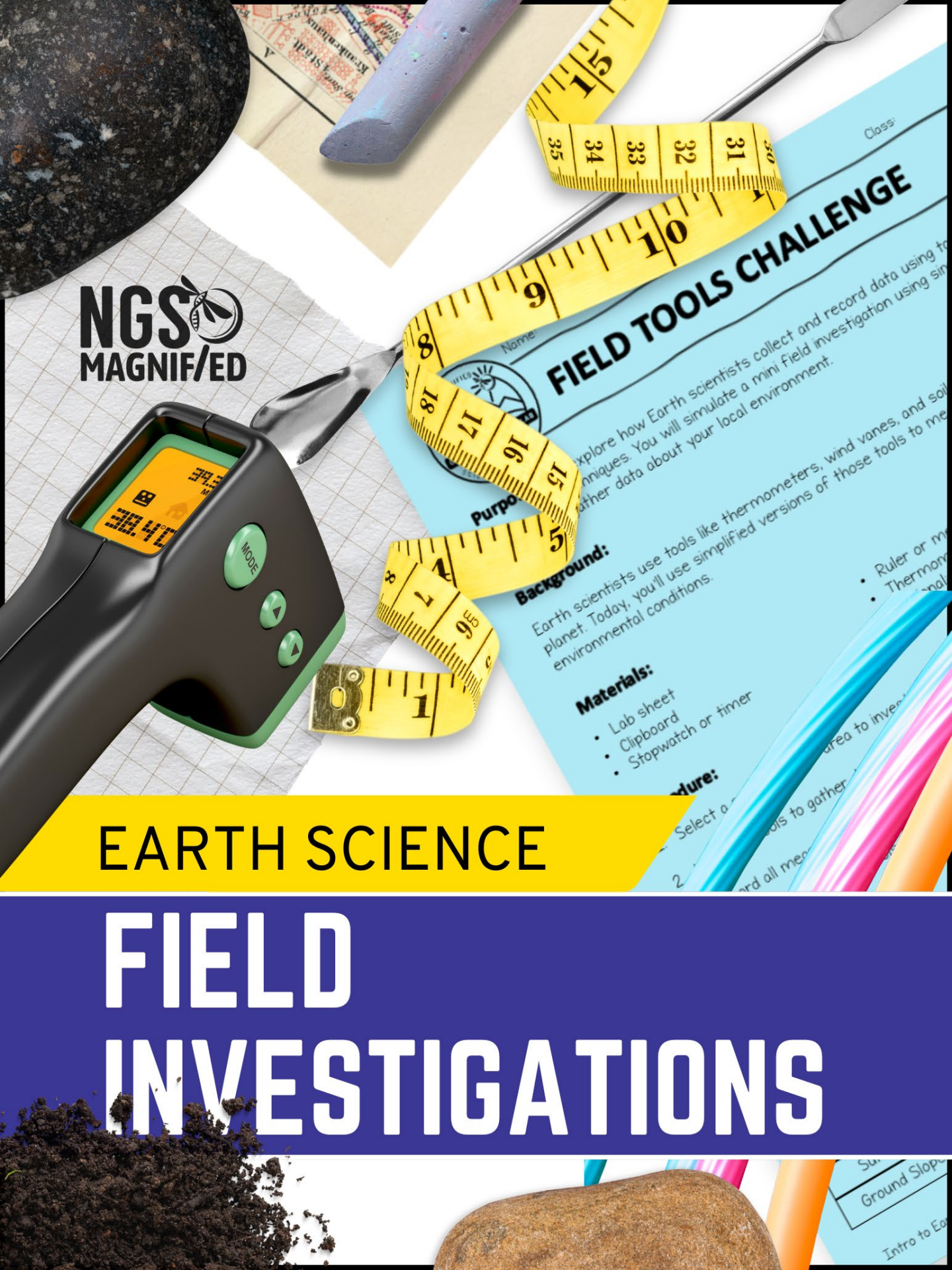




NGS
MAGNIF/ED

FIELD TOOLS CHALLENGE

Name _____

Purpose

Background:

Explore how Earth scientists collect and record data using techniques. You will simulate a mini field investigation using simple tools to gather data about your local environment.

Materials:

- Lab sheet
- Clipboard
- Stopwatch or timer

Procedure:

1. Select a small area to investigate.
2. Use all measurement tools to gather data.

- Ruler or measuring tape
- Thermometer

EARTH SCIENCE

FIELD INVESTIGATIONS

Introduction to Field Investigations

Welcome to the **NGS Magnified Field Investigations**, an original collection of hands-on, **field-based science investigations** designed to transform the outdoors into an extension of your classroom. These investigations are more than simply completing science activities outside; they **immerse students in authentic scientific fieldwork** where the natural environment becomes both the laboratory and the source of evidence.

Rather than observing science through photographs, videos, or textbook examples, students investigate scientific concepts where they naturally occur. They examine living organisms in their habitats, observe Earth processes in action, identify physical science principles in the world around them, and collect firsthand evidence to answer scientific questions.

Whether your outdoor classroom is a school courtyard, playground, athletic field, nature trail, or a small patch of grass beside the parking lot, every environment offers opportunities for meaningful scientific discovery.

The **NGS Magnified Field Investigations** are designed to help teachers make field-based learning a regular part of science instruction, not an occasional special event. By repeatedly returning to outdoor learning spaces throughout the year, students begin to see that science isn't confined to a laboratory; it's happening all around them, every day.

What's Included in Every Investigation?

Each investigation contains two complete resources.

❖ Student Investigation

- Purpose
- Background Information
- Materials
- Procedure
- Data and Observation Table
- Analysis and Conclusion Questions

❖ Teacher Guide

- Objective
- National Standard Alignment
- Materials List
- Setup Instructions
- Discussion / Teacher Tips
- Answer Key



Flexible for Every Classroom

These field investigations were intentionally designed to align with the sequence and concepts taught throughout the **NGS Magnified curriculum**. Whether you're introducing a new topic, reinforcing classroom instruction, or extending student learning, each investigation supports the science concepts students are already exploring.

While every investigation is fully integrated with the NGS Magnified curriculum, they are also flexible enough to be **used with any middle school science program**. Teachers can easily incorporate them into existing lessons, adapt them for local environments, or use them as stand-alone investigations to enrich science instruction.

Field Investigations can be used to:

- Introduce a new unit with real-world observations.
- Reinforce concepts taught in the classroom.
- Apply scientific knowledge in authentic outdoor settings.
- Review major concepts before assessments.
- Assess student understanding through field-based learning.
- Strengthen observation, data collection, and critical thinking skills.
- Support science notebooks and nature journals.
- Encourage regular outdoor learning throughout the school year.

Most investigations can also be adapted for different grade levels by adjusting the expected levels of questioning, discussion, and analysis from students.

Table of Contents

Earth Science Field Investigations

Curriculum Unit Field Investigation Title	NGSS	TEKS	Student Lab	Teacher Guide
Nature of Science Discovery Blitz	MS-ESS2-2*	8.1(A) , 8.1(B)*	10	13
Intro to Earth Science Earth Science All Around Us	MS-ESS3-1	8.10A	17	19
Mapping Earth's Surface Mapping a Bird's Eye View	MS-ESS2-2	7.9A	21	24
Rocks and Minerals Walk the Rock Cycle	MS-ESS2-1	7.9A	26	28
Plate Tectonics Through the Eyes of a Toy	MS-ESS2-3	7.9B	36	40
Forces That Shape the Earth Erosion Detectives	MS-ESS2-1	7.9A	43	46
Earth's Changing Surface Ground Control	MS-ESS2-2	7.9A	49	52
Earth's History Walk the Timeline	MS-ESS1-4	8.10A	54	58
Earth's Water Plant Water Loss	MS-ESS2-4	7.11A	66	70
Earth's Atmosphere Heat Check	MS-ESS2-6	7.11B	72	74
Weather and Climate Your Call, Meteorologist	MS-ESS2-5	7.11C	77	81
Astronomy and Space Sun Angles	MS-ESS1-1	8.12A	84	87
Natural Resources Survivor: Resource Edition	MS-ESS3-1	7.10A	90	93

* This investigation does not allow students to fully meet the listed NGSS Performance Expectation or TEKS but supports future instruction aligned to that standard.

Materials List

The following master list includes every material used throughout the NGS Magnified Field Investigations resource. Many items are reusable and appear in multiple investigations, while others are unique to a specific activity. Refer to each teacher guide for exact quantities, preparation instructions, and optional substitutions.

Equipment / Supply	Recommended Quantity
Air thermometer	1-2
Barometer or weather app	1
Bin of mulch or sawdust	1
Bins of rocks for swapping	2-3
Camera or tablet	1 per group (6-8) optional
Chalk	1 box
Clipboards	1 per student (24-30)
Colored paper	1 pack
Colored pencils	1 class set
Cones	8-12
Cups	1 class set (30)
Cyanotype paper	1 sheet per student (plus extras)
Dice	1 per group (6-8)
Digital scale	1 per 4-6 groups (2-3)
Dowel rods	6-8
Fan	1 or teacher breath
Field guides	4-6
Forceps	1 per group (6-8)
Gallon freezer-strength plastic bags	1 box
Graduated cylinder	1 per group (6-8)
Grid paper	1 pad
Hand lens	1 per student or pair (15-30)
Hula hoop or "pond" bin	1-2

Equipment / Supply	Recommended Quantity
Identification apps	1 per group (optional)
Infrared thermometer	1 per group
Large bucket	2
Markers	1 class set
Masking tape	2-3 rolls
Measuring tape	1 per group (6-8)
Paperclips	1 box
Pencils	1 per student
Pennies (hidden)	50-100
Permanent marker	4-6
Popsicle sticks	1 package (100+)
Poster paper	10-20 sheets
Ruler	1 per group (6-8)
Small envelope	1 per group (6-8)
Small magnets	dozen
Sponge	4-6
Spoon	1 per group (6-8)
Station signs	1 set
Stopwatch or timer	1 per group (or phones)
String	1 roll
Super glue	1 tubes
Tape	2-3 rolls
Towels	6-10
Toy figurine (4 inches or smaller)	6-8
Water bin	2
Wind streamer or compass	1 per group (6-8)
Wooden blocks (Jenga®, Lincoln Logs®, or wood cubes)	1 class set (50-100 pieces)



Name: _____

Date: _____

Class: _____

YOUR CALL, METEOROLOGIST

Sample Student Lab

Purpose:

To collect and compare short-term weather data from different times and use those patterns to make a forecast recommendation for an upcoming outdoor event.

Background:

Every weather forecast identifies patterns, and use is perfect, recognizing trends helps scientists understand and examine real weather data.

Informational background given to tie to science lesson.

School Needs Your Help:

Your school is planning a field trip as the forecast team. Your job is to collect weather conditions, and make a short-term forecast.

- ☐ Proceed outdoors
- ☐ Delay decision
- ☐ Move indoors

Materials:

- Pencil/Clipboard
- Weather Clue Reference
- Cloud Types ID chart
- Wind streamer or compass

Procedure:

1. Identify the weather conditions.
2. Use the chart on the next page to record values from "yesterday" and "today".
3. Identify any trends and patterns.
4. Complete your team's forecast recommendation.

Weather & Climate

Data Table:

Weather Feature	Yesterday / AM Reading	Today's Observation	Trend (X / Rising / Falling / Stable)	What This Might Mean
Temperature				
Humidity				
Barometric Pressure				
Cloud Type(s)				
Cloud Coverage			N/A	
Wind Direction			N/A	
Strength				
Air Feel (qualitative)			N/A	

Data and evidence driving investigations.

Analysis and Conclusion:

1. Mark your event forecast recommendation, then justify your recommendation using at least three pieces of evidence from the weather data.
☐ Proceed outdoors ☐ Delay decision ☐ Move indoors
2. What weather clue in your data was the most uncertain or hardest to interpret, and how could that affect your forecast?
3. What would make your forecast more confident or accurate?

Students analyze data to come to conclusions in each investigation.



YOUR CALL, METEOROLOGIST

Sample Teacher Guide

Objective:

Students will analyze short-term weather trends by comparing current outdoor observations with reference data. They will use atmospheric clues such as cloud type, wind, humidity, and pressure to make a short-term weather forecast and recommend whether an outdoor school event should proceed.

Standards Alignment:

- MS-ESS2-5: Collect data to provide evidence for current conditions; result in weather changes
- Science Practices: Analyzing and interpreting data
- Crosscutting Concepts: Patterns, Cause and Effect

Each investigation is standard-aligned

Materials needed (per group):

- Pencil/Clipboard
- Laminated Weather Clue Reference
- Laminated Cloud Type Chart
- Wind streamer or flag

Set Up:

- Choose 2-5 outdoor locations to observe weather. Avoid locations blocked by buildings or trees.

Prepare Reference Weather Data:

- Students may be asked to provide reference data for specific learning outcomes or to interpret trends in current conditions.

Weather & Climate

Teachers can either:

Use real data from the previous day, or provide constructed reference data that creates clear, instructional trends.

Option 1: Guiding Toward Improving Weather

Use this set if you want students to conclude that conditions are becoming more favorable.

Suggested Reference ("Yesterday") Data Pattern:

- Temperature: Slightly lower than today
- Humidity: Higher than today
- Barometric Pressure: Lower than today
- Cloud Coverage: More clouds than today

Setup tips given for each investigation.

Sample Data:

Data Trend	Student Might Say
Pressure dropped from 30.11 → 29.75	"A low-pressure system is coming in—might rain soon."
Humidity rose from 62% → 88%	"The air is getting wetter—more moisture = higher chance of rain."
Cirrus clouds building	"Those usually come before a front—weather could change in 24 hours."
Wind shifted W → N and became gusty	"Could be a front moving in—it's getting windier and cooler."

Analysis and Conclusions Possible Answers:

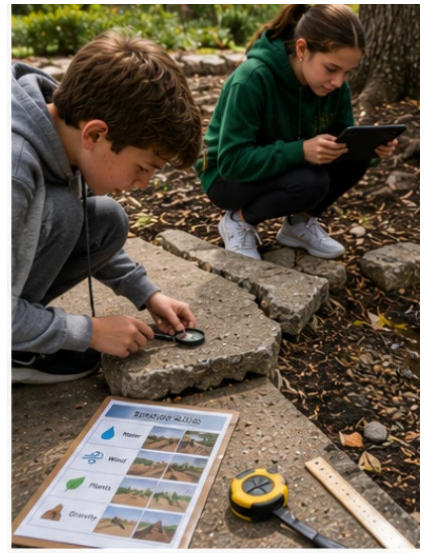
1. Mark your event forecast recommendation, then justify your recommendation using at least three pieces of evidence from the weather data. *We recommend proceeding with caution because barometric pressure is falling, humidity is increasing, and cloud cover is thickening, suggesting unsettled weather may be approaching.*

Answer Key included

2. What weather clue in your data was the most uncertain or hardest to interpret, and how could that affect your forecast? *Students may identify wind direction, cloud type, pressure changes, or air feel as the hardest to interpret. A strong answer explains that unclear or changing data increases uncertainty and could make the forecast less reliable.*
3. What would make your forecast more confident or accurate? *Student responses will vary, but strong answers explain that forecasts become more accurate when scientists have more data over time, measurements from multiple locations, and consistent patterns across variables. Students may also mention the need for clearer trends, repeated measurements, or additional tools.*



Field Investigation: Plant Water Loss



Field Investigation: Ground Control

Field Investigation: Erosion Detectives



Field Investigation: Through the Eyes of a Toy



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