

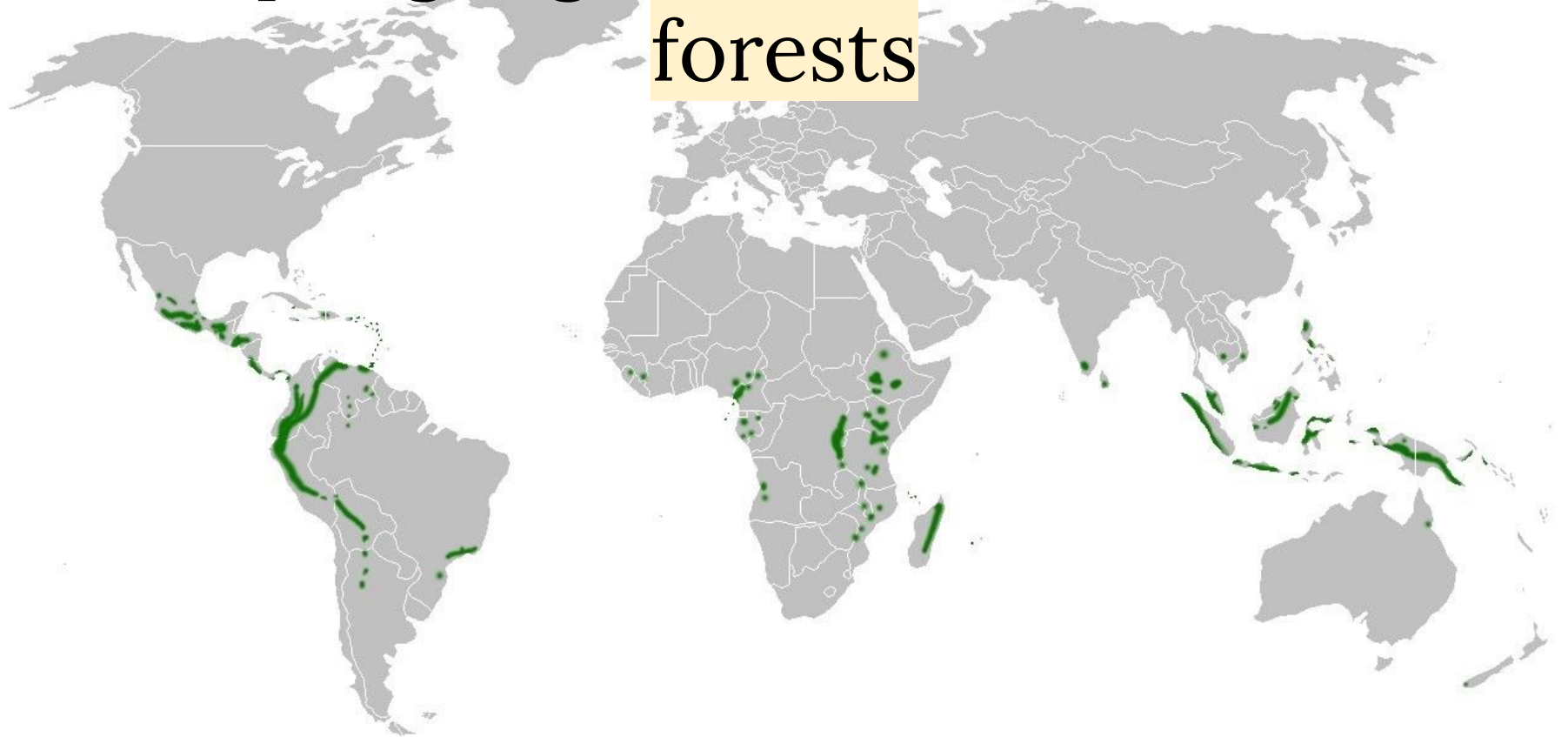
# Cloud Forest of Mindo

By: Cassandra Shank and Nicholas Toth  
International Sustainable Development  
Stockton University  
Tait Chirenje  
Presentation Date: 1/13/20

# Outline of Presentation

1. Description of area
2. Vegetation and Species
3. Cloud forests around the world
4. Expectations of this area
5. Implications of volcanic proximity
6. Implications of tourism
7. Implications of global climate change
8. Reservations/Environmental Agencies
9. Works Consulted

# A map highlighting locations of cloud forests



# Cloud Forests

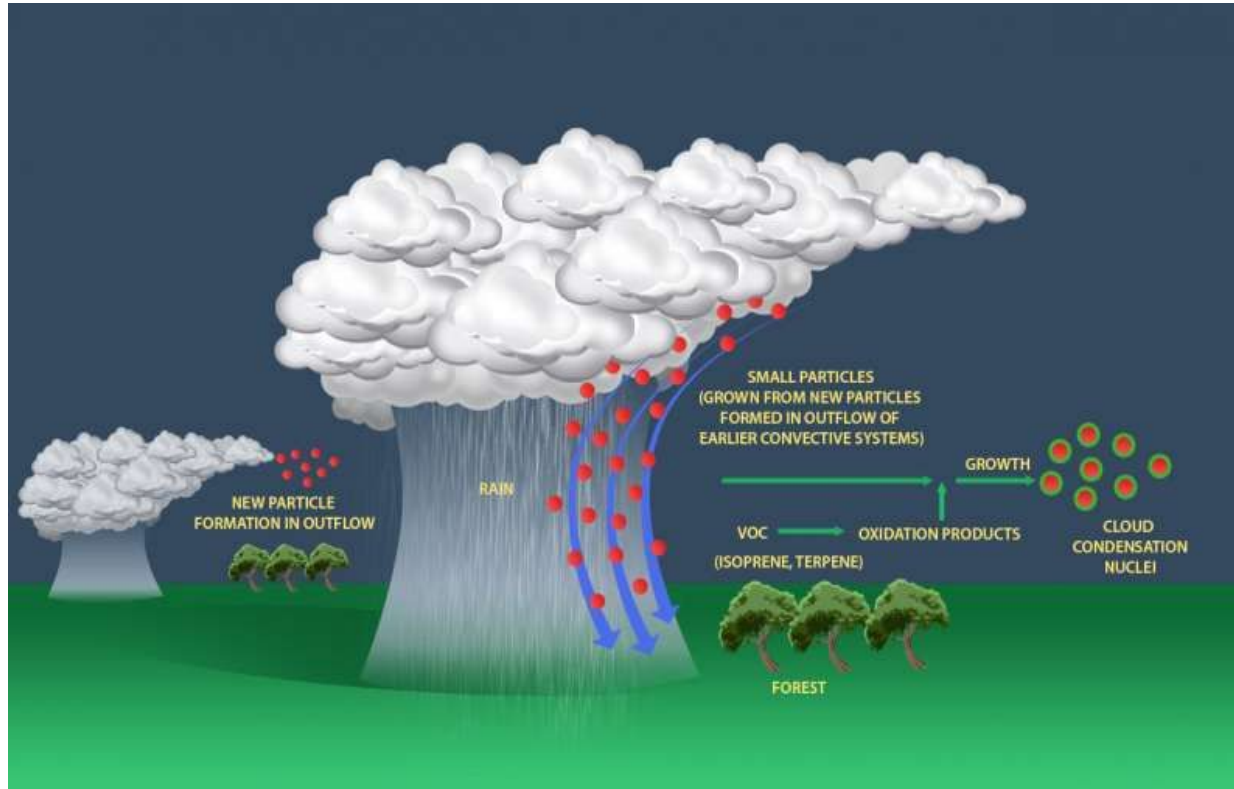
- Names: “Montane rainforests” or the “Elfin Woodland”
- Characteristics
  - Forest engrossed by thick clouds and mist
    - Nearly-Constant
  - Tropical Climate
    - Very wet
    - No dry season
  - Mountains



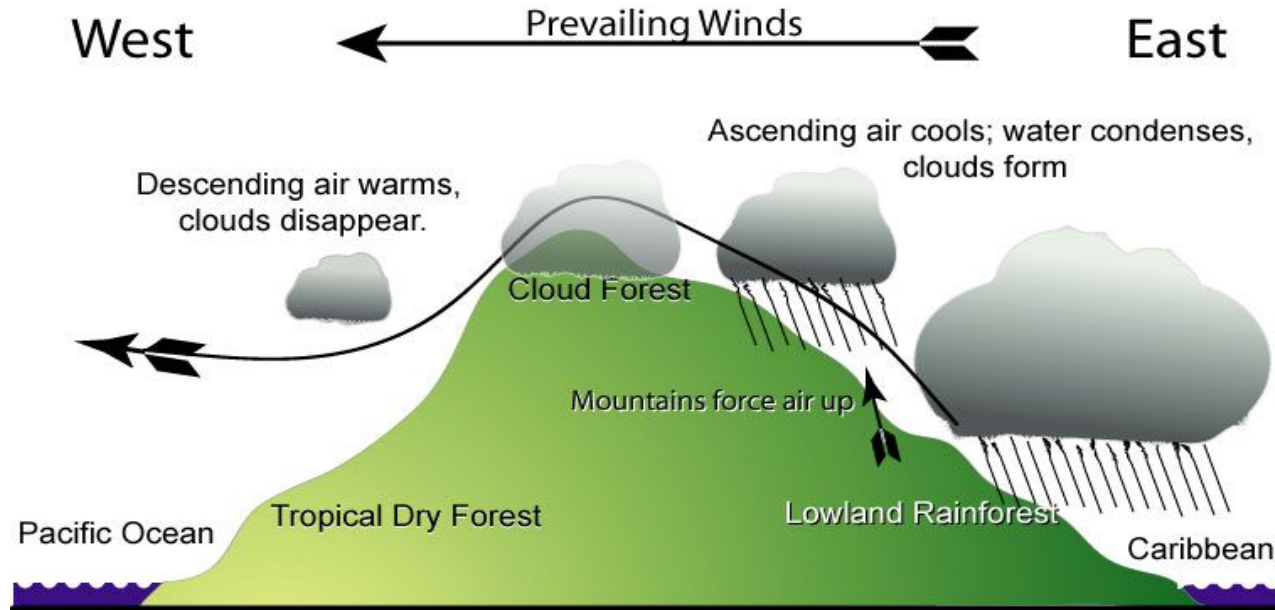
# Formation

- Unique Conditions
  - Elevation between 3,000-10,000 ft
  - Temperature drops
  - Water
    - Condensation
      - High levels
      - Trapped within biomass
      - Put into soil
  - Air currents - Has prevailing winds

# Formation of Cloud Forests



# Formation cont. - Topography and Precipitation in N. Costa Rica



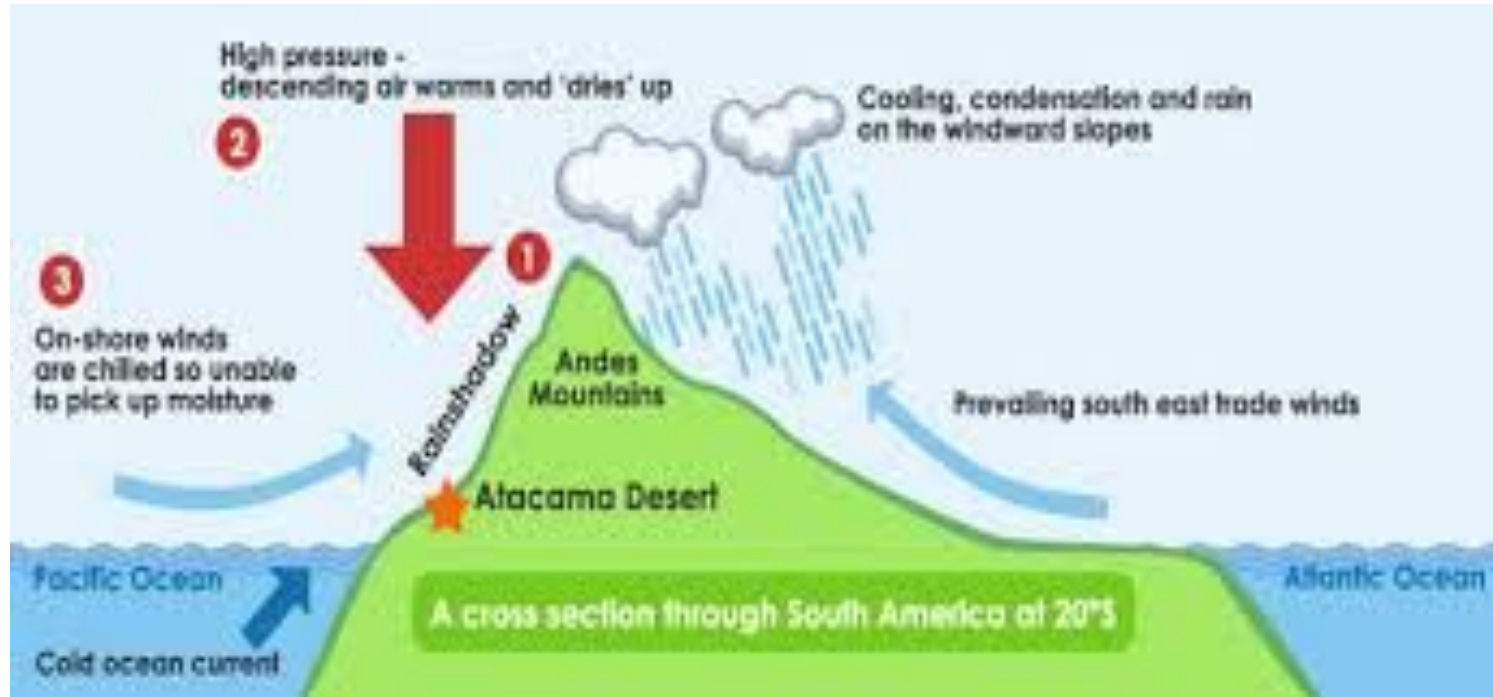
# Formation - cont.

- Similar areas
  - Ecuador
    - Mindo
  - China
    - Zhangjiajie National Forest





# Formation Continued



# Mindo

- Location
  - Latitude
    - -0.048717
    - $0^{\circ} 2' 55.3812''$  S
  - Longitude
    - -78.775198
    - $78^{\circ} 46' 30.7128''$  W



[https://si.wsj.net/public/resources/images/BN-VW868\\_ECUAD O\\_8RH\\_20171031131348.jpg](https://si.wsj.net/public/resources/images/BN-VW868_ECUAD O_8RH_20171031131348.jpg)

# Mindo

- Size
  - 283,561 km<sup>2</sup>
  - 109483.5142 mi<sup>2</sup>
- Population
  - 15,223,680



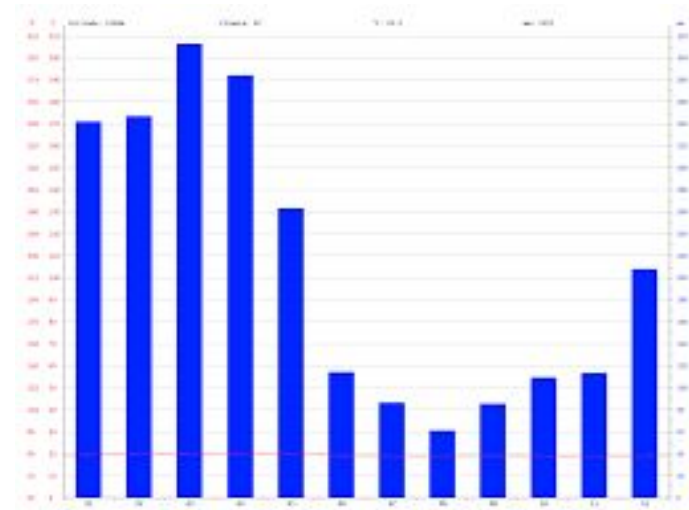
- Cultural significance
  - Yumbo-Nigua
    - Long before the Inca
    - Merchants
      - Link
        - Coast
        - Highlands
    - Colonization
      - Demise
  - Village of Mindo
    - 1861

## History



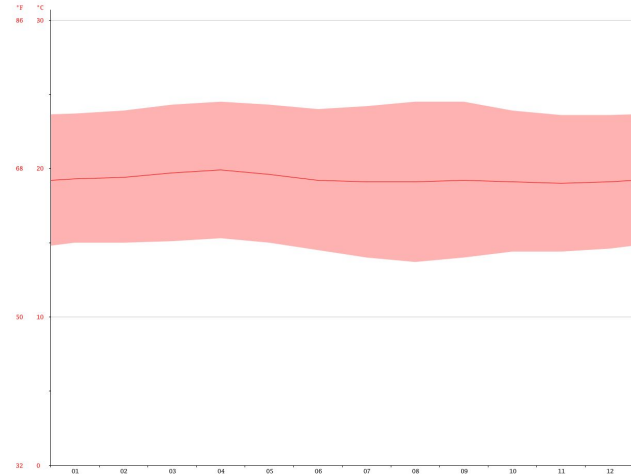
# Climate

- Rainfall
  - Average Annual
    - 2525 mm
    - 99.40625 in
- Cloud coverage
  - Near constant



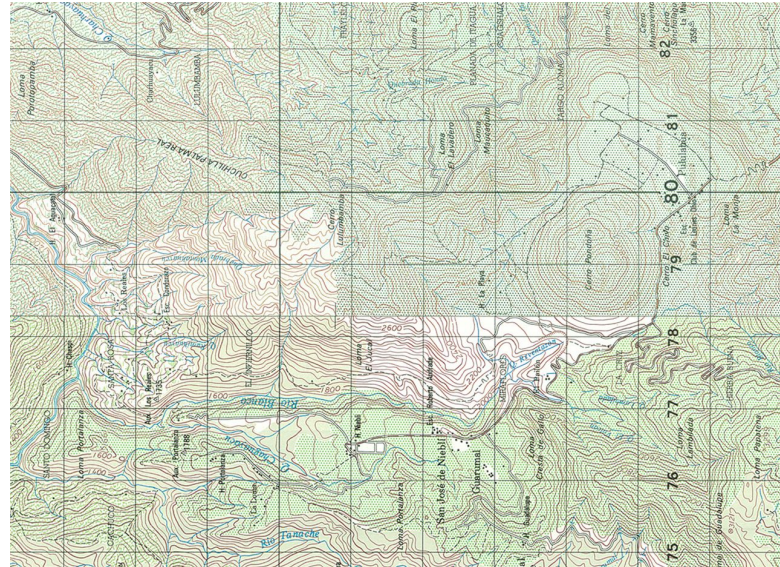
# Climate Continued

- Temperature
  - Average Annual
    - 19.3 °C
    - 66.74 °F



# Topography

- Elevation: 1,180 - 4,780 m (0.73-2.97 miles)
- Area: 19,200 hectares (74.13 square miles)
- Volcano - Guagua Pichincha - Peak Height at 4,780 m (2.97 miles)
- Position
  - Long -78.775198
  - Lat -0.048717



# Overview of Organisms

- Birds
  - Ecuador
    - 4<sup>th</sup> most in world
  - Mindo
    - Capital of bird watching





# Overview of Organisms - cont.

- Orchids
  - Ecuador
    - World capital
  - Mindo
    - 170 Species



# Overview of Organisms - cont.

- Amphibians and Reptiles
  - Two species for every 386 m<sup>2</sup>
    - Ecuador
      - 8<sup>th</sup> in world
    - Mindo
      - 101 species



# Overview of Organisms - cont.

- Butterflies
  - Ecuador
    - 20%
  - Mindo
    - Provides habitat
      - All stages of life visible



# Vegetation

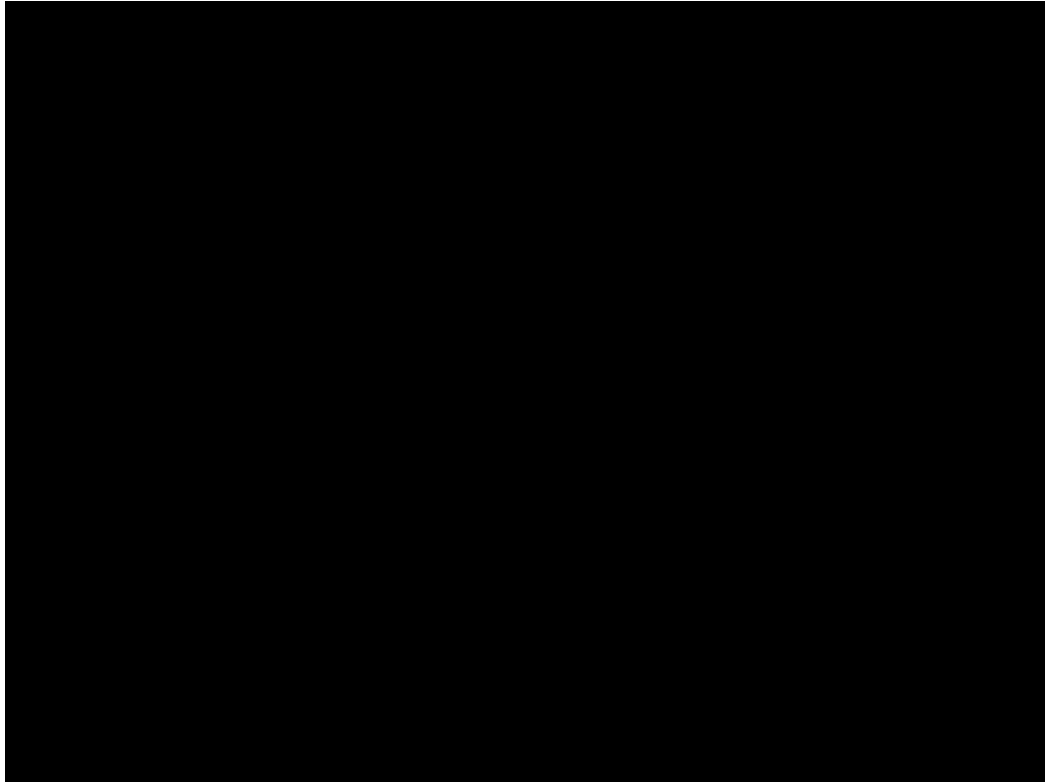
- Canopy
  - Single story
    - Cedro trees
      - 35-45 m  
(about 0.02 miles) tall
- Ferns
- Flowering plants



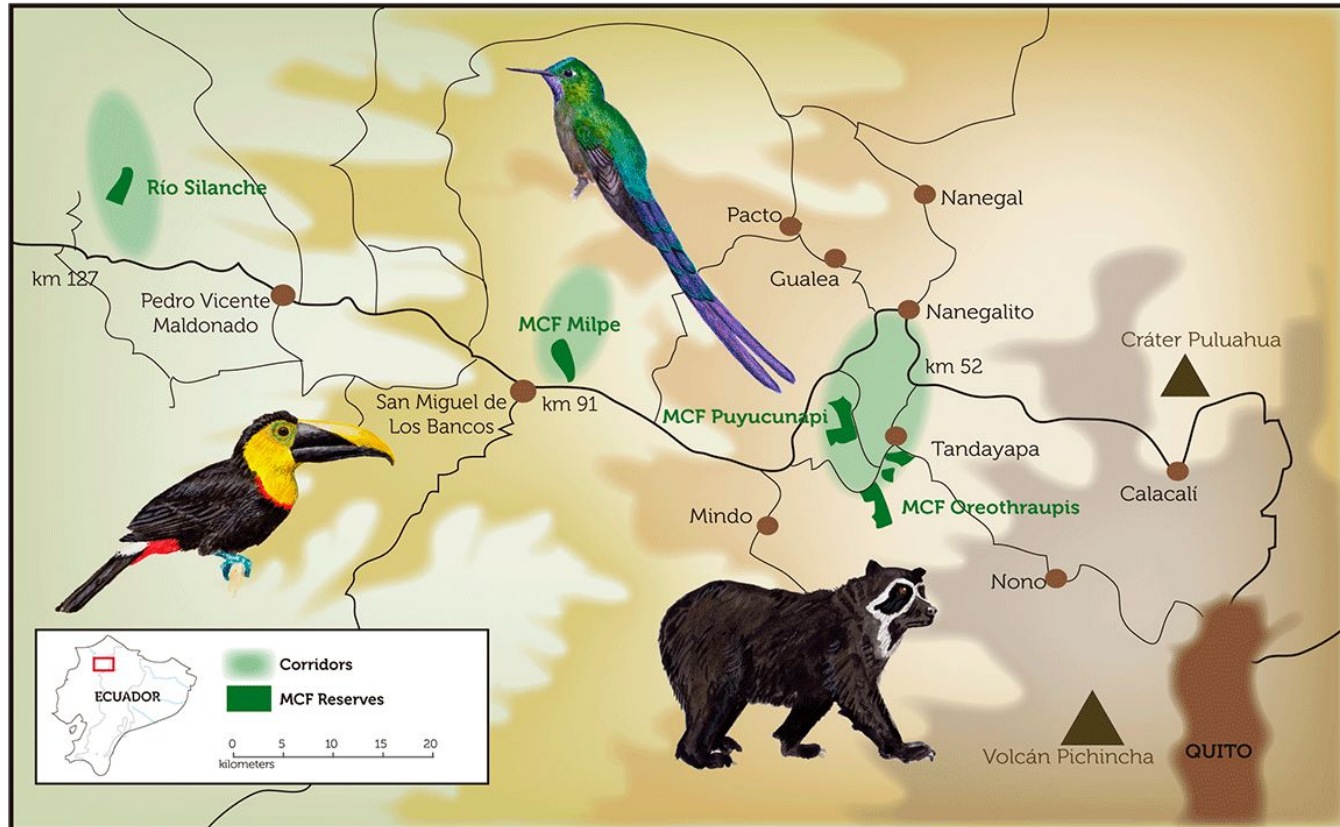
- Epiphytes
  - “Air plants”
    - Orchids
    - Lichen
    - Mosses
    - Bromeliads

<https://youtu.be/vXQSXWCRhR8>

# Birds of Mindo

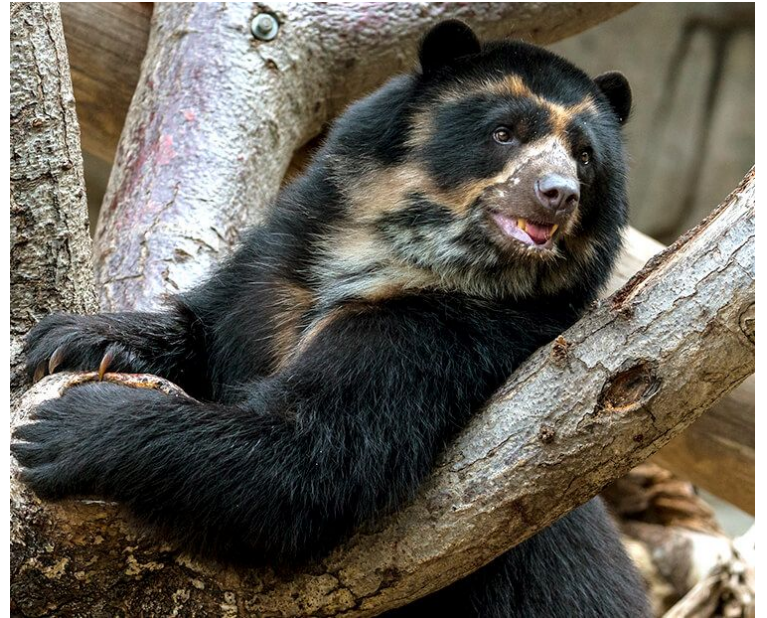


# Map of Ecuador's Cloud Forest reserves



# Andean Bear

- Diet
  - Omnivore
- Other names
  - Tremarctos ornatus, or decorated bear
    - Scientific name
  - Spectacled bear



# Andean Bear - cont

- Age
  - 35 years old in captivity, but it is unknown in the wild
- Size
  - 6.5 ft (1.98m) length and 31 (71.74 cm) inches tall
  - 220-386 pounds (100-175 kg) males
  - 130-176 pound (59-80 kg) females
- Call
  - [https://animals.sandiegozoo.org/sites/default/files/animal\\_sounds/andean\\_bear\\_cooling\\_mono.mp3](https://animals.sandiegozoo.org/sites/default/files/animal_sounds/andean_bear_cooling_mono.mp3)



# Plate-billed Mountain-Toucan

- Diet
  - Fruit
- Name
  - *Andigena laminirostris*
- Range
  - 22,000 km<sup>2</sup>
- Size
  - 42 to 53 cm (16.5-20.9 in) tall
  - 10 cm (3.93 in) long
- Call
  - <https://www.xeno-canto.org/species/Andigena-laminirostris>



# Andean Cock of the Rock

- Diet
  - Fruits and insects
- Names
  - *Rupicola peruvianus*
- Range
  - Roughly 257,000 km<sup>2</sup> (99228 square miles)
- Size
  - 32 cm (12.6 in)
  - 220 grams (0.49 lb)



- Call-

<https://download.ams.birds.cornell.edu/api/v1/asset/526364>

# Video about the Andean Bear



<https://www.youtube.com/watch?v=rwlwRH6r8KY>

# Montane Rainforests Around the World



# Monteverde Cloud Forest in Costa Rica



# Some key facts in this cloud forest

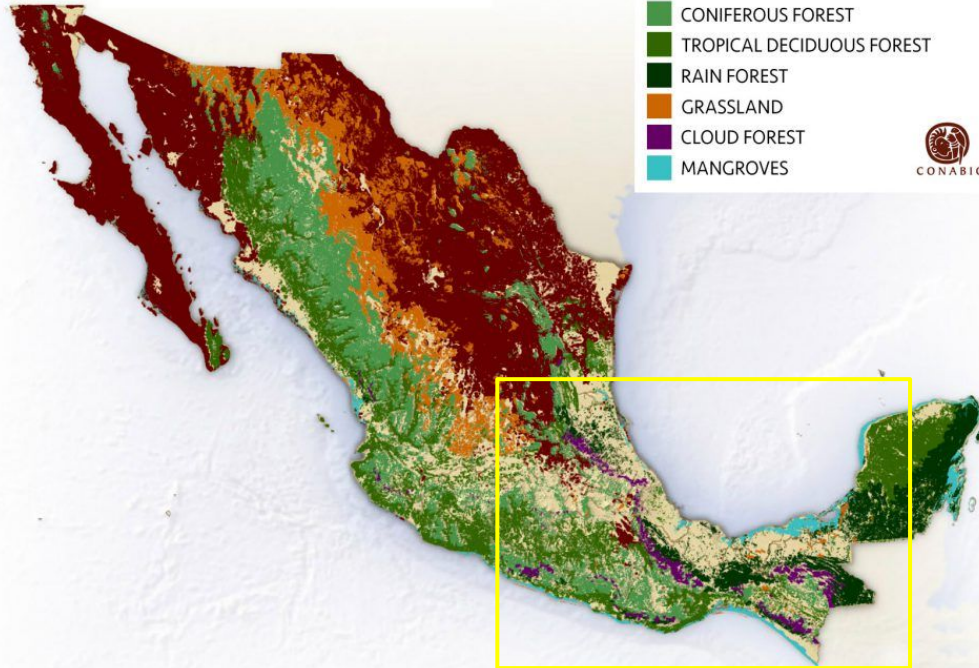
- The reserve was established in 1972
- Its area extends over 35,000 acres (54.69 square miles)
- 8 life zones atop the Continental Divide
- 8 miles (12874.8 m) of walkable trails
- Supports all 6 species of the cat family
  - jaguars, ocelots, pumas, oncillas, margays, and jaguarundis

# Central Mexico's Cloud Forest



# A map showing the location of cloud forests in Mexico

Principal Mexican Ecosystems




[http://vivanatura.org/wp-content/uploads/2017/09/Mexican\\_Ecosystems-1000x694.jpg](http://vivanatura.org/wp-content/uploads/2017/09/Mexican_Ecosystems-1000x694.jpg)

Yellow square indicates regions of cloud forest in Mexico



# Some Key Facts in this Cloud Forest


- Known for its migratory bird populations
- Threat of agricultural development for coffee
- Carbon storage of 128,971 metric tons  
(128971000 kg)
- About 1,000 acres (1,56 square miles) large

A misty forest scene with moss-covered ground and bare trees. The ground is covered in a thick layer of green moss, and the trees are mostly bare, with some sparse green leaves. The atmosphere is hazy and ethereal.

# Yakushima Island, Japan

# Yakushima Island, Japan's cloud forest

Yakushima Island, Japan



## Yakushima Island

屋久島  
Yakushima, Kumage District, Kagoshima  
Japan

4.6 ★★★★★ (402)  
Island

Directions Save Nearby Send to your phone Share

Yakushima, Kumage District, Kagoshima, Japan  
鹿児島県熊毛郡屋久島町  
Add a label

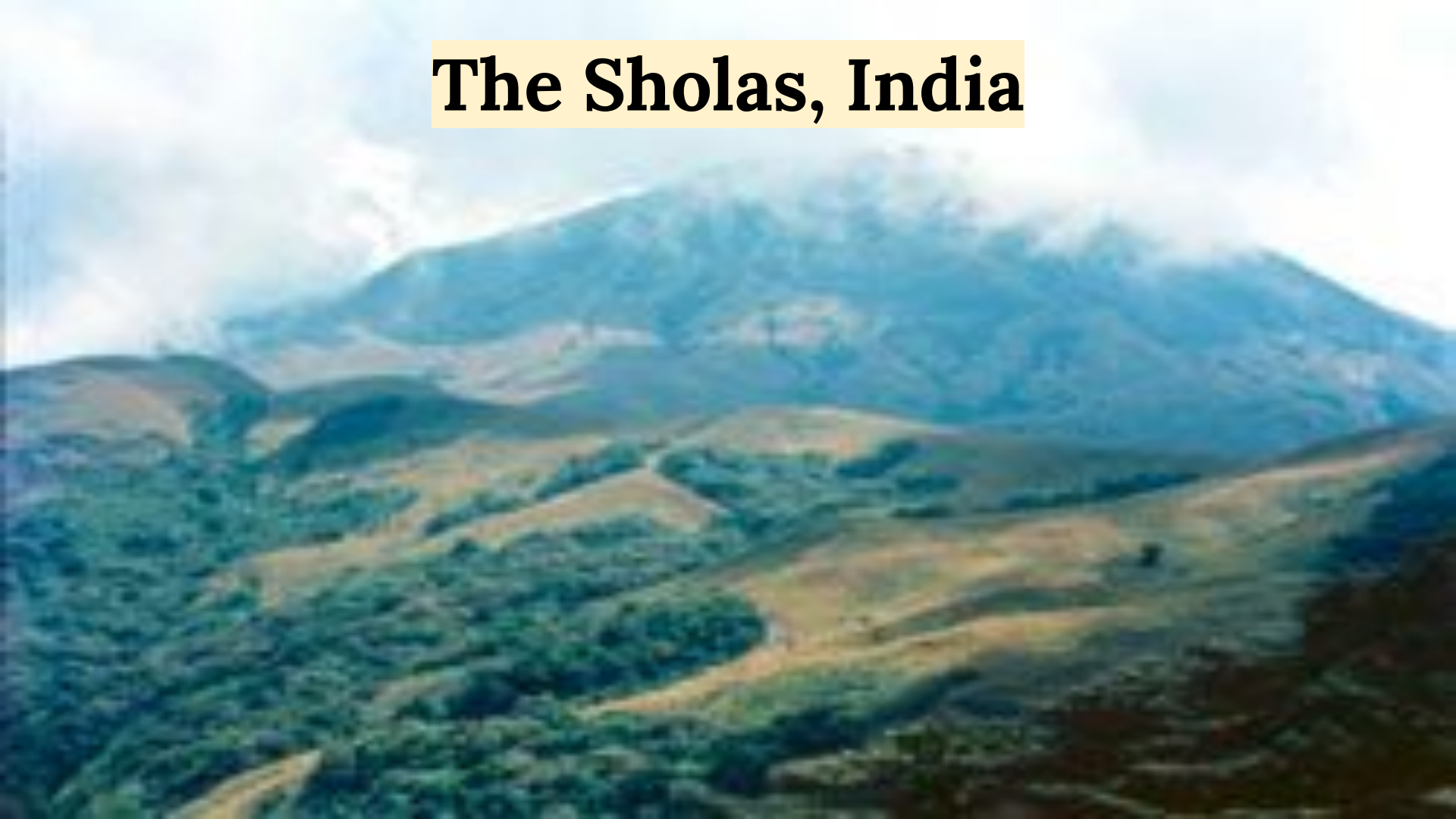
# Some Key Facts in this Cloud Forest

- Known as “the island of ancient forest and water” because of the huge Yaku cedars, which are over 1,000 years old, moss and abundant water system.
- Some special species in this area are the red-bottomed macaques and sika deer
- Only reachable via ferry or flight because it is located on an island

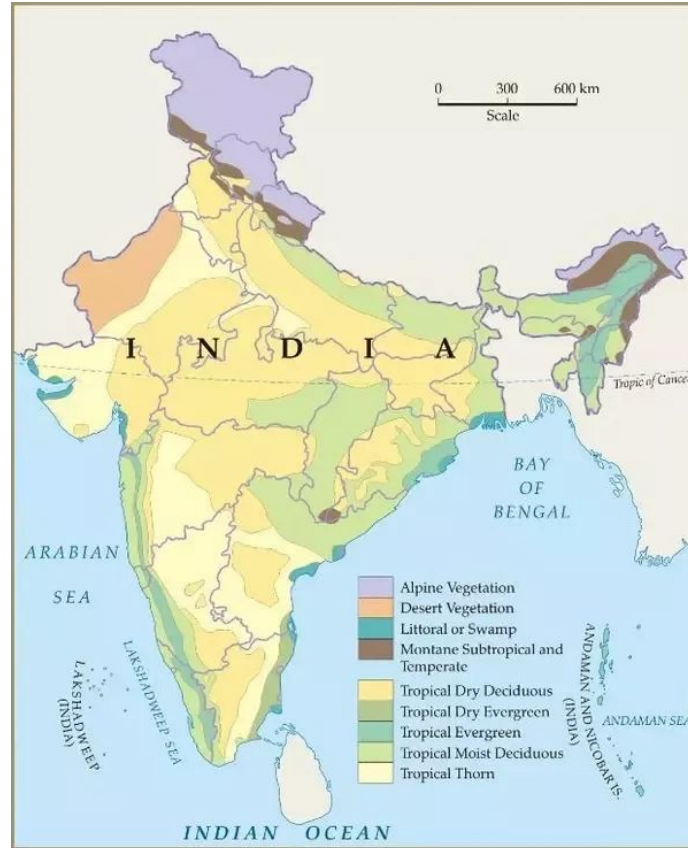
<https://animalcorner.co.uk/wp-content/uploads/2015/02/macaque-monkey-2.jpg>



# The Sholas, India



# Map of the cloud forest in India



<https://qph.fs.quoracdn.net/main-qimg-f7163bece195d4ebb09ea91b67e75ffe.webp>

# Some Key Facts in this Cloud Forest

- Lowest altitude of most cloud forests at 5,000 feet (1524 m) above sea level
  - Warmer and more humid than the average cloud forests
- Home to many indigenous species

# Some Key Facts in this Cloud Forest-cont.

- High level of endemism in this cloud forest
  - 35% plants
  - 42% fish
  - 48% reptiles
  - 75% amphibians

<http://www.happybotanist.com/wp-content/uploads/2017/07/trekking-in-chemra-peak.jpg>





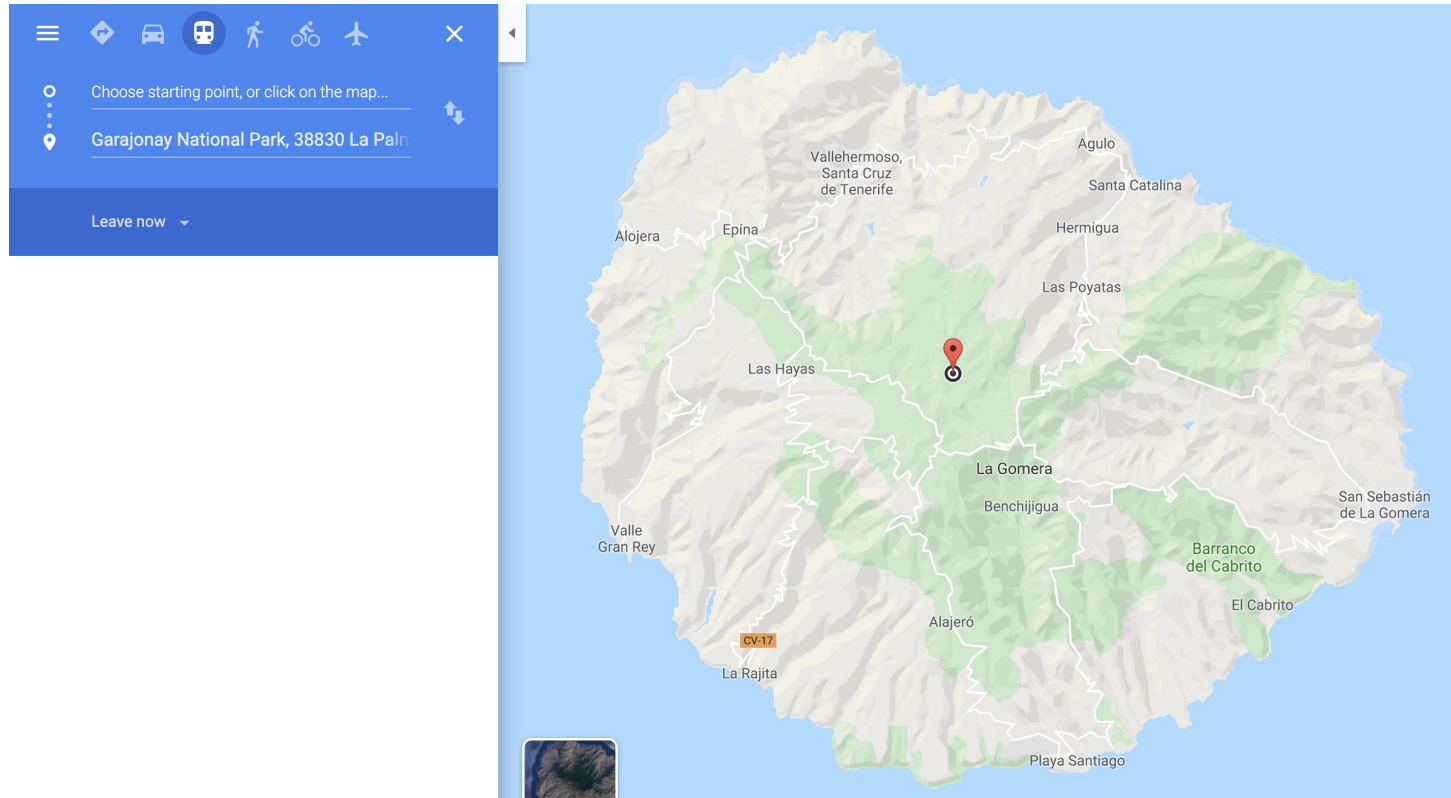
# La Gomera, Spain



# Map of the cloud forest in Spain



# The location of the cloud forest in Spain



# Some Key Facts in this Cloud Forest

[https://www.dw.com/image/50112402\\_303.jpg](https://www.dw.com/image/50112402_303.jpg)



- Part of the Canary Islands
- Snake and spider free
- Biggest threat is forest fires
  - Made up of highly combustible shrubs
- Known for its waterfalls and streams

# **Bale Mountains National Park, Ethiopia**



# Cloud forest of Ethiopia map



[http://ai.stanford.edu/~lalombe/mountain/photo/ethiopia-2013/bale-2013\\_files/image003.jpg](http://ai.stanford.edu/~lalombe/mountain/photo/ethiopia-2013/bale-2013_files/image003.jpg)

# Some key facts in this cloud forest

- Coffee production is popular in this region
- One of the few remaining forests in Ethiopia due to deforestation
- About 530,000 acres (about 828 square miles) large

<https://cdn.britannica.com/54/120754-050-C1C5D3FE/labourer-Guatemalan-coffee-plantation.jpg>

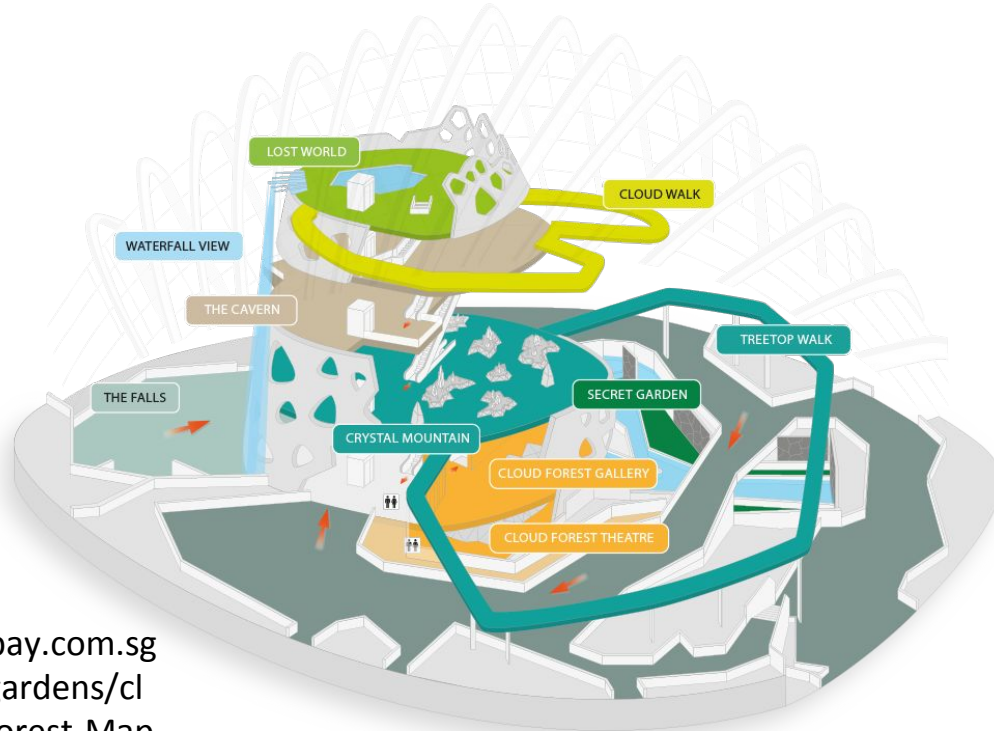


# Singapore's Cloud Forest





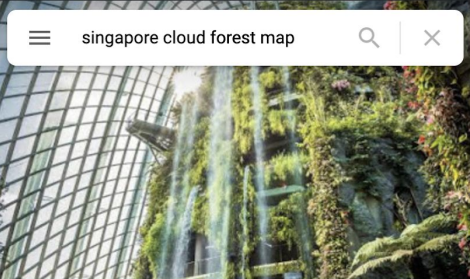
# Singapore's cloud forest map



[https://m.gardensbythebay.com.sg/content/dam/gbb/the-gardens/cloud-forest/GBB\\_Cloud-Forest-Map-1200x800-latest.png](https://m.gardensbythebay.com.sg/content/dam/gbb/the-gardens/cloud-forest/GBB_Cloud-Forest-Map-1200x800-latest.png)

# Map of Singapore's cloud forest location

☰ singapore cloud forest map 🔍 ✕



## Cloud Forest

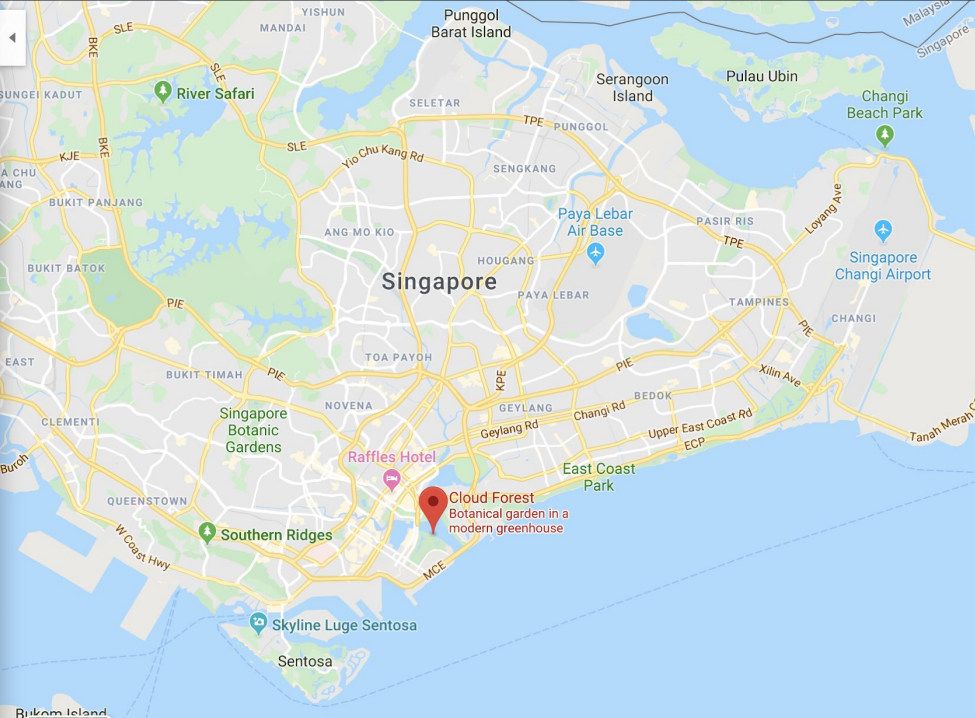
4.7 ★★★★★ (11,549)  
Tourist attraction

[Directions](#) [Save](#) [Nearby](#) [Send to your phone](#) [Share](#)

Lush vegetation of the tropical highlands & a tall waterfall in a soaring, contemporary greenhouse.

[📍 18 Marina Gardens Dr, Singapore 018953](#)  
Located in: Gardens by the Bay

[📍 7/VM8+GC Singapore](#)



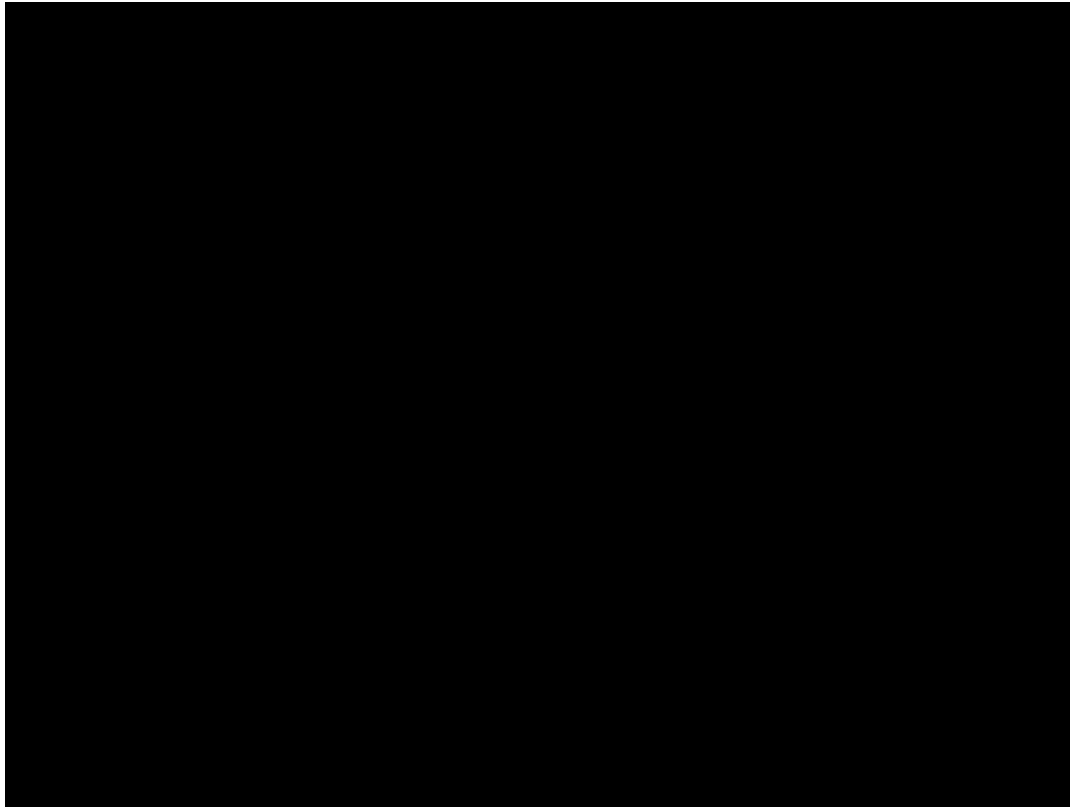
Map of Singapore showing the location of Cloud Forest (Botanical garden in a modern greenhouse) marked with a red pin. The map includes labels for various districts and landmarks such as River Safari, Singapore Botanic Gardens, Raffles Hotel, and Changi Airport.

# Some Key Facts in this Cloud Forest

- Conservatory
- Commercialized - entrance fee and misting hours
- 2 acres (about 0.003 square miles) large
- Its artificial conditions mock conditions between 1,000 and 3,000 meters (between about 0.62 and 1.86 miles) above sea level
- “Cloud mountain”
  - Special vegetation

<https://youtu.be/ZFaJYA1KJeE>

# Cloud Forest Timelapse Video



# Unique Characteristics of the Mindo Cloud Forest

- This area was named the first Important Bird Area in the Americas in 1997
  - Botanical abundance
  - Fauna species
  - Unique flora species
  - Considered to be vital for ecological and responsible tourism development.

# Unique Characteristics of the Mindo Cloud Forest-cont.

- The typical temperature in this area ranges from 60 degrees Fahrenheit (15.56 degrees Celsius) to 75 degrees Fahrenheit (23.89 degrees Celsius)
- No dry season, but drier in the months of May to September
- 48,000 acres (75 square miles) large

# Expectations at this elevation

- Dress in layers due to the temperature variation
- Wear rain gear
- Bring sunscreen lotion, a hat/cap, good hiking shoes, and an extra pair of socks



[https://www.whentobewhere.com/sites/default/files/place\\_inline\\_images/Mindorain\\_node0762.jpg](https://www.whentobewhere.com/sites/default/files/place_inline_images/Mindorain_node0762.jpg)

# Impact of volcanoes in this area

- Eruptions
  - Release gases
    - CO<sub>2</sub>
    - SO<sub>2</sub>
  - Temperature
    - Drop by .5 Degrees Celsius
  - Ash
    - Can impact rivers
- Protection
  - Yumbo-Nigua





# How is it impacted by tourism?

- Local business owners have been moving toward ecotourism so that there are low impact approaches to successfully run their businesses
  - Hiking
  - Butterfly farms
  - Inner tubing
  - Ziplining



<https://www.whentobewhere.com/sites/default/files/photos/Mindo-62.jpg>

# How is it impacted by tourism? - cont.

- Hiking/biking
  - Degrades the soil
  - Scare wildlife
  - Harm vegetation
  - Reduce vegetation with widening of trails
- Infrastructure
  - Habitat destruction to house travellers
  - Increased waste - land and water pollution
  - Air pollution with transportation

# Dangers to the forest

- Dangers to cloud forests on a global scale
  - Habitat loss
  - Habitat degradation
- Both of which will impact biodiversity and species abundance/presence



<https://true-ecuador-travel.org/images/study-travel/mindo1.jpg>

# Hazards Caused by the forest

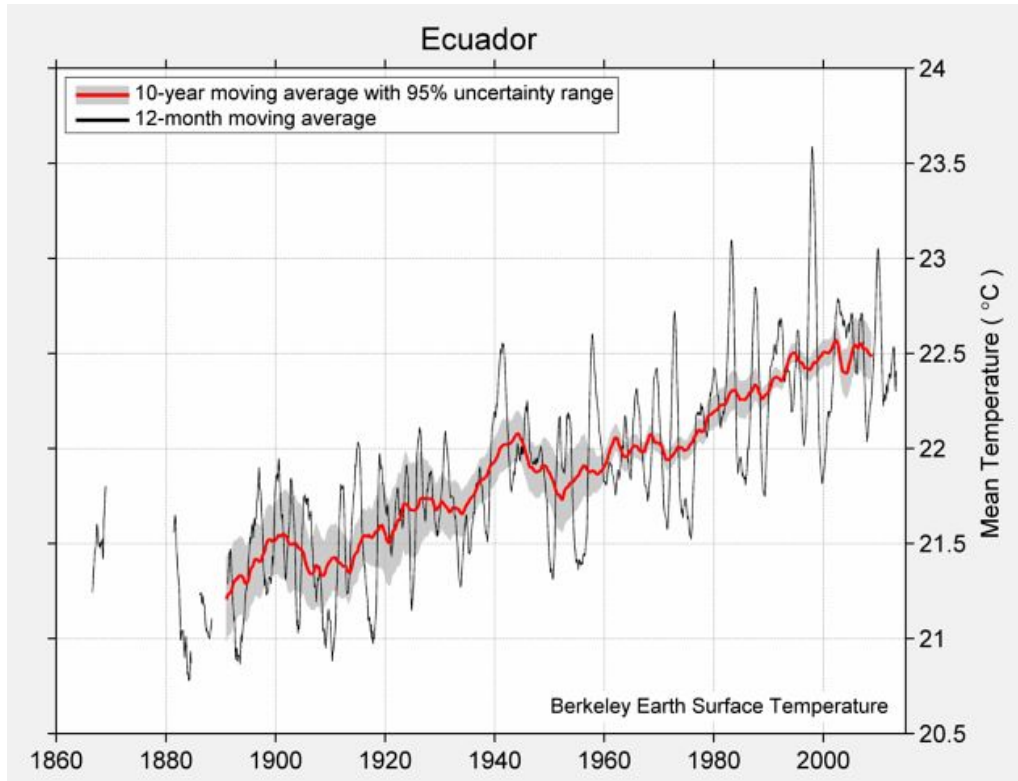
- Mudslides
  - Logging
    - Loose soil erodes away
- Water
  - Clean water
    - Provides water for
      - Loss of habitat and climate change Affect water availability
- Flooding



# How is it impacted by Global Climate Change?

- Altitude at Current levels
  - Narrow range
  - GCC
    - Extinction of forests
- Climate
  - Cloud formations
    - Less clouds
    - Lifting cloud base hypothesis
  - Weather
    - Rainfall
    - Temperature

# Climate Change Graph



# Environmental Agencies

- MCF
  - Mindo Cloudforest Foundation
  - Conservation
  - Ecological Inquiry
  - Ecotourism
  - Restoration



# Reservations

- MINDO-NAMBILLO ECOLOGICAL RESERVE
  - Butterfly farm
    - Mariposario
  - Hiking and biking
- Bird sanctuaries
  - Milpe-Andean foothills reserve
    - Choco
  - Rio Silanche
    - Choco-lowland Bird Sanctuary



# Reservations - cont.

- Sanctuaries
  - Puyucunapi
    - Working dairy farm
    - Flora
    - Fauna
  - Oreothraupis & Tandayapa
    - Along mindo River
    - Named after Tanger Finch
    - Home to Spectacled Bear

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