THE INTEGRATED ECOSYSTEM MODEL

A COLLABORATIVE PROJECT TO UNDERSTAND FUTURE LANDSCAPE CHANGE IN ALASKA & NORTHWEST CANADA

"All working groups agreed that in order to more accurately predict climate change effects on fish and wildlife and their habitats, multidisciplinary work is needed to better understand the underlying biological and physical processes that drive terrestrial and aquatic ecosystem function and the response of those systems to climate change."

Key finding from the *Wildlife Response to Environmental Arctic Change: Predicting Future Habitats of Arctic Alaska* Workshop (2008)

A CRITICAL NEED

Alaska's temperatures are rapidly increasing. The resulting changes in temperature, precipitation, permafrost, vegetation, and fire are closely linked. The Integrated Ecosystem Model for Alaska and Northwest Canada (IEM) aims to understand how changes in these processes are linked and how they will affect the broader region. Landscape change has the potential to impact animal habitats and migration routes; the prevalence of fire and other disturbance; and the availability and accessibility of natural resources for subsistence, recreation, infrastructure, and industry.

Data produced by the IEM encompasses most of Alaska and parts of northwest Canada. The domain coincides with the five Landscape Conservation Cooperatives. (LCCs).

THE IEM PROJECT BY THE NUMBERS

30+ researchers, technicians, students, and coordinators

127 peer-reviewed publications, including several in top journals

150 scientific conference presentations

23 public and stakeholder presentations and webinars

13 news stories in local and national media outlets

$240 thousand dollar investment in computing capacity to meet present and future modeling needs

2008
Managers & scientists discuss the need to link models to improve their utility

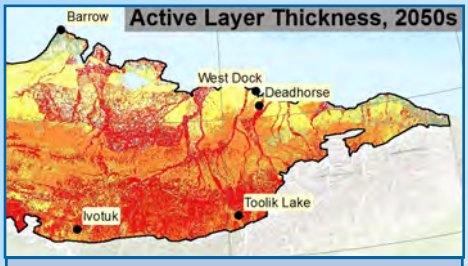
2011
Successful proof of concept developed

2012
Phase 1 of IEM development begins

2016
IEM makes significant contributions to Alaska Carbon Assessment

2016
Phase 1 ends with 34 new datasets

2016
Phase 2 of IEM begins



One of the many data products now available is the projected permafrost active layer thickness for different climate scenarios, as shown here in northern Alaska.

PHASE I DATA DEVELOPMENTS

Because of the size of Alaska and Northwest Canada, the short length of climate records, and the high costs of working in remote areas, climate data for this region has traditionally been limited. The 2008 WildREACH report called for the development of, "models that would link major ecological processes at appropriate spatial and temporal scales." Phase 1 of the IEM generated a comprehensive set of 34 new data products, which include climate, disturbance, landcover and landscape, ecosystem dynamics, and soil properties for Alaska and Northwest Canada.

CASE STUDIES: IEM APPLICATION

The IEM team has developed several partnerships with decision makers and resource managers to develop data products and information that helps answer questions and address specific decision making information needs.

FIRE SUPPRESSION ON US MILITARY LANDS IN ALASKA

Recent, large wildfires, such as the 2013 Stuart Creek Fire in interior Alaska that was sparked by an explosive ordinance on an army weapons range, led army land managers to ask how fire suppression in the near future could influence long-term wildfire activity through the 21st century. The IEM was used to simulate interactions between wildfire, vegetation establishment, and succession for boreal ecosystems, which make up much of the Department of Defense lands in interior Alaska.

ALASKA: CARBON SOURCE OR CARBON SINK?

The *U.S. Energy Independence and Security Act of 2017* called for an assessment of the carbon sequestration potential of all the public lands in the United States. With 35% of all the U.S. public lands, Alaska represented a significant computational challenge. However, the IEM was used to assess the potential for biological carbon sequestration for upland and wetland ecosystems on public lands in Alaska. In 2016, the calculations for carbon sequestration potential, as influenced by interactions among atmospheric CO2, climate, fire, permafrost dynamics, were part of the *Baseline and Projected Future Carbon Storage and Greenhouse Gas Fluxes in Ecosystems of Alaska* report.

QUESTIONS & MORE INFORMATION

More detailed information about the research plan, project objectives, and data products are available at bit.ly/2hcJNq1. For more information, contact Amy Breen, Research Professor at the University of Alaska Fairbanks (albreen@alaska.edu) or Steve Gray, Director of the Alaska Climate Science Center (sgray@usgs.gov).

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AK CSC Alaska Climate Science Center

U.S. Department of the Interior · March 3, 1849

USGS science for a changing world

UAF University of Alaska Fairbanks

Northwest Boreal Landscape Conservation Cooperative

Arctic Landscape Conservation Cooperative

Western Alaska LCC

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