Animal Autographs

Your Feet Are Too Big

Post-visit activity, all grades

Objective

Students will calculate sink factors.

Background

Why can a bird walk on top of a snow drift or mud flat, when you or I would sink into it? The ratio of the bird's weight to the size of its feet is less than the ratio of our weight to our foot size. This ratio is called the sink factor. Sink factors are calculated by using the following formula: weight (in kilograms) divided by total foot area (front and hind-in cm squared)

The following example calculates the sink factor of a snowshoe hare. The prints are measured in the field and then redrawn on graph paper. In this case, the front feet are 20 cm squared, and the hind feet are 76 cm squared. Since a snowshoe hare weighs approximately 1.5 kg., the sink factor is: 1.5 kg divided by 96 cm squared = 0.16kg/cm squared.

An animal weighing more would have a larger sink factor. For example, an animal weighing 96 kg and having the same print sizes would have a sink factor of 1. Conversely, an animal that weighs less and has the same print size will have a much smaller sink factor. The larger the sink factor, the more likely an animal is to sink down in the snow.

Procedure

1. After having the students practice calculating the example given above, take a field trip to an area you have previously scouted for tracks (near a creek or at the edge of the woods). The class can make casts of animal

tracks left in mud by pouring Plaster of Paris into a suitable mold (a double-opened can or container) large enough to surround the footprint and press into the ground to a depth of 1 inch (2-3 cm). Wait four to six hours for the cast to dry. Apply ink to the cast and use it as a stamp to make an impression on graph paper as an aid in taking total foot area measurements. Students may also measure the tracks, then sketch them on graph paper.

2. Back in class have them calculate the sink factor for each of the casts or tracks they were able to find, and for themselves.

3. Discuss: Would an animal be more likely to sink if it had a small or large sink factor? What size sink factor would an animal have with bigger feet and the same/less weight?

Extensions

1. Calculate the sink factors for students wearing skis, snowshoes, or diving fins. Compare to their sink factor wearing shoes. Do these adaptations make a difference? Demonstrate the efficacy of spreading weight over larger area by going outside into snow and wearing various weight distributing devices, such as regular shoes, skis, snowshoes, and fins.

2. Look at pictures of different birds, especially shore and aquatic birds. What adaptations, if any, help birds reduce their sink factor?