Shrinking ponds signal warmer, dryer Alaska

October 12 2006

A first-of-its kind analysis of fifty years of remotely sensed imagery from the 1950s to 2002 shows a dramatic reduction in the size and number of more than 10,000 ponds in Alaska. The analysis, by University of Alaska Fairbanks scientists and published this week in the *Journal of Geophysical Research*, indicates that these landscape-level changes in arctic ponds are associated with recent climate warming in Alaska and may have profound effects on climate and wildlife.

Over the past 50 years, Alaska has experienced a warming climate with longer growing seasons, increased permafrost thawing, an increase in water loss due to evaporation from open water and transpiration from vegetation, and yet no substantial change in precipitation.

The shrinking of these closed-basin ponds may be indicative of widespread lowering of the water table throughout low-lying landscapes in Interior Alaska, write the authors. A lowered water table negatively affects the ability of wetlands to regulate climate because it enhances the release of carbon dioxide by exposing soil carbon to aerobic decomposition.

"Alaska is important in terms of waterfowl production and if you have a lowering of the water table that could have a potentially huge impact on waterfowl production," said Dave Verbyla, co-author and professor in the School of Natural Resources and Agricultural Sciences at UAF.

"This is an issue relevant to flyway management in terms of all the waterfowl that might use the Yukon Flats National Wildlife Refuge and

overwinter elsewhere, and this is something that goes beyond the refuges in Alaska," said A. David McGuire, co-author and professor of ecology at the Institute of Arctic Biology at UAF.

National Wildlife Refuges cover more than 77 million acres in Alaska and make up 81% of the national refuge system. These refuges provide breeding habitat for millions of waterfowl and shorebirds that overwinter in more southerly regions of North America.

"No one has done a state water-body inventory of this magnitude," said Brian Riordan, lead author and data manager for the Bonanza Creek Long-Term Ecological Research program at UAF. "It will allow land managers to stop speculating about possible water body loss and begin to address the implications of this loss."

Using black and white aerial photographs from the 1950s, color infrared aerial photographs from 1978-1982, and digital images from the Landsat satellite from 1999-2002, Riordan outlined each pond by hand. "With automated classification your accuracy goes down," Riordan said. Cloud shadows can look like water and Alaska rarely experiences a cloudless day, said Verbyla.

The most difficult part of the four-year project, said Riordan, was "having the patience to circle 10,000 ponds for each time period."

The main study area was the subarctic boreal region of Interior Alaska, which spans more than 5 million square kilometers bounded on the north by the Brooks Range and on the south by the Alaska Range. To contrast the semi-arid, subarctic sites of discontinuous permafrost in Interior Alaska, the authors also selected a study area in the Arctic Coastal Plain where the temperatures are much colder, the growing season much shorter, and the permafrost is continuous, and a more maritime site south of the Alaska Range.

All ponds in the study regions in subarctic Alaska showed a reduction in area of between 4 and 31 percent, with most of the change occurring since the 1970s. The ponds in the Arctic Coastal Plain showed negligible change.

Source: University of Alaska Fairbanks