# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

Stantec

Ms. Tillquist has over 24 years of experience in environmental consulting, including environmental permitting, environmental toxicology, environmental risk assessment, water quality assessment and analysis, fisheries and wildlife biology. She has evaluated risk and environmental consequences of contaminant releases in 28 states of the U.S. and 6 Canadian provinces. Ms. Tillquist routinely provides technical assistance in support of complicated environmental issues. She has successfully negotiated changes in surface water quality criteria for mining companies and has helped develop water quality criteria for several metals. She has managed numerous projects, such as environmental permitting and compliance for TransCanada's Keystone Pipeline Project and multiple third-party Environmental Impact Statements (EISs). Ms. Tillquist's work requires an in-depth understanding both the engineering and environmental aspects of pipeline projects. Ms. Tillquist breadth of knowledge and ability to effectively communicate between diverse stakeholders (project engineers, environmental staff, regulatory agencies) has resulted in collaborative efforts that focus on potential benefits, constraints and feasibility issues, and short- and long-term costs. Ms. Tillquist believes that development and environmental protection are not mutually exclusive, but are hallmarks of a well-designed and executed project. She has conducted multiple risk assessments for regulatory agencies and mining and the oil and gas industry and provides technical expertise regarding potential environmental impacts. Ms. Tillquist routinely provides expert witness support for issues related to environmental toxicology and risk assessment.

## EDUCATION

MS, Environmental Toxicology, Colorado State University, Fort Collins, Colorado, 1992

BS, Fishery and Wildlife Biology, Colorado State University, Fort Collins, Colorado, 1987

## REGISTRATIONS

Certified Wildlife Biologist #114667, The Wildlife Society

Certified Fisheries Professional #044814, American Fisheries Society

## MEMBERSHIPS

Member, The Wildlife Society

Member, American Fisheries Society

Member, Society for Environmental Toxicology and Chemistry

## PROJECT EXPERIENCE

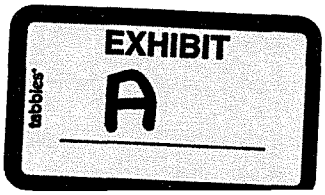
**Pipeline Projects**

TransCanada, Energy East and Related Pipeline Projects, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and New Brunswick, Canada

*Senior technical advisor, pipeline risk assessment lead. TransCanada proposes to repurpose an existing natural gas pipeline, construct new build pipeline and terminal facilities to transport various crude oils from Alberta to terminals in Quebec and New Brunswick. Ms. Tillquist and her staff evaluate risk for project components as part of the National Energy Board (NEB) filing. For each project, Stantec will i) identify high consequence areas, ii) assist engineers with valve siting, and iii) conduct a pipeline risk assessment that assesses failure frequency, probable spill volumes, and spill impacts to terrestrial, freshwater, and marine environments. After the final route is approved, Ms. Tillquist and her staff will conduct detailed flow path modeling to identify pipeline segments with the potential to impact High Consequence Areas per 49 CFR 195. Ms. Tillquist role on this project is to advise TransCanada, addressing and resolving substantive issues, helping to maintain consistency of analysis, and providing TransCanada with legacy information to facilitate and improve the overall project.*

* *denotes projects completed with other firms*





# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

### Grand Rapids, Heartland, and Northern Courier Pipeline Projects, Alberta, Canada

*Senior technical advisor, pipeline risk assessment lead. TransCanada and its affiliates propose to develop multiple pipeline projects in Alberta. For each project, Stantec will i) identify high consequence areas, ii) assist engineers with valve siting, iii) conduct a pipeline risk assessment that assesses failure frequency, probable spill volumes, range of environmental impacts, and mitigation, and iv) map groundwater vulnerability along the ROW. Ms. Tillquist role on this project is to advise TransCanada, addressing and resolving substantive issues, helping to maintain consistency of analysis, and providing TransCanada with legacy information to facilitate and improve the overall project.*

### TransCanada, Keystone XL Pipeline Project*, Montana, South Dakota, Nebraska, Oklahoma, Texas

*Senior Technical Advisor and Lead Pipeline Risk Assessor for the project, attending numerous public meetings and providing expert witness testimony for public utility commissions in South Dakota as well as a variety of condemnation hearings. TransCanada proposed the construction and operation of a 36- inch crude oil pipeline from the Alberta oil sands into the U.S., terminating in the Gulf Coast region in Texas. The pipeline would have a nominal maximum throughput of 830,000 barrels per day. Within the U.S., the pipeline would cross portions of Montana, South Dakota, Nebraska, Oklahoma, and Texas. Because the project crosses the U.S.-Canada border, the Department of State is the lead federal agency. Ms. Tillquist was involved with TransCanada's Keystone XL crude oil pipeline since its initial design phase. Ms. Tillquist conducted an environmental risk assessment estimated spill frequency and spill volumes and the subsequent environmental consequences, particularly to sensitive areas. The risk analysis was used to support Keystone's Presidential Permit Application, various state permitting processes, and for refinement of the project design. As a result of this early interaction, Ms. Tillquist's risk assessment work helped control construction costs while reducing potential impacts of a spill, thereby reducing potential future environmental damages. Ms. Tillquist prepared the South Dakota Public Utilities Commission Application and participated in public meetings and hearings. She provided expert witness testimony in support of environmental and spill risk issues.*

### Hess Corporation, Hawkeye Pipelines, North Dakota

*Senior technical advisor, PHMSA compliance lead, pipeline risk assessment lead. Hess proposes to construct several co-located pipelines to transport crude oil, natural gas liquids, and natural gas from the Bakken Formation. Stantec is leading the environmental permitting process. Ms. Tillquist role on this project is to advise, address, and resolve substantive issues, such as perceived risk associated with crossing of the Missouri River, tribal concerns, and PHMSA compliance.*

### Bureau of Land Management (BLM), BakkenLink Pipeline, North Dakota

*PHMSA Compliance Lead/ Lead Risk Assessor. BakkenLink proposed to construct and operate a 12-inch crude oil pipeline from Frybery to Beaverlodge, North Dakota, with a 8-inch lateral to Belfield. Ms. Tillquist prepared a risk assessment that evaluated failure frequency and environmental consequences of a release, particularly to High Consequence Areas. The risk assessment was successfully used in the Environmental Assessment for the federal NEPA process. Ms. Tillquist also prepared BakkenLink's Emergency Response Plan which was reviewed and approved by PHMSA. Ms. Tillquist will provide technical support for BakkenLink with their Emergency Response Training exercises.*

### TransCanada, Keystone Pipeline System, US and Canada

*Lead Pipeline Risk Assessor, PHMSA Compliance. Ms. Tillquist prepared hazard assessments for both new build and existing pipeline segments associated with the Keystone Pipeline System in the US and Canada. In Canada, Ms. Tillquist created a procedure to identify highly sensitive receptors, based on economic, public health, and ecological concerns. Using fate and transport analyses, segments of pipeline that were capable of potentially affecting the highly sensitive areas (Canada) or PHMSA-defined High Consequence Areas (US) were identified, risk quantified, and pipeline segments prioritized to facilitate operations and maintenance activities. The analysis incorporated both new build and existing infrastructure. Ms. Tillquist assisted TransCanada with PHMSA audits and provided technical responses to information requests. Ms. Tillquist documented legacy information regarding environmental compliance requirements. Ms. Tillquist coordinated with emergency response team. Provided updated to hazard assessments as required by federal regulations. Ms. Tillquist's work on this project continues with Stantec as the project continues to evolve.*

* denotes projects completed with other firms

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

### TransCanada, Keystone Crude Oil Pipeline Project*, North Dakota, South Dakota, Nebraska, Kansas, Missouri, Illinois, Canada

*Environmental Permitting Project Manager and Pipeline Risk Assessor. As the Environmental Project Manager for the project, Ms. Tillquist was responsible for all environmental permitting and surveying within the U.S., including pre-construction siting and post-construction monitoring and compliance. Ms. Tillquist worked with TransCanada's Keystone crude oil pipeline since its initial design phase. As a result of this early interaction, route selection and intelligent valve placement helped control construction costs while reducing potential impacts of a spill, thereby reducing potential future environmental damages. Further, TransCanada successfully used Ms. Tillquist's environmental risk assessment to justify modification of the pipeline's design factor from 0.72 to 0.8 for the majority of the route. This modification reduced capital costs associated with the pipe by $50 million.*

### Texas Offshore Port System (TOPS)*, Texas

*Lead Pipeline Risk Assessor, Senior Technical Advisor. The Texas Offshore Port System (TOPS) Project consisted of the construction and operation of a proposed deepwater port, receiving up to 1,700,000 barrels of crude oil per day and transporting the oil to a receiving terminal and transmission facility via 50 miles of on- and off-shore pipelines. Ms. Tillquist prepared a risk assessment document to support TOPS in permitting the project through the Maritime Administration and US Coast Guard. The document evaluated risk of a pipeline disruption and its potential environmental consequences. The report presented the results of a pipeline incident frequency and spill volume analysis based on TOPS' design and operations criteria and applies the resulting risk probabilities to an environmental consequence analysis, incorporating project-specific environmental data. Specifically, the report evaluated the risk of crude oil spills during pipeline operations, including contribution of natural hazards to spill risk, and the subsequent potential effects on humans and other sensitive resources, particularly High Consequence Areas, that include highly and other populated areas, municipal drinking water intakes (surface and groundwater), and/or ecologically sensitive areas.*

### Enterprise Products Company, Seaway Pipeline – Segment 7, Texas

*Lead Pipeline Risk Assessor. The Seaway Pipeline - Segment 7 is a crude oil pipeline that will loop an existing- 30-inch pipeline for approximately 60 miles in length from Mont Belvieu to Nederland, Texas. Ms. Tillquist was hired as a subcontractor by Project Consulting Services, Inc. (PCS) to identify valve sites to ensure regulatory compliance and to minimize potential impacts to the environment, particularly to High Consequence Areas.*

### Enterprise Products Company, ATEX Express Pipeline*, Ohio, Indiana, Texas

*Lead Pipeline Risk Assessor, Project Manager. The ATEX Express Pipeline (ATEX) is designed to transport ethane from the Marcellus and Utica shale regions in Pennsylvania, West Virginia and Ohio to the U.S. Gulf Coast. The approximately 1,230-mile, 16-inch diameter pipeline will have an initial capacity of 125,000 barrels per day of ethane and will deliver ethane to Enterprise's natural gas liquids storage complex at Mont Belvieu, Texas. Ms. Tillquist was hired as a subcontractor by Project Consulting Services, Inc. (PCS) to identify valve sites and perform a precursory HCA analysis for the purposes of selecting valve locations along Segment 3, approximately 117 miles in length through southwestern Ohio and southeastern Indiana, and Segment 6, approximately 55 miles in length through southeastern Texas.*

### Enterprise Products Company, Lone Star West Texas Pipeline and Laterals, Texas

*Lead Pipeline Risk Assessor, Senior Technical Review. The Lone Star West Texas Pipeline and Laterals project will deliver natural gas liquids across Texas. As a subconsultant to Project Consulting Services, Inc., Ms. Tillquist was responsible for evaluating the placement of valve sites in relation to 1) federal pipeline regulations and 2) protection of environmental resources. Ms. Tillquist also provided senior technical review of a preliminary risk report.*

* denotes projects completed with other firms

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

### FERC and BLM, Entrega Natural Gas Pipeline Environmental Impact Statement*, Colorado and Wyoming

*Project Manager and Lead Pipeline Risk Assessor. Entrega Gas Pipeline Inc. (an affiliate of Encana Natural Gas) proposed to construct and operate a 328-mile 36- to 42-inch-diameter natural gas transmission pipeline. The pipeline transports up to 1.5 billion cubic feet per day of natural gas from the Piceance Basin in Colorado to interconnections in Wamsutter and near Cheyenne, Wyoming. As the Project Manager, Ms. Tillquist supervised the preparation of the EIS as a third-party contractor to the FERC (lead agency) and the BLM (cooperating agency). Major issues include potential impacts to threatened and endangered species (water depletion issues), noxious weed management, and socioeconomic impacts. Because Western Interstate Company (a subsidiary of El Paso Corporation) also proposed to build a large diameter pipeline from the Piceance Basin to Wamsutter, cumulative impacts were also an issue. The project was approved and construction completed in 2007.*

### BLM and USFS, ONEOK, Overland Pass Natural Gas Liquids Pipeline*, Wyoming, Colorado, and Kansas

*Project Manager, Lead Pipeline Risk Assessor. ONEOK and Williams proposed to construct and operate a 760-mile transmission pipeline for transportation of up to 150,000 barrels per day of natural gas liquids from western Wyoming, through Colorado, to Conway, Kansas. As the Project Manager, Ms. Tillquist supervised the preparation of the EIS as a third-party contractor to the BLM (lead agency) and the U.S. Forest Service (cooperating agency). Major issues included potential impacts to cultural resources, threatened and endangered species, and fisheries impacts. The Final EIS was published in 2007, with the pipeline constructed and is currently in-service.*

### FERC, Piceance Basin Expansion Natural Gas Pipeline Environmental Impact Statement*, Wyoming and Colorado

*Senior Technical Advisor. Wyoming Interstate Company (WIC, a subsidiary of El Paso Corporation) proposed to construct and operate a 141.7-mile 36-inch-diameter natural gas pipeline to transport up to 350 million cubic feet per day of natural gas from the Piceance Basin in Colorado to interconnections near Wamsutter, Wyoming. As The Senior Technical Advisor, Ms. Tillquist supervised staff in the preparation of the EIS (concurrent with the Entrega Pipeline EIS) as a third-party contractor to the Federal Energy Regulatory Commission, with the Bureau of Land Management as a cooperating agency. Major issues include potential impacts to threatened and endangered species (water depletion issues), noxious weed management, and socioeconomic impacts. Because Entrega Pipeline Company Inc. also proposed to build a large diameter pipeline from the Piceance Basin to Wamsutter, cumulative impacts also were an issue.*

### BLM, Inland Resources, Castle Peak and Eightmile Flat Oil Expansion Project*, Utah

*Lead Pipeline Risk Assessor. Ms. Tillquist conducted a pipeline risk assessment, evaluating pipeline failure threats, mitigation, failure frequencies, and probable environmental impacts in the event of a failure. The BLM's Vernal Field Office commissioned the preparation of the EIS that examined potential impacts associated with a proposed expansion of oil field development operations in the Uintah Basin area of northeastern Utah. The study area covered approximately 110 sections or 65,500 acres. Inland proposed to expand its existing waterflood oil recovery operations by drilling up to 900 additional wells in the Castle Peak and Eightmile Flat areas of the greater Monument Butte-Myton Bench oil and gas production region. Important issues associated with this project included cumulative effects to raptor species in the Uintah Basin, air quality, and effects on sensitive species, such as the mountain plover and hookless cactus. A Biological Assessment for the U.S. Fish and Wildlife Service was prepared as part of the project permitting.*

* *denotes projects completed with other firms*

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

BLM, Equilon/Shell Pipeline Company, New Mexico Products Pipeline Environmental Impact Statement*, New Mexico and Texas

*Project manager, pipeline risk assessor. Shell proposed to convert and reverse the flow of an existing 406-mile crude oil pipeline to transport refined petroleum products (i.e., gasoline, diesel, jet fuel). System conversion also entailed the construction of two new pipeline extensions (about 100 miles total), pump stations, pressure reducing stations, miscellaneous facilities, and associated electrical transmission lines. The project would affect portions of New Mexico and Texas, involving many local, state, federal, and tribal jurisdictions. Due to public concern, a probabilistic risk assessment evaluated risk to humans and the environment that could result from an accidental release from the pipeline and its facilities. As a third-party contractor for the BLM, the Draft EIS in May 2003 and the Final EIS was completed in September 2003. Prior to the release of the Final EIS, Shell decided to put the project on hold.*

FERC, Raton Basin 2005 Expansion*, Colorado, Kansas, New Mexico, Oklahoma

*Technical support on pipeline risk issues and field surveys. For this 100-mile, six-loop project built in 2005, Ms. Tillquist supported Colorado Interstate Gas with the Federal Energy Regulatory Commission (FERC) NEPA Pre-filing Process (including agency and public scoping), preparation of the FERC certification application, state and federal environmental permitting, Environmental Assessment (EA) preparation, Biological Assessment/ Biological Evaluation preparation, and construction management. Ms. Tillquist also assisted with U.S. Fish and Wildlife Service Section 7 consultation, a Forest Service EA for crossing the Comanche National Grasslands, environmental compliance training, avian and mammal pre-construction clearing and biological monitoring during construction, and construction environmental inspection support.*

FERC, Application for Line 2000 Converting a Crude Oil Pipeline to Natural Gas Pipeline, Texas, New Mexico, Arizona

*Technical evaluation of pipeline reliability and public safety. Ms. Tillquist assisted with the preparation of El Paso Energy's Line 2000 application to the Federal Energy Regulatory Commission (FERC) for the conversion of an existing 800-mile crude oil pipeline to natural gas service. This conversion project affected lands within Texas, New Mexico, and Arizona. Ms. Tillquist's duties included the preparation of FERC resource reports, an applicant-prepared biological assessment, applicant-prepared environmental assessment, and Clean Water Act 404 permit. Ms. Tillquist's project management activities included project budgeting, coordinating office staff and field survey crews, and creation and maintenance of a database detailing over 300 construction sites and activities.*

FERC and CSLC, Southern Trails Natural Gas Pipeline*, California, Arizona, Utah, and New Mexico

*Project Manager. Responsible for personnel management and project budgeting in addition to technical writing responsibilities. Questar Natural Gas proposed to convert a 600-mile crude oil pipeline to a natural gas pipeline, referred to as the Southern Trails Pipeline. Construction resulting from the proposed extensions, reroutes, realignments, and replacements affected portions of California, Arizona, Utah, and New Mexico and involved many local, state, federal, and tribal jurisdictions. As Project Manager, Ms. Tillquist supervised staff in the preparation of this third-party Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Federal Energy Regulatory Commission. As project coordinator, wrote several technical sections, and provided technical review of the EIS document. For the California Environmental Quality Act, a separate Environmental Impact and Mitigation Measures Summary was developed for the California State Lands Commission.*

* denotes projects completed with other firms

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

El Paso - Western Interstate Company, Kanda Natural Gas Lateral Pipeline Project*, Utah

*Environmental Toxicologist and Lead Pipeline Risk Assessor. One of the most significant services that Ms. Tillquist provides is effective communication between oil and gas companies and federal regulating agencies. Ms. Tillquist has repeatedly demonstrated the ability to successfully work through difficult problems. On the Kanda Project, the U.S. Fish and Wildlife Service (USFWS) insisted that El Paso install emergency shutoff valves at the Green River to protect threatened and endangered fish species. The USFWS concerns revolved around the perceived toxicological threats from natural gas and the potential future conversion to hazardous liquids transportation. Ms. Tillquist prepared a white paper that detailed why the USFWS concerns were unjustified. The argument was successful: the USFWS withdrew its request for a valve at the site, thereby saving El Paso an estimated $250,000.*

BLM, Natural Gas Liquid Pipeline Environmental Assessment*, Wyoming

*Lead Pipeline Risk Assessor. Inland Resources plans to develop an area for natural gas liquids extraction. As part of the development, a new pipeline would be constructed which would cross a tributary to the Green River in Utah, which contains several endangered fish species. At the request of the BLM and potential hazard posed by the pipeline by evaluating the likelihood of a spill, attenuation rates, and dilution potential.*

*Additionally, cumulative risk from other natural gas liquid pipelines within the same drainage was also estimated. Based on the pipelines' location, volume of natural gas liquids, probability of failure, and likelihood of downstream transport, the assessment showed that no impacts to endangered fish species would be anticipated.*

**Spill & Resource Damage Evaluations**

Emergency Spill Response, Confidential O&G Client, North Dakota

*Deputy Incident Command/Lead Environmental Risk Assessor. Ms. Tillquist was on-site to within 6 hours of notification, responding to a well blowout near Watford City, North Dakota. Ms. Tillquist coordinated the environmental sampling and documentation. Crude oil and produced water was dispersed over a 5-square mile area during a winter blizzard. Stantec's emergency response team established and Incident Command Center and coordinated containment and cleanup with the US Environmental Protection Agency and North Dakota Department of Health. The site is stabilized, with closure anticipated after spring runoff. Due to the subzero temperatures, quantitative sampling of snow samples was conducted to determine the area where total petroleum hydrocarbons might exceed North Dakota soils standards after spring runoff. Salinity was also examined as a contaminant of concern since the blowout may have contained produced water. Stantec continues to work with North Dakota Department of Health and US Environmental Protection Agency to monitor the site during spring runoff and obtain site closure.*

American Petroleum Institute (API), Fate and Effects of Oil Spills in Freshwater Environments*

*Environmental Toxicologist, Technical Writing and Review. Ms. Tillquist assisted in the preparation of an API report describing the fate and effects of oil spills in freshwater environments. This report summarizes and documents potential environmental effects from inland oil spills into fresh surface waters. It identifies, describes, and compares the behavior, fate, and ecological implications of crude oil and petroleum products in inland waters. The document provides basic information necessary for the formulation of spill response strategies that are tailored to the specific chemical, physical, and ecological constraints of a given spill situation. The report describes the relevant features of various inland spill habitat types, discusses the chemical characteristics of oils and the fate processes that are dependent thereon, summarizes reported ecological and toxicological effects results both generally and with specific reference to distinct organism groupings, and, finally, in the context of case histories from past spills, highlights some of the considerations, difficulties, and elements of success of presently available spill response techniques.*

* denotes projects completed with other firms

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

Toxicity Profile for Crude Oil*, Nationwide
*Ms. Tillquist authored a report that reviewed the toxicity of crude oil to terrestrial and aquatic ecosystems. The intended audience of this report was BP field personnel that might be involved with accidental releases of crude oil into the environment. The document provided a general characterization of crude oil, its environmental fate, and potential effects to various environments.*

Exxon Valdez Oil Spill*, Prince William Sound, Alaska
*Ms. Tillquist provided technical support for Natural Resource Damage Claims filed against Exxon following the Exxon Valdez spill. Data were compiled from thousands of environmental samples, ranging from water and sediment to oiled wildlife. Ms. Tillquist provided technical support for expert witness testimony in support of Exxon. Specifically, Ms. Tillquist was responsible for assembling, synthesizing, and summarizing relevant literature on oils spills and their impacts to aquatic ecosystems.*

Burlington Northern Santa Fe Railroad, Train Derailment Emergency Response Team, Crow Creek*, Cheyenne, Wyoming
*Ms. Tillquist was a team member in an emergency response program to evaluate potential human health and environmental contamination. She participated in an emergency response call to evaluate potential aquatic effects on a train derailment at Crow Creek, Wyoming. Ms. Tillquist was responsible for coordinating activities with state and federal wildlife agencies regarding potential impacts on federally endangered Preble's meadow jumping mouse as well as to the local plain stream fishery. In the field, she was responsible for the sampling design and field sampling. After the event, she summarized the incident events and presented findings in a report to Burlington Northern Santa Fe Railway.*

Evaluation of the Transredes Petroleum Product Spill*, Bolivia (Technical Advisor)
*Ms. Tillquist provided technical support following a pipeline rupture on the Rio Desaguardero. The spatial extent and environmental effects of hydrocarbon contamination were evaluated by chemical analysis of environmental media and laboratory toxicity tests. These data were then used in a risk assessment to evaluate the potential risk to aquatic biota, terrestrial herbivores (cattle, sheep, and endangered vicunas), and human receptors.*

Exxon Valdez Oil Spill*, Prince William Sound, Alaska
*Technical Support. Ms. Tillquist provided technical support for Natural Resource Damage Claims filed against Exxon following the Exxon Valdez spill. Thousands of environmental samples were collected, analyzed, and catalogued, ranging from water and sediment to oiled wildlife. Ms. Tillquist was responsible for assembling synthesizing, and summarizing relevant literature on oils spills and their impacts to aquatic ecosystems in support of expert witness testimony in support of Exxon.*

**Oil and Gas Projects**

Washington Ranch Natural Gas Field Storage Project*, New Mexico
*Technical support evaluating public safety issues, including preparation of Resource Reports for the Federal Energy Regulatory Commission (FREC) application. El Paso proposed to construct a small natural gas storage field in southeastern New Mexico. The project consisted of several horizontal wells, tie-in pipelines, and access roads. Ms. Tillquist prepared several environmental Resource Reports in support of El Paso's successful Federal Energy Regulatory Commission (FERC) application.*

Boehm Natural Gas Storage Field Project*, Colorado
*Ms. Tillquist provided technical support evaluating public safety issues, including preparation of Resource Reports for the Federal Energy Regulatory Commission (FERC) application. El Paso proposed to construct a small natural gas storage field in southeastern Colorado. The project consisted of horizontal wells, tie-in pipelines, and access roads. The project was successfully permitted.*

Raton Basin Expansion Project and Washington Ranch Natural Gas Field Storage Project*, Colorado, Kansas, Oklahoma, and New Mexico
*Technical Review of Public Safety. Ms. Tillquist evaluated public safety issues associated with several El Paso projects, including Raton Basin and Washington Ranch. El Paso proposed to loop its existing Raton Basin natural gas pipeline system in Colorado, Kansas, and Oklahoma. The project would consist of several pipeline loops, laterals, metering stations, and access roads. In New Mexico, El Paso proposed to construct a small natural gas storage field in southeastern New Mexico. The project consisted of several horizontal wells, tie-in pipelines, and access roads. Ms. Tillquist prepared environmental Resource Reports in support of El Paso's successful FERC application.*

* *denotes projects completed with other firms*

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

Pipeline and Facility Decommissioning Evaluation*, New Jersey, Pennsylvania

*Project Manager. Ms. Tillquist was responsible for evaluating the condition of the pipeline and facilities and providing cost estimates for decommissioning the facilities, including regulatory compliance. Reliant owns a 10-mile pipeline that has been used to transport fuel oil #6 (historically) and fuel oil #2 (currently). The company also owns a related facility with breakout tanks and aboveground piping. Reliant was considering temporarily (1 to 3 years) suspending the transport of oil through the pipeline and facility and, perhaps, totally abandoning these assets. Alternatively, Reliant wanted the evaluation to include the potential for reactivating the pipeline after a temporary suspension. Ms. Tillquist and other staff evaluated the federal, state, and local regulatory that govern the temporary suspension, reactivation, and abandonment processes. Additionally, Ms. Tillquist and staff identified technical issues that would be associated with each process. Finally, Ms. Tillquist and staff provided Reliant with a range of anticipated costs associated with each of these activities.*

**Ecological Risk Assessment**

Ecological Risk Assessment of Depleted Uranium*, Sonoran Desert and Chesapeake Bay, Arizona, Maryland

*Co-investigator, assessing the environmental fate and distribution of depleted uranium in the Sonoran Desert, Yuma, Arizona, and the Chesapeake Bay, Aberdeen, Maryland. Ms. Tillquist collected biota, vegetation, water, soils, and sediments in the field from contaminated and uncontaminated sites. She also conducted toxicity tests to evaluate the toxicity of depleted uranium on kangaroo rats and freshwater and marine aquatic organisms. Ms. Tillquist compared concentrations of depleted uranium collected in the field to concentrations that caused toxicity in laboratory organisms.*

Effects of Two-Stroke Outboard Motor Exhaust on Aquatic Biota*, California, Nevada

*Ms. Tillquist conducted a systematic survey of the published literature and prepared a monograph summarizing and documenting the ecological effects from two-stroke outboard engine exhaust into the aquatic environment was produced. The document identified the major constituents of outboard exhaust, described the environmental fate of these constituents, and the detailed the toxicological implications. The ecological significance of two-stroke outboard engines was found to be primarily dependent on the water quality characteristics of the waterbody, the intensity of boat use, and the amount of pollution from other anthropogenic sources.*

U.S. Army Corps of Engineers, Alaska District, Fort Richardson Post-wide Human Health and Ecological Risk Assessment*, Alaska

*Ms. Tillquist provided technical support for the ecological risk assessment and toxicological evaluations for the project. Four ecological risk assessments have been conducted for various areas within the Fort Richardson post. This particular post-wide ecological risk assessment reviewed all previous assessments, identified data and assessment gaps, and re-assessed risk on a post-wide scale. During this process, Ms. Tillquist developed chemical profiles for more than 80 compounds that had been detected at Fort Richardson. Ms. Tillquist calculated exposure of various ecological receptors and compared with toxicity reference values established in the chemical profiles to evaluate the likelihood of risk. The evaluation suggested that potential risk exists to wildlife receptors from bioaccumulating contaminants in aquatic ecosystems. Subsequent field surveys were conducted to confirm or refute this possibility. Data from these surveys indicated that the level of contamination was not significantly impacting aquatic ecosystems. To further reduce potential ecological risk at the site, cooling water was rerouted around sensitive areas, providing a simple and inexpensive mitigation to eliminate further exposure.*

Ecological Risk Assessment of US Navy Facilities, South Weymouth, Department of Defense*, Boston, Massachusetts

*Ms. Tillquist conducted ecological risk assessments for the Navy's South Weymouth facility. Ms. Tillquist and other staff evaluated the potential risk to aquatic, wetland, and terrestrial receptors using a weight-of-evidence approach that included screening against benchmarks values, critical body residues, toxicity tests, quantitative field surveys, and food web exposure models.*

Ecological Risk Evaluation of Dioxin's Effects on Wildlife*, Guam

*Ms. Tillquist evaluated the toxicity of dioxin to terrestrial and aquatic receptors. In support of an ecological risk assessment, provided technical assessment of dioxin hazards and potentially toxic threshold values.*

* *denotes projects completed with other firms*

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

Upper Clark Fork River Ecological Assessment*, Upper Clark Fork River, Montana

*Ms. Tillquist provided technical support for the ecological risk assessment and toxicological evaluations. Terrestrial and aquatic screening-level ecological risk assessments were conducted by Ms. Tillquist to evaluate the potential effects of heavy metals on the Clark Fork River ecosystem. In cooperation with the U.S. Environmental Protection Agency (USEPA) Region VIII, developed food web exposure models and provided extensive chemical profile documentation to justify the selection of aquatic and terrestrial toxicity reference values for arsenic, cadmium, copper, lead, and zinc. Estimated exposure and risk using computer models. Ms. Tillquist submitted multiple documents to the USEPA in support of the advancement of science in the risk assessment process as rebuttals to the State of Montana's legal position.*

Evaluation of 210 Chemicals: Physical Chemistry, Acute Toxicity, and Human Health Protection*, Nationwide

*Ms. Tillquist co-authored a book and accompanying CD-ROM that describes the toxicity, physical chemistry, emergency response procedures, material handling procedures, and regulatory compliance information of 210 chemicals. Information was compiled from various computerized databases.*

Evaluation of Chronic Effects to Aquatic Biota from Organochlorine Exposure, Rocky Mountain Arsenal*, Colorado

*Ms. Tillquist was awarded grant as co-principal investigator to evaluate the sublethal effects of organochlorine pesticide exposure on fish via food web exposure at the Rocky Mountain Arsenal. Specifically, the project evaluated toxic effects using bioenergetic models and used field data to validate the model.*

**Environmental Assessments**

Bureau of Land Management, Over the River™ Art Project Environmental Impact Statement and Event Management Plan*, Colorado

*Lead Public Safety Risk Assessor. Ms. Tillquist evaluated public safety risks associated with the project, including boating accidents, emergency access, and sufficiency of emergency personnel and equipment. The artists, Christo and the late Jeanne-Claude, propose to drape curtains across the Arkansas River as a temporary form of art. Since the project would occur on federal lands, Ms. Tillquist helped prepare a draft EIS as a third-party consultant to the BLM's Royal Gorge Field Office. The project will take three years to construct, display, and disassemble, affecting more than 3,500 acres of land. Public concerns ranged from impacts to bighorn sheep, aesthetics, socio-economic impacts, and public safety and emergency access along the narrow road that parallels the river through the Arkansas River canyon. Ms. Tillquist prepared a semi-quantitative risk assessment on how the project could potentially impact public safety. The four-volume draft EIS evaluated several alternatives that reduced the size or duration of the exhibit. The Draft EIS was published in July 2010, with the Final EIS and Record of Decision issued in February 2011.*

Environmental Assessment of Chatfield Reservoir Drawdown*, Denver, Colorado

*Ms. Tillquist provided technical direction and analyzed impacts associated with potential drawdown. Denver Water proposed to construct and operate a pump station to convey raw water from Chatfield Reservoir to the municipal water supply system during drought conditions. Construction of the pump station and drawdown of the reservoir required the approval of the U.S. Army Corps of Engineers. The Environmental Assessment evaluated the potential impacts from several drawdown and refill scenarios. While the drawdown would affect recreational opportunities, water quality, and fish and wildlife habitat at the reservoir, the No Action alternative (no pump station, but high evaporative losses) also would substantially impact these same resources.*

* *denotes projects completed with other firms*

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

Pima County Wastewater District, Applicability of U.S. EPA Water Quality Criteria in the Arid West*, Arizona and Other Western States

*Project Manager. Ms. Tillquist evaluated the applicability of national water quality criteria (AWQC) for the arid West, particularly for effluent-dominated systems. The evaluation process included the evaluation of four AWQC, looking at duration and frequency of exceedances, sensitivity of local biota, and speed of aquatic system recovery. Various AWQC-modifying procedures, such as the Recalculation Procedure and the Biotic Ligand Model, were reviewed to determine their appropriateness and usefulness for site-specific modification of the AWQC. Results of this project were published in a special publication, "Relevance of Ambient Water Quality Criteria for Ephemeral and Effluent-Dependent Watercourses of the Arid Western U.S.," by the Society of Environmental Toxicology and Analytical Chemistry.*

State of Wyoming, Evaluation of the Effects of Water Depletion on Endangered Species, Litigation Support, North Platte River*, Wyoming and Nebraska

*Ms. Tillquist was responsible for evaluating correlations between water levels, fish populations, and whooping crane and plover populations. The effects of North Platte water depletions on endangered whooping crane and plovers were contested in Federal Court. Both these species use the North Platte drainage during their seasonal migrations as a foraging and resting area. Ms. Tillquist provided a technical evaluation of whooping crane population trends and its relationship to discharge at Grand Island, Nebraska. Results indicated that while discharge rates can directly affect habitat suitability for cranes and forage fish for plovers, these factors have not had any measurable effect of whooping crane populations.*

Programmatic Environmental Impact Statement for Herbicide Application throughout the Western U.S.*

*Lead Technical Advisor for toxicological evaluations of herbicides and their environmental fate and persistence in the environment. Ms. Tillquist assisted in the preparation of a Programmatic EIS for the BLM that evaluated the application of nine herbicides on BLM-administered lands throughout the West. Ms. Tillquist developed an ecological risk assessment to evaluate exposure pathways and potential effects to multiple receptors, ranging from non-target plant species to aquatic biota and terrestrial wildlife species. The nine herbicides included bromacil, chlorsulfuron, diflufenzopyr, diquat, diuron, fluridone, imazapic, sulfmeturon methyl, and tebuthiuron. To evaluate the toxicity of these nine herbicides, Ms. Tillquist review, synthesized, and summarized information from the Environmental Protection Agency registration data and the peer-reviewed literature to develop toxicity benchmarks (toxicity reference values). These benchmark values were subsequently used in the ecological risk assessment and programmatic EIS.*

**Mining**

Bureau of Land Management, Cameco Resources In-Situ Uranium Mine Environmental Impact Statement*, Gas Hills, Wyoming (Lead Public Safety Risk Assessor)

*Cameco proposes to develop the Gas Hills In-situ Recovery Uranium Mine Project. The project area covers approximately 8,500 surface acres (approximately 13 square miles) of federal, state and private lands. The Bureau of Land Management's Lander Field Office is the lead agency for the environmental analysis. The Project is permitted by the Wyoming Department of Environmental Quality and is licensed by the U.S. Nuclear Regulatory Commission. Unlike conventional mining practices, in-situ removal mining methods utilize a solution consisting of oxygen and carbon dioxide or bicarbonate injected via conventional water wells into uranium ore-bearing rock formations in the subsurface. The solution dissolves the uranium ore from the rock formations into the circulating groundwater. The resultant uranium-bearing groundwater is recovered by pumping wells located adjacent to the injection wells. The groundwater containing uranium is then processed through an ion-exchange facility where the uranium is precipitated onto a resin bead media. The resin beads containing uranium would then be transported to the Cameco Smith Ranch-Highland facility for processing into uranium yellowcake. After the uranium has been removed, the resin bead media would be returned to the Project site for re-use. The distance one-way from the Gas Hills to Smith Ranch-Highland is approximately 140 road miles.*

* denotes projects completed with other firms

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

Beartrack Mine, NPDES Issues and Biological Opinion*, Napias Creek, Idaho

*Ms. Tillquist was the project manager for a study that evaluated the toxicity of heavy metals to trout. Because of extremely low water hardness (less than 10 mg/L of $CaCO_3$), the permitted discharge of metals, particularly copper, were extremely low for this mine. Ms. Tillquist developed a site-specific sampling plan to collect the necessary data for the development of a site-specific translator value for the mine's National Pollutant Discharge Elimination System permit. Samples were collected using ultra-clean sampling techniques and were analyzed to detect metal concentrations at very low concentrations. Results from these analyses were used to develop a translator value, allowing the mine to continue to discharge effluent.*

Water Quality Evaluation*, Nevada

*Ms. Tillquist was the environmental toxicologist and risk assessor evaluating the impacts of selenium and mercury from a mine. The U.S. Fish and Wildlife Service (USFWS) expressed concerns that elevated concentrations of contaminants derived from the Big Springs Mine, particularly mercury and selenium, have affected or have the potential to affect aquatic biota in the North Fork of the Humboldt River. The USFWS concern was enhanced by the presence of endangered Lahontan cutthroat trout and other species of concern. Critically evaluated the USFWS-proposed field sampling plan and questioned whether the data that would be collected could credibly discern any adverse effects attributable to the Big Springs Mine from normal environmental variability. As a result of the critique, the USFWS revised its field sampling plan and entered into consultation with Independence Mining Co. regarding alternative approaches.*

Atlanta Gold, National Pollutant Discharge Elimination System Permit*, Atlanta, Idaho

*Project Manager. Mining operations in Atlanta, Idaho, have occurred since the 1870s. As a result of these activities, mine drainage is currently being released at 25 different locations. The primary contaminant of concern is arsenic. Atlanta Gold needs to obtain a National Pollutant Discharge Elimination System (NPDES) permit for these existing discharges. To expedite the NPDES process, the Environmental Protection Agency (EPA) Region 10 agreed to third-party preparation of the NPDES application, EPA Fact Sheet, and the EPA permit.*

Mining Company, Evaluation of Dietary Metals Toxicity to Rainbow Trout*, Western U.S.

*Ms. Tillquist conducted literature research to compile and synthesize data related to dietary metal exposure to trout. In some mining areas, metals concentrations in benthic macroinvertebrates are elevated compared to reference sites. Some scientists have expressed concern that trout may be exposed to potentially toxic levels of metals via dietary exposure. Ms. Tillquist analyzed the published literature and established concentrations of metals in the diets that are considered to have no observable adverse effects as well as the lowest concentration demonstrated to have an adverse effect on survival or growth. This information was presented at the 1999 Society of Environmental Toxicology and Analytical Chemistry.*

Identification of Potential Habitat for the Endangered Lahontan Cutthroat Trout*, Walker River and Carson River, Nevada, California

*Ms. Tillquist identified drainages within the Walker and Carson River basins that contain potential habitat for future restoration work for off-site mitigation for Lahontan cutthroat trout habitat. As a result of the project, suitable habitat was identified for the mining client, who subsequently purchased the property with its associated water rights and successfully conducted off-site habitat mitigation.*

**Electrical Power Generation and Transmission**

Bureau of Indian Affairs and Williams Company, Wanapa Energy Center Environmental Impact Statement*, Hermiston and Umatilla, Oregon

*Ms. Tillquist evaluated water rights and researched water laws applicable to the project, particularly those related to threatened anadromous salmon species. As a third-party contractor for the Bureau of Indian Affairs, Ms. Tillquist evaluated the potential impacts associated with the construction and operation of the Wanapa Energy Center, a power generating plant. Ms. Tillquist evaluated issues associated with water rights and laws pertaining to water withdrawal, given the presumption by Diamond Generating (developer) that the water rights to be used were "reserved" municipal water rights and that these city water rights predated the in-stream flow requirements for the Columbia River. Also, the amount of water withdrawn and the method used to withdraw water were evaluated to determine if they could have potential impacts on federally listed Pacific salmon. Finally, water quality issues were evaluated to assess potential impacts of the effluent water used to cool the power generating equipment and to predict effects to the environment from the discharged water into the environment.*

* denotes projects completed with other firms

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

Tri-State Generation and Transmission Association, Environmental Assessment and Alternative Evaluation*, New Mexico

*Provided technical support, evaluated data, and prepared the majority of the environmental assessment and alternatives evaluation. Tri-State applied for financial assistance from the Rural Utilities Services (RUS) in order to construct a simple-cycle combustion turbine generating facility near Lordsburg, New Mexico. As part of the RUS application process, Ms. Tillquist developed an Alternatives Evaluation which evaluated alternative sites for the power plant. A Site Selection Study also was produced; RUS used this Site Selection Study as its Environmental Assessment (with public scoping).*

Power Plant Application for Certificate*, San Bernardino County, California

*Wildlife Toxicologist evaluating risk to endangered biota from nitrogen deposition. The U.S. Fish and Wildlife Service expressed concerns about the potential negative effects of supplemental atmospheric nitrogen deposition on native plant communities originating from the new Mountainview Power Plant. Ms. Tillquist evaluated the likelihood of changes in the vegetative communities based on their location, growth periods, and estimated amount of nitrogen deposition. Sensitivity to nitrogen enrichment was assessed. The analysis indicated that the amount of additional atmospheric nitrogen deposition was not appreciable, particularly when compared to the sizeable background concentrations in the Los Angeles Air Basin.*

**Solar Energy**

Stirling Energy Systems (SES), LLC, SES Solar Two Project*, Imperial County, California (Lead Biologist)

*SES submitted an application to the Bureau of Land Management (BLM) for development of the proposed SES Solar Two Project, a concentrated solar electrical generating facility capable of generating 750 megawatts (MW) of renewable power. The proposed SES Solar Two Project site is located on approximately 6,140 acres of federal land managed by the BLM and approximately 300 acres of privately owned land, in Imperial County, California. The project would consist of approximately 30,000 SunCatchers, with a total generating capacity of 750 MW. The proposed SES Solar Two Project also includes an electrical transmission line, water supply pipeline, and a site access road. A new 230-kV substation would be constructed on-site, connected to the existing San Diego Gas & Electric Imperial Valley Substation via a 10.3-mile, double-circuit, 230-kV transmission line. Just over 7.5 miles of the new line would be constructed off-site. An off-site 6-inch diameter water supply pipeline would be constructed 3.4 miles from the Westside Main Canal to the project boundary. The BLM and CEC have executed a Memorandum of Understanding concerning their intent to conduct a joint environmental review of the project in a single NEPA/CEQA process. Ms. Tillquist provided review and technical input to the BLM's and CEC's environmental analysis. Ms. Tillquist revised CEC's document under an extremely tight timeline to make the document compliant with BLM minimum standards. Major concerns included biological impacts to desert bighorn sheep and desert tortoise.*

* *denotes projects completed with other firms*

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

Bureau of Land Management and California Energy Commission, Ivanpah Solar Energy Projects*, San Bernardino County, California

*Biological Lead, handling wildlife and special status species issues. BrightSource Energy, Inc. proposed the development three separate solar thermal power plants within a 3,600-acre project site located in the desert in San Bernardino County, California. When constructed, the 392-megawatt project will be the world's largest solar energy project, nearly doubling the amount of solar thermal electricity currently produced in the U.S. It also will be the largest fully solar-powered steam turbine. Ms. Tillquist also helped prepare a Supplemental and Final EIS as a third-party contractor to the BLM. Ms. Tillquist also worked cooperatively with the California Energy Commission (CEC) to ensure the CEC siting committee issued a proposed decision consistent with the BLM's Record of Decision. BrightSource's proprietary Luz Power Tower (LPT) technology enables the company to employ a low-impact environmental design. Instead of the extensive land grading and concrete pads, BrightSource mounts mirrors (heliostats) on individual poles that are placed directly into the ground, allowing the solar field to be built around the natural contours of the land and avoid areas of sensitive vegetation. This design also allows for vegetation to co-exist within the solar field. The Final EIS was published in July 2010 with construction in fall 2010.*

**Inhalation Toxicology**

National Institute of Health, Retention and Clearance of Radioactive Particles from Intermediate Airways in Beagle Dogs, Lovelace Inhalation Toxicology Research Institute*, New Mexico

*Ms. Tillquist was a summer intern who received a grant to examine the movement and retention of small inhaled particles within the intermediate airways of lungs. In the lung, particulate matter tends to be trapped either in the upper airways or deep within the lung. Little was known about the ability of the intermediate airways to clear or retain particulate matter. Based on a grant from the National Institutes of Health, Ms. Tillquist developed a new technique for exposing intermediate airways (bronchioles). Clearance and retention rates of various-sized particulate within the lung were evaluated by using particles labeled with radioactive cesium and strontium. In addition to this basic research, was involved in the post-operative performance evaluation of lung transplants, a relatively new surgical procedure. Finally, Ms. Tillquist acted as a technician for measurement of radioactive materials in various tissues and other matrices for a variety of other projects.*

National Toxicology Program, Acute $Ni^{63}SO_4$ Inhalation Exposures in Mice and Rats, Lovelace Inhalation Toxicology Research Institute*, New Mexico

*Ms. Tillquist was the lead technician responsible to several National Toxicology Program studies. As part of the National Toxicology Program's evaluation of nickel compounds, conducted acute aerosol exposures of laboratory animals (over 100 animals) in order to evaluate the metabolism of nickel. Radioactive nickel was used to trace metabolic pathways. This work required Level B laboratory conditions (respirators, protective clothing, shower-in/shower-out procedures) as well as constant monitoring for radiological contamination.*

National Toxicology Program, Chronic NiO, $NiSO_4$, and $Ni_3S_2$ Inhalation Exposures in Rats and Mice, Lovelace Inhalation Toxicology Research Institute*, New Mexico

*Ms. Tillquist was the lead technician responsible to several National Toxicology Program studies. The National Toxicological Program (NTP) routinely evaluates the toxicity of compounds in the environment. Nickel compounds are used in a number of manufacturing processes. Ms. Tillquist was responsible for the supervision, monitoring, and laboratory measurements associated with three large inhalation toxicology studies (>3,500 animals) for the NTP. Ms. Tillquist ensured that staff followed Good Laboratory Practices (GLP procedures), maintained Quality Assurance of the associated data and other project-related paperwork. This work involved Level B laboratory conditions (respirators, protective clothing, shower-in/shower-out procedures).*

* denotes projects completed with other firms

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

**Water Quality Assessments**

Climax Mine, Evaluation of the Effects of Aqueous Aluminum on Aquatic Biota of Tenmile Creek*, Climax, Colorado

*Ms. Tillquist evaluated eight years of fish and macroinvertebrate community data to determine if any temporal or spatial trends related to water quality, specifically aluminum, were apparent. Whole-effluent toxicity (WET) test results for this same period were summarized and, again, were correlated to aluminum concentrations. Finally, a review on the toxicity of aluminum to aquatic biota was written to summarize the state-of-the-science knowledge of aluminum toxicity in aquatic systems, which has changed dramatically since the ambient water quality criteria were developed for aluminum. Results showed that although aluminum concentrations were above national ambient water quality criteria and local background levels, concentrations of aluminum were not having any demonstrable effect on aquatic biota. Rather, patterns of improvement were observed in the biological data since 1995, coinciding with the implementation of significant changes in the water treatment procedures at the Climax water treatment facility. Moreover, laboratory WET testing showed no acute or chronic toxicity when aluminum was above ambient water quality criteria.*

Beartrack Mine, Review of Biological Opinion on Chinook and Steelhead: Critique and Re-evaluation, Tributary of the Snake River*, Idaho

*Ms. Tillquist conducted a systematic evaluation of water quality in a Snake River tributary to determine if salmonids would be adversely affected by metal concentrations. The National Marine Fisheries Service (NMFS) originally concluded in a Biological Opinion that the continued operation of the mine jeopardized the successful reintroduction of Chinook salmon into this watershed. This conclusion was based on water quality data, which occasionally exceeded the national ambient water quality criteria. Ms. Tillquist re-evaluated the water quality data using a more extensive dataset and conducted a broad, weight-of-evidence evaluation that evaluated aquatic community health. Temporal and spatial trends in water quality and fish and benthic macroinvertebrate community structure were examined to determine if any adverse effects exist which are attributable to the operation of the mine. Specifically, this assessment evaluated the likelihood of adverse effects to federally listed salmonids. This assessment found there was no evidence of adverse impacts from the operation of the mine. Furthermore, there were statistically significant indications that the aquatic community health (measured as density and diversity) has recently improved, perhaps due to the mining company's restoration of historic placer mining areas in the watershed. As a result, the NMFS was forced to recant its original position and revised their Biological Opinion to indicate a no jeopardy finding.*

Aquatic Toxicity Assessment of Leachate from the Cortez Landfill Superfund Site, Delaware Water Gap*, Pennsylvania/ Delaware

*Ms. Tillquist investigated leachate from a Superfund site into a National Park area. In the 1970s, barrels containing unknown contamination were illegally dumped in a landfill in New Jersey. By the late 1980s, material from these barrels was leaching into surrounding properties and into the Delaware River and the landfill was designated as a Superfund site. Notably, there was an increased prevalence of illness in the surrounding areas. This portion of the Delaware River was part of the Delaware River Gap National Park, administrated by the National Park Service. Through a grant from the National Park Service, assessed the aquatic toxicity of leachate entering the Delaware River using Microtox® and several routine aquatic toxicity tests.*

Water Quality Criteria Evaluation*, Nationwide (Technical Lead)

*Ms. Tillquist is providing support on toxicological data and associated environmental impacts. National water quality criteria promulgated by the U.S. Environmental Protection Agency (USEPA) are applicable over a normal range of water hardness. However, the validity of extrapolating criteria to unusually hard or soft waters is unknown. Ms. Tillquist conducted a literature evaluation to determine whether application of the USEPA's criteria for metals is appropriate. Additionally, Ms. Tillquist conducted a series of aquatic toxicity tests with copper in both hard and soft waters. Neither the literature evaluation nor the toxicity tests supported the extrapolation of criteria beyond these hardness limits.*

* denotes projects completed with other firms

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

**Wildlife Biology**

Biomonitoring of the Cache la Poudre River*, Colorado

*Ms. Tillquist provided technical support for a long-term (i.e., over 10 years) biomonitoring project, fish community structure program. The study area encompassed the Poudre River in northern Colorado with the intent to evaluate if changes in water quality attributable to Eastman Kodak have negatively impacted the Cache la Poudre River ecosystem. Habitat was evaluated using U.S. Environmental Protection Agency's Rapid Bioassessment Protocol, while the fish community was assessed using the Index of Biotic Integrity. Large scale, long-term trends in the fish community appeared to be primarily affected by human disturbance activities such as channelization. Ms. Tillquist conducted fieldwork and analyzed data as part of an Index of Biotic Integrity assessment. Fish collected by electrofishing and seining were identified, weighed, measured, and examined for disease. Flow rates, habitat type, and habitat quality were quantitatively evaluated.*

Survey of Fish Assemblage in the Headwaters of East Plum Creek*, Colorado

*Ms. Tillquist conducted field surveys for fish in small streams on U.S. Air Force Academy lands. The Air Force Academy was evaluating the potential environmental impacts of increased training activities in undeveloped areas of the Academy's property. In conjunction with this assessment, conducted fish surveys in the intermittent portions of upper East Plum Creek. Electrofishing gear and seines were used to sample the creek and beaver ponds. No fish were found in these reaches.*

Museum of Southwestern Biology, University of New Mexico, Field Surveys of Fish in Plain Streams of the Southwestern U.S.*, New Mexico, Texas, Colorado

*Ms. Tillquist conducted field surveys for the collection and systematic identification of fish throughout New Mexico, Colorado, and Texas. Special emphasis was placed on the identification of new or existing endangered fish species. Through this work, the Rio Grande silvery minnow was identified and this species subsequently has been listed as an endangered species, largely due to the publication of this fieldwork. She helped curate specimens into the Museum of Southwestern Biology.*

Carbon Dioxide Pipeline Project Environmental Assessment*, Wyoming (Project Wildlife Biologist)

*Anadarko proposed to construct the 125-mile-long Salt Creek Carbon Dioxide Pipeline. Ms. Tillquist conducted sage-grouse, mountain plover, and raptor surveys. Data from these field reconnaissance surveys were used to assist with pipeline route selection and to identify areas with seasonal construction constraints. The pipeline has been successfully permitted and constructed.*

Nesting Habitat Evaluation and Improvement for Threatened Dusky Canada Geese, Prince William Sound & Copper River Delta*, Cordova, Alaska

*Ms. Tillquist evaluated areas on the Copper River Delta for their potential as nesting habitat for the endangered Dusky Canada goose. Once suitable sites were identified, artificial nesting structures and islands were constructed. Nesting success was documented through the breeding season to determine if artificial nesting structures were effective. Ms. Tillquist also participated in breeding waterfowl surveys and banded geese. She also evaluated and constructed in-stream habitat improvement structures for anadromous fish and collected water quality data.*

* denotes projects completed with other firms

# Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

---

PUBLICATIONS

Cooper, A. R., H. Tillquist, L. M. Overholt, and D. C. Jamison. Cooper's Acute Toxic Exposures (with CD-ROM). *CRC Press, Inc.*, 1996.

Ebinger, M. H., P. L. Kennedy, O. B. Myers, W. Clements, H. T. Bestgen [Tillquist], and R. J. Beckman. Long-term Fate of Depleted Uranium at Aberdeen and Yuma Proving Grounds, Phase II: Human Health and Ecological Risk Assessments. *Los Alamos National Laboratory, New Mexico. LA-13156-MS*, 1996.

Bestgen [Tillquist], H. T. Use of soil extracts as a culture and test medium for Ceriodaphnia dubia.. *Master's Thesis. Colorado State University, Fort Collins, Colorado*, 1992.

Nimmo, D. R., J. F. Karrish, H. T. Bestgen [Tillquist], T. A. Steidl-Pulley, M. J. Willox, T. L. Craig. The assessment of nonpoint sources of toxicity in National Park waters using biomonitoring techniques.. *Park Science*, 1992.

Wolff, R. K., H. Tillquist, B. A. Muggenburg, J. R. Harkema, and J. L. Mauderly. Deposition and clearance rate of radiolabeled particles from small ciliated airways in beagle dogs. *Journal of Aerosol Medicine 2(3):261-270.*, 1988.