Modeling Flood Dynamics with Rubber Ducks Lab TEACHER KEY

Purpose:
Students model how natural and human-made changes impact water flow, sedimentation, and aquatic life during flooding. This supports understanding of ecosystem dynamics, human impact, and environmental resilience.

Part 1: Water Movement & Debris

Activity: Students blow through straws to create ripples and observe rubber duck movement.

Expected Observations:

- Ducks move with current; stronger "wind" moves them faster or unpredictably.
- Objects may get trapped near edges or obstacles.

Biology Connection:

- Floodwaters carry **organic and inorganic debris**, affecting stream ecology.
- Debris can block fish passages, uproot vegetation, or displace organisms.

Key Takeaway:
Water flow affects mobility of organisms and distribution of resources.

Part 2: Building and Breaking a Dam

Activity: Students construct a dam with clay/sponges, observe what happens when water builds and the dam "fails."

Expected Observations:

- Upstream flooding or pooling occurs.
- Sudden downstream surge displaces ducks and mixes materials.

Biology Connection:

- Sudden changes in flow can cause **fish kills**, wash away **spawning beds**, or flood riparian zones.
- Dams (real or simulated) disrupt **ecosystem connectivity**, altering migration and nutrient flow.

Key Takeaway:
Human-made structures impact water ecosystems and can cause ecological disruptions when they fail.

Part 3: Simulating Terrain

Activity: Students add pebbles, sand, and rocks to simulate natural terrain.

Expected Observations:

- Water flows differently around each material; pooling or faster channels form.
- Ducks may slow down or get redirected.

Biology Connection:

- Diverse riverbed materials create **microhabitats** (e.g., gravel for fish spawning).
- Changes in terrain (like urban development) alter flood behavior and ecosystem health.

Key Takeaway:
Physical geography shapes ecosystem structure and response to floods.

Part 4: Impact on Aquatic Life

Activity: Orbeez = aquatic organisms; sand or dirt stirred to simulate sedimentation.

Expected Observations:

- Water becomes cloudy.
- Orbeez are harder to see or may "sink" in sediment.

Biology Connection:

- Sediment blocks light → reduces photosynthesis in aquatic plants.
- Sediment clogs gills, smothers eggs, and decreases water quality.
- Floods can transport **pollutants**, further stressing aquatic life.

Key Takeaway:
Sedimentation and turbidity during floods harm aquatic ecosystems.