

CRREL's Biogeochemical Processes in Earth Materials Mission

To enhance battlespace awareness and force protection, and sustain training through microbial forensics and use of new plant materials.

BPEM Challenges

BPEM successfully integrates microbiology, agronomy, and geochemistry by asking critical research questions including:

- Do plants, microbes and earth materials interact in the environment?
- Can these interactions be optimized to sustain Army readiness?
- Can these interactions be harnessed for war-fighter support?

This is accomplished through

- Dissemination of resultant knowledge to the scientific community.
- Transfer technology to end users.



CRREL's BPEM Facilities and Equipment

- Greenhouse
- Soil Microbiology Laboratory
- Chemistry Laboratory
- Permafrost Tunnel (Fairbanks, Alaska)
- Cold Rooms
- Water-quality Laboratory

The Cold Regions Research and Engineering Laboratory (CRREL)

The Cold Regions Research and Engineering Laboratory (CRREL) in Hanover, New Hampshire and Anchorage and Fairbanks, Alaska is part of the US Army Corps of Engineers Engineer Research and Development Center (ERDC). Our mission is to solve interdisciplinary, strategically important problems of the US Army Corps of Engineers, Army, Department of Defense, 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.



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US Army Corps of Engineers®



Land Management

Remediation in Disturbed Natural Systems

Species Persistence, Fate and Monitoring Strategies

U.S. Army Engineer Research and Development Center
Cold Regions Research and Engineering Laboratory

BIOGEOCHEMICAL PROCESSES IN EARTH MATERIALS



Plant morphology



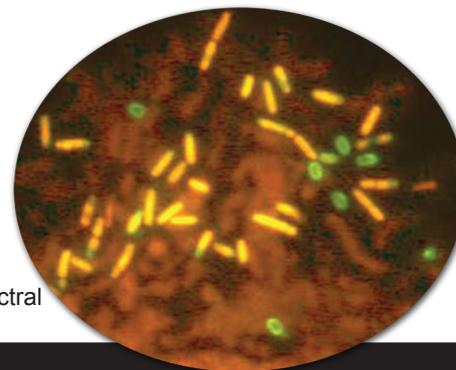
Military land use

Land Management

- Improved land maintenance and repair techniques, including erosion prevention and habitat protection in seasonally frozen/thawed soils.
- Revegetation of metal-contaminated soils, such as in military small-arms ranges.
- Selective breeding and seed increase programs for resilient impact-resistant, cold-tolerant plants on military training lands.
- Ecological-bridge seed mixtures for rapid establishment of native plants.
- Plant genetics.

Remediation in Disturbed Natural Systems

- Rhizosphere enhancement of natural bioremediation processes (phytoremediation).
- Natural attenuation of explosives via humification.
- Low-temperature performance of CB-agent decontamination solutions.
- Biochemical inputs for predicting dissolved oxygen levels in ice-covered rivers and frazil ice.



Spore viability using hyperspectral imagery

Persistence and Fate of Native and Non-Indigenous Organisms

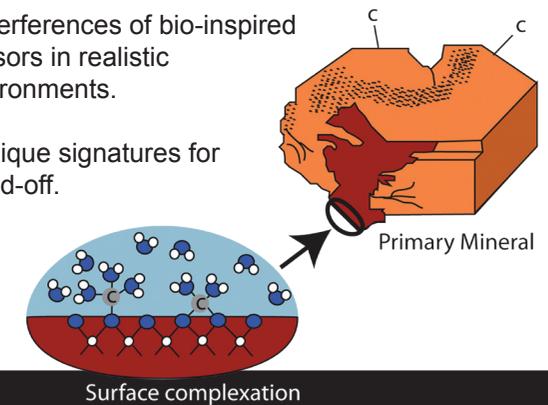
- Pathogen persistence in frozen and thawed soils.
- Chemical and biological agent fate and persistence in dynamic soil conditions.
- Microbial activity in soils during low temperatures and freeze-thaw cycles.



Spore survivability in cold soil

Novel Detectors and Monitoring Strategies

- Novel techniques to monitor biochemical processes in soils.
- Interferences of bio-inspired sensors in realistic environments.
- Unique signatures for stand-off.



Surface complexation



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