

Rain Detective

What Is This Activity?

Is rain on the way? Can families tell *before* the storm clouds roll in? They will look up to the sky for clues that the weather is about to change.

Learning Goals

Big Science Idea:

- Before a rainstorm, the amount of moisture in the air and air pressure change. Those changes affect animals, plants, and the sky.

Skills kids will use to investigate it:

- Observe small details
- Gather, track, and compare observations and data over time (outdoor odors, temperature, wind speed and direction, sky conditions, air pressure, bird behavior)
- Interpret data and draw conclusions

How Do You Get Ready?

- Read the activity and gather the materials.
- Scout out an open outdoor place with a clear view of the sky, the higher the better.
- Troubleshoot safety concerns (traffic, poison ivy, sharp objects, etc.).
- Prepare Sherlock's race course (the warm-up game): Cut the construction paper into quarters, for a total of 12 pieces. On each piece draw a different shape: star, circle, or triangle. Shuffle the pieces into random order and place them on the ground to form a long, spread-out trail. Make a list of the 12 color-shapes in the order placed on the ground for an answer key. Copy or print one key per adult. Identify a start line a little distance from the course.
- Print out one copy per family of the "Rain Detective" and "Rain Detective Checklist" handouts.
- If you don't plan to show the "Where Does All the Snow Go?" video that is paired with this activity on the website, watch it ahead of time and jot down concepts to share with families during the activity.



pbskids.org/plumlanding/parents

Curriculum Topics

weather, water cycle

Activity Type

outdoors (clear or mostly clear sky, all temperatures)

Group Size

whole group, small groups

Activity Time

30–60 minutes

Materials

- 3 sheets of different colored construction paper (for warm-up)
- Scissors
- Black marker
- Sherlock Race Answer Key (one per adult, see "How Do You Get Ready?")
- "Rain Detective" and "Rain Detective Checklist" handouts (one per family)
- Pencil or pen (one per family)
- Optional: 2 or more large jump ropes
- Optional: "Explore Weather Around You" handout

Next Generation Science Standards

Disciplinary Core Ideas

ESS2.D: Weather and Climate

Science and Engineering Practices

Asking Questions and Defining Problems
Using Mathematics and Computational Thinking
Planning and Carrying Out Investigations
Obtaining, Evaluating, and Communicating Information
Analyzing and Interpreting Data

Crosscutting Concepts

Patterns

Cause and Effect: Mechanism and Prediction

Warm-up (10 minutes)

(Science Skills: Observe small details)

Sherlock's Race

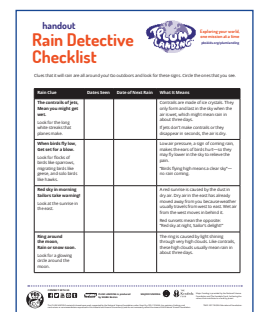
1. This game isn't about forecasting rain, specifically. It's about practicing the science skill of **observing and tracking small details**—which is important to practice before using weather observations to make forecasts. It's also a fun challenge that data-oriented kids will excel at.
2. **Adults stand at the finish line with the answer key** (See: "How Do You Get Ready?"). Kids gather at the starting line. Their goal is to memorize the 12 colors and shapes in order. If your group skews young, consider using fewer colors and shapes.
3. On your signal, **kids begin running, stopping at each paper long enough to memorize the color and shape**. No backtracking!
4. At the finish line, each player tries to **recite the list to an adult** (e.g., red star, yellow triangle, blue circle, etc.). If incorrect, the player runs back to start and races again.
5. **Players who get all 12 items correct** win the game! Stop the game when time is up.
6. **Discuss:** Explain that scientists are like detectives. They notice, remember, and keep track of small details. **Ask:** *What do you notice about the weather today? Can you name three things that are different from yesterday?*

Activity

(Science Skills: Observe multiple details; gather, track, and compare observations and data over time)

Rain Detective (20–40 minutes)

1. **Ask for a show of hands:** *Who thinks it will rain later today? How can you tell? How about tomorrow or the next day?*
2. **Take a deep breath together. Ask:** *What do you smell? Are the odors strong or weak?* Explain that right before rain, odors are stronger. Encourage families to learn the "rain smell" by taking a deep breath outside each day and noticing differences. They can also observe how air smells after rain.
3. **Climb or walk together to your sky-viewing area. Ask:** *How's the air up here? Fresher? Cooler? Windier?* Explain that what's in the air, the temperature, and the wind speed and direction all change as you go higher. That's true from the ground all the way to the edge of space!
4. **Pass out the "Rain Detective Checklist" handout and review the directions with families.**
5. Tell families that air pressure is a tough concept for most people to understand, but it's key to measuring changing weather. **Explain that air has weight, even though you can't see it.** Air pressure is a measure of the weight of air that is pressing down on Earth—how many pounds per square inch, for example.



Air Pressure

Air has weight. Air pressure is a measure of the weight of the air that is pressing down on Earth—how many pounds per square inch, for example.

6. **Ask:** *Has anyone ever felt their ears pop or hurt while flying in an airplane or driving up a mountain?* That's caused by a change in air pressure, which decreases with altitude, or how high you are. **Tell families they will look for signs of rising or falling air pressure.**
7. **Ask a volunteer to read aloud the first row of the "Rain Detective Checklist," about jet contrails** (long white clouds of ice crystals that a jet makes very high in the sky).
 - **If you see a contrail, point it out and ask kids to describe it.** *How many contrails can you find? Do contrails all look the same?* (Some contrails stay thin; others spread and puff up, a sign of very moist air.) *Will it rain in three days?* Wait and see! Tell families to record today's date on the chart and, later, the date of the next rain.
 - **If high-flying jets don't make contrails or their contrails disappear quickly, discuss why.** (The atmosphere is very dry. Ice crystals change back into water vapor quickly.)
 - **Encourage families to keep looking for contrails** on clear days and track the dates on the chart.
8. **Look for flying birds, the next row on the chart. Ask:** *Are the birds flying low or high?* **Look for flocks of birds**, like swallows or starlings, which are easier to spot than solo birds.
9. **Tell families that birds are sensitive to changes in air pressure.** Migrating birds and hawks, falcons, and other birds of prey normally fly very high, so it's easy to notice one when it is flying low.
10. **Encourage families to take home the handout and look for the last two "Rain Clues" on their own**, at sunrise and on an evening when they can see the moon.
11. **Time permitting, try this fun and active way to memorize the weather rhymes from the "Rain Detective Checklist" by playing jump rope.** Ask pairs of adult volunteers to twirl the jump ropes while everyone (kids and adults) take turns jumping in while saying a rhyme. Then, encourage kids to make up their own weather rhymes on any topic. Then allow kids to enjoy a few minutes of energetic jump-rope free play, if they like.

Wrap-up (10 minutes)

(Science Skills: Interpret data to conclude whether observed changes [due to varying levels of air pressure and moisture] precede a rainstorm)

- **Ask kids what they think of these rain clues.** *Are they true? How could you know for sure?* (Keep track of clues and rainstorms over time and then count how often rain follows the clues.)
- **Review the Rain Clues** together to see what weather words come up over and over. (Wet, dry, air pressure, etc.) Explain that rain is likely when the atmosphere is wet—when it contains a lot of water vapor, droplets, or ice crystals. Rain is also more likely when the air pressure changes from high to low—meaning the air gets lighter.

- **Encourage families to take home the “Rain Detective Checklist”** to track the rain clues over a series of days; also point out the “Explore Some More” activities. If you wish, **give them the “Explore Weather Around You”** **handout** to provide them with more ideas on how to continue investigating weather together.

Explore Some More

When Rainbows Mean Rain

Rainbows are like sunsets and sunrises when it comes to forecasting rain—and for the same reason. If you see one in the east in the morning, there’s moisture coming your way. If you see one in the west in the evening, the moisture has passed you by, and tomorrow will likely be fair. Have families make up a rhyme to remember this “Rain Clue.”

VISIT pbskids.org/plumlanding/parents to find more activities, games, and videos.



CONNECT WITH US



PLUM LANDING is produced by WGBH Boston

MAJOR FUNDING



Major Funding is provided by the National Science Foundation and The Kendeda Fund; furthering the values that contribute to a healthy planet

handout

Rain Detective



Exploring your world,
one mission at a time
pbskids.org/plumlanding

What Is This Activity?

Is rain on the way? Can you tell before the storm clouds roll in? You will look up to the sky for clues that the weather is about to change.

Big Science Idea: Before a rainstorm, the wind, temperature, and air pressure change. Those changes affect animals, plants, and the sky.

Go Outside

- 1. On clear days, look up at the sky for the “Rain Clues” on the checklist.**
- 2. Jet contrails:** If you see a jet making one, time how long it takes for the contrail to disappear. A contrail that lasts 20 to 30 minutes and spreads out into a puffy line is a sign of very moist air.
- 3. Low-flying birds:** This one takes a little practice to learn how high or low birds in your area generally fly.
- 4. Sunrise, sunset:** A colorful sky in the morning forecasts rain (“sailors take warning”) and a colorful sunset forecasts fair weather (“sailor’s delight”), but it’s not foolproof. View as many sunsets and sunrises as you can to see a pattern.
- 5. Glowing moon:** Go online and check a “moon phases” calendar for evenings when the moon is visible. A full or nearly full moon appears in the eastern sky just after sunset.



Explore Some More

Smoke Signals

Does your city or town have factories or power plants with active smokestacks? Or subway vents with rising steam? If so, add another “Rain Clue” to the chart! If the smoke or steam rises straight up, the weather is good and likely to stay that way. But if it starts to twist around and drop low, that means rain is likely. (It’s a sign that air pressure is dropping.) Have your child make up a rhyme to remember this rain clue.

Activity Time

5–10 minutes to look for and record each rain clue

Materials

- “Rain Detective Checklist”
- Pencil or pen

Outdoor Family Fun with Plum APP

This app gets families outdoors exploring the world. Every day, the app offers five outdoor missions to get everyone thinking and talking about nature and the science that’s all around us.

Find the app and more fun resources on pbskids.org/plumlanding.



CONNECT WITH US



PLUM LANDING is produced by WGBH Boston

MAJOR FUNDING



THE Kendeda FUND

Major Funding is provided by the National Science Foundation and The Kendeda Fund: furthering the values that contribute to a healthy planet

This PLUM LANDING material is based upon work supported by the National Science Foundation under Grant No. DRL-1516466. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

TM/© 2017 WGBH Educational Foundation.

handout

Rain Detective Checklist



Exploring your world,
one mission at a time
pbskids.org/plumlanding

Clues that it will rain are all around you! Go outdoors and look for these signs. Circle the ones that you see.

| Rain Clue | Dates Seen | Date of Next Rain | What It Means |
|---|------------|-------------------|---|
| <p>The contrails of jets, Mean you might get wet.</p> <p>Look for the long white streaks that planes make.</p> | | | <p>Contrails are made of ice crystals. They only form and last in the sky when the air is wet, which might mean rain in about three days.</p> <p>If jets don't make contrails or they disappear in seconds, the air is dry.</p> |
| <p>When birds fly low, Get set for a blow.</p> <p>Look for flocks of birds like sparrows, migrating birds like geese, and solo birds like hawks.</p> | | | <p>Low air pressure, a sign of coming rain, makes the ears of birds hurt—so they may fly lower in the sky to relieve the pain.</p> <p>“Birds flying high means a clear sky”—no rain coming.</p> |
| <p>Red sky in morning, Sailors take warning!</p> <p>Look at the sunrise in the east.</p> | | | <p>A red sunrise is caused by the dust in dry air. Dry air in the east has already moved away from you because weather usually travels from west to east. Wet air from the west moves in behind it.</p> <p>Red sunsets mean the opposite: “Red sky at night, Sailor's delight!”</p> |
| <p>Ring around the moon, Rain or snow soon.</p> <p>Look for a glowing circle around the moon.</p> | | | <p>The ring is caused by light shining through very high clouds. Like contrails, these high clouds usually mean rain in about three days.</p> |



CONNECT WITH US



PLUM LANDING is produced by WGBH Boston

MAJOR FUNDING



Major Funding is provided by the National Science Foundation and The Kendeda Fund: furthering the values that contribute to a healthy planet

hoja para repartir

Detective de la lluvia



Exploramos tu mundo,
una misión a la vez
pbskids.org/plumlanding

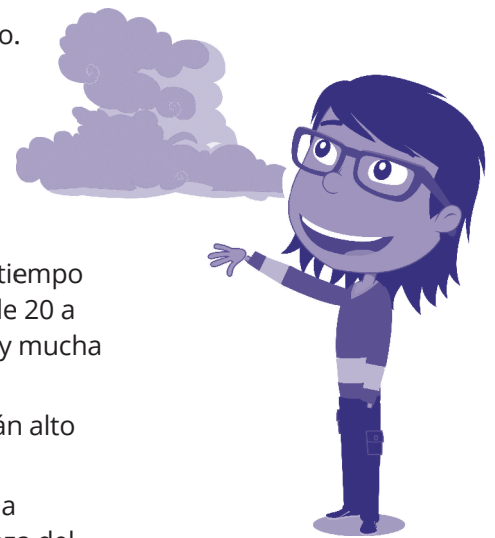
¿De qué trata esta actividad?

¿Va a llover? ¿Lo saben antes de que aparezcan los nubarrones que predicen la tormenta? Miren al cielo en busca de pistas de que el estado del tiempo está a punto de cambiar.

Megaconcepto científico: Antes de una tormenta, el viento, la temperatura y la presión del aire cambian. Esos cambios afectan a los animales, las plantas y el cielo.

Salgamos al aire libre

- 1. En días despejados, miren al cielo y busquen las “pistas de lluvia” en la lista.**
- 2. Estelas de condensación:** Si ven la estela que dejó un avión, midan cuánto tiempo se demora la estela en desaparecer. Una estela de condensación que dure de 20 a 30 minutos y se disemina en una línea de algodoncillos, es indicio de que hay mucha humedad en el aire.
- 3. Aves en vuelo bajo:** Aquí se necesita un poco de práctica para aprender cuán alto o bajo generalmente vuelan las aves donde vives.
- 4. Amanecer, atardecer:** El colorido del cielo matutino predice la lluvia (“agua a porrazos”) y un atardecer lleno de color pronostica buen tiempo (“la esperanza del marino”), pero no es ninguna garantía. Observen muchos atardeceres y amaneceres para determinar si existe un patrón.
- 5. Luna anillada:** Miren en internet las “fases lunares” para ver en qué noches se podrá divisar la luna al atardecer. La luna llena o casi llena se ve en el cielo oriental (del este) justo después de que caiga el sol.



Exploremos más

Señales de humo

¿Hay en la ciudad fábricas o centrales eléctricas con chimeneas activas? ¿De las rejillas del metro sale vapor? De ser así, agreguen otro indicio al cuadro de pistas de la lluvia. Si el humo o el vapor suben derecho, el estado del tiempo es bueno y seguirá así. Pero si se arremolina y cae, es probable que llueva. (Es indicio de que está cayendo la presión del aire). Pídale al niño que invente una rima para recordar esta pista sobre la lluvia.

Diversión familiar al aire libre con el app de Plum

Este app invita a las familias a salir al aire libre a explorar el mundo. Cada día, el app ofrece cinco misiones al aire libre que ponen a todos a pensar y a hablar sobre la naturaleza y las ciencias que tenemos a nuestro alrededor. Disponible en inglés solamente.

Encuentren el app y más recursos divertidos en:
pbskids.org/plum.



CONÉCTATE CON NOSOTROS



PLUM LANDING es una
producción de WGBH Boston

CON AUSPICIO
CLAVE DE



Auspicio clave de la National Science Foundation y el Kendeda Fund: promovemos los valores que aportan a tener un planeta saludable.

hoja para repartir

Lista del detective de la lluvia



Exploramos tu mundo,
una misión a la vez
pbskids.org/plumlanding

Los indicios de que va a llover están en todas partes a su alrededor. Salgan al aire libre y búsquenlos. Encierren en un círculo los indicios que vean.

| Indicio de lluvia | Fecha en que se vio | Fecha en que llovió | Qué significa |
|---|---------------------|---------------------|---|
| <p>Si en el cielo estelas ven, no lo duden: va a llover.</p> <p>Busquen en el cielo las nubes largas y blancas que dejan los aviones a su paso.</p> | | | <p>Las estelas de condensación están compuestas por cristales de hielo. Solamente se forman y permanecen en el cielo cuando el aire está húmedo, lo cual puede indicar que lloverá en unos tres días.</p> <p>Si los aviones no dejan estelas de condensación o estas desaparecen en segundos, el aire está seco.</p> |
| <p>Golondrina en bajo vuelo, hay lluvia en el cielo.</p> <p>¿Hay en el cielo bandadas de pájaros (p. ej., golondrinas), aves que migran (gansos) o aves que vuelan solas (halcones)?</p> | | | <p>Si la presión del aire es baja, lo cual indica que va a llover, a las aves les duelen los oídos, y por eso quizás vuelan a menor altura para calmar el dolor.</p> <p>En cambio, si las aves vuelan a gran altura quiere decir que no va a llover.</p> |
| <p>Cielo rojazo, agua a porrazos.</p> <p>Miren hacia el oriente al amanecer.</p> | | | <p>Los amaneceres rojizos se deben a la presencia de polvo en el aire seco. El aire seco en el occidente ya se ha alejado porque por lo general, el estado del tiempo se mueve de occidente a oriente. El aire húmedo del occidente entra a ocupar ese espacio.</p> <p>Los atardeceres rojizos significan lo contrario. Un refrán dice: "Cielo rojo vespertino la esperanza es del marino".</p> |
| <p>Luna anillada o rojiza, que lloverá profetiza.</p> <p>Vean si hay un anillo brillante alrededor de la luna.</p> | | | <p>El anillo se debe al brillo de la luz que pasa por nubes que se encuentran a gran altura. Al igual que las estelas de condensación, estas nubes altas normalmente indican que lloverá en unos tres días.</p> |



CONÉCTATE CON NOSOTROS



PLUM LANDING es una producción de WGBH Boston

CON AUSPICIO CLAVE DE



Auspicio clave de la National Science Foundation y el Kendeda Fund: promovemos los valores que aportan a tener un planeta saludable.