

**Programmatic Biological Evaluation
for
Activities in the Lower Columbia River,
Washington State
for Species Listed or Proposed by
National Marine Fisheries Service under the
Endangered Species Act**

March 22, 2002

References

References

Intent of Use

- 33 Code of Federal Regulations (CFR) Part 320. Corps of Engineers, Department of the Army, Department of Defense – General Regulatory Policies.
- 33 Code of Federal Regulations (CFR) Part 322. Corps of Engineers, Department of the Army, Department of Defense – Permits for Structures or Work in or affecting Navigable Waters of the United States.
- 33 Code of Federal Regulations (CFR) Part 323. Corps of Engineers, Department of the Army, Department of Defense – Permits for the Discharge of Dredged or Fill Material in Waters of the United States.
- 33 Code of Federal Regulations (CFR) Part 328. Corps of Engineers, Department of the Army, Department of Defense – Definitions of Waters of the United States.
- 33 Code of Federal Regulations (CFR) Part 329. Corps of Engineers, Department of the Army, Department of Defense – Definition of Navigable Waters of the United States.
- 33 Code of Federal Regulations (CFR) Part 330. Corps of Engineers, Department of the Army, Department of Defense – Nationwide Permit Program.
- 50 Code of Federal Regulations (CFR) 226. National Marine Fisheries Service, National Oceanographic and Atmospheric Administration (NOAA), Department of Commerce – Designated Critical Habitat.
- 50 Code of Federal Regulations (CFR) 402. Joint Regulations for Endangered Species Act – Interagency Cooperation, Endangered Species Act of 1973 as amended.
- 16 United States Code (U.S.C) 1531. The Endangered Species Act. 1988.
- 16 United States Code (U.S.C.) 1532. The Endangered Species Act. 1988.
- Endangered Species Act, Public Law No. 93-205, § 3. Definitions. (1973).
- Endangered Species Act, Public Law No. 93-205, § 4. Determination of Endangered Species and Threatened Species. (1973).
- U.S. Army Corps of Engineers, 1987. *Corps of Engineers Wetlands Delineation Manual*.

Activity Descriptions and Conservation Measures

50 Code of Federal Regulations (CFR) 402. Joint Regulations for Endangered Species Act – Interagency Cooperation, Endangered Species Act of 1973 as amended.

National Marine Fisheries Service, 1995. *Juvenile Fish Screen Criteria*.

National Marine Fisheries Service, 1996. *Addendum: Juvenile Fish Screen Criteria for Pump Intakes*.

National Marine Fisheries Service, Northwest Region, 2001. “Programmatic Biological Opinion for 15 Categories of Activities Requiring Department of the Army Permits”

U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Oregon Department of Environmental Quality, Washington Department of Ecology, and Washington Department of Natural Resources, 1998. *Dredged Material Evaluation Framework: Lower Columbia River Management Area*.

U.S. Army Corps of Engineers, Portland District, Regulatory Branch, 2000. “Programmatic Biological Assessment for Categories of Activities Requiring Department of the Army Permits.”

Washington Department of Fish and Wildlife, 1999. “Fish Passage Design at Road Culverts: A Design Manual for Fish Passage at Road Crossings.”

Washington Department of Fish and Wildlife, Washington Department of Transportation and Washington Department of Ecology, 2000. “Integrated Streambank Protection Guidelines”.

Affected Environment

U.S. Army Corps of Engineers, 1999. *FINAL Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement – Columbia and Lower Willamette River Federal Navigation Channel*.

Washington Conservation Organization, 2000. “*Habitat Factors Limiting Salmon Success in Washington State*.” [Accessed March 30, 2001 at www.conserver.org/salmon/index.php3]

Washington State Department of Ecology (Ecology), 2000. *Final 1998 Section 303(d) List*. April 4, 2000.

Washington Department of Natural Resources, 2000. *Changing Our Water Ways – Trends in Washington’s Water Systems*.

Cumulative Effects

Beechie, T.J., M. Pollock, B. Collins, and G. Pess. 1997. Historical reconstruction of stream temperatures in the Stillaguamish River basin. 10,000 Years Institute, Bainbridge Island, Washington.

Kiffney, P.M., J.S. Richardson, and J.P. Bull. *In review*. Periphyton and insect grazer dynamics in coastal streams of British Columbia: influence of riparian buffer width. Ecological Applications.

Pess G.R., B. D. Collins, M. M. Pollock, T. J. Beechie, A. Haas and S. Grigsby. 1999. Historic and current factors that limit coho salmon (*Oncorhynchus kisutch*) production in the Stillaguamish River basin, Washington State: implications for salmonid habitat protection and restoration. Prepared for Snohomish County Department of Public Works. Everett, Washington.

Washington Department of Natural Resources (DNR). 2000. *Changing Our Water Ways - Trends in Washington's Water Systems*.

Washington Office of Financial Management (OFM). 1999. State of Washington 1999 Data Book.

Essential Fish Habitat Assessment

Pacific Fishery Management Council (PFMC). 1999. Amendment 14 to the Pacific Coast Plan. Appendix A: Description and Identification of Essential Fish Habitat, Adverse and Recommended Conservation Measures for Salmon (August 1999).

Pacific Fishery Management Council (PFMC). 1998a. Final Environmental Assessment/Review for Amendment 11 to the Pacific Coast Groundfish Fishery Management (October 1998).

Pacific Fishery Management Council (PFMC). 1998b. The Coastal Pelagic Species Fishery Plan: Amendment 8 (December 1998).

Simenstad, C.A., L.F. Small, and C.D. McIntire. 1990. Consumption processes and food web structure in the Columbia River estuary. *Prog. Oceanog.* Vol. 25, pp. 271-297.

Sogard, S.M. and K.W. Able. 1991. A comparison of eelgrass, sea lettuce macroalgae, and marsh creeks as habitats for epibenthic fishes and decapods. *Estuarine, Coastal and Shelf Science*. Vol. 33, pp. 501-519.

Appendix C – Species Descriptions

- Aitkin, J.K. 1998. The importance of estuarine habitats to anadromous salmonids of the Pacific Northwest: A literature review. U.S. Fish and Wildlife Service, Lacey, WA 25 pp.
- Allee, B.A. 1981. The role of interspecific competition in the distribution of salmonids in streams. In: E.L. Brannon and E.O. Salo (eds.) Salmon and trout migratory behavior symposium. Pp. 111-122. University of Washington, Seattle, WA.
- Allen, M.A. and T.J. Hassler. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest)--chinook salmon. U.S. Fish and Wildlife Service Biological Report 82 (11.49). U.S. Army Corps of Engineers, TR EL-82-4. 26 pp.
- Bakkala, R.G. 1970. Synopsis of biological data on the chum salmon *Oncorhynchus keta* (Walbaum) 1792. FAO Fish. Synop. 41; U.S. Fish. Will. Serv. Circ. 315:89 pp.
- Barlow, J., K.A. Forney, P.S. Hill, R.L. Brownell, Jr., J.V. Caretta, D.P. DeMaster, F. Julian, M.S. Lowry, T. Ragen, and R.R. Reeves. 1997. U.S. Pacific marine mammal stock assessment: 1996. U.S. Dept. of Commerce, NOAA Tech. Memo NMFS-SWFSC-248, 223 pp.
- Barnhart, R.A. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest)--steelhead. U.S. Fish Will. Serv. Biol. Rep. 82(11.60), 21 pp.
- Behnke, R.J. 1992. Native trout of western North America. Monograph No. 6. American Fish. Soc., Bethesda, MD. 275 pp.
- Bishop, S., and A. Morgan, (eds.). 1996. Critical habitat issues by basin for natural chinook salmon stocks in the coastal and Puget Sound areas of Washington State. Northwest Indian Fisheries Commission, Olympia, WA 105 pp.
- Blum, J.P. Assessment of factors affecting sockeye salmon (*Oncorhynchus nerka*) in Ozette Lake, WA. Masters Thesis, Univ. of Washington, Seattle, WA. 107 pp.
- Brown, E.R. (ed.). 1985. Management of Wildlife and Fish Habitats in Forests of Western Washington, Part 2- Appendices. USDA Forest Service Pacific Northwest Region and USDI Bureau of Land Management. Publ. No. R6-F and WL-192-195. 302 pp.
- Brueggeman, J.J. (ed.). 1989. Information Synthesis and Hypothesis Formulation for Oregon and Washington Marine Mammal and Seabird Surveys. Final Report prepared by Envirosphere Company, Bellevue, WA, and Ecological Consulting, Inc., Portland, OR, for the Minerals Management Service, Pacific OCS Region. OCS Study MMS 89-0030. 374 pp.

- Buck, S., C-. Mullis, and A. Mossman. 1983. Corral Bottom - Hayfork Bally fisher study. Final rept. to the USDA Forest Service, Region 5, San Francisco, CA.
- Burgner, R. L., J. T. Light, I. Margolis, T. Okazaki, A. Tautz and S. Ito. 1992. Distribution and origins of steelhead trout (*Oncorhynchus mykiss*) in offshore waters of the North Pacific Ocean. Int. North Pac. Fish. Comm. Bull. 51, 92 pp.
- Burgner, R. L. 1991. The life history of sockeye salmon *Oncorhynchus nerka*. In: C. Groot and L. Margolis (eds.), Pacific salmon life histories, pp. 3-117. University of British Columbia Press, Vancouver British Columbia, Canada.
- Busby, P. J., T. C. Wainwright, G. J. Bryant, L. Lierheimer, R. S. Waples, F. W. Waknitz, and I. V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. U. S. Dept. Commer., NOAA Tech Memo. NMFS-NWFSC-27, 261 pp.
- Chamberlin, T. W. 1982. Timber harvest. In: M. R. Meehan (ed) Influence of forest and range management on anadromous fish habitat in western North America. U. S. For. Serv. Gen. Tech. Rep. PNW- 136. pp. 1-30. Pacific Northwest Forest and Range Experiment Station, Portland, OR.
- Chapman, D. W. 1962. Aggressive behavior in juvenile coho salmon as a cause of emigration. J. Fish. Res. Board Can. 19:1047-1080.
- Chapman, D., C. Peven, T. Hillman, A. Giorgi, and F. Utter. 1994. Status of summer steelhead in the mid-Columbia River. Don Chapman Consultants, Inc, 318 pp. plus appendices. (Available from Don Chapman Consultants, inc., 3653 Rickenbacker, Suite 200, Boise, ID 83705).
- Cook-Tabor, C. K. 1995. Summer chum salmon in Hood Canal. U.S. Fish and Wildlife Service, Western Washington Office, Division of Aquatic Resources, Lacey, WA 98503.
- Dlugokenski, C. E., W. H. Bradshaw, and S. R. Hager. 1981. An investigation of the limiting factors to Lake Ozette sockeye salmon production and a plan for their restoration. U. S. Fish Will. Serv., Fisheries Assistance Office, Olympia, WA. 52 pp.
- Foerster, R. E. 1968. The sockeye salmon, *Oncorhynchus nerka*. Bull. Fish. Res. Board Can. 162, 422 pp.
- Folmar, L. C. and W. W. Dickhoff 1980. The parr-smolt transformation (smoltification) and seawater adaption in salmonids: review of selected literature. Aquaculture 21(1): 1-37.
- Foote, C. J. and P. A. Larkin. 1988. The role of male choice in the assortative mating of anadromous and non-anadromous; sockeye salmon (*Oncorhynchus nerka*). Behavior 106(1-2):43-61.

- Footo, C. J., C. C. Wood, and R. E. Withler. 1989. Biochemical genetic comparison of sockeye salmon and kokanee, the anadromous and non-anadromous forms of *Oncorhynchus nerka*. *Can. J. Fish. Aquat. Sci.* 46:149-158.
- Footo, C. J., C. C. Wood and J. Blackburn. 1992. Circannual cycle of seawater adaptability in *Oncorhynchus nerka*: Genetic differences between sympatric sockeye salmon and kokanee. *Can. J. Fish. Aquat. Sci.* 49:99-109.
- Footo, C. J., I. Mayer, C. C. Wood, W. C. Clarke, and J. Blackburn. 1994. On the developmental pathway to non-anadromy in sockeye salmon, *Oncorhynchus nerka*. *Can. J. Zool.* 72:397405.
- Foerster, R. E., W. E. Ricker 1953. The coho salmon of Cultus Lake and Sweltzer Creek. *J. Fish. Res. Board Can.* 10:293-319.
- Giger, R. D. 1972. Ecology and management of coastal cutthroat trout in Oregon. Oregon State Game Commission, Fisheries Research Report 6, Corvallis, OR.
- Gilbert, C. H. 1912. Age at maturity of Pacific coast salmon of the genus *Oncorhynchus*. *Bull. U. S. Fish Comm.* 32:57-70.
- Glova, G. J. and J. C. Mason. 1977. Interactions for food and space between sympatric populations of underyearling coho salmon and coastal cutthroat trout in a stream simulator during summer. Fisheries Research Board of Canada Manuscript Report 1428.
- Glova, G. J. and J. C. Mason. 1976. Interactive ecology of juvenile salmon and trout in streams. Fisheries Research Board of Canada Manuscript report 13 9 1.
- Gribanov, V.I. 1948. The coho salmon (*Oncorhynchus kisutch* Walb.)-a biological sketch. *Izv. Tikhookean. Nauchno-Issled. Inst. Rybn. Khoz. Okeanogr.* 28:43-101. (Transl. From Russian; Fish Res. Board Can. Transl. Ser. 370).
- Gustafson, R. G. , T. C. Wainwright, G. A. Winans, F. W. Waknitz, L. T. Parker, and R. S. Waples. 1997. Status review of sockeye salmon from Washington and Oregon. U.S. Dept. Commer., NOAA Tech Memo. NMFS-NWFSC-33,282 pp.
- Hanamura, N. 1966. Salmon of the North Pacific Ocean -- Part III. A review of the life history of North Pacific salmon. 1. , Sockeye salmon in the far east. *Int. North Pac. Fish. Comm. Bull.* 23:1-7.
- Hartt, A.C. 1980. Juvenile salmonid in the oceanic ecosystem - the critical first summer. *In* W. J. Mc Neil and D.C. Himsworth (eds.) *Salmonid ecosystems of the North Pacific*. Oregon State University Press, Corvallis, OR.
- Healey, M.C. 1991. The life history of chinook salmon (*Oncorhynchus tshawytscha*). *In*: C. Groot and L. Margolis (eds.), *Pacific salmon life histories*, pp. 311-193. University of British Columbia Press, Vancouver British Columbia, Canada.

- Healey, M.C. 1982. Juvenile Pacific salmon in estuaries: the life support system. *In* V.S. Kennedy (ed) Estuarine Comparisons. Academic Press, New York. pp. 315-341.
- Hoar, W. S. 1958. The evolution of migratory behavior among juvenile salmon of the genus *Oncorhynchus*. *J. Fish. Res. Board Can.* 15:391-428.
- Hutting, M.T. 1961. Geologic map of Washington. Washington Dept. of Conservation. Division of Mines and Geology.
- Idaho Department of Fish and Game. 1994. Documents submitted to the ESA Administrative Record for west coast steelhead by E. Leitzinger. 18 October 1994. (Available from Environmental and Technical Services Division, Natl. Mar. Fish. Serv. 525 N. E. Oregon Street, Suite 500, Portland, OR 97232).
- Iwamoto, R. N., B.A. Alexander, and W. K. Hershberger. 1984. Genotypic and environmental effects on the incidence of sexual precocity in coho salmon (*Oncorhynchus kisutch*). *Aquaculture* 43 (1984):105-121.
- Jakober, M. 1995. Autumn and Winter Movement and Habitat Use of Resident Bull Trout and Westslope Cutthroat Trout in Montana.
- Johnson, O. W., W. S. Grant, R. G. Cope, K. Neely, F. W. Waknitz, and R. S. Waples. 1997. Status review of chum salmon from Washington, Oregon, and California. U.S. Department of Commerce, NOAA Tech. Memo. NMFS-NWFSC-32,280 pp.
- Jones, D. E. 1979. Development of a technique for enhancement and management of anadromous cutthroat trout in southeast Alaska. *In*: Anadromous fish studies. Alaska Department of Fish and Game, Annual Performance Report 1977-1978, Project AFS 42-B, Juneau.
- June, J. A. 1981. Life history and habitat utilization of cutthroat trout (*Salmo clarki*) in a headwater stream on the Olympic Peninsula, Washington. Master's thesis. University of Washington. Seattle.
- Kaeriyama, M. S. Urawa, and T. Suzuki. 1992. Anadromous sockeye salmon (*Oncorhynchus nerka*) derived from non-anadromous kokanees: Life history in Lake Toro. *Sci. Rep. Hokkaido Salmon Hatchery* 46:157-174.
- Kjelson, M.A., P. F. Raquel, and F. W. Fisher. 1982. Life history of fall-run juvenile chinook salmon, *Oncorhynchus tshawytscha*, in the Sacramento-San Joaquin estuary, California. *In* V.S. Kennedy (ed.), Estuarine Comparisons, pp. 393-411. Academic Press, New York, NY.
- Larkin, P. A. 1977. Pacific salmon. *In*: J. A. Gulland (ed.). Fish population dynamics. J. Wiley and Sons, New York, NY.

- Laufle, J. C., G. B. Pauley, M. F. Shepard. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest)-coho salmon. U.S. Fish and Wildlife Service Biological Report 82(11.48). U.S. Army Corps of Engineers, TR EL-82-4. 18 pp.
- Liknes, G.A., and P.S. Graham. 1988. Westslope cutthroat trout in Montana: Life History, status, and management. American Fisheries Society Symposium 4:53-60.
- Mason, J. C. 1974. Aspects of the ecology of juvenile coho salmon (*Oncorhynchus kisutch*) in Great Central Lake, B.C. Fish. Res. Board Can. Tech. Rep. 438:7 pp.
- McDonald, J. 1960. The behaviour of Pacific salmon fry during their downstream migration to freshwater and saltwater nursery areas. J. Fish. Res. Board Can. 17:655-676.
- McPhail, J.D. and R. Carveth. 1992. A foundation for conservation: the nature and origin of the freshwater fish fauna of British Columbia. Fish Museum, Department of Zoology, University of British Columbia. Vancouver, B.C.
- Meehan, W.R., and T. C. Bjornn. 1991. Salmonid distributions and life histories. American Fisheries Society Special Publication 19:47-82.
- Miller, R. J., and E. L. Brannon. 1982. The origin and development of life history patterns in Pacific salmon. In E. L. Brannon and E.O. Salo (eds) Proceedings of the Salmon and Trout Migratory Behavior Symposium, pp. 296-309. Univ. of Wash. Press, Seattle, WA.
- Moore, K. M. S., and S. V. Gregory. 1988. Summer habitat utilization and ecology of cutthroat trout fry (*Salmo clarki*) in Cascade Mountain streams. Can. J. Fish. Aquat. Sci. 45:192-193.
- Moring, J. R., R. L. Younker, and R. M. Hooten. 1986. Movements of potamodromous coastal cutthroat trout, *Salmo clarki clarki*, inferred from tagging and scale analysis. Fisheries Research (Amsterdam) 4: 343-354.
- Mullan, J. W., K. R. Williams, G. Rhodus, T. W. Hillman, and J. D. McIntyre. 1992. Production and habitat of salmonids in mid-Columbia River tributary streams. Monograph 1, U. S. Fish and Wildlife Service, Box 549, Leavenworth, WA 98826, 489 pp.
- Mundie, J. H. 1969. Ecological implications of the diet of juvenile coho in streams, pp. 135-152. In: T.G. Northcote (ed.). Symposium on salmon and trout in streams. H. R. MacMillan Lectures in Fisheries. Institute of Fisheries, University of British Columbia, Vancouver, B.C.. Canada.

- Myers, J. M., R. G. Kope, G. J. Bryant, D. Teel, L. J. Lierheimer, T. C. Wainwright, W. S. Grant, F. W. Waknitz, K. Neely, S. T. Lindley, and R. S. Waples. 1998. Status review of chinook salmon from Washington, Idaho, Oregon, and California. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-35,443 pp.
- Narver, D. W. 1976. Stream management for west coast anadromous salmonids. *In*: Stream management of salmonids. Trout, Winter 1976 Suppl. pp. 7-13.
- National Marine Fisheries Service. 1991. Endangered and threatened species; endangered status for Snake River sockeye salmon. Final rule. Federal Register [56(224)FR: 58619-58624].
- National Marine Fisheries Service. 1993. Designated critical habitat: Snake River sockeye salmon, Snake River spring/summer chinook salmon, and Snake River fall chinook salmon. Final rule. Federal Register. [58(247) FR:68543-68553].
- National Marine Fisheries Service. 1995a. Endangered and threatened species; status of Snake River spring/summer chinook salmon and Snake River fall chinook salmon. Final rule. Federal Register [60(73) FR: 19341-19342].
- National Marine Fisheries Service. 1995b. Endangered and threatened species; proposed threatened status for three contiguous ESUs of coho salmon ranging from Oregon through central California; Proposed rule. Federal Register [60(142) FR 38011-38030].
- National Marine Fisheries Service. 1997. Endangered and threatened species, listing of several evolutionarily significant units (ESUs) of west coast steelhead. Final rule. Federal Register [62(159) FR 4393743965].
- National Marine Fisheries Service. 1998a. Proposed endangered status for two chinook salmon ESUs and proposed threatened status for five chinook salmon ESUs; proposed redefinition, threatened status, and revision of critical habitat for one chinook salmon ESU; proposed designation of chinook salmon critical habitat in California, Oregon, Washington, Idaho. Proposed rule. Federal Register [63(45) FR: 11481-11520].
- National Marine Fisheries Service. 1998d. Endangered and threatened species; threatened status for two ESUs of steelhead in Washington, Oregon, and California. Final rule. Federal Register [63(53) FR: 13347-13371].
- National Marine Fisheries Service. 1998e. Endangered species; proposed threatened status for two ESUs of steelhead in Washington and Oregon; Proposed rule. Federal Register [63(46) FR: 11797-11809].

- National Marine Fisheries Service. 1999a. Endangered and Threatened Species: Threatened status for three chinook salmon evolutionarily significant units in Washington and Oregon, and endangered status of one chinook salmon ESU in Washington; Final rule. Partial 6-month extension on final listing determinations for four evolutionarily significant units of West Coast chinook salmon; Proposed Rule. Federal Register[64(56) FR: 14307-14328].
- National Marine Fisheries Service. 1999b. Endangered and Threatened Species: Threatened status for Southwestern Washington/Columbia River Coastal cutthroat trout in Washington and Oregon, and delisting of Umpqua River cutthroat trout in Oregon. Proposed rule. Federal Register [64(64) FR: 16397-16414].
- National Marine Fisheries Service. 1999c. Endangered and Threatened Species: Threatened status for two ESUs of steelhead in Washington and Oregon. Final rule. Federal Register [64(57) FR: 14517-14528].
- National Marine Fisheries Service. 1999e. Endangered and Threatened Species: Threatened status for two ESUs of chum salmon in Washington and Oregon. Final rule. Federal Register[64(57) FR: 14507-14517].
- National Marine Fisheries Service. 1999f, Designated critical habitat: Proposed critical habitat for nine evolutionarily significant units of steelhead in Washington, Oregon, Idaho, and California. Proposed rule. Federal Register [64(24) FR: 5740-5753].
- National Marine Fisheries Service. 2000a. Designated critical habitat: Critical Habitat for 19 Evolutionarily Significant Units of Salmon and Steelhead in Washington, Oregon, Idaho, and California.. Final rule. Federal Register [65(32) FR: 7764-7787].
- Nehlsen, W., J. E. Williams, J. A. Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho, and Washington. Fisheries Vol. 16, No. 2 pp.4-20.
- Nicholas, J. W. 1978. Life history differences between sympatric populations of rainbow and cutthroat trouts in relation to fisheries management strategies. *In*: J. W. Moring (ed). Proceedings of the wild trout-catchable trout symposium. Oregon Department of Fish and Game, Portland.
- Nilsson, N. A. And T. G. Northcote. 198 1. Rainbow trout (*Salmo gairdneri*) and cutthroat trout (*S. clarki*) interactions in coastal British Columbia lakes. Can. J. Fish. Aquat. Sci. 38:1228-1246.
- Oliver, C.G. 1979. Fisheries investigations in tributaries of the Canadian portion of the Libby Reservoir. Fish and Wildlife Branch, Kootenay Region.

- Page, L. M. and B. M. Burr. 1991. Peterson field Guides: Freshwater Fishes. Houghton Mifflin Company. New York, NY. 432 pp.
- Pauley, G. B., K. L. Bowers, G. L. Thomas. 1988. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest)-chum salmon. U.S. Fish and Wildlife Service Biological Report 82(11.81). U.S. Army Corps of Engineers, TR EL-824.17 pp.
- Pauley, G. B., B. M. Bortz, and M. F. Shepard. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest) steelhead trout. U. S. Fish Wildlife. Serv. Biol. Rep. 82(11.62). U. S. Army Corps of Engineers, TR EL-82-4. 24 pp.
- Pierce, B. E. 1984. The trouts of Lake Crescent, Washington. Master's Thesis. Colorado State University, Fort Collins.
- Platts, W. S. 1981. Effects of livestock grazing. *In*: M. R. Meehan (ed) Influence of forest and range management on anadromous fish habitat in western North America. U. S. For. Serv. Gen. Tech. Rep. PNW-124. pp. 1-25. Pacific Northwest Forest and Range Experiment Station, Portland, OR.
- Pravdin, I.F. 1940. A review of investigations on the far-eastern salmon. *Izv. Tikhookean, Nauchno-Issled, Inst. Rybn. Khoz. Okeangr.* 18:5-105 (Transl. From Russian; Fish Res. Board Can. Transl. Ser. 371).
- Pritchard, A. L. 1936. Stomach content analyses of fishes preying upon the young of Pacific salmon during the fry migration at McClinton Creek, Masset Inlet, B.C.-Can. *Field Nat.* 50:104-105.
- Quinn, T. P., C. C. Wood, L. Margolis, B. E. Riddel, and K. D. Hyatt. 1987. Homing in wild sockeye salmon (*Oncorhynchus nerka*) populations as inferred from differences in parasite prevalence and allozyme allele frequencies. *Can. J. Fish. Aquat. Sci.* 44:1963-1971.
- Quinn, T. P. 1985. Homing and evolution of sockeye salmon (*Oncorhynchus nerka*). *In*: M. A. Rankin (ed), *Migration: Mechanisms and adaptive significance*. *Contrib. Mar. Sci. (Suppl.)* 27:353-366.
- Reimers, P.E. 1973. The length of residence of juvenile fall chinook salmon in the Sixes River, OR. Oregon Fish Commission. 4, 2-43 pp.
- Rieman, B.E., and J.R. Lukens. 1979. Lake and reservoir investigations: Priest Lake creel census. Job Completion Report. Project F-73-R-1. Idaho Department of Fish and Game, Boise.
- Reisenbichler, R. R., J. D. McIntyre, M. F. Solzzi, and S. W. Landino. 1992. Genetic variation in steelhead of Oregon and northern California. *Trans. Am. Fish. Soc.* 121:158-169.

- Reiser, D. W. and T. C. Bjornn. 1979. Habitat requirements of anadromous salmonids. In: W.R. Meehan (ed). Influence of forest and rangeland management on anadromous fish habitat in western North America, pp. 1-54. U.S. For. Serv. Gen. Tech. Rep. PNW-96. Pacific Northwest Forest and Range Experiment Station, Portland, OR.
- Rich, C.F., Jr. 1996. Influence of abiotic and biotic factors on occurrence of resident bull trout in fragmented habitats, western Montana. MS thesis, Montana State University, Bozeman, MT.
- Ricker, W. E. 1941. The consumption of young sockeye salmon by predaceous fish. J. Fish. Res. Board Can. 5:293-313.
- Rodrick, E. and R. Milner (eds.). 1991. Management Recommendations for Washington's Priority Habitats and Species. Washington Dept. of Wildlife, Olympia, WA.
- Roelofs, T. D. 1983. Current status of California summer steelhead (*Salmo gairdneri*) stocks and habitat and recommendations for their management. Submitted to USDA Forest Service Region 5, 77 pp. (Available from Environmental and Technical Services division, Natl. Mar. Fish. Serv. 525 N. E. Oregon Street, Suite 500, Portland, OR 97232).
- Rosgen, D. L. 1998. Applied Fluvial Geomorphology Manual. Wildland Hydrology. Pagosa Springs, CO.
- Rosgen, D. L. 1998. River Restoration and Natural Channel Design Manual. Wildland Hydrology. Pagosa Springs, CO.
- Rutherford, D. T., C. C. Wood., and J. R. Candy. 1988. Stock assessments and biological investigations of kokanee (*Oncorhynchus nerka*) in Cowichan Lake, B.C.. Can. Manuscr. Rep. Fish. Aquat. Sci. 1995, 35 pp.
- Salo, E. O. 1991. Life History of Chum Salmon (*Oncorhynchus keta*). In: C. Groot and L. Margolis (eds.), Pacific salmon life histories, pp. 233-309. University of British Columbia Press, Vancouver B.C., Canada.
- Sandercock, F. K. 1991. Life history of coho salmon (*Oncorhynchus kisutch*). In: C. Groot and L. Margolis (eds.), Pacific salmon life histories, pp. 311-393. University of British Columbia Press, Vancouver, B.C., Canada.
- Scarlett, W. J. and C. J. Cederholm. 1984. Juvenile coho salmon fall-winter utilization of two small tributaries of the Clearwater River, Jefferson County, Washington. In: J. M. Walton and D.B. Houston (eds.). Proceedings of the Olympic Wild Fish Conference, March 23-25, 1983. Pp. 227-242. Fisheries Technology Program, Peninsula College, Port Angeles, WA.

- Schreck, C. B., H. W. Li, R. C. Hjort, and C. S. Sharpe. 1986. Stock identification of Columbia River chinook salmon and steelhead trout. Final Report to Bonneville Power Administration, Contract DE-A1 79-83BP 13499, Project 83-541, Bonneville Power Administration, Portland OR 184 pp.
- Scott D. 1984. Origin of the New Zealand sockeye salmon, *Oncorhynchus nerka* (Walbaum). J. Roy. Soc. N. Z. 14:245-249.
- Scott W. B. and E. J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada Bulletin 184, Ottawa.
- Sedell, J.R. and F.H. Everest. 1991. Historic changes in poll habitat for Columbia River Basin salmon under study for TES listing. Draft USDA Report. Pacific Northwest Research Station. Corvallis, OR
- Senger, C.M. and R.L. Crawford. 1984. Biological inventory: Mount St. Helens cave basalt flow area. Final rept. Gifford-Pinchot National Forest, St. Helens Ranger District contract no. 3-05K3-3-05108n.
- Sexauer, H.M. and P.W. James. 1997. Microhabitat Use by Juvenile Trout in Four Streams Located in the Eastern Cascades, Washington. Pages 361-370 *In* Mackay, W.C., M.K. Brewin and M. Monita, eds. Friends of the Bull Trout Conference Proceedings.
- Shapovalov, L., and A.C. Taft. 1954. The life histories of the steelhead rainbow trout (*Salmo gairdneri gairdneri*) and silver salmon (*Oncorhynchus kisutch*) with special reference to Waddell Creek, California, and recommendations regarding their management. Calif. Dept. Fish Game, Fish Bull. 98, 375 pp.
- Shepard, B.B., S.A. Leathe, T.M. Weaver, and M.D. Emk. 1984. Monitoring levels of fine sediment within tributaries of Flathead Lake and impacts of fine sediment on bull trout recruitment. Proceedings of the Wild Trout III Symposium, Yellowstone National Park, WY.
- Shepherd, B. G. 1974. Activity localization in coastal cutthroat trout (*Salmo clarki clarli*) in a small bog lake. Journal of the Fisheries Research Board of Canada 31:1246-1249.
- Silverstein, J. T., and W. K. Hershberger. 1992. Precocious maturation in coho salmon (*Oncorhynchus kisutch*): Estimation of the additive genetic variance. J. Heredity 83:282-286.
- Simenstad, C.A., K. L. Fresh, and E. O. Salo. 1982. The role of Puget Sound and Washington coastal estuaries in the life history of Pacific salmon; an unappreciated function. *In* V.S. Kennedy (ed) Estuarine Comparisons. Academic Press. New York. pp.343-364.

- Spence, B. C., G. A. Lomnický, R. M. Hughes, and R. P. Novitzki. 1996. An-ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp., Corvallis, OR. (Available from the National Marine Fisheries Service, Portland, OR.
- Sutherland, D. F. 1973. Distribution, seasonal abundance and some biological features of steelhead trout, *Salmo gairdneri*, in the North Pacific Ocean. U. S. Natl. Mar. Fish. Serv. Fish. Bull. 71(3) 787-826.
- Swanberg, T.R. 1997. Movement and habitat use by fluvial bull trout in the Blackfoot River, Montana. Transactions of the American Fisheries Society 126:735-746.
- Taylor, E. B., C. J. Feet, and C. C. Wood. 1996. Molecular genetic evidence for parallel life history evolution within a Pacific salmon (sockeye salmon and kokanee, *Oncorhynchus nerka*). Evolution 50:401416.
- The Federal Interagency Stream Restoration Working Group. 1998. Stream Corridor Restoration: Principles, Process, and Practices. Washington, D.C.
- Tomasson T. 1978. Age and growth of cutthroat trout *Salmon clarki clarki* in the Rogue River, Oregon. Master's Thesis. Oregon State University, Corvallis, OR.
- Trotter, P. C. 1989. Coastal cutthroat trout: a life history compendium. Trans. Amer. Fish. Soc. 118:463-473.
- Tschaplinski, P. J., and G. F. Hartman. 1983. Winter distribution of juvenile coho salmon (*Oncorhynchus kisutch*) before and after logging in Carnation Creek, British-Columbia, and some implications for overwinter survival. Can. J. Fish. Aquat. Sci. 40:452-46 1.
- U.S. Fish and Wildlife Service. 1999. Programmatic biological assessment for U.S. Fish and Wildlife Service Habitat Restoration Activities of the Western Washington Office, Upper Columbia River Basin Office, Moses Lake Fish and Wildlife Office, Mid-Columbia River Basin Fisheries Resource Office. Olympia, WA
- Wahle, R. J. and R. E. Pearson. 1987. A listing of Pacific Coast spawning streams and hatcheries producing chinook and coho salmon (with estimates on numbers of spawners and data on hatchery releases). U. S. Dept. Commerce, NOAA Tech Memo., NMFS F/NWS-122 109 pp
- Washington Department of Fisheries, Washington Department of Wildlife, and Western Washington Treaty Indian Tribes. 1993. 1992 Washington State salmon and steelhead stock inventory (SASSI). Washington Department of Fish Wildlife., 212 pp.+ three appendices. Appendix 1: Hood Canal and Strait of Juan de Fuca (December 1994, 424 pp.), North Puget Sound (June 1994, 418 pp.) And South Puget Sound (September 1994, 371 pp. volumes. Appendix 2: Coastal stocks (August 1994, 587 pp.). Appendix 3: Columbia River stocks (June 1993, 580 pp.). Wash. Dept. Fish Wildlife., P.O. Box 43151, Olympia, WA 98504.

- Washington Department of Natural Resources. 1995. Washington Department of Natural Resources Habitat Conservation Plan, Response to Work Order No. 20. Prepared by Foster Wheeler Environmental Corporation for Washington Department of Natural Resources, Olympia, WA.
- Washington Department of Natural Resources. 1997a. Final habitat conservation plan, September 1997. Washington Department of Natural Resources, Olympia, WA.
- Wedemeyer, G. A., R. L. Saunders, and W. C. Clarke. 1980. Environmental factors limiting smoltification and early marine survival of anadromous salmonids. *Mar. Fish. Rev.* 42(6): 1-14.
- Weitkamp, L. A., T. C. Wainwright, G. J. Bryant, G. B. Milner, D. J. Teel, R. G. Kope, and R. S. Waples. 1995. Status review of coho salmon from Washington, Oregon, and California, U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-24,258 pp.
- Wilzbach, A. A. and J. D. Hall. 1985. Prey availability and foraging behavior of cutthroat trout in an open and forested section of stream. *Verhandlungen internationale Vereinigung fur theoretische und angewandte Limnologie* 22:2516-2522.
- Winans, G. A., P. A. Aebersold, and R. S. Waples. 1996. Allozyme variability of *Oncorhynchus nerka* in the Pacific Northwest, with special consideration to populations of Redfish Lake, Idaho. *Trans. Am. Fish. Soc.* 205: 645-663.
- Withler, I. L. 1966. Variability in life history characteristics of steelhead trout (*Salmon gairdneri*) along the Pacific coast of North America. *J. Fish. Res. Board Can.* 23(3):365-393.
- Wood, C. C., and C. J. Feet. 1990. Genetic differences in the early development and growth of sympatric sockeye salmon and kokanee (*Oncorhynchus nerka*), and their hybrids. *Can. J. Fish. Aquat. Sci.* 47:2250-2260.
- Wood, C. C., and C. J. Feet. 1996. Evidence for sympatric genetic divergence of anadromous and non-anadromous morphs of sockeye salmon (*Oncorhynchus nerka*). *Evolution* 50:1265-1279.
- Wood, C. C. 1995. Life history variation and population structure in sockeye salmon. *In*; J. L. Nielsen (ed), *Evolution and the aquatic ecosystem; defining unique units in population conservation.* *Am. Fish. Soc. Symp.* 17:195-216.
- Wyatt, B. 1959. Observations on the movements and reproduction of the Cascade form of cutthroat trout. Master's thesis. Oregon State College, Corvallis.
- Wydoski, R. S., and R. R. Whitney. 1979. *Inland fish of Washington.* University of Washington Press. Seattle, WA. 220 pp.

- Wyman, K. H. 1975. Two unfished salmonid populations in Lake Chester Morse. MS thesis, University of Washington. Seattle, WA.
- Aitkin, J. K. 1998. The importance of estuarine habitats to anadromous salmonids of the Pacific Northwest: A literature review. U. S. Fish and Wildlife Service, Western Washington Office, Lacey, WA.
- Yee, C. S. And T. D. Roelofs. 1980. Planning forest roads to protect salmonid habitat. *In* M. R. Meehan (ed) Influence of forest and rangeland management on anadromous fish habitat in western North America. U. S. For. Serv. Gen. Tech. Rep.. PNW- 109. pp. 1-26. Pacific Northwest Forest and Range Experiment Station, Portland, OR.