deSTEMber

SCIENCE ★ TECHNOLOGY ★ ENGINEERING ★ MATH

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Pipeline Design Challenge

Civil engineers need your help! They need you to design an aboveground pipeline system to transport oil from Alaska. Using straws and craft sticks, can you create a system that reduces the environmental impact around your pipeline?

TEKS:

5.9C Predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways.
7.8A Predict and describe how different types of catastrophic events impact ecosystems such as floods, hurricanes, or tornadoes.

How To:

1. Print both pages of the attached *Ecosystems Map* and set them side-by-side so that there is a line connecting the 'Start' and 'Finish' areas.
2. Construct a pipeline that goes from the 'Start' circle to the 'Finish' circle using straws. Add craft sticks and modeling clay to create structures that support your pipeline. Your pipeline should follow the path indicated on the map and cause as little damage to the ecosystems as possible.
3. On the 'Start' circle, construct a funnel that will prevent water from spilling on the ground when you pour it into the pipeline. The Styrofoam cup should be placed on the 'Finish' circle to catch water that drains from the pipeline.
4. To test, pour one Dixie cup of water through the funnel on the 'Start' circle. Make sure that the water flows freely through the pipeline and drains into the cup on the 'Finish' circle.
5. If the water can't get through your pipeline or you have a leak, think about how you could make it work better and add these new modifications. Redesign and test your pipeline as needed.

Materials:

- Flexible straws
- Duct tape
- Craft sticks
- Modeling clay
- 3 oz. Dixie cups
- 10 oz. Styrofoam cup
- Water
- Ecosystems Map (attached below)

31 Days of STEM Fun!

The STEM Explanation:

In order for oil to travel through a pipeline, one end is usually elevated to allow gravity to pull the oil down to a refinery, an industrial process plant where crude oil is processed and refined into more useful products, at the end of the pipeline. This design is more cost efficient and safer than using trucks to transfer all the oil. However, as civil engineers design these above ground pipelines, they must figure out a way to transport the oil most efficiently without losing any along the way, as well as protect the environments surrounding these pipelines.

Career Connection:

Civil engineers plan, design, construct, and maintain structures such as buildings, roads, bridges, dams, tunnels, and pipelines. Civil engineers analyze how building the structures will affect the environment.

Resources:

- PBS: Alaska Pipeline: http://www.pbs.org/wgbh/amex/pipeline/sfeature/transport.html
- Pipeline 101: http://www.pipeline101.com/overview/crude-pl.html
- The Mammals of Texas: http://www.nsrl.ttu.edu/tmot1/Default.htm
- Texas Parks and Wildlife: Wildlife Fact Sheets: http://www.nsrl.ttu.edu/tmot1/Default.htm

Hilly Grasslands
The land here includes rolling to hilly grasslands, plateaus (high, flat land) and steep canyons. There are many springs, lakes, and aquifers that provide water for people, farming, and wildlife.

Forest
The land here includes rolling terrain that is covered with pines and oaks, and rich bottomlands with tall hardwood trees. Plants and animals here like woodlands and wetlands. Swamps are common.

Wild turkey
Population – 60,000

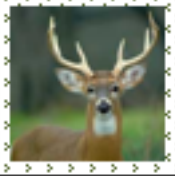
Peccary "javelina"
Population – 50,000

Opossum
Population – 50,000

Swamp rabbit
Population – 70,000

LAKE

START



White-tailed deer
Population – 300,000

Red bellied woodpecker
Population – 25,000

Plains
The land here has mostly flat, grassy land and plains. The land is mostly treeless. Some areas are divided by deep canyons carved by rivers.

Rattlesnake
Population – 100,000

Desert Mountains
The land here includes wide-open spaces with rugged plateaus and desert mountains. The mountains are covered with short grasses and trees along the slopes. The desert is dry and hot in the day and cool at night.

Mountain Lion
Population – 10,000

FINISH

Prairie Dog
Population – 100,000

Pronghorn Antelope
Population – 15,000

Coyote
Population – 25,000

Roadrunner
Population – 15,000