

## Riders of the Storm

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#### Research Background

- Dust particles in the air cause harm to humans, the environment, and industry. These fugitive dust particles ride erosion storms of wind and water.
- CBBG (Center for Bio-Mediated and Bio-Inspired Geo-Technics) research demonstrates methods to reduce dust pollution for mainstream industrial practices and more.
- EICP (Enzyme Induced Carbonate Precipitation) alters Earth's crust surface by using an enzyme mixture to strengthen and stabilize soil.
- EICP turns sand to sandstone.



EICP column compression test



Untreated soil wind erosion test

#### Research Objectives

CBBG research alters Earth's crust using an enzyme mixture to strengthen and stabilize the first few centimeters of soil. Using EICP (Enzyme Induced Carbonate Precipitation) sand turns to thin sandstone. The goal of using EICP is to minimize dust particles from riding through the air which can impact humans and the environment.

What is the best way to strengthen the soil and develop nature-compatible methods for its use?



EICP treatment soaking in the soil

#### Research Conclusions

- Soil loss occurred more in fine-grained sand than in heavier sand particles.
- Steep angles of soil has more natural erosion than smaller angles.
- EICP treatment is 3-4 times stronger in penetration tests compared to untreated soil.
- Ammonium is present at less than .01% in treated soil.
- Carbonate is 11% present in treated soil.
- Erosion from wind and water are both reduced with EICP treatment.



Xi Yu performing P-Swirl test on untreated soil



Untreated water erosion test

#### Lesson Description

Students have learned that soil crust solidification can be accomplished by spraying bio-mediated solutions to dirt at the ground level. This process turns fine sand into a crust-like sandstone material.

Prior to treatment, flying dust particles are harmful to human respiration, increase environment erosion, and are a legally, monitored issue for industries like construction, mines, and dams.



OTAWAA 20/30 sand from similar quarries

#### Lesson Objectives

Students will choose from a variety of mixtures and methods to strengthen soil against wind and water erosion using household products, water, EICP.

Students will implement their treatments on fine-grained soil surfaces. After treatment has dried, students will perform strength tests after 72 hours.

Students will finalize the rubric and write procedures to build 3 different strength tests.



Electron microscope view of a particle of clay on a grain of sand

#### Lesson Outcomes

Students will perform 2 Labs:

Lab 1: Students will choose from a variety of mixture choices and methods to strengthen soil against wind and water erosion using household products, water, EICP (Enzyme Induced Carbonate Precipitation).

Lab 2: Students will finalize their team rubric, and then write the procedures of how to build the 3 different strength tests they are designing for the next class strength testing.

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