

# Hotspots and the Hawaiian Islands

Lesson Map: <http://esriaustralia.com.au/education/SpatialActivity53>

## Engage

*What do you notice about the spatial distribution of the Hawaiian Islands?*

- Click on the map URL above to open the lesson map. A topographic map showing the world is evident. Under the 'Details' pane, click on 'Content' and turn on the *Hawaiian Islands* layer.
- Click on the 'Bookmarks' tab and select *Hawaiian Islands*. This will focus the map extent to include the Hawaiian Islands only.
- ? What do you notice about the spatial distribution of the Hawaiian Islands? [*They appear in a relatively straight line, moving in a North-West direction*]

## Explore

*How does plate movement and a hotspot form new landforms?*

- ? What is a hotspot? [*A hot spot is an area that exists beneath the Earth's crust where magma causes melting and thinning of the rocky crust. This allows for magma to penetrate the Earth's crust and spew forth*].
- As magma makes it to the Earth's surface, it allows for the creation of new landforms. Magma, when it cools, can create volcanoes that channel the hot spot's magma into eruptions. It can also create islands, as seen with the Hawaiian Islands. Whilst many of these islands are volcanic islands, not all of them are. As the ocean water cools the magma, it creates a land mass in the Pacific Ocean.
- Click the 'Bookmarks' tab and select *Pacific Plate* bookmark.
- Under the 'Details' pane, click on 'Content' and turn off the *Hawaiian Islands* layer. Turn on the following layers: *Tectonic Plate Boundaries*, *Pacific Plate movement* and *Hotspot Tracks*.
- ? Look at the North / North-West boundary of the Pacific Plate. What direction is the plate spreading or moving? [*North-West*].

Download student worksheet [here](#).

Time

35 minutes

Activity

Investigate how the Hawaiian Island were formed

## Learning Outcome

Students will be able to:

- Understand how the Hawaiian Islands were formed
- Examine how hotspots and plate movement activity create landforms
- Explain how the Hawaiian Islands were formed

## ACARA Curriculum Link

Year 8 Geography - Unit 1: Landforms and landscapes

[ACHGK048](#) | [ACHGK049](#) | [ACHGK053](#) | [ACHGS059](#) | [ACHGS061](#)

## Teacher Feedback:

To share your feedback on this, or any Spatial Activity, please contact [education@esriaustralia.com.au](mailto:education@esriaustralia.com.au)

- ? What patterns do you notice between the Pacific Plate's current direction of movement and the Hawaiian Empire Chain? [*The Pacific Plate is spreading/ moving in a North-Westerly direction, which is reflective of the string of Hawaiian Islands.*]
- Under the 'Details' pane, click 'Content' and turn on the *World Volcanoes* feature layer.
- Unlike most volcanoes that are created where two plates meet, hotspot volcanoes form far from plate boundaries. The hotspot is caused by mantle plumes that exist below the tectonic plates. Therefore, as the plates move, the hotspot does not.
- This means that the hotspot will continue to heat and thin the Earth's crust as the plate moves. This may create a chain of volcanoes or islands across the Earth's surface.
- Zoom out on the map and explore other hotspots. Toggle the *World Volcanoes* layer on and off as necessary.
- ? What do you notice about the location of these hotspots in relation to plate boundaries? [*They are far away from the boundary*]

## Explain

### *Why does the Hotspot track change direction?*

- ? How long has the Pacific Plate been spreading in this direction? Hint: Click on the red dots to view the age of islands. [*The creation of the Hancock Volcanic Center is approximately 27.7 to 38.7 million years old. It is the Western-most island in the chain of islands, which indicates that the Pacific Plate began to spread in a North-West direction from this point forward*]
- This may seem like an incredibly long time. However, plate movement occurs very slowly. The Pacific Plate is currently moving to the northwest at a speed of between 7 and 11 centimetres each year.
- ? What direction was the Pacific Plate moving before it was moving North-West? [*North, as reflected in the chain of islands having a North – South pattern*]
- ? How long did the Pacific Plate move in this direction? [*By clicking on the Northern-most hotspot point and southern-most hotspot point (before it changes direction), the plate moved North for approximately 46.3 million years; Meiji (85 million) – Colahan (38.7 million)*]
- ? Consider what you may already know about Continental Drift theory. Using Pangaea as an example, why is it likely that tectonic plates move in different directions over

millions of years? [Pangaea refers to a singular super continent where long ago, the continents made up one large land mass. As the theory dictates, as tectonic plates moved over time, land masses on different plates separated, appearing as they do today. This would likely have involved many changes in the direction of plate movements over millions of years]

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## Extend

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*Demonstrate your own understanding.*

- ➔ Ensure that the following feature layers are still on: *Pacific Plate movement, Tectonic Plate Boundaries, Hotspot Tracks.*
- ? Demonstrate your understanding of how hotspots and plate movement have created the Hawaiian Islands in a paragraph response. Consider the following aspects in your response:
  - Defining a hotspot
  - Plate movement / direction
  - The landforms created

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## Next Steps:

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