

Lesson 2: Human Impact

Performance Expectation:

- MS-ESS3-3- Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Timing: 60- 90 minutes

Materials:

All experiments will require:

- A bin (1 bin if doing whole class demonstration or 1 bin per group)
- Enough soil/dirt to fill the bin halfway
- A bucket
- Water (enough for each group to use about 8 cups of water)

Exploring Debris Experiment:

- Exploring Debris Science Notebook Page (1 per student)
- Small miscellaneous items to act as debris
- Long object to act as a bridge

River Straightening Experiment:

- River Straightening Science Notebook Page (1 per student)
- 15-30 small objects to represent buildings, people, and debris (per group)

Removing Wetlands Experiment:

- Removing Wetland Areas Science Notebook Page (1 per student)
- An area of sidewalk, street, or pavement
- An area with dirt/soil or a bucket of dirt

Floodplain Building Experiment:

- Floodplain Building Science Notebook Page (1 per student)
- 15-30 small objects to represent buildings, people, and debris (per group)

Lesson Directions:

- Introduction – Exploring Debris (15-25 minutes)
 1. Tell students they are going to be learning about human impact on flood mitigation by doing an experiment.
 2. Pass out the Exploring Debris Science Notebook Page.
 - a. If doing virtually, ask students to open the document.
 3. If students still have their Flood Investigation Science Notebook Pages from Lesson 1 they can refer back to that to support their thinking.
 4. Have students write/type their answers as to why they think scientists were able to predict the flood of 1997 but not prevent it.
 - a. This part can also include a discussion where students share their answers after they have answered the question.

5. Have students think about ways people can help reduce the impacts of flooding since we cannot always prevent floods and write/type their answers.
 6. Have students think back to the Reno/Sparks level of the Flood Fighters game. Discuss with students why they think it was necessary to clear debris from under the bridge. What happened if they did not? Have the students write down their thoughts on their science notebook page.
 - a. This section could be done whole group or independently.
 7. Tell students they need the following materials for this next activity. They can work independently, small groups or in pairs.
 - a. A bin (roughly 10"x 10" but any size will work)
 - b. Enough soil/dirt to fill the bin halfway
 - c. A bucket of water (about 2 cups, enough to make their river "flow")
 - d. Small miscellaneous items to act as debris
 - e. Long object to act as a bridge
 8. Have students place their bin either propping one side up or on a sloped surface so when the water is poured in it will flow "downhill".
 9. Have students fill their bin halfway with dirt.
 10. Tell students to use their hands or a tool to carve a winding river into the dirt from one side of the bin to the other. The back of a spoon works really well.
 11. Tell students to place the long object 6 inches from the end of the river to act as a bridge.
 12. Have students put the little debris objects into the bucket of water.
 13. Ask students to make a prediction as to what they think is going to happen to the river when they pour the water with the debris down their river.
 - a. Have students share their answers aloud whole group or just write it down.
 14. Tell students to slowly pour the water into the beginning of their river (uphill side) until the bucket is empty of water and debris or until their river begins to flood being careful not to overflow their bins.
 15. Ask the students what they noticed happening when they poured their water and debris down their river.
 16. Students should understand that debris will build up against bridges and other obstructions along the river. This debris can prevent the water from flowing in its established channel. During high flows, the water will be forced to find a new route (over-top the river banks) by flooding bridges, riverbanks and the surrounding areas as seen in downtown Reno in the flood of 1997.
 17. Ask the students what they think people can do to reduce this type of flooding from happening in the future.
- River Straightening (15-25 minutes)
 1. Pass out the River Straightening Science Notebook Page.
 - a. If doing virtually, ask students to open the document.

2. Tell students they need the following materials for this next activity:
 - a. A bin (roughly 10"x 10" but any size will work)
 - b. Enough soil/dirt to fill half the bin
 - c. A bucket of water (about 2 cups, enough to make their river "flow")
 3. Have students place their bin either propping one side up or on a sloped surface so when the water is poured in it will flow "downhill".
 4. Have students fill their bin halfway with dirt.
 - a. This activity can be done in groups or individually.
 5. Tell students to use their hands or a tool to carve a straight line into the dirt from one side of the bin to the other.
 6. Ask students to predict what they think is going to happen to the river when they pour the water.
 - a. Have students share their answers aloud whole group or just write it down.
 7. Tell students to slowly pour the water into the uphill end of their river until the bucket is empty of water.
 8. Ask the students what they noticed happening to the river when they did that.
 9. Have students drain the water back into the bucket as much as possible or set up the experiment again.
 10. This time tell students to carve a curvy line into the dirt from one edge of the bin to the other.
 11. Ask students to predict what they think is going to happen to the river when they pour the water this time.
 - a. Have students share their answers aloud whole group or just write it down. Discuss why they think the results will be the same or different from the straightened river.
 12. Tell students to slowly pour the water into the uphill end of their river until the bucket is empty of water.
 13. Ask the students what they noticed happening to the river when they did that.
 14. Ask students what they think of straightening the river as a form of flood control.
 15. Students should understand that straightening the river forces water to move more quickly and does not allow for sediment to be deposited slowly along river banks but instead collects and continues to move downstream. When the sediment encounters obstacles in the river, such as bridges, it gets caught and accumulates. This can "clog" the river.
- Floodplain Building (15-25 minutes)
 1. Pass out the Floodplain Building Science Notebook Page.
 - a. If doing virtually, ask students to open the document.
 2. Explain to students that as the number of people living in the Reno/Sparks area grows, the city has to grow too. That generally leads to more housing developments being built in the floodplain (the low-lying lands next to rivers and streams). With new buildings in floodplains comes new challenges. Development in the floodplain decreases the amount of water

that be absorbed by the ground and increases the amount of debris that can be washed downriver during a flood event.

3. Tell students they need the following materials for this next activity:
 - a. A bin (roughly 10"x 10" but any size will work)
 - a. Enough soil/dirt to fill half the bin
 - b. A bucket of water (about 2 cups, enough to make their river "flow")
 - c. 15-30 small objects to represent buildings, people, and debris
 4. Have students place their bin either propping one side up or on a sloped surface so when the water is poured in it will flow "downhill".
 5. Have students fill their bin halfway with dirt.
 - a. This activity can be done in groups or individually.
 6. Tell students to use their hands or a tool to carve a straight river into the dirt from one side of the bin to the other.
 7. Tell the students to set up the small objects in various places on either side of their "river." Have them place some of them closer to the river and some of them a little farther back. (Some inside the floodplain and some outside of the floodplain)
 8. Ask students to make a prediction as to what they think is going to happen to the river when they pour the water.
 - a. Have students share their answers aloud whole group or just write them down.
 9. Tell students to slowly pour the water into the uphill end of their river until the bucket is empty of water.
 10. Ask the students what they noticed happening to the river when they did that.
 11. Have students drain the water back into the bucket as much as possible or set up the experiment again.
 12. This time tell students to carve a curvy river into the dirt from one edge of the bin to the other.
 13. Ask students to make a prediction as to what they think is going to happen to the river when they pour the water.
 - a. Have students share their answers aloud whole group or just write them down.
 14. Tell students to slowly pour the water into the uphill end of their river until the bucket is empty of water.
 15. Ask the students what they noticed happening to the river when they did that.
 16. Explain that the area that flooded is called a floodplain. Floodplains are areas of land surrounding rivers and streams that flood when the river becomes too full.
 17. Ask students if they think building on a floodplain is a good idea or not and why.
- Closing – Removing Wetlands (15-25 minutes)

This demonstration is best done outside in an area that has both dirt and paved areas.

 1. Pass out the Removing Wetlands Science Notebook Page.

- a. If doing virtually, ask students to open the document.
2. Tell students they need the following materials for this next activity:
 - a. Two cups of water
 - b. An area of sidewalk, street, or pavement
 - c. An area with dirt/soil or a bucket of dirt
3. Tell students to find an area of pavement or cement.
4. Ask students to make a prediction as to what they think is going to happen to the water when they pour it on the pavement or cement. (Will it be absorbed or run off?)
5. Have students pour a cup of water onto the pavement.
6. Ask the students what they noticed happening to the pavement when they did that.
7. Tell students to find an area with dirt or to use a bucket with dirt.
8. Ask students to make a prediction as to what they think is going to happen to the water when they pour it on the dirt/soil . (Will it be absorbed or run off?)
9. Have students pour one of the cups of water onto the dirt.
10. Ask the students what they noticed happening to the dirt when they did that.
11. Students should see that soil absorbs water while pavement does not. Explain to students that areas such as wetlands are places where rivers can overflow safely and help to reduce flooding effects on surrounding areas.
12. Ask students, “After looking at the different ways humans can impact flooding, how do you think we can reduce the severity of floods?”
 - a. This can be done as a think, pair, share, a whole class discussion, or individually.