Stormwater

NorthBay

Name: **Date:**

Click to watch: Introduction to Stormwater with Ms. Jackie!

What You Will Need: for the STORMWATER SLEUTH section, a golf ball or tennis ball; For the INVESTIGATE section, an internet connection and access to Google Earth on a tablet or laptop, **OR** a 100' measuring tape, **OR** a measuring tool on your phone.

Stormwater Sleuth: Track Water Movement In Your Community

Step 1: Find the highest point of the land you see, and with your feet firmly planted on the ground, predict where the ball, which represents a raindrop, will travel when you drop it.

Step 2: Drop the ball and follow it. Repeat a few times, keeping yourself safe.

Step 3: What do you notice? Was your prediction correct?

Let's continue the stormwater sleuthing journey. If you can do this in the rain, even better. Do not go outside during a thunderstorm, however. **Please document your journey!**

Low Tech Option: Use the lines below to take notes or sketch what you discovered.
Medium Tech Option: Using your phone, take photos or make a voice recording. You can share your results with your teacher at the end of the activity.

Step 4: Identify every impervious (hard surface, water runs off) you see. Name them out loud. (“Sidewalk,” “driveway,” “parking lot,” “roof,” etc.)

Step 5: If it is raining, watch water hit impervious surfaces, collect and move. Notice how fast it travels.

Step 6: If you are looking up at a roof, find the gutters. If water flows into a gutter that leads underground, determine where the water goes to next. (It may go into the stormwater system which oftentimes bypasses water treatment and dumps directly into a nearby waterway.)

Step 7: Notice where the water soaks in (pervious surfaces.) Trees, forests, grass, shrubs, meadows and weeds all help capture stormwater, although some, like forests, capture more than others, such as lawns.

Step 8: Notice what gets picked up and moved: trash, oil, sediments, etc. Think about where the water will flow to next.

Step 9: Look closer. Find where water puddles instead of soaking in the soil.

Step 10: Find evidence of erosion.

Figure 1. Evidence of erosion at a construction site.

Figure 2. An eroding trail.

Step 11: Look for evidence of deposition (piles of sand, pebbles, trash).

Figure 3. Deposition (of eroded materials) at a construction site.

Now that you know how to read the clues that reveal how water moves in our built landscapes, let's continue with an investigation.

Investigate!

Here is the question we invite you to research: To what extent does your home or school contribute to stormwater runoff?

The systematic, thoughtful steps you follow to answer the question is your **Procedure**:

- There are three options for collecting measurements: low tech, medium tech, and high tech. You can check your accuracy by doing more than one.
- Get a pencil, measuring tape (low tech), or phone (med tech) or tablet/laptop (high tech).
- Determine what impervious surface(s) you will measure in addition to the building(s). Is there a sidewalk, a driveway, or a parking lot? Plan to measure them.

Option 1 Low Tech:

Step 1: Grab your measuring tape and go outside. Measure the length and width of each impervious surface to determine the impervious surface area.

Step 2: Record measurements in **CHART 2.** (round measurements to the nearest whole foot)

Step 3: Add all measurements together and record the **total area** at the bottom of **CHART 2.**

Step 4: Transfer the total square feet of area to **CHART 3.**

TIP: Measuring irregular shapes? Make them into standard shapes like squares, rectangles, and triangles to make calculating the area easier.

Here are a few equations to help you find the area of different shapes:

Area of a rectangle	L x W (Length x Width)
Area of a triangle	½ bh (b= base of triangle, h = height)
Area of a square	L^2 (L x L)
Area of a circle	$\pi \times r^2$ (π = pi, r = radius)

CHART 1: SAMPLE CHART

Impervious Surface Name	Dimensions	Area
Ex. NorthBay Gym	86 ft x 126 ft	10,836 sq ft
Ex. Triangular Gym Deck b = 16 ft, h = 95 ft	½ (16 ft x 95 ft)	760 sq ft
Total	→	11, 596 sq ft

CHART 2: YOUR IMPERVIOUS SURFACE DATA

Impervious Surface Name	Dimensions	Area
Total	→	

Option 2 Medium Tech:

Step 1: Use the measuring tool on your phone to find the dimensions of impervious surfaces.

Step 2: Record the measurements **CHART 2.**

Step 3: Add them together and record the **total area** at the bottom of **CHART 2.**

Step 4: Transfer the total square feet of area to **CHART 3.**

Option 3 High Tech (Laptop, Tablet, use Google Earth)

Step 1: Find your residence on GOOGLE Earth. Our example uses NorthBay's Rocky Point Gym.

Step 2: Zoom in so you can clearly see the edges of impervious surfaces.

Step 3: Find and click the measuring tool on Google Earth. (It looks like a ruler). You'll be prompted to select a starting point.

Step 4: Click points as needed to accurately outline the space. When the space is outlined, close the shape to find the area.

Step 5: Change the answer to square feet by clicking on the small arrow next to the "Area."

Step 6: Record the area for each impervious surface in **CHART 2.**

Step 7: Add them up and record the total area at the bottom of **CHART 2**.

Step 8: Transfer the total square feet of area to **CHART 3** to calculate the amount of stormwater that flows off the impervious surfaces where you live. Refer to the example if you need clarification.

Figure 4.

ANALYSIS

EXAMPLE Stormwater Runoff: NorthBay's Rocky Point Gym and deck:	
Total Impervious Surfaces:	11,596 square feet
Stormwater Calculation:	
1. Convert square feet to square inches:	11, 596 sq feet x 144 sq inches = 1,669,824 square inches
2. Determine how many cubic inches of rain based on area and a **1.0 inch rainfall:**	1,669,824 square inches x 1.0 inch of rainfall = 1,669,824 cubic inches of rainfall
3. Convert cubic inches of rainfall to gallons of water:	1,669,824 cubic inches ÷ 231 cubic inches= 7,228 gallons
4. Multiply this result by 44 inches, the average amount of rain MD receives in a year[1]:	7,228 gallons x 44" = **318,061 gallons of water a year coming off of one roof and deck!**

CHART 3: STORMWATER RUNOFF

TOTAL for Research Area:	
Total Impervious Surfaces:	_____ square feet
Stormwater Calculation:	
1. Convert square feet to square inches:	_____ sq feet x 144 sq inches = _____ square inches
2. Determine how many cubic inches of rain based on area and a **1.0 inch rainfall:**	_____ square inches x 1.0 inch of rainfall = _____ cubic inches of rainfall
3. Convert cubic inches of rainfall to gallons of water:	_____ cubic inches ÷ 231 cubic inches= _____ gallons of water
4. Multiply this result by 44 inches, the average amount of rain MD receives in a year[2]:	_____ **gallons x 44" =** _____ **gallons of stormwater runoff a year**
5. Share data in the google form and then click on LIVE link	Click here!

The bottom line is that impervious surfaces in our built environments lead to a lot of water with nowhere to go. This is why we need you to be stormwater savvy! Stormwater runoff has significant impacts on our communities. Please take a few minutes to reflect on your communities, and then we will invite you to take some action.

[1,2] If you live in PA, the state receives on average 42" a rain a year.

CONCLUSION

Now, please tell us what you found. Write your conclusion and include responses to:

- What did you do?

- What did you discover?

- What else do you wonder about stormwater runoff in your community?

Character Connection

- Describe your community. Who are the people, places, and things that make your community work?

- Sometimes our community will experience difficult times. Describe a challenge your community has faced recently.

- Just like we need to repair the damages from storm water runoff, how can we begin to repair damaged relationships in our community?

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And now it is time for **ACTION!** What will you do?

Here are some ideas! Pick one or more, do it (or them), then tell us about it by emailing us at: nbmedia@northbayadventure.org, follow us on social media, & #NorthBayEducation your posts.

- **Teach people about stormwater runoff.**
- **Replace a patch of lawn with native plants (conservation plantings) to absorb more runoff:**
  a. National Wildlife Federation Native Plant Finder [BETA]
  b. Native Plant Suppliers
  c. Chesapeake Bay Watershed Native Plants
- **Plant native trees (native plants and trees help prevent stormwater runoff and provide habitat for birds, bugs, frogs, salamanders, and mammals. And, they are beautiful!)**
- **Join a tree planting in your area.**
- **Learn more about green infrastructure in your community: rain gardens, pervious pavers, rain barrels, conservation plantings, green roofs, swales, curbside rain gardens etc.**
- **Join a local community group that is installing green infrastructure projects. (Be sure green infrastructure experts are on the team.)**
- **Create a walking/biking tour of green infrastructure projects in your community to spread awareness.**

Click to watch: Stormwater Video Wrap Up