Alaska—FRPA Region II

(Interior Spruce/Hardwood Forest, South of the Alaska Range)

145) Ashton, W.S. 1983. Determination of fish passage discharge for design of hydraulic structures on Little Tonsina River, Alaska. M.S. Thesis, University of Alaska, Fairbanks. 51pp. (G)

Author abstract: The flow regime of the Little Tonsina River, Alaska, was analyzed to determine the peak and low flows during periods of fish migration. Seven methods of predicting the Critical Migration Discharge for use in designing hydraulic structures for fish passage were evaluated. These methods were evaluated to determine which method provided the most accurate prediction of streamflow during periods of fish migration. Three periods of analysis were considered: spring, April 1 to June 30; summer, July 1 to August 31; and fall, September 1 to October 31. For the Little Tonsina River the spring period 12-hour duration discharge with a 2-year return period and the fall period 7-day, 5-year return period low-flow were considered critical for the design of culverts for fish passage. The Critical Migration Discharge determined using floods predicted by regional regression equations overestimated the spring and fall design discharges by 51% and 8%, respectively.

146) Feulner, A.J. 1971. Water-resources reconnaissance of a part of the Matanuska-Susitna Borough, Alaska. USDI Geological Survey Hydrologic Investigations Atlas HA-364. (G, I)

Electronic abstract: This one-sheet hydrologic atlas consisting of maps, graphs, tables of data, and a descriptive text summarizes the groundwater and surface water resources of the Matanuska-Susitna borough, Alaska. Average cumulative discharge of all measured streams in the study area was about 28,000 cfs. The greatest yields of groundwater (more than 100 gpm) comes from wells in the flood plains and lowland areas adjacent to streams and rivers. These areas are underlain by glacial and alluvial deposits of sand and gravel. Groundwater in the study area has a greater chemical-quality variation than the surface water. It generally is harder than surface water, except in areas adjacent to streams where the water quality of both is similar. Much of the groundwater obtained from shallow wells drilled in the alluvium contains objectionable concentrations of iron, most of which could be easily removed by aeration and filtration of the water prior to storage or use. Groundwater ranges from about 50 to more than 200 mg/liter in hardness and is of the calcium bicarbonate type.

147) Freeman, M.W., and J. Durst (Editors). 2004. Region II forest resources & practices riparian management annotated bibliography. Report by the Alaska Department of Natural Resources Division of Forestry, and Alaska Department of Natural Resources Office of Habitat Management & Permitting. Report to the Alaska Board of Forestry. 136pp. plus an alphabeticasl list of references (A, B, C, D, E, F, G, H, I, J)

Compiler abstract: This annotated bibliography is a compilation of published research relevant to riparian management issues in the spruce/hardwood forests of southcentral Alaska (i.e. Region II). The bibliography is separated into eleven topics: 1) overwintering and spawning ecology of

fishes in cold climates; 2) adult anadromous fish use in the Susitna River; 3) fluvial processes with special emphasis on glacial river; 4) forestry slope and stability; 5) temperature effects in brownwater streams; 6) effects of beetle epidemics and harvesting on stream flow; 7) the use of winter roads in forest practices, and the relationship with ATV use; 8) riparian areas, logging roads, and invasive species; 9) riparian area function and management in headwaters and small streams; 10) riparian area function and management in lakes; and 11) revegetation in Alaska using native plants, and soils in riparian areas/wetlands and interpretations for use. A brief summary of the referenced literature for each topic is provided at the beginning of each section of the bibliography.

148) **Knott, J.M., S.W. Lipscomb, and T.W. Lewis. 1986. Sediment transport characteristics of selected streams in the Susitna River Basin, Alaska, October 1983 to September 1984. USDI Geological Survey Open-File Report 86-424W. 73pp. (G, I)**

Author abstract: The upper reaches of the Susitna River have been considered for development of a large power generation system for south-central Alaska. This report presents a summary and discussion of sediment and hydraulic data obtained from October 1983 to September 1984 at ten sites on the Susitna, Chulitna, Talkeetna, and Yentna Rivers. Sediment data include measurements of suspended sediment and bedload discharge and analyses of particle size distribution of suspended sediment, bed-load, and bed material; hydraulic data include measurements of width, average depth and velocity, and water surface slope. Relations between water and sediment discharge are developed for selected sites. Sediment loads for the 1984 water year were estimated for the Yentna, Chulitna, and Talkeetna Rivers and for four sites on the Susitna River. About 25 million tons of sediment was transported by the Susitna River at Susitna Station during the 1984 water year. The Yentna and Chulitna Rivers contributed more than 20 million tons of sediment to the Susitna River. About 90% of suspended material (silt, clay, and sand) transported past upstream sites reached Susitna Station during the same period.

149) **Knott, J.M., S.W. Lipscomb, and T.W. Lewis. 1987. Sediment transport characteristics of selected streams in the Susitna River Basin, Alaska: Data for water year 1985 and trends in bedload discharge, 1981-85. USDI Geological Survey Open-File Report 87-229. 51pp. (G, I)**

Author abstract: The upper reaches of the Susitna River have been considered for development of a large power generation system for south-central Alaska. Sediment and hydraulic data obtained from October 1984 to September 1985 (water year 1985) at selected sites on the Susitna, Chulitna, Talkeetna and Yentna Rivers are summarized. Sediment data include measurements of suspended sediment and bedload discharge, and analyses of particle size distribution of suspended sediment, bedload, and bed material; hydraulic data include measurements of channel width, average depth and velocity of water, and water surface slope. Relations between water and sediment discharge are developed for each site. Sediment loads for water year 1985 were estimated for the Yentna , Chulitna, and Talkectna Rivers and for three sites on the Susitna River. About 31 million tons of sediment were transported to the Susitna River at Susitna Station during the year. The Yentna and Chulitna Rivers contributed about 21 million tons of sediment to the Susitna River.

150) Kyle, R.E., and T.B. Brabets. 2001. Water temperature of streams in the Cook Inlet Basin, Alaska, and implications of climate change. USDI Geological Survey Water-Resources Investigations Report 01-4109. Anchorage, Alaska. 24pp. (J)

Author abstract: Water-temperature data from 32 sites in the Cook Inlet Basin, south-central Alaska, indicate various trends that depend on watershed characteristics. Basins with 25 percent or more of their area consisting of glaciers have the coldest water temperatures during the open-water season, mid-May to mid-October. Streams and rivers that drain lowlands have the warmest water temperatures. A model that uses air temperature as input to predict water temperature as output was utilized to simulate future trends in water temperature based on increased air temperatures due to climate warming. Based on the Nash-Sutcliffe coefficient, the model produces acceptable results for 27 sites. For basins with more than 25 percent glacial coverage, the model was not as accurate. Results indicate that 15 sites had a predicted water-temperature change of 3 degrees Celsius or more, a magnitude of change that is considered significant for the incidence of disease in fish populations.

151) Martin, D.C. 1988. Aquatic habitat of the Tiekel River, southcentral Alaska, and its utilization by resident Dolly Varden (*Salvelinus malma*). M.S. Thesis, University of Alaska, Fairbanks. 179pp. (C, J)

Author abstract: The Tiekel River is a third order stream in southcentral Alaska and contains stream-resident Dolly Varden (*Salvelinus malma*) that are small in size. The purpose of this project was to compile baseline aquatic habitat data, determine which habitats were the most important to the Dolly Varden and should be protected from future development, and develop management recommendations. Habitat data suggested that the Tiekel River drainage contained a wide variety of habitats that could fulfill the life requirements for a number of fish species. Habitat suitability index graphs were constructed for the important habitat variables and should be used in the planning of future habitat alterations to assure that habitat quality does not suffer. The beaver ponds were found to have a greater probability of producing large fish than the stream habitats. Fish size was positively correlated with August water temperatures and chlorophyll *a* concentrations.

152) Martin, D.J. 1996. Spawning gravel quality in selected streams of the Ninilchik Area, Kenai Peninsula, Alaska. Project No. 51-004 revised draft data report written by Pentec Environmental, Inc., Edmonds, Washington. Written for the Alaska Department of Natural Resources and Klukwan Forest Products. 20pp. plus Appendices. (B)

Compiler abstract: This report describes sample locations, sample methods, and 1995 sample results for a monitoring program to measure spawning gravel quality in areas of the Ninilchik area of the Kenai Peninsula where future timber harvest was planned. The monitoring program was initiated to establish baseline (i.e. pre-harvest) conditions which would later be compared against conditions after timber harvest was conducted.

Spawning gravel samples were collected from 13 locations of the North Fork Ninilchik River, Clam Creek, and Stariski Creek. Sample locations were located downstream from forest

stands scheduled for timber harvest. Stream channels were characterized by measuring bankfull channel width, average channel depth, and gradient at three consecutive riffles at each gravel sample location. For each gravel sample, spawning gravels were characterized by determining particle size composition by volume and dry weight. The percentage of fines was used as an indicator of habitat quality.

The mean percentage of fines was highly variable among streams, and significant differences in mean levels if fines occurred among the stations within each stream. The 1995 data indicated that pre-harvest levels of fines were relatively high at all stream locations, primarily because Ninilchik area streams are located in old glacial outwash channels and drain an area with low topographic relief composed of sand and small gravels.

153) Mauger, S. 2004. A preliminary water quality assessment of lower Kenai Peninsula salmon bearing streams: August 1998 – June 2004. Homer Soil and Water Conservation District and Cook Inlet Keeper, Homer, Alaska. 71pp. (G, E, I, J)

Compiler abstract: This report presents a preliminary water quality assessment of four salmon bearing creeks on the lower Kenai Peninsula—Ninilchik River, Deep Creek, Stariski Creek, and Anchor River. Water quality data were collected from August 1998 through June 2004, and consisted of the following variables: streamflow, water temperature, dissolved oxygen, pH, total dissolved solids, conductivity, nutrients (nitrogen, phosphorus), turbidity, suspended solids, settleable solids, and color.

154) Schulz, B.K. 1993. Movement of Metasystox-R2 in an Alaskan landscape soil. M.S. Thesis, University of Alaska, Fairbanks. 79pp. (I)

Author abstract: Metasystox-R2 is a systemic insecticide that is injected into the soil to control aphids on ornamental birch trees. Its active ingredient is oxydemeton-methyl (ODM), a highly water soluble organophosphate. Soils in south-central Alaska are frozen for up to six months a year. When not frozen, soils are cold and permeable to water movement. Concerns have been expressed by home owners and pesticide applicators over the potential of Metasystox-R2 to contaminate groundwater under local soil and climatic conditions. An application of Metasystox-R2 was made to five individual birch trees in a landscape setting. Soil samples were collected to a depth of 61 centimeters over a 78-day period following application. Residues of the active ingredient and its toxic sulfone metabolite were recovered at the maximum depth sampled. Results suggest that downward transport of ODM and its toxic sulfone metabolite can be minimized by limiting depth of soil saturation during post-application irrigation.

155) Scott, K.M. 1982. Erosion and sedimentation in the Kenai River, Alaska. US Geological Survey Professional Paper 1235. United States Government Printing Office, Washington, D.C. 35pp. (A, F, G)

Author abstract: The Kenai River is the most important freshwater fishery in Alaska. The flow regime is characterized by high summer flow of glacial melt water and periodic flooding caused by sudden releases of glacier-dammed lakes in the headwaters. Throughout most of its 50-mi course across the Kenai Peninsula Lowlands to Cook Inlet, the river meanders within coarse bed

material with a median diameter typically in the range 40-60 mm. Every nontidal section of the stream is a known or potential salmon-spawning site.

The stream is underfit, a condition attributed to regional glacial recession and hypothesized drainage changes, and locally is entrenched in response to geologically recent changes in base level. The coarseness of the bed material is explained by these characteristics, combined with the reservoir like effects of two large morainally impounded lakes, Kenai and Skilak Lakes, that formed as lowland glaciers receded. Throughout the central section of the river the channel is effectively armored, a condition that may have important long-term implications for the ability of this section of channel to support the spawning and rearing of salmon.

The 3.8-river-mile channel below Skilak Lake contains submersed, crescentic gravel dunes with lengths of more than 500 ft and heights of more than 15 ft. Such bed forms are highly unusual in streams with coarse bed material. The dunes were entirely stable from 1950 to at least 1977, so much so that small details of shape were unmodified by a major glacial-outburst flood in 1974. The features are the product of a flood greatly in excess of any recorded discharge.

The entrenched section of the channel has been stable since 1950-51 or earlier; only negligible amounts of bank erosion are indicated by sequential aerial photographs. Bank erosion is active both upstream and downstream from the entrenched channel, however, and erosion rates in those reaches are locally comparable to rates in other streams of similar size. Although erosion rates have been generally constant since 1950-51, evidence suggests a possible recent decrease in bank stability and an increase in erosion that could be related to changes in river use.

The high sustained flow of summer encourages a variety of recreation-related modification to the bank and flood plain—canals, groins, boat ramps, slips, embankments, as well as commercial developments. As population and recreational use increase, development can pose a hazard to the productivity of the stream through increased suspended-sediment concentration resulting directly from construction and, with greater potential for long-term impact, indirectly from bank erosion. A short-term hazard to both stream and developments is the cutoff of meander loops, the risk of which is increased by canals and boat slips cut in the surface layer of cohesive, erosion-resistant sediment on the flood plain within nonentrenched meander loops. A significant long-term hazard is an increase in bank erosion rates resulting from the loss of stabilizing vegetation on the high (as high as 70 ft) cutbanks of entrenched and partly entrenched sections of channel. Potential causes of erosion and consequent vegetation loss are river-use practices, meander cutoffs, and groin construction.

156) Shelby, B., B.P. Van Haveren, W.L. Jackson, D. Whittaker, and D. Prichard. 1990. Resource values and instream flow recommendations: Gulkana National Wild River, Alaska. USDI Bureau of Land Management, Denver, Colorado, Technical Paper. 191pp. (G)

Electronic abstract: The Gulkana River, a clear-water tributary to the Copper River in south-central Alaska, was designated a National Wild River by Congress on December 2, 1980. Inclusion into the Wild and Scenic Rivers System was based partially on its location in a wilderness environment with a variety of wildlife, excellent water quality, excellent habitat for resident and anadromous fish, and outstanding opportunities for recreational boating. The goal of the project was to identify the amount of water necessary to preserve and protect the natural values of the Gulkana National Wild River and its immediate corridor environs and to

recommend a legal mechanism through which those recommended flow regimes can be recognized and protected.

157) Tydingco, T.A. 1999. The effects of timber harvest practices on fish habitat in Kenai Peninsula streams. M.S. Thesis, University of Alaska, Fairbanks. 53pp. (B, D, J)

Electronic abstract: The effects of logging on fish habitat in streams of the lower Kenai Peninsula, Alaska during the summers of 1997 and 1998 were evaluated. Large woody debris, riffle particle composition, and temperature were chosen as variables that would reflect fish-related changes in habitat that might result from logging. Only temperature was significantly different (higher) in treatment areas. The logging operations that were investigated provided greater habitat protection than required by the Alaska Forest Resources and Practices Act.

158) Wilson, W.J., M.D. Kelly, and P.R. Meyer. 1987. Instream temperature modeling and fish impact assessment for a proposed large scale Alaska hydroelectric project. In: Regulated Streams: Advances in Ecology. J.F. Craig and J.B. Kemper, Editors. Plenum Press, New York. Pages 183-206. (J)

Electronic abstract: The State of Alaska is proposing to construct a two dam, 1620 megawatt hydroelectric project (U.S. Federal Energy Regulatory Commission N. 7114) on the Susitna River approximately 190 km NNE of Anchorage. A study is underway to determine the effects this project may have on the indigenous aquatic resources of the Susitna drainage. Reported on here are the studies of the expected alteration of the instream temperature regime of the Susitna River. Twenty species of fish are known to inhabit the Susitna basin. This study focuses on the most numerous and economically valuable Pacific salmon species, approximately two million of which annually enter this river to spawn. Analysis of expected effects on salmon from altered water temperatures due to operation of the Susitna Hydroelectric Project is based on a comparison of available predictions from the Stream Network Temperature Simulation Model (SNTEMP) model with fish thermal tolerance criteria. Based on the SNTEMP model results, salmon thermal tolerance criteria, Susitna stock life history information, and professional judgment, the authors conclude that no direct mortality is anticipated to occur from with-project temperatures, although unquantifiable, indirect mortality to some species may occur.