

Dear Educator,

For years, experts have speculated when the next major earthquake might hit California, and just how big it will be. Now, filmmakers offer you their perspective on this question with the upcoming disaster thriller, *San Andreas*, starring Dwayne Johnson as a search-and-rescue helicopter pilot who teams up with his estranged wife and heads right into the epicenter to save his daughter.

YMI is excited to bring you this educational program, developed in partnership with Warner Bros., that channels the heart-pounding action of *San Andreas* into a series of standards-based STEM and social studies activities. Students will learn how earthquakes happen and how scientists predict and measure them before making their own speculations about when the "Big One" will hit. Then they'll review other types of natural disasters — particularly those most likely to occur in your region — and learn how to keep themselves safe when disaster strikes.

We hope you will share this program with other teachers in your school. Although the materials are copyrighted, you may make as many copies as you need for educational purposes.

Please use the enclosed reply card to let us know your opinion of this program, or send us your comments at ymiclassroom.com/feedback-san-andreas. We look forward to hearing from you.

Sincerely,



Dr. Dominic Kinsley
Editor in Chief
Young Minds Inspired

 For questions, contact us toll-free at 1-800-859-8005 or by email at feedback@ymiclassroom.com.

WHERE WILL YOU BE?

SAN ANDREAS

TARGET AUDIENCE

This program is designed for middle school students, grades 6-8, as a supplement to the STEM curriculum.

PROGRAM OBJECTIVES

- To introduce students to the science of earthquakes and the history of the San Andreas Fault.
- To teach students about natural disasters that might affect them.
- To guide families in developing emergency preparedness plans and safety kits.

PROGRAM COMPONENTS

- This one-page teacher's guide
- Three reproducible activity sheets
- A wall poster for display in your classroom
- A teacher reply card, or reply online at ymiclassroom.com/feedback-san-andreas.

HOW TO USE THIS PROGRAM

Display the poster prominently and distribute copies of the activity sheets to students. The final activity should be reviewed in class, but completed at home. Students can complete the activities before they see *San Andreas*, which will enrich their understanding of earthquakes and the need to be prepared for potential disasters.

NATIONAL STANDARDS

This program aligns with Next Generation Science Standards for grades 6-8. For more details, visit ymiclassroom.com/san-andreas.

ABOUT SAN ANDREAS

After the infamous San Andreas Fault finally gives, triggering a magnitude 9 earthquake in California, a search-and-rescue helicopter pilot (Dwayne Johnson) and his estranged wife make their way together from Los Angeles to San Francisco to save their only daughter. But their treacherous journey north is only the beginning. And when they think the worst may be over...it's just getting started.

ACTIVITY 1 UNDERNEATH IT ALL

Use this activity as a geology primer for earthquakes and seismology. Have students review the diagram of Earth's tectonic plates and help them identify convergent, divergent, and transform boundaries. Explain how the release of pressure that builds at a transform boundary can cause an earthquake. Provide time for them to identify each of the transform boundaries and discuss the unique characteristics of the San Andreas Fault and others in the region. Your discussion should provide context for the vocabulary words in Part 2.

Epicenter: The location directly above the point where an earthquake begins when pressure is released deep in the Earth's crust.

Fault: A split in the Earth's crust.

Moment magnitude: A scale used for measuring earthquakes globally above magnitude 8, based on how far and with how much force a fault was moved.

Radon count: A key measurement in a controversial method believed by some physicists to support earthquake prediction.

Richter scale: A scale used to measure earthquakes based on the size of the largest seismic wave and its distance from a particular seismograph.

Seismic waves: Vibrations sent by an earthquake that are used to measure location and magnitude.

Transform boundary: The border between two tectonic plates moving alongside one another, instead of getting closer or further apart.

Tsunami: A sudden rise in the ocean level along the shoreline (as opposed to a typical "breaking" wave) caused when certain types of earthquakes that begin at sea trigger a massive amount of water to rush up from the ocean floor.

ACTIVITY 2 TRACING THE PAST

In order to prepare for the future, it is important to understand what has happened in the past. In this lesson, students will learn that scientists attempt to predict major earthquakes based on prior patterns of seismic activity in a fault zone, using the San Francisco Bay Area as an example. Students will then use a map to identify other types of natural disasters that are historically prevalent in their geographic region and research how to prepare for these risks.

ACTIVITY 3 STAYING SAFE

This activity focuses on emergency preparedness. Using the American Red Cross and relevant government resources, students will begin outlining a detailed plan that includes safe places to go during an evacuation; contact information for doctors and family members; and the key components of an emergency kit — as well as why they need all of this. Urge your students to bring this worksheet home and complete it with their parents, and then keep their plan in a convenient, prominent place.

RESOURCES

Official Movie Site: sanandreas.com
www.ymiclassroom.com/san-andreas

EARTHQUAKES

<http://earthquake.usgs.gov>
<http://news.nationalgeographic.com/news/2014/10/141013-bay-area-earthquakes-seismology-prediction-science/>

DISASTER PREPAREDNESS

www.ready.gov
www.redcross.org/prepare

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UNDERNEATH IT ALL

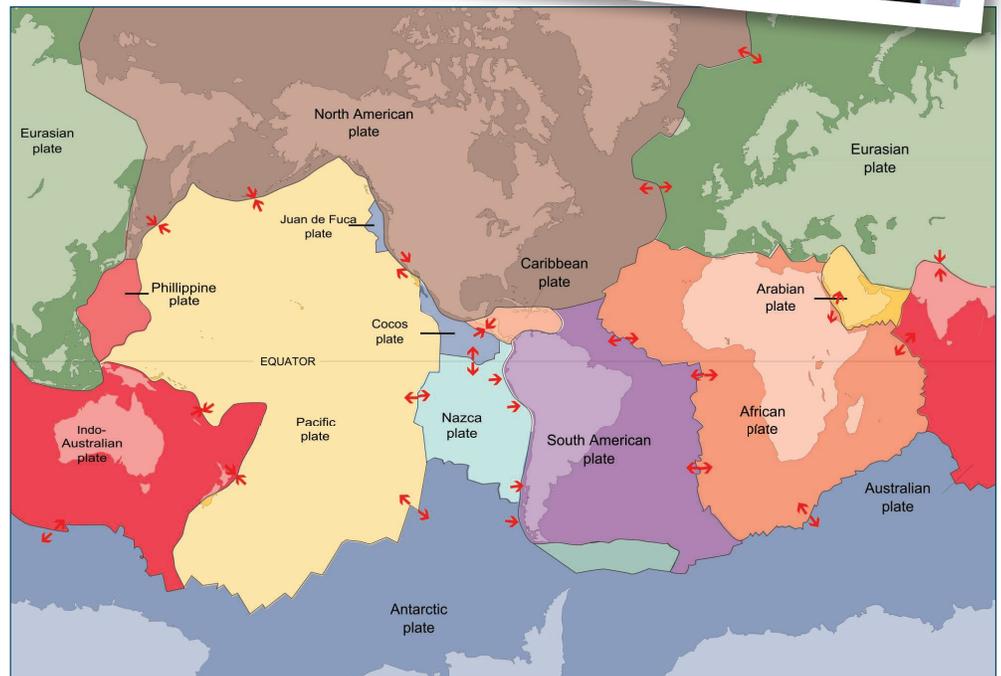
In the action thriller *San Andreas* (in theaters May 29), a magnitude 9 earthquake rocks California. But that's just the beginning, as a rescue pilot (Dwayne Johnson) and his estranged wife join together for the treacherous journey north, from Los Angeles, to save their daughter, Blake, in San Francisco.



PART 1: EARTHQUAKE SCIENCE

As the film opens, we watch how Earth has changed over millions of years. Huge slabs of rock shift and slide, colliding to form mountain ranges like the Himalayas, cracking apart to create oceans and canyons. These gigantic slabs of rock are called **tectonic plates**, the puzzle-pieces that make up the surface of the Earth — except that, unlike puzzle-pieces, they move and shift position, even today.

Some plates are being pulled apart; this is called a **divergent boundary**. Others are pushing into one another at what is called a **convergent boundary**. And in some places, the plates slide against one another, the way you might rub your hands together to keep warm. This is called a **transform boundary**. Pressure builds here as the plates rub against each other until, one day, they finally break free with a release of pressure that we feel as an earthquake.



This map shows the boundaries of Earth's major tectonic plates and the direction each plate is moving. Circle the places where earthquakes are most likely to occur.

PART 2: EARTHQUAKE TERMINOLOGY

San Andreas is the name of a fault that runs through most of California. Label it on the map. Then research these terms used to describe the earthquake that occurs in the film *San Andreas*. Write the definition of each term on the back of this sheet, then, after you have seen *San Andreas*, circle the terms you recognized and discuss the scientific accuracy of the film.

Epicenter
Fault

Moment magnitude
Radon count

Richter scale
Seismic waves

Transform boundary
Tsunami

WHERE WILL YOU BE?

SAN ANDREAS

[HTTP://SANANDREASMOVIE.COM](http://sanandreasmovie.com)



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TRACING THE PAST

PART 1: NEXT TIME

Some experts predict that the fault running through the San Francisco Bay Area will likely produce a major earthquake within the next 30 years. To them, the real question is not “Could it happen?” but “When?”

This timeline lists some of the largest earthquakes along the San Andreas Fault and the magnitude of each one. Do you see a pattern? Read the two articles listed below, then fill in the last row on the timeline. When do you think the next major earthquake will strike along the San Andreas?

Year	Magnitude	Location
1906	7.8	San Francisco
1911	6.5	Morgan Hill
1979	6.0	Coyote Lake
1980	6.0	Livermore
1984	6.3	Morgan Hill
1989	7.1	Loma Prieta
2001	5.1	Napa
2007	5.6	Calaveras Valley
2014	6.0	Napa Valley



- *When Could the Next Large Earthquake Occur Along the San Andreas Fault?* (<http://pubs.usgs.gov/gip/earthq3/when.html>)
- *Forecasting California's Earthquakes* (<http://www.earthquakesafety.com/earthquake-faults.html>)

PART 2: KNOW YOUR RISKS

Earthquakes aren't the only type of disaster we face in the U.S. Every geographic region experiences natural disasters, from hurricanes in the east to tsunamis in the west. Use this map to identify the kinds of natural disasters that are most likely to happen in your part of the U.S. Then visit ready.gov/kids/know-the-facts to learn the science behind the kinds of disasters that occur in your region. Use the back of this sheet to list the disasters you should prepare for and what you should do to protect yourself and your family for each disaster.



Map courtesy of The American Red Cross. © 2015 The American Red Cross. All Rights Reserved.

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[HTTP://SANANDREASMOVIE.COM](http://SANANDREASMOVIE.COM)



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STAYING SAFE

In the film, Blake is lucky enough to find a battery-powered phone, two-way radio, and an emergency kit with water and food gels. But she is also well trained to know what she needs and where to find it. How would you fare in her situation? Is your family prepared for an emergency?

Answer the following questions to see how ready you are:

- I know exactly where to go if there is an emergency and I am separated from my family.
Yes No
- I carry a written list of emergency phone numbers in case mobile phone service is not available.
Yes No
- My family has an emergency kit ready with food and water, first aid supplies, and basic safety equipment like a flashlight, batteries, and a radio.
Yes No
- We have a plan for taking care of family members with special needs, such as a pet, elderly grandparent, or infant.
Yes No
- We practice our evacuation plan.
Yes No

If you answered **YES** to these questions, congratulations! Your family is prepared for an emergency.

If you answered **NO** to any of these questions, it's important that your family takes the time to sit down and develop a plan. Begin by researching the types of emergencies you might face in your area. Then use the outline at right to complete your plan.

Check out the following resources to get started:

- On FEMA's **Ready.gov** site, you can find out about specific natural disasters that might be a concern in your area, learn how to plan for each type of emergency, and sign up for Emergency Alerts.
- The American Red Cross website, "Be Red Cross Ready," at arcbrcr.org, will walk you step by step through creating a plan and stocking an emergency kit that's customized for your family.

EMERGENCY PREPAREDNESS PLAN FOR THE [] FAMILY

1. Emergency Contact Information

This should include home and mobile phone numbers for every member of your family, your physician, emergency contacts, and the local hospital, also, a list of medications and allergies that might be important for rescue personnel to know about. Include contacts for when mobile service is disrupted. For example:

If mobile phone service is disabled, call Grandma Joan at her office: (999) 876-5432 xt 12. After hours, call Grandpa John at home: (999) 876-1234.

2. Evacuation and Family Link-up Plan

A family link-up plan makes sure that everyone knows exactly where to go in an emergency and how to communicate with the rest of the family. Use the following guide to create a plan for your family. We have filled in an example for you. Be sure to include notes about who will be responsible for any family pets or children at daycare. Once completed, make a copy of your plan for every member of the family and keep one in a safe location at home.

If there is an emergency and we need to leave our house, we will meet at:

The Corner Coffee Shop

If we are evacuated from our town, we will go to:

Grandpa John's House, 123 Apple St., Next Town Over. (999) 876-1234

_____ will pick up the kids from school and

_____ will get the pets from home.

FAMILY LINK-UP PLAN

(Use the back of this sheet to complete this chart by adding all affected family members.)

Family Member	Address & phone number of work/school	If at (place), will go to (safe place).
Mom	Work: 55 Poplar St, Suite 5B (000) 123-4567	If at Work, will go to nearest Police Station, 30 Poplar St (000) 123-9876.
		If at Gym, will go Home.

3. Put Together an Emergency Kit

Be sure to include enough food and water to survive for three days without access to replenishments; basic first aid such as adhesive bandages and disinfectant; and communications equipment like a battery-operated radio or phone and batteries. Don't forget about medications and specialty items like diapers, wipes, and pet food.

4. Practice, Practice, Practice

Once your plan is in place, practice it twice a year to help find and solve any problems, and make sure everyone remembers what to do under pressure. Check your kit regularly and replace any expired medications or equipment that is no longer working.

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D W A Y N E J O H N S O N



SAN ANDREAS

NEW LINE CINEMA PRESENTS IN ASSOCIATION WITH VILLAGE ROADSHOW PICTURES AN FPC PRODUCTION A BRAD PEYTON FILM "SAN ANDREAS"

DWAYNE JOHNSON CARLA GUGINO ALEXANDRA DADDARIO IOAN GRUFFUDD ARCHIE PANJABI AND PAUL GIAMATTI MUSIC BY ANDREW LOCKINGTON

FILM EDITOR BOB DUCSAY PRODUCTION DESIGNER BARRY CHUSID DIRECTOR OF PHOTOGRAPHY STEVE YEDLIN EXECUTIVE PRODUCERS RICHARD BRENER SAMUEL J. BROWN MICHAEL DISCO TOBY EMMERICH ROB COWAN

TRIPP VINSON AND BRUCE BERMAN STORY BY ANDRE FABRIZIO & JEREMY PASSMORE SCREENPLAY BY CARLTON CUSE PRODUCED BY BEAU FLYNN, p.g.a. DIRECTED BY BRAD PEYTON

NEW LINE CINEMA

VILLAGE ROADSHOW PICTURES

PG-13 INTENSE DISASTER ACTION AND SOME DRUG USE THROUGHOUT AND STRONG LANGUAGE

MAY 29

#SANANDREAS

WATER TOWER

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SEE IT IN realD 3D