The objective of this experiment was to determine whether freeze-thaw cycles could be used to reduce soil strength. Little is known about the effectiveness of freeze-thaw cycling in reducing soil strength changes. Soil samples were subjected to various numbers of freeze-thaw cycles, and the effects on soil strength were measured.

Materials and Methods

Two soils were used for the freeze-thaw experiment: a Weld loam that is fine sandy loam characterized by a low organic matter content (2.0%); and a Heldt clay that is silt loam characterized by a high organic matter content (6.0%). The soils were compacted into cylinders and then subjected to a series of freeze-thaw cycles. The number of cycles ranged from 1 to 10 per week for a period of 12 weeks.

Results

Freeze-thaw cycles were found to decrease soil strength. The Heldt clay had a greater decrease in soil strength at a given water content compared to the Weld loam. Freeze-thaw cycles greater than once per week did not have an additive effect on decreasing vane shear strength.

Conclusions

Freeze-thaw cycles can be used to reduce soil strength. The number of freeze-thaw cycles required to achieve a desired decrease in soil strength should be determined based on the soil type and the desired level of reduction.