# Humboldt Redwoods State Park

*Photo: Bret Koehler*

## Landscape Formation

Humboldt Redwoods State Park is located in a tectonically dynamic environment at the junction of three crustal plates known as the Mendocino Triple Junction. The redwood forests evolved along with the climate and landscape as the Coast Ranges and river valleys formed—driven by plate tectonics.

**Features/Process:**
Regional uplift-related geomorphology and jade pebbles

The regional compression has uplifted the Coast Ranges, blocking the prevailing Pacific storms so the Coast Ranges capture abundant rainfall. As the area is uplifted, the erosion power of the streams is increased. The streams incise into the rising ground creating deeper and steeper canyons. This creates an inner gorge.

## Inner Gorges

The walls of gorges are very unstable and numerous landslides and debris-slide slopes form along the streams. Periodically, the streams erode away the base of slides only to trigger additional slides in a never-ending process of landscape evolution.

*Photo: Shannon Utley*

**What you can see:** Steep, unstable hill slopes, active landslides, sediment-charged stream channels, and rare encounters with jade as pebbles and cobbles within gravel bars of the Eel River. The effects of continuous landscape change on new and ancient redwoods are on display.

## Landslides

The uplift of the Coast Ranges that has created the climatic conditions for the redwoods to survive has also created unstable hillslopes that can occasionally jeopardize some of the ancient trees. Due to abundant rainfall, which often occurs as severe, intense storms and proximity of the seismically active fault zones, landslides are commonly triggered by intense rainfall or earthquake shaking. Landslides that move as a mass of deep and relatively intact rock are common in the area, but the most common landslides occur in loose and unconsolidated earth materials on the slopes. The sloughing of weathered and loosened material is called debris sliding. If there is sufficient water in the material, the slide may degenerate into a liquid mass that can flow for long distances downslope as a debris flow. Some slopes in the northern Coast Ranges are sculpted by repeated debris-slides and debris flows, creating a landform called a debris slide slope.

## Stream Conditions

Input of some landslide-carried debris and sediment to streams is beneficial for aquatic and terrestrial habitat, for instance by providing 1) rocks and logs for pool formation and gravel for spawning beds and renewing floodplains, like the one

*Photo: Bret Koehler*

**Why it's important:** Humboldt Redwoods State Park has international reknown and is classified as both a World Heritage Site and an International Biosphere Reserve. The coast redwoods (sequoia sempervirens) exist only in a narrow band that runs for 500 miles from Monterey to just over the Oregon border. Needing a warm, moist, and foggy environment, coast redwoods are confined to the coast and elevations below 3,000 feet. Redwoods are "living fossils" dating back 100 million years to the Cretaceous Period—the time of the dinosaurs. The oldest redwoods range from several hundred to as much as 2,000 years old. Old growth groves are truly monuments of the past. Prior to the Ice Ages (1.8 million years ago), the redwood forests were much more widespread but became restricted to their present range due to cooler temperatures and regional uplift of the Coast Ranges.

occupied by the Rockefeller Forest, and 2) nutrients and sediment necessary for forest function. Excessive landslide debris though can adversely impact aquatic habitat by filling pools and silting in gravel beds. In the historical period following European settlement, land use practices, such as, timber harvesting and road building have accelerated erosion by altering natural drainage patterns, soil and water conditions, and decreasing root reinforcement of soils on steep slopes.

**... a certain amount of landslide carried debris and sediment to streams is necessary for aquatic and terrestrial habitat ...**

## Origin of Jade

The region surrounding the park and areas upstream along the South Fork of the Eel River are underlain by rocks from the Franciscan Complex—the dominant geologic material underlying the entire Coast Ranges geomorphic province. The Franciscan Complex is made up of an accumulation of over 40,000 vertical feet (almost eight miles) of sandstone, shale, serpentine, chert, and greenstone (cooked and squeezed submarine volcanic rocks). The complex originated as oceanic floor and the accumulated sediments on top of it have been scraped, bent, subducted and mashed against the North American continent.

As subduction forces oceanic plates beneath the continent, some material from great depths within the earth gets squeezed up to the surface. Very dense minerals within these deep earth rocks are intensely sheared in the process. During their journey to the surface, the minerals formed at great pressures and temperatures changed to minerals that are more stable in near surface pressure and temperature conditions, such as serpentine, jadeite and nephrite jade.

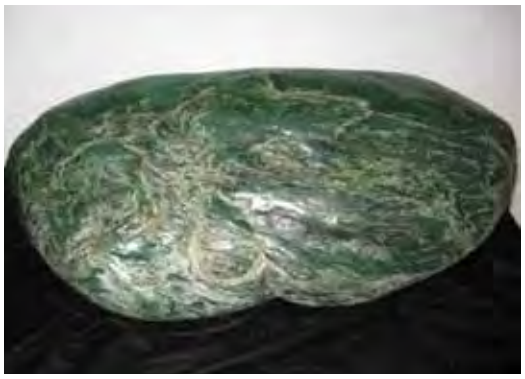

*Photo: Mike Fuller*

Outcrops of serpentinite within the park along the South Fork of the Eel River may be the source of jade pebbles and cobbles found on gravel bars. Other potential source areas may lie upstream of the park.

## Final Thoughts

This landscape continues to evolve by the dueling processes of uplift against erosion.

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Prepared by California Geological Survey, Department of Conservation | www.conservation.ca.gov/cgs
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