Lesson Title	**Lesson 7 – Flood Risk Management**
Time	1-50 min class period If you have access to stream tables – combine this lesson with lessons 4 and 5 to allow students to have more access to the stream tables with smaller group sizes. For example - on day 4 of this unit, have two small groups of students at stream tables working on "Lesson 4 - Young Stream and Stream Cutoffs" and have two groups of students working on "Lesson 6 - Flooding Causes". The following day, swap these two groups. On days 6 and 7, split groups between "Lesson 5 - The Great Flood" and "Lesson 7 - Flood Risk Management".
Resources	● Flooding Risk Management Worksheet
Objective	SWBAT describe flood risk management strategies and their benefits and drawbacks.
Standard	HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
Plan	**Introduction** ● Ask students what type of flood control structures they see in their communities. ● Have students share their ideas with a partner and make a class list of all ideas **Activity** ● Students will watch "How Do Flood Control Structures Work?" video on YouTube and complete the table on the Flood Risk Management Worksheet. ● Students will then watch "How "levee wars" are making floods worse" on YouTube ● Have students read the hypothetical scenario and answer the discussion questions. **Closing** ● As a class, discuss how students answered the discussion questions, include all viewpoints
Authors	Amanda Oanes and Jill Wold – West Fargo Public Schools
Acknowledgements	The curriculum was developed under National Science Foundation RET grant #1953102. However, these contents do not necessarily represent the policies of the National Science Foundation, and you should not assume endorsement by the federal government.

Flood Risk Management

Part 1 – Flood Control Structures

- Watch the video "How do Flood Control Structures Work?" on YouTube
- Fill out the following table on the benefits and drawbacks on the different flood control methods

Flood Control Structure	Description	Benefits	Drawbacks
Levees			
Diversions			
Dams / Reservoirs			
Strategic Development			

Part 2 – River Management Stakeholders

- Watch "How "levee wars" are making floods worse" video on YouTube
- Read the following hypothetical scenario:

The city of Hendrum, MN (300 residents) received a proposal from a wealthy residential developer that wants to pay for the installation of levees along the Red River and Wild Rice River north of Hendrum to build a country club community between the two rivers. This community will include large riverside homes for commuters to Fargo or Grand Forks and a country club with a pool and beautiful destination golf course. Six miles downstream of Hendrum is Halstad, MN (600 residents). The residents of Halstad fear that this development will cause increased flood damage to their community because the inundation of flood waters will increase due to the presence of levees upstream. However, both cities would benefit greatly from an increase in money being spent in their communities.

Discussion:

What are the pros and cons of installing the levees and creating this country club community?

Pros	Cons

Do you think that the levees should be installed? Provide reasoning that supports your decision.

Describe an alternative flood control method that either community could use to improve the flood risk management for both communities. (Hint: look at Part 1 for ideas!)

KEY

Flood Control Structure	Description	Benefits	Drawbacks
Levees	Earthen embankments or concrete walls that make the banks of the river higher	Protect developed areas Areas outside levees flood less frequently Simple	Always possible to have extreme event that erodes or breaches levee
Diversions	Human made channels used to divert flood waters to undeveloped flood areas	Can use in highly developed areas	Can affect other areas
Dams / Reservoirs	Impound and store large volumes of water	Can store extreme flood event water and release slowly over time	If reservoir is full, flood waters must be released Frustrating for residents who thought they were protected
Strategic Development	Reserving or converting the floodplain for natural wetlands, parks, trails, etc	Property buyouts are cost effective	Not politically popular

Discussion:

What are the pros and cons of installing the levees and creating this country club community?

Pros	Cons
Answers will vary, but the following should be included: ● Hendrum will be protected from higher flood levels ● Brings money into the communities	Answers will vary, but the following should be included: ● Increased flooding in Halstad

Do you think that the levees should be installed? Provide reasoning that supports your decision.

Answers will vary.

Describe an alternative flood control method that either community could use to improve the flood risk management for both communities. (Hint: look at Part 1 for ideas!)

Answers will vary. Should talk about diversions, dams/reservoirs, or strategic development.