



## Starting The Year With Science

by Sabrina Carlson

At least once a school year, Mr. Craig of Mount Elden Middle School likes to take his students on a walking field trip to the forested area uphill from their campus. Doing this facilitates a deep sense of place, and an awareness of the natural areas near many students' homes and community.

On September 13, 2016 we set out from the school, one class period at a time, to hike the 1-mile roundtrip to the base of Mount Elden near the Elden Mountain Passage (Passage 32) of

the Arizona Trail. A total of 85 students from grades 6-8 completed the field trip.

Mr. Craig's students have been studying the transfer of energy through an ecosystem, food chains, and trophic pyramids. To support and reinforce their learning, we played a game called Trophic Tag.

In this game, white and yellow golf balls represent a producer species. Some kind of plant that converts the energy of the sun into glucose, useful to the plant and any animal that happens to eat it. For our game the balls represented blue grama grass, an important native grass species in our area.



Hide from the fox, little mouse!

All of the students in the first round played the part of deer mice, a primary consumer species native to the Colorado Plateau. Players had about 10 seconds to gather enough food in their "stomach" (a gallon ziplock bag) to make it through the winter and have enough energy to reproduce the next spring. At the end of the round, only one or two mice seemed to have the five golf balls needed to thrive. A few more had enough to survive the winter, but not enough to support a litter of new mice, and most just didn't get enough food to make it at all. Surveying the ground, we could see that not much "food" was left either. Our ecosystem was out of balance and we had exceeded the carrying capacity of the habitat.

On the next round, we swapped out four of our mice for grey fox, our secondary consumers. The fox also needs to survive and they love to eat mice! Grey fox would tag the mice and take the food from the mouse for their own plastic bag stomach. That mouse was then removed from the ecosystem for the remainder of the round. By the end of the "season" (or round of the game), more mice had survived and thrived, but we still had some mice starving to death and not all of our foxes made it either. Uh oh...our eco system still wasn't quite right.

Enter the decomposers. This time we swapped out four more of the mice for bacteria. New rules for the new round: If a mouse gets eaten by a fox, it gives the fox half of its golf balls and the other half are processed by the bacteria and put back into the ecosystem. More food for everyone! By the end

of this round, we started to see most of our mice and fox thriving. Then we posed the question, “How does the human element impact an ecosystem like this?” This got everyone thinking, and produced answers like “When people build things there is less space for grass and other plants.” and “People don’t like mice and exterminate them, this leaves more food for the rest of the mice.” This and so much more is certainly true and left plenty of thinking for us to do on the return to school.

This game can be extended by adding a tertiary consumer (like a mountain lion) if you have enough food and primary consumers to support apex predators. You can also demonstrate concentration of toxins in predator animals by marking a fourth of the golf balls and seeing how many of the marked balls end up at different parts of the trophic pyramid. (Spoiler alert: it usually ends up being the apex predators who concentrate the pollution!)

We headed back to school with a deep, kinesthetic understanding of the importance of the right balance of producers, consumers and decomposers in an ecosystem, and how quickly the balance can be disturbed.



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