



Proceedings of the Fourth Interagency Conference on Research in the Watersheds

Observing, Studying, and Managing for Change



Scientific Investigations Report 2011-5169

U.S. Department of the Interior
U.S. Geological Survey



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p. 107: (Denali National Park, Alaska). *Don Becker, U.S. Geological Survey*

p. 127: Alaskan costal marsh along Cook Inlet (Beluga, Alaska). *James Lynch, U.S. Geological Survey*

p. 131: Sampling stream water (Denali National Park, Alaska). *Dennis G. Dye, U.S. Geological Survey*

p. 140: "Another Day at the Office" (Solomon Gulch, Valdez, Alaska). *Johnse S. Ostman, U.S. Geological Survey*

p. 148: Permafrost erosion measurement (along the Arctic coast, Alaska). *Christopher Arp, U.S. Geological Survey*

p. 180: Sampling at ice out (Pilot Station, Alaska). *Paul Schuster, U.S. Geological Survey*

p. 194: Retreating glacier (Denali National Park, Alaska). *Dennis G. Dye, U.S. Geological Survey*

Back cover: (Prince William Sound, Alaska). *Don Becker, U.S. Geological Survey*



Proceedings of the Fourth Interagency Conference on Research in the Watersheds

Observing, Studying, and Managing for Change

Edited by C. Nicolas Medley, Glenn Patterson, and Melanie J. Parker

Scientific Investigations Report 2011–5169

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
KEN SALAZAR, Secretary

U.S. Geological Survey
Marcia K. McNutt, Director

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Preface

These proceedings contain the abstracts, manuscripts, and posters of presentations given at the Fourth Interagency Conference on Research in the Watersheds—Observing, Studying, and Managing for Change, held at the Westmark Hotel in Fairbanks, Alaska, September 26–30, 2011. The conference was jointly hosted by the Bureau of Land Management and the National Park Service.

Watersheds face resource impacts driven by accelerated change related to land use, population, and climate. About every three years a conference is held to bring together watershed researchers, observers, and managers to share scientific advances and management strategies. This year, the Fourth ICRW took a wider perspective on watershed science and examined some pressing issues of watershed science and management in our largest and perhaps most vulnerable state, Alaska. The purpose of the conference was to better understand the processes driving change and help managers incorporate societal needs and scientific uncertainty in the management of natural resources.

The conference echoed similar themes to the last, highlighting the challenges of managing watersheds based on available science when considerably uncertainty remains regarding the hypothesized relationships between observed environmental changes and their ultimate effects. For example, while the scientific case for anthropogenic climate change has been well presented, confirming possible cause and effect relationships between climatic change and physical and ecological impacts in highly variable, natural systems continues to represent a scientific challenge. This goal becomes even more difficult when superimposed upon a long history of natural resource and land management practices that have fundamentally changed the physical, chemical and biological processes important in maintaining naturally functioning ecosystems. Designing and implementing studies to better understand watersheds and clearly communicating the findings to decisionmakers will be the primary challenge for natural resource scientists and managers into the foreseeable future.

The decision to hold the Fourth ICRW in Alaska was intended to highlight these challenges, and specifically the potential changes associated with climate change. The relatively pristine environment of Alaska perhaps provides the best opportunity to confirm predicted cause and effect relationships associated with climate change, absent the confounding influence of anthropogenic disturbances characteristic of more populated areas.

The Fourth ICRW presented a mix of science and management. The conference was loosely structured to reflect important aspects of the scientific process that lead to scientifically defensible management decisions. Abstracts for presentations or posters were invited on the following topics, related to both pristine and altered watersheds:

1. Observing Watersheds: Inventory and monitoring. Instrumentation. Study design and implementation. Remote sensing. Data collection and management.
2. Studying Watersheds: Hypothesis testing and experimental approaches. Results, analysis and interpretation of data. Trends, relationships, causes and effects and predictions. Ecosystem modeling. Cumulative and indirect effects. Potential drivers of change including climate, land use, population growth and water demand, wildfire, disease, insects, agriculture, mining, and energy development. Impacted goods and services including quantity and quality of water, biota and habitats, controls on carbon, nutrient, and sediment fluxes, and aesthetics. Opportunities for education and recreation.
3. Managing Watersheds for Change: Approaches to adaptive management. Incorporation of uncertainty in decisionmaking. Prioritization of management actions. Collaborative approaches. Ecosystem restoration and strategies for adaptation, mitigation, and enhancement of resiliency.

The Fourth ICRW conference program contained several major elements that highlighted the theme of the conference; Federal agency representative science policy presentations; technical talks and poster presentations; invited speaker keynote addresses; a selection of all-day field trips in the Fairbanks area; and a plenary session.

All presenters were invited to report on their professional and personal experience with watershed research and management during the technical talks and poster presentations of the conference. Each was also invited to provide an abstract, manuscript, or poster for inclusion in the conference proceedings. The contributions contained within these proceedings do not include all presentations given at the conference. Only those submitted by presenters that met the U.S. Geological Survey Scientific Investigations Report peer review and agency approval standards were published. The organizers thank the many people who contributed manuscripts and abstracts to these proceedings and to the attendees whose interest and energy made the Fourth Interagency Conference on Research in the Watersheds a success.

Looking ahead, the Fifth ICRW will be hosted by the Center for Watershed Sciences, Southern Research Station, U.S. Forest Service and will be held at the Santee Experimental Forest located in Charleston, South Carolina, in September or October 2014, to coincide with the 50th anniversary of watershed research at the facility. Updates and information will be made available on the conference website <http://www.hydrologicscience.org/icrw/>. We look forward to seeing you there.

Proceeding Editors

C. Nicolas Medley
National Park Service

Glenn Patterson
National Park Service and
U.S. Geological Survey liaison

Melanie Parker
U.S. Geological Survey

*Fourth Interagency Conference on
Research in the Watersheds*

Acknowledgments

Conference Chair

Jim Renthal, Bureau of Land Management
Bill Jackson, National Park Service, Water Resources Division

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Jessica Annadale, Consortium of Universities for the Advancement of Hydrologic Science, Inc.
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Jade Soddell, U.S. Bureau of Reclamation
Rob Striegl, U.S. Geological Survey
Carl C. Trettin, U.S. Forest Service
Rick Webb, U.S. Geological Survey

Permafrost Workshop

Torre Jorgenson, University of Alaska, Fairbanks
Misha Kanevskiy, University of Alaska, Fairbanks
Yuri Shur, University of Alaska, Fairbanks

Keynote Speakers

Jeff Arnold, U.S. Army Corps of Engineers, Institute of Water Resources, Senior Scientist
Jessica Cherry, University of Alaska, Fairbanks, International Arctic Research Center
Ellen Wohl, Colorado State University
Susan Moran, U.S. Department of Agriculture, Agricultural Research Service, Southwest Watershed Research Center
Rob Striegl, U.S. Geological Survey
Scott Guyer, North Slope Science Initiative

Welcome Address

Jon Waterhouse, Yukon River Inter-Tribal Watershed Council
Bob Winfree, National Park Service, Alaska Regional Science Advisor, Anchorage

Agency Presentations

Charles Noss, U.S. Environmental Protection Agency
Jerad Bales, U.S. Geological Survey
Ben Kennedy (tentative), Bureau of Land Management
Mark Walbridge, U.S. Department of Agriculture, Agricultural Research Service
Rick Hooper, Consortium of Universities for the Advancement of Hydrologic Science, Inc.
Andy Loranger (tentative), U.S. Fish and Wildlife Service
Deb Hayes and Mary Beth Adams, U.S. Forest Service
Gary Machlis (tentative), National Park Service

Session Moderators

Ben Kennedy—Alaskan Water Quality
Don Campbell—Climate and Hydrology
C. Nicolas Medley—Ecohydrology
Susan Moran—Carbon, Nitrogen, and Agriculture
Scott Davis—Forested Watersheds
Jim Renthal—Lakes, Wetlands, and Soil Moisture
Mary Beth Adams—Water Quality Monitoring
Chuck Noss—Data and Modeling
Rick Webb—Geomorphology and Watershed Management

Field Trip Leaders

Denali National Park (preconference)—Denny Capps, National Park Service
Permafrost Tunnel—Tom Douglas, U.S. Army Corps of Engineers
Yukon Crossing—Dennis Keill, Bureau of Land Management (retired); Paul Schuster, U.S. Geological Survey; Hans Arnett
Bonanza-Poker Creeks—Jay Jones and Kenji Yoshikawa, University of Alaska, Fairbanks
Chena Geothermal Springs—John Schaake, U.S. Army Corps of Engineers; Bernie Karl, Chena Lake Hot Springs Resort (owner)

Proceedings Editors

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Glenn Patterson, National Park Service, Water Resources Division
Melanie Parker, U.S. Geological Survey

Proceedings Layout and Design

Mari L. Kauffmann, (Contractor, ADC Management Services, Inc.)
Melanie Parker, U.S. Geological Survey

The organizers would like to thank the many unnamed people, including the panel presenters, who helped in so many ways to make the conference a success.

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26–30 September 2011, Fairbanks, Alaska

C. Nicolas Medley, Glenn Patterson, and Melanie J. Parker, editors

Conference Program

Preconference Permafrost Workshop

Monday, September 26, 8:00 AM

Building Management Competency in Permafrost Terrain—Torre Jorgenson, University of Alaska, Fairbanks, AK

Monday, September 26

4:00 PM Arrival / Check in / Registration

6:30 PM Opening Reception—Hors d'oeuvres and no-host bar

7:00 PM Welcome Speech—Jon Waterhouse, Yukon River Inter-Tribal Watershed Council

7:30 PM Reception continues

Tuesday, September 27

8:00 AM Call to Order and Orientation—Jim Renthall, Bureau of Land Management

8:10 AM Welcome—Bob Winfree, Alaska Regional Science Advisor, National Park Service

8:30 AM Introduction of Keynote Speaker, Jeff Arnold—Tom Douglas, U.S. Army Corps of Engineers

8:40 AM First Keynote Address—Jeff Arnold, Senior Scientist at the U.S. Army Corps of Engineers Institute of Water Resources

9:45 AM Break

Agency Presentations

10:00 AM Chuck Noss, U.S. Environmental Protection Agency

10:30 AM Jerad Bales, U.S. Geological Survey

11:00 AM Ben Kennedy (tentative), Bureau of Land Management

11:30 AM Mark Walbridge, Agricultural Research Service

12:00 PM Lunch

Second Keynote Address—Hydroclimate of the Seward Peninsular in Western Alaska: A Century of Change—Jessica Cherry, International Arctic Research Center, University of Alaska, Fairbanks, AK

Tuesday, September 27 (Continued)

Concurrent Session I			
	Session 1A: Alaskan Water Quality	Session 1B: Climate and Hydrology	Session 1C: Ecohydrology
	Moderator: Ben Kennedy	Moderator: Don Campbell	Moderator: C. Nic Medley
1:30 PM	Hydrogeochemistry of Antimony and Arsenic in Watersheds of the Kantishna Hills District, Denali National Park and Preserve, Alaska—T.P. Trainor	Potential Climate Change Effects on Water Tables and Pyrite Oxidation in Headwater Catchments in Colorado—R.M.T. Webb	Predicting the Impact of Glacier Loss on Fish, Birds, Floodplains, and Estuaries in the Arctic National Wildlife Refuge—M. Nolan
1:55 PM	Use of Pore Water as Part of Contaminated Sites Management: Case Studies in Kotzebue and Fairbanks, Alaska—J. Fish	Utilizing Long-Term ARS Data to Compare and Contrast Hydroclimatic Trends from Snow and Rainfall Dominated Watersheds—D.C. Goodrich	Land Use and Salmon Habitat: A Comparison of North Pacific Watershed Parameters—S.F. Loshbaugh
2:20 PM	Assessment of High-Flow Events and Water Quality in the Birch Creek and Nome Creek Placer-Mined Watersheds near Central, Alaska, 2008–2010—B.W. Kennedy	Analysis of Trends in Climate, Streamflow, and Stream Temperature in North Coastal California—M.A. Madej	Intrinsic Potential: A Tool for Identifying Salmon Habitat at the Watershed Scale—G.H. Reeves
2:45 PM	Application of Updated Approaches for the Reclamation of Placer-Mined Lands in the Harrison Creek Watershed near Central, Alaska—H.R. Arnett	Evidence of Climate Change in the Streamflow and Water Temperature Record in the Missouri River Basin—M.T. Anderson	Evaluating Biodiversity Response to Forecasted Land Use Change: A Case Study in the South Platte River Basin, Colorado—W.G. Kepner
3:10 PM	Break	Break	Break
3:40 PM	Developing a Long-Term Aquatic Monitoring Network in a Complex Watershed of the Alaskan Arctic Coastal Plain—M.S. Whitman	Long-Term Climate Change Controls Stream and Riparian Area Response to Disturbance in the Semiarid Great Basin—J.C. Chambers	Modeling Impacts of Environmental Change on Ecosystem Services across the Conterminous United States—P. Caldwell
4:05 PM	Permafrost and Active Layer Dynamics Inferred from Major Element Geochemical Signatures in Six Arctic Alaskan Rivers—T.A. Douglas		The Urban Fishery: An Application of System Robustness—M.B. Krupa
4:30 PM	Monitoring Water Quality in Alaskan National Parks: Development and Application of RIVPACS Empirical Models for the Assessment of Ecological Condition—T. Simmons		Quantifying Uncertainty in Ecosystem Studies (QUEST): Using Long-Term Data from Small Watersheds—M.B. Adams

Tuesday, September 27 (Continued)

Poster Session and Reception

5:30 PM

Hors d'oeuvres and no-host bar

Using Ground-Based Geophysics in the Yukon Flats, Alaska, to Characterize Permafrost and Subsurface Features Critical to Hydrologic Models of Subarctic Systems—H.R. Best

Restoring and Protecting a National Treasure: An Overview of the Chesapeake Bay Program—A.S. Burnett

Making Long-Term Watershed Research Accessible—K.J. Cole

Building a Hydrology Science Plan for the Arctic Landscape Conservation Cooperative—B.T. Crosby

Renewable Energy Locations for Existing and Potential Facilities within BLM Leased Land—S. Davis

An Investigation of Carbon Dynamics in Beaver Creek, Alaska, Using in situ Sensors—M.M. Dornblaser

Influence of Organic Matter on *Cryptosporidium parvum* Oocyst Mobility in Watersheds Characterized by Variable-Charge Soils—R.W. Harvey

Evaluating Cumulative Effects of Logging and Potential Climate Change on Dry-Season Flow in a Coast Redwood Forest—J. Lewis

The Yukon River Basin Indigenous Observation Network: Preliminary Results from Baseline Datasets Highlighting Climate Variation Indicators—L.M. Mackey

Outreach in the Yukon River Basin: Connecting Science and Community—P.F. Schuster

Using Remotely Sensed Brightness Temperatures to Infer Snowmelt Onset and Runoff in High Latitude Drainage Basins—K.A. Semmens

Modeling Coastal Plain Drainage Ditches with SWAT—A.M. Sexton

Wednesday, September 28

6:00 AM Breakfast service begins at Northern Lights Restaurant in Westmark Hotel

Field Trips (Box Lunch)

More information on p. 9.

7:00 AM Yukon Crossing

Caribou-Poker Creeks Research Watershed—Bonanza Creek Long-Term Ecological Research (LTER) Program

Chena River Flood Diversion Project and Chena Lake Hot Springs Resort—Geothermal Energy

5:30 PM Return to Fairbanks

Thursday, September 29

8:00 AM Third Keynote Address—Steep Streams: What's New, What's Problematic—Ellen Wohl, Colorado State University, Fort Collins, CO

Thursday, September 29 (Continued)

Concurrent Session II					
Session 2A: Carbon, Nitrogen, and Agriculture		Session 2B: Forested Watersheds		Session 2C: Lakes, Wetlands, and Soil Moisture	
Moderator: Susan Moran		Moderator: Scott Davis		Moderator: Jim Renthall	
9:00 AM	Seasonality in Water, Carbon, and Nitrogen Fluxes from an Upland Boreal Catchment Underlain by Continuous Permafrost—J.C. Koch	Quantifying Hydrologic Impacts of Vegetation Treatments in the Bates Creek Watersheds—G.B. Paige	Classification, Mapping, and Management of Wetlands in Alaskan Watersheds with Rapidly Growing Populations—M. Gracz		
9:25 AM	Improved Nitrogen Management Utilizing Ground-Penetrating Radar: A Nine-Year Investigation—T. Gish	Long-Term Forest Management and Climate Effects on Streamflow—S.G. Laird	Will the Arctic Coastal Plain Wetlands Disappear?—A.K. Liljedahl		
9:50 AM	Water, Energy, and Carbon Flux Observations from Agricultural Research Service Watersheds and Agro-Ecosystem Experimental Sites—J. Alfieri	Effects of Forest Cover and Environmental Variables on Snow Accumulation and Melt—M. Dobre	Measuring Soundscapes Relative to Global Change in Interconnected Wetlands and Uplands along North American Environmental Gradients—W. Sadinski		
10:15 AM	Integrating Watershed- and Farm-Scale Models to Target Critical Source Areas While Maintaining Farm Economic Viability—T. Veith	Headwater Variability across the Rain-Snow Transition in California's Sierra Nevada: Stream Discharge, Runoff Timing, and Sediment Yield—C.T. Hunsaker	Lake Districts of the Koyukuk National Wildlife Refuge—K. Lehmkuhl Bodony		
10:40 AM	Break		Break		
11:00 AM			Contrasts in Carbon and Nitrogen Ecosystem Budgets in Adjacent Norway Spruce and Appalachian Hardwood Watersheds in the Fernow Experimental Forest, West Virginia—M.B. Adams	Using SAR to Characterize the Winter State of Ponds and Lakes In Arctic Alaska—J. Grunblatt	
11:25 AM			Whole Watershed Manipulations of Deposition Chemistry at Bear Brook Watershed in Maine and the Fernow Experimental Forest, West Virginia—M.B. Adams	Reclamation Activities in the Climate Change and Water Working Group (CCAWWG)—L. Brekke	

12:15 PM Lunch

Fourth Keynote Address—Response of Southwestern Grasslands to Precipitation and Temperature Extremes of the Early 21st Century Drought—Susan Moran, Agricultural Research Service, Southwest Watershed Research Center, Tuscon, AZ

Thursday, September 29 (continued)

Concurrent Session III			
	Session 3A: Water Quality Monitoring	Session 3B: Data and Modeling	Session 3C: Geomorphology and Watershed Management
	Moderator: Mary Beth Adams	Moderator: Chuck Noss (tentative)	Moderator: Rick Webb
1:30 PM	Water Quality Effects of Fire Retardant Application in a Tundra Lake near Hughes, Alaska—B.W. Kennedy	Hydrologic Response to Climate Change and Habitat Resiliency Illustrated Using Fine-Scale Watershed Modeling—L.E. Flint	Temporal and Spatial Distribution of Landslides in the Redwood Creek Basin, Northern California—M.A. Madej
1:55 PM	Long-Term Pesticide Volatilization Monitoring at the Catchment Scale—J.H. Prueger	Simulation of Hydrologic Response to Climate and Landscape Change Using the Precipitation Runoff Modeling System in the Apalachicola–Chattahoochee–Flint River Basin in the Southeastern United States—J.H. LaFontaine	Holocene Extraordinary Floods and the Social Impacts in the Weihe River Basin, China—C. Huang
2:20 PM	Reconnaissance Investigation of Emerging Contaminants in Effluent from Wastewater Treatment Plant and Stormwater Runoff in the Columbia River Basin—J. Morace	Parameterization of the Yukon River Basin Using the Data of Wolf Creek Research Watershed—O. Semanova	Paleochannels as Reservoirs for Watershed Management—R.P. Gupta
2:45 PM	Monitoring and Modeling Hydrologic and Water Quality Responses to Disturbance Resulting from Natural Gas Development in Muddy Creek, Wyoming—S.N. Miller	Spatiotemporal Analyses of Simulated Biophysical Processes in the Chippewa River Watershed, Minnesota—A.A. Jaradat	The Effectiveness of Aerial Hydromulch as an Erosion Control Treatment in Burned Chaparral Watersheds, Southern California—P.M. Wohlgenuth
3:10 PM	Break	Break	Break
3:40 PM	Pesticide Monitoring in Watersheds: Balancing Cost and Uncertainty—E.A. Pappas	Instrumentation of Crow Creek Watershed for Short- and Long-Term Hydrologic Studies in the Northern Intermountain West—G.B. Paige	The National Watershed Boundary Dataset (WBD), a Framework for all Watershed Science—K.M. Hanson
4:05 PM	An Upside-Down River: Impoundments and Eutrophication Alter Downstream Predictions of Water Quality in the Klamath River—A.A. Oliver	The International Joint Commission’s Binational Hydrographic Data Harmonization Effort: Alaska-Yukon Perspective—M.T. Laitta	Remote Sensing of Soil Tillage Intensity in a CEAP Watershed in Central Iowa—C.S.T. Daughtry
4:30 PM	Use of Early Agency Coordination to Efficiently Navigate the Permitting Process for Complex Stream- and River-Related Projects—H.R. Arnett		Spatiotemporal Analysis of Surface and Subsurface Soil Moisture for Remote Sensing Applications within the Upper Cedar Creek Watershed—G.C. Heathman

Thursday, September 29 (continued)

7:00 PM Banquet and Awards

Fifth Keynote Address—Research on the Yukon River—Rob Striegl, U.S. Geological Survey, Boulder, CO

Friday, September 30

Agency Presentations

7:45 AM Jennifer Arrigo, Consortium of Universities for the Advancement of Hydrologic Science, Inc., Senior Program Manager

8:15 AM Jeff Adams, U.S. Fish and Wildlife Service

8:45 AM Deb Hayes and Mary Beth Adams, U.S. Forest Service

9:15 AM Break

9:30 AM National Park Service (TBA)

10:00 AM Panel Discussion—Approaches and Tools for Future Management Challenges

10:40 AM Looking Past and Forward—Rick Webb, U.S. Geological Survey

11:00 AM Plans for the 5th ICRW—Chuck Noss, U.S. Environmental Protection Agency

11:15 AM Lunch

Sixth Keynote Address—Current Activity of the North Slope Science Initiative—Scott Guyer, North Slope Science Initiative

12:30 PM Final Comments and Adjournment of the 4th ICRW—Jim Renthal, Bureau of Land Management

Field Trip Information

Yukon Crossing

The group will visit the Permafrost Tunnel (16 miles north of Fairbanks near Fox and Goldstream Creek), built by the U.S. Army Corps of Engineers–Cold Regions Research and Engineering Laboratory, nearly 50 years ago. The entrance is representative of the typical seasonally frozen soil of the Fairbanks area but the interior of the tunnel is permanently frozen and does not require structural support.

Next we'll visit the Erickson Creek fire (2003) which burned 118,000 acres and discuss Alaska fire ecology and issues related to buried and elevated pipelines at the ecosystem-permafrost transition. We will view differences between south- and north-facing slopes on the landscape along the 140 miles of the Elliott and Dalton Highways between Fairbanks and the Yukon River (a river nearly 1,900 miles in length from Canada to the Bering Sea).

- 7:00 AM Depart from Westmark Hotel parking lot; traveled north on the Elliott Highway
- 7:30–8:30 AM Stop at the Trans-Alaska Oil Pipeline and continued north on Elliott Highway to view more of the Pipeline (caribou not guaranteed in tour)
- 8:30–9:30 AM Visit Hess Creek overlook, 21 miles from Fairbanks on Elliott Highway. View past wildfire: Erickson Creek fire, 2003, burned 118,000 acres.
- 9:30–10:30 AM 34 miles on Elliott Highway—View Trans-Alaska Oil Pipeline and discuss buried and elevated pipelines at the ecosystem-permafrost transition.
- 10:30 AM–12:00 PM 18 miles north on Elliot Highway—View black spruce forest at Tolovana River Bridge
- 13 miles north on Elliott Highway (84 miles from Fairbanks)—Livengood (Elliott Highway becomes the Dalton Highway/Haul Road)
Observe a fire ecology photo stop (29 miles north of Livengood). See the Bureau of Land Management publication *Birds of the Dalton Highway*.
- 12:00–1:00 PM 56 miles north on Dalton Highway, close to the Yukon River crossing—Hotspot Cafe for box lunch
- Presentation**—Success Story on Intergovernmental Coordination for Complex Stream and River Related Projects: Obtaining the Permitting Process by Early Involvement of Regulatory Agencies—Hans Arnett and Sara Lindberg
- 1:00–2:30 PM Visit Yukon Bridge viewing station and Yukon River crossing. Another good fire ecology site is north of the river.
- 2:30–5:30 PM Return 140 miles to Fairbanks, Westmark Hotel
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Field Trip Information

Caribou-Poker Creeks Research Watershed Bonanza Creek Long-Term Ecological Research (LTER) Program

The purpose of this field trip is to learn about ecological research on taiga and floodplain forests including the influence of slope aspect, the absence or discontinuity of permafrost and its thaw depths, leaf litter, seeds, fire effects, nutrient cycling, carbon cycles, insects and disease infestations, hydrologic effects, changes from vertebrate herbivores, and the successional, physical, and biogeochemical changes on landscapes and species growth. Tied to these topics, the group will address the influences and exchanges of methane, carbon dioxide, water, and energy and how they may influence climate. Degradation of oil spills on organic soils and their vegetative recovery and resilience will be discussed.

7:00–7:45 AM Depart from Westmark Hotel; traveled 13 miles to the Bonanza Creek Experiment Station

7:45–10:00 AM Talk on the diversity of the LTER project and long-term databases

10:00–11:00 AM Travel to the Trans-Alaska Oil Pipeline. View and discuss buried and elevated pipelines at the ecosystem-permafrost transition

11:00 AM–12:00 PM Visit Permafrost Tunnel (16 miles north of Fairbanks)

Note: The Permafrost tunnel was built by the U.S. Army Corps of Engineers–Cold Regions Research and Engineering Laboratory. Late Pleistocene syngenetic permafrost is exposed in the walls and ceiling. It consists of ice- and organic-rich silty sediments penetrated by ice wedges. Evidence of long-continued syngenetic freezing under cold-climate conditions includes the dominance of lenticular and microlenticular cryostructures throughout the walls, ice veins and wedges at many levels, the presence of undecomposed rootlets, and organic-rich layers that reflect the former positions of the ground surface. Fluvio-thermal modifications are indicated by bodies of thermokarst-cave ('pool') ice, soil and ice pseudomorphs, and reticulate-chaotic cryostructures associated with freezing of saturated sediments trapped in underground channels.

12:00–1:30 PM Travel to the Caribou-Poker Creeks Research Watershed (31 miles north of Fairbanks) for lunch

1:30–4:30 PM Visit Caribou-Poker Creeks Research Watershed

Here we will review a variety of watershed, fire, and forest succession conditions from south and north slopes and within floodplains. Available information on stream macroinvertebrates, benthic organic materials, flow rates, water/streambed temperatures, stream and groundwater chemistry, denitrification rates, soil nitrogen pools, the National Atmospheric Deposition Program, and snow surveys for the Caribou-Poker Creeks Research Watersheds will be discussed.

4:00–5:00 PM Return to Fairbanks, Westmark Hotel

Field Trip Information

Chena River Flood Diversion Project and Chena Lake Hot Springs Resort—Geothermal Energy

The group will visit with Bernie Karl to hear the story of using geothermal energy to create water reaching about 165°F for heating and to generate electricity. After Karl purchased the resort in 1998, geothermal energy reinvented the way energy was consumed, replacing the 1,000 gallons of diesel fuel that had been used every month. Many of Karl's ideas stem from a desire to find alternative ways to use and reuse resources he already has at his fingertips. After acquiring the 400-acre resort, Karl began trapping water from the underground hot springs, which produce enough power to heat the facility's greenhouses year-round. We also will see a portable geothermal power plant that has saves over \$200,000 a year and has partnered with the U.S. Department of Energy that funded half of a \$1.4 million exploration project to find and characterize the geothermal resources at Chena Hot Springs.

7:00–10:30 AM Depart Fairbanks; travel to flood control project
Stop before Chena Lake—U.S. Army Corps of Engineers personnel will lead discussion of the project's function, leakage problems and corrective actions. We will discuss the history of the 1967 flooding of Fairbanks.

10:30–11:30 AM Travel to Chena Lake Hot Springs Resort.

11:30 AM–12:30 PM Lunch at restaurant at Chena Hot Springs, lunch at restaurant,
Bernie and Connie Karl, owners of resort, will lead discussions and a tour. Tour includes an overview of the geothermal power plant, geothermal exploration project, ice museum and absorption chiller, and greenhouses and gardens.

12:30–3:00 PM Continue tour of geothermal renewable energy development, geothermal exploration project, reservoir engineering, geology, heatflow, alternative energy, and ice museum.

3:00–5:00 PM Travel to the Trans-Alaska Oil Pipeline. View and discuss buried and elevated pipelines at the ecosystem-permafrost transition

Note: The Permafrost tunnel was built by the U.S. Army Corps of Engineers—Cold Regions Research and Engineering Laboratory. Late Pleistocene syngenetic permafrost is exposed in the walls and ceiling. It consists of ice- and organic-rich silty sediments penetrated by ice wedges. Evidence of long-continued syngenetic freezing under cold-climate conditions includes the dominance of lenticular and microlenticular cryostructures throughout the walls, ice veins and wedges at many levels, the presence of undecomposed rootlets, and organic-rich layers that reflect the former positions of the ground surface. Fluvio-thermal modifications are indicated by bodies of thermokarst-cave ('pool') ice, soil and ice pseudomorphs, and reticulate-chaotic cryostructures associated with freezing of saturated sediments trapped in underground channels.

5:00–5:30 PM Return to Fairbanks, Westmark Hotel
