Dam Removal – River Restoration Residency Program – Session 1 Teacher Notes

River Systems PowerPoint

Slide 1 – *River Systems*

Slide 2 – Running water is part of Earth's hydrologic system and is the most important agent of erosion.

Slide 3 – Stream valleys are the most abundant and widespread landforms on the continents.

Slide 4 – A river system consists of a **main channel**,

Slide 5 – and all of its **tributaries.**

Slide 6 – *A river system can be divided into three subsystems;*

Slide 7 – a **collecting** system,

Slide 8 – a **transporting** system,

Slide 9 – and a **dispersing** system.

Slide 10 – *Boundaries:*

Slide 11 – A river system is bounded by a divide (ridge), beyond which water is drained by another system.

Slide 12 – The divide defines the **watershed** or **drainage basin**.

Slide 13 – *Sediment*

Slide 14 – Rivers erode sediment by **removal of regolith**,

Slide 15 – downcutting of the stream channel by abrasion, and

Slide 16 – headward erosion.

Slide 17 – There is enough energy in the running water to transport the sediment downstream. (Geologists call this process **sediment transport.)**

Slide 18 – Most of a river's sediment is **deposited** where the river empties into a lake or ocean. When a river enters a lake or ocean the water slows down and there is not enough energy to move the sediment further.

Slide 19 – This deposition commonly builds a **delta** at the river's mouth.

Slide 20 – *Variables is stream flow*

Slide 21 – Discharge is defined as the amount of water passing a given point in a specific interval of time.

Slide 22 – Gradient us the steepness or slope of the channel. Gradient is steepest at the headwaters and decreases downstream.

Slide 23 – Velocity is simply the speed of the water and is closely related to gradient.

Slide 24 – Sediment load is the amount of sediment being transported by the river.

Slide 25 – The **base level** of a stream is the lowest level to which a stream can erode. This is effectively the elevation of the stream's mouth where it enters the ocean, a lake, or another stream.

Slide 26 – *Equilibrium*

Slide 27 – All river systems naturally adjust these variables to reach a state of **equilibrium**, or a balance point.

Slide 28 – If one variable, such as base level, is changed the other variables will change too and establish a new **equilibrium**,

Slide 29 – As you've seen, **equilibrium** can look like many things depending on the variables. The important point is that rivers change in response to changes in the system.

Slide 30 – *People change rivers* too.

Slide 31 – People change rivers by building **dams** to control water, generate power, etc.,

Slide 32 – by building **locks** and **dams** through areas of steep slope and **dredging** channels (making them deeper) to facilitate shipping, and

Slide 33 – by **changing the surface of the watershed** (which may changes how quickly water enters the river as well as the amount of sediment it contains).

Slide 34 – Now that we know about river systems in general lets look at a specific river system: The Elwha river in Washington State.

Slides 35-37 – Zoom in on the Elwha Basin.

Maps Investigation

*Hand out Map 1 – **Slide 38***

Q: Look at the map. What can you tell me about the Elwha River System?

Hand out markers

Trace the Elwha from its delta/sink to its beginning/headwaters.

Trace the bigger tributaries also.

Trace the outline of the watershed by following the divide/ridge around the rivers. Line should not cross any rivers.

The land that you just outlined is the Elwha River Drainage Basin / Watershed.

*Hand out Map 2 and 3-D glasses – **Slide 39***

3 – 5 minutes of discovery. List as many things that you can see or learn about the Elwha River System from this map.

Identify and trace the watershed boundary.

Q: What changes have people made in the landscape and river system?

Hand out Map 3 – Lake Mills

Q: How was Lake Mills created?

Q: How do people use Lake Mills?

Q: Why are we looking at Lake Mills if this is a class about River Restoration?

What's Next?

Next, using working models of Glines Canyon, students map and make qualitative observations of the system as it changes over time under different dam removal scenarios developed by the students. Students then identify dependent and independent variables, form hypotheses, plan and conduct experiments, and collect quantitative data on different dam removal scenarios. The residency then engages students to interpret, critique, and compare the data the groups collected, to identify and design other research questions that could be pursued using the equipment at hand, and ultimately to develop and advocate a recommendation for the "ideal" dam removal scenario.