

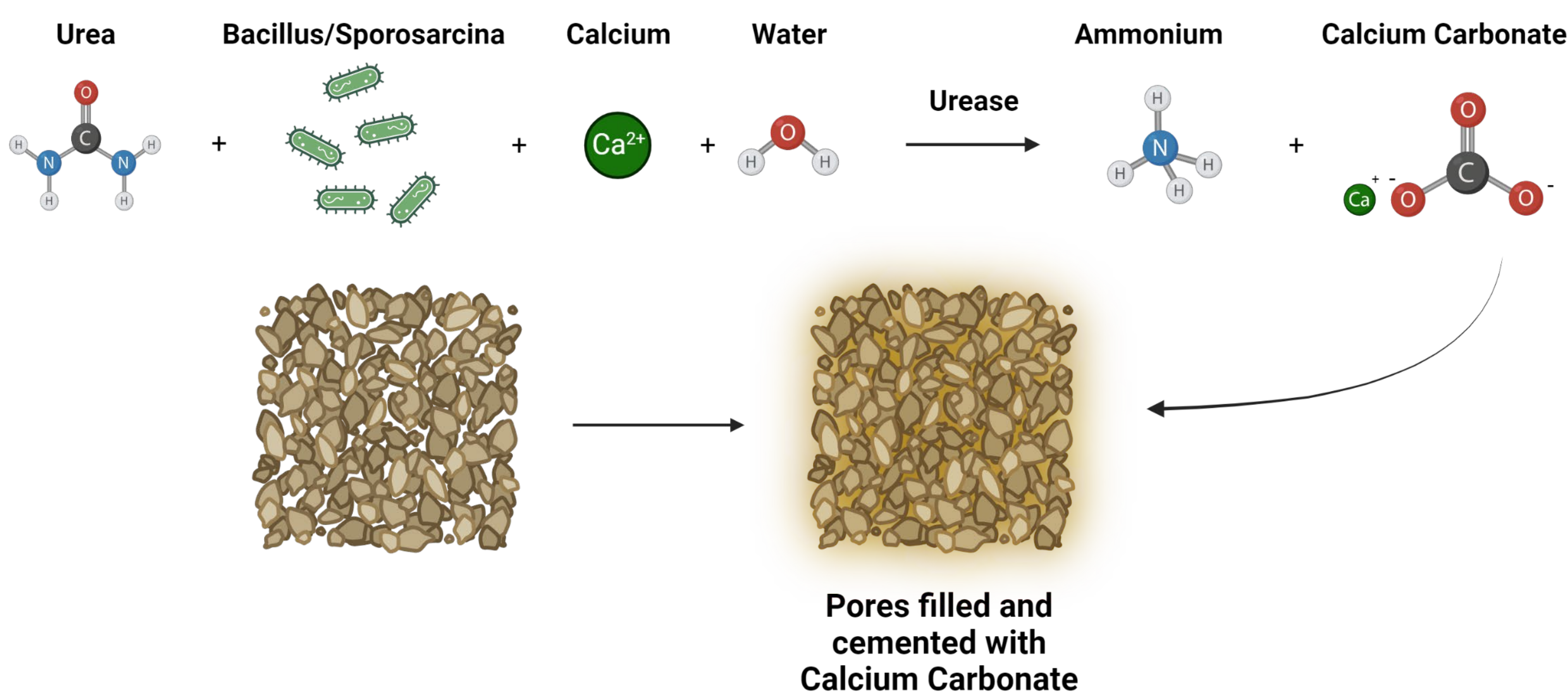
Can you build on quicksand?

- Soil aggregate stability refers to the ability of soil particles to bind together and resist breaking apart or disintegrating.



- Aggregates form through natural forces and organic substances, for example microbial by-products, cementing particles into micro- and macro-aggregates.
- MICP stands for Microbially Induced Calcite Precipitation. It is a biogeochemical process in which certain bacteria, often belonging to the genera Bacillus and Sporosarcina, are used to precipitate calcium carbonate in the presence of Calcium.

Microbial-Induced Calcite Precipitation



- It influences the engineering properties of soil, impacting factors such as compaction, shear strength, and permeability.



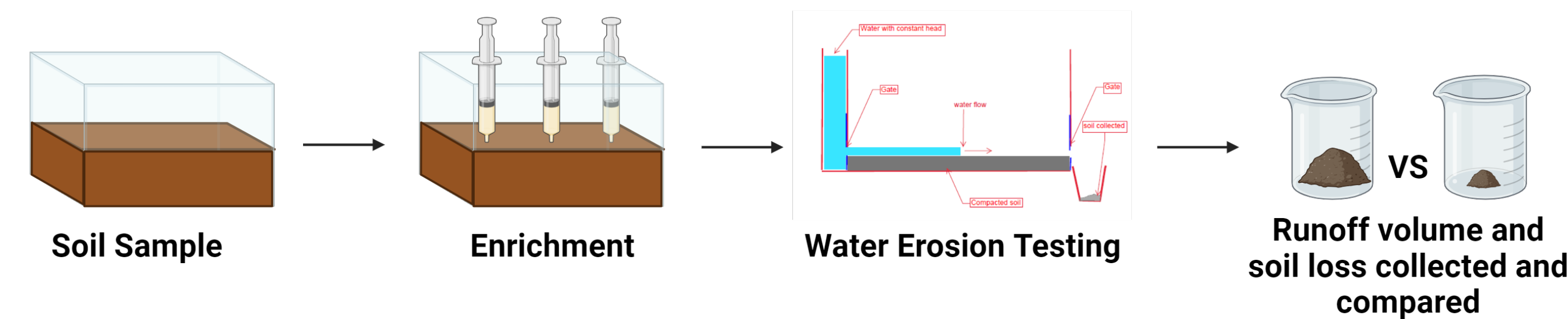
- Forest fire remediation and the stabilization of coastal soils are applications that could benefit from a novel method to increase aggregate stability. Which is why our research focused on two treatments, burned and unburned soil.



- Left to right, samples collected in the field, Oven for soil burning, our burned and unburned samples.

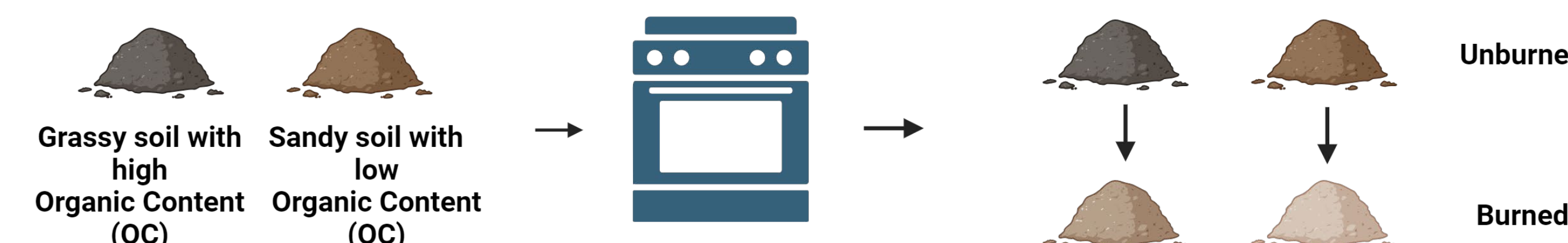
Hypothesis

- This study hypothesizes that amendment of soil with Urea will enrich the natural population of ureolytic bacteria which upon the addition of Calcium Chloride will result in the stabilization of soils.



Experimental Design

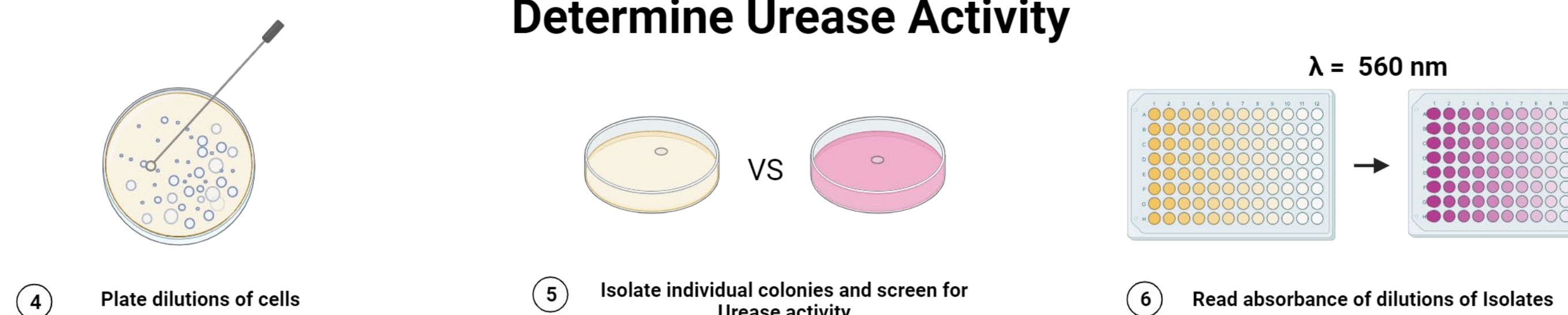
Two Treatments: Burned and Unburned



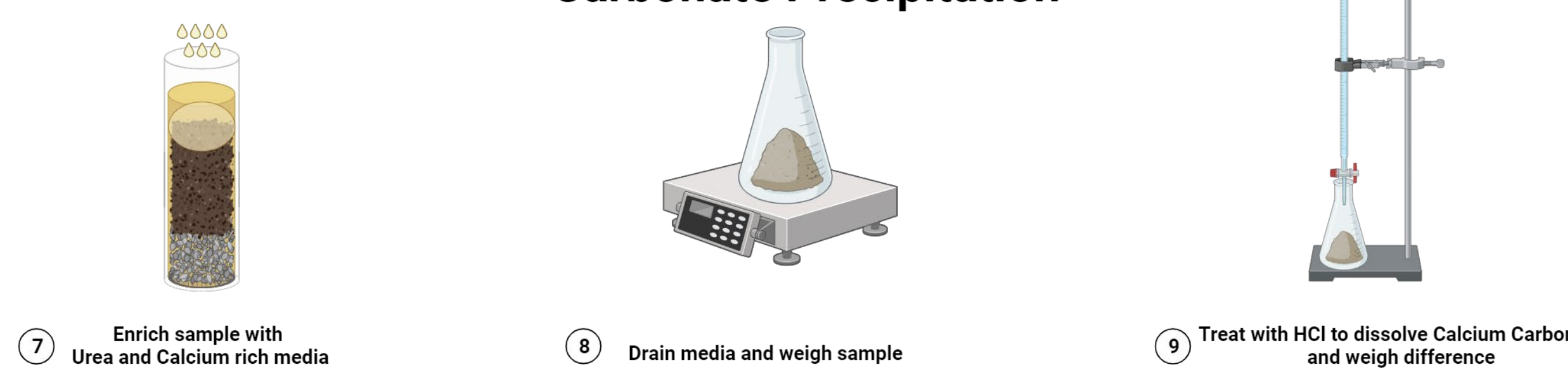
Enrich Native Population



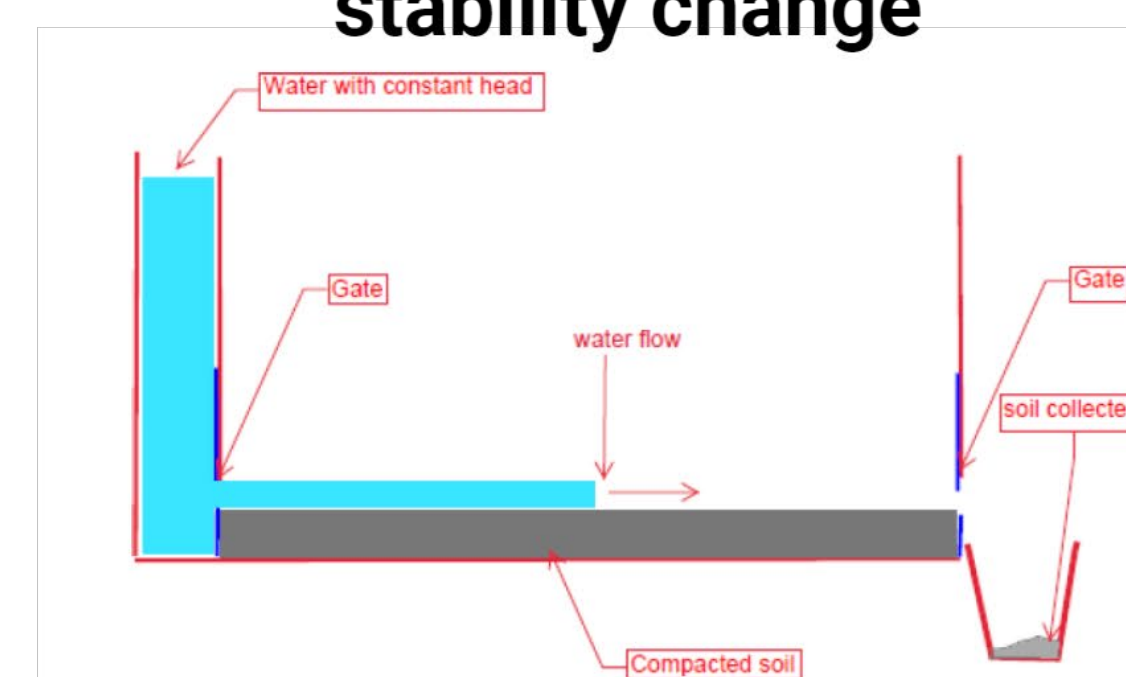
Determine Urease Activity



Quantify Calcium Carbonate Precipitation

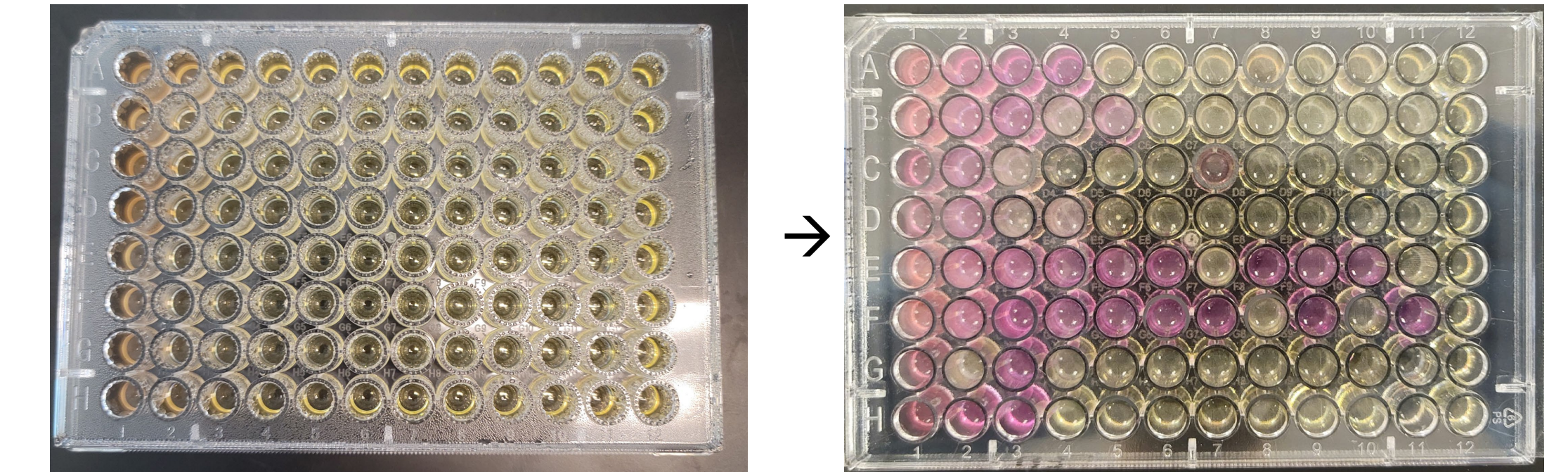


Enrich on a Macro-scale and determine aggregate stability change

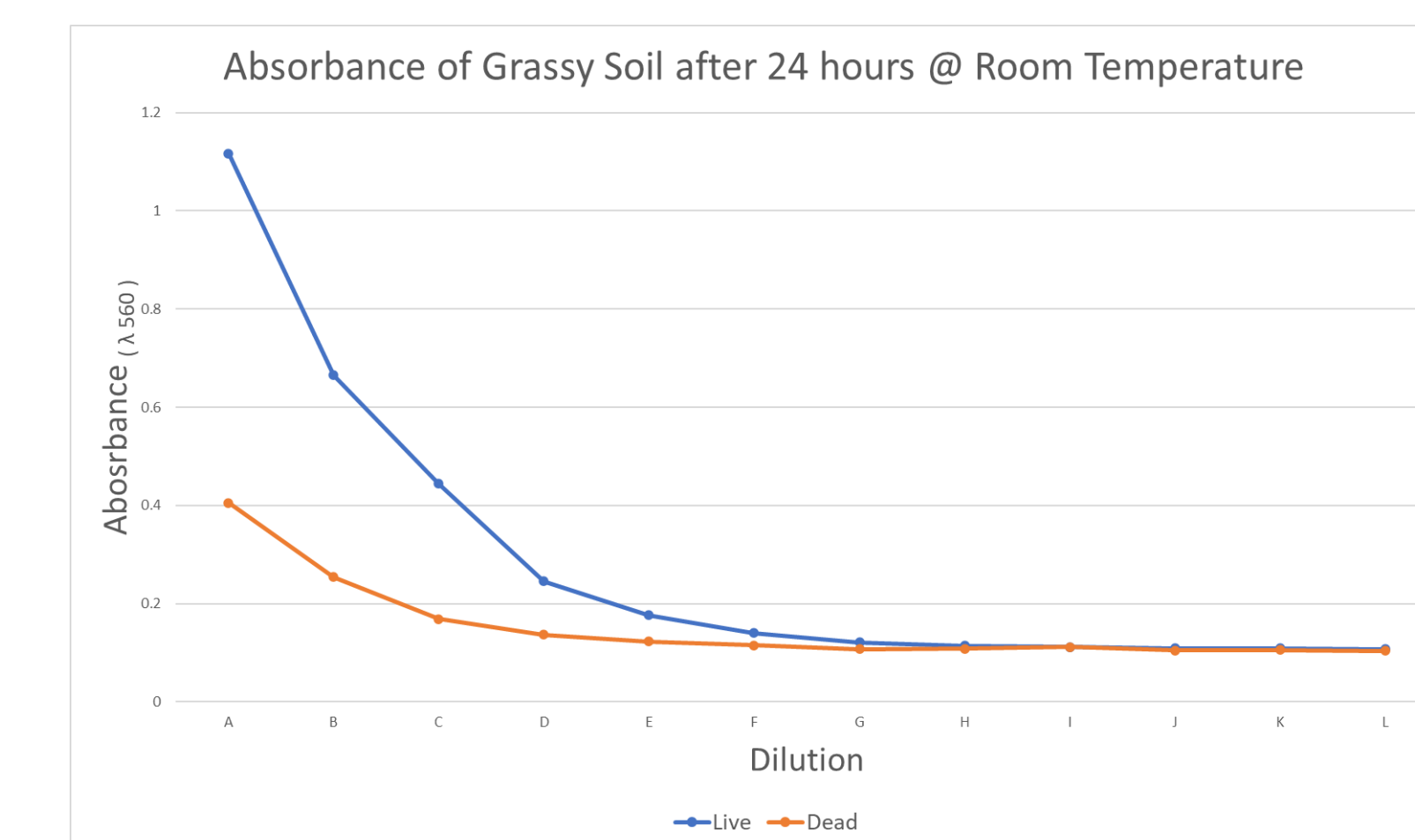


Results

- This research is ongoing and funded by an Undergraduate Internal Grant.



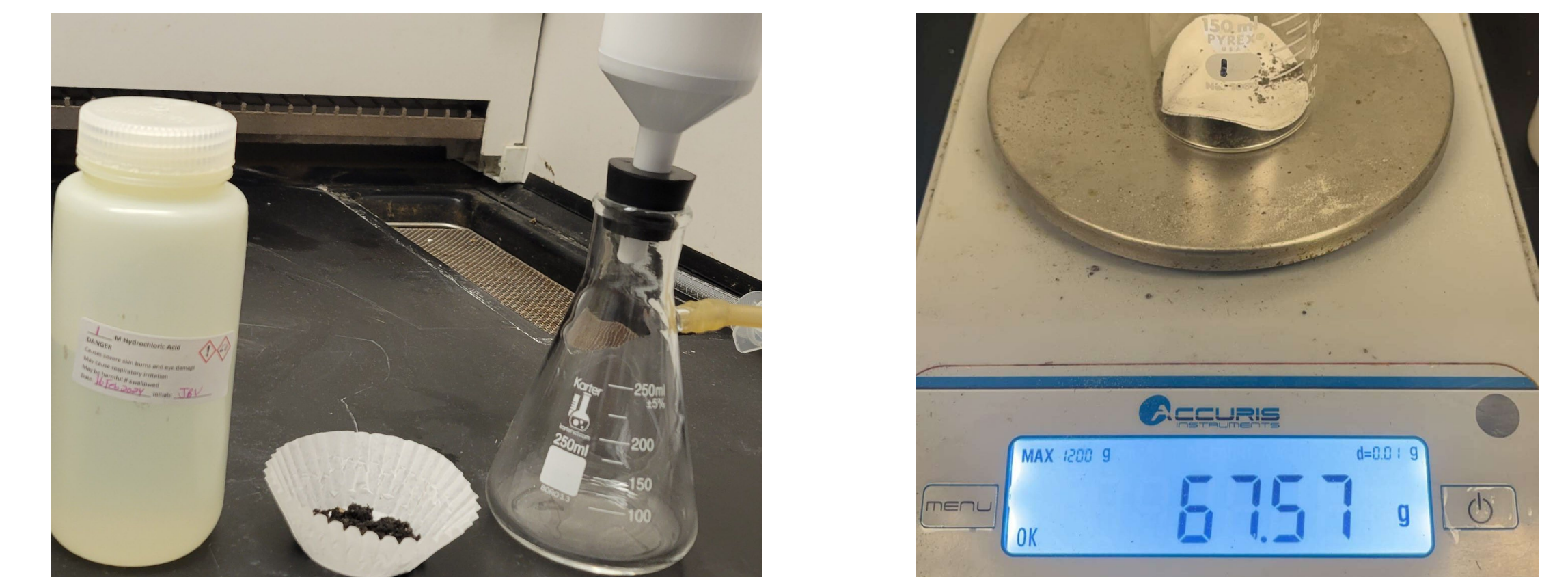
- A urease activity assay was carried out and grassy soil was chosen as the primary soil sample to investigate during the subsequent tests.



- The samples behaved predictably as the autoclaved sample showed little to no growth and only the first four dilutions of the live burned soil demonstrated a positive reaction with an absorbance above .1 at $\lambda = 560 \text{ nm}$.



- The soil samples were treated with the same media as prior with a .27 M Calcium Chloride solution added over the course of three weeks.



- The samples were washed with 1 M HCl to determine their Calcium Carbonate Content

Ongoing Research

- The next steps entail identifying the ideal treatment duration by comparing the increase in compressive strength with the duration of treatment. Following this, the modified water flume will be employed to evaluate the stability change of the sample.