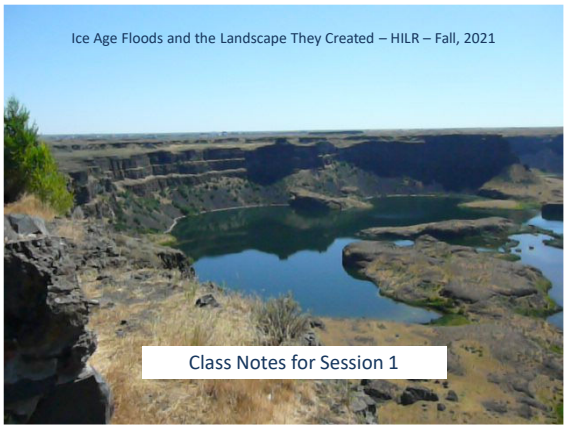



## Topics for Today

- Introductions
- Overview of the Study Group
- Ice Ages and Glaciers 001 (not even 101)
- The basic geography of the American West
- Erosion and abrasion by flowing water
- Fossil Falls



## Overview

- We will follow three threads through the study group:
  - Some basic geologic concepts (high-school level) related to ice ages, glaciers, and erosion by melt waters.
  - Specific (and terrific) examples of the effects of glacial melt.
  - The scientific-discovery story related to the biggest such event: Floods from Glacial Lake Missoula.
- We will visit and revisit topics so that jargon and terminology gradually become familiar and friendly.
- In addition to the text, we will use internet resources and some videos.



## Ice Ages

- There have been multiple Ice Ages in earth's history, during which massive ice sheets covered enormous areas, and sea levels were greatly lower than today.
- The most recent Ice Age ended about 11,000 years ago, and since then, the world has been warming, the ice has been melting, and the water is gradually refilling the oceans from their low point of about 200 feet below current sea level.
- So lets look first, at how glaciers work and, second, what happens to the melt water …

## Glaciers 001

- There is an accumulation region where snow falls.
- Any snow left-over after the warm season is called firn.
- Firn gradually compacts to make a dense form of granular ice which, while solid, is nevertheless deformable.
- The weight of the ice, combined with the melting of water at the base, can result in net flow of the ice downhill.
- At the downhill edge of the glacier, there is a dynamic balance between melting and flow
- Glaciers can advance and retreat depending on snowfall versus melt rate, but there is always melting going on.

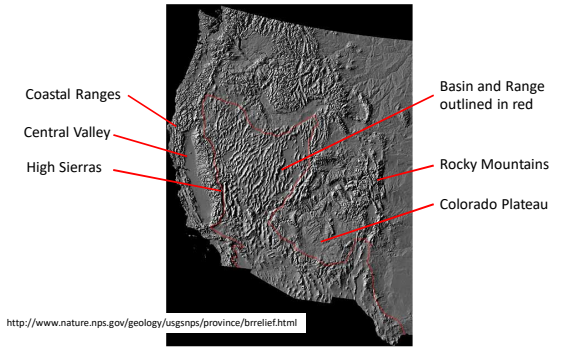


## The Most Recent Glaciation

- The most recent glaciation, referred to by various names including the Wisconsin Glacial Episode, extended from about 75,000 to 11,000 years ago.

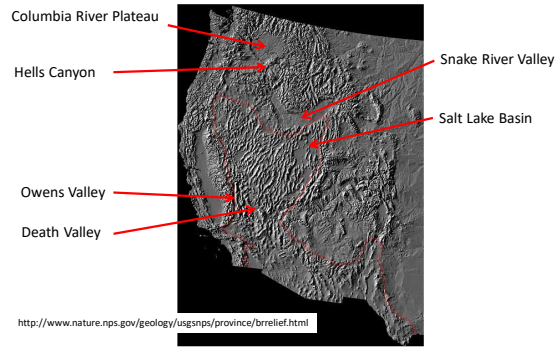



## Major Geologic Features

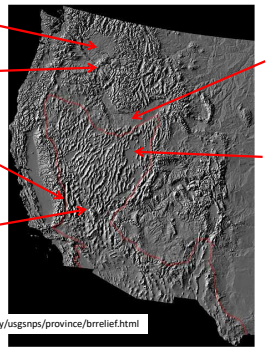





## The Geography We Will Study



## Not All Melt Water Flows to the Ocean






## The Melt Water Causes Erosion

- Streams of water carry solids, depending on speed
  - Clay and silt
  - Sand
  - Cobbles
  - Boulders
- The stream load itself can create wear and abrasion
- We now examine the Press textbook excerpt on stream capacity and sedimentation and then look at the details of Fossil Falls, located between Owens Lake and China Lake.



## The Excerpt From Press

- Turbulent flow is common
- Flowing water can carry a suspended load
- Flowing water can also push the bed load along
- Saltation is an unusual transport mechanism
- The moving bed load can create erosion (potholes)
- The SPEED of the flow affects the SIZE of what can be carried by either suspended-load or bed-load material
- CALIBRATION: 60 mph = 2680 cm/sec



## Fossil Falls Background

- The bedrock in parts of the Owens Valley is volcanic basalt
- Basaltic lava is typically quite fluid, and can flow for long distances

## When Basalt Cools, It Often Cracks

- Cracked rock is more easily eroded



## We Look at Google Maps

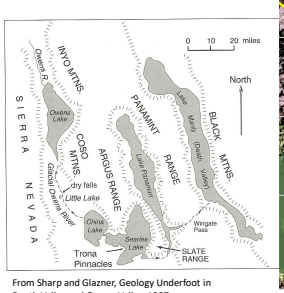
- We will identify:
  - Mt. Whitney – highest point in continental US
  - Death Valley – lowest point in continental US
  - Owens Lake
  - The course of the Glacial Owens River all the way to Death Valley
  - And, along the way, Fossil Falls



## Owens Lake

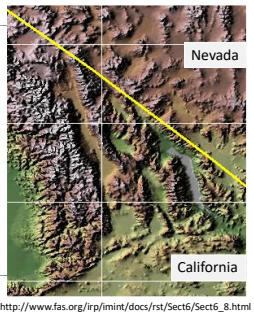



## Glacial Owens River and Death Valley




*The five pluvial lakes fed by Glacial Owens River from the Sierra Nevada to Death Valley.*

From Sharp and Glazner, Geology Underfoot in Death Valley and Owens Valley, 1997




http://www.fas.org/irp/imint/docs/rst/Sect6/Sect6_8.html

## A Picture Tour of Fossil Falls