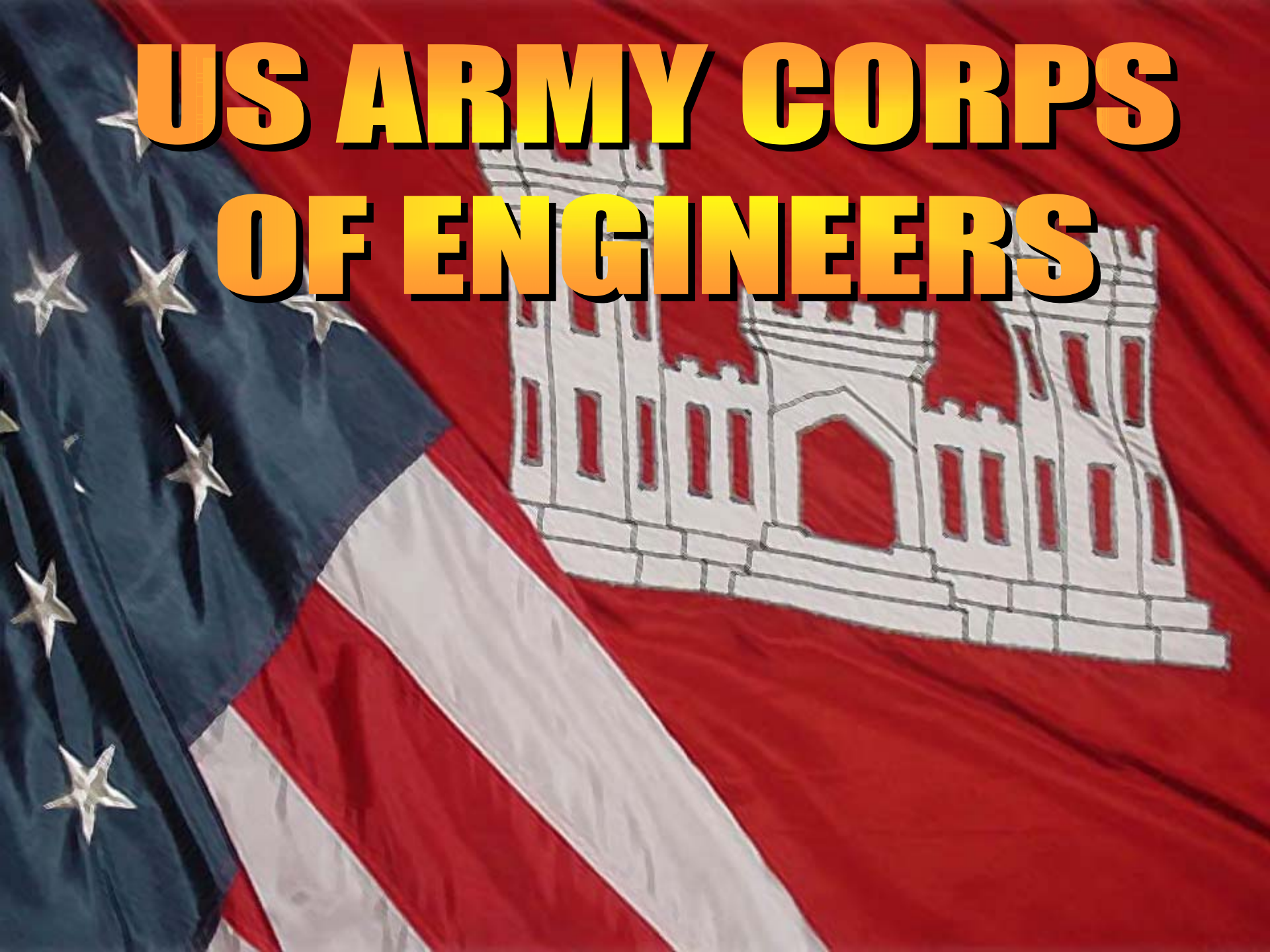


US ARMY CORPS OF ENGINEERS





Presentation to the Alaska Climate Change Commission

October 10, 2007

**Patricia S. Opheen, PE
Chief, Engineering Division
US Army Corps of Engineers,
Alaska District**

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US Army Corps of Engineers,
CRREL-AK**

Mission

The US Army Corps of Engineers (Corps):

- **Is an engineering and construction agency;**
- **Has a water related Civil Works mission;**
- **Has a design and construction Military mission;**
- **Has regulatory oversight of navigable waters of the United States;**
- **Provides emergency response operations, and disaster relief support for FEMA;**
- **Undertakes water related planning, design, and construction for local and state governments, other Federal agencies, and international customers; and,**
- **Operates 7 World-Class Research and Design Labs.**

Capability

Corps Water Related Capability Encompasses:

- **Navigation;**
- **Flood Damage Reduction;**
- **Hydropower;**
- **Water Supply Storage;**
- **Emergency Stream bank Protection;**
- **Coastal Storm Damage Reduction;**
- **Environmental Protection and Restoration;**
- **Recreation; and,**
- **Emergency Preparedness Response and Recovery.**

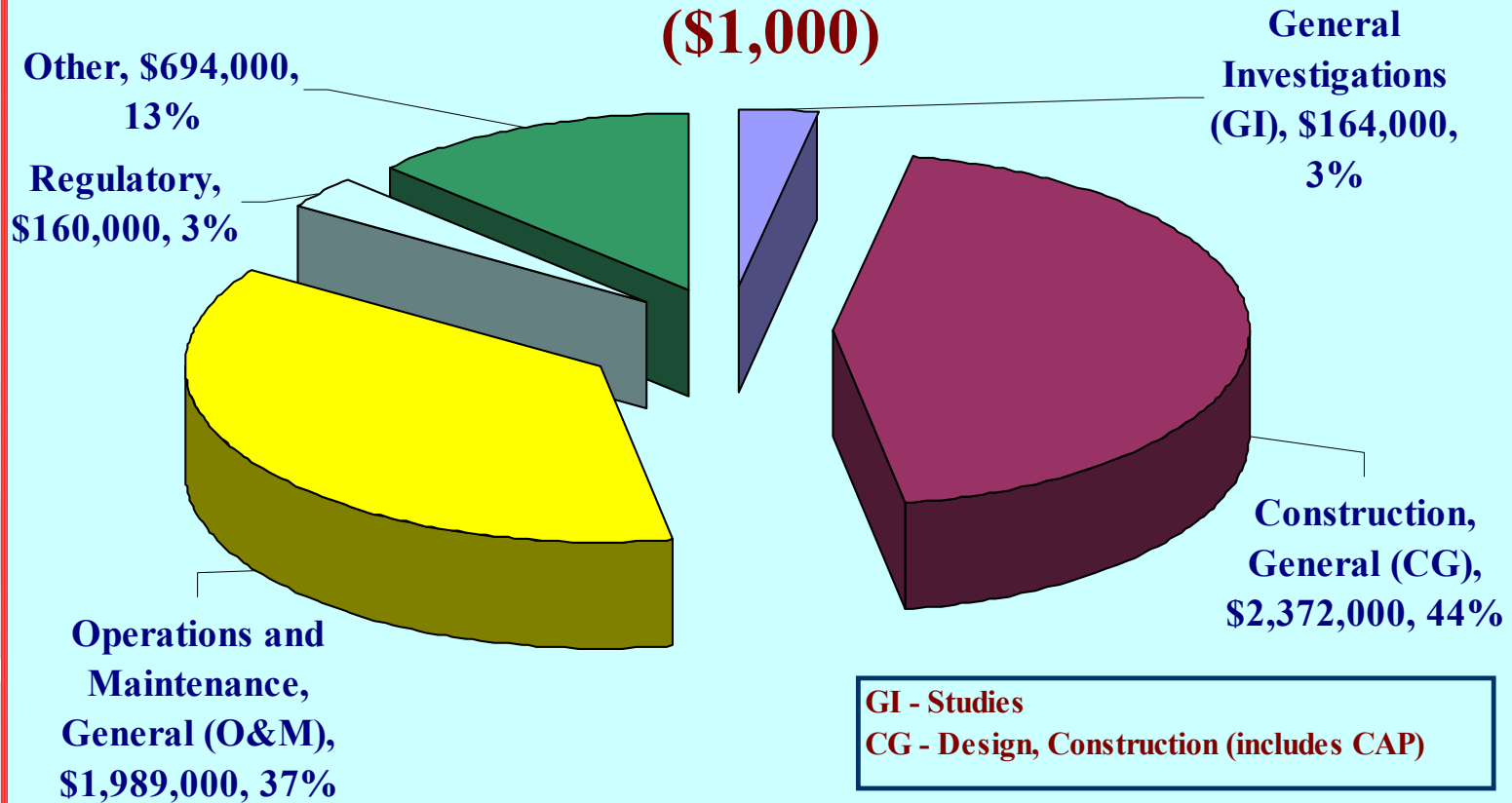
Authorities and Appropriations

- **Before the Corps can begin any work, it must have the legal authority and funding to do so;**
- **These are typically separate actions which originate in the Congress and are signed into law by the Administration;**
- **Federal Government operates on a two year budget preparation cycle with annual appropriations;**
- **Unless specifically excluded in law, all Corps studies and construction projects are cost-shared;**
- **Authorities used in Alaska may be general (umbrella), specific (individual project), or continuing, and may authorize studies, construction, or both.**

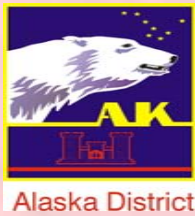
Corps Civil Works Appropriations

Corps of Engineers Civil Works Budget Fiscal Year 2006

(\$1,000)



District Civil Works Appropriations



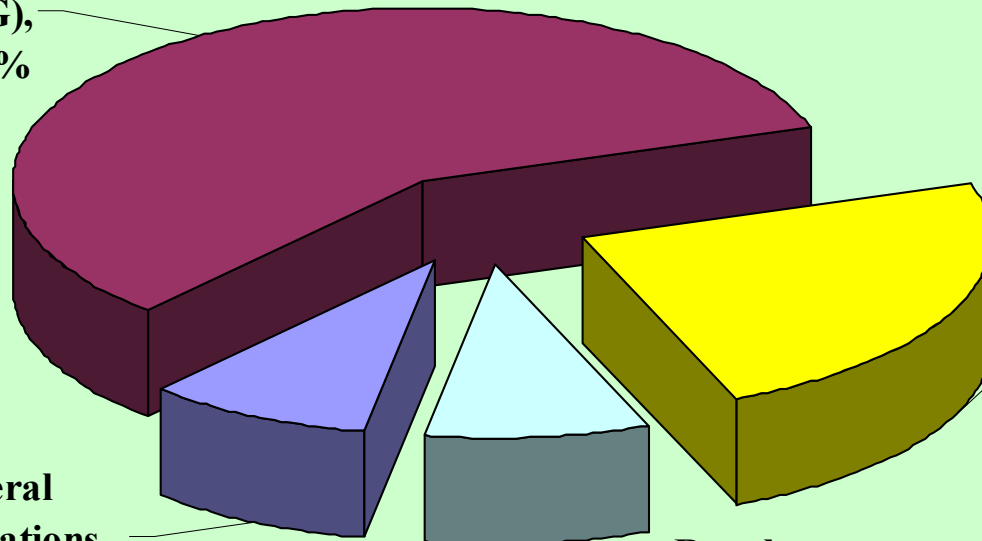
Alaska District Civil Works Budget Fiscal Year 2006 (\$1,000)

Construction,
General (CG),
\$46,329, 58%

Operations and
Maintenance,
General (O&M),
\$19,025, 24%

General
Investigations
(GI), \$7,068, 9%

Regulatory,
\$7,099, 9%



Corps Appropriations

- **General Investigations (GI) – Planning Studies**
 - **Matanuska – Susitna Watershed Study**
 - **Valdez Navigation Improvements Study**
 - **McGrath Bank Stabilization Study**
- **Construction General (CG) – Advanced Design and Construction**
 - **Tribal Partnership**
 - **Alaska Coastal Erosion**
 - **Nome Harbor Improvements**
 - **Kake Dam**

Corps Appropriations cont.

- **Operations and Maintenance (O&M)**
 - **Chena River Lakes Flood Control Project**
 - **Project Condition Surveys, Various Locations**
 - **Inspection of Completed Works, Various Locations**
 - **Homer Harbor Maintenance Dredging**
- **Regulatory – New Permits, Permit Compliance, Wetland Delineation**
 - **BIA – Annette Bay, Metlakatla**
 - **Stevens Village IRA Council**
 - **Fairbanks North Star Borough – Tanana River**
 - **Misty Fjord LLC – Mink Bay**

General Authorities

General Authorities are programmatic, e.g., Flood Control Act of 1938, Rivers and Harbors Act of 1899 (Regulatory).

- **Tribal Partnership, Section 203 of Water Resources Development Act (WRDA) of 2000;**
 - **Alaska Villages Erosion Technical Assistance (AVETA) - Report to Congress - Investigate and prepare a report on the impacts of coastal erosion due to continued climate change and other factors for 7 specific communities. (completed)**
 - **Alaska Baseline Erosion Assessment - Coordinate and plan the appropriate responses and assistance for Alaska villages in the most need, and provide an overall assessment on the priority of which villages should receive assistance. (165 communities, on-going).**



Alaska District

General Authorities cont.

- **Rivers and Harbors in Alaska - House of Representatives Committee on Public Works resolution dated December 2, 1970;**
 - **Port Lyons Harbor Study;**
 - **McGrath Bank Stabilization Study;**
 - **Homer Harbor Study**
 - **One of the most frequently used authorities by Alaska District.**
 - **Authorized by a resolution, not legislation.**
- **Planning Assistance To States – Section 22 of WRDA of 1974;**
 - **Kivalina Relocation Master Plan**
 - **Newtok Relocation Assistance**
- **Emergency Preparedness, Response, and Recovery – Emergency Flood Control Funds Act of 1955 (PL 84-99);**
 - **Kivalina FY 2007 Emergency Assistance**

Specific Authorities

Specific Authorities authorize study and/or construction of specific projects.

- **Section 116 of PL 99-190 (1986) – Directed the Corps to study and construct erosion control measures for Bethel, Dillingham and Galena at full federal expense.****
- **Section 117 of the FY 2005 Consolidated Appropriations Act - Carry out, at full Federal expense, structural and non-structural projects for storm damage prevention and reduction, coastal erosion, and ice and glacial damage in Alaska****
 - **Alaska Coastal Erosion**
 - **Kivalina Erosion Control Structure**
 - **Shishmaref Erosion Control Structure**
 - **Unalakleet Erosion Control Structure**
 - **Newtok Erosion Relocation Support**
 - **Others in progress**
 - **McGrath Streambank Erosion**

**** Full Federal Funding is unusual.**

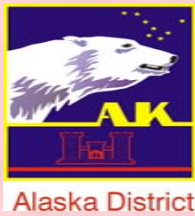
Continuing Authorities

Continuing Authorities are programmatically funded to study, design and construct small projects, within Corps discretion. CA accounts for less than 4% of the Civil Works annual budget. Federal contribution limits / project shown:

- **Section 14 - Emergency Stream Bank Protection –\$1 Million****
- **Section 103 - Coastal Storm Damage Reduction –\$3 Million**
- **Section 107 - Navigation –\$4 Million****
- **Section 111 – Mitigation of Navigation Damages - \$5 Million**
- **Section 204 Beneficial Use of Dredge Material — Up to \$15 Million (programmatic limit)**
- **Section 205 - Flood Damage Reduction –\$7 Million**
- **Section 206 - Aquatic Ecosystem Restoration –\$5 Million**
- **Section 1135 - Project Modification for Environmental Improvements - \$5 Million**

**** will be increased by WRDA 2007**

Authorities Modified by WRDA 2007



- **Section 2006 - Remote and Subsistence Harbors**
 - Provides for non-economic justification of projects
- **Section 2017 - Access to Water Resources Data**
 - Provides for public access of data; greater collaboration between Federal and State agencies, NPOs, and others.
- **Section 2020 – 2024 Programmatic and Project Limit Increases for Several Continuing Authority Program**

Effects of Climate Change in Alaska



- **Shore fast ice is forming later in the year.**
- **Sea ice cover diminishing.**
 - National Snow and Ice Data Center reported that, as of September 4th, 2007, the polar ice cover had dwindled to the smallest coverage in recorded history.
 - Recent article in the Anchorage Daily News stated that the Arctic Sea could be ice free by the year 2040.
- **Sea level rise vs. post-glacial rebound.**
- **Thawing of permafrost.**

Impacts of Climate Change on Corps Projects



- **Thawing permafrost will require different approach to foundation design;**
- **Changing weather conditions, increased storms, loss of ice pack and shorefast ice may change Corps coastal flood and erosion designs;**
 - **However, lack of historical data currently results in conservative designs which may accommodate changes.**
 - **Applicability of historical data lessened for climate change.**
- **More coastal communities are likely to see increased erosion or flooding, increasing demand for protection;**
- **Sea level rise will probably affect community relocation plans.**
- **Projects are expected to cost more, however budgets are not expected to increase significantly; and,**
- **Collaboration with other agencies, communities, boroughs, NGOs, industry, and academia will become even more critical.**

Broader Implications

- **Cost of climate change related project will increase while funding sources are likely to shrink, plateau, or grow slowly;**
- **To meet public needs we must get more bang for the buck;**
 - **Identify and fund a lead agency;**
 - **Develop a mechanism to share information on state and Federal on-going activities, available data, and data needs;**
 - **Identify and close data gaps; and,**
 - **Prioritize Needs/Requirements.**

Corps Research Activities

- **Shishmaref Thermistors – monitor soil temperatures behind revetment;**
- **Long-Term Alaska Wind, Wave and Surge Climatology Study – on-going data collection to develop wave climate analysis; and,**
- **Decadal Forecast of Climate Change Impact on Waves in Alaska Waters Study –Proposal to provide long-term wave projections, currently unfunded.**



Corps' Engineering Research and Design Center (ERDC)

ERDC's mission: Research and Development in four major areas: **Battlespace Environment, Military Engineering, Environmental Quality/Installations, and Civil Works/Water Resources.**

ERDC has a staff of more than 2,000 engineers, scientists and support personnel, with an annual research program of \$700 million. ERDC's seven laboratories are:

- **Construction Engineering Research Laboratory in Champaign, Il.;**
- **Cold Regions Research and Engineering Laboratory in Hanover, N.H.;**
- **Topographic Engineering Center in Alexandria, Va.; and,**
- **Coastal and Hydraulics, Geotechnical and Structures, Environmental, and Information Technology Laboratories in Vicksburg, Ms.**



Cold Regions Research and Engineering Laboratory (CRREL)

Jon E. Zufelt, PhD, PE

Our mission is to solve interdisciplinary, strategically important problems of the US Army Corps of Engineers, Army, DOD, and the Nation by advancing and applying science and engineering to complex environments, materials, and processes in all seasons and climates, with unique core competencies related to the Earth's cold regions.



CRREL's Research Activities

Current work related to Climate Change

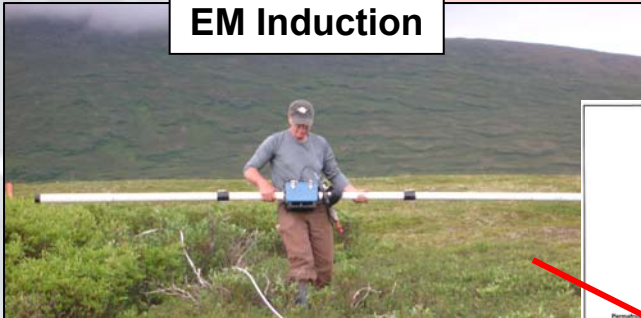
- **Customer driven**
- **Climate change impacts relatively low priority for military**
- **Current related work funded by non-military sources (e.g. District, MMS, DOT, NOAA, NSF, NASA)**
- **Basic and applied engineering research**
 - **Observing and understanding change**
 - **Documenting change**
 - **Mitigating technologies to cope with change**

CRREL's Research Activities

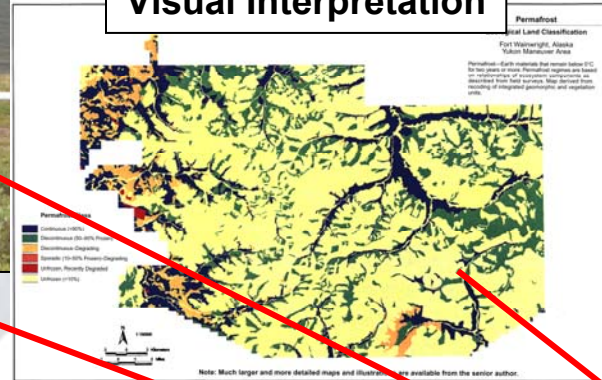


Permafrost

EM Induction



Visual Interpretation

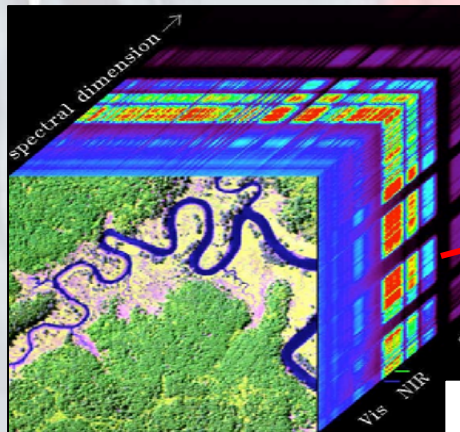
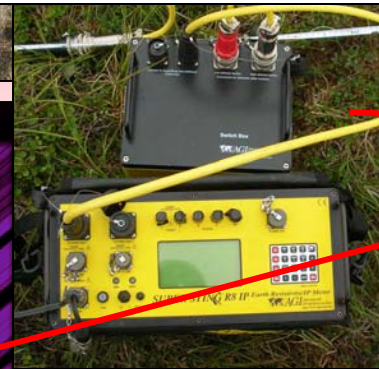


Development and application of technologies to detect and monitor permafrost

Ground Penetrating Radar

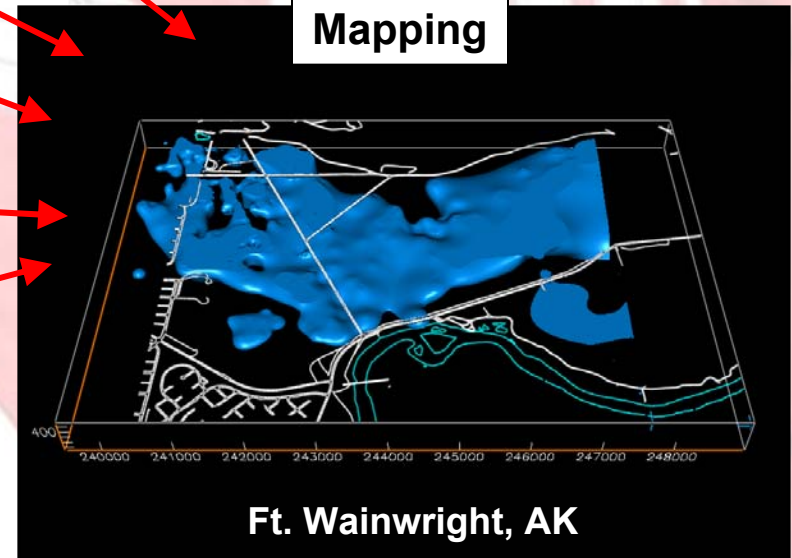


Electrical Resistivity



Hyperspectral Imagery

Mapping

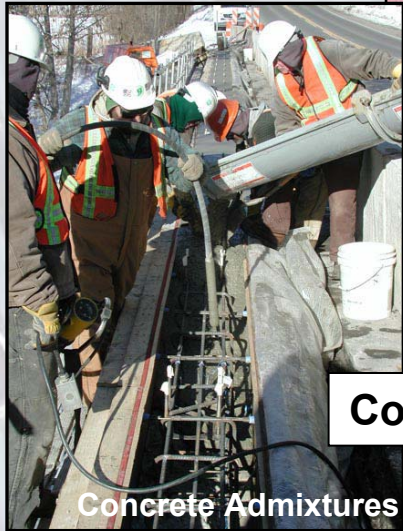


Ft. Wainwright, AK

CRREL's Research Activities

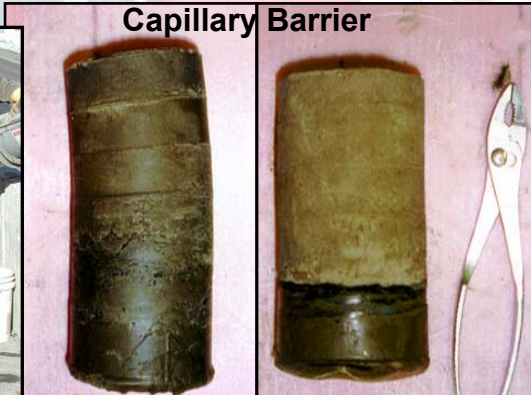
Engineering Solutions

Investigating and implementing technologies to mitigate the impact of climate change

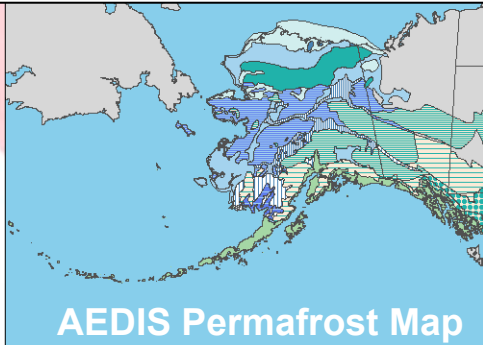


Cold Weather Construction

Concrete Admixtures

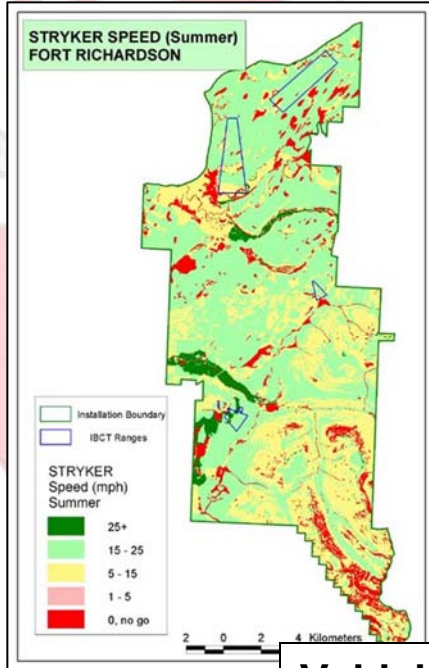
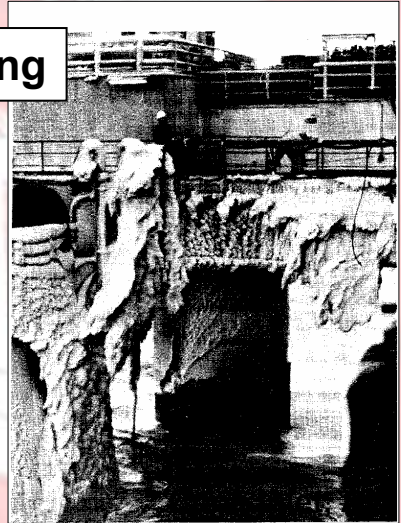


GIS-Based Decision Tools



AEDIS Permafrost Map

Structural Icing



Vehicle Guidance

CRREL's Research Activities

Engineering Solutions

Investigating and implementing technologies to mitigate the impact of climate change

Physical models of ice-structure interaction



Coastal Erosion



Barrow, AK

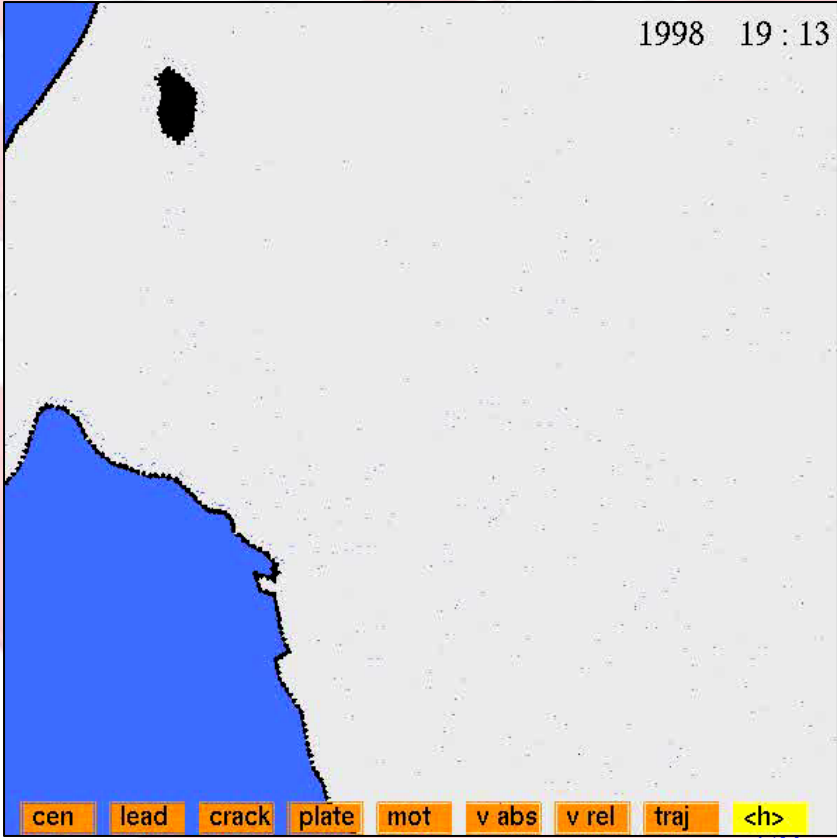
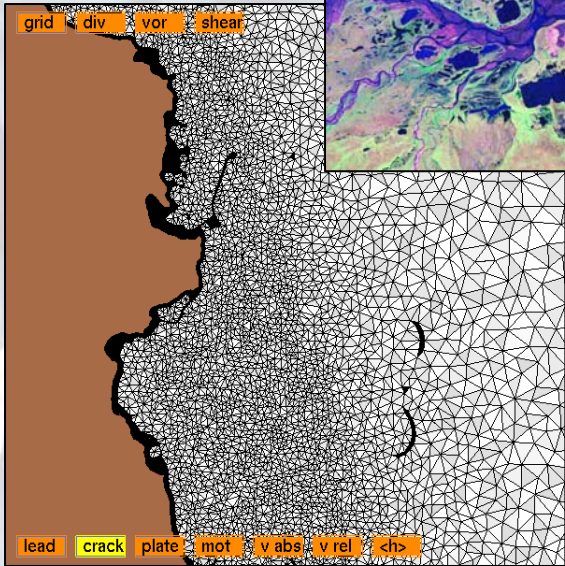


CRREL's Research Activities

Engineering Solutions

Investigating and implementing technologies to mitigate the impact of climate change

Computer models of ice motion





Alaska District

QUESTIONS?