Engineering Connection

Algae Biofuel Cars combust fossil fuels, releasing large amounts of carbon dioxide into the atmosphere. Carbon dioxide gas is one of the leading contributors to greenhouse gases and increasing global temperatures. To counteract this effect on the environment, engineers have been researching alternative fuels, such as algae biofuels, that do not release greenhouse gas emissions. Algae trap, transform, and store solar energy as oil through the process of photosynthesis. The oil can then be processed into biofuel.

Using library and Internet resources, research algae biofuels. Write a blog entry explaining the potential uses of algae biofuels. What impact could biofuels have on human-driven greenhouse gas emissions?

FIGURE 1: Algae biofuel production.

Social Studies Connection

BFFs: Black-Footed Ferrets As European settlers moved into the Great Plains, they converted prairie land into farmland. These farmers and ranchers found the prairie dogs that lived on that land a nuisance and killed them off in large numbers. The black-footed ferrets (BFFs), which feed almost exclusively on prairie dogs, were nearly eradicated in the process. BFFs are a key species in the ecosystem, and their health is a primary indicator of the overall health of that ecosystem.

The BFF population has undergone a large captive breeding program and is being reintroduced to the wild, with great success. Using library and Internet resources, research the story of the BFF and what its reintroduction into the ecosystem means. Make a pamphlet to document the history of the BFF, and explain any possible implications for local ranchers and farmers.

FIGURE 2: Black-footed ferrets released into the wild.

Computer Science Connection

Computational Ecology In recent years, advancements in computer modeling software and processing speed have allowed scientists to study the complexity of ecosystems in new depths. Historically, food webs had been presented as images of producers and consumers connected by a web of energy arrows. However, with new software, scientists can now model hundreds of interactions between species and build a complete ecosystem network, as shown in Figure 3.

With a partner or a small group, review the ecosystem network shown here. What are the pros and cons of making such a computer model of an ecosystem? Do you think a human could analyze this network without a computer? On your own, make a list of questions that, if you were a scientist, you would ask based on this model. Share your questions with your partner or group. Did you have similar questions?

FIGURE 3: A complex ecosystem network developed using network modeling computer software.