Extreme Weather & Cloud Physics

Companion Guide for *Bullheaded* Chapters 1-13

STEAM Framework:	Primary Discipline: Physical Science Secondary Connections: Art, Math, Literature
Target Grade Level	Grades 4-6
Time Horizon	45-60 minutes
What's included:	1. Quick Links: Curated digital resources (online lessons) 2. Step-by-Step Lesson Plan 3. Hands-On Activities 4. Read-Aloud Book Connections and Discussion Prompts 5. Vocabulary Definitions, Student Word-Match Worksheet, and Teacher Answer Key
Book Connection	Chapters 1-13, *Bullheaded*
Art Connection Math Connection	Link to Lesson 4: How Artists Use Elements to Create Space <insert hyperlink to M1.U1.L4-Art_Spatial Tools-Cloud Study> Link to M1.U1.L3_Math Topic *(coming soon)*

Quick Links: Curated Digital Resources

Resource	**Link**
Core Lesson 30 minutes	NOAA JetStream Online School for Weather: Thunderstorms A detailed background text covering ingredients, life cycles, and hazard identification.
Hands-On Activity 10-15 min.	SciJinks Activity: How Much Water Can a Cloud Hold? Students explore cloud saturation and Fast Facts about rainfall Book question asks students to estimate how much rain fell in Scrub Oak in the "Storm of the Century."

Step-by-Step Lesson Plan

1. **Read for Background:** Read Chapters 1-13 of *Bullheaded* to set the context.
2. **Explore Atmospheric Physics:** Open the **NOAA JetStream** link. Read *"Introduction to Thunderstorms"* topics: how a thunderstorm cell grows, what makes it dissipate, and hazards it may bring.
3. **Conduct the Cloud Lab:** Complete the **SciJinks Hands-On Activity** to simulate a storm cloud's water capacity before it collapses into rain. Read the accompanying ***Fast Facts*** sidebar that estimates gallons of water in one inch of rain over one square mile, and compares the weight of that water to more than 10,000 elephants.
4. **Discuss the Story:** Prompts to check literal comprehension and analytical skills
5. **Optional:** Teach and test vocabulary (definitions provided)

@ 2026 Martha Stott. All rights reserved. Teachers may copy for classroom use.

Hands-On Activity: How Much Water Is In That Cloud?

Activity 1: 15 minutes	**Materials**: Cotton balls, cups, water, eyedropper. Paper and pencil to record results.
Book Connection (math link) 5 minutes	Based on SciJinks Fast Facts (or other web research), how many tons of water do you think fell over Scrub Oak to cause Turkey Creek to flood?

Evidence of Learning (What to Check)

- **Lab Data:** Verify the student's completed data table or drawing showing how many drops of water their simulated "cotton cloud" held before it saturated and precipitated. Ask students to give reasons for why different cotton ball "clouds" held different numbers of drops of water.
- **Critical Thinking Math:** Students should correctly state that 1 inch of rain over 1 square mile weighs **145 million pounds (72,500 tons)**. Since seven inches of rain fell over three hours, students should conclude that the "Storm of the Century" dropped hundreds of thousands of tons of water over the area. (72,500 tons x 7 = 217,500 tons)

Read Aloud Connections and Discussion Prompts

Directions to Students: Review the key book passage below. Use evidence from the book and your lab discoveries to answer the discussion prompts.

Key Book Passage (Chapter 9, Page 36):

"…I scanned the story. The storm dumped more than seven inches of rain across the region in less than three hours. Local creeks couldn't handle the runoff. Several flooded, even tiny tributaries that didn't have a name. One rancher lost three cows that drowned when a normally dry gulch flooded his pasture."

- **Prompt 1 (Literal Comprehension):** How many inches of rain fell when the storm passed through? What did the newspaper call this weather event?
- **Prompt 2 (Analytical STEAM Application):** What immediate hazards or structural damage did the storm cause? Why couldn't local streams and tributaries handle the runoff?
- **Prompt 3 (Story Meaning & Speculation):** Why was a candy bar wrapper the only thing left in the cab of the flooded truck? Why does Grace think the candy bar wrapper is a clue?

@ 2026 Martha Stott. All rights reserved. Teachers may copy for classroom use.

Vocabulary & Idiom Definitions

GRADE 4

capacity (noun): The maximum amount of liquid or moisture that an object or cloud can hold.

"Early bird gets the worm" (idiom): An expression meaning that those who arrive first or take action immediately will succeed.

flash flood (noun): A sudden, rapid flooding of low-lying areas caused by intense, heavy rainfall.

precipitation (noun): Any form of water, like rain, snow, or hail, that falls from clouds to the ground.

scuttle (verb): Moving quickly or scurrying with short, fast steps.

spigot (noun): A plumbing valve or outdoor faucet used to control the flow of water.

squelch (verb): To make a soft, sucking, squishy sound, like walking through deep mud.

water vapor (noun): Water in its invisible, gaseous state floating in the air.

GRADE 5

cumulus cloud (noun): A puffy, fluffy, low-level cloud with a flat base that can build into a storm.

diligent (adjective): Showing steady, careful, and hard-working effort in your duties.

exaggerate (verb): To represent something as being larger, better, or worse than it actually is.

gulch (noun): A small, narrow, and sharp ravine or ditch carved out by rushing water.

optimistic (adjective): Feeling hopeful, positive, and confident about the future.

saturation (noun): The state of being completely full of moisture so that no more can be absorbed.

updraft (noun): A strong, localized upward current of warm air that feeds a growing storm.

volume (noun): The total three-dimensional space occupied by an object or air mass.

GRADE 6

brazen (adjective): Bold, shameless, and completely lacking respect for authority.

brusque (adjective): Abrupt, blunt, or sharp in speech and social mannerisms.

@ 2026 Martha Stott. All rights reserved. Teachers may copy for classroom use.

condensation (noun): The thermodynamic process where cooling water vapor transforms back into liquid water droplets.

density (noun): The measure of how tightly packed mass or air molecules are within a given space.

downdraft (noun): A column of sinking, rain-cooled air that pushes down toward the ground.

eminent domain (noun): The legal power of the government to take private property for public use.

hypothetical (adjective): Based on a "what-if" imaginary scenario rather than an absolute fact.

inversion (noun): A warm layer of air aloft that acts like a lid, trapping storm instability below.

“opening a Pandora’s box” (idiom): An allusion meaning an action that creates a flood of unexpected and unpredictable troubles.

TEACHER ANSWER KEYS TO PRINTABLE STUDENT WORKSHEETS

PAGES 5-6-7

Vocabulary Matching Keys

- **Grade 4 Worksheet:** 1-E, 2-G, 3-B, 4-F, 5-H, 6-C, 7-D, 8-A
- **Grade 5 Worksheet:** 1-C, 2-E, 3-G, 4-H, 5-B, 6-A, 7-D, 8-F
- **Grade 6 Worksheet:** 1-E, 2-F, 3-I, 4-A, 5-G, 6-C, 7-D, 8-B, 9-H

@ 2026 Martha Stott. All rights reserved. Teachers may copy for classroom use.

GRADE 4: STUDENT WORKSHEET: CHAPTERS 1–13 VOCABULARY

Student Name: _____ **Date:** _____

Instructions: Match the word, phrase, or technical term on the left with its correct definition on the right by writing the correct letter in the blank space provided.

Word / Phrase / Term
1. Spigot _____
2. Squelch _____
3. Scuttle _____
4. "Early bird gets the worm" _____
5. Capacity _____
6. Flash flood _____
7. Precipitation _____
8. Water vapor _____

	Definition / Meaning
A	Water in its invisible, gaseous state floating in the air.
B	Moving quickly or scurrying with short, fast steps.
C	A sudden, rapid flooding of low-lying areas caused by intense rainfall.
D	Any form of water (like rain, snow, or hail) that falls from clouds to the ground.
E	A plumbing valve or outdoor faucet used to control the flow of water.
F	An expression meaning that those who arrive or act early will succeed.
G	To make a soft, sucking, squishy sound, like walking through deep mud.
H	The maximum amount of liquid or moisture that an object or cloud can hold.

@ 2026 Martha Stott. All rights reserved. Teachers may copy for classroom use.

GRADE 5 STUDENT WORKSHEET: CHAPTERS 1–13 VOCABULARY

Student Name: _____ **Date:** _____

Instructions: Match the word, phrase, or technical term on the left with its correct definition on the right by writing the correct letter in the blank space provided.

Word / Phrase / Term		Definition / Meaning
1. Diligent _____	**A**	The state of being completely full of moisture so that no more can be absorbed.
2. Exaggerate _____	**B**	A puffy, fluffy, low-level cloud with a flat base that can build into a storm.
3. Gulch _____	**C**	Showing steady, careful, and hard-working effort in your duties.
4. Optimistic _____	**D**	A strong, localized upward current of warm air that feeds a growing storm.
5. Cumulus cloud _____	**E**	To represent something as being larger, better, or worse than it actually is.
6. Saturation _____	**F**	The total three-dimensional space occupied by an object or air mass.
7. Updraft _____	**G**	A small, narrow, and sharp ravine or ditch carved out by rushing water.
8. Volume _____	**H**	Feeling hopeful, positive, and confident about the future.

@ 2026 Martha Stott. All rights reserved. Teachers may copy for classroom use.

GRADE 6 STUDENT WORKSHEET: CHAPTERS 1–13 VOCABULARY

Student Name: _____ **Date:** _____

Instructions: Match the word, phrase, or technical term on the left with its correct definition on the right by writing the correct letter in the blank space provided.

Word / Phrase / Term		Definition / Meaning
1. Brazen _____	**A**	An absolute statement or thought based on a "what-if" imaginary scenario.
2. Brusque _____	**B**	A column of sinking, rain-cooled air that pushes down toward the ground.
3. Eminent Domain _____	**C**	The process where cooling water vapor transforms back into liquid water droplets.
4. Hypothetical _____	**D**	The measure of how tightly packed mass or air molecules are within a given space.
5. "Opening a Pandora's Box" _____	**E**	Bold, shameless, and completely lacking respect for authority.
6. Condensation _____	**F**	Abrupt, blunt, or sharp in speech and social mannerisms.
7. Density _____	**G**	An allusion meaning an action that creates a flood of unexpected and unpredictable troubles.
8. Downdraft _____	**H**	A warm layer of air aloft that acts like a lid, trapping storm instability below.
9. Inversion _____	**I**	The legal power of the government to take private property for public use.

@ 2026 Martha Stott. All rights reserved. Teachers may copy for classroom use.