

ACTIVITY 5: MODELING THE ALBEDO EFFECT

The purpose of this activity is for students to investigate the relationship between ice coverage, the albedo effect, and warming waters.

Materials:

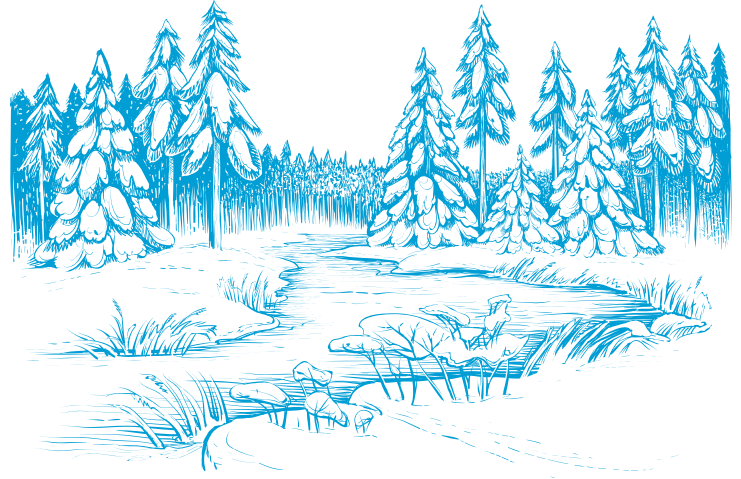
- White printer paper
- Black construction paper
- Thermometers
- Ice cubes
- Sunny outdoor area or heat lamps
- Stopwatch or timer
- Notebook and pen for recording data

First, inform students that they'll be studying the albedo effect, which refers to the measure of reflectivity of a surface, specifically how much radiation (e.g., sunlight) is reflected by a surface compared to how much is absorbed. Remind them that lakes in colder climates, like Lake Superior, typically have a lot of ice and snow coverage in the winter months, which increases the albedo effect on the waters below.

Next, have students partner up and obtain the supplies needed to perform the experiment. Give them time to set up the experiment and review the procedure.

Procedure

1. Place a sheet of white paper and a sheet of black paper side by side in a sunny outdoor area or under a heat lamp.
2. Place an ice cube on each paper.
3. Start a timer to measure the melting time.
4. Record the temperature of the surface of each paper using thermometers at the start, periodically during the melting process, and at the end.
5. Note the time it takes for each ice cube to completely melt.
6. Record temperature readings and observe any differences in the rate of melting between the white and black paper.
7. Repeat the experiment with a mix of black and white paper checkered under the ice.



Last, have students summarize their findings on chart paper or a large dry erase board. Invite them to include a particle diagram to represent what they think was happening inside the system (e.g., the ice) and the surroundings at the smallest possible level (e.g., the molecular level). Invite groups to show their posters to each other and compare group data in order to arrive at a consensus about what happened.

Discuss with them how the albedo effect describes how surfaces with higher reflectivity (such as ice and snow) reflect more sunlight, while darker surfaces (such as water or vegetation) absorb more light, and thus more energy transfer into the system, warming the waters. This concept is critical in understanding various climate processes and the impact of surface characteristics on global temperature.

Have them update their particle diagrams to ensure it visually represents the albedo effect and the warming of the waters in Lake Superior due to less ice coverage in winter.

****Teaching Tip: To extend the lab, different groups can try different sized pieces of ice; however, ensure that each group tests the same size piece of ice on both their white and their black sheets of paper within one set of trials.***