article 4: Research in your watershed

Landowners aren't the only folks who find the peninsula watersheds of great interest. Researchers from state and federal agencies and area nonprofits are among those who want to know more about these river systems and how they work. In this entry, we highlight some recent salmon-related studies in lower peninsula watersheds (primarily the Anchor River) and provide links to other research efforts.

The summaries below are from *Kenai Peninsula Watershed Efforts* compiled by the Kachemak Bay Research Reserve Coastal Training Program (CTP, http://www.adfg.alaska.gov/index.cfm?adfg=kbrr_educationcoastal.home) in October 2011. For more information about particular studies, contact the individuals identified with each study. For a pdf copy of *Kenai Peninsula Watershed Efforts*, contact Megan Murphy at megan.murphy@alaska.gov, 226-4653.

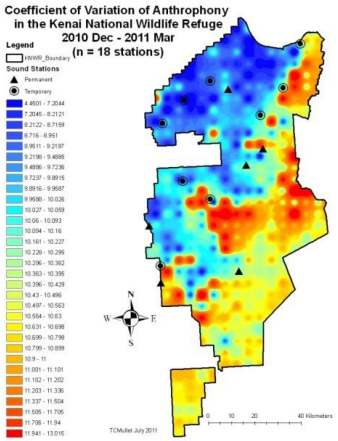
Summaries of selected KBRR studies can also be found at: http://www.adfg.alaska.gov/index.cfm?adfg=kbrr_resources.summaries, and a variety of KBRR research reports can be accessed at: http://www.adfg.alaska.gov/index.cfm?adfg=kbrr_resources.reports. Other ADF&G biologists also regularly carry out research on Lower Kenai Peninsula streams, including Anchor River and Deep Creek. Check at http://www.adfg.alaska.gov/index.cfm?adfg=ByAreaSouthcentralLowerCookInlet.research for summaries The Kenai National Wildlife Refuge carries out many research studies within the refuge, which includes the headwaters of Anchor River, Deep Creek, Ninilchik River, and Stariski Creek watersheds. As a result, KNWR research studies may also be of interest, see: http://alaska.fws.gov/nwr/kenai/science/studies.htm. Finally, if you search online for "research reports" and include the name of your watershed or your stream, you may find other reports of interest.

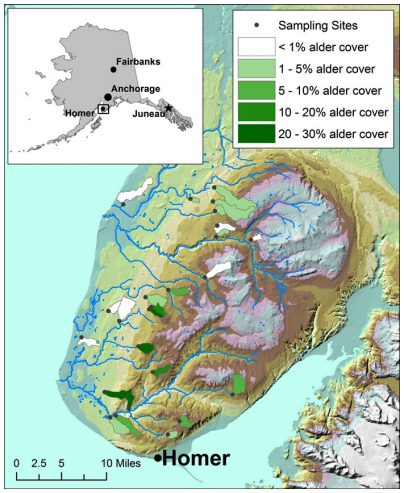
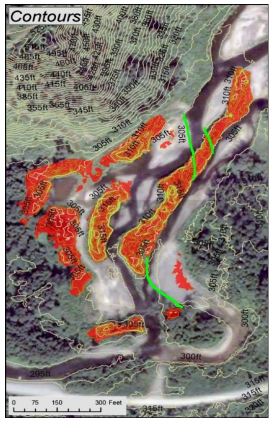
Here are direct links to a few Anchor River-related research reports from various sources (file size is listed in case you want to avoid downloading large files at the moment).

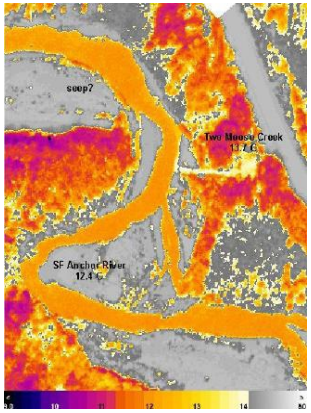
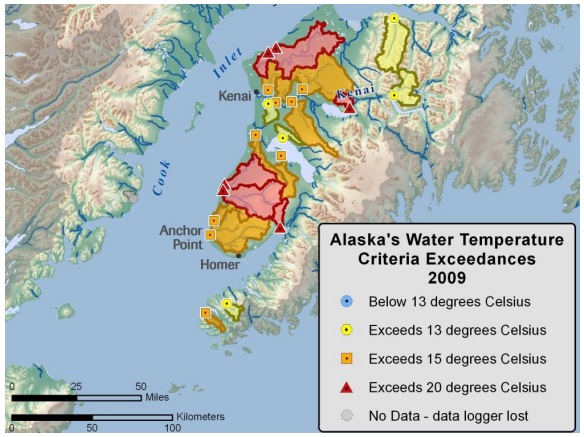
- Headwater Stream Wetland Settings and Shallow Ground Water Influence: Relationships to Juvenile Salmon Habitat on the Kenai Peninsula, Alaska (4.65 MB pdf): http://www.adfg.alaska.gov/static/lands/habitatresearch/kbrr/pdfs/HWS2_final_report_12.27.09.pdf
- Wetland Geomorphic Linkages to Juvenile Salmonids and Macroinvertebrate Communities in Headwater Streams of the Kenai Lowlands, Alaska (9.77 MB pdf): http://www.adfg.alaska.gov/static/lands/habitatresearch/kbrr/pdfs/HWS_finalreport_10.07.pdf
- Presence and Effects of Marine Derived Nutrients (MDN) in Stream, Riparian and Nearshore Ecosystems on Southern Kenai Peninsula, Alaska: Developing Monitoring Tools for Tracking MDN in Alaska Watersheds (2 MB pdf): http://www.adfg.alaska.gov/static/lands/habitatresearch/kbrr/pdfs/MDN_finalreport_7.13.07.pdf
  This study is designed to increase understanding of how marine-derived nutrients from returning adult salmon affect stream productivity and food webs, as well as to develop tools for tracking MDN throughout watersheds. Initial results show that streams with spawning salmon are enriched compared to streams without spawning salmon and that Omega 3 fatty acids are a reliable indicator of marine-derived influence on fishes
- Lower Kenai Peninsula summer off-road-vehicle (ORV) trail stream crossings. DRAFT (3.68 MB pdf) http://www.adfg.alaska.gov/static/home/library/pdfs/habitat/02_02_draft.pdf
- Landowners guide to fish habitat conservation and restoration practices (5.02 MB): http://www.adfg.alaska.gov/static/home/library/pdfs/habitat/01_03.pdf

Selected recent research in the Anchor River watershed (from *Kenai Peninsula Watershed Efforts* compiled by KBRR)

	Project name, timeframe, contact, and goals	Interesting results to date
	***Marine-derived nutrients*** —2004-2006, study completed Coowe Walker, KBRR, Homer coowe.walker@alaska.gov or (907) 226-4651 • Understand of how marine-derived nutrients from returning adult salmon affect stream productivity and food webs • Develop tools to track marine derived nutrients Link to report at: http://www.adfg.alaska.gov/static/lands/habitatresearch/kbrr/pdfs/MDN_finalreport_7.13.07.pdf	• Streams with spawning salmon are enriched compared to streams without spawning salmon • Omega 3:omega fatty acids are a reliable indicator of marine-derived influence on fishes
	***Chinook and coho salmon freshwater life history characteristics in the Anchor River watershed*** —2010-2011 Jeff Anderson, U. S. Fish & Wildlife Service, Soldotna jeffry_anderson@fws.gov or (907) 260-0132 • Assess current habitat conditions for chinook and coho salmon • Understand the relationship of key life stages of salmon to habitats throughout the Anchor River • Model potential freshwater production of chinook and coho salmon in the Anchor River	• Peak smolt migration occurred in late June and early July • Most adult steelhead passed through the video weir at night
	***Headwater streams as rearing habitats for juvenile*** —2005-2013 (headwater stream food web studies complete; studies of alder influences on headwaters are ongoing) Coowe Walker, KBRR, Homer coowe.walker@alaska.gov or (907) 226-4651 • Identify how wetlands, uplands and headwater streams are connected • Understand juvenile salmon use of headwater streams as rearing habitat	• Juvenile salmon use different types of habitats at different times of their lives • Alder in the surrounding watershed is an important driver of nutrients in the stream

	***Wintering habitat for juvenile coho*** —2010-2013 (field sampling complete; data analysis in progress) Coowe Walker, KBRR, Homer coowe.walker@alaska.gov or (907) 226-4651 • Determine variability in overwintering habitat characteristics. - • Determine the effects of over-wintering habitat on juvenile coho condition and survival. • Document winter habitat throughout the Anchor River watershed	• Groundwater is an important factor in overwintering sites • Juvenile coho are growing substantially between fall and spring
	***Coho salmon use of estuarine habitats*** —2011-2012 (field sampling complete) Tammy Hoen Neher UAF, KBRR, Homer tdhoem@alaska.edu 907-226-4668 • Describe the size, age, and time periods of estuarine habitat use by smolting coho salmon • Compare and contrast smolt traits (size, age, patterns of estuarine use) and environmental conditions between Fox and Anchor River estuaries • Compare and contrast population characteristics (such as genetic diversity, behavioral and size/age structure) between fish using Fox and Anchor River watersheds to spawn.	• Preliminary diet analysis links juvenile salmon to estuary habitats, demonstrating rearing • Patterns of distribution in smolt abundance and size appear to follow hypothesized patterns within an estuary: habitats with more variable conditions had more variation in patterns of use and sizes of fish • Larger, older fish appear to use and leave the estuary by late June; smaller, younger fish appear to use the estuary throughout the summer season • Anchor River fish appear more similar in size and age structure than Fox River fish
	***Cumulative ecological effects of snow machines in the Kenai National Wildlife Refuge*** —ongoing Tim Mullet UAF, Department of Wildlife Biology	

	***Integrated pest management of invasive plants on the Kenai National Wildlife Refuge*** —ongoing John Morton, KNWR john_m_morton@fws.gov or (907) 262-3599	
	***How Alder is Related to Nitrogen Concentrations in Streams and How Stream Nitrogen Concentrations Affect Leaf Breakdown*** —2009 (completed) Becky Shaftel, Biology MS, Baylor University rsshaftel@uaa.alaska.edu • Map alder in headwater stream watersheds and sample stream nutrients seasonally to determine if alder is related to stream nitrogen • Evaluate the breakdown of bluejoint grass, a dominant riparian plant, along a natural nutrient gradient of six streams Link to report at: http://www.baylor.edu/content/services/document.php/125852.pdf	• Alder is very strongly related to headwater stream nitrogen concentrations • Bluejoint breakdown rates and litter quality were significantly related to stream nutrients over time • See publications, "Alder cover drives nitrogen availability in Kenai lowland headwater streams, Alaska" in Biogeochemistry AND "Breakdown rates, nutrient concentrations, and macroinvertebrate colonization of bluejoint grass litter in headwater streams of the Kenai Peninsula, AK" in Journal of the North American Benthological Society.
	***Connection Between Floodplain Modification and Channel Response–a Historical Perspective of the Anchor River Mainstem*** —1950–2003 decade-by-decade aerial look at channel position (Project complete, with restoration options being implemented, see Anchor River Restoration Project) Robert Ruffner, Kenai Watershed Forum robert@kenaiwatershed.org or (907) 260-5479 • Identify how stable the Anchor River mainstem channel has been over the past 60 years • Understand what activities may contribute to instability and provide recommendations for corrective action where warranted	• A portion of the Anchor River was on the opposite side of the Sterling Highway until 1961/2 • Restoration scheduled for summer 2011 was designed based on discoveries of this work

	***Stream Temperatures for Salmon: Thermal Refugia*** —2010-2011 Sue Mauger, Cook Inletkeeper sue@inletkeeper.org or (907) 235-4068 • Assess 34 miles of surface water temperatures on the Anchor River • Develop a longitudinal temperature profile that illustrates basin scale stream temperature patterns • Identify and map habitats and groundwater areas that provide cooler water than the main channel • Create GIS layers that can be used to plan future research, direct ground based monitoring, and protect and restore critical habitat	• Eighteen tributaries, 23 seeps and springs, 11 sloughs, and 9 small side channels were sampled on 6/30/10. • Two Moose Creek is the only tributary that contributes warmer water to the mainstem.
	Stream Temperature Monitoring Network —2008-2012 Sue Mauger, Cook Inletkeeper sue@inletkeeper.org or (907) 235-4068 • Monitor stream temperature patterns in 20 of the Kenai Peninsula's non-glacial salmon streams and correlate how they relate to air temperature patterns • Use historical air temperature data from local airports to backcast historical water temperatures • Use air temperature predictions from climate models to forecast future stream temperatures on the Kenai Peninsula	• Stream temperatures on the Kenai Peninsula routinely exceed Alaska's temperature criteria for the protection of fish: stream temperatures exceeded Alaska's Water Temperature Criteria of 13 degrees C at 20 sites, 15 degrees C at 15 sites, and 20 degrees C at 6 sites in 2009 on the Kenai Peninsula • In 2009, maximum water temperatures in all 20 Kenai Peninsula streams were above levels known to be stressful to salmon • Anchor River temperatures are warmer in the last 20 years than they were in the previous 50 years • Anchor River temperatures in July may increase by as much as 3 degrees C (5.4 degrees F) over the next 90 years
	***Monitoring and Managing Anchor River King Salmon*** —2003, ongoing Carol Kerkvliet or Michael Booz, ADF&G, Sport Fish, Homer carol.kerkvliet@alaska.gov or michael.booz@alaska.gov 907-235-8191 • Ensure sustainability of Anchor River king salmon stock • Using best available data, determine number of king salmon needing to spawn (escapement) to sustain the stock • Actively monitor escapement and the fishery and adjust regulations in season when needed	• Before the sonar/weir project began in 2003, king salmon regulations were made postseason; since 2003, regulations may also change in season now that timely escapement data is available • Since 2003, estimated number of kings escaping to spawn has ranged from approximately 3,500-12,000 • In 2010, a sustainable escapement goal range was set at 3,800 to 10,000; this range minimizes risk of overfishing yet allows liberalization of harvest when escapements are large