December 1943, the US Federal Power Commission joins the tripartite of the US Departments of Interior, Agriculture, and War (Corps of Engineers), and execute a quadripartite agreement that provided monthly meetings of these agencies to discuss results of studies/investigations, to adjust differences of opinions, and to promote ways/means for implementing other provisions of the agreement-representatives of these four Departments constituted the Federal Inter-Agency River Basin Commission (FIABRC); 13) In February 1946, the Columbia Basin Inter-Agency Committee, the second field committee of Federal Inter-Agency River Basin Commission, is established to facilitate progress on the multipurpose development projects presently authorized by congress (p. 7-9 provides details of conditions of the agreement.); 14) In 1965, the US Congress passes the Water Resources Planning Act; 15) In June 1967, the Pacific River Basins Commission takes over the functions of the Columbia Basin Inter-Agency Committee.

C. A chronicle of agency meetings and general outcomes from these meetings is presented (pages 10-123)

- 1) In March 1947, the Assistant Secretary of Interior (Warner W. Gardner) sends a memorandum/recommendations to the Federal Inter-Agency River Basin Commission (FIABRC) that propose the construction of mainstem dams on the Columbia below Okanogan R. and on the Snake below the Salmon R., with the exception of the proposed McNary Dam, be postponed until 1958 (for 10 years) provided that alternate sources of power could be developed to meet Bonneville Power Administration load demands; this moratorium period would allow the US Fish & Wildlife Service and state fisheries agencies to determine remedial measures (per research, studies, and planning) that could be taken to preserve the Columbia River fishery; p. 22-23);
- 2) On 2 April 1947, the Assistant Secretary of Interior (Warner W. Gardner) memorandum was forwarded by the Federal Inter-Agency River Basin Commission (FIABRC) to the Columbia Basin Inter-Agency Committee for study, discussion, and recommendations;
- 3) On 23 July 1947 at the 11th meeting of the Columbia Basin Inter-Agency Committee, (a) Fred Foster (US Fish & Wildlife Service) outlined the Lower Columbia River Fishery Program, consisting of obstruction removal, pollution abatement, diversion screening, fishway construction, hatchery construction and fish sanctuaries - a program estimated at a cost of \$20 million, and (b) a Fish & Wildlife subcommittee was established to coordinate and integrate fish and wildlife programs with water resource program; p. 25;
- 4) On 22 September 1947, the Fish & Wildlife Subcommittee (Columbia Basin Inter-Agency Committee) filed a report that summarized factual data relating to navigation, power, fish, irrigation, Indians, and National Defense, p. 26;
- 5) On 8 October 1947, at its 12 meeting, the Columbia Basin Inter-Agency Committee unanimously approved and forwarded a letter to the Federal Inter-Agency river basin Commission (FIABRC) recommending that a) Grand Coulee power installations proceed, construction of Hungry Horse, Foster Creek, Detroit, and McNary Dam proceed, etc. b) authorized dams on the Columbia River system not to be rescheduled, approval of the Lower Columbia River Fishery Program, and compensation of Treaty Indians, and c) upstream dams be authorized promptly and if authorized before 1958 they be constructed ahead of planned/unauthorized The Dalles, John Day and Arlington Dams unless the fish problem has been solved in the interim, etc., p. 26;
- 6) In 1950, the Columbia Basin Inter-Agency Committee establishes the Fisheries Steering Committee, and this subcommittee prepares a comprehensive program of research and construction (to cost 25-50 million dollars) and proposed to finance it by a tax of fifty cents per kilowatt year (note proposal failed and caused an outcry from power interests) p. 27;
- 7) On 17 September 1948, at its 21st meeting, the Columbia Basin Inter-Agency Committee authorized a Technical Subcommittee for Operating Plan to prepare an integrated and coordinated operating plan for the release and control of waters in connection with Columbia River development program (note plan was never consummated) p. 32;
- 8) On 10 November 1948 at its 22nd meeting of the Columbia Basin Inter-Agency Committee, the Corps of Engineers presented an eight volume "Review of the

Columbia River and its Tributaries,; a report costing \$5 million; p. 33; 9) On 28 June 1950 at its 40th meeting, the Columbia Basin Inter-Agency committee approved an interim fishery research program (prepared by the Fish & Wildlife Subcommittee) that called for studies of fish passage at river obstructions, impoundment studies, artificial propagation, and studies of life history, trends and abundance, trout habitat and pollution, at an estimated \$600,000 per year - another \$500,000 was included for stream development and improvement; p. 46; 10) On 19 January 1955, the Columbia Basin Inter-Agency Committee directed the Fisheries Steering Committee to a) prepare an Upper Columbia River fishery program comparable to that in effect on the Lower Columbia River, b) a program of needed fishery research for the whole area, and c) explore ways and means of implementing/financing both programs; p. 83; 1) On 13 March 1957, the Columbia Basin Inter-Agency Committee accepted the Fisheries Steering Committee report with respect to a) prepare an Upper Columbia River fishery program comparable to that in effect on the Lower Columbia River, and b) a program of needed fishery research for the whole area - established research priorities and recommendations as to what agency would carry out specific studies recommended; p. 91; 12) On 13-14 November 1963, the Columbia Basin Inter-Agency Committee heard a panel of University of Washington academicians (James Crutchfield, W.F. Royce, D. Bevan, Robert Fletcher, R.C. Van Cleave, and R.W. Johnson) carry on extensive dialogues on "Fisheries in the Pacific Northwest - the academicians view this controversial issue," Don Bevan was very critical of fishery regulation; p. 114; 13) On 14 December 1965 at the 132 meeting of the Columbia Basin Inter-Agency Committee, the Executive Subcommittee presented its recommendations on seven fishery proposals (previously submitted by the Fisheries Steering Committee on 6 October 1965) summarized as follows: Proposal 1 - Greater Committee representation for salmon and steelhead, Proposal 2 - Reduction of the use of the Columbia River water for nuclear production to reduce heat pollution of the river, Proposal 3 - Establishment of working contract with Canada on Fishery problem, Proposal 4 - Development of small watersheds for power production should be discontinued, Proposal 5 - Assure proper attention to fish requirements in any inter-basin water transfer studies, Proposal 6 - Fishery research should be continued, the Proposal 7 - The Columbia River Fishery Development program should be retained; 14) On 29 September 1966 at its second Columbia-North Pacific study review, the Columbia Basin Inter-Agency Committee accepted the report of the Water Supply and Pollution Subcommittee entitled "Columbia River - Water Temperature Conditions and Research Requirements" report stemmed from one of the seven fishery proposals (previously submitted by the Fisheries Steering committee on 6 October 1965; p. 21); (15) On 9 June 1967, the Columbia Basin Inter-Agency committee held its last meeting, and handed over its responsibilities, function and records to the new River Basins Commission, p. 122.

Seaman, Margaret H. 1977. Columbia River estuary inventory of physical, biological and cultural characteristics. Columbia River Estuary Study Taskforce,  
Abstract: Author provides a document containing a compilation of work contributions by various experts for the Columbia river basin, with respect to physical characteristics (e.g. climate, freshwater, estuarine tides, etc.); biological characteristics (e.g. tidal marshes, shoreline habitat, plankton, fishes, etc.); and cultural characteristics (e.g. land & water uses, recreation, etc.).

Shippen, H. 1954. Columbia River survey, ecological section. (Final report to the US Fish Wildl. Serv.). contract 14-19-008-2220. 178 p. p.  
Abstract: Author provides a listing of fish species reported in the Columbia river drainage, based on various published and unpublished references; associates fish species with reference sources contained in listing of abstracts/annotations. These references within the abstracts/annotations section of this report contain information regarding species description, distribution, habitat, food habits, reproduction, and predation. Some but limited information for fishes species inhabiting the estuarine zones of the Columbia river. **Note: Excellent Source For Old References Regarding the Fish Species and Habitat (including anadromous salmonids) within the Columbia River Basin.**

Simenstad, C. A., Jay, D., McIntire, C. D., Nehlsen, W., Sherwood, C., and Small, L. 1984 . The dynamics of the Columbia River estuarine ecosystem, Vol. I and II. Columbia River Estuary Data Development Program, Astoria, Oregon. 695 p.

Abstract: Authors present a synthesis of ecological information & data, derived the physical and biological studies carried out in the Columbia river estuary by CREDDP. The general sections of this reference are:

1. Regional setting and previous studies;
2. Circulatory processes;
3. Sedimentary geology;
4. Historical changes in Columbia river estuarine physical processes;
5. Conceptual framework for physical-biological integration;
6. Ecosystem processes; and
7. Ecosystem analyses by regions and habitat types.

Simenstad, C. A., Jay, D. A., and Sherwood, C. R. 1992. Impacts of watershed management on land-margin ecosystems: the Columbia River estuary. 266-306. Watershed Management: balancing sustainability and environmental change. Springer-Verlag, New York, NY. 543 p.

Abstract: Authors describe the pattern of land use development, changes in estuarine dynamics/process, and habitat alterations of the Columbia river estuary, with respect to river flow, physical properties, and discharge of sediments. State a reduction in 1) mean river flow by ~20%, 2) spring freshet discharge by ~50% of natural flow, 3) sediment inflow by ~25%, and 4) tidal prism by ~15% since the 19 th century. Modifications of the estuary have had significant effects on the estuarine processes that occur in the estuarine turbidity maximum (ETM). Subject of headings of reference are: 1) Watershed impacts on land-margin ecosystems, 2) Land margin ecosystems of illustrative of watershed impacts, 3) River characteristics and the influence of watershed alterations, 4) River flow dynamics, 5) Water characteristics and constituents, 6) Historic alterations to the Columbia river from the watershed to the land margin (includes subsections specifying/describing alterations to (a) watershed, (b) river flow frequency spectrum, & (c) sediment transport), 7) Effects of modifications to watershed on land-margin ecosystem processes (ETM, estuarine heat budget, organic input and food web, consumer populations & ecology). Reference contains excellent descriptive tables and figures that illustrate estuarine alterations, historical trends of specific physical/hydrologic factors in the estuary, and historical trends in anadromous salmon landings in the Columbia river.

Simenstad, C. A., Small, L. F., McIntire, C. D., Jay, D. A., and Sherwood, C. 1990. Columbia River estuary studies: An introduction to the estuary, a brief history, and prior studies. Prog. Ocean. 25: 1-13.

Abstract: Authors provide a short synopsis on: 1) a description of the Columbia river estuary, 2) previous investigations and the Columbia River Estuary Data Development Program (CREDDP), and Definitions and Conventions in CREDDP. Figures illustrate the various regions & zones and bathymetry of the Columbia estuary. A table illustrates and quantifies the area of habitat types within each region of the Columbia estuary. Extensive reference list included.

Smith, C. 1979. Salmon fishers of the Columbia. Oregon State University Press, Corvallis.

Abstract: Author describes a history of the Columbia River fishing industry, from the early Indian fishing activities through the modern day, using numerous reference sources. Provides fish landing and pack statistics over this period. Discusses the habitat alterations/ losses, due to water development, and artificial propagation activities in the Columbia River. Also discusses management history of the Columbia River, and regulatory actions of the States of Oregon and Washington since the late 1800s.

Stanley, G. F. 1970. Mapping the frontier - Charles Wilson's diary of the survey of the 49th parallel, 1858-1862, while secretary of the British Boundary Commission. University of Washington Press, Seattle, 182 pages.

Abstract: Charles William Wilson, a British Army officer, documents his travels, activities during his assignment in the survey and mapping of the region around the British Columbia and US boundary. Lieutenant Wilson provides excellent notes and observations of fisheries resources, Indian fishing, and habitat in the upper Columbia basin (e.g. Columbia, Okanogan, Kettle, Pend d'Oreille rivers basins); and also documents fisheries/habitat in the Fraser River basin and Skagit River basin. (NOTE: an excellent reference to fish stocks and habitat that have not been documented in other references/publications related to the Columbia River fisheries resources). The following historical notes of historical milestones and fisheries/natural resources information were derived: 1) Mentions the survey (late 1850s) of the DD.G.F. Macdonald (civil engineer) in the region between the Chilliwack Lake and the Skagit river; p. 13; 2) An illustration of a map of the area (Chilliwack, Skagit, Pasayten, Ashnola (Rosalia), Similkameen, and Okanogan Rivers basin) surveyed in 1858-1860, p. 34-35; 3) Indian fishing and processing for winter use noted on the Fraser River opposite Fort Langley on 16 October 1858, p. 37; 4) Description of habitat surrounding the Chilliwack River (tributary to the Fraser R.) at Chilukweyuk Prairie Headquarters camp on 16 June 1859; also mentions that salmon abound in this area; p. 49; 5) On 30 July 1859, Lt. Wilson mentions that a "fearful fire was raging" in the Skagit Valley beyond the Cascades that originated from an American camp fire, which the Americans were too lazy to put out properly; p. 65; 6) On 9 October 1859, Lt. Wilson mentions, in respect to the Chilliwack river and tributaries that "at this season of the year is the quantity of dead salmon on the banks of the river; in some of the smaller streams the quantities are so numerous that it produces a most intolerable smell and renders the water anything but pleasant for drinking purposes...who has been dissecting several of them, thinks this arises from the want of insects to feed enormous numbers of salmon that run up the rivers." p. 73; 7) On 22 May 1860, Lt. Wilson describes Indian fishing activities at The Dalles (Celilo Falls) and notes that the fish "average 25 to 40 lbs. weight..." p. 95; 8) An illustration (map) of the region survey in the upper Columbia River basin (e.g. Kettle, Colville, Spokane, Pend d'Oreille Rivers) in 1860-1861; p. 104-5; 9) On 29 June 1860, Lt. Wilson briefly describes the habitat of the Spokane River basin in the area between Willow Springs and Deep Creek; p. 108-9; 10) On 30 June 1860, Lt. Wilson briefly describes the habitat of the Colville River; p. 109; 11) On 2 July 1860, Lt. Wilson reported that the American Commission has been brought to a standstill at Pend d'Oreille Lake due to extensive flooding..."I hear a tract of nearly 60 miles of land is flooded there." p. 112; 12) On 1 August 1860, Lt. Wilson extensively describes Indian fishing activities at Kettle Falls on the Columbia River, and notes that the Indians catch 700 to 1000 fish per day; p. 113-114; 13) On 12 August 1860, Lt. Wilson briefly describes the habitat surrounding the Okanogan River in the vicinity of Lake Osoyoos; and mentions the salmon fishing methods of the Indians "catching the salmon running at this time in great numbers..." p. 118; 14) On 26 August 1860, Lt. Wilson mentions gold miners at work on the Similkameen River near the forks of the Similkameen and Ashnolon (Rosalia) rivers, and notes that there were about 150 miners in the lower Similkameen basin; p. 124; 15) On 29 August 1860 Lt. Wilson briefly describes the habitat of Rock Creek (tributary to Kettle River); p. 125; 16) On 30 August 1860, Lt. Wilson briefly describes the habitat of the Kettle River (Nehoiapitku") in the vicinity of the town of Rock Creek and also describes the gold mining activity and methods on Rock Creek; p. 126-6; 17) On 31 August 1860, Lt. Wilson briefly again describes the habitat of the Kettle River ("Nehoiapitku"); p. 128; 18) On 2 September 1860, Lt. Wilson notes that "salmon are running in great numbers up the river (the Kettle River "Nehoiapitku"); p. 129; 19) Lt. Wilson describes the habitat in the Little Spokane River basin; p. 146. General description of attributes in the vicinity of the confluence of the Snake and Columbia Rivers. General description of attributes in the vicinity of the Palouse river mouth.

Stone, L. 1885. Explorations on the Columbia River from the head of the Clarks Fork to the Pacific

Ocean, made in the summer 1883, with reference to the selection of suitable place for establishing a salmon breeding station. US Bureau of Fisheries Report, 1883 (1885), p. 237-258. Doc. 97 issued 1886; F11-241. US Bureau of Fisheries, Washington, DC.

Abstract: Derived reference from Appendix V: An analytical subject bibliography of the publications of the Bureau of Fisheries, 1871-1920, by Rose M.E. MacDonald. Document review: Author generally describes his investigation of the various Columbia tributaries in terms as potential fish hatchery sites; provides some habitat characteristics of the tributaries.

Sutton, Sarah. 1854. Diary of Sarah Sutton 1, 69-86 (incomplete) p.

Abstract: Author provides some detailed descriptions of activities, habitat and surroundings of various sub-basins (e.g. Burnt, Powder, and Grande Ronde) during her journey to Oregon; diary abruptly ends since the author died at an unknown place in transit of the Grande Ronde valley.

Symons, Thomas W. 1882. Report of an examination of the upper Columbia River and the territory in its vicinity in September and October 1881. 47th congress, 1st Session, Senate, Ex. Doc. No. 186, Washington; Government Printing Office, 1882. 1-135, maps (complete) p.

Abstract: Author presents a comprehensive account of observations (geologic, botanical, hydraulic/topographic characteristics) and surveys of the upper Columbia River and its tributaries (e.g. Pend d'Oreille, Kootenay, Colville, Spokane, San Poil, Methow River, etc.) Note: Excellent reference to derive habitat information and inferences of the upper Columbia River.

Thomas, D. W. 1983. Changes in the Columbia River estuary habitat types over the past century. Columbia River Estuary Data Development Program, Astoria, Oregon. 51 p. (complete) p.

Abstract: The author provides and compares information for habitat of the Columbia river from the period predating most human interventions (circa 1870) to the present day (1980). Qualitative and quantitative changes in various estuarine habitat are described and illustrated (figures & tables) according to:

- (1) Area- river mouth, mixing zone, Youngs Bay, Baker Bay, Grays Bay, Cathlamet Bay, Upper Estuary, and Estuary;
- (2) Habitat type- deep water, medium depth, shallows/ flats, tidal marshes, tidal swamps, developed floodplain, uplands (natural & filled), non-estuarine swamp, and non-estuarine water;
- (3) Acreage by period- 1870 and present;
- (4) Change- acreage (plus or minus) and percentage;
- (5) 1870 acreage, Present estuarine acreage, estuarine area removed, and non-estuarine wetlands added.

Includes appendices providing information regarding:

- (1) Excerpts from Annual Reports of Superintendent of the US Coast Survey concerning the Columbia river survey for 1868-1873;
- (2) Verification of the US Coast Survey charts;
- (3) An explanation of the boundaries of the historical subarea map;
- (4) Subarea reports for the River Mouth, Mixing Zone, Youngs Bay, Baker Bay, Grays Bay, Cathlamet Bay, and Upper Estuary;
- (5) The nineteen intertidal vegetation communities of the Columbia river, with tables showing their present acreage per subarea and their former acreage and importance (Thomas, 1980).

**Note:** Excellent reference.

United States. Army Corps of Engineers. 1974. Draft environmental statement of Lower Monumental lock and dam, Snake river, Washington U.S. Army Engineer District, Walla Walla, Washington.

Abstract: This draft environmental impact statement addresses the proposed Lower Monumental dam project. Includes information that describes the Lower Monumental project and the existing

environment (terrestrial and water habitat/resources) in the area of the project; and describes the impacts of proposed project alternatives.

United States. Army Corps of Engineers. 1975. Draft environmental statement of Lower Granite project, Snake river, Washington U.S. Army Engineer District, Walla Walla, Washington.

Abstract: This draft environmental impact statement addresses the proposed Lower Granite dam project. Includes information that describes the Lower Granite project and the existing environment (terrestrial and water habitat/resources) in the area of the project; and describes the impacts of proposed project alternatives.

United States. Army Corps of Engineers. 1975. Draft environmental statement of lower Snake river fish and wildlife compensation U.S. Army Engineer District, Walla Walla, Washington. 1, I-4, 46-47, 70-106, maps p.

Abstract: This draft environmental impact statement addresses proposed actions to compensate fish and wildlife losses resulting from four multi-purpose water resources development projects on the lower Snake river. Includes information that describes the existing environment (terrestrial and water habitat/resources) in the area of the project; and describes the impacts of proposed project alternatives.

United States. Army Corps of Engineers. 1979. Final environmental statement of Ice Harbor lock and dam, Snake river, Washington U.S. Army Engineer District, Walla Walla, Washington. 1,11, 2(1)-2(19), 2(33)-2(36) p.

Abstract: This draft environmental impact statement addresses the proposed Ice Harbor dam project. Includes information that describes the Ice Harbor project and the existing environment (terrestrial and water habitat/resources) in the area of the project; and describes the impacts of proposed project alternatives.

United States. Army Corps of Engineers and Department of Commerce. 1994. (Draft environmental statement.). Lower Snake river biological drawdown test.

Abstract: This draft environmental impact statement addresses a proposed biological drawdown test to be conducted at a Lower Granite Reservoir, possibly as early as 1995. Includes information describing the Lower Granite project and the existing environment (terrestrial and water habitat/resources) in the area of the project.

US Army. 1897. Report of the chief of engineers 1897 in six parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1897. (Annual report).Government Printing Office, Washington. 3456-3463 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

(1) Mouth of Columbia river-Part 1, p. 502-503, Part 4, p. 3404-3406;

(2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 503, Part 4, p. 3407-3414;

(3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 504, Part 4, p. 3414-3416.

(4) Cowlitz river- Part 1, p. 520, Part 4, p. 3463-3465;

(5) Young's and Klasskuine rivers-Part 1, p. 466, Part 5, p.3595-3596 (removal of snags and

overhanging trees);

(6) Clatskanie river, from mouth to town of Clatskanie -Part 1, p. 467, Part 4, p. 3596-3598;

(7) Lewis river (survey)-Part 1, p. 523, Part 4, p. 3469-3478; and

(8) South channel of Columbia river (in front of Astoria, OR-Part 1, p. 468, Part 4, p. 3406-3407.

General description of attributes for the Snake river in the vicinity of Wild Goose Island (~74 miles above the Snake river mouth)- human alterations. General description of attributes for the Snake river in the vicinity of Log Island (~38 miles below Lewiston, ID)- human alterations.

US Army. 1898. Report of the chief of engineers 1898 in six parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1898. (Annual report). Government Printing Office, Washington. 3014-3025 (incomplete) p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

(1) Mouth of Columbia river-Part 1, p. 507-508, Part 4, p. 3040;

(2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 505-506, Part 4, p. 3031-3038;

(3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 499, Part 4, p. 3414-3416.

(4) Cowlitz river- Part 1, p. 508-509, Part 4, p. 3041-3042;

(5) Willamette Slough (Scappoose Creek/ Bay)- Part 4, p. 3043-3044;

(6) Clatskanie river, from mouth to town of Clatskanie -Part 1, p. 510, Part 4, p. 3049-3050; and

(7) South channel of Columbia river (in front of Astoria, OR-Part 1, p. 507, Part 4, p. 3039.

Detailed description of attributes for the Snake river from mouth to Riparia- derived from House Document No. 411, Fifty-Fifth Congress, Second Session: Survey of the Snake River, Washington, From Its Mouth to Riparia (with maps in four sheets). General description of attributes for the Snake river in the vicinity of Wild Goose Island (~74 miles above the Snake river mouth)- human alteration. General description of attributes for the Snake river in the vicinity of Log Island (~38 miles below Lewiston, ID)- human alterations.

US Army. 1899. Report of the chief of engineers 1899 in six parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1899. (Annual report). Government Printing Office, Washington.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

(1) Mouth of Columbia river-Part 1, p. 595 Part 4, p. 3246-3247 (includes bathymetry map, dated June 1899, of mouth);

(2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 592-593, Part 4, p. 3239-3245;;

(3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 586-588, Part 4, p. 3229-3231 (includes map of Hayden Slough characteristics & 6 pages of photographs);

(4) Cowlitz river- Part 1, p. 597-598, Part 4, p. 3249-3250;

(5) Lewis river-Part 1, p. 596-597, Part 4, p. 3248-3249;

- (6) Clatskanie river-Part 1, p. 595-596, Part 4, p. 3247-3248; and
- (7) Columbia river below Tongue Point-Part 1, p. 594, Part 4, p. 3245-3246.

US Army. 1900. Report of the chief of engineers 1900 in nine parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1900. (Annual report).Government Printing Office, Washington. 4338-4343 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 671-672 & p. 676,-Part 6, p. 4361-4362 & p. 4434-4455 (includes bathymetry map, dated June 1900, of mouth);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 669-670 & p. 676, Part 6, p. 4352-4360 & p. 4416-4433 (includes bar above Tongue Pt, Dobelbower Bar, Walker Is. Bar, Martin Is., Hunters Bar, Martin Is.-Upper Bar, & Pillar Rock Bar);
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 661-663, Part 6, p. 4334-4337 (includes map of Hayden Slough characteristics);
- (4) Cowlitz river- Part 1, p. 674-675, Part 6, p. 4366-4367;
- (5) Lewis river-Part 1, p. 673-674, Part 6, p. 4364-4365;
- (6) Clatskanie river-Part 1, p. 672-673, Part 6, p. 4363-4364; and
- (7) Columbia river below Tongue Point-Part 1, p. 670-671, Part 6, p. 4360-4361.

General description of attributes for the Snake river in the vicinity of Wild Goose Island (~74 miles above the Snake river mouth)- human alteration. General description of attributes for the Snake river in the vicinity of Log Island (~38 miles below Lewiston, ID)- human alterations. General description of attributes for Steptoe Rapids, located ~20 miles below Lewiston, ID. Detailed description of attributes for the Snake R. from Asotin to Wolf Cr. vicinity- derived from House Document No. 75, Fifty-Sixth Congress, 1st Session: Preliminary examination of Snake River from Asotin, WA to Pittsburg, OR (photos and maps included).

US Army. 1901. Report of the chief of engineers 1901 in five parts plus supplement. Annual Reports, War Department, Fiscal Year Ended June 30, 1901. (Annual report).Government Printing Office, Washington. 3528-3544 (incomplete) p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 635-637,-Part 5, p. 3567-3570;
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 633-634, Part 5, p. 3557-3565;
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 627-628, Part 5, p. 3499-3501;
- (4) Cowlitz river- Part 1, p. 639-640, Part 5, p. 3573-3575;
- (5) Lewis river-Part 1, p. 638-639, Part 5, p. 3572-3573;

- (6) Clatskanie river-Part 1, p. 637-638, Part 5, p. 3571-3572; and
- (7) Columbia river below Tongue Point-Part 1, p. 634-635, Part 5, p. 3565-3567.

Detailed description of attributes for the Snake river from the mouth to Lewiston, ID. Vicinity-derived from House Document No. 127, Fifty-Sixth Congress, 2nd Session: Preliminary examination of Snake River from Lewiston, ID to Riparia, WA.

US Army. 1902. Report of the chief of engineers 1902 in four parts plus supplement. Annual Reports, War Department, Fiscal Year Ended June 30, 1902. (Annual report).Government Printing Office, Washington.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 556-558,-Part 3, p. 2400-2402;
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 554-555, Part 3, p. 2393--2398;
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 549-550, Part 3, p. 2383-2384;
- (4) Cowlitz river- Part 1, p. 559-560, Part 3, p. 2404-2405;
- (5) Lewis river-Part 1, p. 560-561, Part 3, p. 2406-2407;
- (6) Clatskanie river-Part 1, p. 558-559, Part 3, p. 2403-2404; and
- (7) Columbia river below Tongue Point-Part 1, p. 556-558, Part 3, p. 2398-2400.

US Army. 1903. Report of the chief of engineers 1903-Volume 9, Part 1, Volume 10, Part 2, Volume 11, Part 3, Volume 12, Part 4, & Volume 13, Supplement.. Annual Reports, War Department, Fiscal Year Ended June 30, 1903. (Annual report).Government Printing Office, Washington. 2246-2255, 2270-2319 and maps p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 614-616,-Part 3, p. 2271-2318 (includes a comprehensive synopsis for the Columbia river entrance, with respect to description, history, physical data, sand movements, projects such as jetties, dredging, etc, and appendices with historical surveys & bathymetric maps);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 612-614, Part 3, p. 2263-2270 (includes an index map of the lower Columbia and Willamette rivers, opposite p. 2266);
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 608-609, Part 3, p. 2228-2229;
- (4) Cowlitz river- Part 1, p. 616-618, Part 3, p. 2319;
- (5) Lewis river-Part 1, p. 618-619, Part 3, p. 2320-2321 (includes index map of Lewis river);
- (6) Clatskanie river-Part 1, p. 616-617, Part 3, p. 2318; and
- (7) Columbia river below Tongue Point-Part 1, p. 614, Part 3, p. 2398-2400.

**Note: Excellent reference that provides the history of the Columbia entrance from late 1700's to present.**

Detailed description of attributes for the Snake R. from Lewiston (ID) to Imnaha river mouth- 14 maps included. Detailed description of attributes for the Snake R. from Lewiston (ID) to Imnaha river mouth- 13 maps to scale of 1:5000 with an index sheet and profile of the river (not printed in report?)

US Army. 1904. Report of the chief of engineers 1904- Volume 5, Part 1, Volume 6, Part 2, Volume 7, Part 3, Volume 8, Part 4, & Volume 9, Supplement. Annual Reports, War Department, Fiscal Year Ended June 30, 1904. (Annual report).Government Printing Office, Washington . 3468-3471, maps p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area.The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 678-681,-Part 3, p. 3543-3553 (includes a bathymetric map of the Columbia river entrance for June 1904, opposite p. 3548);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 675--677, Part 3, p. 3534-3542 (includes an index map of the lower Columbia and Willamette rivers, opposite p. 3538);
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 670-671, Part 3, p. 3496-3506;
- (4) Cowlitz river- Part 1, p. 682-683, Part 3, p. 3555-3557;
- (5) Lewis river-Part 1, p. 683-685, Part 3, p. 3557-3558 (includes index map of Lewis river);
- (6) Clatskanie river-Part 1, p. 681-682, Part 3, p. 3554-3555; and
- (7) Columbia river below Tongue Point-Part 1, p. 678, Part 3, p. 3543.

US Army. 1905. Report of the chief of engineers 1905- Volume 5, Part 1, Volume 6, Part 2, Volume 7, Part 3, Volume 8, Supplement.. Annual Reports, War Department, Fiscal Year Ended June 30, 1905. (Annual report). Government Printing Office, Washington. 2454-2469, 2482-2495 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area.The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 685-687,-Part 3, p. 2484-2492 (includes a bathymetric map of the Columbia river entrance for June 1905, opposite p. 2488);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 681-684, Part 3, p. 2475-2483 (includes an index map of the lower Columbia and Willamette rivers, opposite p. 2478);
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 676-678, Part 3, p. 2467-2468;
- (4) Cowlitz river- Part 1, p. 688-689, Part 3, p. 2493-2494;
- (5) Lewis river-Part 1, p. 689-691, Part 3, p. 2495-2496;
- (6) Clatskanie river-Part 1, p. 687-688, Part 3, p. 2492-2493; and
- (7) Columbia river below Tongue Point-Part 1, p. 684, Part 3, p. 2483-2484.

US Army. 1906. Report of the chief of engineers US Army 1906 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1906. (Annual report).Government Printing Office, Washington . 1984-1999, 2004-2019, 2044-2047 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 757-760,-Part 2, p. 2012-2017-(includes a bathymetric map of the Columbia river entrance for May-June 1906, opposite p. 2016);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 754-756, Part 2, p. 2006-2012 - (includes an index map of the lower Columbia and Willamette rivers, opposite p. 2010);
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 750-751, Part 2, p. 1998-2000;
- (4) Cowlitz river- Part 1, p. 761-763, Part 2, p. 2018-2019;
- (5) Lewis river-Part 1, p. 763-765, Part 2, p. 2019; and
- (6) Clatskanie river-Part 1, p. 760-761, Part 2, p. 2017-2018.

Detailed description of the attributes for the Snake R. from Imnaha river mouth to Wolf creek vicinity (Pittsburg, OR)- seven map sheets not included. Detailed description of the attributes for the Snake R. from Imnaha river mouth to Wolf creek vicinity (Pittsburg, OR)- index map of upper Columbia and Snake rivers from Ceilo to Pittsburg Landing.

US Army. 1907. Report of the chief of engineers US Army 1907 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1907. (Annual report).Government Printing Office, Washington. 2168-2179, 2188-2205, 2226-2227 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Columbia river- mouth to mouth of Willamette river-Part 1, p. 767-768;
- 2) Columbia and lower Willamette rivers below Portland- Part 1, p.771-772;
- 3) Mouth of Columbia river- Part 1, p. 773-774, Part 3, p. 2196-2203;
- 5) Dredge for improving lower Willamette and Columbia rivers- Part 2, p. 1105-1106, Part 3, p. 2190-2196;
- 6) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 775-776, Part 3, p. 2203-2204;
- 7) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 777-778, Part 3, p. 2204-2207;
- 8) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 776-777, Part 3, p. 2204-2207; and
- 9) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 779, Part 3, p. 2207.

US Army. 1908. Report of the chief of engineers US Army 1908 in three parts. Annual Reports, War

Department, Fiscal Year Ended June 30, 1908. (Annual report).Government Printing Office, Washington. 2244-2257, 2264-2279, 2305-2307 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Columbia and lower Willamette rivers below Portland- Part 1, p.820-822, Part 3, p.2264-2270;
- 2) Mouth of the Columbia river- Part 1, p. 822-825, Part 3, p. 2270-2274 (**Note**: opposite page 2272 is survey map of Columbia river entrance for the year 1908);
- 3) Dredge for improving lower Willamette and Columbia rivers- Part 1, p. 1143-1144;
- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 825-826, Part 3, p. 2274-2275;
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 827-829, Part 3, p. 2277-2278;
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 826-8277, Part 3, p. 2275-2277; and
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 829-830, Part 3, p. 2278-2279.

US Army. 1909. Report of the chief of engineers US Army 1909 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1909. (Annual report).Government Printing Office, Washington. 2210-2217, 2222-2223, 2230-2238, 2240-2243, 2260-2263 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Columbia and lower Willamette rivers below Portland- Part 1, p. 859-982, Part 3, p. 2230-2236;
- 2) Mouth of the Columbia river- Part 1, p.862-864, Part 3, p. 2236-2239;
- 3) Dredge for improving lower Willamette and Columbia rivers- Part 1, p.1153 (**Note**: opposite page 2238 is survey map of Columbia river entrance for the year 1909);
- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 865-866, Part 3, p. 2239-2240;
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 867-869, Part 3, p. 2241-2242;
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 866-867, Part 3, p. 2240-2241; and
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 869-870, Part 3, p. 2242-2243.

US Army. 1913. Report of the chief of engineers US Army 1913 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1913. (Annual report).Government Printing Office, Washington. 3068-3085, 3092-3095, 3100-3105,3108-3115, 3140-3143 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Oregon Slough (part of the former channel of the Columbia river which separates Hayden Island from the Oregon mainland)- Part 1, p. 1338-1340 (**Note:** Includes table of references to examination or survey reports or maps not in the project documents for years 1892, 1896, 1904, & 1912), Part 3, p. 3083-3084;
- 2) Columbia and lower Willamette rivers below Portland- Part 1, p. 1350-1354 (**Note:** Includes table of references to examination or survey reports or maps including the project documents for years 1877, 1891, 1892, & 1900), Part 3, p. 3092-3100;
- 3) Mouth of the Columbia river- Part 1, p. 1354-1359, Part 3, p. 3100-3108 (**Note:** opposite page 3104 is survey map of Columbia river entrance for the year 1913);
- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1359-1361 & p. 1367-1368 (**Note:** Snag removal projects), Part 3, p. 3108-3109 & p. 3115 (**Note:** Snag removal projects);
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1364-1367 & p. 1367-1368 (**Note:** Snag removal projects), Part 3, p. 3113-3114 & p. 3115 (**Note:** Snag removal projects);
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1362-1364 & p. 1367-1368 (**Note:** Snag removal projects), Part 3, p. 3110-3112 & p. 3115 (**Note:** Snag removal projects); and
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1368-1369, Part 3, p. 3115-3116.

US Army. 1914. Report of the chief of engineers US Army 1914 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1914. (Annual report). Government Printing Office, Washington. 3197-3215, 3222-3245, 3266-3267 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Oregon Slough (part of the former channel of the Columbia river which separates Hayden Island from the Oregon mainland)- Part 1, p. 1387-1389 (**Note:** Includes table of references to examination or survey reports or maps not in the project documents for years 1892, 1896, 1904, & 1912),
- 2) Columbia and lower Willamette rivers below Portland- Part 1, p. 1400-1403 (**Note:** Includes table of references to examination or survey reports or maps including the project documents for years 1877, 1891, 1892, & 1900),
- 3) Mouth of the Columbia river- Part 1, p. 1403-1409 (**Note:** Includes (1) Table of references to examination or survey reports or maps including the project documents for years 1879, 1880, 1883, 1886, 1890, 1893, 1895, 1900 & 1903, and (2) Information on the amount of stone used for the 1884 and 1903 jetty projects);

- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1409-1411 & p. 1417-1418 (Note: Dredge & snag removal projects), Part 3, p. 3239-3240 & p. 3245 (Note: Dredge & snag removal projects);
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1414-1417 & p. 1417-1418 (Note: Dredge & snag removal projects), Part 3, p. 3243-3444 & p. 3455 (Note: Dredge & snag removal projects);
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1411-1414 & p. 1417-1418 (Note: Dredge & snag removal projects), Part 3, p. 3240-3243 & p. 3455 (Note: Dredge & snag removal projects); and
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1418-1419, Part 3, p. 3245-3246.

US Army. 1915. Report of the chief of engineers US Army 1915 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1915. (Annual report).Government Printing Office, Washington. 3370-3375, 3388-3389, 3396-3419, 3442-3443 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) The Columbia river between Vancouver, WA and the mouth of the Willamette river- Part 1, p. 1513-115;
- 2) Oregon Slough (part of the former channel of the Columbia river which separates Hayden Island from the Oregon mainland)- Part 1, p. 1515-1518, Part 3, p. 3389-3390;
- 3) Columbia and lower Willamette rivers below Portland- Part 1, p. 1527-1532, Part 2, p. 1998-1999, Part 3, p. 3397-3404;
- 4) Mouth of the Columbia river- Part 1, p.1533-1538, Part 2, p. 1999-2000, Part 3, p. 3404-3414 (Note: opposite page 3408 are survey maps of Columbia river entrance for the September and December 1914, and March and June 1915);
- 5) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1538-1540 & p. 1546-1547 (Note: Dredge & snag removal projects), Part 2, p. 2000, Part 3, p. 3414-3415 & p. 3418-3419 (Note: Dredge & snag removal projects);
- 6) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1543-1546 & p. 1546-1547 (Note: Dredge & snag removal projects), Part 2, 2001, Part 3, p. 3417--3418 & p. 3418-3419 (Note: Dredge & snag removal projects);
- 7) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1540-1542 & p. 1546-1547 (Note: Dredge & snag removal projects), Part 2, p. 2000, Part 3, p. 3415-3417 & p. 3418-3419 (Note: Dredge & snag removal projects); and
- 8) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1547-1549, Part 3, p. 3245-3246.

US Army. 1916. Report of the chief of engineers US Army 1916 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1916. (Annual report).Government Printing Office, Washington. 3207-3219, 3226-3227, 3232-3245, 3270-3273 p.

Abstract: The reference contains comprehensive information regarding projects and activities related

to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Columbia and lower Willamette rivers below Portland- Part 1, p. 1649-1655, Part 3, p.3227-3233;
- 2) Mouth of the Columbia river- Part 1, p. 1655-1658, Part 3, p. 3233-3238 (**Note**: opposite page 3408 is survey map of Columbia river entrance for the June 1916).
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1658-1661 & p. 1668 (Note: Dredge & snag removal projects), Part 3, p. 3239-3240 & p. 3244-3245 (Note: Dredge & snag removal projects);
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1663-1667 & p. 1668 (Note: Dredge & snag removal projects), Part 3, p. 3242--3244 & p. 3244-3245 (Note: Dredge & snag removal projects);
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1661-1663 & p. 1668 (Note: Dredge & snag removal projects), Part 3, p. 3240-3242 & p. 3244-3245 (**Note** : Dredge & snag removal projects); and
- 6) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1668-1670, Part 3, p. 3245-3246.

US Army. 1917. Report of the chief of engineers US Army 1917 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1917. (Annual report).Government Printing Office, Washington. 3322-3323, 3328-3335, 3344-3349, 3376-3377 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1716-1719, Part 2, p. 3329-3333;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1719-1726, Part 2, p. 3333-3340;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1726-1729, Part 2, p. 3340-3342;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1735-1739, Part 2, p. 3345--3347;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1739-1741, Part 2, p. 3347-3349; and
- 6) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1742-1744, Part 2, p. 3349-3350.

US Army. 1918. Report of the chief of engineers US Army 1918 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1918. (Annual report).Government Printing Office, Washington. 3370-3371, 3377-3385, 3394-3397 p.

Abstract: The reference contains comprehensive information regarding projects and activities related

to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p. 1763-1766, Part 3, p. 3377-3380 (**Note**: opposite page 3378 is survey map of Columbia river entrance for the June 1918).;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p.1766-1772, Part 3, p. 3381-3388;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1773-1775, Part 3, p. 3389-3390;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1782-1786, Part 3, p. 3394--3395;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1786-1789, Part 3, p. 3395-3397; and
- 6) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1789-1791, Part 3, p. 3397-3398.

US Army. 1919. Report of the chief of engineers US Army 1919 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1919. (Annual report).Government Printing Office, Washington . 3424-3441 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p. 1857-1861, Part 3, p. 3433-3437 (**Note**: opposite page 3434 is survey map of Columbia river entrance for the June 1919).;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p.1861-1867, Part 3, p. 3437-3445.
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1867-1870, Part 3, p.3445-3446 ;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1877-1880, Part 2, p. 3450-3451;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1881-1883, Part 3, p. 3452-3453;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1883-1885, Part 3, p. 3453-3454; and
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1885-1888, Part 3, p. 3454-3455.

US Army. 1920. (Annual report).Government Printing Office, Washington. 2926-2945 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis,

Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1851-1854, Part 2, p. 2935-2937 (**Note** : opposite page 2936 is survey map of Columbia river entrance for the June 1920);
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1854-1861, Part 2, p. 2937-2940;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1861-1863, Part 2, p.2941 ;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1870-1873, Part 2, p. 2943-2944;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1874-1876, Part 2, p. 2944;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1876-1878, Part 2, p. 2945; and
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1878-1881, Part 2, p. 2945.

US Army. 1921. Report of the chief of engineers US Army 1921 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1921. (Annual report).Government Printing Office, Washington . 1850-1877, 1886-1895, 1944-1947 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1867-1870 (**Note** : opposite page 1868 is survey map of Columbia river entrance for the June 1921);
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1870-1877;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1877-1880;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1886-1889;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1889-1892;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1892-1894; and
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1894-1897.

US Army. 1922. Report of the chief of engineers US Army 1922 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1922. (Annual report).Government Printing Office, Washington . 1868-1899, 1909-1921, 1964-1967 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones

of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1887-1889;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1890-1897;
- 3) Willamette Slough (also known as Multnomah Channel- 21 miles in length, flowing in northerly direction, connecting the Willamette and Columbia rivers at St. Helens, OR)- Part 1, p. 1897-1899 (**Note:** a new project in the fiscal year 1922);
- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1900-1902;
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1909-1912;
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1912-1914;
- 7) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1915-1916; and
- 8) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1916-1919.

US Army. 1923. Report of the chief of engineers US Army 1923 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1923. Washington Government Printing Office, Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1743-11746;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1746-1754;
- 3) Willamette Slough (also known as Multnomah Channel- 21 miles in length, flowing in northerly direction, connecting the Willamette and Columbia rivers at St. Helens, OR)- Part 1, p. 1754-1756;
- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1756-1759;
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1764-1767;
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1767-1769;
- 7) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1769-1771; and
- 8) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1772-1774.

US Army. 1924. Report of the chief of engineers US Army 1924 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1924. Washington Government Printing Office, Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis,

Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1748-1751;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1751-1759;
- 3) Willamette Slough (also known as Multnomah Channel 21 miles in length, flowing in northerly direction, connecting the Willamette and Columbia rivers at St. Helens, OR)- Part 1, p. 1760-1762;
- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1762-1764;
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1769-1772;
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1772-1774;
- 7) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1775-1776; and
- 8) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1777-1779.

US Army. 1925. Report of the chief of engineers US Army 1925 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1925. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1676-1679;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1679-1686;
- 3) Willamette Slough (also known as Multnomah Channel 21 miles in length, flowing in northerly direction, connecting the Willamette and Columbia rivers at St. Helens, OR)- Part 1, p. 1686-1688;
- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1688-1691;
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1699-1701;
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1702-1704;
- 7) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1704-1705;
- 8) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1706-1707; and
- 9) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1708-1709.

US Army. 1926. Report of the chief of engineers US Army 1926 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1926. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the

river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1665-1668;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1668-1677;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1677-1680;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1688-1691;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1691-1694;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1694-1696;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1696-1698; and
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1698-1701.

US Army. 1927. Report of the chief of engineers US Army 1927 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1927. Washington Government Printing Office, Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1664-1667;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1667-1675;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1675-1678;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1700-1702;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1702-1705;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1705-1707;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1707-1709; and
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1709-1711.

US Army. 1928. Report of the chief of engineers US Army 1928 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1928. Washington Government Printing Office, Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results,

etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1725-1728;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1728-1736;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1736-1739;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1761-1763;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1764-1766;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1766-1768;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1769-1770; and
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1771-1773.

US Army. 1929. Report of the chief of engineers US Army 1929 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1929. Washington Government Printing Office, Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1753-1756;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1756-1764;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1764-1767;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1790-1793;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1793-1796;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1796-1798;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1798-1800; and
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1800-1802.

US Army. 1930. Report of the chief of engineers US Army 1930 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1930. Washington Government Printing Office, Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1844-1847;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1849-1856;

- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1856-1859;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1886-1889;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1889-1892;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1893-1895;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1895-1897;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1897-1900;
- 9) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)- Part 1, p. 1847-1849 (**Note**: reference provides a short history of the stream & condition);
- 10) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1885-1886 (**Note**: a short history of the stream and associated activities/description is provided); and
- 11) Steamboat Slough (also known as Skamokama Slough)- Part 1, p. 1892-1893.

US Army. 1931. Report of the chief of engineers US Army 1931 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1931. Washington Government Printing Office, Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1854- 1857;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1861-1869;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1869-1872;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1899-1901;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1901-1905;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1906-1910;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1895-1897;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1911-1913;
- 9) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)- Part 1, p. 1857-1860 (**Note**: reference provides a short history of the stream & condition);
- 10) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1896-1899 (**Note**: a short history of the stream and associated activities/description is provided); and
- 11) Steamboat Slough (also known as Skamokama Slough)- Part 1, p. 1905-1906.

US Army. 1932. Report of the chief of engineers US Army 1932 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1932. Washington Government Printing Office, Abstract: The reference contains comprehensive information regarding projects and activities related

to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1756-1760;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1762-1771;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1771-1773;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1794-1796;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1796-1799;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1800-1802;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1802-1803;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1803-1805;
- 9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1792-1794 (**Note** : a short history of the stream and associated activities/description is provided); and
- 10) Steamboat Slough (also known as Skamokama Slough)- Part 1, p. 1799-1800.

US Army. 1933. Report of the chief of engineers US Army 1933 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1933. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1140-1143;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1145-1150;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1150-1152;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1164-1165;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1166-1168;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1168-1169;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1802-1803;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1169-1170; and
- 9) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)- Part 1, p. 1143-1145 (**Note** : reference provides a short history of the stream & condition).

US Army. 1934. Report of the chief of engineers US Army 1934 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1934. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1313-1316;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1318-1325;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1325-1326;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1343-1344;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1344-1347;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1347-1348;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1348-1350;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1350-1351;
- 9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1341-1343 (**Note** : a short history of the stream and associated activities/description is provided);
- 10) Columbia river at Bakers Bay- Part 1, p. 1351-1352;
- 11) Columbia river at Bonneville-Part 1, p. 1334-1337; and
- 12) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)- Part 1, - Part 1, p. 1316-1318 (**Note** : reference provides a short history of the stream & condition).

US Army. 1935. Report of the chief of engineers US Army 1935 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1935. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1475-1477;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1479-1487;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1487-1488;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1499-1501;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1501-1503;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1503-1504;

- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1504-1505;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1505-1507;
- 9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1498-1499 (**Note** : a short history of the stream and associated activities/description is provided);
- 10) Columbia river at Bakers Bay- Part 1, p. 1507-1508;
- 11) Columbia river at Bonneville-Part 1, p. 1513-1516;
- 12) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)- Part 1, - Part 1, p. 1477-1478 (**Note** : reference provides a short history of the stream & condition);
- 13) Youngs Bay and Youngs river (lower 8 mi. tidal)-Part 1, p. 1478-1479; and
- 14) Multnomah Channel (also known as Willamette Slough)-Part 1, p. 1489-1490.

US Army. 1936. Report of the chief of engineers US Army 1936 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1936. Washington Government Printing Office, Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1476-1478;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1481-1487;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1487-1489;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1500-1502;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1502-1504;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1504-1505;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1505-1506;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1506-1507;
- 9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1499-1500 (**Note** : a short history of the stream and associated activities/description is provided);
- 10) Columbia river at Bakers Bay- Part 1, p. 1507-1508;
- 11) Columbia river at Bonneville -Part 1, p. 1517-1524;
- 12) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)- Part 1, - Part 1, p. 1479-1480 (**Note** : reference provides a short history of the stream & condition);
- 13) Youngs Bay and Youngs river (lower 8 mi. tidal)-Part 1, p. 1480;
- 14) Multnomah Channel (also known as Willamette Slough)-Part 1, p. 1489-1490; and
- 15) Oregon Slough (also known as North Portland Harbor)-Part 1, p. 1498-1499.

US Army. 1937. Report of the chief of engineers US Army 1937 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1937. Washington Government Printing Office, Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones

of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1487-1489;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1492-1498;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1499-1500;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1509-1510;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1510-1512;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1513-1514;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1514-1515;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1515-1516;
- 9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1508-1509 (**Note** : a short history of the stream and associated activities/description is provided);
- 10) Columbia river at Bakers Bay- Part 1, p. 1516-1517;
- 11) Columbia river at Bonneville -Part 1, p. 1529-1536;
- 12) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)-Part 1, p. 1489-1491 (**Note** : reference provides a short history of the stream & condition);
- 13) Youngs Bay and Youngs river (lower 8 mi. tidal)-Part 1, p. 1491-1492;
- 14) Multnomah Channel (also known as Willamette Slough)-Part 1, p. 1500-1501;
- 15) Oregon Slough (also known as North Portland Harbor)-Part 1, p. 1498-1499;
- 16) Westport Slough (side channel of the Columbia river located 70 mi. below Portland, OR)-Part 1, p. 1498-1499;
- 17) Elockomin Slough (3.5 mi. in length, located 75 mi. below Portland)-Part 1, p. 1512-1513; and
- 18) Columbia river between Vancouver and Bonneville -Part 1, p. 1528-1529.

US Army. 1938. Report of the chief of engineers US Army 1938 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1938. Washington Government Printing Office, Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1740-1742;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1746-1750;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1751-1753;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1762-1763;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)-

- Part 1, p. 1763-1765;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1766-1767;
  - 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1767-1768;
  - 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1768-1769;
  - 9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1761-1762 (**Note** : a short history of the stream and associated activities/description is provided);
  - 10) Columbia river at Bakers Bay- Part 1, p. 1769-1770;
  - 11) Columbia river at Bonneville -Part 1, p. 1829-1838;
  - 12) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)-Part 1, p. 1742-1744 (**Note** : reference provides a short history of the stream & condition);
  - 13) Youngs Bay and Youngs river (lower 8 mi. tidal)-Part 1, p. 1745-1746;
  - 14) Multnomah Channel (also known as Willamette Slough)-Part 1, p. 1753-1754;
  - 15) Oregon Slough (also known as North Portland Harbor)-Part 1, p. 1498-1499;
  - 16) Westport Slough (side channel of the Columbia river located 70 mi. below Portland, OR)-Part 1, p. 1751;
  - 17) Elockomin Slough (3.5 mi. in length, located 75 mi. below Portland)-Part 1, p. 1765-1766;
  - 18) Columbia river between Vancouver and Bonneville-Part 1, p. 1828-1829;
  - 19) Columbia river between Chinook, WA and head of Sand Island-Part 1, p. 1770-1771; and
  - 20) Information regarding diking & Improving Districts along lower Columbia-Part 1, p. 1774-1808.

US Army. 1939. Report of the chief of engineers US Army 1939 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1939. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1890-1893;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1897-1903;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1903-1904;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1914-1915;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1915-1917;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1918-1919;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1919-1920;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1920-1922;
- 9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1913-1914 (**Note** : a short history of the stream and associated activities/description is provided);
- 10) Columbia river at Bakers Bay- Part 1, p. 1922-1923;
- 11) Columbia river at Bonneville -Part 1, p. 2002-2011;
- 12) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked

stream with ~1.8 mi tidal)-Part 1, p. 1893-1895 (**Note**: reference provides a short history of the stream & condition);

13) Youngs Bay and Youngs river (lower 8 mi. tidal)-Part 1, p. 1895-1897;

14) Multnomah Channel (also known as Willamette Slough)-Part 1, p. 1904-1905;

15) Oregon Slough (also known as North Portland Harbor)-Part 1, p. 1498-1499;

16) Westport Slough (side channel of the Columbia river located 70 mi. below Portland, OR)-Part 1, p. 1751;

17) Elockomin Slough (3.5 mi. in length, located 75 mi. below Portland)-Part 1, p. 1917-1918;

18) Columbia river between Vancouver and Bonneville -Part 1, p. 2000-2002;

19) Columbia river between Chinook, WA and head of Sand Island-Part 1, p. 1923-1924; and

20) Information regarding diking & Improving Districts along lower Columbia -Part 1, p. 1927-1973.

US Army Corps of Engineers. 1978. Columbia river downstream of Bonneville dam- maintenance disposal plan. US Army Corps of Engineers, Portland District, 79 p.

Abstract: Reference provides information regarding shoal/bar patterns of the entrance and estuary of the Columbia river to Bonneville dam, with respect to current and future dredging operations (and disposal areas of materials) for maintenance of the navigation channel. Information (past maintenance, present Oregon side disposal, and present Washington side disposal) for each critical bar/reach is provided; each is illustrated using an aerial photograph that is detailed with data & outlines.

**Note**: Photographs provide excellent details of inriver, riparian and uplands habitat from an aerial perspective.

US Commission of Fish and Fisheries. 1895. Bulletin of the US Fish Commission for 1894, Vol. XIV. US Commission of Fish and Fisheries, Washington, DC: Government printing office, 1894.

Abstract: Eigenmann, Carl H. Results of explorations in western Canada and the northwestern US (pages 101-132): References to habitat of Umatilla River, Grande Ronde, Snake River (at Idaho Falls); and a milling dam on the Grande Ronde at the town of La Grande. Discussion of species and taxonomic characteristics. NOTE: VERY IMPORTANT REFERENCE. Gilbert, C.H. and B.W. Evermann. A report upon the physical and natural history investigations in the Columbia River basin (pages 169-207): Extensive discussions of habitat characteristics for tributaries of the Lower Columbia (Cowlitz, Yakima, Naches, and Toutle) and the upper Columbia (Colville, Little Spokane, Spokane, Snake and tributaries. References that large numbers of salmon used to ascend the Yakima River and Columbia River at Kettle Falls; also has stream temperature and flow data for the Yakima, Naches, and Manatash Creek. NOTE: VERY IMPORTANT REFERENCE. McDonald, Marshall. The salmon Fisheries of the Columbia River, together with a report upon the physical and natural history investigations in the region, by Gilbert and Evermann (Pages 153-207): a presentation of the status of salmon and reasons for decline of salmon in the Columbia basin, that was given to the Congress. NOTE: VERY IMPORTANT REFERENCE.

US Commission of Fish and Fisheries. 1895. Part XIX: Report of the Commissioner for 1893. US Commission of Fish and Fisheries, Washington, DC: Government printing office. 38-41 p.

Abstract: Discussion of the investigations of interior waters of the Columbia River (Clarke Fort, Pend d'Oreille Lake, and Pend d' Oreille River) in terms of habitat, physical impediments to passage/navigation. Reference to occurrence of chinook salmon and steelhead trout in the Pend d'Oreille River. Commissioner stated intentions to expand investigations of habitat/passage of salmon throughout the entire Columbia River and its tributaries. Pages 38-41. Discussion of the operation of the Clackamas station Oregon (Waldo F. Hubbard, superintendent) during 1892; references to adult and egg collection of chinook salmon at the Sandy River. Pages 121-122. Extensive section that elaborates on The Fisheries of The Pacific Coast (text and statistical tables), inclusive of the Columbia River. Pages 143-304.

US Department of Commerce. 1932. Doctor Ellis demonstrates serious effects of mine pollution. Fisheries Service Bulletin No. 211, Bureau of Fisheries, US Department of Commerce, Washington DC, December 1, 1932.

Abstract: Notes the history and results of Dr. M.M. Ellis (US Bureau of Fisheries) who studied the pollution problem of Couer d'Alene River in Idaho, regarding wastes from silver, lead, and zinc mines. Survey extended from Montana to Spokane River in Washington. Provides extensive information on extent and type of habitat degradation to streams and lakes caused from mining wastes. Mentions that aquatic production of Couer d'Alene Lake was showing decline in the southern end from 1911, and species of trout were scarce, p. 3-4.

US House of Representatives. 1881. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1881 in three parts. 47th Congress, 1st Session, Ex. Doc.1, pt 2, vol.II. Washington Government Printing Office,

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river- Part 3, p. 2534-2552 (includes historical description of river mouth for physical characteristics and projects since early 1839, and bathymetry maps December 1880 and February 1881 opposite p.2546 & 2552 respectively);
- (2) Lower Willamette and Columbia rivers from Portland to the sea-Part 1, p. 324-326, Part 3, p. 2531-2534 (surveys & dredging activities);
- (3) Cowlitz River-Part 1, p.331, Part 3, p. 2600-2603 (includes brief historical description of river characteristics and commerce in the valley adjacent to the river); and
- (4) Young's, Lewis & Clark, and Skipanon rivers, tributaries to Young's Bay-Part 1, p.332.

US House of Representatives. 1887. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1887 in four parts. 50th Congress, 1st Session, Ex. Doc.1, pt 2, vol.II. Washington Government Printing Office,

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river- Part 1, p. 327, Part 3, p. 2470 etc. (not available at U of W library for review);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 331, Part 3, p. 2507 etc. (not available at U of W library for review); and
- (3) Cowlitz river- Part 1, p. 333, Part 3, p. 2524 etc. (not available at U of W library for review).

US House of Representatives. 1891. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1891 in six parts. 52D Congress, 1st Session, Ex. Doc.1, pt 2, vol.II. (Annual report).Government Printing Office, Washington. 3284-3293 (incomplete) p.

Abstract: The reference contains comprehensive information regarding projects and activities related

to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 412-413 (channel maintenance and work on low-tide jetty from Fort Stevens to Clatsop Spit), Part 5, p. 3314-3328 (includes bathymetry map of Columbia mouth for June 1891);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 416-417, Part 5, p. 3362-3367;
- (3) Cowlitz river- Part 1, p. 418-419
- (4) Willamette river at Swan Island-Part 1, p. 420, Part 5, p.3370-3371;
- (5) Young's Bay (improvement of Young's and Klasskuine rivers) at Columbia river mouth-Part 1, p. 420, Part 5, p.3371-3372 (removal of snags and overhanging trees);
- (6) Deep, Skamakawa, and Crooked rivers-Part 1, p. 420
- (7) Lower Columbia river between Astoria and Woods Landing (snag removal project)-Part 1, p. 420, Part 5, p.3380;
- (8) Lewis and Clarke's river (snag & overhanging trees removal project)-Part 1, p. 421, Part 5, p.3384-3385;
- (9) Grays river (sand bar, snag & overhanging trees removal project)-Part 1, p. 421, Part 5, p.3386-3387; and
- (10) Deep, Skamakawa, and Crooked rivers-Part 5, p. 3378-3379.

General description of attributes for the Snake river from the mouth to Lewiston, ID, Table containing gradient information for various rapids.

General description of attributes for the Snake river from the Seven Devils Mining District (~65 miles below Huntington Bridge) to Huntington Bridge (near the Burnt river mouth).

US House of Representatives. 1892. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1892 in four parts and atlas. 52D Congress, 2d Session, Ex. Doc.1, pt 2, vol.II. (Annual report).Government Printing Office, Washington. 2374-2485, 2400-2409, 2708-2715 p. Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 386-388 (channel maintenance and work on low-tide jetty from Fort Stevens to Clatsop Spit), Part 3, p. 2808-2818;
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 389-391, Part 3, p. 2829-2835;
- (3) Cowlitz river- Part 1, p. 392-393, Part 3, p. 2837-2838;
- (4) Young's Bay (improvement of Young's and Klasskuine rivers) at Columbia river mouth-Part 1, p. 393, Part 3, p.2839 (removal of snags and overhanging trees);
- (5) Lower Willamette and Columbia rivers, with view of securing 25 feet a low water from Portland to the mouth of the Columbia-Part 1, p. 394-395, Part 3, p. 2851-2869; and
- (6) Willamette river at Ross Island-Part 3, p.2842-2844.

**Atlas**: Map no. 126- Depth sounding of the Columbia river mouth, 9,10, 11 June 1892; Map no. 127- Showing jetty construction at Columbia river mouth

General description of attributes for the Snake river reaches from Riparia to Lewiston, ID.

US House of Representatives. 1893. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1893 in six parts. 53D Congress, 2d Session, Ex. Doc.1, pt 2, vol.II. (Annual report).Government Printing Office, Washington. 3374-3377 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area.The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

(1) Mouth of Columbia river-Part 1, p. 447-449 (channel maintenance and work on low-tide jetty from Fort Stevens to Clatsop Spit), Part 4, p. 3488-3503 (includes bathymetry map of mouth, June 1893 opposite of p. 3496);

(2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 452-455, Part 4, p. 3515-3522;;

(3) Cowlitz river- Part 1, p. 456, Part 4, p. 3526-3527;

(4) Young's and Klasskuine rivers-Part 1, p. 456-457, Part 4, p.3527-3528 (removal of snags and overhanging trees);

(5) Lewis river from mouth to Speliah creek-Part 1, p. 458, Part 4, p. 3533-3536; and

(6) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 449-450, Part 4, p. 3503-3506.

General description of attributes for the Snake river from the Seven Devils Mining District (~65 miles below Huntington Bridge) to Huntington Bridge (near the Burnt river mouth).

US House of Representatives. 1894. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1894 in six parts. 53D Congress, 3d Session, Ex. Doc.1, pt 2, vol.II. (Annual report).Government Printing Office, Washington. 2588-2593 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area.The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

(1) Mouth of Columbia river-Part 1, p. 413-414 (channel maintenance and work on low-tide jetty from Fort Stevens to Clatsop Spit), Part 4, p. 2631-2642 (includes bathymetry map of mouth, June 1894 opposite of p. 2640);

(2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 416-417, Part 4, p. 2654-2659;

(3) Cowlitz river- Part 1, p. 417-418, Part 4, p. 2662-2663;

(4) Young's and Klasskuine rivers-Part 1, p. 418, Part 4, p.2663 (removal of snags and overhanging trees); and

(5) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 414-415, Part 4, p. 2643-2645.

General description of attributes for the Snake river from the Seven Devils Mining District (~65 miles below Huntington Bridge) to Huntington Bridge (near the Burnt river mouth). - brief note on original condition of this reach.

US House of Representatives. 1895. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1895 in seven parts. 54th Congress, 1st Session, Ex. Doc.1, pt 2, vol.II. (Annual report). Government Printing Office, Washington. 3388-3393 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 460-461, Part 5, p. 3551-3561 (includes bathymetry map of mouth, October-November 1894 opposite of p. 3560);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 461-462, Part 5, p. 3561-3566;
- (3) Cowlitz river- Part 1, p. 466, Part 5, p. 3594-3595;
- (4) Young's and Klasskuine rivers-Part 1, p. 466, Part 5, p.3595-3596 (removal of snags and overhanging trees);
- (5) Clatskanie river, from mouth to town of Clatskanie-Part 1, p. 467, Part 5, p. 3596-3598 (description of existing conditions prior to project improvements);
- (6) Lewis river from La Center to its mouth-Part 1, p. 467, Part 5, p. 3600-3601;
- (7) South channel of Columbia river (in front of Astoria, OR-Part 1, p. 468, Part 5, p. 3605-3606 (includes bathymetry map of south channel, Tongue Pt to Smith Point, dated November 1894 opposite p. 3608); and
- (8) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 462-463, Part 5, p. 3566-3568.

General description of attributes for the Snake river from the Seven Devils Mining District (~65 miles below Huntington Bridge) to Huntington Bridge (near the Burnt river mouth). - brief note on original condition of this reach.

US House of Representatives. 1896. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1896 in six parts. 54th Congress, 2d Session, Ex. Doc.1, pt 2, vol.II. (Annual report). Government Printing Office, Washington. 3382-3389 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 400-401, Part 5, p. 3250-3256 (includes bathymetry map of mouth, October-November 1894 opposite of p. 3560);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 401-422, Part 5, p. 3257-3262;
- (3) Cowlitz river- Part 1, p. 415, Part 5, p. 3385-3386;
- (4) Young's and Klasskuine rivers-Part 1, p. 405, Part 5, p.3283; and
- (5) South channel of Columbia river (in front of Astoria, OR-Part 1, p. 401, Part 5, p. 3256-3257;
- (6) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 402-403, Part 5, p. 3263-3266.

General description of attributes for the Snake river from the Seven Devils Mining District (~65 miles below Huntington Bridge) to Huntington Bridge (near the Burnt river mouth). - brief note on original condition of this reach.

Victor, E. 1935. some effects of cultivation upon stream history and upon the topography of the Palouse region. Northwest Science IX(3): 18-19 (September, 1935).

Abstract: Author discusses habitat alterations (bank erosion, channel scouring, etc.) along stream courses in the Palouse region, due to human activities and environmental dynamics; mentions Miller Creek (near Walla Walla), Touchet (near Waitsburg) and Palouse rivers as examples of channel changes.

Ward, H. B. 1939. The migration and conservation of salmon. Publication of the American Association of Advanced Sciences 8: 60-71.

Abstract: Author discusses habitat influences on behavior of salmonid fishes; emphasizes that habitats are not static, and that it is important to understand environmental factors that modify behaviors. Makes continuous references to effects of temperature on behavior patterns and outcomes. (Pertinent to life history strategies paper.)

Washington Department of Fisheries. 1938. Report of the preliminary investigations into the possible methods of preserving the Columbia River salmon and steelhead at the Grand Coulee Dam. Report prepared for the US Bureau of Reclamation by the State of Washington Department of Fisheries, in cooperation with the Department of Game and the US Bureau of Fisheries. 121 pp.

Abstract: Comprehensive report of investigative findings regarding fish counts, biology, behavior, habitat of salmon stocks in the tributaries of the Columbia River above Rock Island to Grand Coulee. Includes trap counts of upstream and downstream migrants at Rock Island and tributaries; some biometric data of these trapped fish are presented (Wenatchee, Methow, Twisp, etc.) Some environmental data such as water temperature and water flow are given for some tributaries. Briefly describes water development projects (irrigation) and their associated fish protection facilities. Excellent document for deriving historical background information regarding the planning of fish salvage and mitigation measures associated with the Grand Coulee project.

Washington State. 1907. 16th and 17th annual reports of the state fish commissioner and game warden: 1905-1906. State of Washington Department of Fisheries and Game, Seattle, Washington. C.W. Corham, Public Printer, 1907.

Abstract: The commissioner (John L. Riseland) discusses the situation of fishing, fishing seasons, and disjointed regulations of Oregon and Washington in the lower Columbia River; expresses concern that if the early season is not shortened, the Royal chinook will further decline and lead to situation where packers will have to depend on fall season rather than early and mid seasons. Provides newspaper quotes from the Portland Oregonian that support his statements. pages 10-14. Provides a report on Washington salmon hatcheries in the Columbia basin; notes that the Wenatchee Hatchery is the only hatchery tributary to the Columbia that propagates Silverside salmon (coho). Also mentions that manager of the Colville Hatchery could only acquire 90,000 silverside salmon eggs in the stream (Colville River); and that the facility was deemed not to operate. Notes that the Klickitat hatchery was never completed, and was abandoned in 1902, pages 24-25. Notes that the Wind River Logging company, on the Wind River, flooded the Wind River, carrying all their logs into the Columbia River; this citation documents the use of crib dams to contain logs and flush logs down the Wind River, page 30. Notes that the Methow hatchery is the only remaining salmon hatchery (Colville, Little Spokane and Klickitat hatcheries are closed) on the east side of the Cascades to propagate silverside salmon; infers that Colville, Little Spokane and Klickitat Rivers have or had runs of coho salmon, pages 30-131. Provides letters that note run and habitat conditions on the Klickitat, Colville, Wenatchee, and Lewis Rivers, Page 39-42.

Wilkes, Charles. 1856. Narrative of the United States expedition. During the years 1838, 1839, 1840, 1841, 1842. By Charles Wilkes, USN. Commander of the expedition, member of the American Philosophical Society, etc. In five volumes, with thirteen maps. Vol IV. G.P. Putnam & Co., 321

Broadway, New York. 1-4 (notes on work) p.

Abstract: Author provides an account of his experiences and observations during his travels in the Columbia river basin; notes habitat/landscapes, fauna, flora of various reach sections of the Columbia river and tributaries.

Wissmar, R. C., J.E. Smith, B.A. McIntosh, H.W. Li, G.H. Reaves, and J.R. Sedell. 1994. A history of resource use and disturbance in riverine basins of eastern Oregon and Washington (early 1800s-1900s). Northwest Science 68, Special Issue: 1-35.

Abstract: Authors provide a historical review of human activities (mining, livestock, irrigation, and logging) and habitat alterations in the Okanogan, Methow, Little Naches, Grande Ronde, and John Day basins) Table 1 presents a chronology of major settlement, human activities, and natural resources development in these basins.

Wood, Tallmadge R. 1903. Letters of Tallmadge R. Wood. The Quarterly of the Oregon Historical Society VI(1): 80-85 (March 1903).

Abstract: Author notes in letter of 19 February 1846 (Clatsop, Co. Oregon Territory) that: 1) six sawmills and five flour mills are now in operation (the Clatsop county region), p.81; 2) heavy timber and broken land along each side of the river (Columbia River from Astoria to the mouth of the Cowlitz River),p. 82; Provides general description of the habitat/vegetation/soil along the banks of the Columbia River in the Clatsop County area.

## **HARVEST**

### Reference List

Gaumer, Tom, Demory, Darrell, and Osis, Laimons. 1973. 1971 Columbia River Estuarine estuary resource use study. Fish Commission of Oregon, Division of Management and Research, Portland, Oregon.

Abstract: Authors provide information regarding fish species (invertebrate and vertebrate) harvested and observed in the recreation harvest from the seaward end of the south jetty upstream to the area adjacent to Jetty Sands parking lot, from 1 March through 31 October 1971. Figures and tables temporally and spatially illustrate the species and catch statistics for this harvest.

Griffin, L. E. 1935. Certainties and risks affecting fisheries connected with damming the Columbia River. Northwest Science IX(1): 25-30 (February, 1935).

Abstract: Author discusses 1) the economic importance of anadromous and resident fish species, and the effects on dam construction on said species; 2) the importance and distribution of salmon harvest in the Columbia basin; 3) the certainties associated with current state of technology of fish passage systems, and risks associated with designs and plans to be incorporated at the Bonneville project; 4) recommended actions to reduce risks associated with current fish passage technology; 5) certainties and risks associated with sedimentation and submergence of fish habitat (sloughs and shallows) in the Bonneville impoundment; 6) the certainties and risks of power plants to migration of young salmon; and 7) turbine designs and devices to reduce the risks associated with hydropower operation. Author alludes to a hypothesis that the Columbia impoundments (e.g. Bonneville) may present risks to the importance of the sloughs and shallow ponds contiguous to the river, as being very important as a food source to young salmon during their downstream migration.

Oregon State. 1896. 3rd and 4th Annual Reports of the State Fish and Game Protector of the State of Oregon 1895-1896. State of Oregon, Salem, Oregon. W.H. Leeds, State Printer, 1896. 10,53 p.

Abstract: The Protector (Hollister D. McGuire) discusses failure of the last legislature to enact laws for more effectual regulation and protection related to such topics as concurrent regulations with the state of Washington, protection of salmon through construction of fishways, and harvest limitations

on the Columbia River, page 5. Mentions that Oregon has an 1878 statute on the books requiring fishway construction at barriers to salmon, but his predecessors showed no willingness to enforce the statute. He lists the fishways that have been put in under his direction. pages 8-9. He discusses Indian fishing (Warm Spring Indians) and the earliest date of chinook salmon spawning in vicinity of the upper Clackamas River at its junction with a warm spring where thousands of salmon naturally spawn; this date is July 20th. page 10. Notes that a dam and operation of fishing in the lower Clackamas River (four miles below the hatchery) prevent salmon from ascending to the hatchery racks in 1893 and 1894; mentions that dam was removed last spring 1895. page 31. Mentions that \$10,000 was appropriated by the 1893 Oregon legislature for work to construct a fishway on the Willamette River at the falls at Oregon City, and notes that fishway work is completed but not adequate (except during high water stage) for the March and April migration of chinook at Oregon City falls, and that another \$4000 is necessary to effect this passage. pages 50-52. Recommends that a provision in the law should mandate that fish screens constructed at mill races, irrigation ditches, or canals, taking or receiving water from any river, creek, stream or lake having food fish; his attention to the need for such law was derived from a letter of Dr. C.H. Gilbert (Stanford University) who noted that water diverters on the Wallowa River killed thousands of young chinook and bludback salmon by diversion of them into irrigated fields. page 53. Notes that an Oregon law of 1893 and reenacted in 1895 created the office of the Fish & Game Protector. page 83.

Oregon State. 1907. Annual Report of the Department of Fisheries of the State of Oregon for year 1907 to the legislative assembly, twenty-fourth regular session (1907). State of Oregon, Salem, Oregon. W.S. Duniway, State Printer, 1907. 78-79 p.

Abstract: The Master Fish Warden (H.G. Van Dusen) states that "in view of the fear that the salmon of the Columbia River was not being rehabilitated through the medium of the system of artificial propagation, I am very pleased to be able to chronicle...that there has been a considerable increase in salmon produced by the Columbia River this year over last year..." This increase was for Chinook and steelhead in both Washington and Oregon. He mentions that chinook and steelhead over past five years, but decreases in silversides and bluebacks; and says that artificial propagation has been of assistance in the increase of chinook and steelhead. Page 7. Notes that hatcheries select to use large and strong fish (males) for egg fertilization, and do not use small males; attributes this selective practice to maintaining the 25 lb. average weight of chinook over the past seasons. Page 8. Notes that egg collection at facilities in Snake and Wallowa Rivers was very unsatisfactory, even though the fish racks were operated early, few fish go upstream this far, and those that did were three males to one female. But the eggtake at federal and state hatcheries (Oregon and Washington) below Celilo Falls the eggtake was good. page 13. Notes an inspection of the Santiam River (Willamette tributary) in regards to sites for artificial propagation activities. pages 17-18. Mentions that the first contract for the construction of the fishway over the falls of the Willamette River at Oregon City was completed and accepted by the state engineer on November 29, 1904. Mentions that as the Willamette Pulp and Paper Company completed a concrete dam at the falls, this dam caused water hydraulic problems in the fishway (upper pools) - the gradient of the upper portion of the fishway was too steep. This situation caused problems for the spring chinook migration over the falls. Surveys were conducted to make recommendations and provide cost estimates to remedy the fishway problem. Pages 20-24. Notes that hatchery station was established and operated on the McKenzie River at a site situated a couple of miles below Gates Creek; mentions that they took spawn of the early variety of chinook from August 15 to October 15th. States that liberated approximately 1.5 million fry of this 1905 brood year into the McKenzie River in the immediate vicinity of the station during the months of January and February 1906. Pages 75-76. Notes that Wallowa Hatchery station did not secure any sockeye salmon spawn during the 1905 BY - (note: appears that this BY cycle is extinct or some lower river blockage prevented sockeye from upper area). page 78. Notes that by leaving racks of the Wallowa Hatchery in the river late, they discover a late run of silversides that passed the racks in the month of November, but were unable to hold them to spawning due to severe cold weather

conditions. page 78. Notes that the Ontario hatchery station (Snake River at Swan Falls) left their rack in river late (until November 23rd) in hopes of collecting late running silversides, but none appeared. Page 84. Mentions the 1901 law passed by the Oregon State legislature that prohibited fishing above tide water and established fishing deadlines on all coast streams. page 129. Notes that fishway for the falls of the Willamette River at Oregon City provides excellent passage for early chinook in 1906, Page 132. Mentions request for two special deputy fish wardens to enforce laws regarding water diversions and dam obstructions that are causing mortality of young migrants going to sea; notes causes due to extensive development of power/mill dams across streams and irrigation projects that are taking water for irrigation purposes. Pages 134-135. Notes the needs for laws that assure better escapement to the spawning ground in the Columbia River; infers that hatcheries alone will not solve the problem of diminishing harvest to fishermen in the Columbia River. page 137. Notes that 1906 BY salmon returns (chinook and sockeye) in northeastern Oregon (Wallowa and Ontario Hatcheries) were poor; and that salmon runs in the lower Columbia River below Celilo Falls appeared to have been successful in running the gauntlet of net fishermen in the lower Columbia, Page 139. Mentions that he must secure eggs in order to assure shortage of Snake River stock (at Ontario Hatchery) four to five years hence, based on "...theory that Salmon return to the stream of their nativity to spawn..." Page 140.

Oregon State. 1951. Biennial report of the Fish Commission of the State of Oregon to the governor and forty-sixth legislative assembly, 1951. Fish Commission of the State of Oregon; Salem, Oregon, State Printing Office, 1951.

Abstract: Notes that (1) Fish commission has particular interest in the study of logging effects on salmon production, page 3. (2) On June 1948, the states of Oregon, Washington, and Idaho, and Federal Government (Fish & Wildlife Service, Department of Interior) consummated agreement of the provision of funds for the rehabilitation of the lower tributaries of the Columbia River, under the Lower Columbia River Salmon Rehabilitation Program, page 10. (3) A fishway is installed at a diversion dam (owned by the Vancouver Plywood Company) on Rock, a tributary of the North Santiam River, this reopened considerable area for steelhead spawning. page 12. (4) A new concrete fishway is constructed at the Powerdale Dam (owned by Pacific Power and Light Company) on the Hood River, page 13. (5) A fish screening and by-pass system is completed in the Marmot Dam Canal (Marmot Dam project, owned by Portland General Electric Company) on the Sandy River, page 13. (6) Columbia River investigations are studying five different problems; (a) extension of reduction in productivity of the Columbia River Basin by the encroachment of man, (b) harvest practices, stock timing/migration/distribution; (c) knowledge of growth and survival and limiting factors of young salmon in freshwater, (d) effect contemplated water development projects on Columbia River salmon, and (e) studies on sturgeon. page 15. (7) A need for the development of cheap and nutritional diets alternative to the liver based diets. page 18.

Pollock, C. R. 1930. Fishery conditions in the state of Washington: Puget Sound appears healthy, but Columbia River shows decline. Pacific Fisherman Annual Statistical Number, Vol. 28, No. 2, January 25, 1930, pages 110-111. Seattle, Washington.

Abstract: Supervisor of Fisheries states that there was a shortage of escapement in the Columbia River district. Mentions that there is little hope of increasing spring chinook run until adequate screening installations have been completed on irrigation ditches. Says that summer and fall chinook runs must be looked to as the source of harvest for the fishing industry in the Columbia River district. Also provides a report on hatchery operations in the Columbia River district during 1929.

Washington State. 1921. 30th and 31st annual reports of the state fish commissioner to the governor of the state of Washington: April 1, 1919 to March 31, 1921. State of Washington Department of Fisheries and Game, Olympia, Washington. Frank M. Lamborn, Public Printer, 1921.

Abstract: The commissioner (L.H. Darwin) discusses: 1) the actions and impacts of the 1921

legislative action to create the State Fish Commission, with respect to Washington fisheries resource management, in the context of state and international (Canada) benefits (p. 8-10); 2) discusses "Wastefulness of Natural production," in the context of justifying increased harvest rates through use of efficient fish artificial propagation. NOTE: this reference may be the premise for Washington state fisheries policy over the next 60 years (p. 18-19); 3) Notes negotiations with Northwestern Electric Company to provide mitigation monies for construction of a new hatchery at Chinook, WA (replacement of the old Chinook Salmon Hatchery) in lieu of upgrading and operating the existing fishway over their hydroelectric dam on the Big White Salmon River. Mentions that dam is 160 ft. in height, and that adult steelhead trout are the only species that transcend this dam upstream (p. 24); 4) extensive discussion of the Indian fishing privileges at Prosser Dam, and the fate of salmon resources in the Yakima River, based on the prognosis of irrigation/water developments in the Yakima basin - states that within the next 10 years salmon will not exist in the Yakima (p. 27-29).

## HATCHERIES

### Reference List

Attwell, J. 1974. Columbia River gorge history, Volume One. Fourth Printing, Talkie Books, 34 Landing Road, Skamania, WA 98648, p. 151.

Abstract: A history of the Columbia River in its early days is provided with respect to early inhabitants (Indians, explorers, white settlers), industry/commerce activities. References regarding fisheries and habitat characteristics of this area in this era are lacking in this reference. The following notes are related to milestones/events; 1) 1825 Fort Vancouver was the first settlement in what is now the state of Washington; p. 41; 2) 1837 John McLoughlin had farms at Fort Vancouver on the Cowlitz River; p. 45; 3) In 1846, Joel Palmer established the Columbia River Pack Trail, down the south side of the river from The Dalles to the Sandy River, for cattle; p. 50; 4) In 1851, Frances A. Chenoweth established the Cascades Portage Railroad, the first railroad in the northwest, at the Cascades to portage cargo around the rapids on the Columbia River.

Bayha, Keith. 1974. Anatomy of a river Pacific Northwest River Basins Commission, 1 Columbia River, P.O. Box 908, Vancouver, Washington 98660, Vancouver, Washington.

Abstract: Authors present a comprehensive evaluation of water requirements for the Hell's Canyon reach of the Snake river, based on field surveys of March 1973. Surveys included collection of information regarding the time of travel of the stage wave and water mass, water quality, biological resources, etc. Includes photographs that illustrate the habitat (terrestrial and water) of this area.

Blanchard, R. E. 1977. Columbia River estuary physical alterations. Columbia River estuary, inventory of physical, biological and cultural characteristics 209-1 to-209-22. Columbia River Estuary Taskforce, Astoria, Oregon.

Abstract: The author discusses the man-induced physical alterations river bed, and adjacent riparian/upland areas of the Columbia river estuary, caused by following projects/activities (1) dredging & disposal for improvement and maintenance of river navigation (2) dikes & levees for flood control/protection, and (3) jetties/pile dikes for protection the river mouth entrance. Description of project histories, types, methods, and locations are discussed and supporting illustrations (tables and figures) are presented. Land disposal of dredging spoils are given with respect site, location (approximate river mile), habitat type, wildlife affected, and area size (in acres).

**Note:** Excellent reference for generally determining the location of projects by typed and general impacts.

Bottom, D. and Jones, K. K. 1990. Species composition, distribution, and invertebrate prey of fish assemblages in the Columbia River estuary. Prog. Oceanogr. 25: 243-270 .

Abstract: Authors note that seasonality of abundance and species in an estuary reflect the timing of migration and the reproductive cycles of marine and anadromous species. Composition of the fish community and dominant species in the Columbia river estuary are similar to many smaller estuaries in the Pacific Northwest; these similarities reflect the influence of the nearshore marine environment on the fish community structure, and considerable physiological tolerance of many euryhaline species. The distribution of fish assemblages in the Columbia river estuary is influenced by large seasonal variation in river discharge and salinity; and within large areas and salinity zones, species assemblages use different habitat and prey. The distribution of abundance and the stomach fullness of fishes vary directly with the density of potential prey; it is hypothesized that fish production may be limited by dynamic physical processes that control prey availability or the feeding efficiencies of predators in the highly turbid water.

Bryant, F. G. 1949. A survey of the Columbia River and its tributaries with special reference to the management of its fishery resources. 2. Washington streams from the mouth of the Columbia River to and including the Klickitat River (Area I). Special Scientific Report No. 62, US Fish and Wildlife Service, Department of Interior, Washington DC.

Abstract: Provides a comprehensive description and perspective of tributaries at period in time, in terms of habitat and water flow/temperature. 103 pages.

Bryant, F. G. and Parkhurst, Z. E. 1950. Survey of the Columbia and its tributaries 4. Area III Washington streams from the Klickitat and Snake Rivers to Grand Coulee Dam, with notes on the Columbia and its tributaries above Grand Coulee Dam. Special Scientific Report Fisheries No. 37, US Fish and Wildlife Service, Department of Interior, Washington, DC.

Abstract: Provides a comprehensive description and perspective of Columbia tributaries (within Washington State), above the Klickitat River (excluding the Snake River) at period in time, in terms of habitat and water flow/temperature.

Burner, C. J. 1951. Characteristics of spawning nests of Columbia River salmon. Fisheries Bulletin 52(61): 97-110. US Fish and Wildlife Service, Department of Interior, Washington, DC.

Abstract: Author describes spawning habitat and characteristics of chinook (spring, summer, fall) coho, chum, and sockeye, based on observations in Columbia tributaries (lower and upper).

Cobb, J. N. 1922. Protecting migrating Pacific salmon. Transactions of the American Fisheries Society 52: 146-153.

Abstract: Author gives extensive information on the Yakima Basin regarding habitat, fish, and water development projects (Kennewick, Wapato, Sunnyside, Prosser) Provides general design and adult fish behavior (steelhead) at Sunnyside, Kennewick, and Prosser.

Columbia Basin Interagency Committee. 1957. Columbia River basin fishery program, part II: Inventory of streams and proposed improvements for the development of the fisheries resources. Fishery Steering Committee, Columbia Basin Interagency Committee, January 1957; 100 pages.

Abstract: Provide a comprehensive inventory and listing of proposed improvements of habitat/rehabilitation projects and considerations for major tributaries of the Columbia basin above McNary Dam. Notes basin descriptions for each tributary, in terms of flow, temperature (air and water). Includes maps of tributary/basins showing geographical orientation of streams and proposed improvements.

Craig, J. A. 1935. The effects of power and irrigation projects on the migratory fish of the Columbia River. Northwest Science IX(1): 19-24 (February, 1935).

Abstract: Author discusses the effects of human land and water uses (logging, mining, power, and irrigation) on fisheries resources in the Columbia basin. Provides examples of habitat alterations

imposed by these human uses. Briefly discusses life history and ecology of all anadromous salmonid species inhabiting the Columbia River basin. Discusses how the use of streams for power and irrigation purposes affect migratory salmon species: 1) obstacles that obstruct or delay migration of adult upstream to natal streams; and 2) injurious or delay impediments to downstream juvenile migration. Presents fishways and screening as mechanisms to protect fish, and the use of artificial propagation in the case of high dams.

Davison, M. A. and Spencer, R. D. 1979. *Columbia river islands land status survey, Columbian White-Tailed Deer Study*. Project E-I, Study 2, Job 4, Section 4. Washington Department of Game, Olympia, Washington.

Abstract: Author provides information regarding the status of habitat and ownership for 28 islands, located within 107 mile section of the lower Columbia river between Bonneville Dam and Cathlamet, Washington. Provides information for each island, with respect to geographic location/acreage, ownership (deed abstract), floral communities/habitat, historical, present, future uses of island. Includes information regarding alterations in terms of dredging, fill, and forest removal, etc. **Note: Excellent Reference**

Downing, Alfred. 1980. *The region of the upper Columbia River and how I saw it* Ye Galleon Press, Fairfield, Washington.

Abstract: Author provide a general accounting of his adventures and trip with Lt. T. Symons (U.S. Army) during the expedition down the upper Columbia river. No substantive information regarding fisheries-related habitat and stock was derived from a review of this monograph. A listing of books and periods was derived as a source for additional reference candidates.

Downs, J. L., Tiller, B. L., Witter, M., and Mazaika, R. 1996. *Monitoring and mapping selected riparian habitat along the lower Snake River*. PNNL-10953/UC-702: Pacific Northwest National Laboratory, Richland, Washington.

Dunn, J., Hockman, G., Howerton, J., and Tabor, J. 1984. *Key mammals of the Columbia River estuary*. Columbia River Estuary Data Development Program, Astoria, Oregon. 116 p. p.

Abstract: Authors provide extensive information about key mammalian species occurring the Columbia river estuary, with respect to 1) habitat use, 2) period of birth, 3) relationship to other trophic levels, and 4) critical habitat. Extensive tables and graphics are provide to illustrate spatial and temporal occurrence and inhabitation of key mammals within the Columbia river estuarine zone.

Franchere, Gabriel. 1969. *Journal of a voyage on the north west coast of North America during the years 1811, 1812, 1813, and 1814* The Champlain Society, Toronto. 78,82-83, 96-97, 100-101, 110-111, 142-143, 148-149, 152-157 p.

Abstract: Author provides an account of his observations and experiences during his travels in the Columbia river basin during the early 19th century. Briefly notes habitat, flora, and fauna at various points of travel up and down the Columbia river and its tributaries. General description of attributes for the Snake river mouth.

Glenn, John G. n.d. *Diary of John G. Glenn, 1852* 14-15 p.

Abstract: Author provides a brief description of the scenery and habitat of the Grand Ronde sub-basin.

Good, James W. 1977. *Columbia river tidal marshes*. Columbia River estuary, inventory of physical, biological and cultural characteristics, Sect. 302-1 to 302-19. Columbia River Estuary Data Development Program.

Abstract: The author identifies, describes, and enumerates the marsh habitat and communities of the Columbia river estuary. Provides illustrations (figures and tables) describing the location and area of tidal marsh habitat; and discusses each tidal marsh area with respect to community structure and alterations/impacts induced by human interventions (dredging, diking, etc.).

**Note:** Excellent reference for deriving a perspective of the estuarine habitat and associated communities prior to and after human intervention.

Good, James W. and Potter, George D. 1977. Columbia river estuary shoreline habitat and wildlife resources. Columbia River estuary, inventory of physical, biological and cultural characteristics, Sect. 303-1 to 303-33. Columbia River Estuary Data Development Program,

Abstract: The authors identify, describe, and enumerate the shoreline/riparian habitat and wildlife communities (waterfowl, birds, big game, furbearers, small mammals, reptiles, amphibians, and marine mammals) of the Columbia river estuary. Provide illustrations (figures and tables) describing the kinds, location and area of various wildlife and their associated habitat that presently occur within the estuarine zone of the Columbia river.

**Note:** Excellent reference for deriving a perspective of the estuarine habitat and associated wildlife communities occurring in the shoreline/riparian zone of the Columbia river estuary.

Griffin, L. E. 1935. Certainties and risks affecting fisheries connected with damming the Columbia River. Northwest Science IX(1): 25-30 (February, 1935).

Abstract: Author discusses 1) the economic importance of anadromous and resident fish species, and the effects on dam construction on said species; 2) the importance and distribution of salmon harvest in the Columbia basin; 3) the certainties associated with current state of technology of fish passage systems, and risks associated with designs and plans to be incorporated at the Bonneville project; 4) recommended actions to reduce risks associated with current fish passage technology; 5) certainties and risks associated with sedimentation and submergence of fish habitat (sloughs and shallows) in the Bonneville impoundment; 6) the certainties and risks of power plants to migration of young salmon; and 7) turbine designs and devices to reduce the risks associated with hydropower operation. Author alludes to a hypothesis that the Columbia impoundments (e.g. Bonneville) may present risks to the importance of the sloughs and shallow ponds contiguous to the river, as being very important as a food source to young salmon during their downstream migration.

Harden, Absolom B. 1847. Diary of Absolom B. Harden 1, 14-30 (incomplete) p.

Abstract: Author provides descriptions of his activities and the habitat in various sub-basins (e.g. Grand Ronde) of the Snake and Columbia river.

Hardesty, W. P. 1923. Drainage project on the Columbia adjoining Portland, Ore.: levees and pumping plant with three types of motor-driven pumps --new sluice gate --design --assessment system. Engineering News-Record 90(9): 395, 398.

Abstract: Reference discusses a drainage project on the Columbia river that encompasses the use of levees and a pumping plant for reclamation of 8,478 acres of low land in Multnomah County Drainage District No. 1 (near Portland, Oregon). The project affects the habitat characteristics of Columbia Slough and adjacent lands. An eleven mile levee borders and is set back 50-100 ft from the river; a fringe of willows and cottonwoods lies between the river and levee. The enlargement of the slough is considered for use as a dilution vehicle for municipal sewage. Includes a map illustrating the Columbia Slough/project area and its orientation with the Columbia river reach adjacent to the Vancouver/Portland area.

Hazel, C. R. 1984. Avifauna of the Columbia River estuary. Columbia River Estuary Data Development, Astoria, Oregon. 85 p. p.

Abstract: Author presents and describes information regarding key avian species and their associated

habitat, key avian habitats and their avian species composition, and food habits of key avian species within the Columbia river estuary. Tables and graphics are used to illustrate the spatial and temporal distribution of key avian species, and their associated habitats and food habits.

Hines, H. K. 1893. An illustrated history of the State of Washington. The Lewis Publishing Company, Chicago. 933 pages.

Abstract: Author provides a very comprehensive history of the Washington and Oregon areas, during the pre-and post-Oregon Territory period (late 1770s to late 1880s); provides biographical sketches of principals of Washington state history. Limited notes regarding fisheries resources and habitat alternations are provided. NOTE: excellent reference for Washington and Oregon territorial history.

Idaho State. 1927. Eleventh biennial report of the Fish & Game Warden of the State of Idaho, 1925-1926. R.E. Thomas, State Game Warden; Boise, Idaho.

Abstract: (1) Photograph of the riparian zone of a section of the Selway River; near the junction with the Clearwater River, is illustrated on page 6. (2) The topography and status of lands of Idaho is generally described in terms of its habitat zones and types of development, page 7. (3) Photograph of the riparian zone of a section of the Middle Fork of the Salmon River is illustrated on page 18. (4) Photograph of the riparian zone near the junction of Camas Creek and the Middle Fork of the Salmon River is illustrated on page 28. (5) Description of the resident fish planting program in the Redfish Lake section of Idaho in 1925; this program illustrates the emphasis of the resident fishes management in lieu of anadromous species (e.g. Blueback salmon), page 47-48. (6) Photograph of the riparian zone of a section of the upper inlet to Redfish lake is illustrated on page 55. (7) Photograph of the Vernon and Edna Lakes area in the headwaters of the south fork of the Payette River is illustrated on page 58. (8) Note that a landlocked salmon, weighing slightly over six pounds was taken in the Salmon River a short distance below the outlet of Redfish Lake. NOTE: This fish may have been anadromous variety of blueback salmon? page 59. (9) Photograph of the riparian zone of a section (with a road along stream-side) of the Lochsa River, near Kooskia, Idaho County is illustrated on page 66.

Johnson, Overton and Winter, W. H. 1906. Route across the Rocky Mountains with a description of Oregon and California, their geographical features, their resources, soil, climate, productions, etc., 1843. Chapters I & II. The Quarterly of the Oregon Historical Society VII(1): 62-63, 88-103 p.

Abstract: Authors provide descriptive information regarding the habitat, geology, and flora/fauna of Oregon Territory between the Blue Mountains and the coast. Provides general descriptions of riparian habitat in terms of flora. NOTE: Excellent reference to derive habitat status/description prior to significant alteration due to settlement and resources development.

Johnson, Overton and Winter, W. H. 1906. Route across the Rocky Mountains with a description of Oregon and California, their geographical features, their resources, soil, climate, productions, etc., 1843. Chapters III & IV. The Quarterly of the Oregon Historical Society VII(2): 163-165, 174-179 p.

Abstract: Authors provide descriptive information regarding the habitat, geology, and flora/fauna of Oregon Territory in the Willamette River valley region and the Columbia River estuarine area (p. 175-76). Provides general descriptions of riparian habitat in terms of flora. NOTE: Excellent reference to derive habitat status/description prior to significant alteration due to settlement and resources development.

Lancaster, Samuel C. 1915. The Columbia America's great highway. Press of Kilham Stationary and Printing Company, Portland, Oregon.

Abstract: Author provides a general history of the Columbia basin, in terms of the human activities along the Columbia river. Excellent color photographs of the various locations along the Columbia

river, viewed from the old Columbia highway route, are presented; illustrates various morphological attributes, habitat structure, etc. of these locations, situated on the lower Columbia river (Cascades area to Astoria).

Lelbhardt, Barbara. 1990. Law, environment, and social change in the Columbia basin: the Yakima Indian Nation as a case study, 1840-1933. Dissertation for Doctor of Philosophy in Jurisprudence and Social Policy, University of California at Berkeley, 1990, 488 pages.

Abstract: A. Author provides a comprehensive history and legal premise of water rights and fishing issues of the Yakima Indian Nation within the Yakima and Columbia rivers basin; includes an extensive bibliography. Documents the social and economic dependence of the Yakima Indians on fisheries resources; provides some insight of salmon, water, and habitat of the Yakima Basin prior to and during development of fisheries and agricultural industries in the Yakima basin. The following historical notes of historical milestones and fisheries resources information were derived: 1) In 1850, the US Congress passes the Land Donation Act which provided for the appropriation of lands from the public domain in the territories (e.g. Oregon Territory); p. 104; 2) In 1873, the Washington Territorial legislature passed an act that allowed Yakima County farmers, miners, manufacturers- or anyone that could use water for "beneficial purposes" to construct diversion works necessary to convey water onto their non-riparian lands (An Act Regulating Irrigation and Water Rights in the County of Yakima, Washington Territory, 13 November 1873, Washington Laws 520-522), p. 245; 3) In 1890, the Washington State Legislature passed a statute that provided for the appropriation of any unclaimed waters 'from any natural streams or lakes in the state' for irrigation and permitted the condemnation of rights of ways for ditches to carry water 91890 Washington laws 706, paragraph 1), p. 246; 4) In 1917, Washington State Legislature passed a law adopting an administrative water code that recognized prior appropriation as the only means by which an individual could acquire water rights (Riparian and Appropriation Rights, Washington laws 447-68), p. 247; 5) Around 1867, the Meninick/Shumit Ditch on Simcoe Creek (tributary to the yakima River) was constructed on the Yakima Indian Reservation; p. 250; 6) In 1906, the US Congress passed the Jones Act, that provided for funding the on-reservation portion of the US Reclamation Service's larger yakima irrigation project by allowing each Indian allottee to sell 60 acres of his or her allotment for bring water to the remaining twenty acres under the project; p. 254-255; 7) In 1891, the Northern Pacific, Yakima, Kittitas Irrigation Company, who filed on 1000 cfs of Yakima River water (in 1890) began construction of the Sunnyside irrigation project, and in that year built an adjustable dam (at the old Yakima dance house site) that was believed to have the capability to appropriate virtually the entire low flow when the river was at its lowest point; p. 258; 8) In 1892, the first 25 miles of the Sunnyside irrigation project is dedicated; p. 259; 9) In 1893, the Northern Pacific Railroad (owner of the Northern Pacific, Yakima, Kittitas Irrigation Company) declares bankruptcy during the Panic of 1893; p. 259; 10) In 1894, the US Congress passed the Carey Act which allowed states to choose up to one million acres of arid land for irrigation development; p. 260; 11) In 1895, the Washington State legislature set up the Arid Lands Commission to investigate the possibility of developing lands between the Yakima and Columbia Rivers, above the Sunnyside irrigation project; p. 260; 12) Up to and through the 1890s individuals, farmers cooperatives, and ditch companies invested in their own small scale irrigation systems; p. 260; 13) In 1902, the US Congress passed the Newlands Act which created the Reclamation Service with the US Department of Interior; the Reclamation Service was empowered to provide planning, engineering, and financial assistance for irrigation projects; p. 261; 14) In 1906, the US Reclamation Service purchases the Sunnyside irrigation project from the Northern Pacific, Yakima, Kittitas Irrigation company, p. 241; 15) In 1908, the US Supreme Court issued its decision on the Winters vs US, where the court held that Indians reserve water rights even when their treaties made no express mention of water; p. 270; 16) In 1905, the Washington irrigation Company, on their attorneys' advice blew up the dam of Union Gap irrigation Company at Lake Cle Elum when insufficient water threatened to destroy the crops on the Sunnyside Project; . p. 272; 17) In 1889, the Ahtaneum Creek (tributary of the Yakima River) was virtually drained of water by

irrigators on the north side of stream where it bordered the Yakima Indian Reservation; p. 275; 18) In 1891, the Ahtaneum Creek (tributary of the Yakima River) was virtually drained of water by irrigators on the north side of stream where it bordered the Yakima Indian Reservation; . p. 275; 19) In 1892, (a dry summer), the US Bureau of Reclamation attempted to re divert water of Ahtaneum Creek, virtually drained of water by irrigators on the north side of stream where it bordered the Yakima Indian Reservation, but the north-side irrigation users brought suit against the Bureau's action; . p. 276; 20) In 1905 the US Secretary of Interior allocated 2065 cfs and 147 cfs of yakima River water respectively to the white water users and Yakima Indian water users; p. 292; 21) J.H. Lynch (in 1901) noted that the more water flowed in the Ahtaneum Creek (tributary of the Yakima River) in the early days than at present, and the runoff was also later, coming mostly after July 1st; he said " the watershed had not been burned off nor grazed excessively by sheep, hence more water". ; p. 310; 22) In 1908, the Washington State Fish Commissioner asked the Reclamation Service to include fish ladders at Yakima project dams, but was told that fish ladders were not feasible, nor was the Reclamation Service responsible for meeting state fishery laws; p. 310-311; 23) The Washington State Fish commissioner (Mr. Darwin) closed the Klickitat River to food fishing (white commercial and Indian fishing) - not sport fishing - between 1915 and 1917, p. 373.

Mattson, C. R. 1948. Spawning ground studies of Willamette River spring chinook salmon. Oregon Fish Commission, Research Briefs 1(2): 21-32.

Abstract: Provides extensive and comprehensive environment/habitat/distribution information for chinook salmon in the Willamette River and its tributaries.

May, Dean L. 1994. Three frontiers - family, land, and society in the American west, 1850-1900. Cambridge University Press, 313 pages.

Abstract: Author provides the history of settlement and development of the Willamette Valley region (Oregon), the Utah Valley region (Utah), and the Boise Valley region (Idaho) from the 1840-1900. He documents and illustrates agrarian development in these regions (during and after the mining era); provides a perspective of milestones/events affecting settlement and expansion of population in these regions. Note: an excellent documentation of mining and agriculture development in terms of habitat alteration of the Boise River basin/upper Snake river region of Idaho during the 1850-1900 era. The following notes are related to this development in Boise and Willamette basins: 1) An excellent description of the habitat surrounding the Boise River is provided by early explorers/settlers such as John C. Fremont (1843) and Basil Nelson Longworth (18 August 1853)p. 20-21; 2) Short description of the habitat in the region of the Santiam and Pudding Rivers region in the 1840s..."largely open prairie land begins to break into rolling hills...scattered thickets of Douglas fir, hemlock, spruce, incense cedar in the 1840s", p. 26; 3) Short description of the habitat in the Middleton region of the lower Boise River in 1863..."bottoms were wooded, covered with brush, and often cut through with sloughs...and subirrigated by the low water table throughout the season." p. 37 (Map of Middleton area, and rivers, p. 36).

McClung, James S. 1862. Journal to Oregon, April 22nd 1862 1, 71-80 (incomplete) p.

Abstract: Author provides descriptions of habitat (e.g. forest/timber) and water resources (e.g. springs) in various sub-basins (e.g. Powder and Grande Ronde) to the Snake and Columbia Rivers.

McIntosh, B. A., J.R. Sedell, J.E. Smith, R.C. Wissmar, S.E. Clarke, G.H. Reeves, and L.A. Brown. 1994. Historical changes in fish habitat for select river basins of eastern Oregon and Washington. Northwest Science 68, Special Issue: 36-53.

Abstract: Authors compare the changes in and condition of fisheries habitat in a subset of historical surveyed streams (Tucannon, Asotin, Grande Ronde, yakima, Wenatchee and Methow basins) by comparing the US Bureau of Fisheries surveys (1934-1942) with resurveys of 1990-1992. Habitat information and analyses regarding pool habitat, substrate composition, and riparian zone are

provided.

McIntosh, Bruce A. 1992. Historical changes in anadromous fish habitat in the Upper Grande Ronde River, Oregon, 1941-1990. Masters Thesis. Oregon State University, Corvallis, Oregon. 1-88 (complete) p.

McIntosh, Bruce A., Sedell, James R., Smith, Jeanette E., Wissmar, R. C., Clarke, S. E., Reeves, G. H., Brown, L. A., Hessburg, Paul F., and Everett, Richard L. Management history of eastside ecosystems: changes in fish habitat over 50 years, 1935 to 1992. General Technical Report PNW-GTR-321. US Department of Agriculture, Forest Service, Pacific Northwest Research Station in cooperation with Pacific Northwest Region, 8-25 p.

Merrel, T. R. 1951. Stream improvement as conducted in Oregon on the Clatskanie River and tributaries. Oregon Fish Commission, Research Briefs 3(2): 41-47.  
Abstract: Provides information regarding the habitat of this river system, and associated recommendations for habitat improvements in tributaries/areas negatively impacted by logging activities 15 years previous.

Moore, Cecil R. 1939. The Willamette river project. Military Engineer 31(177): 208-211.  
Abstract : Author provides a brief history, and geophysical, hydrologic, climatologic description of the Willamette river basin. Discusses and describes the Willamette basin plan that will includes 1) navigation improvement from the mouth to upstream of Willamette Falls, 2) irrigation (seven storage projects of 335,000 acre ft) and stream purification projects. Mentions loss and mitigation of fish habitat and mitigating factors for this loss in terms of improved water flows and quality. Provides illustrative tables for reservoir projects and project costs- pp. 208-211.

Mudd, D., Boe, L., and Bugert, R. 1980. Evaluation of wildlife habitat developed on government project lands along Snake river in Washington. Washington Department of Game, Habitat Management Division, 62, maps p.  
Abstract: Report provides a baseline of wildlife resources and habitat in areas of the lower Snake river affected by the Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dam projects.

Nielson, R. S. 1950. Survey of the Columbia and its tributaries, Part 5. Special Scientific Report Fisheries No. 38, US Fish and Wildlife Service, Department of Interior, Washington, DC.  
Abstract: Provides a comprehensive description and perspective of the Deschutes, John Day, Umatilla and Walla Walla River systems at period in time, in terms of habitat and water flow/temperature.

O'Malley, H. 1935. Some problems which confront the fishery experts in the construction of dams in the Inland Empire. Northwest Science IX(1): 23-24 (February, 1935).  
Abstract: Author presents the problems of dam construction in the Columbia River as 1) successful passing of adults over dams, 2) getting small fish and steelhead kelts back to the sea, and 3) the complex problem of changed conditions brought about by the dams and artificial lakes. Mentions the four commissions that control the destiny of commercial and game fishes in the States of Washington and Oregon; the annual value and employment associated with the fishing industry; the budget and employment figure projected for construction of the Bonneville dam; fishways associated with the Rock Island dam; and the impassability of Grand Coulee dam. Discussion of the biological effects on native fish species, based on experiences in New England and other parts of the US; generalizes and predicts the ecological changes of the habitat and species resulting from water impoundments on the Columbia River. Briefly mentions the requirement for proper screening of power intakes and immediate steps to combat pollution, due to industrialization of the Inland Empire.

Oregon State. 1903. Annual Reports of the Department of Fisheries of the State of Oregon to the legislative assembly, Twenty-second regular session, 1903. State of Oregon, Salem, Oregon. W.H. Leeds, State Printer, 1903. 14-21, 34-37, 64-79, 116-119 p.

Abstract: The Master Fish Warden (H.G. Van Dusen) provides detailed accounts for investigations of various waters/streams, such as the Salmon River (tributary to the Sandy River), Clackamas River, the McKenzie River (tributary to the Willamette River), Gate Creek and Blue River (tributary to the McKenzie River), Santiam River (tributary to the Willamette River), Molalla River (tributary to the Willamette River), Tanner and Eagle Creek (tributary to the Columbia River near Bonneville), Deschutes River (tributary to the Columbia River), Crooked River (tributary to the Deschutes River), John Day River (tributary to the Columbia River), Grande Ronde River and its tributaries including Wallowa lake (tributary to the Columbia River), Imnaha River (tributary to the Snake River), Powder River (tributary to the Snake River), Malheur River (tributary to the Snake River), Owyhee River (tributary to the Snake River), and Snake River. Includes notations of salmon species presence and timing, utilization, habitat/habitat alteration, etc. pages 10-21. Notes fish investigative/propagation activities at the Grande Ronde River Experimental Station at the mouth of the Wenaha River (tributary to Grande Ronde River at approximately RM 50); provides information on fish species passage to a fish rack across the Wenaha River; blueback pass this point between June 20th and July 20th, silversides begin showing on September 14th (silverside eggtake conducted mid-October into early December, summary table, Page 36. Notes during investigations/field work at the Swan Falls Experimental Station on the Snake River, that chinook salmon began to arrive at this point on September 1st, and fish were spawned from October 12th to November 13th. page 37. Notes that Oregon State passed a law in 1899 that required the licensing of the salmon and sturgeon industry (fishing and processing) some of funds derived from this licensing law were to be used for artificial propagation of fishes. page 88. Notes on the Grande Ronde River Hatchery Station: chinook salmon begin arriving immediately after rack is emplaced in the Wenaha River completed on July 4th. Holding rack enclosure is full by September 1st, and first eggs are taken on September 13th and completed October 31. First sockeye eggs were taken October 21st. Pages 116-118. Notes on the Ontario hatchery Station on the Snake River (lies on the left bank of the Snake River directly opposite Morton's Island, near Ontario Oregon); rack barrier is emplaced on August 25th, and next day 300 chinook salmon were already in the racks; run continued at this rate per day until last of September; eggtake was conducted from October 13th through November 8th. pages 119-121.

Oregon State. 1947. Biennial report of the Fish Commission of the State of Oregon to the governor and forty-fourth legislative assembly, 1947. Fish Commission of the State of Oregon; Salem, Oregon, State Printing Office, 1947.

Abstract: Notes that (1) the State of Oregon is entering a period of expansion and industrialization, and population increase where development of rivers will deplete fisheries resources; the early history of the state saw the destruction of salmon spawning habitat. (2) the policy of the Oregon Fish Commission is (a) to study the causes and effects of decline of various fisheries, (b) to study methods of rehabilitation of species involved, and (c) to evaluate and increase efficiency of artificial propagation and to use hatcheries to supplant and rehabilitate, but not replace, natural spawning. (3) A new fishway is constructed by the Oregon Iron and Steel Company at their dam in the Tualatin River, tributary of the Willamette River, under the supervision of the Division of Engineering (Oregon Fish Commission) page 13. (4) A fishway at Eagle Creek Falls on Eagle Creek (tributary to the Clackamas River) is removed under the supervision of the Division of Engineering (Oregon Fish Commission), page 13. (6) A new dam is constructed by the Hines Lumber Company on the North Fork of the Willamette River, at Westfir (Oregon) construction of an adequate fishway will be completed by early summer 1947. page 14.

Parkhurst, Z. E. 1950. Survey of the Columbia and its tributaries, Part 6 Area V - Snake River system from mouth through Grande Ronde River. Special Scientific Report Fisheries No. 39, US Fish and

Wildlife Service, Department of Interior, Washington, DC.

Abstract: Provides a comprehensive description and perspective of the Snake and Grande Ronde River systems at period in time, in terms of habitat and water flow/temperature.

Parkhurst, Z. E. 1950. Survey of the Columbia and its tributaries, Part 7 - Snake River from above the Grande Ronde River through the Payette River. Special Scientific Report Fisheries No. 40, US Fish and Wildlife Service, Department of Interior, Washington, DC.

Abstract: Provides a comprehensive description and perspective of the Snake above the Grande Ronde, Salmon, Weiser, and Payette Systems at period in time, in terms of habitat and water flow/temperature.

Parkhurst, Z. E. 1950. Survey of the Columbia and its tributaries, Part 8 Area VII - Snake River from above the Payette River to Upper Salmon Falls. Special Scientific Report Fisheries No. 57, US Fish and Wildlife Service, Department of Interior, Washington, DC.

Abstract: Provides a comprehensive description and perspective of the main Snake and its tributaries above the Payette River at period in time, in terms of habitat and water flow/temperature.

Parkhurst, Z. E., Bryant, F. G., and Nelson, R. S. 1950. Survey of the Columbia River and its tributaries - Part III. Special Scientific Report Fisheries No. 36, US Fish and Wildlife Service, Department of Interior, Washington, DC.

Abstract: Provides a comprehensive description and perspective of Columbia River tributaries in Oregon and the Willamette system at period in time, in terms of habitat and water flow/temperature.

Porter, Elizabeth Lee. 1864. Crossing the plains, a diary by Elizabeth Lee Porter 1864 1, 6-7 (incomplete) p.

Abstract: Author gives abbreviated diary of her activities and observations from Iowa to Oregon; some brief notes of climate and habitat of various sub-basins (e.g. Burnt, Powder and Grand Ronde) to the Snake and Columbia river.

Renshaw, Robert Harvey. 1851. Diary of Robert Harvey Renshaw 1, 24-35 (incomplete) p.

Abstract: Author notes his activities and habitat of various sub-basins (e.g. upper Snake tributaries, Burnt, Powder, and Grand Ronde) to the Snake and Columbia rivers. Gives brief mention to the timber and water of the Grand Ronde area.

Rich, E. E. 1950. Peter Skene Ogden's Snake country journals, 1824-25 and 1825-26 The Hudson's Bay Record Society, London. 92-93, 126-135, 166-171, 190-193 p.

Abstract: Author provides an account of his observations and experiences during his travels in the Columbia river basin during the early 19th century. Briefly notes habitat, flora, and fauna at various points of travel in the various sub-basins (e.g. Bruneau, Payette, Malheur, Owyhee, etc.) of the Upper Snake river, and the Umatilla, John Day, Deschutes, Hood, and Willamette sub-basins of the Columbia river.

General description of attributes for the upper Snake river in the vicinity of the Payette river to the Burnt river (River Brule). - observation of dead salmon (carcasses) along the river.

General description of attributes for the upper Snake river in the vicinity of Burnt river (River Brule) to the Malheur River.

General description of attributes for the upper Snake river in the vicinity of Burnt river (River Brule) to the King Hill creek. - note of sturgeon present in this area during spring.

General description of attributes for the upper Snake river in the vicinity of the Payette river mouth.

General description of attributes for the upper Snake river in the vicinity of the Owyhee river mouth.

General description of attributes for the upper Snake river in the vicinity of the Owyhee river mouth to the Malheur river mouth-notes water flow (spring freshet condition).

General description of attributes for the upper Snake river in the vicinity above the Owyhee river mouth to the Bruneau river mouth.

General description of attributes for the upper Snake river in the vicinity of the Bruneau river mouth.

General description of attributes for the upper Snake river in the vicinity above the Owyhee river mouth to the Bruneau river mouth - notes seeing salmon ascending the stream.

General description of attributes for the upper Snake river in the vicinity above the Owyhee river mouth to the Bruneau river mouth - notes regarding Indian fishing success/salmon presence in the vicinity.

General description of attributes for the upper Snake river in the vicinity above the Bruneau river mouth to Alkali creek mouth.

General description of attributes for the upper Snake river in the vicinity of the Bruneau and Snake river confluence.

General description of attributes for the upper Snake river in the vicinity below Big Wood river to the Bruneau river.

General description of attributes for the upper Snake river in the vicinity of King Hill Creek.

Scheufele, Roy W. 1970. History of the Columbia Basin Inter-Agency Committee. Prepared under sponsorship of the Pacific Northwest River Basins Committee.

Abstract: A. Author presents a comprehensive details regarding the genesis, policy & objectives, actions, and chronology of meeting/events for the Columbia Basin Inter-Agency Committee, during the period of 1946-1967. Provides information regarding governmental legislation (laws) and policy framework, institutional relationships with other state and federal agencies in the Columbia basin, and accomplishments of the agency. NOTE: Reference is very important in terms of its description of policy and philosophy governing water and fisheries policy in the Columbia River basin during the period of 1946-1967. B. Genesis of Agency and Federal Action (pages 3-9): 1) In 1902, the US Congress passes the Reclamation Act; 2) In 1905, the US Congress establishes the US Forest Service; 3) In 1920, the US Congress passes the Federal Power Act; 4) In 1925, the US Congress passes a statute that directed the inventory of those streams in the US where power development appeared feasible and practical in combination with navigation, flood control, and irrigation; 5) In 1927, the US Congress passes the River and Harbor Act, which commenced the survey of Pacific Northwest streams, that were inventoried under the 1925 congressional statute; 6) In 1936, the US Congress passes the Flood Control Act; 7) In 1936 (?) the US Congress establishes the US Soils Conservation Service; 8) In 1943, the Pacific Northwest Regional Planning Commission, an arm of the National Resources Planning Board, is abolished by the US Congress; 9) In July 1943, the governors of the Pacific Northwest States establish the Northwest States' Development Association to coordinate and correlate plans of member states as they relate to unified development of all the resources of the Pacific Northwest; 10) In December 1943, the Northwest States' Development Association prepares a program and governing principles of emergency and immediate post-war projects for the development of the Columbia Drainage Basin; 11) In summer 1939, the US Departments of Interior, Agriculture, and War (Corps of Engineers) enter a tripartite agreement to coordinate their work, both in Washington DC and field regions; 12) In December 1943, the US Federal Power Commission joins the tripartite of the US Departments of Interior, Agriculture, and War (Corps of Engineers), and execute a quadripartite agreement that provided monthly meetings of these agencies to discuss results of studies/investigations, to adjust differences of opinions, and to promote ways/means for implementing other provisions of the agreement-representatives of these four Departments constituted the Federal Inter-Agency River Basin Commission (FIABRC); 13) In February 1946, the Columbia Basin Inter-Agency Committee, the second field committee of Federal Inter-Agency River Basin Commission, is established to facilitate progress on the multipurpose development projects presently authorized by congress (p. 7-9 provides details of conditions of the agreement.); 14) In 1965, the US Congress passes the Water Resources Planning Act; 15) In June

1967, the Pacific River Basins Commission takes over the functions of the Columbia Basin Inter-Agency Committee. C. A chronicle of agency meetings and general outcomes from these meetings is presented (pages 10-123)

- 1) In March 1947, the Assistant Secretary of Interior (Warner W. Gardner) sends a memorandum/recommendations to the Federal Inter-Agency River Basin Commission (FIABRC) that propose the construction of mainstem dams on the Columbia below Okanogan R. and on the Snake below the Salmon R., with the exception of the proposed McNary Dam, be postponed until 1958 (for 10 years) provided that alternate sources of power could be developed to meet Bonneville Power Administration load demands; this moratorium period would allow the US Fish & Wildlife Service and state fisheries agencies to determine remedial measures (per research, studies, and planning) that could be taken to preserve the Columbia River fishery; p. 22-23;
- 2) On 2 April 1947, the Assistant Secretary of Interior (Warner W. Gardner) memorandum was forwarded by the Federal Inter-Agency River Basin Commission (FIABRC) to the Columbia Basin Inter-Agency Committee for study, discussion, and recommendations;
- 3) On 23 July 1947 at the 11th meeting of the Columbia Basin Inter-Agency Committee, (a) Fred Foster (US Fish & Wildlife Service) outlined the Lower Columbia River Fishery Program, consisting of obstruction removal, pollution abatement, diversion screening, fishway construction, hatchery construction and fish sanctuaries - a program estimated at a cost of \$20 million, and (b) a Fish & Wildlife subcommittee was established to coordinate and integrate fish and wildlife programs with water resource program; p. 25;
- 4) On 22 September 1947, the Fish & Wildlife Subcommittee (Columbia Basin Inter-Agency Committee) filed a report that summarized factual data relating to navigation, power, fish, irrigation, Indians, and National Defense, p. 26;
- 5) On 8 October 1947, at its 12 meeting, the Columbia Basin Inter-Agency Committee unanimously approved and forwarded a letter to the Federal Inter-Agency river basin Commission (FIABRC) recommending that a) Grand Coulee power installations proceed, construction of Hungry Horse, Foster Creek, Detroit, and McNary Dam proceed, etc. b) authorized dams on the Columbia River system not to be rescheduled, approval of the Lower Columbia River Fishery Program, and compensation of Treaty Indians, and c) upstream dams be authorized promptly and if authorized before 1958 they be constructed ahead of planned/unauthorized The Dalles, John Day and Arlington Dams unless the fish problem has been solved in the interim, etc., p. 26;
- 6) In 1950, the Columbia Basin Inter-Agency Committee establishes the Fisheries Steering Committee, and this subcommittee prepares a comprehensive program of research and construction (to cost 25-50 million dollars) and proposed to finance it by a tax of fifty cents per kilowatt year (note proposal failed and caused an outcry from power interests) p. 27;
- 7) On 17 September 1948, at its 21st meeting, the Columbia Basin Inter-Agency Committee authorized a Technical Subcommittee for Operating Plan to prepare an integrated and coordinated operating plan for the release and control of waters in connection with Columbia River development program (note plan was never consummated) p. 32;
- 8) On 10 November 1948 at its 22nd meeting of the Columbia Basin Inter-Agency Committee, the Corps of Engineers presented an eight volume "Review of the Columbia River and its Tributaries,": a report costing \$5 million; p. 33;
- 9) On 28 June 1950 at its 40th meeting, the Columbia Basin Inter-Agency committee approved an interim fishery research program (prepared by the Fish & Wildlife Subcommittee) that called for studies of fish passage at river obstructions, impoundment studies, artificial propagation, and studies of life history, trends and abundance, trout habitat and pollution, at an estimated \$600,000 per year - another \$500,000 was included for stream development and improvement; p. 46;
- 10) On 19 January 1955, the Columbia Basin Inter-Agency Committee directed the Fisheries Steering Committee to a) prepare an Upper Columbia River fishery program comparable to that in effect on the Lower Columbia River, b) a program of needed fishery research for the whole area, and c) explore ways and means of implementing/financing both programs; p. 83;
- 1) On 13 March 1957, the Columbia Basin Inter-Agency Committee accepted the Fisheries Steering Committee report with respect to a) prepare an Upper Columbia River fishery program comparable to that in effect on the Lower Columbia River, and b) a program of needed fishery research for the whole area - established research priorities and recommendations as to what agency would carry out specific studies recommended; p. 91;
- 12) On

13-14 November 1963, the Columbia Basin Inter-Agency Committee heard a panel of University of Washington academicians (James Crutchfield, W.F. Royce, D. Bevan, Robert Fletcher, R.C. Van Cleave, and R.W. Johnson) carry on extensive dialogues on "Fisheries in the Pacific Northwest - the academicians view this controversial issue," Don Bevan was very critical of fishery regulation; p. 114; 13) On 14 December 1965 at the 132 meeting of the Columbia Basin Inter-Agency Committee, the Executive Subcommittee presented its recommendations on seven fishery proposals (previously submitted by the Fisheries Steering Committee on 6 October 1965) summarized as follows: Proposal 1 - Greater Committee representation for salmon and steelhead, Proposal 2 - Reduction of the use of the Columbia River water for nuclear production to reduce heat pollution of the river, Proposal 3 - Establishment of working contract with Canada on Fishery problem, Proposal 4 - Development of small watersheds for power production should be discontinued, Proposal 5 - Assure proper attention to fish requirements in any inter-basin water transfer studies, Proposal 6 - Fishery research should be continued, the Proposal 7 - The Columbia River Fishery Development program should be retained; 14) On 29 September 1966 at its second Columbia-North Pacific study review, the Columbia Basin Inter-Agency Committee accepted the report of the Water Supply and Pollution Subcommittee entitled "Columbia River - Water Temperature Conditions and Research Requirements" report stemmed from one of the seven fishery proposals (previously submitted by the Fisheries Steering committee on 6 October 1965; p. 21); (15) On 9 June 1967, the Columbia Basin Inter-Agency committee held its last meeting, and handed over its responsibilities, function and records to the new River Basins Commission, p. 122.

Seaman, Margaret H. 1977. Columbia River estuary inventory of physical, biological and cultural characteristics. Columbia River Estuary Study Taskforce,  
Abstract: Author provides a document containing a compilation of work contributions by various experts for the Columbia river basin, with respect to physical characteristics (e.g. climate, freshwater, estuarine tides, etc.); biological characteristics (e.g. tidal marshes, shoreline habitat, plankton, fishes, etc.); and cultural characteristics (e.g. land & water uses, recreation, etc.).

Shippen, H. 1954. Columbia River survey, ecological section. (Final report to the US Fish Wildl. Serv.) contract 14-19-008-2220. 178 p. p.  
Abstract: Author provides a listing of fish species reported in the Columbia river drainage, based on various published and unpublished references; associates fish species with reference sources contained in listing of abstracts/annotations. These references within the abstracts/annotations section of this report contain information regarding species description, distribution, habitat, food habits, reproduction, and predation. Some but limited information for fishes species inhabiting the estuarine zones of the Columbia river. **Note: Excellent Source For Old References Regarding the Fish Species and Habitat (including anadromous salmonids) within the Columbia River Basin.**

Simenstad, C. A., Jay, D., McIntire, C. D., Nehlsen, W., Sherwood, C., and Small, L. 1984 . The dynamics of the Columbia River estuarine ecosystem, Vol. I and II. Columbia River Estuary Data Development Program, Astoria, Oregon. 695 p. p.  
Abstract: Authors present a synthesis of ecological information & data, derived the physical and biological studies carried out in the Columbia river estuary by CREDDP. The general sections of this reference are:  
1. Regional setting and previous studies;  
2. Circulatory processes;  
3. Sedimentary geology;  
4. Historical changes in Columbia river estuarine physical processes;  
5. Conceptual framework for physical-biological integration;  
6. Ecosystem processes; and  
7. Ecosystem analyses by regions and habitat types.

Simenstad, C. A., Jay, D. A., and Sherwood, C. R. 1992. Impacts of watershed management on land-margin ecosystems: the Columbia River estuary. 266-306. *Watershed Management: balancing sustainability and environmental change*. Springer-Verlag, New York, NY. 543 p.

Abstract: Authors describe the pattern of land use development, changes in estuarine dynamics/process, and habitat alterations of the Columbia river estuary, with respect to river flow, physical properties, and discharge of sediments. State a reduction in 1) mean river flow by ~20%, 2) spring freshet discharge by ~50% of natural flow, 3) sediment inflow by ~25%, and 4) tidal prism by ~15% since the 19th century. Modifications of the estuary have had significant effects on the estuarine processes that occur in the estuarine turbidity maximum (ETM). Subject of headings of reference are: 1) Watershed impacts on land-margin ecosystems, 2) Land margin ecosystems of illustrative of watershed impacts, 3) River characteristics and the influence of watershed alterations, 4) River flow dynamics, 5) Water characteristics and constituents, 6) Historic alterations to the Columbia river from the watershed to the land margin (includes subsections specifying/describing alterations to (a) watershed, (b) river flow frequency spectrum, & (c) sediment transport), 7) Effects of modifications to watershed on land-margin ecosystem processes (ETM, estuarine heat budget, organic input and food web, consumer populations & ecology). Reference contains excellent descriptive tables and figures that illustrate estuarine alterations, historical trends of specific physical/hydrologic factors in the estuary, and historical trends in anadromous salmon landings in the Columbia river.

Simenstad, C. A., Small, L. F., McIntire, C. D., Jay, D. A., and Sherwood, C. 1990. Columbia River estuary studies: An introduction to the estuary, a brief history, and prior studies. *Prog. Ocean.* 25: 1-13.

Abstract: Authors provide a short synopsis on: 1) a description of the Columbia river estuary, 2) previous investigations and the Columbia River Estuary Data Development Program (CREDDP), and Definitions and Conventions in CREDDP. Figures illustrate the various regions & zones and bathymetry of the Columbia estuary. A table illustrates and quantifies the area of habitat types within each region of the Columbia estuary. Extensive reference list included.

Smith, C. 1979. *Salmon fishers of the Columbia*. Oregon State University Press, Corvallis.

Abstract: Author describes a history of the Columbia River fishing industry, from the early Indian fishing activities through the modern day, using numerous reference sources. Provides fish landing and pack statistics over this period. Discusses the habitat alterations/ losses, due to water development, and artificial propagation activities in the Columbia River. Also discusses management history of the Columbia River, and regulatory actions of the States of Oregon and Washington since the late 1800s.

Stanley, G. F. 1970. *Mapping the frontier - Charles Wilson's diary of the survey of the 49th parallel, 1858-1862, while secretary of the British Boundary Commission*. University of Washington Press, Seattle, 182 pages.

Abstract: Charles William Wilson, a British Army officer, documents his travels, activities during his assignment in the survey and mapping of the region around the British Columbia and US boundary. Lieutenant Wilson provides excellent notes and observations of fisheries resources, Indian fishing, and habitat in the upper Columbia basin (e.g. Columbia, Okanogan, Kettle, Pend d'Oreille rivers basins); and also documents fisheries/habitat in the Fraser River basin and Skagit River basin. (NOTE: an excellent reference to fish stocks and habitat that have not been documented in other references/publications related to the Columbia River fisheries resources). The following historical notes of historical milestones and fisheries/natural resources information were derived: 1) Mentions the survey (late 1850s) of the DD.G.F. Macdonald (civil engineer) in the region between the Chilliwack Lake and the Skagit river; p. 13; 2) An illustration of a map of the area (Chilliwack, Skagit, Pasayten, Ashnola (Rosalia), Similkameen, and Okanogan Rivers basin) surveyed in 1858-

1860, p. 34-35; 3) Indian fishing and processing for winter use noted on the Fraser River opposite Fort Langley on 16 October 1858, p. 37; 4) Description of habitat surrounding the Chillawack River (tributary to the Fraser R.) at Chilukweyuk Prairie Headquarters camp on 16 June 1859; also mentions that salmon abound in this area; p. 49; 5) On 30 July 1859, Lt. Wilson mentions that a "fearful fire was raging" in the Skagit Valley beyond the Cascades that originated from an American camp fire, which the Americans were too lazy to put out properly; p. 65; 6) On 9 October 1859, Lt. Wilson mentions, in respect to the Chillawack river and tributaries that "at this season of the year is the quantity of dead salmon on the banks of the river; in some of the smaller streams the quantities are so numerous that it produces a most intolerable smell and renders the water anything but pleasant for drinking purposes...who has been dissecting several of them, thinks this arises from the want of insects to feed enormous numbers of salmon that run up the rivers." p. 73; 7) On 22 May 1860, Lt. Wilson describes Indian fishing activities at The Dalles (Celilo Falls) and notes that the fish "average 25 to 40 lbs. weight..." p. 95; 8) An illustration (map) of the region survey in the upper Columbia River basin (e.g. Kettle, Colville, Spokane, Pend d'Oreille Rivers) in 1860-1861; p. 104-5; 9) On 29 June 1860, Lt. Wilson briefly describes the habitat of the Spokane River basin in the area between Willow Springs and Deep Creek; p. 108-9; 10) On 30 June 1860, Lt. Wilson briefly describes the habitat of the Colville River; p. 109; 11) On 2 July 1860, Lt. Wilson reported that the American Commission has been brought to a standstill at Pend d'Oreille Lake due to extensive flooding..."I hear a tract of nearly 60 miles of land is flooded there." p. 112; 12) On 1 August 1860, Lt. Wilson extensively describes Indian fishing activities at Kettle Falls on the Columbia River, and notes that the Indians catch 700 to 1000 fish per day; p. 113-114; 13) On 12 August 1860, Lt. Wilson briefly describes the habitat surrounding the Okanogan River in the vicinity of Lake Osoyoos; and mentions the salmon fishing methods of the Indians "catching the salmon running at this time in great numbers...": p. 118; 14) On 26 August 1860, Lt. Wilson mentions gold miners at work on the Similkameen River near the forks of the Similkameen and Ashnolon (Rosalia) rivers, and notes that there were about 150 miners in the lower Similkameen basin; p. 124; 15) On 29 August 1860 Lt. Wilson briefly describes the habitat of Rock Creek (tributary to Kettle River); p. 125; 16) On 30 August 1860, Lt. Wilson briefly describes the habitat of the Kettle River (Nehoiapitku") in the vicinity of the town of Rock Creek and also describes the gold mining activity and methods on Rock Creek; p. 126-6; 17) On 31 August 1860, Lt. Wilson briefly again describes the habitat of the Kettle River ("Nehoiapitku"); p. 128; 18) On 2 September 1860, Lt. Wilson notes that "salmon are running in great numbers up the river (the Kettle River "Nehoiapitku"); p. 129; 19) Lt. Wilson describes the habitat in the Little Spokane River basin; p. 146. General description of attributes in the vicinity of the confluence of the Snake and Columbia Rivers. General description of attributes in the vicinity of the Palouse river mouth.

Stone, L. 1885. Explorations on the Columbia River from the head of the Clarks Fork to the Pacific Ocean, made in the summer 1883, with reference to the selection of suitable place for establishing a salmon breeding station. US Bureau of Fisheries Report, 1883 (1885), p. 237-258. Doc. 97 issued 1886; F11-241. US Bureau of Fisheries, Washington, DC.

Abstract: Derived reference from Appendix V: An analytical subject bibliography of the publications of the Bureau of Fisheries, 1871-1920, by Rose M.E. MacDonald. Document review: Author generally describes his investigation of the various Columbia tributaries in terms as potential fish hatchery sites; provides some habitat characteristics of the tributaries.

Sutton, Sarah. 1854. Diary of Sarah Sutton 1, 69-86 (incomplete) p.

Abstract: Author provides some detailed descriptions of activities, habitat and surroundings of various sub-basins (e.g. Burnt, Powder, and Grande Ronde) during her journey to Oregon; diary abruptly ends since the author died at an unknown place in transit of the Grande Ronde valley.

Symons, Thomas W. 1882. Report of an examination of the upper Columbia River and the territory in its

vicinity in September and October 1881. 47th congress, 1st Session, Senate, Ex. Doc. No. 186, Washington; Government Printing Office, 1882. 1-135, maps (complete) p.

Abstract: Author presents a comprehensive account of observations (geologic, botanical, hydraulic/topographic characteristics) and surveys of the upper Columbia River and its tributaries (e.g. Pend d'Oreille, Kootenay, Colville, Spokane, San Poil, Methow River, etc.) Note: Excellent reference to derive habitat information and inferences of the upper Columbia River.

Thomas, D. W. 1983. Changes in the Columbia River estuary habitat types over the past century. Columbia River Estuary Data Development Program, Astoria, Oregon. 51 p. (complete) p.

Abstract: The author provides and compares information for habitat of the Columbia river from the period predating most human interventions (circa 1870) to the present day (1980). Qualitative and quantitative changes in various estuarine habitat are described and illustrated (figures & tables) according to:

- (1) Area- river mouth, mixing zone, Youngs Bay, Baker Bay, Grays Bay, Cathlamet Bay, Upper Estuary, and Estuary;
- (2) Habitat type- deep water, medium depth, shallows/ flats, tidal marshes, tidal swamps, developed floodplain, uplands (natural & filled), non-estuarine swamp, and non-estuarine water;
- (3) Acreage by period- 1870 and present;
- (4) Change- acreage (plus or minus) and percentage;
- (5) 1870 acreage, Present estuarine acreage, estuarine area removed, and non-estuarine wetlands added.

Includes appendices providing information regarding:

- (1) Excerpts from Annual Reports of Superintendent of the US Coast Survey concerning the Columbia river survey for 1868-1873;
- (2) Verification of the US Coast Survey charts;
- (3) An explanation of the boundaries of the historical subarea map;
- (4) Subarea reports for the River Mouth, Mixing Zone, Youngs Bay, Baker Bay, Grays Bay, Cathlamet Bay, and Upper Estuary;
- (5) The nineteen intertidal vegetation communities of the Columbia river, with tables showing their present acreage per subarea and their former acreage and importance (Thomas, 1980).

**Note:** Excellent reference.

United States. Army Corps of Engineers. 1974. Draft environmental statement of Lower Monumental lock and dam, Snake river, Washington U.S. Army Engineer District, Walla Walla, Washington.

Abstract: This draft environmental impact statement addresses the proposed Lower Monumental dam project. Includes information that describes the Lower Monumental project and the existing environment (terrestrial and water habitat/resources) in the area of the project; and describes the impacts of proposed project alternatives.

United States. Army Corps of Engineers. 1975. Draft environmental statement of Lower Granite project, Snake river, Washington U.S. Army Engineer District, Walla Walla, Washington.

Abstract: This draft environmental impact statement addresses the proposed Lower Granite dam project. Includes information that describes the Lower Granite project and the existing environment (terrestrial and water habitat/resources) in the area of the project; and describes the impacts of proposed project alternatives.

United States. Army Corps of Engineers. 1975. Draft environmental statement of lower Snake river fish and wildlife compensation U.S. Army Engineer District, Walla Walla, Washington. 1, I-4, 46-47, 70-106, maps p.

Abstract: This draft environmental impact statement addresses proposed actions to compensate fish

and wildlife losses resulting from four multi-purpose water resources development projects on the lower Snake river. Includes information that describes the existing environment (terrestrial and water habitat/resources) in the area of the project; and describes the impacts of proposed project alternatives.

United States. Army Corps of Engineers. 1979. Final environmental statement of Ice Harbor lock and dam, Snake river, Washington U.S. Army Engineer District, Walla Walla, Washington. 1,11, 2(1)-2(19), 2(33)-2(36) p.

Abstract: This draft environmental impact statement addresses the proposed Ice Harbor dam project. Includes information that describes the Ice Harbor project and the existing environment (terrestrial and water habitat/resources) in the area of the project; and describes the impacts of proposed project alternatives.

United States. Army Corps of Engineers and Department of Commerce. 1994. (Draft environmental statement.). Lower Snake river biological drawdown test.

Abstract: This draft environmental impact statement addresses a proposed biological drawdown test to be conducted a Lower Granite Reservoir, possibly as early as 1995. Include information describing the Lower Granite project and the existing environment (terrestrial and water habitat/resources) in the area of the project.

US Army. 1897. Report of the chief of engineers 1897 in six parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1897. (Annual report).Government Printing Office, Washington. 3456-3463 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

(1) Mouth of Columbia river-Part 1, p. 502-503, Part 4, p. 3404-3406;

(2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 503, Part 4, p. 3407-3414;

(3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 504, Part 4, p. 3414-3416.

(4) Cowlitz river- Part 1, p. 520, Part 4, p. 3463-3465;

(5) Young's and Klasskuine rivers-Part 1, p. 466, Part 5, p.3595-3596 (removal of snags and overhanging trees);

(6) Clatskanie river, from mouth to town of Clatskanie -Part 1, p. 467, Part 4, p. 3596-3598;

(7) Lewis river (survey)-Part 1, p. 523, Part 4, p. 3469-3478; and

(8) South channel of Columbia river (in front of Astoria, OR-Part 1, p. 468, Part 4, p. 3406-3407.

General description of attributes for the Snake river in the vicinity of Wild Goose Island (~74 miles above the Snake river mouth)- human alterations. General description of attributes for the Snake river in the vicinity of Log Island (~38 miles below Lewiston, ID)- human alterations.

US Army. 1898. Report of the chief of engineers 1898 in six parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1898. (Annual report). Government Printing Office, Washington. 3014-3025 (incomplete) p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis,

Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 507-508, Part 4, p. 3040;
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 505-506, Part 4, p. 3031-3038;
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 499, Part 4, p. 3414-3416.
- (4) Cowlitz river- Part 1, p. 508-509, Part 4, p. 3041-3042;
- (5) Willamette Slough (Scappoose Creek/ Bay)- Part 4, p. 3043-3044;
- (6) Clatskanie river, from mouth to town of Clatskanie -Part 1, p. 510, Part 4, p. 3049-3050; and
- (7) South channel of Columbia river (in front of Astoria, OR-Part 1, p. 507, Part 4, p. 3039.

Detailed description of attributes for the Snake river from mouth to Riparia - derived from House Document No. 411, Fifty-Fifth Congress, Second Session: Survey of the Snake River, Washington, From Its Mouth to Riparia (with maps in four sheets). General description of attributes for the Snake river in the vicinity of Wild Goose Island (~74 miles above the Snake river mouth)- human alteration. General description of attributes for the Snake river in the vicinity of Log Island (~38 miles below Lewiston, ID)- human alterations.

US Army. 1899. Report of the chief of engineers 1899 in six parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1899. (Annual report). Government Printing Office, Washington.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 595 Part 4, p. 3246-3247 (includes bathymetry map, dated June 1899, of mouth);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 592-593, Part 4, p. 3239-3245;;
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 586-588, Part 4, p. 3229-3231 (includes map of Hayden Slough characteristics & 6 pages of photographs);
- (4) Cowlitz river- Part 1, p. 597-598, Part 4, p. 3249-3250;
- (5) Lewis river-Part 1, p. 596-597, Part 4, p. 3248-3249;
- (6) Clatskanie river-Part 1, p. 595-596, Part 4, p. 3247-3248; and
- (7) Columbia river below Tongue Point-Part 1, p. 594, Part 4, p. 3245-3246.

US Army. 1900. Report of the chief of engineers 1900 in nine parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1900. (Annual report). Government Printing Office, Washington. 4338-4343 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results,

etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 671-672 & p. 676,-Part 6, p. 4361-4362 & p. 4434-4455 (includes bathymetry map, dated June 1900, of mouth);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 669-670 & p. 676, Part 6, p. 4352-4360 & p. 4416-4433 (includes bar above Tongue Pt, Dobelbower Bar, Walker Is. Bar, Martin Is., Hunters Bar, Martin Is.-Upper Bar, & Pillar Rock Bar);
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 661-663, Part 6, p. 4334-4337 (includes map of Hayden Slough characteristics);
- (4) Cowlitz river- Part 1, p. 674-675, Part 6, p. 4366-4367;
- (5) Lewis river-Part 1, p. 673-674, Part 6, p. 4364-4365;
- (6) Clatskanie river-Part 1, p. 672-673, Part 6, p. 4363-4364; and
- (7) Columbia river below Tongue Point-Part 1, p. 670-671, Part 6, p. 4360-4361.

General description of attributes for the Snake river in the vicinity of Wild Goose Island (~74 miles above the Snake river mouth)- human alteration. General description of attributes for the Snake river in the vicinity of Log Island (~38 miles below Lewiston, ID)- human alterations. General description of attributes for Steptoe Rapids, located ~20 miles below Lewiston, ID. Detailed description of attributes for the Snake R. from Asotin to Wolf Cr. vicinity- derived from House Document No. 75, Fifty-Sixth Congress, 1st Session: Preliminary examination of Snake River from Asotin, WA to Pittsburg, OR (photos and maps included).

US Army. 1901. Report of the chief of engineers 1901 in five parts plus supplement. Annual Reports, War Department, Fiscal Year Ended June 30, 1901. (Annual report).Government Printing Office, Washington. 3528-3544 (incomplete) p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 635-637,-Part 5, p. 3567-3570;
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 633-634, Part 5, p. 3557-3565;
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 627-628, Part 5, p. 3499-3501;
- (4) Cowlitz river- Part 1, p. 639-640, Part 5, p. 3573-3575;
- (5) Lewis river-Part 1, p. 638-639, Part 5, p. 3572-3573;
- (6) Clatskanie river-Part 1, p. 637-638, Part 5, p. 3571-3572; and
- (7) Columbia river below Tongue Point-Part 1, p. 634-635, Part 5, p. 3565-3567.

Detailed description of attributes for the Snake river from the mouth to Lewiston, ID. Vicinity-derived from House Document No. 127, Fifty-Sixth Congress, 2nd Session: Preliminary examination of Snake River from Lewiston, ID to Riparia, WA.

US Army. 1902. Report of the chief of engineers 1902 in four parts plus supplement. Annual Reports, War Department, Fiscal Year Ended June 30, 1902. (Annual report).Government Printing Office, Washington.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce &

development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 556-558,-Part 3, p. 2400-2402;
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 554-555, Part 3, p. 2393--2398;
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 549-550, Part 3, p. 2383-2384;
- (4) Cowlitz river- Part 1, p. 559-560, Part 3, p. 2404-2405;
- (5) Lewis river-Part 1, p. 560-561, Part 3, p. 2406-2407;
- (6) Clatskanie river-Part 1, p. 558-559, Part 3, p. 2403-2404; and
- (7) Columbia river below Tongue Point-Part 1, p. 556-558, Part 3, p. 2398-2400.

US Army. 1903. Report of the chief of engineers 1903-Volume 9, Part 1, Volume 10, Part 2, Volume 11, Part 3, Volume 12, Part 4, & Volume 13, Supplement.. Annual Reports, War Department, Fiscal Year Ended June 30, 1903. (Annual report).Government Printing Office, Washington. 2246-2255, 2270-2319 and maps p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 614-616,-Part 3, p. 2271-2318 (includes a comprehensive synopsis for the Columbia river entrance, with respect to description, history, physical data, sand movements, projects such as jetties, dredging, etc, and appendices with historical surveys & bathymetric maps);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 612-614, Part 3, p. 2263-2270 (includes an index map of the lower Columbia and Willamette rivers, opposite p. 2266);
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 608-609, Part 3, p. 2228-2229;
- (4) Cowlitz river- Part 1, p. 616-618, Part 3, p. 2319;
- (5) Lewis river-Part 1, p. 618-619, Part 3, p. 2320-2321 (includes index map of Lewis river);
- (6) Clatskanie river-Part 1, p. 616-617, Part 3, p. 2318; and
- (7) Columbia river below Tongue Point-Part 1, p. 614, Part 3, p. 2398-2400.

**Note: Excellent reference that provides the history of the Columbia entrance from late 1700's to present.**

Detailed description of attributes for the Snake R. from Lewiston (ID) to Imnaha river mouth- 14 maps included. Detailed description of attributes for the Snake R. from Lewiston (ID) to Imnaha river mouth- 13 maps to scale of 1:5000 with an index sheet and profile of the river (not printed in report?)

US Army. 1904. Report of the chief of engineers 1904- Volume 5, Part 1, Volume 6, Part 2, Volume 7, Part 3, Volume 8, Part 4, & Volume 9, Supplement. Annual Reports, War Department, Fiscal Year Ended June 30, 1904. (Annual report).Government Printing Office, Washington . 3468-3471, maps p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the

river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 678-681,-Part 3, p. 3543-3553 (includes a bathymetric map of the Columbia river entrance for June 1904, opposite p. 3548);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 675--677, Part 3, p. 3534-3542 (includes an index map of the lower Columbia and Willamette rivers, opposite p. 3538);
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 670-671, Part 3, p. 3496-3506;
- (4) Cowlitz river- Part 1, p. 682-683, Part 3, p. 3555-3557;
- (5) Lewis river-Part 1, p. 683-685, Part 3, p. 3557-3558 (includes index map of Lewis river);
- (6) Clatskanie river-Part 1, p. 681-682, Part 3, p. 3554-3555; and
- (7) Columbia river below Tongue Point-Part 1, p. 678, Part 3, p. 3543.

US Army. 1905. Report of the chief of engineers 1905- Volume 5, Part 1, Volume 6, Part 2, Volume 7, Part 3, Volume 8, Supplement.. Annual Reports, War Department, Fiscal Year Ended June 30, 1905. (Annual report). Government Printing Office, Washington. 2454-2469, 2482-2495 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 685-687,-Part 3, p. 2484-2492 (includes a bathymetric map of the Columbia river entrance for June 1905, opposite p. 2488);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 681-684, Part 3, p. 2475-2483 (includes an index map of the lower Columbia and Willamette rivers, opposite p. 2478);
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 676-678, Part 3, p. 2467-2468;
- (4) Cowlitz river- Part 1, p. 688-689, Part 3, p. 2493-2494;
- (5) Lewis river-Part 1, p. 689-691, Part 3, p. 2495-2496;
- (6) Clatskanie river-Part 1, p. 687-688, Part 3, p. 2492-2493; and
- (7) Columbia river below Tongue Point-Part 1, p. 684, Part 3, p. 2483-2484.

US Army. 1906. Report of the chief of engineers US Army 1906 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1906. (Annual report). Government Printing Office, Washington . 1984-1999, 2004-2019, 2044-2047 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 757-760,-Part 2, p. 2012-2017-(includes a bathymetric map of the Columbia river entrance for May-June 1906, opposite p. 2016);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 754-756, Part 2, p. 2006-2012 -

- (includes an index map of the lower Columbia and Willamette rivers, opposite p. 2010);
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 750-751, Part 2, p. 1998-2000;
  - (4) Cowlitz river- Part 1, p. 761-763, Part 2, p. 2018-2019;
  - (5) Lewis river-Part 1, p. 763-765, Part 2, p. 2019; and
  - (6) Clatskanie river-Part 1, p. 760-761, Part 2, p. 2017-2018.

Detailed description of the attributes for the Snake R. from Imnaha river mouth to Wolf creek vicinity (Pittsburg, OR)- seven map sheets not included. Detailed description of the attributes for the Snake R. from Imnaha river mouth to Wolf creek vicinity (Pittsburg, OR)- index map of upper Columbia and Snake rivers from Ceilo to Pittsburg Landing.

US Army. 1907. Report of the chief of engineers US Army 1907 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1907. (Annual report).Government Printing Office, Washington. 2168-2179, 2188-2205, 2226-2227 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Columbia river- mouth to mouth of Willamette river-Part 1, p. 767-768;
- 2) Columbia and lower Willamette rivers below Portland- Part 1, p.771-772;
- 3) Mouth of Columbia river- Part 1, p. 773-774, Part 3, p. 2196-2203;
- 5) Dredge for improving lower Willamette and Columbia rivers- Part 2, p. 1105-1106, Part 3, p. 2190-2196;
- 6) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 775-776, Part 3, p. 2203-2204;
- 7) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 777-778, Part 3, p. 2204-2207;
- 8) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 776-777, Part 3, p. 2204-2207; and
- 9) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 779, Part 3, p. 2207.

US Army. 1908. Report of the chief of engineers US Army 1908 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1908. (Annual report).Government Printing Office, Washington. 2244-2257, 2264-2279, 2305-2307 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Columbia and lower Willamette rivers below Portland- Part 1, p.820-822, Part 3, p.2264-2270;
- 2) Mouth of the Columbia river- Part 1, p. 822-825, Part 3, p. 2270-2274 (**Note:** opposite page 2272 is survey map of Columbia river entrance for the year 1908);
- 3) Dredge for improving lower Willamette and Columbia rivers- Part 1, p. 1143-1144;

- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 825-826, Part 3, p. 2274-2275;
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 827-829, Part 3, p. 2277-2278;
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 826-8277, Part 3, p. 2275-2277; and
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 829-830, Part 3, p. 2278-2279.

US Army. 1909. Report of the chief of engineers US Army 1909 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1909. (Annual report).Government Printing Office, Washington. 2210-2217, 2222-2223, 2230-2238, 2240-2243, 2260-2263 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Columbia and lower Willamette rivers below Portland- Part 1, p. 859-982, Part 3, p. 2230-2236;
- 2) Mouth of the Columbia river- Part 1, p.862-864, Part 3, p. 2236-2239;
- 3) Dredge for improving lower Willamette and Columbia rivers- Part 1, p.1153 (**Note:** opposite page 2238 is survey map of Columbia river entrance for the year 1909);
- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 865-866, Part 3, p. 2239-2240;
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 867-869, Part 3, p. 2241-2242;
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 866-867, Part 3, p. 2240-2241; and
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 869-870, Part 3, p. 2242-2243.

US Army. 1913. Report of the chief of engineers US Army 1913 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1913. (Annual report).Government Printing Office, Washington. 3068-3085, 3092-3095, 3100-3105,3108-3115, 3140-3143 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Oregon Slough (part of the former channel of the Columbia river which separates Hayden Island from the Oregon mainland)- Part 1, p. 1338-1340 (**Note:** Includes table of references to examination or survey reports or maps not in the project documents for years 1892, 1896, 1904, & 1912), Part 3, p. 3083-3084;
- 2) Columbia and lower Willamette rivers below Portland- Part 1, p. 1350-1354 (**Note:** Includes table of references to examination or survey reports or maps including the project documents for years

- 1877, 1891, 1892, & 1900), Part 3, p. 3092-3100;
- 3) Mouth of the Columbia river- Part 1, p. 1354-1359, Part 3, p. 3100-3108 (**Note:** opposite page 3104 is survey map of Columbia river entrance for the year 1913);
- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1359-1361 & p. 1367-1368 (Note: Snag removal projects), Part 3, p. 3108-3109 & p. 3115 (Note: Snag removal projects);
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1364-1367 & p. 1367-1368 (Note: Snag removal projects), Part 3, p. 3113-3114 & p. 3115 (Note: Snag removal projects);
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1362-1364 & p. 1367-1368 (Note: Snag removal projects), Part 3, p. 3110-3112 & p. 3115 (Note: Snag removal projects); and
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1368-1369, Part 3, p. 3115-3116.

US Army. 1914. Report of the chief of engineers US Army 1914 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1914. (Annual report).Government Printing Office, Washington. 3197-3215, 3222-3245, 3266-3267 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Oregon Slough (part of the former channel of the Columbia river which separates Hayden Island from the Oregon mainland)- Part 1, p.1387-1389 (**Note:** Includes table of references to examination or survey reports or maps not in the project documents for years 1892, 1896, 1904, & 1912),
- 2) Columbia and lower Willamette rivers below Portland- Part 1, p. 1400-1403 (**Note:** Includes table of references to examination or survey reports or maps including the project documents for years 1877, 1891, 1892, & 1900),
- 3) Mouth of the Columbia river- Part 1, p. 1403-1409 (**Note:** Includes (1) Table of references to examination or survey reports or maps including the project documents for years 1879, 1880, 1883, 1886,1890, 1893, 1895,1900 & 1903, and (2) Information on the amount of stone used for the 1884 and 1903 jetty projects);
- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1409-1411 & p. 1417-1418 (Note: Dredge & snag removal projects), Part 3, p. 3239-3240 & p. 3245 (Note: Dredge & snag removal projects);
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1414-1417 & p. 1417-1418 (Note: Dredge & snag removal projects), Part 3, p. 3243-3444 & p. 3455 (Note: Dredge & snag removal projects);
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1411-1414 & p. 1417-1418 (Note: Dredge & snag removal projects), Part 3, p. 3240-3243 & p. 3455 (Note: Dredge & snag removal projects); and
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1418-1419, Part 3, p. 3245-3246.

US Army. 1915. Report of the chief of engineers US Army 1915 in three parts. Annual Reports, War

Department, Fiscal Year Ended June 30, 1915. (Annual report).Government Printing Office, Washington. 3370-3375, 3388-3389, 3396-3419, 3442-3443 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) The Columbia river between Vancouver, WA and the mouth of the Willamette river- Part 1, p. 1513-115;
- 2) Oregon Slough (part of the former channel of the Columbia river which separates Hayden Island from the Oregon mainland)- Part 1, p. 1515-1518, Part 3, p. 3389-3390;
- 3) Columbia and lower Willamette rivers below Portland- Part 1, p. 1527-1532, Part 2, p. 1998-1999, Part 3, p. 3397-3404;
- 4) Mouth of the Columbia river- Part 1, p.1533-1538, Part 2, p. 1999-2000, Part 3, p. 3404-3414 (**Note:** opposite page 3408 are survey maps of Columbia river entrance for the September and December 1914, and March and June 1915);
- 5) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1538-1540 & p. 1546-1547 (Note: Dredge & snag removal projects), Part 2, p. 2000, Part 3, p. 3414-3415 & p. 3418-3419 (Note: Dredge & snag removal projects);
- 6) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1543-1546 & p. 1546-1547 (Note: Dredge & snag removal projects), Part 2, 2001, Part 3, p. 3417--3418 & p. 3418-3419 (Note: Dredge & snag removal projects);
- 7) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1540-1542 & p. 1546-1547 (Note: Dredge & snag removal projects), Part 2, p. 2000, Part 3, p. 3415-3417 & p. 3418-3419 (Note: Dredge & snag removal projects); and
- 8) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1547-1549, Part 3, p. 3245-3246.

US Army. 1916. Report of the chief of engineers US Army 1916 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1916. (Annual report).Government Printing Office, Washington. 3207-3219, 3226-3227, 3232-3245, 3270-3273 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Columbia and lower Willamette rivers below Portland- Part 1, p. 1649-1655, Part 3, p.3227-3233;
- 2) Mouth of the Columbia river- Part 1, p. 1655-1658, Part 3, p. 3233-3238 (**Note:** opposite page 3408 is survey map of Columbia river entrance for the June 1916).
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1658-1661 & p. 1668 (Note: Dredge & snag removal projects), Part 3, p. 3239-3240 & p. 3244-3245 (Note: Dredge & snag removal projects);
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East

Fork and Woodland on the North Fork)- Part 1, p. 1663-1667 & p. 1668 (Note: Dredge & snag removal projects), Part 3, p. 3242--3244 & p. 3244-3245 (Note: Dredge & snag removal projects);  
5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1661-1663 & p. 1668 (Note: Dredge & snag removal projects), Part 3, p. 3240-3242 & p. 3244-3245 (**Note**: Dredge & snag removal projects); and  
6) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1668-1670, Part 3, p. 3245-3246.

US Army. 1917. Report of the chief of engineers US Army 1917 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1917. (Annual report).Government Printing Office, Washington. 3322-3323, 3328-3335, 3344-3349, 3376-3377 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1716-1719, Part 2, p. 3329-3333;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1719-1726, Part 2, p. 3333-3340;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1726-1729, Part 2, p. 3340-3342;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1735-1739, Part 2, p. 3345--3347;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1739-1741, Part 2, p. 3347-3349; and
- 6) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1742-1744, Part 2, p. 3349-3350.

US Army. 1918. Report of the chief of engineers US Army 1918 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1918. (Annual report).Government Printing Office, Washington. 3370-3371, 3377-3385, 3394-3397 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p. 1763-1766, Part 3, p. 3377-3380 (**Note**: opposite page 3378 is survey map of Columbia river entrance for the June 1918).;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p.1766-1772, Part 3, p. 3381-3388;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1773-1775, Part 3, p. 3389-3390;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East

- Fork and Woodland on the North Fork)- Part 1, p. 1782-1786, Part 3, p. 3394--3395;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1786-1789, Part 3, p. 3395-3397; and
- 6) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1789-1791, Part 3, p. 3397-3398.

US Army. 1919. Report of the chief of engineers US Army 1919 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1919. (Annual report).Government Printing Office, Washington . 3424-3441 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p. 1857-1861, Part 3, p. 3433-3437 (**Note**: opposite page 3434 is survey map of Columbia river entrance for the June 1919).;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p.1861-1867, Part 3, p. 3437-3445.
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1867-1870, Part 3, p.3445-3446 ;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1877-1880, Part 2, p. 3450-3451;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1881-1883, Part 3, p. 3452-3453;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1883-1885, Part 3, p. 3453-3454; and
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1885-1888, Part 3, p. 3454-3455.

US Army. 1920. (Annual report).Government Printing Office, Washington. 2926-2945 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1851-1854, Part 2, p. 2935-2937 (**Note**: opposite page 2936 is survey map of Columbia river entrance for the June 1920);
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1854-1861, Part 2, p. 2937-2940;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1861-1863, Part 2, p.2941 ;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1870-1873, Part 2, p. 2943-2944;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)-

Part 1, p. 1874-1876, Part 2, p. 2944;

6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1876-1878, Part 2, p. 2945; and

7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1878-1881, Part 2, p. 2945.

US Army. 1921. Report of the chief of engineers US Army 1921 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1921. (Annual report).Government Printing Office, Washington . 1850-1877, 1886-1895, 1944-1947 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

1) Mouth of the Columbia river- Part 1, p.1867-1870 (**Note:** opposite page 1868 is survey map of Columbia river entrance for the June 1921);

2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1870-1877;

3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1877-1880;

4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1886-1889;

5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1889-1892;

6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1892-1894; and

7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1894-1897.

US Army. 1922. Report of the chief of engineers US Army 1922 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1922. (Annual report).Government Printing Office, Washington . 1868-1899, 1909-1921, 1964-1967 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

1) Mouth of the Columbia river- Part 1, p.1887-1889;

2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1890-1897;

3) Willamette Slough (also known as Multnomah Channel- 21 miles in length, flowing in northerly direction, connecting the Willamette and Columbia rivers at St. Helens, OR)- Part 1, p. 1897-1899 (**Note:** a new project in the fiscal year 1922);

4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1900-1902;

5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East

- Fork and Woodland on the North Fork)- Part 1, p. 1909-1912;
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1912-1914;
- 7) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1915-1916; and
- 8) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1916-1919.

US Army. 1923. Report of the chief of engineers US Army 1923 in three parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1923. Washington Government Printing Office,

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1743-11746;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1746-1754;
- 3) Willamette Slough (also known as Multnomah Channel 21 miles in length, flowing in northerly direction, connecting the Willamette and Columbia rivers at St. Helens, OR)- Part 1, p. 1754-1756;
- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1756-1759;
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1764-1767;
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1767-1769;
- 7) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1769-1771; and
- 8) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1772-1774.

US Army. 1924. Report of the chief of engineers US Army 1924 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1924. Washington Government Printing Office,

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1748-1751;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1751-1759;
- 3) Willamette Slough (also known as Multnomah Channel 21 miles in length, flowing in northerly direction, connecting the Willamette and Columbia rivers at St. Helens, OR)- Part 1, p. 1760-1762;
- 4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1762-1764;
- 5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1769-1772;
- 6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)-

Part 1, p. 1772-1774;

7) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1775-1776; and

8) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1777-1779.

US Army. 1925. Report of the chief of engineers US Army 1925 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1925. Washington Government Printing Office,

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

1) Mouth of the Columbia river- Part 1, p.1676-1679;

2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1679-1686;

3) Willamette Slough (also known as Multnomah Channel- 21 miles in length, flowing in northerly direction, connecting the Willamette and Columbia rivers at St. Helens, OR)- Part 1, p. 1686-1688;

4) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1688-1691;

5) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1699-1701;

6) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1702-1704;

7) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1704-1705;

8) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1706-1707; and

9) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1708-1709.

US Army. 1926. Report of the chief of engineers US Army 1926 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1926. Washington Government Printing Office,

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

1) Mouth of the Columbia river- Part 1, p.1665-1668;

2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1668-1677;

3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1677-1680;

4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1688-1691;

5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1691-1694;

6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1694-1696;

- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1696-1698; and
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1698-1701.

US Army. 1927. Report of the chief of engineers US Army 1927 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1927. Washington Government Printing Office,

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1664-1667;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1667-1675;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1675-1678;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1700-1702;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1702-1705;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1705-1707;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1707-1709; and
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1709-1711.

US Army. 1928. Report of the chief of engineers US Army 1928 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1928. Washington Government Printing Office,

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1725-1728;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1728-1736;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1736-1739;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1761-1763;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1764-1766;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1766-1768;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1769-1770; and
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1771-1773.

US Army. 1929. Report of the chief of engineers US Army 1929 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1929. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1753-1756;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1756-1764;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1764-1767;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1790-1793;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1793-1796;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1796-1798;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1798-1800; and
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1800-1802.

US Army. 1930. Report of the chief of engineers US Army 1930 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1930. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1844-1847;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1849-1856;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1856-1859;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1886-1889;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1889-1892;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1893-1895;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1895-1897;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1897-1900;
- 9) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)- Part 1, p. 1847-1849 (**Note:** reference provides a short history of the stream & condition);
- 10) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1885-1886 (**Note:**

a short history of the stream and associated activities/description is provided); and  
11) Steamboat Slough (also known as Skamokama Slough)- Part 1, p. 1892-1893.

US Army. 1931. Report of the chief of engineers US Army 1931 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1931. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1854-1857;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1861-1869;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1869-1872;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1899-1901;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1901-1905;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1906-1910;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1895-1897;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1911-1913;
- 9) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)- Part 1, p. 1857-1860 (**Note**: reference provides a short history of the stream & condition);
- 10) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1896-1899 (**Note**: a short history of the stream and associated activities/description is provided); and
- 11) Steamboat Slough (also known as Skamokama Slough)- Part 1, p. 1905-1906.

US Army. 1932. Report of the chief of engineers US Army 1932 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1932. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1756-1760;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1762-1771;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1771-1773;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1794-1796;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1796-1799;

- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1800-1802;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1802-1803;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1803-1805;
- 9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1792-1794 (**Note** : a short history of the stream and associated activities/description is provided); and
- 10) Steamboat Slough (also known as Skamokama Slough)- Part 1, p. 1799-1800.

US Army. 1933. Report of the chief of engineers US Army 1933 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1933. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1140-1143;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1145-1150;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1150-1152;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1164-1165;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1166-1168;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1168-1169;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1802-1803;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1169-1170; and
- 9) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)- Part 1, p. 1143-1145 (**Note** : reference provides a short history of the stream & condition).

US Army. 1934. Report of the chief of engineers US Army 1934 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1934. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1313-1316;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1318-1325;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1325-1326;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East

- Fork and Woodland on the North Fork)- Part 1, p. 1343-1344;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1344-1347;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1347-1348;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1348-1350;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1350-1351;
- 9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1341-1343 (**Note** : a short history of the stream and associated activities/description is provided);
- 10) Columbia river at Bakers Bay- Part 1, p. 1351-1352;
- 11) Columbia river at Bonneville -Part 1, p. 1334-1337; and
- 12) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)- Part 1, - Part 1, p. 1316-1318 (**Note** : reference provides a short history of the stream & condition).

US Army. 1935. Report of the chief of engineers US Army 1935 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1935. Washington Government Printing Office, Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1475-1477;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1479-1487;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1487-1488;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1499-1501;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1501-1503;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1503-1504;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1504-1505;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1505-1507;
- 9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1498-1499 (**Note** : a short history of the stream and associated activities/description is provided);
- 10) Columbia river at Bakers Bay- Part 1, p. 1507-1508;
- 11) Columbia river at Bonneville -Part 1, p. 1513-1516;
- 12) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)- Part 1, - Part 1, p. 1477-1478 (**Note** : reference provides a short history of the stream & condition);
- 13) Youngs Bay and Youngs river (lower 8 mi. tidal)-Part 1, p. 1478-1479; and
- 14) Multnomah Channel (also known as Willamette Slough)-Part 1, p. 1489-1490.

US Army. 1936. Report of the chief of engineers US Army 1936 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1936. Washington Government Printing Office,

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1476-1478;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1481-1487;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1487-1489;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1500-1502;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1502-1504;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1504-1505;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1505-1506;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1506-1507;
- 9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1499-1500 (**Note** : a short history of the stream and associated activities/description is provided);
- 10) Columbia river at Bakers Bay- Part 1, p. 1507-1508;
- 11) Columbia river at Bonneville-Part 1, p. 1517-1524;
- 12) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)- Part 1, - Part 1, p. 1479-1480 (**Note** : reference provides a short history of the stream & condition);
- 13) Youngs Bay and Youngs river (lower 8 mi. tidal)-Part 1, p. 1480;
- 14) Multnomah Channel (also known as Willamette Slough)-Part 1, p. 1489-1490; and
- 15) Oregon Slough (also known as North Portland Harbor)-Part 1, p. 1498-1499.

US Army. 1937. Report of the chief of engineers US Army 1937 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1937. Washington Government Printing Office,

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1487-1489;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1492-1498;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1499-1500;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1509-1510;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1510-1512;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1513-

1514;

7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1514-1515;

8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1515-1516;

9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1508-1509 (**Note** : a short history of the stream and associated activities/description is provided);

10) Columbia river at Bakers Bay- Part 1, p. 1516-1517;

11) Columbia river at Bonneville-Part 1, p. 1529-1536;

12) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)-Part 1, p. 1489-1491 (**Note** : reference provides a short history of the stream & condition);

13) Youngs Bay and Youngs river (lower 8 mi. tidal)-Part 1, p. 1491-1492;

14) Multnomah Channel (also known as Willamette Slough)-Part 1, p. 1500-1501;

15) Oregon Slough (also known as North Portland Harbor)-Part 1, p. 1498-1499;

16) Westport Slough (side channel of the Columbia river located 70 mi. below Portland, OR)-Part 1, p. 1498-1499;

17) Elockomin Slough (3.5 mi. in length, located 75 mi. below Portland)-Part 1, p. 1512-1513; and

18) Columbia river between Vancouver and Bonneville-Part 1, p. 1528-1529.

US Army. 1938. Report of the chief of engineers US Army 1938 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1938. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

1) Mouth of the Columbia river- Part 1, p.1740-1742;

2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1746-1750;

3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1751-1753;

4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1762-1763;

5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1763-1765;

6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1766-1767;

7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1767-1768;

8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1768-1769;

9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1761-1762 (**Note** : a short history of the stream and associated activities/description is provided);

10) Columbia river at Bakers Bay- Part 1, p. 1769-1770;

11) Columbia river at Bonneville-Part 1, p. 1829-1838;

12) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)-Part 1, p. 1742-1744 (**Note** : reference provides a short history of the stream & condition);

13) Youngs Bay and Youngs river (lower 8 mi. tidal)-Part 1, p. 1745-1746;

14) Multnomah Channel (also known as Willamette Slough)-Part 1, p. 1753-1754;

- 15) Oregon Slough (also known as North Portland Harbor)-Part 1, p. 1498-1499;
- 16) Westport Slough (side channel of the Columbia river located 70 mi. below Portland, OR)-Part 1, p. 1751;
- 17) Elockomin Slough (3.5 mi. in length, located 75 mi. below Portland)-Part 1, p. 1765-1766;
- 18) Columbia river between Vancouver and Bonneville-Part 1, p. 1828-1829;
- 19) Columbia river between Chinook, WA and head of Sand Island-Part 1, p. 1770-1771; and
- 20) Information regarding diking & Improving Districts along lower Columbia-Part 1, p. 1774-1808.

US Army. 1939. Report of the chief of engineers US Army 1939 in two parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1939. Washington Government Printing Office,

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- 1) Mouth of the Columbia river- Part 1, p.1890-1893;
- 2) Columbia and lower Willamette rivers below Vancouver and Portland- Part 1, p. 1897-1903;
- 3) Clatskanie river (empties through Beaver and Wallace Sloughs into the Columbia river 65 mi below Portland)- Part 1, p. 1903-1904;
- 4) Lewis river (empties into Columbia 26 miles below Portland, stream is tidal to La Center on East Fork and Woodland on the North Fork)- Part 1, p. 1914-1915;
- 5) Cowlitz river (empties into Columbia river 45 mi. below Portland; tidal to 9 miles above mouth)- Part 1, p. 1915-1917;
- 6) Skamokawa Creek (empties into Columbia river at RM 34, lower 1.5 mi. tidal)- Part 1, p. 1918-1919;
- 7) Grays river (empties into Grays Bay at mouth; tidal in lower 8 mi.)- Part 1, p. 1919-1920;
- 8) Deep river (formerly known as Alamicut river- a tidal slough extending 4 mi. inland from a northerly direction of Grays Bay- Part 1, p. 1920-1922;
- 9) Lake river ( enters Columbia river near the mouth of the Lewis river)- Part 1, p. 1913-1914 (**Note** : a short history of the stream and associated activities/description is provided);
- 10) Columbia river at Bakers Bay- Part 1, p. 1922-1923;
- 11) Columbia river at Bonneville-Part 1, p. 2002-2011;
- 12) Skipanon Channel (located at Warrenton, OR; originally called Skipanon river, a narrow crooked stream with ~1.8 mi tidal)-Part 1, p. 1893-1895 (**Note** : reference provides a short history of the stream & condition);
- 13) Youngs Bay and Youngs river (lower 8 mi. tidal)-Part 1, p. 1895-1897;
- 14) Multnomah Channel (also known as Willamette Slough)-Part 1, p. 1904-1905;
- 15) Oregon Slough (also known as North Portland Harbor)-Part 1, p. 1498-1499;
- 16) Westport Slough (side channel of the Columbia river located 70 mi. below Portland, OR)-Part 1, p. 1751;
- 17) Elockomin Slough (3.5 mi. in length, located 75 mi. below Portland)-Part 1, p. 1917-1918;
- 18) Columbia river between Vancouver and Bonneville-Part 1, p. 2000-2002;
- 19) Columbia river between Chinook, WA and head of Sand Island-Part 1, p. 1923-1924; and
- 20) Information regarding diking & Improving Districts along lower Columbia-Part 1, p. 1927-1973.

US Army Corps of Engineers. 1978. Columbia river downstream of Bonneville dam- maintenance disposal plan. US Army Corps of Engineers, Portland District, 79 p.

Abstract: Reference provides information regarding shoal/bar patterns of the entrance and estuary of

the Columbia river to Bonneville dam, with respect to current and future dredging operations (and disposal areas of materials) for maintenance of the navigation channel. Information (past maintenance, present Oregon side disposal, and present Washington side disposal) for each critical bar/reach is provided; each is illustrated using an aerial photograph that is detailed with data & outlines.

**Note:** Photographs provide excellent details of inriver, riparian and uplands habitat from an aerial perspective.

US Commission of Fish and Fisheries. 1895. Bulletin of the US Fish Commission for 1894, Vol. XIV. US Commission of Fish and Fisheries, Washington, DC: Government printing office, 1894.  
Abstract: Eigenmann, Carl H. Results of explorations in western Canada and the northwestern US (pages 101-132): References to habitat of Umatilla River, Grande Ronde, Snake River (at Idaho Falls); and a milling dam on the Grande Ronde at the town of La Grande. Discussion of species and taxonomic characteristics. NOTE: VERY IMPORTANT REFERENCE. Gilbert, C.H. and B.W. Evermann. A report upon the physical and natural history investigations in the Columbia River basin (pages 169-207): Extensive discussions of habitat characteristics for tributaries of the Lower Columbia (Cowlitz, Yakima, Naches, and Toutle) and the upper Columbia (Colville, Little Spokane, Spokane, Snake and tributaries. References that large numbers of salmon used to ascend the Yakima River and Columbia River at Kettle Falls; also has stream temperature and flow data for the Yakima, Naches, and Manatash Creek. NOTE: VERY IMPORTANT REFERENCE. McDonald, Marshall. The salmon Fisheries of the Columbia River, together with a report upon the physical and natural history investigations in the region, by Gilbert and Evermann (Pages 153-207): a presentation of the status of salmon and reasons for decline of salmon in the Columbia basin, that was given to the Congress. NOTE: VERY IMPORTANT REFERENCE.

US Commission of Fish and Fisheries. 1895. Part XIX: Report of the Commissioner for 1893. US Commission of Fish and Fisheries, Washington, DC: Government printing office. 38-41 p.  
Abstract: Discussion of the investigations of interior waters of the Columbia River (Clarke Fort, Pend d'Oreille Lake, and Pend d' Oreille River) in terms of habitat, physical impediments to passage/navigation. Reference to occurrence of chinook salmon and steelhead trout in the Pend d'Oreille River. Commissioner stated intentions to expand investigations of habitat/passage of salmon throughout the entire Columbia River and its tributaries. Pages 38-41. Discussion of the operation of the Clackamas station Oregon (Waldo F. Hubbard, superintendent) during 1892; references to adult and egg collection of chinook salmon at the Sandy River. Pages 121-122. Extensive section that elaborates on The Fisheries of The Pacific Coast (text and statistical tables), inclusive of the Columbia River. Pages 143-304.

US Department of Commerce. 1932. Doctor Ellis demonstrates serious effects of mine pollution. Fisheries Service Bulletin No. 211, Bureau of Fisheries, US Department of Commerce, Washington DC, December 1, 1932.  
Abstract: Notes the history and results of Dr. M.M. Ellis (US Bureau of Fisheries) who studied the pollution problem of Couer d'Alene River in Idaho, regarding wastes from silver, lead, and zinc mines. Survey extended from Montana to Spokane River in Washington. Provides extensive information on extent and type of habitat degradation to streams and lakes caused from mining wastes. Mentions that aquatic production of Couer d'Alene Lake was showing decline in the southern end from 1911, and species of trout were scarce, p. 3-4.

US House of Representatives. 1881. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1881 in three parts. 47th Congress, 1st Session, Ex. Doc.1, pt 2, vol.II. Washington Government Printing Office,  
Abstract: The reference contains comprehensive information regarding projects and activities related

to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river- Part 3, p. 2534-2552 (includes historical description of river mouth for physical characteristics and projects since early 1839, and bathymetry maps December 1880 and February 1881 opposite p.2546 & 2552 respectively);
- (2) Lower Willamette and Columbia rivers from Portland to the sea-Part 1, p. 324-326, Part 3, p. 2531-2534 (surveys & dredging activities);
- (3) Cowlitz River-Part 1, p.331, Part 3, p. 2600-2603 (includes brief historical description of river characteristics and commerce in the valley adjacent to the river); and
- (4) Young's, Lewis & Clark, and Skipanon rivers, tributaries to Young's Bay-Part 1, p.332.

US House of Representatives. 1887. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1887 in four parts. 50th Congress, 1st Session, Ex. Doc.1, pt 2, vol.II. Washington Government Printing Office,

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river- Part 1, p. 327, Part 3, p. 2470 etc. (not available at U of W library for review);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 331, Part 3, p. 2507 etc. (not available at U of W library for review); and
- (3) Cowlitz river- Part 1, p. 333, Part 3, p. 2524 etc. (not available at U of W library for review).

US House of Representatives. 1891. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1891 in six parts. 52D Congress, 1st Session, Ex. Doc.1, pt 2, vol.II. (Annual report).Government Printing Office, Washington. 3284-3293 (incomplete) p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 412-413 (channel maintenance and work on low-tide jetty from Fort Stevens to Clatsop Spit), Part 5, p. 3314-3328 (includes bathymetry map of Columbia mouth for June 1891);
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 416-417, Part 5, p. 3362-3367;
- (3) Cowlitz river- Part 1, p. 418-419
- (4) Willamette river at Swan Island-Part 1, p. 420, Part 5, p.3370-3371;
- (5) Young's Bay (improvement of Young's and Klasskuine rivers) at Columbia river mouth-Part 1, p.

- 420, Part 5, p.3371-3372 (removal of snags and overhanging trees);  
 (6) Deep, Skamakawa, and Crooked rivers-Part 1, p. 420  
 (7) Lower Columbia river between Astoria and Woods Landing (snag removal project)-Part 1, p. 420, Part 5, p.3380;  
 (8) Lewis and Clarke's river (snag & overhanging trees removal project)-Part 1, p. 421, Part 5, p.3384-3385;  
 (9) Grays river (sand bar, snag & overhanging trees removal project)-Part 1, p. 421, Part 5, p.3386-3387; and  
 (10) Deep, Skamakawa, and Crooked rivers-Part 5, p. 3378-3379.

General description of attributes for the Snake river from the mouth to Lewiston, ID, Table containing gradient information for various rapids.

General description of attributes for the Snake river from the Seven Devils Mining District (~65 miles below Huntington Bridge) to Huntington Bridge (near the Burnt river mouth).

US House of Representatives. 1892. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1892 in four parts and atlas. 52D Congress, 2d Session, Ex. Doc.1, pt 2, vol.II. (Annual report).Government Printing Office, Washington. 2374-2485, 2400-2409, 2708-2715 p.  
Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area.The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 386-388 (channel maintenance and work on low-tide jetty from Fort Stevens to Clatsop Spit), Part 3, p. 2808-2818;
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 389-391, Part 3, p. 2829-2835;
- (3) Cowlitz river- Part 1, p. 392-393, Part 3, p. 2837-2838;
- (4) Young's Bay (improvement of Young's and Klasskuine rivers) at Columbia river mouth-Part 1, p. 393, Part 3, p.2839 (removal of snags and overhanging trees);
- (5) Lower Willamette and Columbia rivers, with view of securing 25 feet a low water from Portland to the mouth of the Columbia-Part 1, p. 394-395, Part 3, p. 2851-2869; and
- (6) Willamette river at Ross Island-Part 3, p.2842-2844.

**Atlas:** Map no. 126- Depth sounding of the Columbia river mouth, 9,10, 11 June 1892; Map no. 127- Showing jetty construction at Columbia river mouth

General description of attributes for the Snake river reaches from Riparia to Lewiston, ID.

US House of Representatives. 1893. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1893 in six parts. 53D Congress, 2d Session, Ex. Doc.1, pt 2, vol.II. (Annual report).Government Printing Office, Washington. 3374-3377 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area.The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 447-449 (channel maintenance and work on low-tide jetty from Fort Stevens to Clatsop Spit), Part 4, p. 3488-3503 (includes bathymetry map of mouth, June

1893 opposite of p. 3496);

(2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 452-455, Part 4, p. 3515-3522;;

(3) Cowlitz river- Part 1, p. 456, Part 4, p. 3526-3527;

(4) Young's and Klasskuine rivers-Part 1, p. 456-457, Part 4, p.3527-3528 (removal of snags and overhanging trees);

(5) Lewis river from mouth to Speliah creek-Part 1, p. 458, Part 4, p. 3533-3536; and

(6) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 449-450, Part 4, p. 3503-3506.

General description of attributes for the Snake river from the Seven Devils Mining District (~65 miles below Huntington Bridge) to Huntington Bridge (near the Burnt river mouth).

US House of Representatives. 1894. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1894 in six parts. 53D Congress, 3d Session, Ex. Doc.1, pt 2, vol.II. (Annual report).Government Printing Office, Washington. 2588-2593 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area.The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

(1) Mouth of Columbia river-Part 1, p. 413-414 (channel maintenance and work on low-tide jetty from Fort Stevens to Clatsop Spit), Part 4, p. 2631-2642 (includes bathymetry map of mouth, June 1894 opposite of p. 2640);

(2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 416-417, Part 4, p. 2654-2659;

(3) Cowlitz river- Part 1, p. 417-418, Part 4, p. 2662-2663;

(4) Young's and Klasskuine rivers-Part 1, p. 418, Part 4, p.2663 (removal of snags and overhanging trees); and

(5) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 414-415, Part 4, p. 2643-2645.

General description of attributes for the Snake river from the Seven Devils Mining District (~65 miles below Huntington Bridge) to Huntington Bridge (near the Burnt river mouth). - brief note on original condition of this reach.

US House of Representatives. 1895. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1895 in seven parts. 54th Congress, 1st Session, Ex. Doc.1, pt 2, vol.II. (Annual report). Government Printing Office, Washington. 3388-3393 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area.The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

(1) Mouth of Columbia river-Part 1, p. 460-461, Part 5, p. 3551-3561 (includes bathymetry map of mouth, October-November 1894 opposite of p. 3560);

(2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 461-462, Part 5, p. 3561-3566;

(3) Cowlitz river- Part 1, p. 466, Part 5, p. 3594-3595;

(4) Young's and Klasskuine rivers-Part 1, p. 466, Part 5, p.3595-3596 (removal of snags and

overhanging trees);

(5) Clatskanie river, from mouth to town of Clatskanie -Part 1, p. 467, Part 5, p. 3596-3598

(description of existing conditions prior to project improvements);

(6) Lewis river from La Center to its mouth-Part 1, p. 467, Part 5, p. 3600-3601;

(7) South channel of Columbia river (in front of Astoria, OR-Part 1, p. 468, Part 5, p. 3605-3606 (includes bathymetry map of south channel, Tongue Pt to Smith Point, dated November 1894 opposite p. 3608); and

(8) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 462-463, Part 5, p. 3566-3568.

General description of attributes for the Snake river from the Seven Devils Mining District (~65 miles below Huntington Bridge) to Huntington Bridge (near the Burnt river mouth). - brief note on original condition of this reach.

US House of Representatives. 1896. Annual report of the chief of engineers, US Army, to the Secretary of War for the year 1896 in six parts. 54th Congress, 2d Session, Ex. Doc.1, pt 2, vol.II. (Annual report).Government Printing Office, Washington. 3382-3389 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

(1) Mouth of Columbia river-Part 1, p. 400-401, Part 5, p. 3250-3256 (includes bathymetry map of mouth, October-November 1894 opposite of p. 3560);

(2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 401-422, Part 5, p. 3257-3262;

(3) Cowlitz river- Part 1, p. 415, Part 5, p. 3385-3386;

(4) Young's and Klasskuine rivers-Part 1, p. 405, Part 5, p.3283; and

(5) South channel of Columbia river (in front of Astoria, OR-Part 1, p. 401, Part 5, p. 3256-3257;

(6) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 402-403, Part 5, p. 3263-3266.

General description of attributes for the Snake river from the Seven Devils Mining District (~65 miles below Huntington Bridge) to Huntington Bridge (near the Burnt river mouth). - brief note on original condition of this reach.

Victor, E. 1935. some effects of cultivation upon stream history and upon the topography of the Palouse region. Northwest Science IX(3): 18-19 (September, 1935).

Abstract: Author discusses habitat alterations (bank erosion, channel scouring, etc.) along stream courses in the Palouse region, due to human activities and environmental dynamics; mentions Miller Creek (near Walla Walla), Touchet (near Waitsburg) and Palouse rivers as examples of channel changes.

Ward, H. B. 1939. The migration and conservation of salmon. Publication of the American Association of Advanced Sciences 8: 60-71.

Abstract: Author discusses habitat influences on behavior of salmonid fishes; emphasizes that habitats are not static, and that it is important to understand environmental factors that modify behaviors. Makes continuous references to effects of temperature on behavior patterns and outcomes. (Pertinent to life history strategies paper.)

Washington Department of Fisheries. 1938. Report of the preliminary investigations into the possible methods of preserving the Columbia River salmon and steelhead at the Grand Coulee Dam. Report prepared for the US Bureau of Reclamation by the State of Washington Department of Fisheries, in cooperation with the Department of Game and the US Bureau of Fisheries. 121 pp.  
Abstract: Comprehensive report of investigative findings regarding fish counts, biology, behavior, habitat of salmon stocks in the tributaries of the Columbia River above Rock Island to Grand Coulee. Includes trap counts of upstream and downstream migrants at Rock Island and tributaries; some biometric data of these trapped fish are presented (Wenatchee, Methow, Twisp, etc.) Some environmental data such as water temperature and water flow are given for some tributaries. Briefly describes water development projects (irrigation) and their associated fish protection facilities. Excellent document for deriving historical background information regarding the planning of fish salvage and mitigation measures associated with the Grand Coulee project.

Washington State. 1907. 16th and 17th annual reports of the state fish commissioner and game warden: 1905-1906. State of Washington Department of Fisheries and Game, Seattle, Washington. C.W. Corham, Public Printer, 1907.

Abstract: The commissioner (John L. Riseland) discusses the situation of fishing, fishing seasons, and disjointed regulations of Oregon and Washington in the lower Columbia River; expresses concern that if the early season is not shortened, the Royal chinook will further decline and lead to situation where packers will have to depend on fall season rather than early and mid seasons. Provides newspaper quotes from the Portland Oregonian that support his statements. pages 10-14. Provides a report on Washington salmon hatcheries in the Columbia basin; notes that the Wenatchee Hatchery is the only hatchery tributary to the Columbia that propagates Silverside salmon (coho). Also mentions that manager of the Colville Hatchery could only acquire 90,000 silverside salmon eggs in the stream (Colville River); and that the facility was deemed not to operate. Notes that the Klickitat hatchery was never completed, and was abandoned in 1902, pages 24-25. Notes that the Wind River Logging company, on the Wind River, flooded the Wind River, carrying all their logs into the Columbia River; this citation documents the use of crib dams to contain logs and flush logs down the Wind River, page 30. Notes that the Methow hatchery is the only remaining salmon hatchery (Colville, Little Spokane and Klickitat hatcheries are closed) on the east side of the Cascades to propagate silverside salmon; infers that Colville, Little Spokane and Klickitat Rivers have or had runs of coho salmon, pages 30-131. Provides letters that note run and habitat conditions on the Klickitat, Colville, Wenatchee, and Lewis Rivers, Page 39-42.

Wilkes, Charles. 1856. Narrative of the United States expedition. During the years 1838, 1839, 1840, 1841, 1842. By Charles Wilkes, USN. Commander of the expedition, member of the American Philosophical Society, etc. In five volumes, with thirteen maps. Vol IV. G.P. Putnam & Co., 321 Broadway, New York. 1-4 (notes on work) p.

Abstract: Author provides an account of his experiences and observations during his travels in the Columbia river basin; notes habitat/landscapes, fauna, flora of various reach sections of the Columbia river and tributaries.

Wissmar, R. C., J.E. Smith, B.A. McIntosh, H.W. Li, G.H. Reaves, and J.R. Sedell. 1994. A history of resource use and disturbance in riverine basins of eastern Oregon and Washington (early 1800s-1900s). Northwest Science 68, Special Issue: 1-35.

Abstract: Authors provide a historical review of human activities (mining, livestock, irrigation, and logging) and habitat alterations in the Okanogan, Methow, Little Naches, Grande Ronde, and John Day basins) Table 1 presents a chronology of major settlement, human activities, and natural resources development in these basins.

Wood, Tallmadge R. 1903. Letters of Tallmadge R. Wood. The Quarterly of the Oregon Historical

Society VI(1): 80-85 (March 1903).

Abstract: Author notes in letter of 19 February 1846 (Clatsop, Co. Oregon Territory) that: 1) six sawmills and five flour mills are now in operation (the Clatsop county region), p.81; 2) heavy timber and broken land along each side of the river (Columbia River from Astoria to the mouth of the Cowlitz River), p. 82; Provides general description of the habitat/vegetation/soil along the banks of the Columbia River in the Clatsop County area.

## LIFE-HISTORY

### Reference List

Bayha, Keith. 1974. Anatomy of a river Pacific Northwest River Basins Commission, 1 Columbia River, P.O. Box 908, Vancouver, Washington 98660, Vancouver, Washington.

Abstract: Authors present a comprehensive evaluation of water requirements for the Hell's Canyon reach of the Snake river, based on field surveys of March 1973. Surveys included collection of information regarding the time of travel of the stage wave and water mass, water quality, biological resources, etc. Includes photographs that illustrate the habitat (terrestrial and water) of this area.

Craig, J. A. 1935. The effects of power and irrigation projects on the migratory fish of the Columbia River. Northwest Science IX(1): 19-24 (February, 1935).

Abstract: Author discusses the effects of human land and water uses (logging, mining, power, and irrigation) on fisheries resources in the Columbia basin. Provides examples of habitat alterations imposed by these human uses. Briefly discusses life history and ecology of all anadromous salmonid species inhabiting the Columbia River basin. Discusses how the use of streams for power and irrigation purposes affect migratory salmon species: 1) obstacles that obstruct or delay migration of adult upstream to natal streams; and 2) injurious or delay impediments to downstream juvenile migration. Presents fishways and screening as mechanisms to protect fish, and the use of artificial propagation in the case of high dams.

Davis, H. S. 1903. The migrations and growth of salmon fry. Pacific Fisherman I(4): 9-10. Seattle, Washington and Vancouver, B.C. complete p.

Abstract: Author provides an excellent synopsis of the state of knowledge for life history information regarding young salmon species in the Pacific Northwest region (including the Columbia River). Describes life history in terms of summer residents, and rate of growth. Proposes 1) application of information and results to other salmon streams and 2) bearing of these facts on artificial propagation, notes the following: 1) growth of salmon in lower Columbia tributaries is faster than that of upper Columbia basin tributaries (east of the Cascades) and 2) nothing is known of the age at which fry in the Columbia reach the sea. NOTE: excellent reference.

Franchere, Gabriel. 1969. Journal of a voyage on the north west coast of North America during the years 1811, 1812, 1813, and 1814 The Champlain Society, Toronto. 78,82-83, 96-97, 100-101, 110-111, 142-143, 148-149, 152-157 p.

Abstract: Author provides an account of his observations and experiences during his travels in the Columbia river basin during the early 19th century. Briefly notes habitat, flora, and fauna at various points of travel up and down the Columbia river and its tributaries. General description of attributes for the Snake river mouth.

Harts William W. 1899. Preliminary examination of Snake river, from Asotin, Wash., to Pittsburg Landing, Oreg. 56th Congress, 1st Session, House Document No. 75: U.S. House of Representatives,

Abstract: Author provides a survey report describing the Snake river from *Asotin (Washington) to Pittsburg (Oregon)*; report includes information describing the river channel (slope, width,

obstructions) and lands peripheral to the river. Includes photographs of various river reaches that present problems/obstacles to water navigation.

Harts, William W. 1900. Survey of Snake river from Lewiston, Idaho, to Riparia, Wash. 56th Congress, 2nd Session, House Document No. 127: U.S. House of Representatives,  
Abstract: Author provides a survey report describing the Snake river from *Lewiston to Riparia*; report includes information describing the river channel (slope, width, obstructions) and lands peripheral to the river. Includes a table of survey data for various river sections from Lewiston to Riparia, that present problems/obstacles to water navigation.

Jones, W. A. 1888. The salmon fisheries of the Columbia River. (Letter from the Secretary of War).50th Congress, 1st Session, Senate Document 123: Washington D.C. 18-21 p.  
Abstract: Author presents a comprehensive perspective of the status and various facets on the salmon fisheries of the Columbia River, in a report (seven chapters) to the Secretary of War. Chapters of the report cover the following: Chapter I - General descriptions of the anadromous salmon species and their life history and habits in the Columbia and Snake Rivers; Chapter II - the depletion of salmon in streams of the Columbia River; Chapter III - the fisheries of the Columbia River; Chapter IV - the question of salmon fisheries being an obstruction to navigation; Chapter V - Artificial propagation of salmon; Chapter VI - Suggestions; and Chapter VII - Quantity, value, and price of salmon paid to fishermen over the past 20 years. Includes photographs of salmon and fishing apparatus. Excellent reference.

Karr, M. B. Tanovan R. Turner and D. Bennett. 1992. Water temperature control project Snake river interim report: model studies and 1991 operations A report from the Columbia River Inter-Tribal Fish Commission Public Policy Department, U.S. Army Corps of Engineers North Pacific Division Reservoir Control Center, and University of Idaho Fish and Wildlife Resources Department.  
Abstract: Authors model and provide water temperature data for the Snake river downstream of Lewiston, Idaho for the water year 1991. Figure 3 of the report illustrates the water temperature profile of the Snake river at its mouth (1955-1958) and below Ice Harbor Dam (1987 and 1990). Figure 4 of the report compares the water temperature profile of the Snake river above and below the mouth of the Imnaha & Salmon rivers and below Hells Canyon Dam.

McMurrick, J. P. 1910. The life history of the Pacific salmon. Transactions of the Canadian Institute IX(20), Part I, August 1910: 23-44.  
Abstract: Author gives background on the biology and distribution of the species of family Salmonidae in North America, with emphasis on the genus *Salmo* and *Oncorhynchus*. Comprehensively discusses the life history and biology of Pacific salmon species in the Columbia and Fraser rivers; also gives observations of big run years, and canning statistics for British Columbia and Washington.

McMurrick, J. P. 1912. The life cycles of the Pacific coast salmon belonging to the genus *Oncorhynchus* as revealed by their otolith and scale markings. Proceedings and Transactions of the Royal Society of Canada, Third Series VI(Transactions Section IV): 9-28, 10 plates.  
Abstract: Author describes the life history of chinook, coho, chum, sockeye, and pink salmon based on comprehensive analyses and comparisons of scales and otolith structures; derived scales and otoliths from salmon canneries in the Esquimalt and Claxton Canneries in British Columbia, Canada. Includes photographic plates of scales.

Mudd, D., Boe, L., and Bugert, R. 1980. Evaluation of wildlife habitat developed on government project lands along Snake river in Washington. Washington Department of Game, Habitat

Management Division, 62, maps p.

Abstract: Report provides a baseline of wildlife resources and habitat in areas of the lower Snake river affected by the Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dam projects.

Netboy, Anthony. 1958. Salmon of the Pacific Northwest: fish versus dams. Binforde & Mort, Publishers, Portland, Oregon. 122 pages.

Abstract: Author discusses: (1) Life history and migrations of Pacific species in the Columbia River; (2) Indian fisheries and methods prior to and after the settlement of white men in the Columbia basin; (3) Historical and contemporary alterations of the Columbia River (e.g. land use, pollution, and dams); (4) Fish passage, management, and propagation methods to overcome the human alterations in the Columbia River.

Netboy, Anthony. 1980. The Columbia River salmon and trout; their fight for survival. University of Washington Press, Seattle and London. 180 pages.

Abstract: Author documents and describes (1) the pristine Columbia River; (2) The Columbia River Indian fishery; (3) life history of Columbia River salmon and steelhead trout species; (4) Intrusive alterations (e.g. irrigation, pollution, dams) of the watershed and consequences (e.g. decline of Pacific salmon species); (5) Fishery compensation programs in the Columbia River; and (6) Endangered species. Contains a comprehensive bibliography of Columbia River related historical and contemporary references.

Park, Donn. 1993. Snake river water temperature- 1950 's Unpublished memorandum from Donn Park (Biomark Inc.) to Dennis Dauble (Battelle Richland, Washington, 19 February 1993).

Abstract: Author provides water temperature data for the Snake river at Oxbow, Oregon (1957 and 1958) and at Clarkston, Washington (1958); these data were cited from U.S. Fish and Wildlife Service (Department of Interior) publications.

Rich, W. H. 1935. The biology of the Columbia River salmon. Northwest Science IX(1): 3-14.

Abstract: Author provides an historical background and purposes of biological investigations of salmon in the Columbia River basin; and the general distribution of anadromous salmonid species. A general discussion of the biology, life history, and behavior of anadromous salmonid species is presented. Extensive information provided in support of the Home Stream Theory for homing behavior of anadromous salmonids, and the effects of environmental factors (e.g. water quality) on homing to parent stream/tributary thereof.

Rich, W. H. and Holmes, H. B. 1929. Experiments in marking young chinook salmon on the Columbia River, 1916-1927. US Bureau of Fisheries Bulletin 44, pages 215-264.

Abstract: Report on the marking experiments of the US Bureau of Fisheries during an 11 year period. Provides the methods, procedures and results for various marking experiments conducted at Bonneville, Klaskanie, Little White Salmon, Herman Creek, and Big White Salmon hatcheries. Purpose of marking experiments was to test relative efficiencies of various artificial propagation procedures, and to determine life history strategies of salmon. Provides extensive morphometric information (fish scale, body weight, body length, age etc.) for chinook salmon. Conclusions on experiments are categorized as Percentage of Returns, Success of Long and Short Term Periods of Rearing, Interpretation of Scale, Time of Entering Freshwater, Age at Maturity, and Homing Instinct.

Rutter, C. 1902. Natural history of the quinnat salmon. Bulletin US Bureau of Fisheries, pages 65-141.

Abstract: Author provides a comprehensive treatment of the life history of chinook salmon in the Sacramento River basin. Extensive life history and behavioral information of young chinook salmon are provided Hatchery plantings of chinook are observed during their freshwater residency, and evaluation of adult returns of these plantings are evaluated.

Scheufele, Roy W. 1970. History of the Columbia Basin Inter-Agency Committee. Prepared under sponsorship of the Pacific Northwest River Basins Committee.

Abstract: A. Author presents a comprehensive details regarding the genesis, policy & objectives, actions, and chronology of meeting/events for the Columbia Basin Inter-Agency Committee, during the period of 1946-1967. Provides information regarding governmental legislation (laws) and policy framework, institutional relationships with other state and federal agencies in the Columbia basin, and accomplishments of the agency. NOTE: Reference is very important in terms of its description of policy and philosophy governing water and fisheries policy in the Columbia River basin during the period of 1946-1967. B. Genesis of Agency and Federal Action (pages 3-9): 1) In 1902, the US Congress passes the Reclamation Act; 2) In 1905, the US Congress establishes the US Forest Service; 3) In 1920, the US Congress passes the Federal Power Act; 4) In 1925, the US Congress passes a statute that directed the inventory of those streams in the US where power development appeared feasible and practical in combination with navigation, flood control, and irrigation; 5) In 1927, the US Congress passes the River and Harbor Act, which commenced the survey of Pacific Northwest streams, that were inventoried under the 1925 congressional statute; 6) In 1936, the US Congress passes the Flood Control Act; 7) In 1936 (?) the US Congress establishes the US Soils Conservation Service; 8) In 1943, the Pacific Northwest Regional Planning Commission, an arm of the National Resources Planning Board, is abolished by the US Congress; 9) In July 1943, the governors of the Pacific Northwest States establish the Northwest States' Development Association to coordinate and correlate plans of member states as they relate to unified development of all the resources of the Pacific Northwest; 10) In December 1943, the Northwest States' Development Association prepares a program and governing principles of emergency and immediate post-war projects for the development of the Columbia Drainage Basin; 11) In summer 1939, the US Departments of Interior, Agriculture, and War (Corps of Engineers) enter a tripartite agreement to coordinate their work, both in Washington DC and field regions; 12) In December 1943, the US Federal Power Commission joins the tripartite of the US Departments of Interior, Agriculture, and War (Corps of Engineers), and execute a quadripartite agreement that provided monthly meetings of these agencies to discuss results of studies/investigations, to adjust differences of opinions, and to promote ways/means for implementing other provisions of the agreement-representatives of these four Departments constituted the Federal Inter-Agency River Basin Commission (FIABRC); 13) In February 1946, the Columbia Basin Inter-Agency Committee, the second field committee of Federal Inter-Agency River Basin Commission, is established to facilitate progress on the multipurpose development projects presently authorized by congress (p. 7-9 provides details of conditions of the agreement.); 14) In 1965, the US Congress passes the Water Resources Planning Act; 15) In June 1967, the Pacific River Basins Commission takes over the functions of the Columbia Basin Inter-Agency Committee. C. A chronicle of agency meetings and general outcomes from these meetings is presented (pages 10-123) 1) In March 1947, the Assistant Secretary of Interior (Warner W. Gardner) sends a memorandum/recommendations to the Federal Inter-Agency River Basin Commission (FIABRC) that propose the construction of mainstem dams on the Columbia below Okanogan R. and on the Snake below the Salmon R., with the exception of the proposed McNary Dam, be postponed until 1958 (for 10 years) provided that alternate sources of power could be developed to meet Bonneville Power Administration load demands; this moratorium period would allow the US Fish & Wildlife Service and state fisheries agencies to determine remedial measures (per research, studies, and planning) that could be taken to preserve the Columbia River fishery; p. 22-23); 2) On 2 April 1947, the Assistant Secretary of Interior (Warner W. Gardner) memorandum was forwarded by the Federal Inter-Agency River Basin Commission (FIABRC) to the Columbia Basin Inter-Agency Committee for study, discussion, and recommendations; 3) On 23 July 1947 at the 11th meeting of the Columbia Basin Inter-Agency Committee, (a) Fred Foster (US Fish & Wildlife Service) outlined the Lower Columbia River Fishery Program, consisting of obstruction removal, pollution abatement, diversion screening, fishway construction, hatchery construction and fish sanctuaries - a program estimated at a cost of \$20 million, and (b) a Fish & Wildlife

subcommittee was established to coordinate and integrate fish and wildlife programs with water resource program; p. 25; 4) On 22 September 1947, the Fish & Wildlife Subcommittee (Columbia Basin Inter-Agency Committee) filed a report that summarized factual data relating to navigation, power, fish, irrigation, Indians, and National Defense, p. 26; 5) On 8 October 1947, at its 12 meeting, the Columbia Basin Inter-Agency Committee unanimously approved and forwarded a letter to the Federal Inter-Agency river basin Commission (FIABRC) recommending that a) Grand Coulee power installations proceed, construction of Hungry Horse, Foster Creek, Detroit, and McNary Dam proceed, etc. b) authorized dams on the Columbia River system not to be rescheduled, approval of the Lower Columbia River Fishery Program, and compensation of Treaty Indians, and c) upstream dams be authorized promptly and if authorized before 1958 they be constructed ahead of planned/unauthorized The Dalles, John Day and Arlington Dams unless the fish problem has been solved in the interim, etc., p. 26; 6) In 1950, the Columbia Basin Inter-Agency Committee establishes the Fisheries Steering Committee, and this subcommittee prepares a comprehensive program of research and construction (to cost 25-50 million dollars) and proposed to finance it by a tax of fifty cents per kilowatt year (note proposal failed and caused an outcry from power interests) p. 27; 7) On 17 September 1948, at its 21st meeting, the Columbia Basin Inter-Agency Committee authorized a Technical Subcommittee for Operating Plan to prepare an integrated and coordinated operating plan for the release and control of waters in connection with Columbia River development program (note plan was never consummated) p. 32; 8) On 10 November 1948 at its 22nd meeting of the Columbia Basin Inter-Agency Committee, the Corps of Engineers presented an eight volume "Review of the Columbia River and its Tributaries,; a report costing \$5 million; p. 33; 9) On 28 June 1950 at its 40th meeting, the Columbia Basin Inter-Agency committee approved an interim fishery research program (prepared by the Fish & Wildlife Subcommittee) that called for studies of fish passage at river obstructions, impoundment studies, artificial propagation, and studies of life history, trends and abundance, trout habitat and pollution, at an estimated \$600,000 per year - another \$500,000 was included for stream development and improvement; p. 46; 10) On 19 January 1955, the Columbia Basin Inter-Agency Committee directed the Fisheries Steering Committee to a) prepare an Upper Columbia River fishery program comparable to that in effect on the Lower Columbia River, b) a program of needed fishery research for the whole area, and c) explore ways and means of implementing/financing both programs; p. 83; 1) On 13 March 1957, the Columbia Basin Inter-Agency Committee accepted the Fisheries Steering Committee report with respect to a) prepare an Upper Columbia River fishery program comparable to that in effect on the Lower Columbia River, and b) a program of needed fishery research for the whole area - established research priorities and recommendations as to what agency would carry out specific studies recommended; p. 91; 12) On 13-14 November 1963, the Columbia Basin Inter-Agency Committee heard a panel of University of Washington academicians (James Crutchfield, W.F. Royce, D. Bevan, Robert Fletcher, R.C. Van Cleave, and R.W. Johnson) carry on extensive dialogues on "Fisheries in the Pacific Northwest - the academicians view this controversial issue," Don Bevan was very critical of fishery regulation; p. 114; 13) On 14 December 1965 at the 132 meeting of the Columbia Basin Inter-Agency Committee, the Executive Subcommittee presented its recommendations on seven fishery proposals (previously submitted by the Fisheries Steering Committee on 6 October 1965) summarized as follows: Proposal 1 - Greater Committee representation for salmon and steelhead, Proposal 2 - Reduction of the use of the Columbia River water for nuclear production to reduce heat pollution of the river, Proposal 3 - Establishment of working contract with Canada on Fishery problem, Proposal 4 - Development of small watersheds for power production should be discontinued, Proposal 5 - Assure proper attention to fish requirements in any inter-basin water transfer studies, Proposal 6 - Fishery research should be continued, the Proposal 7 - The Columbia River Fishery Development program should be retained; 14) On 29 September 1966 at its second Columbia-North Pacific study review, the Columbia Basin Inter-Agency Committee accepted the report of the Water Supply and Pollution Subcommittee entitled "Columbia River - Water Temperature Conditions and Research Requirements" report stemmed from one of the seven fishery proposals (previously submitted by the Fisheries Steering

committee on 6 October 1965; p. 21); (15) On 9 June 1967, the Columbia Basin Inter-Agency committee held its last meeting, and handed over its responsibilities, function and records to the new River Basins Commission, p. 122.

Symons, Thomas W. 1882. Examination of Snake river from Lewiston to the mouth of Salmon river, Idaho 47th Congress, 1st Session, Senate Executive Document No. 112: U.S. Senate, Abstract: Author provides a survey report describing the Snake river from *Lewiston (Idaho) to the mouth of the Salmon river*; report includes information describing the river channel (slope, width, obstructions) and lands peripheral to the river. Includes survey maps of various river reaches that present problems/obstacles to water navigation.

Taylor, Harry. 1898. Survey of Snake river, Washington, from its mouth to Riparia 55th Congress, 2nd Session, House Document No. 411: U.S. House of Representatives, Abstract: Author provides a survey report describing the Snake river from *its mouth to Riparia*; report includes information describing the river channel (slope, width, obstructions) and lands peripheral to the river. Includes survey maps of various river reaches that present problems/obstacles to water navigation.

United States. Army Corps of Engineers. 1947. Columbia river and tributaries review report, interim report no. 3, Hells Canyon, appendix A- hydrology U.S. Army Engineer District, Portland, Oregon. Abstract: This report includes comprehensive information regarding the hydrological characteristics of the Snake river in the Hells Canyon area. Report includes general information describing the topography, uplands, plain, drainage area, tributaries, geology, soils, stream flow, etc. for this area of the Snake river.

United States. Army Corps of Engineers. 1974. Draft environmental statement of Lower Monumental lock and dam, Snake river, Washington U.S. Army Engineer District, Walla Walla, Washington. Abstract: This draft environmental impact statement addresses the proposed Lower Monumental dam project. Includes information that describes the Lower Monumental project and the existing environment (terrestrial and water habitat/resources) in the area of the project; and describes the impacts of proposed project alternatives.

United States. Army Corps of Engineers. 1975. Draft environmental statement of Lower Granite project, Snake river, Washington U.S. Army Engineer District, Walla Walla, Washington. Abstract: This draft environmental impact statement addresses the proposed Lower Granite dam project. Includes information that describes the Lower Granite project and the existing environment (terrestrial and water habitat/resources) in the area of the project; and describes the impacts of proposed project alternatives.

United States. Army Corps of Engineers. 1975. Draft environmental statement of lower Snake river fish and wildlife compensation U.S. Army Engineer District, Walla Walla, Washington. 1, I-4, 46-47, 70-106, maps p. Abstract: This draft environmental impact statement addresses proposed actions to compensate fish and wildlife losses resulting from four multi-purpose water resources development projects on the lower Snake river. Includes information that describes the existing environment (terrestrial and water habitat/resources) in the area of the project; and describes the impacts of proposed project alternatives.

United States. Army Corps of Engineers. 1979. Final environmental statement of Ice Harbor lock

and dam, Snake river, Washington U.S. Army Engineer District, Walla Walla, Washington. 1,11, 2(1)-2(19), 2(33)-2(36) p.

Abstract: This draft environmental impact statement addresses the proposed Ice Harbor dam project. Includes information that describes the Ice Harbor project and the existing environment (terrestrial and water habitat/resources) in the area of the project; and describes the impacts of proposed project alternatives.

United States. Army Corps of Engineers and Department of Commerce. 1994. (Draft environmental statement.). Lower Snake river biological drawdown test.

Abstract: This draft environmental impact statement addresses a proposed biological drawdown test to be conducted a Lower Granite Reservoir, possibly as early as 1995. Include information describing the Lower Granite project and the existing environment (terrestrial and water habitat/resources) in the area of the project.

United States. Commissioner of Fish and Fisheries. 1894. Report of the Commissioner of Fish and Fisheries on investigations in the Columbia river basin in regard to the salmon fisheries. 53 rd Congress, 2nd Session Senate Miscellaneous Document No. 200. Government Printing Office, Washington. 3-57, figures, maps p.

Abstract: Document contains three reports:

- 1) "The salmon fisheries of the Columbia river basin" by Marshall McDonald; this report discusses (a) conditions determining the salmon production of a river basin, (b) the limits of migration of salmon, (c) decrease of salmon in the head waters of the Columbia river, (d) detailed statistics of the salmon industry of the Columbia river, 1889-92, (e) artificial propagation of salmon on the Columbia river, (f) the fishing grounds, and (g) the fishing season.
- 2) "A report upon investigations in the Columbia river basin, with descriptions of four new specie" by C. H. Gilbert and B.W. Barton; this report generally describes salmon resources in terms of their status, biology and distribution in the mainstem and tributaries of the lower Columbia, upper Columbia and Snake rivers.
- 3) "Notes on Willamson's whitefish in breeding color, from Little Spokane river, Washington, and remarks on the distribution of the species" by B. A. Bean.

Document includes photographs for sections of the Little Spokane river and the Kettle Falls of the upper Columbia river; also includes a plan view maps of the Columbia river from Ceilo Falls to the mouth.

US Army. 1897. Report of the chief of engineers 1897 in six parts. Annual Reports, War Department, Fiscal Year Ended June 30, 1897. (Annual report).Government Printing Office, Washington. 3456-3463 p.

Abstract: The reference contains comprehensive information regarding projects and activities related to the channelization, diking, and channel/bank maintenance of the mouth, estuarine, tidal river zones of the Columbia and Willamette rivers and other tributaries thereof (e.g. Clatskanie, Cowlitz, Lewis, Skamokawa, Grays, and Deep). Includes information regarding original and existing conditions of the river section/surrounding area (may be relative to habitat conditions) and notes commerce & development activities of adjacent area. The following estuarine/tidal river zone (of the lower Columbia region) and associated activities information (e.g. surveys, project history, costs & results, etc.) are covered:

- (1) Mouth of Columbia river-Part 1, p. 502-503, Part 4, p. 3404-3406;
- (2) Columbia and Willamette rivers below Portland, OR- Part 1, p. 503, Part 4, p. 3407-3414;
- (3) Columbia river between Vancouver, WA and mouth of Willamette river-Part 1, p. 504, Part 4, p. 3414-3416.
- (4) Cowlitz river- Part 1, p. 520, Part 4, p. 3463-3465;
- (5) Young's and Klasskuine rivers-Part 1, p. 466, Part 5, p.3595-3596 (removal of snags and

overhanging trees);

(6) Clatskanie river, from mouth to town of Clatskanie -Part 1, p. 467, Part 4, p. 3596-3598;

(7) Lewis river (survey)-Part 1, p. 523, Part 4, p. 3469-3478; and

(8) South channel of Columbia river (in front of Astoria, OR-Part 1, p. 468, Part 4, p. 3406-3407.

General description of attributes for the Snake river in the vicinity of Wild Goose Island (~74 miles above the Snake river mouth)- human alterations. General description of attributes for the Snake river in the vicinity of Log Island (~38 miles below Lewiston, ID)- human alterations.

US Department of Commerce. 1921. Results of salmon marking experiments. Fisheries Service Bulletin No. 72, Bureau of Fisheries, US Department of Commerce, Washington DC, May 2, 1921.

Abstract: Notes a report of Willis H. Rich, entitled "Returns from experimentation on the marking of young chinook salmon on the Columbia River," Mentions that experiments 1) corroborate the theory that the arrangement of the scale circuli provides an accurate record of the previous life history of fish, 2) contributes to the knowledge of the biology of salmon as it relates to the hereditary character of the factors determining adult run entry into freshwater and upward migration to spawning grounds, and 3) provides evidence that spring run progeny produce spring run returns, and fall run produce fall run returns., p.3.

US Department of Commerce. 1923. Notes from the division of fish culture. Fisheries Service Bulletin No. 97, Bureau of Fisheries, US Department of Commerce, Washington DC, June 1, 1923.

Abstract: Mentions a recently published US Bureau of Fisheries pamphlet "The Story of the Salmon" that briefly discusses the salmon life history, development of the salmon canning industry, the growing depletion of salmon runs in Alaska and the Pacific Coast States, the need for conservation, and methods that have been adopted to preserve salmon runs, p. 5.

US Department of Commerce. 1929. Treaty in regard to the sockeye salmon fisheries. Fisheries Service Bulletin No. 167, Bureau of Fisheries, US Department of Commerce, Washington DC, April 1, 1929.

Abstract: Notes the signing of a treaty for the preservation and extension of the sockeye salmon fisheries of the Fraser River system; the treaty provides for the establishment of an International Fisheries Commission. The Commission was in charge of making a thorough investigation into the life history of sockeye salmon, was given the power to maintain and develop hatcheries and to develop the fisheries, and to regulate the sockeye salmon fisheries, p.1.

Ward, H. B. 1939. The migration and conservation of salmon. Publication of the American Association of Advanced Sciences 8: 60-71.

Abstract: Author discusses habitat influences on behavior of salmonid fishes; emphasizes that habitats are not static, and that it is important to understand environmental factors that modify behaviors. Makes continuous references to effects of temperature on behavior patterns and outcomes. (Pertinent to life history strategies paper.)

Ward, H. B. 1939. Salmon psychology. Journal Washington Academy of Science 29: 1-14.

Abstract: Author's early studies were focused how far and in what way the activities of Pacific salmon in freshwater were determined or modified by external factors; and the correlation of external factors with environmental conditions and the life of fish. Discussion on stimuli/factors (stream current, water temperature, etc.) affecting migratory behavior of adult and juvenile sockeye salmon; notes racial differences in temperature tolerance (minimum, maximum and optimum) Mentions removal of perceived objectionable feature in Sulfur Creek that made the stream less turbid and colder that caused salmon to select another stream. This reference illustrates life history strategies and associated race/stocks.

Wilkes, Charles. 1856. Narrative of the United States expedition. During the years 1838, 1839, 1840,

1841, 1842. By Charles Wilkes, USN. Commander of the expedition, member of the American Philosophical Society, etc. In five volumes, with thirteen maps. Vol IV. G.P. Putnam & Co., 321 Broadway, New York. 1-4 (notes on work) p.

Abstract: Author provides an account of his experiences and observations during his travels in the Columbia river basin; notes habitat/landscapes, fauna, flora of various reach sections of the Columbia river and tributaries.

## PRODUCTIVITY

### Reference List

Anderson, George C. 1963. Columbia river effluent in the northeast Pacific ocean, 1961, 1962: selected aspects of phytoplankton distribution and production. Univ. of Washington, Dept. of Oceanogr., Tech. Rep. No. 96. 77 p.

Abstract: Author describes the distribution of chlorophyll *a* and phytoplankton productivity of the Washington and Oregon coasts, during 1961-1962, with respect to the surface waters in the area covered by the Columbia river effluent. Notes that these surface waters (Columbia river effluent area) generally contain more phytoplankton and had a higher rate of photosynthesis than ambient waters. Describes the rate of productivity and standing crop for phytoplankton on a seasonal basis. Reference contains figures illustrating hydrography of Columbia river effluent off the Washington-Oregon coast, nutrient chemistry, and seasonal distribution and annual production of chlorophyll *a* and primary production.

Dahm, C. N., Gregory, S. V., and Park, P. K. 1981. Organic carbon transport in the Columbia River. Est. Coast. Shelf Sci. 13: 645-658.

Abstract: Authors discuss the monthly measurements of total organic carbon (TOC) and dissolved organic carbon (DOC) in the Columbia river, based on sampling behind the Bonneville dam spillway and at Kalama, Washington (128 km above the mouth) during May 1973 - December 1974. They estimate total, dissolved and particulate organic carbon output from the Columbia river into the northeastern Pacific ocean. Discuss diel and monthly variations in TOC and DOC, and their correlations with oxygen saturation and river discharge. Correlate particulate organic carbon (POC) with instream primary productivity per pH and oxygen saturation.

Ebel, W. J., Becker, C. D., Mullan, J. W., and Raymond, H. L. 1986. The Columbia River-Towards a holistic understanding. Proceedings of the International Large River Symposium, Can. Spec. Publ. Aquat. Sci 106: 205-219.

Abstract: Authors provide synopses of the Morphometry, Hydrology, Mainstem Flow Regimes, Sedimentation, Water Quality, Mainstem Temperatures, Productive Potential, Primary Production, Zooplankton, Secondary Production, General Productivity, Fish Species/Salmonid Resources & Fisheries of the Columbia River basin. They briefly discuss and provide a historical perspective of the Regional Exploitation and Development of fisheries and water resources of the Columbia river, and associated fish problems and mitigation strategies. Also discuss Institutional Arrangements in the Columbia basin per federal legislation. Brief notes of sedimentation and sediment load in the Columbia river estuary and adjacent ocean waters- p. 208

Fleming, Richard H. 1955. Review of the oceanography of the northern Pacific. International North Pacific Fisheries Commission Bulletin No. 2. International North Pacific Fisheries Commission, Vancouver, B.C. 1-43 (complete) p.

Abstract: Author provides comprehensive information regarding the northern Pacific Ocean in terms of (1) Characteristics of natural regions; (2) Description of area- bathymetry and bottom sediments;

(3) Climatology- winds, precipitation, sea ice, comparisons to Atlantic; (4) Water descriptions- surface temperatures & salinities, comparisons with Atlantic, vertical circulation, thickness of mixed layers, and distribution of phosphate; (5) Water movements, (6) Factors affecting productivity, (7) Longterm temperature trends; (8) State of knowledge, (9) Comprehensive bibliography, (10) Illustrative figures. Figure 20 illustrates the range of major oceanographic expeditions conducted in the northern Pacific Ocean- Challenger (1872-1876), Albatross (1882-1905), Shintoku Maru (1924, 1930-1933), International Fish Commission (1927, 1928, 1929), Bushell (August 19340 etc. Note: Excellent reference.

Jay, D. 1977. Columbia River estuarine nutrients, mixing, and water quality. Columbia River Estuary, inventory of physical, biological, and cultural characteristics Sect. 205-1 to 205-38. Columbia River Estuary Data Development Program,

Abstract: Author presents an examination, information and illustrations of the seasonal and spatial characteristics for the physical, biological, chemical and cultural processes governing the concentrations of nutrients, dissolved oxygen, suspended particulate matter and pollutants in the Columbia river, its estuary, and the adjacent ocean waters. This presentation includes the following categories:

A. Chemical budgets of the Columbia river, in terms of (1) Sources of variability, (2) Limiting factors in primary productivity, and (3) Nutrient ratios and limiting factors;

B. Mixing of water masses and the spatial distribution of nutrients and particular matter, in terms of (1) Water mass analysis, (2) Mixing processes at the mouth of the Columbia river, (3) Nutrient distribution, transport and utilization, and (4) Cycling of particulate organic matter; and

C. Water quality, in terms of (1) Water quality management in Washington & Oregon, and (2) Municipal and industrial waste.

McKernan, D. L., Johnson, D. R., and Hodges, J. I. 1950. Some factors influencing the trends of salmon populations in Oregon. Transactions of the 15th North American Wildlife Conference, pages 427-449 Also reprinted in Oregon Fish Comm. Contribution No. 12.

Abstract: Authors present graphical representation of trend in chinook landings from 1866-1948; discuss factors affecting productivity of salmon stocks, using coho salmon as the subject.

Oregon State. 1951. Biennial report of the Fish Commission of the State of Oregon to the governor and forty-sixth legislative assembly, 1951. Fish Commission of the State of Oregon; Salem, Oregon, State Printing Office, 1951.

Abstract: Notes that (1) Fish commission has particular interest in the study of logging effects on salmon production, page 3. (2) On June 1948, the states of Oregon, Washington, and Idaho, and Federal Government (Fish & Wildlife Service, Department of Interior) consummated agreement of the provision of funds for the rehabilitation of the lower tributaries of the Columbia River, under the Lower Columbia River Salmon Rehabilitation Program, page 10. (3) A fishway is installed at a diversion dam (owned by the Vancouver Plywood Company) on Rock, a tributary of the North Santiam River, this reopened considerable area for steelhead spawning. page 12. (4) A new concrete fishway is constructed at the Powerdale Dam (owned by Pacific Power and Light Company) on the Hood River, page 13. (5) A fish screening and by-pass system is completed in the Marmot Dam Canal (Marmot Dam project, owned by Portland General Electric Company) on the Sandy River, page 13. (6) Columbia River investigations are studying five different problems; (a) extension of reduction in productivity of the Columbia River Basin by the encroachment of man, (b) harvest practices, stock timing/migration/distribution; (c) knowledge of growth and survival and limiting factors of young salmon in freshwater, (d) effect contemplated water development projects on Columbia River salmon, and (e) studies on sturgeon. page 15. (7) A need for the development of cheap and nutritional diets alternative to the liver based diets. page 18.

Rich, W. H. 1939. Local populations and migration in relation to the conservation of Pacific salmon in the western states and Alaska. Publication of the American Association of Advanced Science No. 8: 45. Migration and Conservation of Salmon.

Abstract: Author references characteristics of Columbia River stocks, research activities, factors affecting productivity.

Rich, W. H. 1940. The future of the Columbia River salmon fisheries. Stanford Ichthyological Bulletin 2(2): 37-47 Also reprinted in Oregon Fish Comm. Contribution No. 6.

Abstract: Synopsis of Columbia salmon stocks, status, limiting factors to productivity, and future.

Ruggles, C. P. 1959. Salmon populations and bottom fauna in the Wenatchee River, Washington. Transactions of the American Fisheries Society 88(3): 186-190.

Abstract: Author reports on productivity of bottom fauna in Wenatchee River and its tributary Nason Creek. Notes that fish population in Wenatchee has increased 7 fold since 1939.

## **RUN SIZE**

### Reference List

Bell, M. C. 1954. Salmon fisheries versus power development. World Fishing 3(11): 392-396, 421-422 (November 1954).

Abstract: Author provides a short synopsis of the Columbia River basin and its conflict between water users (dams and irrigation) and salmon fisheries resources; notes data regarding some Columbia River dam projects, number fish screen projects, and sockeye run size.