



Toolik Field Station GIS

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Mr. Galvin:

On behalf of the administration and scientists of Toolik Field Station we would like to offer the attached materials for the North Slope Foothills Areawide 2005 Call for New Information. We hope to illustrate the importance of minimal landscape disturbance to the current and continued viability of the science conducted at Toolik, situated in the state-topfiled BLM Administered Utility Corridor. Altering the integrity of the regional landscape as it currently exists would directly threaten the validity of science conducted from Toolik Field Station, an internationally recognized long-term biological research and monitoring site and the flagship U.S. terrestrial arctic research station. We believe that diligent, advance communication between the Division of Oil & Gas and the Toolik Field Station Management Team can enable current land uses to coexist with nearby, future development activities.

Toolik Field Station is located in the foothills of the Brooks Range on Alaska's north slope, and hosts over 300 resident scientists and technicians annually (enclosed map: "Toolik Field Station to Prudhoe Bay/Deadhorse, Alaska"). Alaskan scientists and colleagues from over 70 institutions representing all 50 states and a number of foreign countries congregate there to take advantage of the unique opportunity for intensive study of arctic physical, biological, hydrological and atmospheric processes. Current funding (over 95% federal) for research at Toolik is \$36,000,000 (total), averaging \$8,600,000 annually, with annual logistic and facility support of \$1,700,000, and \$1,000,000 in annual facility upgrades.

Research at Toolik Field Station centers on understanding arctic environments as a system and how this system affects global climate patterns. Each project conducts its respective work on rivers, lakes, soil, atmosphere, geology, vegetation, mammals, fish, birds, insects etc, and the data are interpreted as a whole by the body of researchers working there. Scientists currently utilize over 13,000 individual research plots, primarily within the BLM Toolik Lake RNA (ACEC), to conduct their work. Current funding commitments from NSF, UAF and other, Toolik-affiliated institutions portend a steady increase in number of researchers and research projects in the next ten years.

Results are regularly published in the top scientific journals in the world, including *Nature*, *Science*, *Bioscience* and *Ecology*. Toolik based science is also represented in critical policy and management documents such as the National Research Council's report on Cumulative Environmental Effects of Oil & Gas Activities on Alaska's North Slope, released in 2003.

According to Simon Stephenson, Program Manager in the Office of Polar Programs at the National Science Foundation (NSF) in Washington, DC the facility is considered a flagship arctic research station on par

with McMurdo Station in Antarctica. He further states that Toolik research has contributed more to the understanding of arctic natural systems than any other site in the world.

The central goal of Toolik science is to: a) provide the best possible understanding of arctic systems as they currently exist, and b) track local and regional changes and predict their effects on these systems. Use of the Toolik area for long-term, intensive study and monitoring dates back to 1975. Scientists chose this site for its unique access to a suite of landscapes representative of different arctic tundra and aquatic environments. Landscapes ranging from mountains to coastal plain can be studied from one logistical hub and compared through annual and decadal patterns of change. Enclosed is a series of thematic maps of the Upper Kuparuk River Region, including Toolik, showing some of the important landscape variables that drive the science there. These illustrate the richness of landscape types which are not found together in any other road accessible location in Alaska. **The basic premise is that these landscapes are unaltered or only very minimally affected by current or past human activity. Once the landscape undergoes human alteration, it no longer serves this purpose. The continued integrity of this landscape is critical to the continued federal support of Toolik Field Station.**

The impacts of ORV use, seismic exploration, road construction and facility development on tundra landscapes have been documented through a number of published studies. A short list of relevant papers has been included in this packet, and their contents can be summarized as follows. Impacts vary with season, local conditions, vegetative cover, permafrost, soil composition and other factors. Landscape response to these impacts varies between eventual recovery and self-perpetuating, continued degradation. In general, sites that are both wet and cold are affected most, and the warmest and driest sites tend to be more resilient. Depending on the sensitivity of the site, impacts can be detectible, permanent and self-perpetuating after one use, or may withstand multiple use before changes emerge. The landscape within 25 miles of Toolik is a complex matrix of wet/cooler and dry/warmer areas within each watershed, so it is expected that measurable impacts would arise in every watershed where exploration/development occur.

Among the most common impacts seen with summer activity include: 1) vegetative degradation, 2) reduction in insulative vegetation & organic layers, 3) subsequent melting (thermokarst), and permafrost reduction, 4) alteration of surface hydrology and 5) erosion and subsidence. Clearly this entails localized landscape alteration, but the greater threat to Toolik science is change in hydrology and nutrient flux regimes. Changes in permafrost and surface hydrology are accompanied by the release of nutrients (previously stored in frozen soil) which wash downslope and downstream, altering water chemistry, plant composition, insect communities and fish populations along the way. In many cases even small-scale changes have long-term, detectible effects. Because Toolik science is based on integrated landscape research, these impacts would directly threaten the viability of continued research there.

Conditions affecting the impacts of winter use are less documented, though similar impacts have been described. However, within certain thresholds of snowcover and soil temperature impacts are minimal. To ensure minimal impact, Alaska Dept. of Natural Resources stipulations on industrial winter travel employ conservative criteria for tundra openings pending the results of winter travel research currently underway. To date, these criteria appear to have been successful in preventing the sort of impacts that would compromise or invalidate current Toolik research.

Attached are additional materials regarding science at Toolik Field Station, reference maps, and article citations on the impacts of human activities in tundra environments.

We invite you to visit Toolik Field Station at your convenience so that we may better answer any questions and show you the research firsthand. Please contact Michael Abels, Operations Supervisor, for travel and accommodation arrangements at 907.474.5063.

Thank you for taking this information into consideration. Please do not hesitate to contact my office or Dr. Brian Barnes – Director of IAB, UAF (907.474.6665) with any further questions.

Sincerely,

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Toolik Field Station

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