ARMY EDUCATIONAL OUTREACH PROGRAM

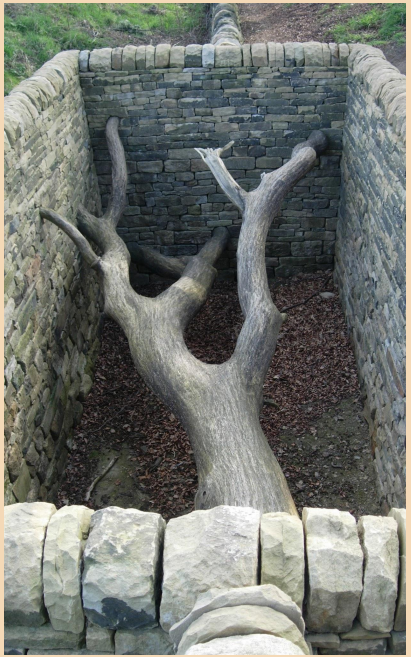
Art and Nature as Inspiration for River Restoration

ENGAGE:

On each slide, select one image that you like the “most”.

Which of the images are you drawn to:







Which of the images are you drawn to:







Which of the images are you drawn to:







Which of the images are you drawn to:

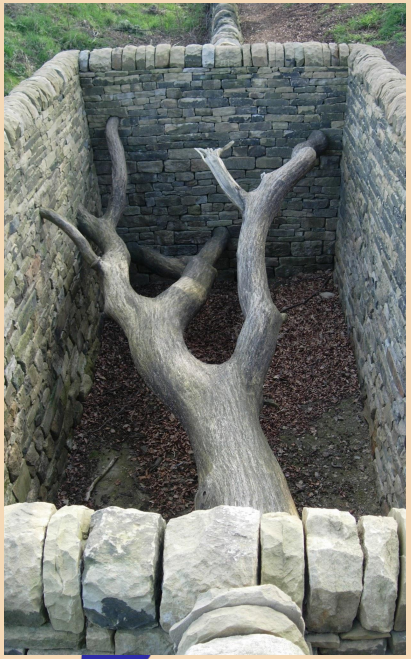






Reflect on the images you selected, which category do most of them belong to?







Nature

Art

Engineering

What is “Land Art”?

Land Art, also called Environmental Art, is a special kind of art that uses things from nature to make sculptures.

These sculptures can be made from plants, rocks, soil, or sand, and they can even interact with these things.

This type of art has a long history, going back to the days when people would make art with stones and draw the shapes of animals on hills.

Land Art is a way for artists to express themselves and show how important nature is to us.

What is “Engineering with Nature”?

Engineering with Nature means working together to make the best use of nature and technology to help people and the environment.

It′s about finding smart ways to use the power of nature and engineering to create good things for our economy, environment, and society.

By combining our knowledge and working hand-in-hand with nature, we can find ways to get things done efficiently and without harming nature.

This helps us all in the long run and makes sure we can enjoy a better future.

Write your thoughts about two of these questions:

1. Why do you think you liked a certain image?
2. Do you think nature is “art”?
3. What are your thoughts about “Land Art”?
4. How might the Art affect the environment?
5. Do you find the engineering images beautiful?

EXPLAIN:

Need transition

-

Roles: Enginee

Make a landmass w

half of the tray

- the landmass wil
  lower than the ec
  tray on one side

- It will slant downl
  the bottom where
  collect.

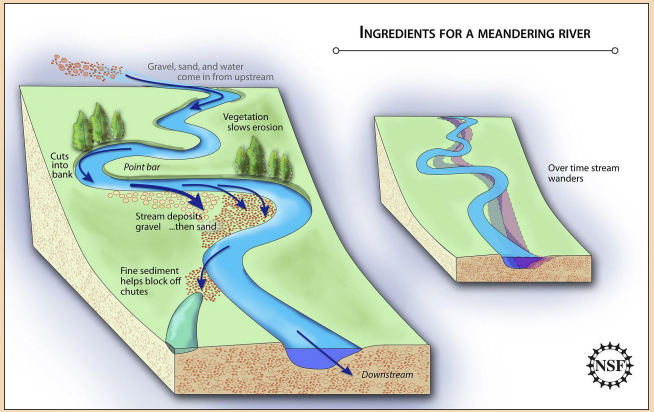


Step 2: Scientist:

Create a riverbed in the model:

- Lightly drag a pen or pencil through the sand
- Create an “S” shape to which will act as the riverbed





Step 3: Artist/Architect-

Design your ecosystem:

- Place rocks/river rock/stone along the riverbed.
- Slowly pour water where the riverbed starts and then allow it to run downhill along the riverbed.



Step 4: Communications

- Observe and discuss the results of the water running through the riverbed at the bottom of the hill
  - What changed?
  - What moved?

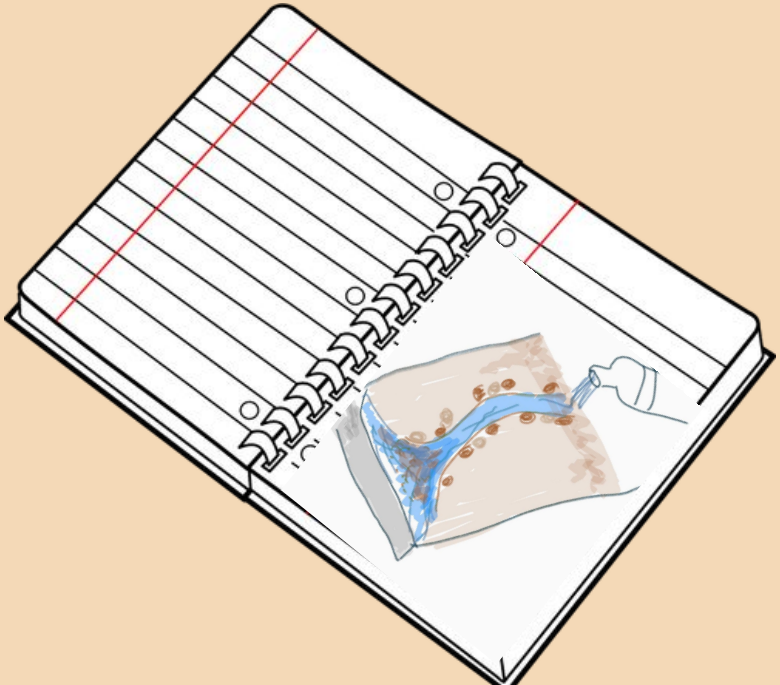
- Record the observations for your team



Roles:

Artist

- **Draw a diagram of the model your team created and tested**





ELABORATION

Let us revisit “Engineering with Nature”?

Engineering with Nature means working together to make the best use of nature and technology to help people and the environment.

It's about finding smart ways to use the power of nature and engineering to create good things for our economy, environment, and society.

By combining our knowledge and working hand in hand, we can find ways to get things done efficiently and without harming nature.

This helps us all in the long run and makes sure we can enjoy a better future.

Examples of Engineering with Nature

Around the world, engineers have used nature to inspire ways to reshape or restore rivers.

Let’s look at a few examples.









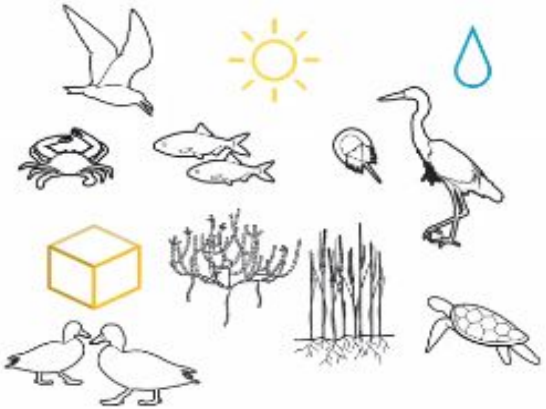






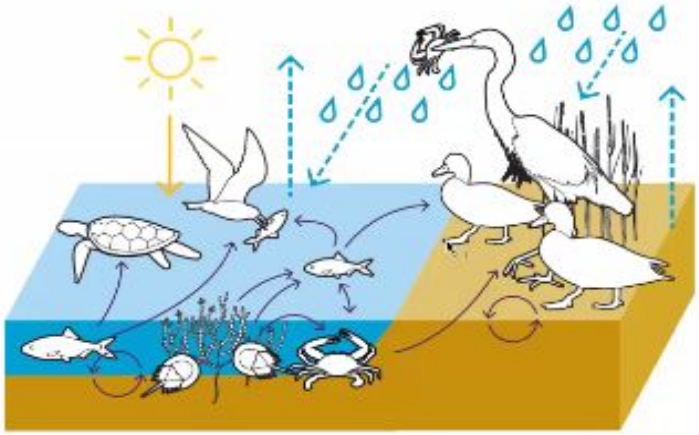
Components





Systems





As a team decide which of the following goals you will have in addition to stopping Erosion (choose two):

Beauty Habitat Pollination

Use only materials provided by nature

Wildlife Plant life Art/artistic

In an engineering project there are always CONSTRAINTS:

Examples - Time, Materials, Cost, Location

- In this challenge, you will have the constraints of time and materials

Collaboration - entire team:

- Discuss the sediment found in the bottom of your model
  - Why did that happen
- Discuss your plan to reduce the amount of sand that is at the bottom of the river
  - How could you use the recycled, reclaimed, natural materials collected by your teammates

Roles: Engineer-

- Using the natural materials members of your team collected
- Engineer the solution your team agreed upon
- Your goal is to slow or stop the erosion your team observed in the initial model.
- *Once it is created, set it on the table/desks, you will not add it to the model yet.*

Role: Scientist-

Recreate the initial riverbed model your team tested:

Make a landmass with the sand in one half of the tray

- Lightly drag a pen or pencil through the sand
- Create an “S” shape to which will act as the riverbed

Role: Artist/Architect-

Design your ecosystem:

- Replace rocks/river rock/stone along the riverbed.
- Work with your team to determine the best location for your engineered by nature solution, now you can add it to the model



Role: Communications-

- Once the model is reset, and the new addition inspired by nature is in place
- Run the water over the new design
- Record the results of the test
  - What changed?
  - What moved?
  - What was improved?
  - Did anything get worse?

Role: Artist-

- Draw a diagram of the new model, the engineered solutions that you added and any changes your team saw from the new design.
- Label items that were improved
- Label items that changed in other ways
- Label areas that became worse

Group Reflection:

- Take a moment to reflect on your design
  - Did you team meet your goal
  - Did you team stay within the constraints
  - What new idea do you have about using nature to inspire engineering solutions

Individual Reflection:

- What was the hardest part of this challenge for you
- What was the hardest part of this challenge for members of your team
- What did you learn about “Engineering with Nature” from this project

EVALUATION

During a Science Seminar, we will have a whole-class discussion led by you, the students. Using evidence and working together you will work to answer the Science Seminar Question.

How do humans change rivers?

- You will prepare for the whole-class discussion by first sharing your ideas with your partner.
  - Note- You ideas may chance when you hear your partner's argument. You may change your mind about the claim is most convincing, Scientists often change their minds as they gather more evidence.

Science Seminar Claims:

1. Deep, straight rivers provide important routes for moving goods down river.
2. Rivers have a lot of features like wildlife, plants, and geology that benefit humans.
3. Rivers that have been changed by humans can be restored by engineering with nature.
4. Weathering and erosion are a part of nature and they benefit the ecosystem.

Preparing for the whole-class discussion by first **sharing your ideas** with your partner.

1. Select the claim you think is the most convincing
2. Write down the evidence that you have to support that claim.
3. With your partner, practice stating your claim and provide the evidence and reasoning to support it.
4. Trade off, be sure that each person has a chance to speak and discuss the claims after you have each gone.

Science Seminar Claims:

1. Deep, straight rivers provide important routes for moving goods down river.
2. Rivers have a lot of features like wildlife, plants, and geology that benefit humans.
3. Rivers that have been changed by humans can be restored by engineering with nature.
4. Weathering and erosion are a part of nature and they benefit the ecosystem.

We are now moving on to the Science Seminar:

Scientists engage in a Science Seminar to have scientific discussions where ideas are shared, and they can question and challenge one another.

Today, the goal of our Science Seminar is to increase everyone's knowledge and come to a deeper understanding of weathering and erosion in rivers and streams.

Expectations during Science Seminar:

You, the students will:

- run the conversation.
- use evidence to support ideas.
- explain your thinking.
- listen to one another.
- respond to one another.
- be open to changing your mind.

Format of discussion during Science Seminar:

Inner Semicircle

Students who selected the claim will sit in the inner semicircle. These students will **share and discuss their ideas** about the evidence.

Outer Semicircle

The other portion of the class sits in the outer semicircle. These students will **listen and take notes.**

Switch Roles

Halfway through, students **switch positions and roles**

Move yourself into the portion of the circle you are assigned to start in.

As you do, you should have your claim, evidence, reasoning and something to take notes with.

- When directed, you will switch seats between the inner and outer semicircles.

Let's start today with this claim:

Weathering and erosion are a part of nature and they benefit the ecosystem.

If this is your claim, move into the inner circle.

Share your ideas about the evidence and the claims.

Let’s move on to this claim:

Rivers have a lot of features like wildlife, plants, and geology that benefit humans.

If this is your claim, move into the inner circle.

Share your ideas about the evidence and the claims.

Let’s move on to this claim:

Deep, straight rivers provide important routes for moving goods down river.

If this is your claim, move into the inner circle.

Share your ideas about the evidence and the claims.

Let’s move on to this claim:

Rivers that have been changed by humans can be restored by engineering with nature.

If this is your claim, move into the inner circle.

Share your ideas about the evidence and the claims.

Reflection:

Now that the science seminar is over, take a moment to reflect on your participation. Record the answers to the following questions in you science notebook.

1. After listening to others, you may have changed your mind. What claim do you currently think is the most convincing?
2. How prepared are you for participating in the seminar?

Now answer the question:

3. HOW DO HUMANS CHANGE RIVERS?

ResourcePage

References- used in Slideshow:

- Andy Goldsworthy- Land Artist Video: Rivers and Tides: Andy Goldsworthy
- Charles Jencks- Terrace Land Artist
- Arches National Park
- Wind Tree
- Living root bridges
- Terraces- natural, Rice terraces throughout Asia
- Images and video for Riverbed models
- Science Seminar modified from Amplify Science resources

Additional resources: Regional resources from across the country

- Search images of diatoms
- Little Island
- Rivers- Training , McCarran Ranch Sculptures
- Living Breakwaters

Engineering with Nature Resources:

- Engineering With Nature



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