

# Applied Geography

FCUS

**Geography may not change the world,  
but it will change the way you see it.**



# Introduction Death Valley NP



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# Background Note



**Gregory Lee**

Prof. Emeritus of  
Geography

This report is a demonstration of the Geographic Systems Model used to systematically understand the unique characteristics of a place.

Prof. Gregory Lee developed the Geographic Systems Model and used it successfully in teaching and other education projects for over 20 years.



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# Advisory Note

This presentation is formatted for viewing on a single computer screen by a few people.

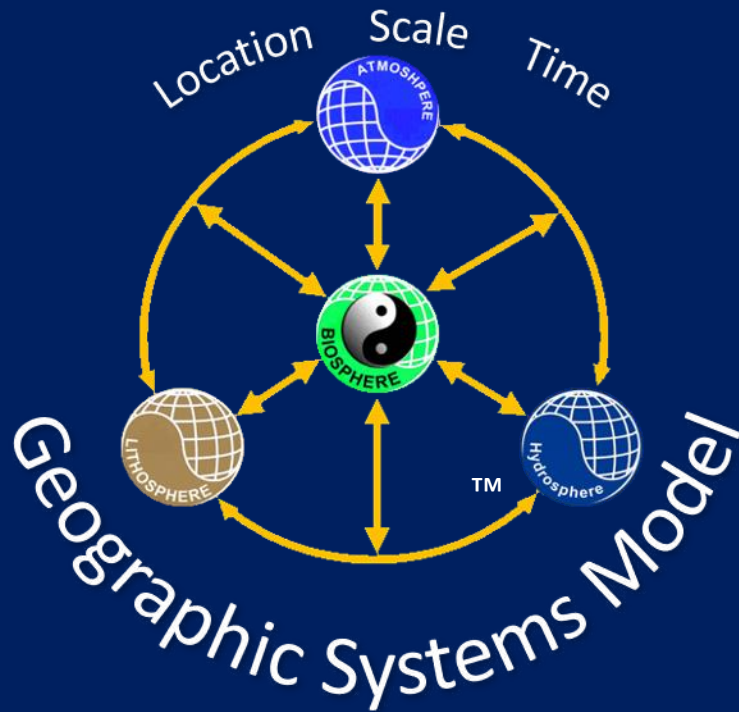


For large group presentations, a narrator should read the slides with text not readily legible to the audience.



# The Geographic Systems Model

This is a conceptual model to systematically observe the world. It helps you to consistently compare and contrast one place to another. It also helps to reveal the connections between the materials, processes, and places on Earth.





# The Death Valley NP

We will visit the  
Death Valley NP  
using the  
Geographic  
Systems Model.



AG-DVNP Intro

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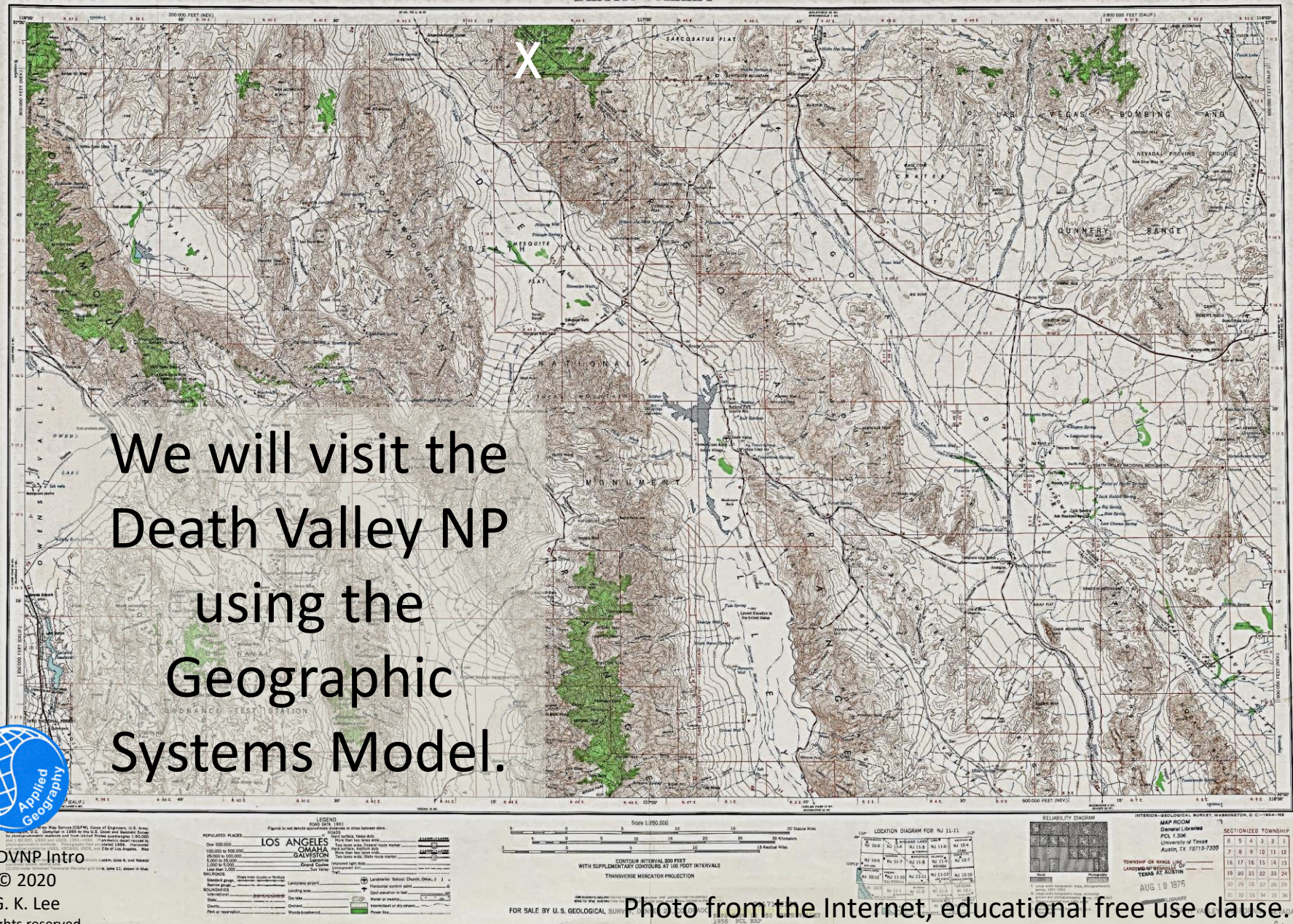


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# Death Valley : Lowest Point in US

The  
Death  
Valley NP  
is among  
the lowest  
places in  
the world.





# Atmosphere Checklist

<b>Atmosphere (LLAOATS)</b>
Latitude
Land / Water Distribution
Atmospheric Circulation
Oceanic Circulation
Altitude
Topographic Barriers
Storms

This checklist is key to knowing the heat and moisture available in an area. Most life on Earth requires water to survive. All living organisms have a range

of temperatures in which they can survive. Too cold or too hot and they die.



# Using the Atmosphere Checklist

Atmosphere (LLAOATS)
Latitude
Land / Water Distribution
Atmospheric Circulation
Oceanic Circulation
Altitude
Topographic Barriers
Storms

Get data for each topic on the list.

- Latitude: 36.46° N, 116.87° W
- Land/Water Distribution: Interior, N. American west coast.
- Atmospheric Circulation: Subtropical High
- Oceanic Circulation: California current (cold).
- Altitude: -85.5 m (-282 ft) to 3,370.5 m (11,058 ft) AMSL
- Topographic Barriers: 4 mountain ranges to W
- Storms: tropical cyclones





# Latitude Zones

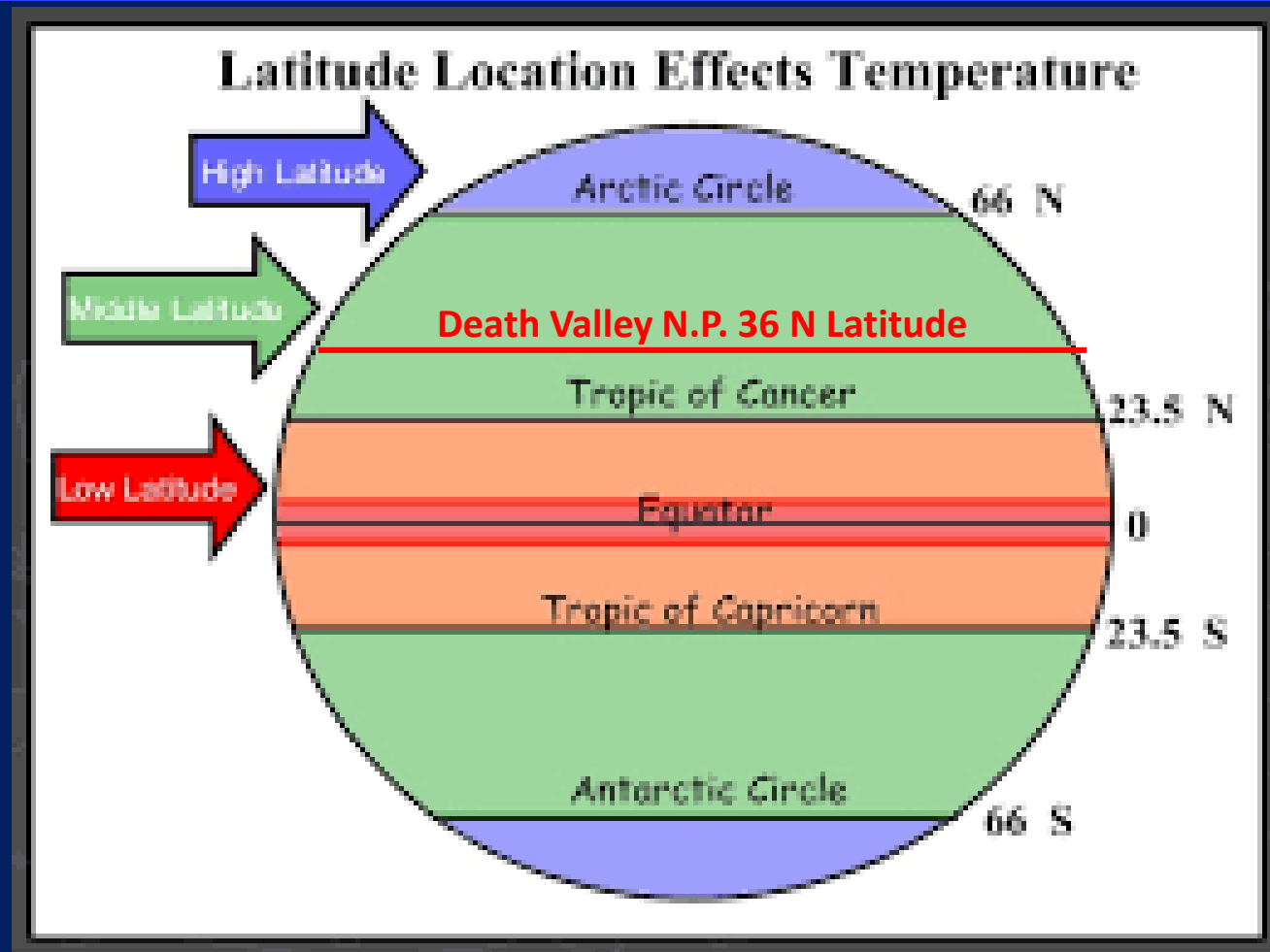
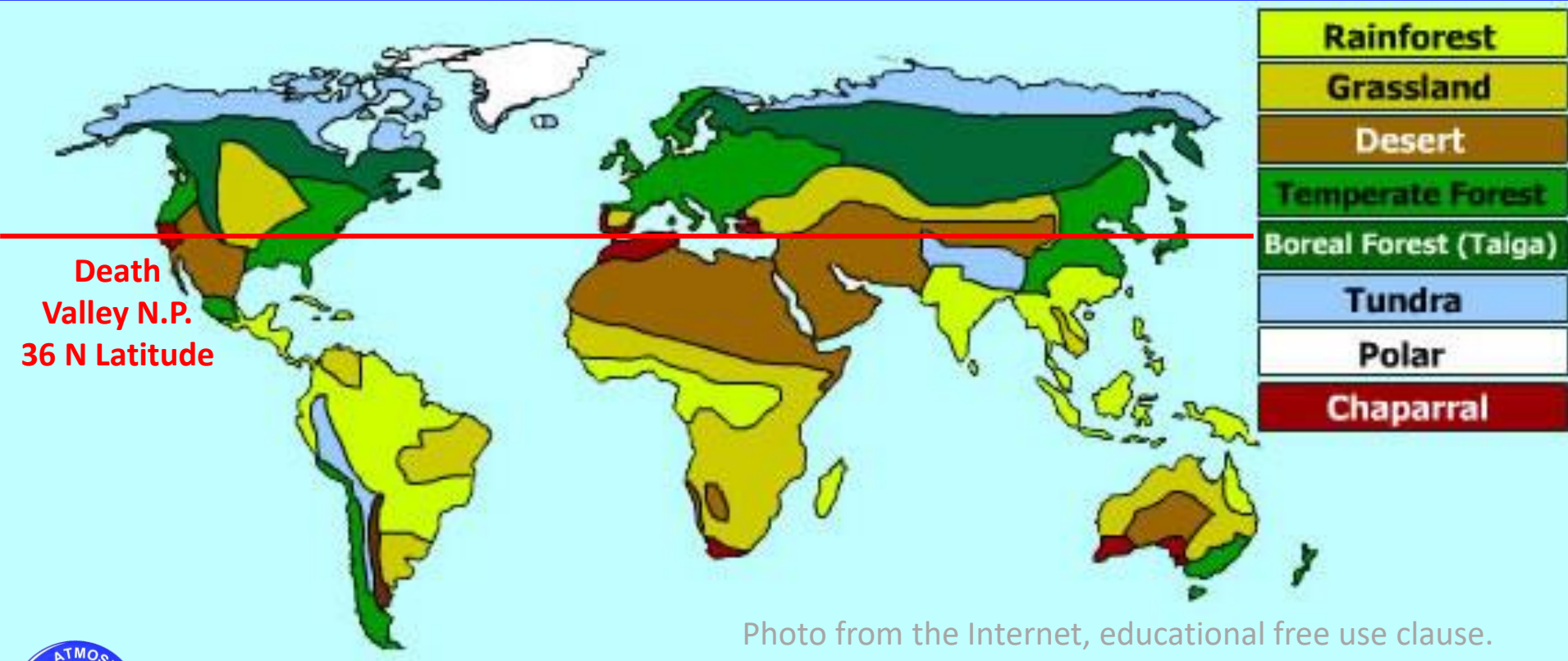


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DVNP is in the Subtropical Highs and Westerly wind belt, subject to frontal, orographic, and convective lifting.



# Land / Water Distribution



Land tends to be dry; Water is wet.  
DVNP is an interior continental, west coast desert location.





# Atmospheric Circulation

Dry Zone

Moist Zone

Dry Zone

Moist Zone

Dry Zone

Moist Zone

Dry Zone

Death  
Valley N.P.  
36 N Latitude

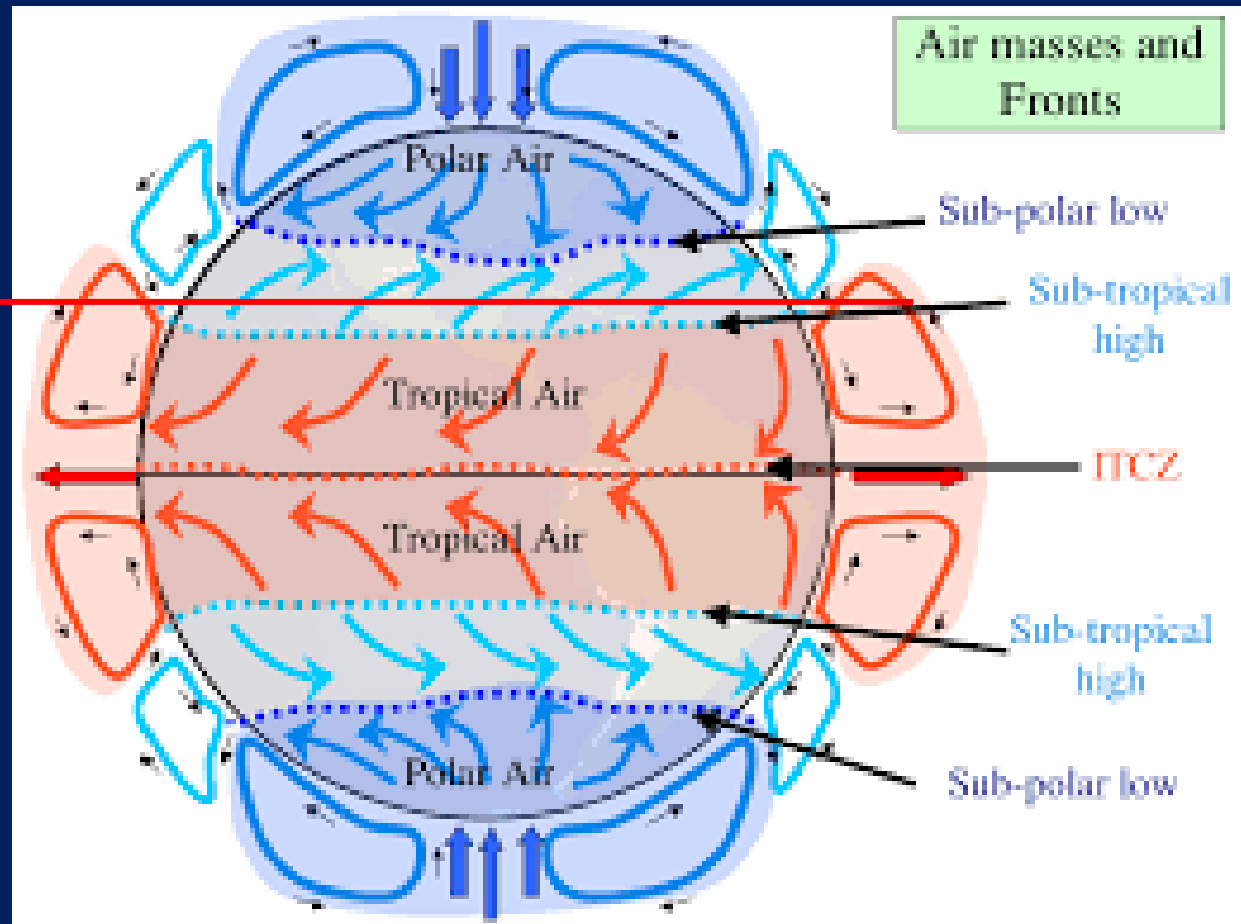
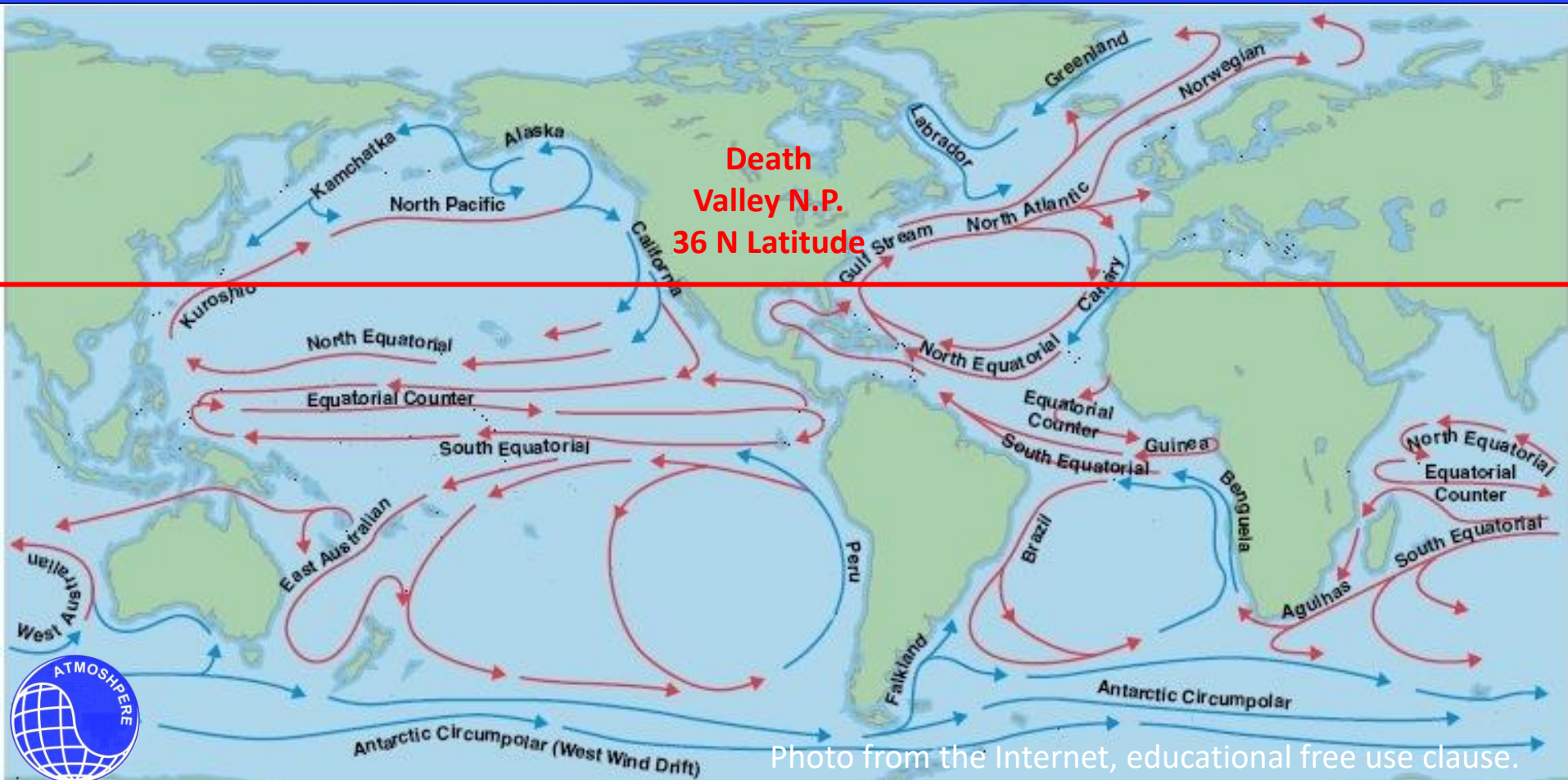


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DVNP is under the STH zone dominated by summer convective lifting, and frontal lifting in winter (both combined with orographic lifting)



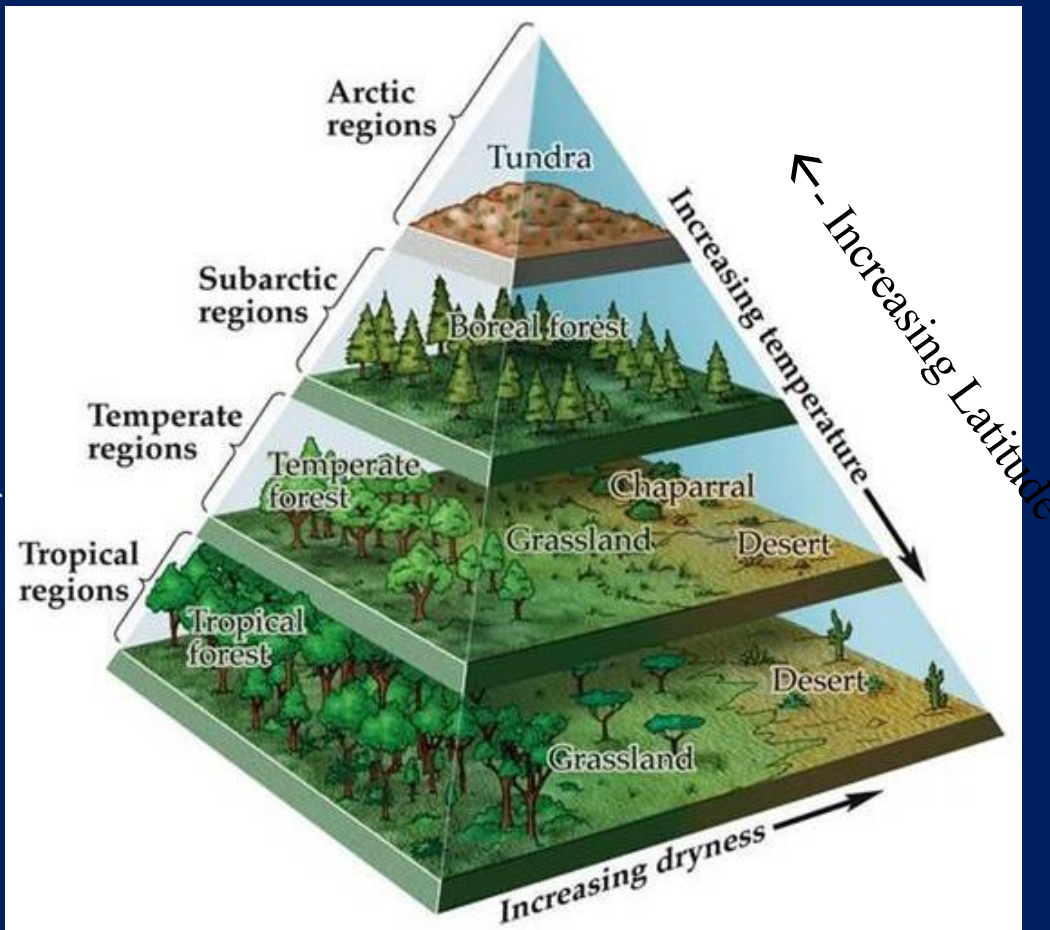
# Oceanic Circulation



The cold ocean current of the US west coast affects the regional weather systems.



# Altitude



Altitude and temperature are inversely related. High altitude = low temperature; Low altitude = high temperature. Latitude and temperature are also inversely related.

Elevation in DVNP ranges from -80 m / 282 ft BMSL to 3,368 m / 11,049 ft AMSL

Photo from the Internet, educational free use clause.



# Topographic Barriers



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**Topographic barriers** block winds carrying heat and moisture. There are 4 mountain barriers between the Pacific Ocean and DVNP.

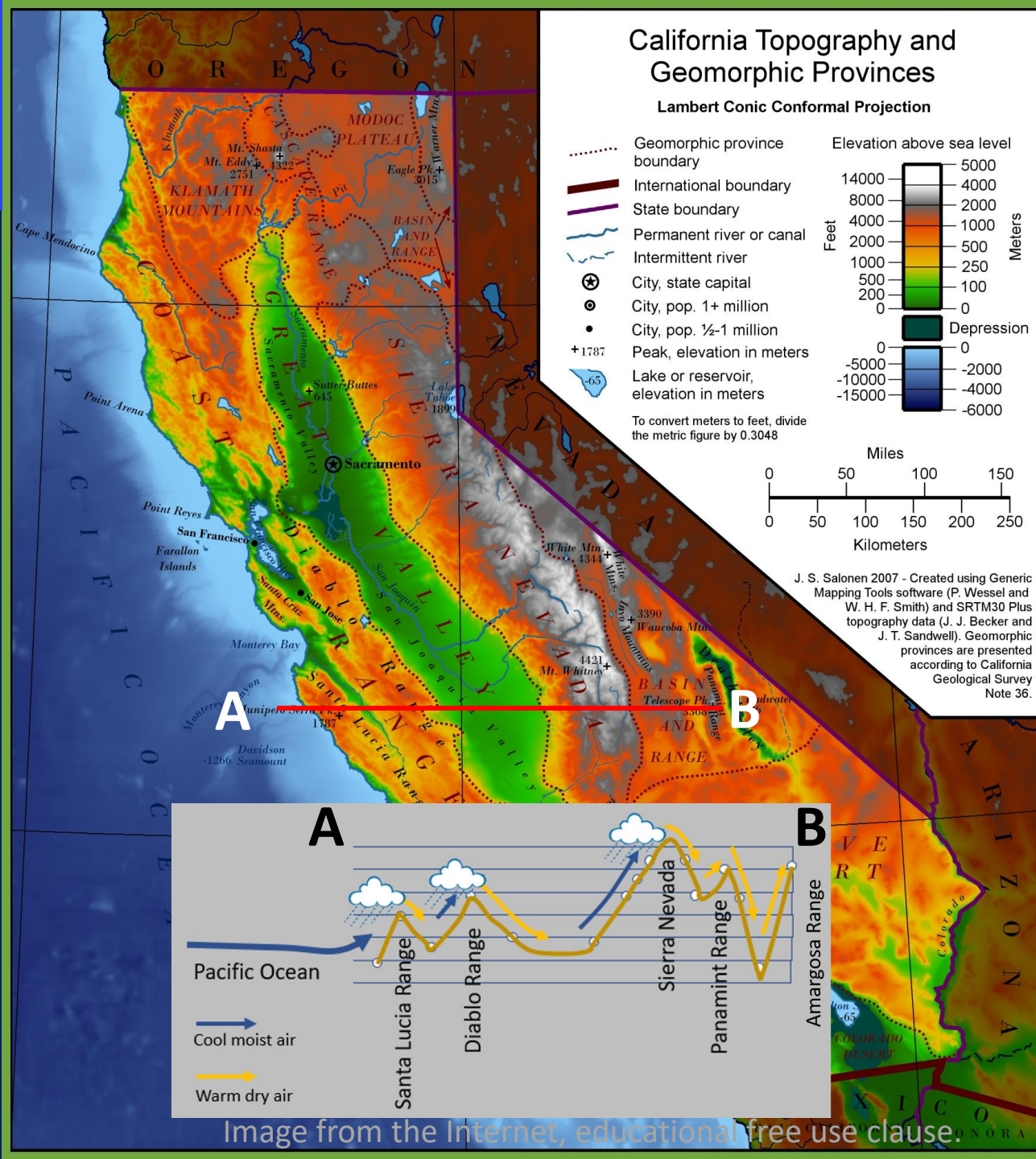




# Topographic Barriers

The warm, moist winds from the Pacific cross the mountains at right angles. The air is forced up, cools, and rain falls on the west slopes. As it descends, it's warm and dry removing moisture from the east slopes.

When it gets to Death Valley, there little or no moisture left.





# Storms

Death valley  
gets Winter  
Frontal Lifting /  
T-storms

Hurricanes /  
Typhoons

Frontal Lifting /  
T-storms

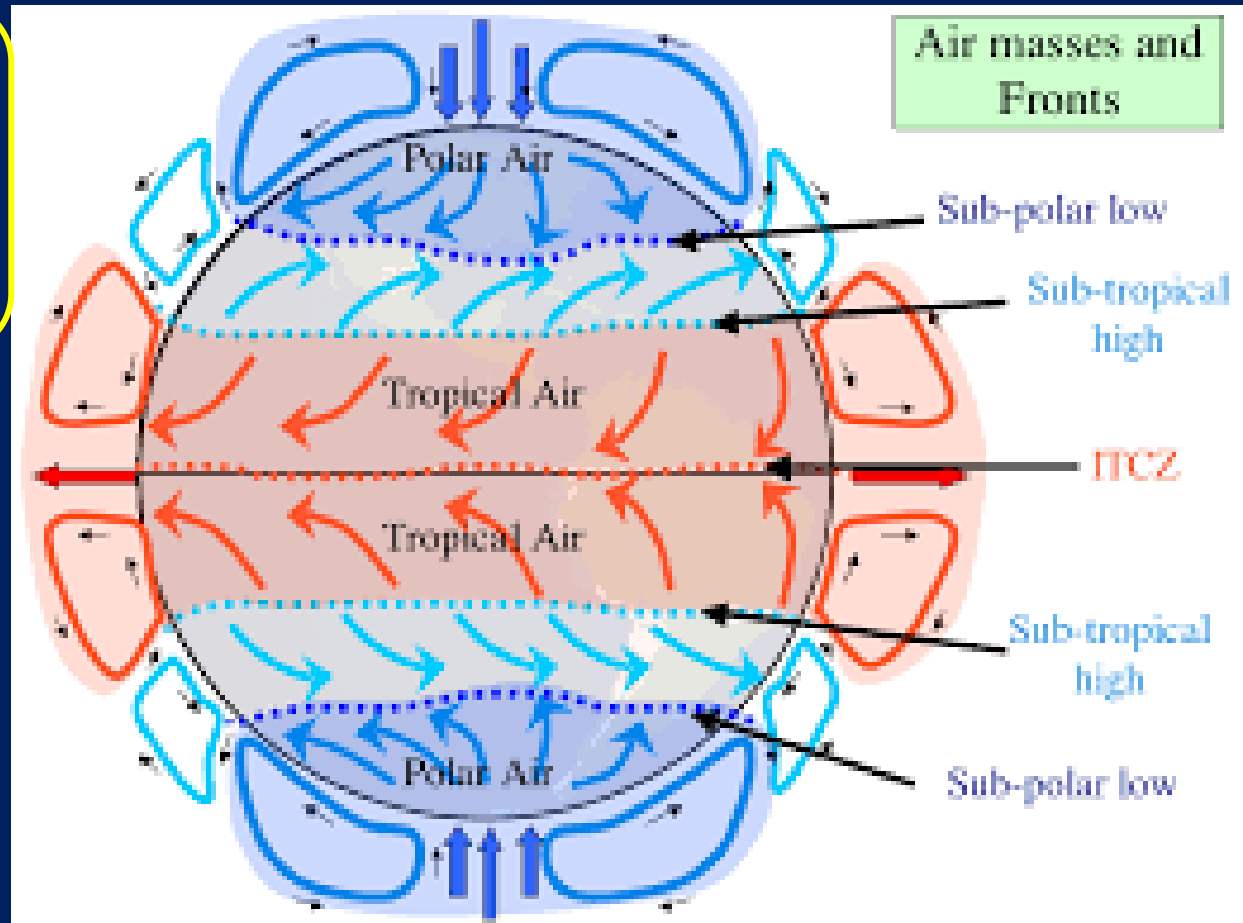


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Hurricanes and typhoons are associated with  
the Tropics.



# Storms

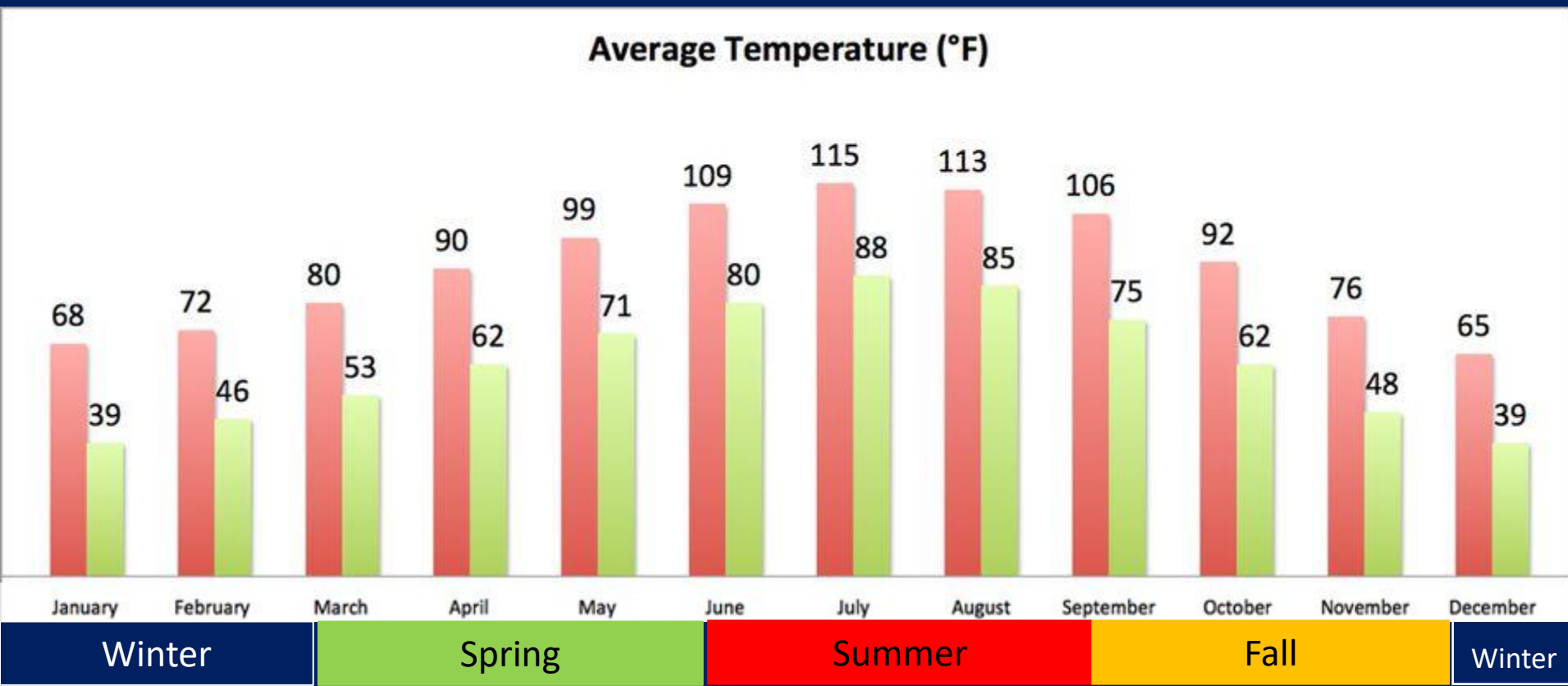


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In Dec-Feb, frontal storm systems from the NW  
bring rain to Death Valley.



# Effect of Season on Temperature



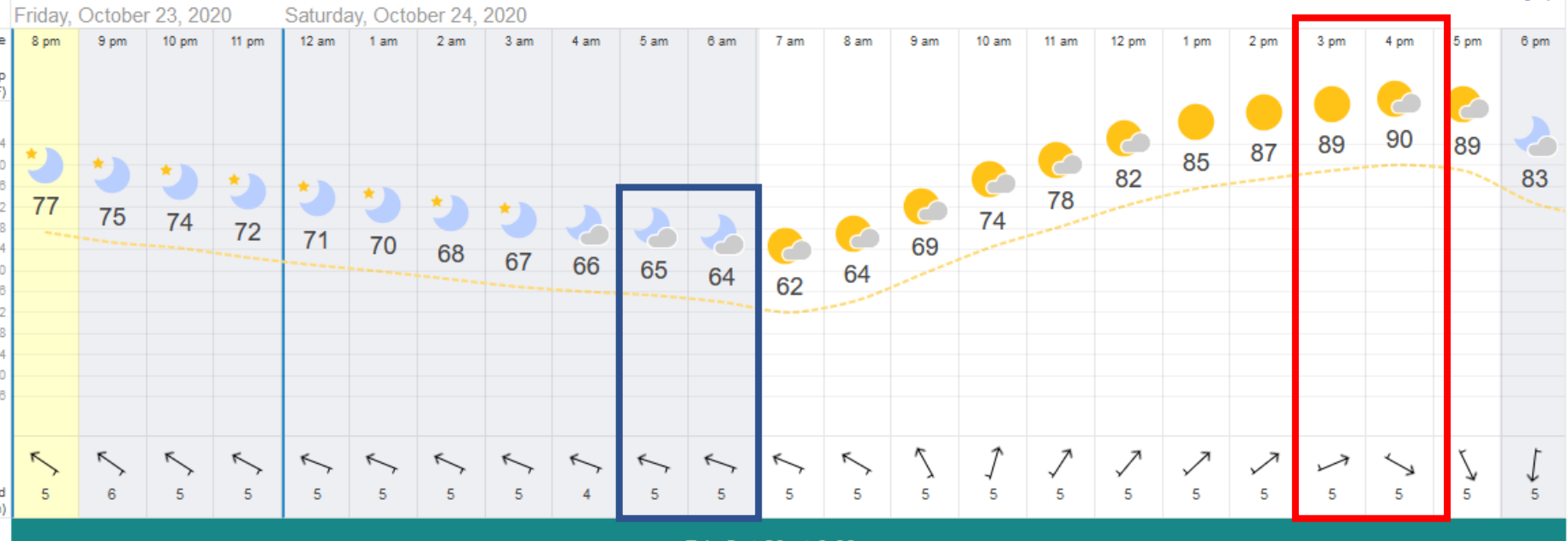
Seasonal temperatures in Death Valley.





# Effect of Time of Day on Temperature

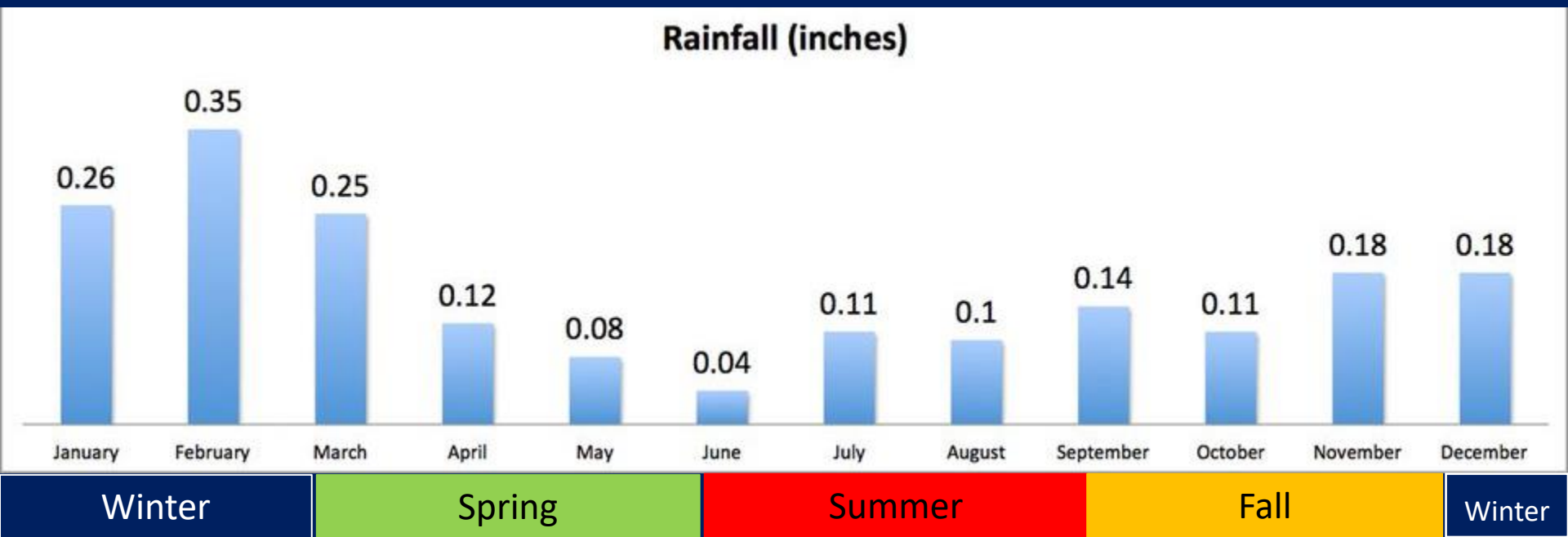
Hour-by-hour Forecast in Furnace Creek (Death Valley) — Graph



The lowest daily temperature is just before dawn.  
The highest temperatures are mid to late afternoon.



# Effect of Seasons on Rainfall



Rainfall in Death Valley reaches a maximum in Dec-Feb.



# LLOATS Summary: Death Valley

**Latitude:** Subtropics, Northern Hemisphere

**Land/Water:** Land (interior)

**Atmospheric Circulation:** Subtropical High

**Oceanic Circulation:** Cold offshore current

**Altitude:** Sea Level to -284ft m (13,800 ft)

**Topographic Barriers:** Mountains

**Storms:** Cold Fronts





# Lithosphere Checklist

## Lithosphere (SPSD)

Structure

Process

Slope

Drainage

This lists guides your study of the rocks / mineral resources and the landforms of an area. It helps you to understand how the land was formed, the nature of the soil, and the movement of water on the surface. The Atmosphere supplies the heat and moisture that causes the weathering, erosion, and deposition in an area.



# Using Lithosphere Checklist

## Lithosphere (SPSD)

Structure

Process

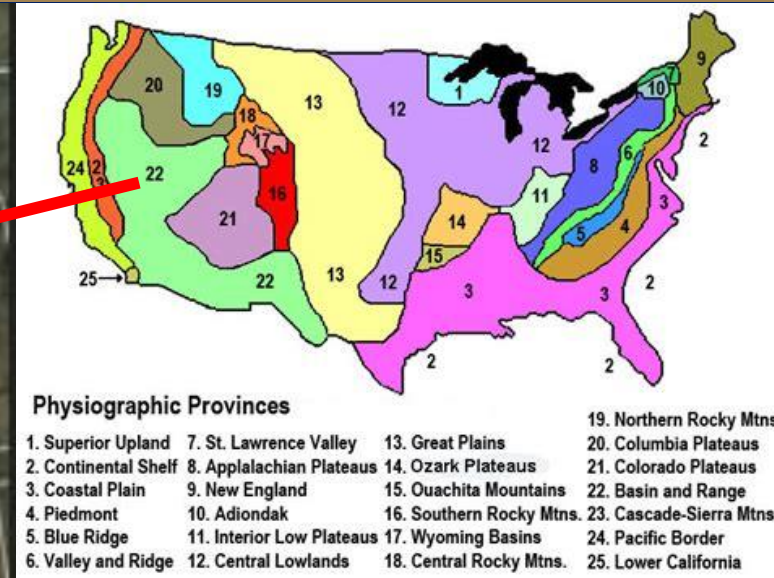
Slope

Drainage

- Structure refers to the shape of the land. In general, it is level, low, or high relative to where you stand.
- Process refers to the forces of nature that created the landform.
- Slope is the vertical angles of the landform.
- Drainage is the movement of water on the landform. Water velocity is based on the slope angle and water volume.



# Regional Setting for Death Valley

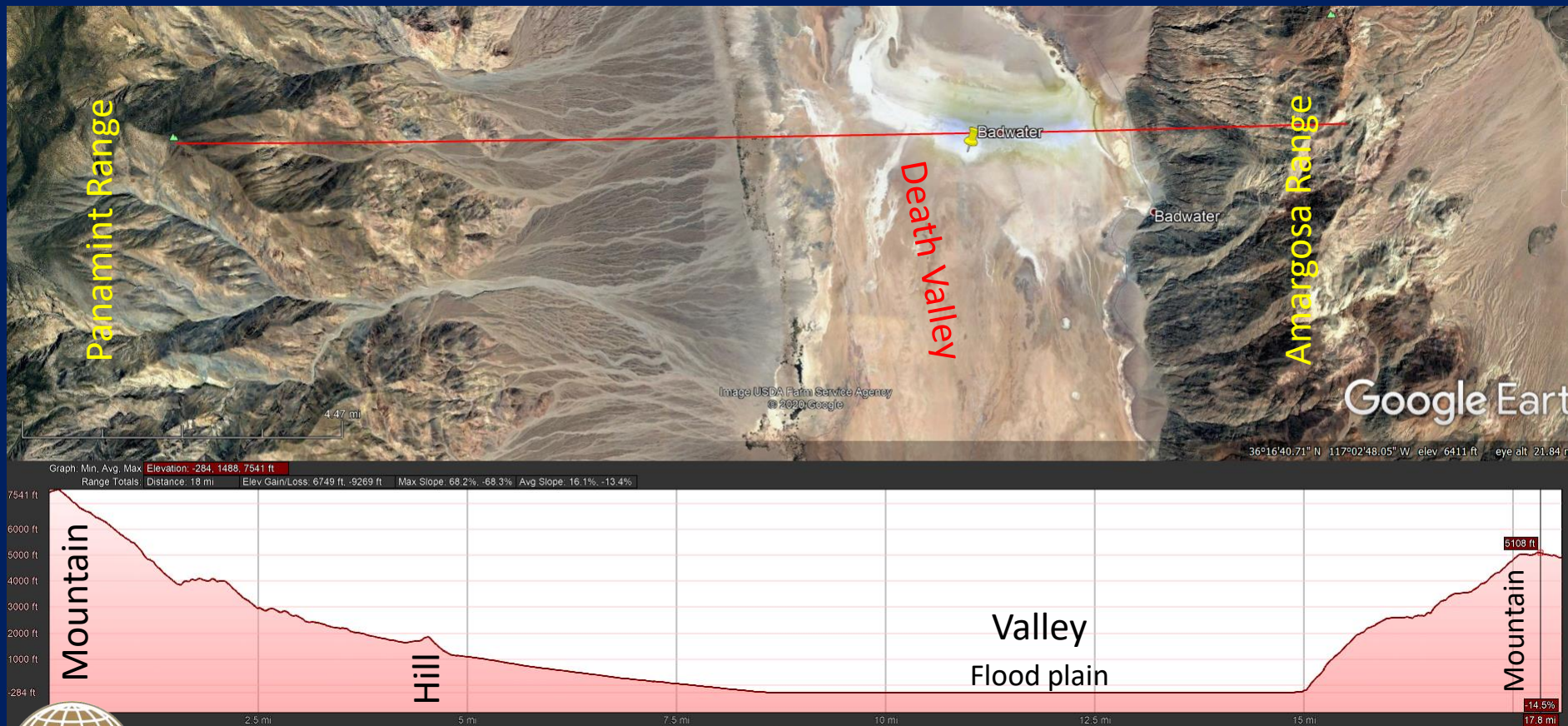


Death Valley is part of the Basin & Range Physiographic Province. It is characterized by N-S trending, parallel mountains/valleys. No rivers drain to the ocean.





# Death Valley Terrain Profile

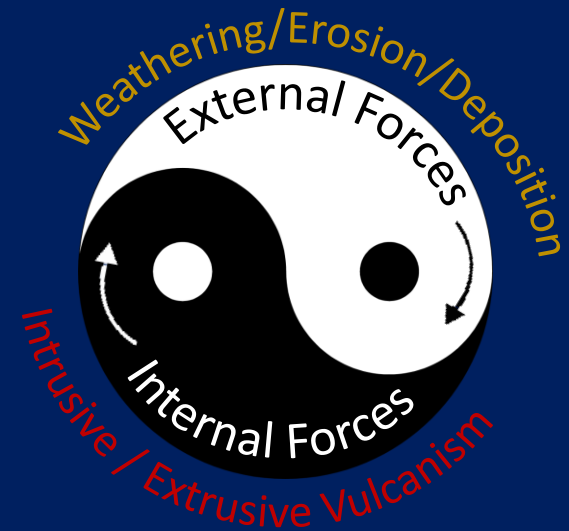
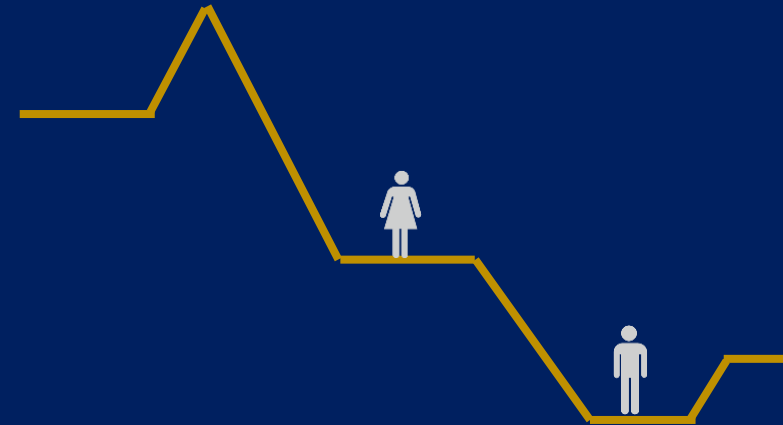


This terrain profile goes West to East across Death Valley through Badwater (the lowest point in Death Valley and North America).



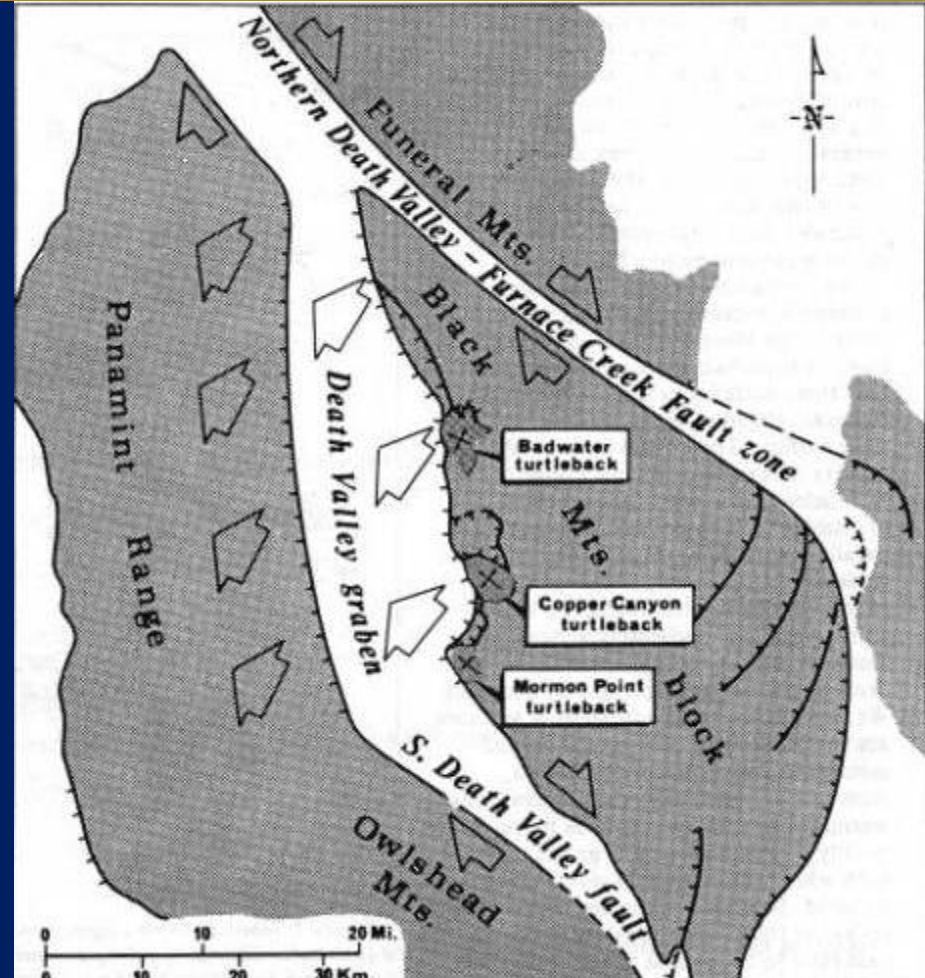
# Structure & Process

- Structure refers to the shape of the land. It is generally level, low, or high relative to your position.
- Process refers to the forces of nature that created the landform.



# Tectonic Forces Making Structures

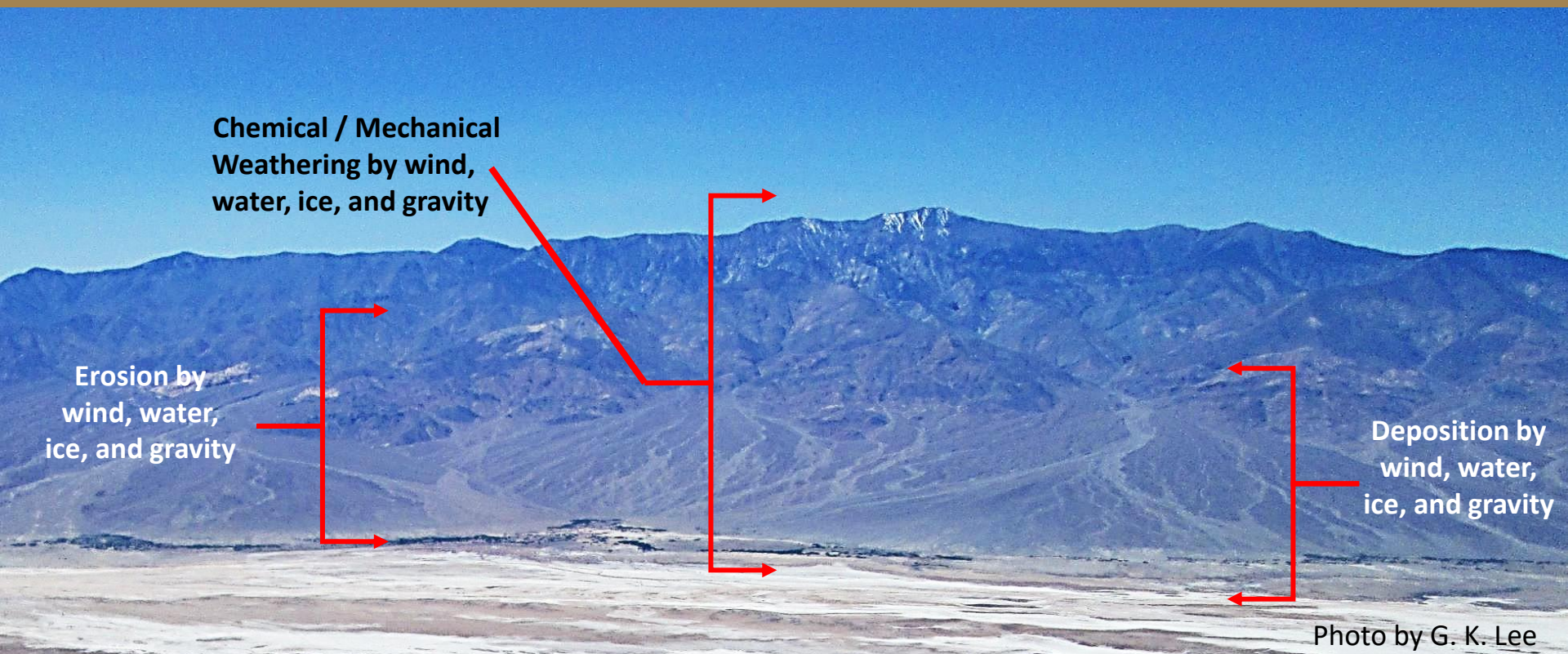
The major geologic force creating Death Valley is faulting. The valley floor has dropped down relative to the Panamint Range (to the West) and the Amargosa Range (comprised of the Funeral and Black Mtns. on the East).



Generalized structural map of Death Valley region. (Write et al., 1974 ).



# Weathering, Erosion, Deposition

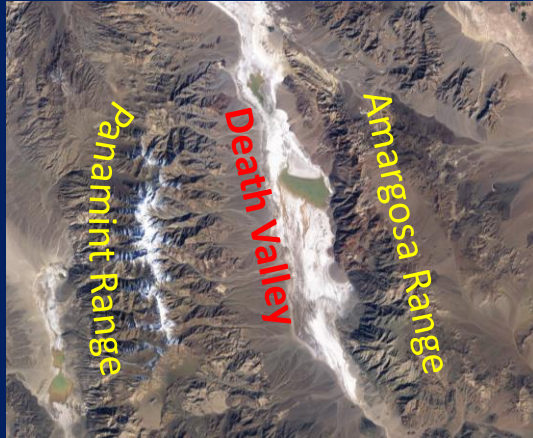


Rocks exposed at the surface are subjected to weathering (breaking down of rock material), erosion (movement of weathered rocks), and deposition (when weathered rocks stop being transported). Eventually the mountains are worn down and fill in the valleys.

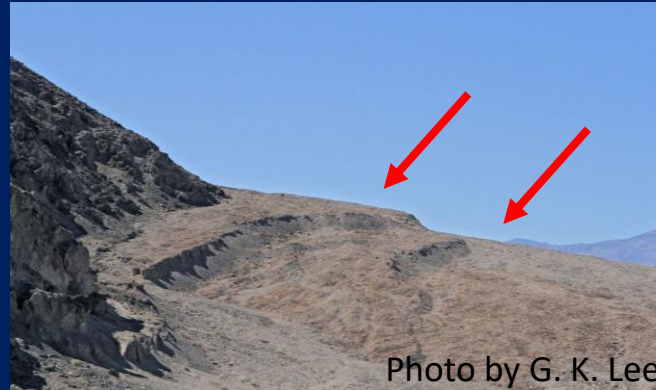




# DVNP Landforms: Above Level



N-S trending, parallel  
mountains/valleys



Fault Scarps



Turtlebacks

The mountains were made by tectonic forces moving rock materials vertically. Faults can cause some land to move upward relative to surrounding land (mountains) or downward (valleys). Some structures, like the Turtlebacks, had surrounding material removed from around them. The remaining material is higher than their surroundings.



# DVNP Landforms: Above Level

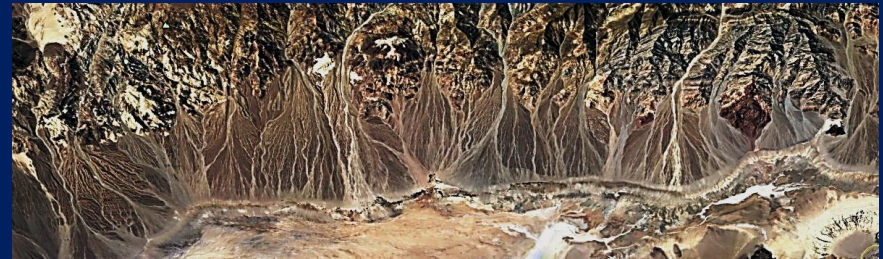


Alluvial Fan



Photo by G. K. Lee

Bajada  
(Two or more adjacent alluvial fans)



Bajada (aerial view)



Photo by G. K. Lee

Sand Dunes (Mesquite Flats)

Some landforms were made higher than the surrounding land by piling rock materials on top of the land surface.

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# DVNP Landforms: Level



Photo by G. K. Lee

Valley Floor



Photo by G. K. Lee

Salt Flats



Photo by G. K. Lee

Playa (Dry Lake)



Photo by G. K. Lee

Stream Terraces



Photo by G. K. Lee

Lake Terraces (old shorelines)





# DVNP Landforms: Below Level



Canyons



Creeks



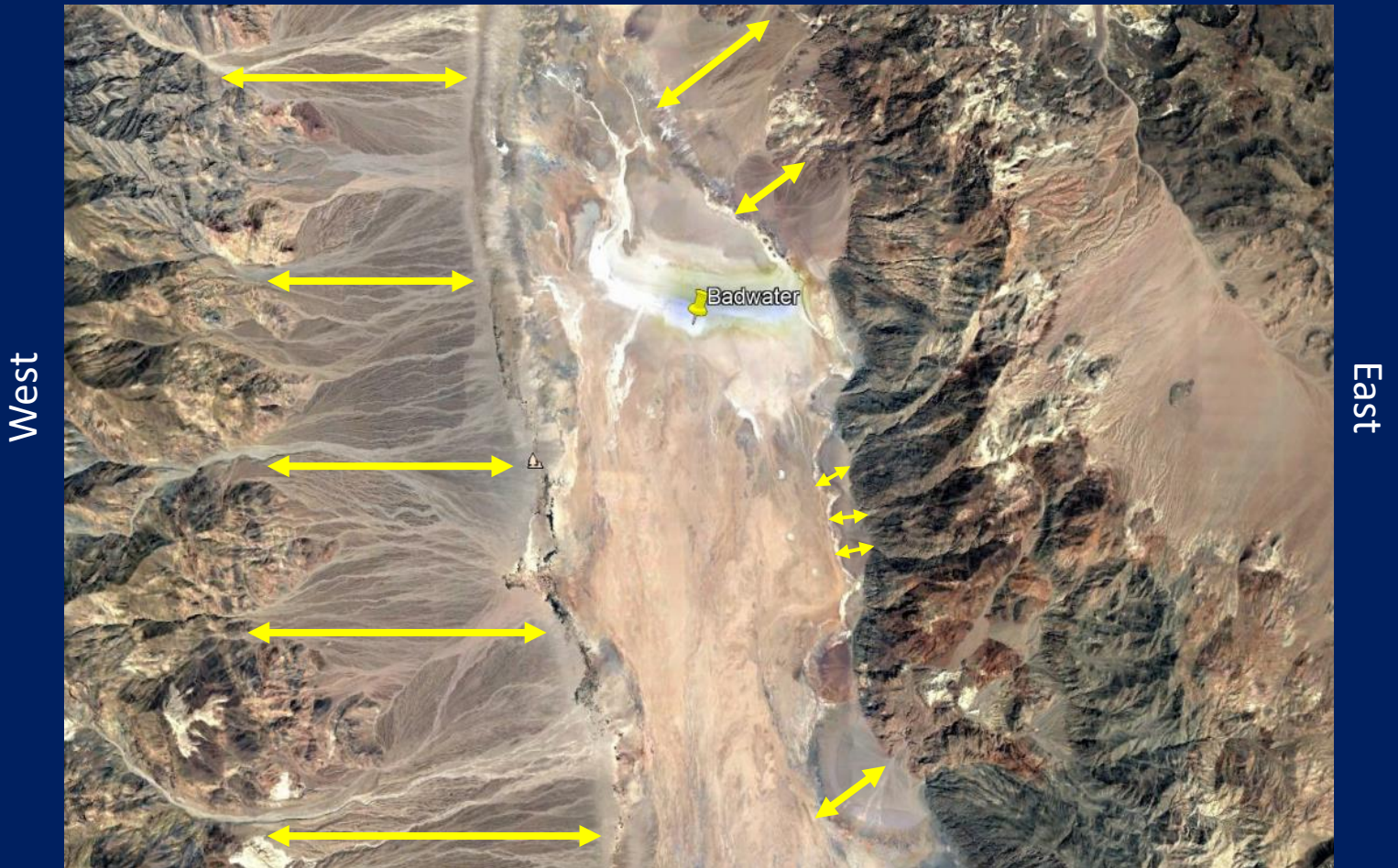
Stream beds

Water flows to the lowest point in the area. Moving water erodes rock materials, thus creating areas below the surface level of land.





# Slope



Slope is the angular orientation of the land surface. It controls the flow of water over the land. The greater lengths of the alluvial fans on the West side of the valley shows the has a gentler slope than the East side.

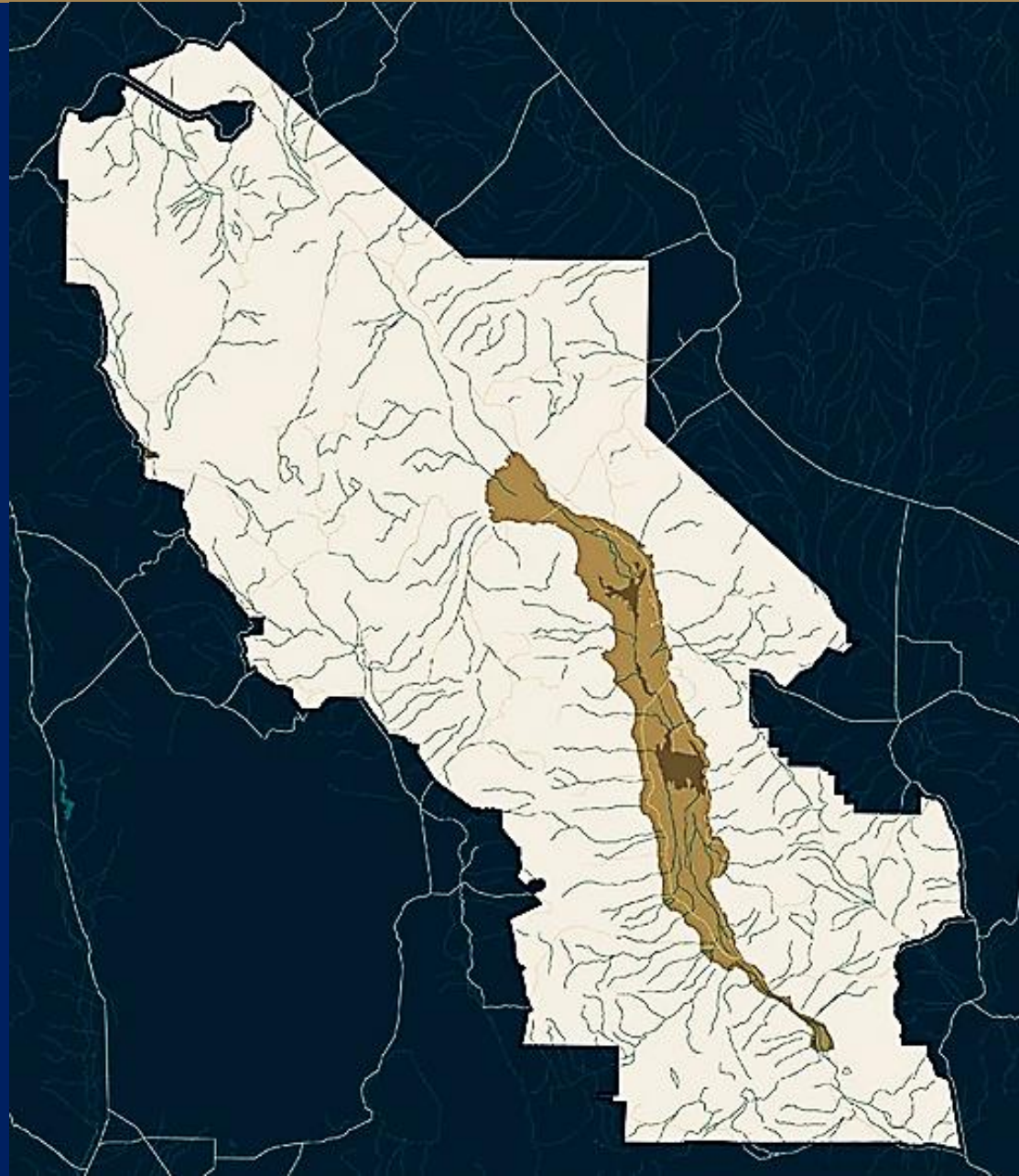


# Drainage

This is the movement of water over the land.

Rivers in the area have no outlet to the sea. Water drains into the Death Valley basin. Evaporation exceeds the rainfall.

Most stream beds are dry, but flashfloods are responsible for shaping much of the land here.





# Lithosphere Summary: Death Valley

**Structure:** Basin & Range topography

**Process:** Tectonic forces (faulting), Weathering, Erosion, Deposition create alluvial fans and .

**Slope:** Variable from low to high angles. More soil forms on low angle slopes; less on high angled slopes.

**Drainage:** Interior drainage. Soil drainage varies with site; Well drained vs some low-lying areas and marshes along creeks.





# Hydrosphere Checklist

Hydrosphere (FBS-LCO) (A matrix not a checklist)			
	Land	Coast	Ocean
Fresh	●	○	○
Brackish	○	●	○
Salt	○	○	●
● = Found mainly here			
○ = Some found here			

Use this to know the types of water resources of a place. Fresh water is needed by most living organisms to survive. Some organisms are adapted

for brackish water environments (a mix of fresh and salt) and some for salt water. All types of water can be found in DVNP. The water in Salt Creek is 2.5 X saltier than the ocean.



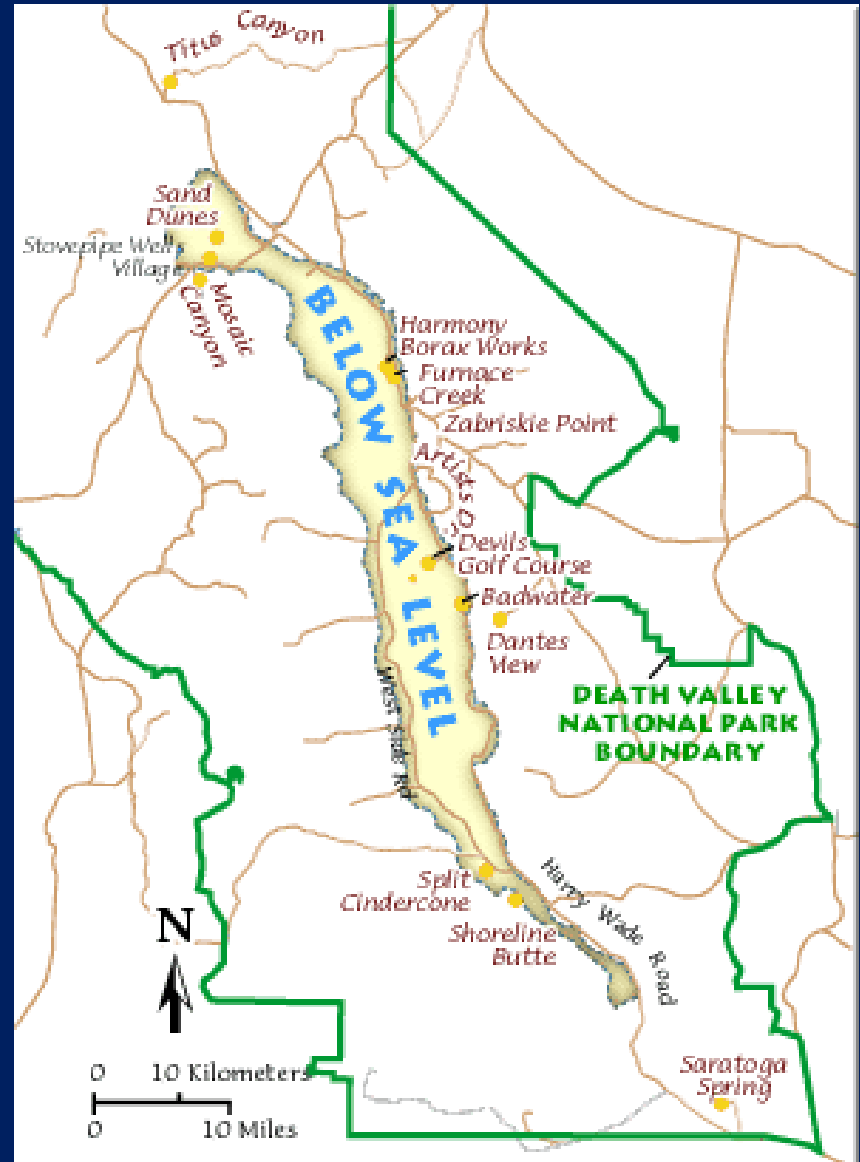
# Surface Hydrology in Death Valley

Surface water flow here is called “interior drainage” as the water does not flow to the ocean. It stays within the drainage basin.

The low rainfall means most streams are ephemeral (flowing after a brief rain).



Arroyos  
(Dry Stream Beds) are a  
common sight.



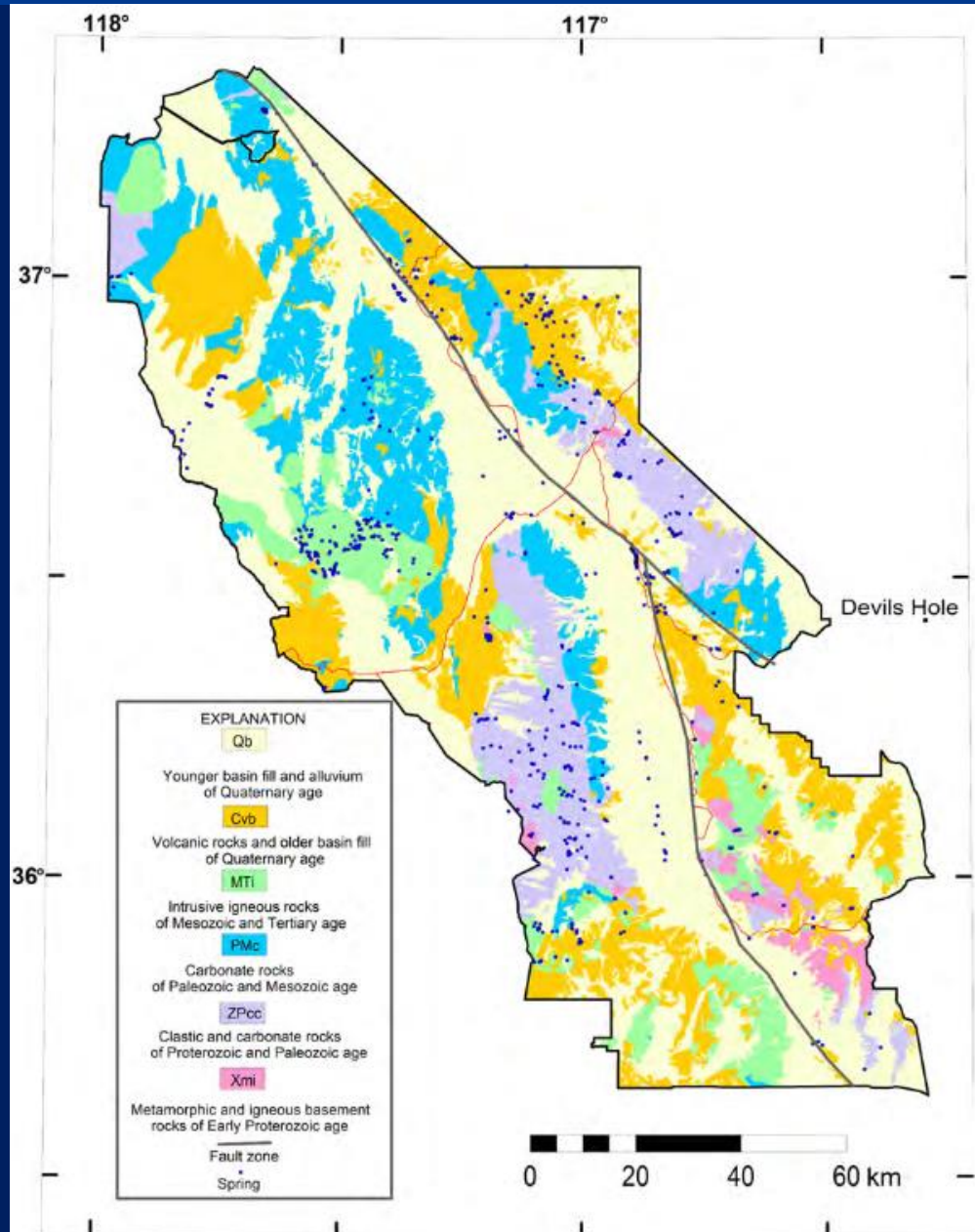
# Springs in Death Valley

Map showing distribution of springs of Death Valley National Park.

Upland springs occur in bedrock areas and are derived from recharge to local mountain areas.

Valley floor springs issue from Quaternary basin fill and alluvium and are derived from recharge in nearby mountains and regional flow.

Regional springs issue at the valley floor and above the valley floor and originate from inter-basin flow from outside Death Valley National Park



<https://irma.nps.gov/DataStore/DownloadFile/461112>





# Surface Hydrology in Death Valley



Playa (Dry Lake)



Salt Flats / Salt Pan

Most surface water in Death Valley is saline. Winter rainfall and snow meltwater drain to the lower elevations in the valley.

The water in Salt Creek is 2 ½ times saltier than the ocean.



Springs  
(Badwater Spring)



Creeks



# Hydrosphere Summary: Death Valley

**F**resh: primarily rainfall and snow fall on the land feeding seeps, creeks and underground aquifers and artesian wells.

**B**rackish: mostly at ponds at low spots where rain or snow melt mixes with existing saline water..

**S**alt: mostly in creeks and seeps at the valley floor.



# Biosphere Checklist

Biosphere (CTED/SWFS)	
Environmental	Habitat
Climate	Shelter
Topography	Water
Edaphic (Soil) Conditions	Food
	Space
Disruptions	

Use this to know the natural environment of a locale. Climate (heat & moisture) and the Topography (landforms) affect the formation of the soils. The soils are the foundation for the plants.

and animals living there. Disruptions (fires, earthquakes, etc.) are like pushing the “reset” button, essentially restarting natural processes anew.

The habitat consists of the basic elements affecting the ability of living organisms to





# Biosphere Checklist: CTED

Climate

Topography

Edaphic (Soil)  
Conditions

Disruptions

Climate: Köppen classification is BWh (hot desert).

Topography: Basin and Range (N-S trending mountains / valleys. Local relief is 3,453.5 m/11,331 ft.

Soils: Aridisols are dry and low in organic matter and may have subsoil horizons cemented by carbonates, gypsum, or silica.

Disruptions: Flash floods, droughts, earthquakes, invasive plants, non-native fauna, wildfires.



# Biosphere Checklist: SWFS

Shelter
Water
Food
Space

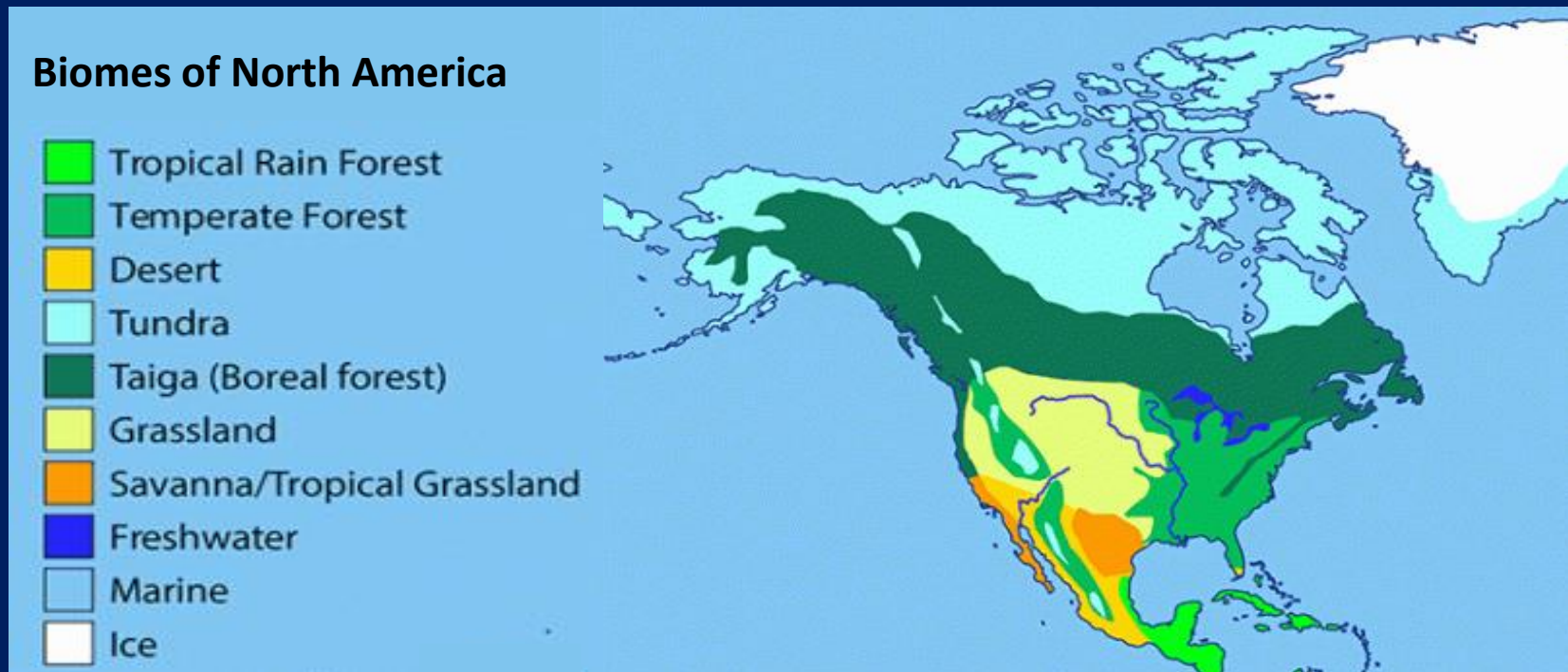
Living organisms in DVNP are able to find these 4 factors to survive: shelter, water, food, and space in which to find these resources. The diversity of flora and fauna reinforces the idea there is

no ONE right way to survive here. Plants are fixed in their location. The diverse ways to cope with heat, need for water, getting pollinated, sowing seeds, etc. Animals are nocturnal to avoid the heat of the day. But some are out and about in daylight. All of this points to the advantage of diverse approaches to survival.



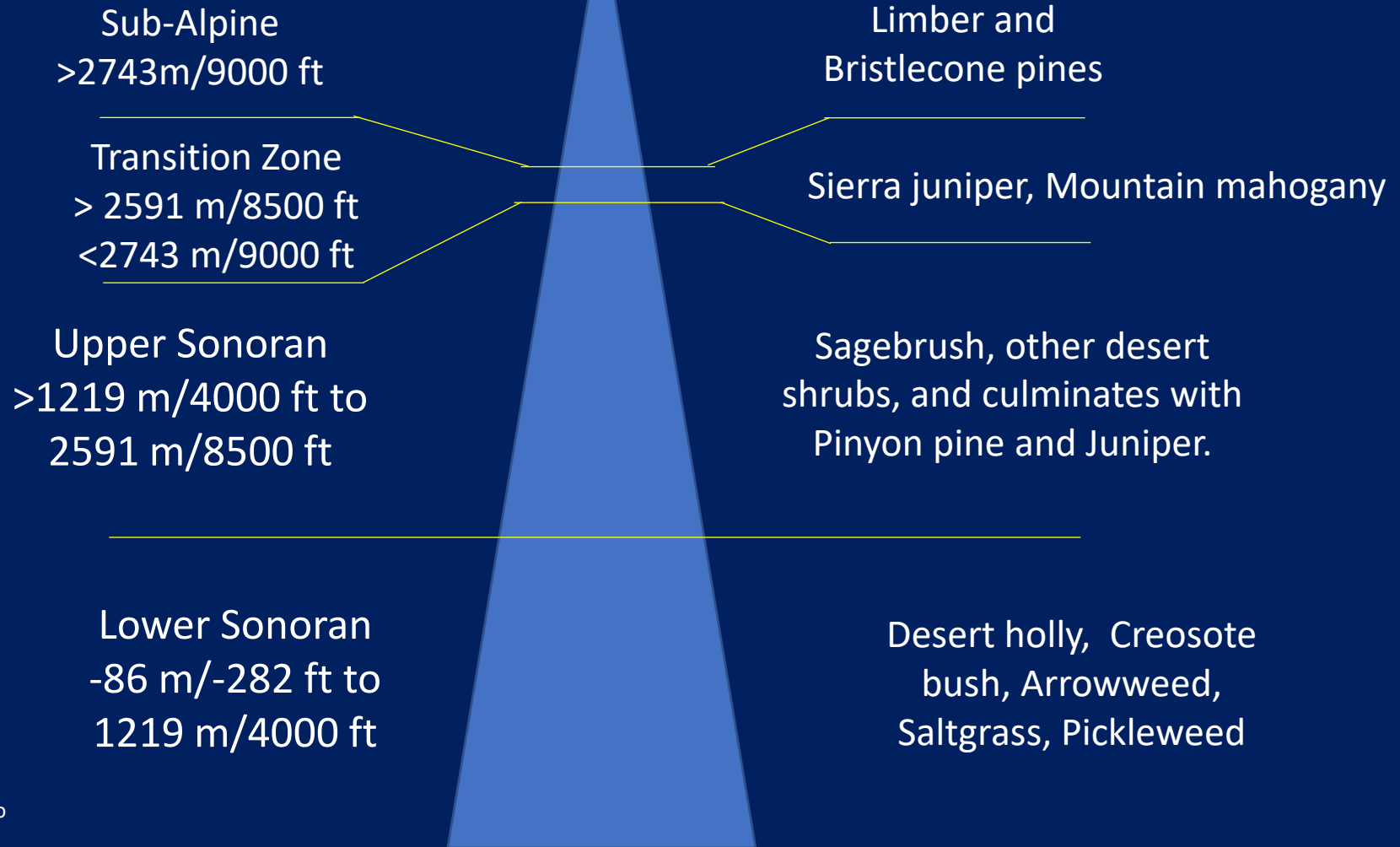
# DVNP is in the Desert Biome

A biome is the naturally occurring community of flora and fauna in a major habitat. Death Valley is in the North American Desert Biome. Biomes are collections of ecosystems sharing similar climatic conditions.



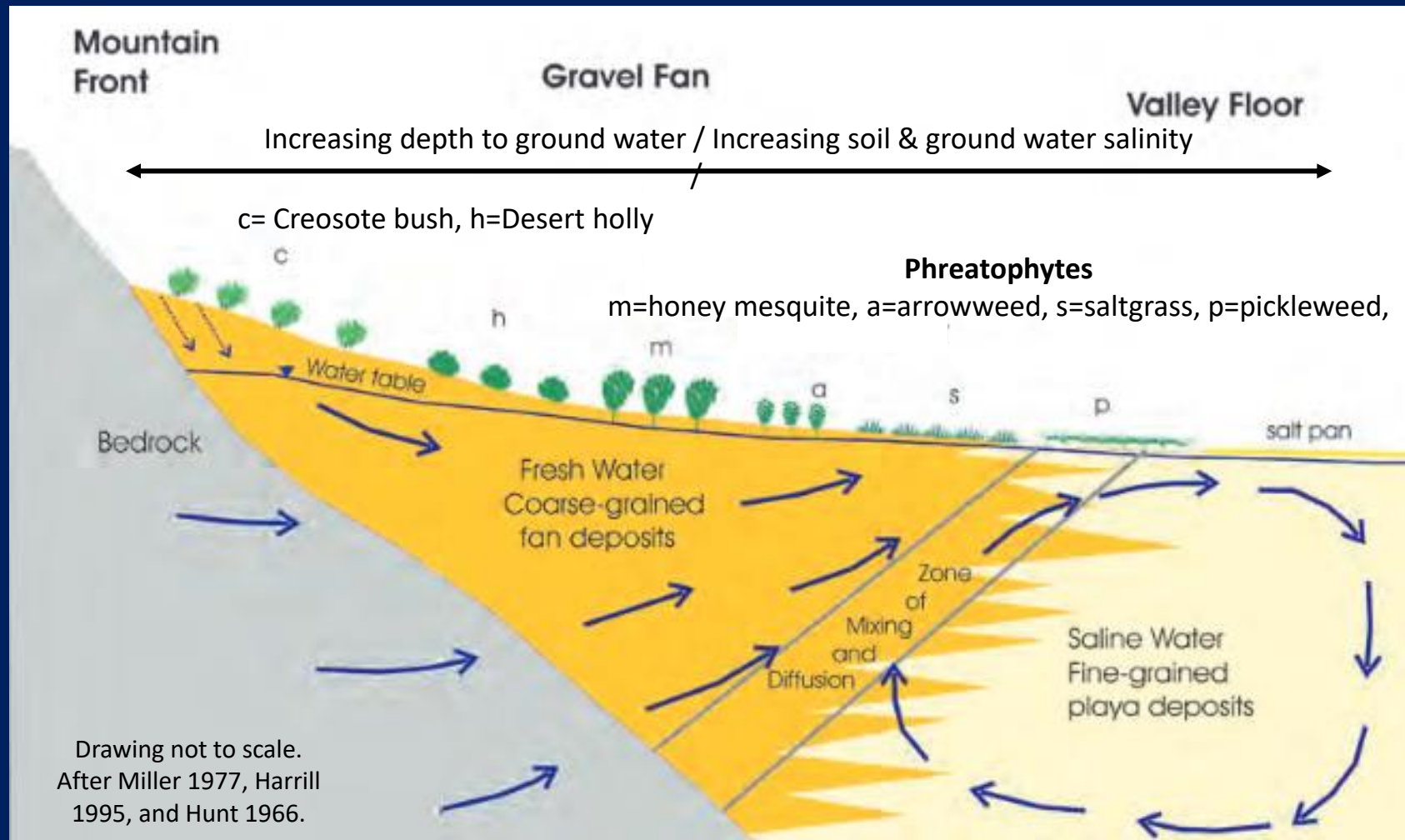


# Altitude and Ecological Zones



# Alluvial Fan Vegetation Transect

The diagram below shows the typical vegetation on an alluvial fan in DVNP.



# DVNP Fauna

DVNP is home to 51 species of native mammals, 346 types of birds, 36 classifications of reptiles, six types of fish and five species of amphibians.





# People of DVNP



The Timbisha Shoshone have lived in Death Valley for a thousand years or more. A reservation is still in DVNP today.



Mining figured prominently in the history of Death Valley. Tourism is a mainstay of DVNP today.

Photos from the Internet, educational free use clause.



# Biosphere Summary: Death Valley

**C**limate: Generally subtropical, but variations occur with elevation and slope orientation creating arid to semi-arid conditions.

**T**opography: Mountains, valleys, salt pans.

**S**oils: saline soils, x

**D**isruptions: Flash floods, droughts, extreme heat, earthquakes, invasive plants, non-native fauna, wildfires.



# Biosphere Summary: Death Valley

**S**helter: Native plants and rock provided materials for building shelter

**W**ater: Scant rainfall meant adequate water was unavailable.

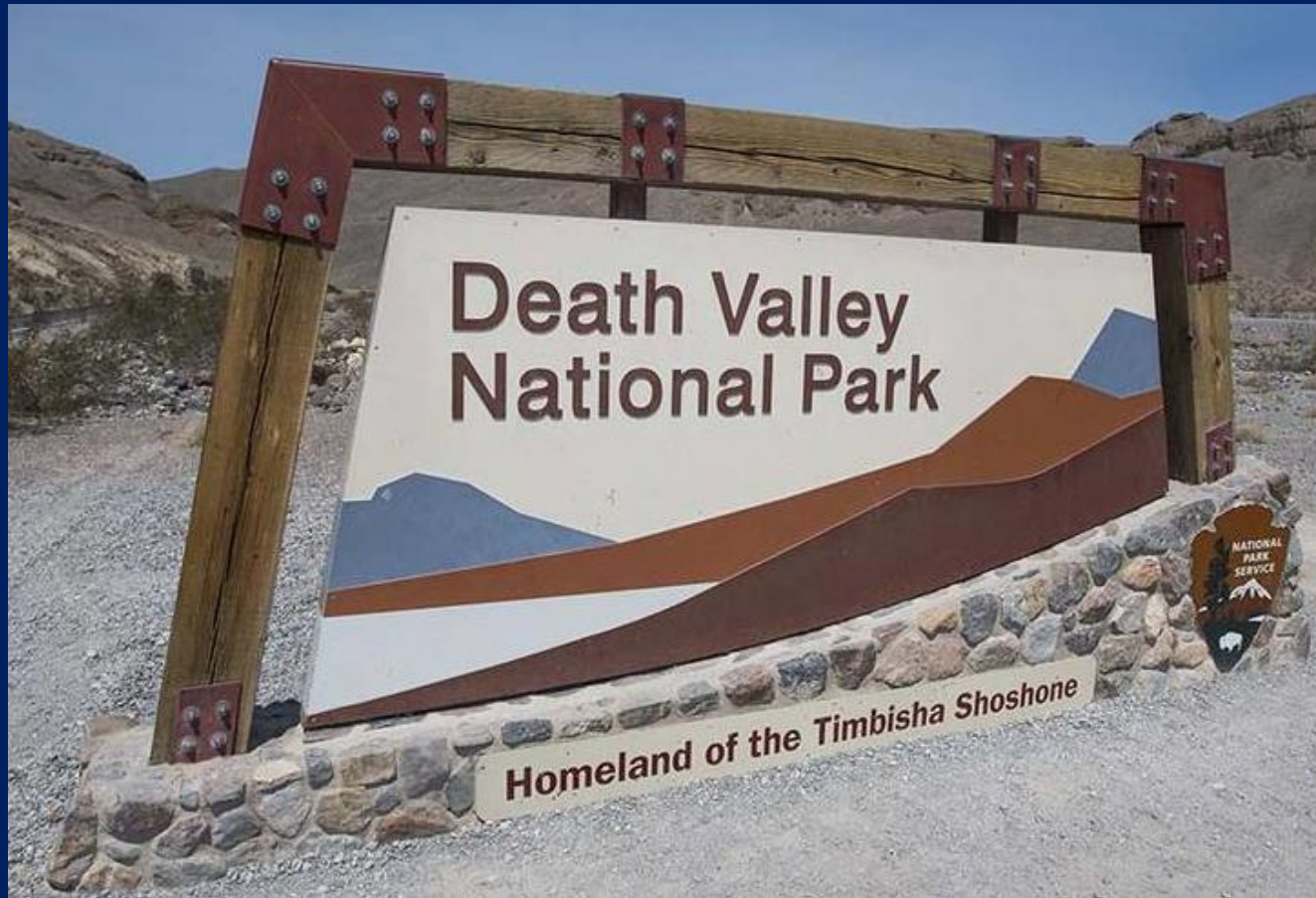
**F**ood: Indigenous people hunted and gathered provided food; season trips to mountains.

**S**pace: Vast space, however the x enabled a relatively sustainable life.





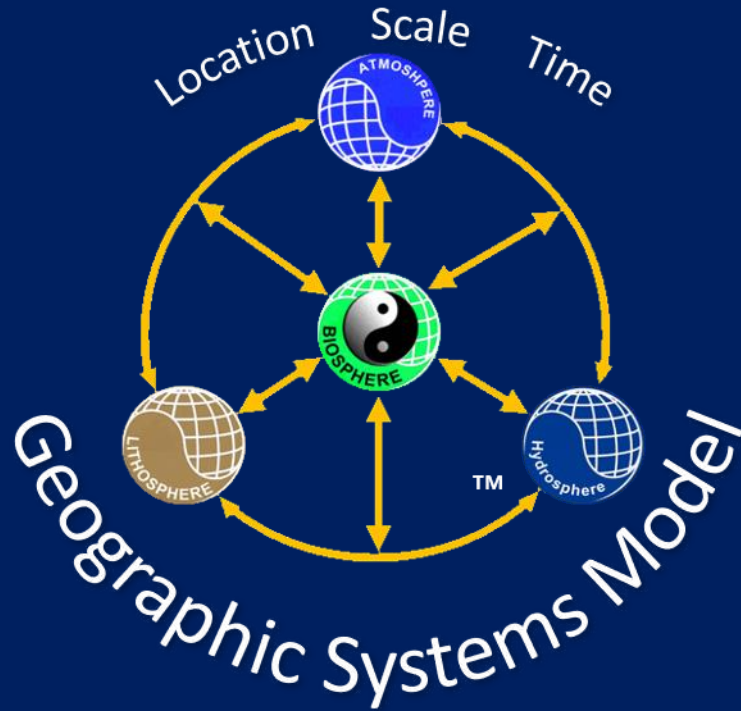
# Visit DVNP



Plan a visit [Death Valley NP](#)



# For More Information



Geography may  
not change the  
world, but it will  
change the way  
you see it.



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Website: [Applied Geography for Sustainable Living](#)



Community-based Education  
of, by, and for the people.

# The End

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