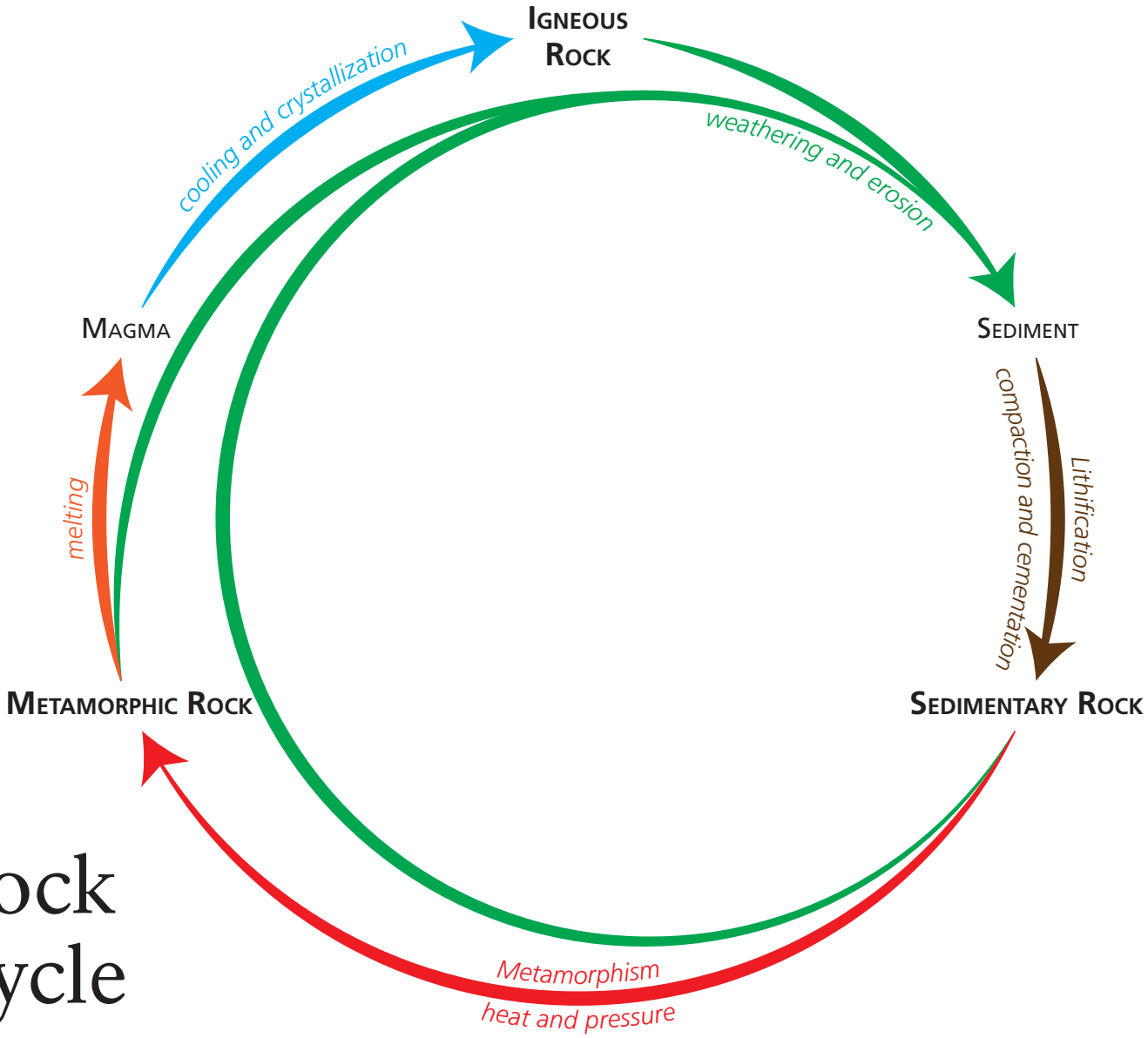
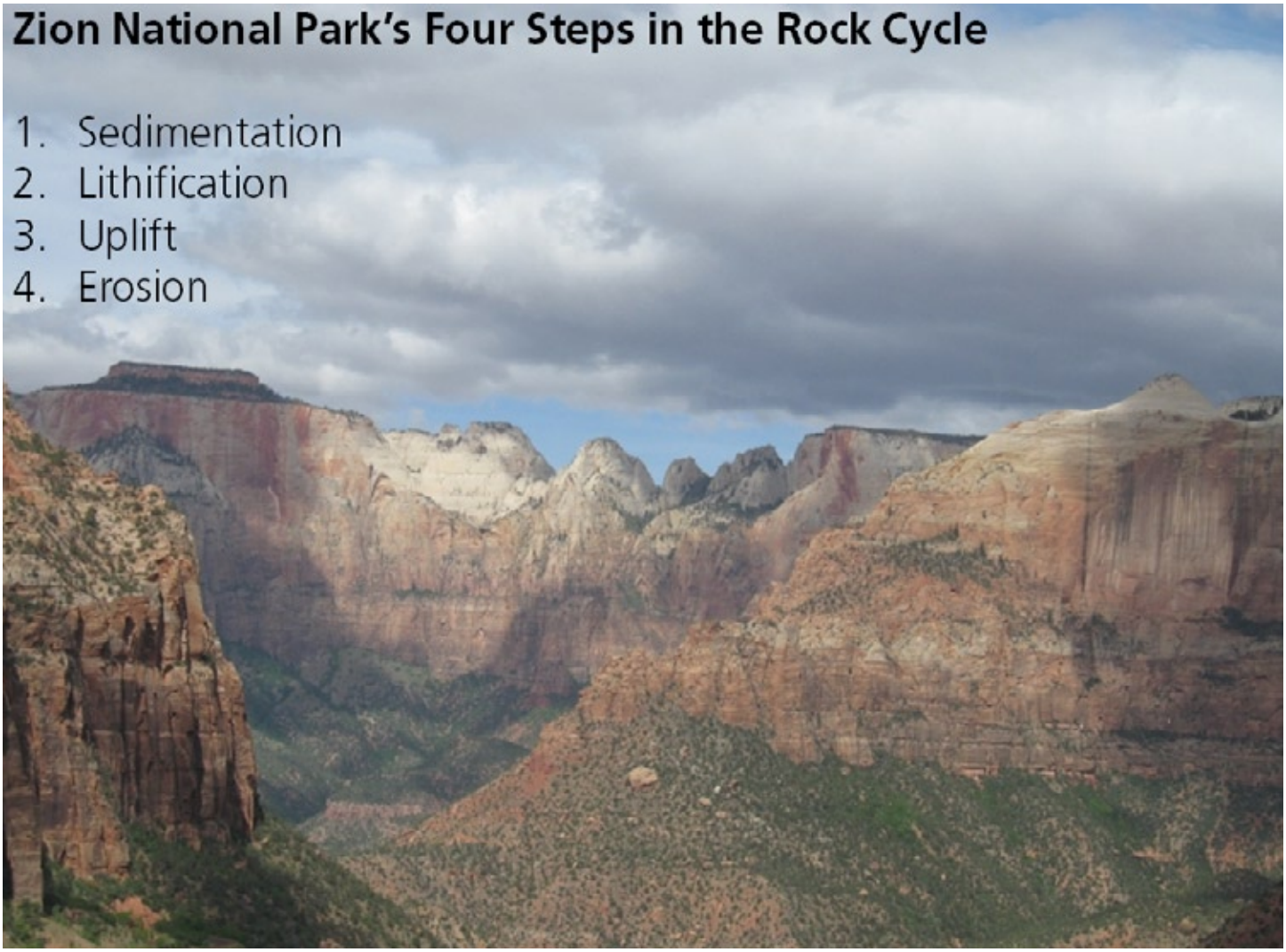
National Park Service
U.S. Department of the Interior

Zion National Park
Utah

Changing Landscapes - Images
Pre-Activity 2
Rock On Zion!

Rock Cycle


IGNEOUS ROCK
cooling and crystallization
weathering and erosion
MAGMA
SEDIMENT
compaction and cementation
Lithification
melting
METAMORPHIC ROCK
SEDIMENTARY ROCK
Metamorphism
heat and pressure


Zion National Park's Four Steps in the Rock Cycle
1. Sedimentation
2. Lithification
3. Uplift
4. Erosion

1. Sedimentation

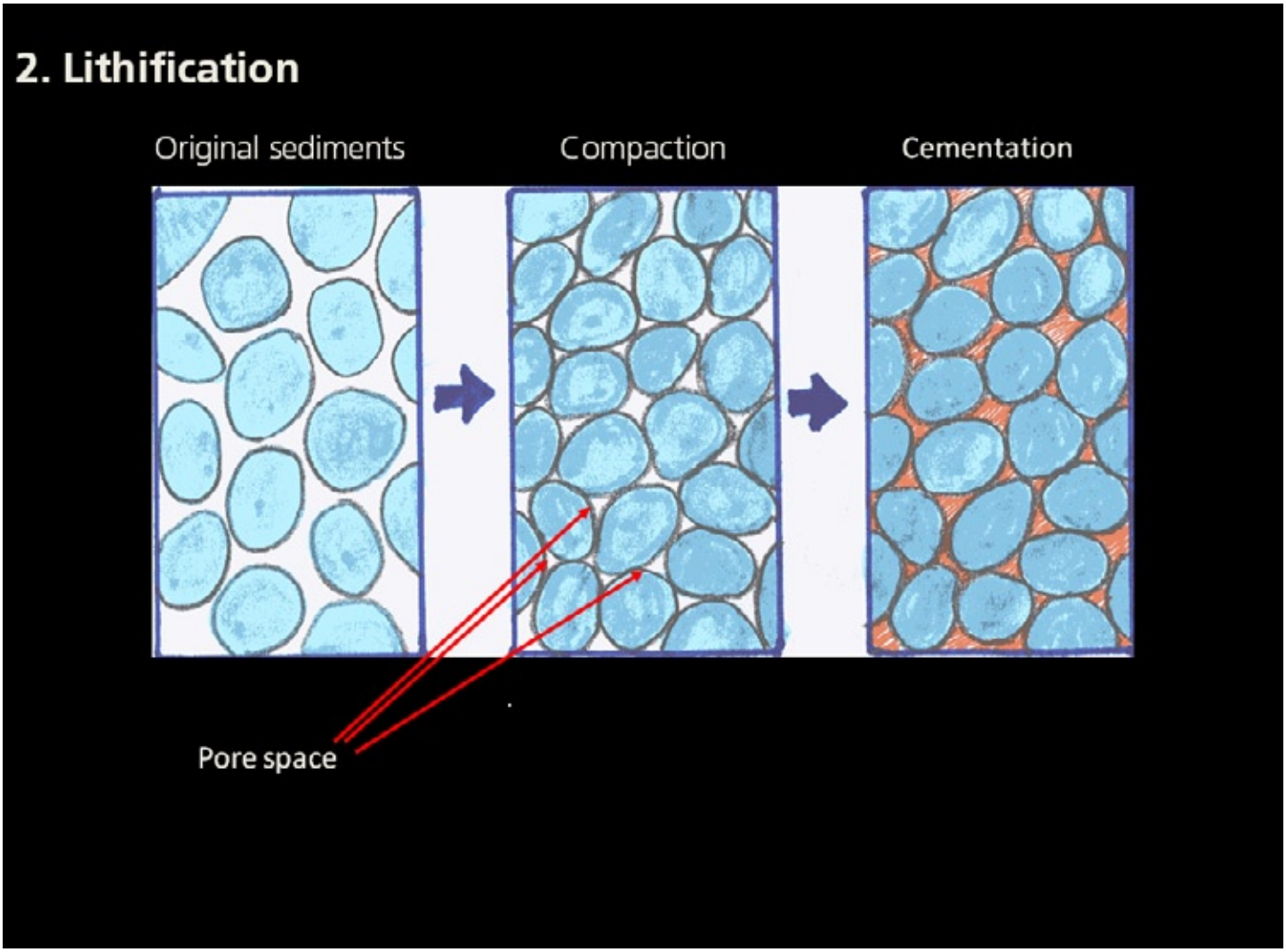
Geologic Formations

Rock Layer	Appearance	Where To See	Deposition	Rock Type
Cinder cones and lava flows	black layers and cones	Kolob Terrace and west of Rockville	lava flows and cinder cones	basalt and cinders
Carmel	cliffs	Mt. Carmel Junction	shallow sea and coastal desert	limestone, gypsum, sandstone
Temple Cap	cliffs	top of West Temple	desert	sandstone
Navajo Sandstone	steep cliffs 1,600 to 2,200 feet thick red lower layers are colored by iron oxides	tall cliffs of Zion Canyon; highest exposures are West Temple, Checkerboard Mesa believed to be the tallest sandstone cliffs in the world	desert sand dunes covered 150,000 square miles shifting winds during deposition created cross-bedding	cross-bedded sandstone
Kayenta	rocky slopes	throughout canyon	streams	siltstone and sandstone
Moenave	slopes and ledges	lower red cliffs seen from Zion Canyon Visitor Center	streams and ponds	siltstone and sandstone
Chinle	purplish slopes	above Rockville	streams	shale, loose clay, conglomerate
Moenkopi	chocolate cliffs with white bands	rocky slopes from Virgin to Rockville	shallow sea	shale, siltstone, mudstone, others
Kaibab	cliffs	escarpment along I-15 near Kolob Canyons	shallow sea	limestone

Sediments (broken down pieces of older rocks)
- are transported from their original source
- deposited in various environments

Some sedimentary rocks form by chemical precipitation of minerals

2. Lithification

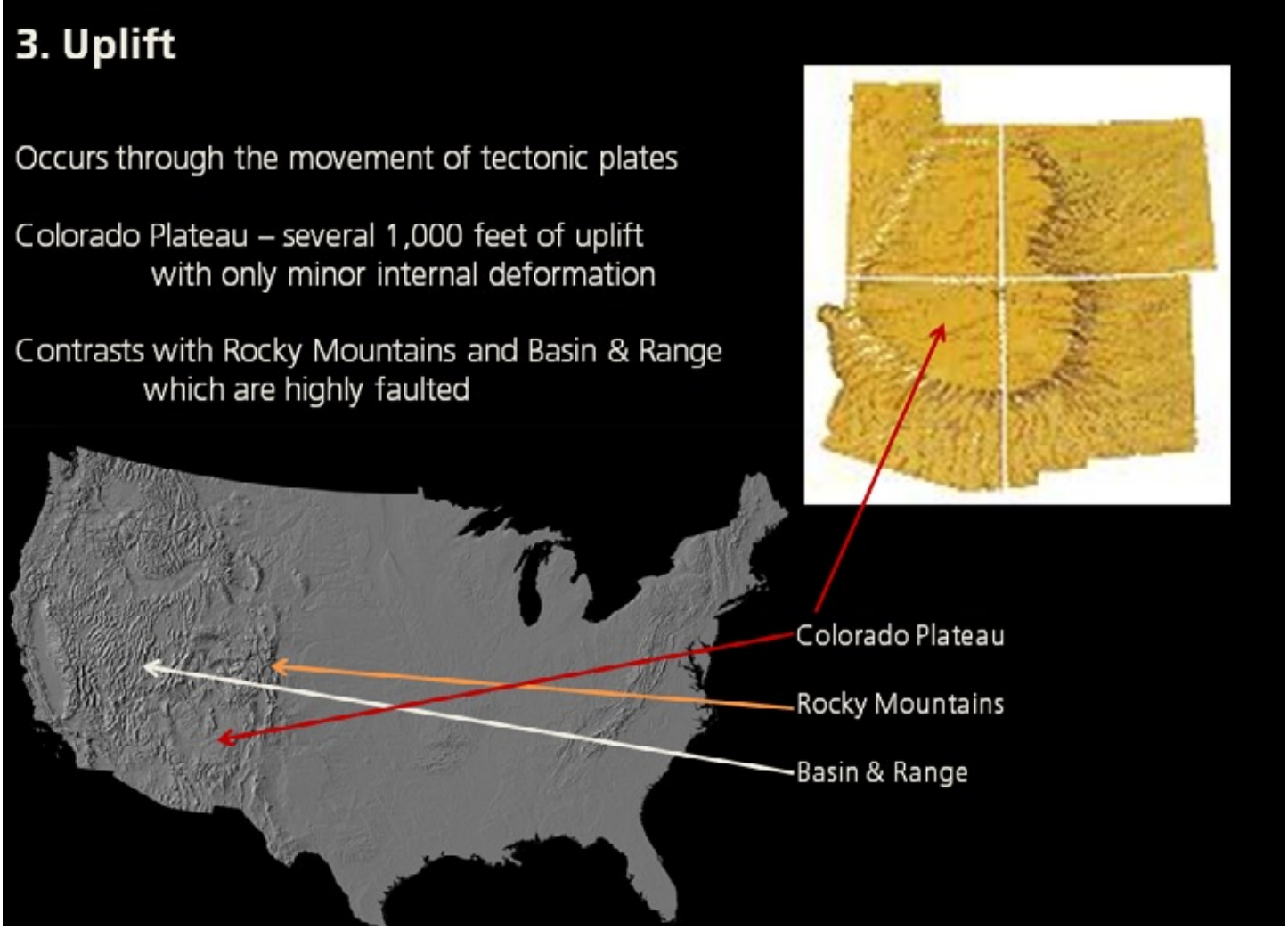


3. Uplift

Occurs through the movement of tectonic plates

Colorado Plateau – several 1,000 feet of uplift
with only minor internal deformation

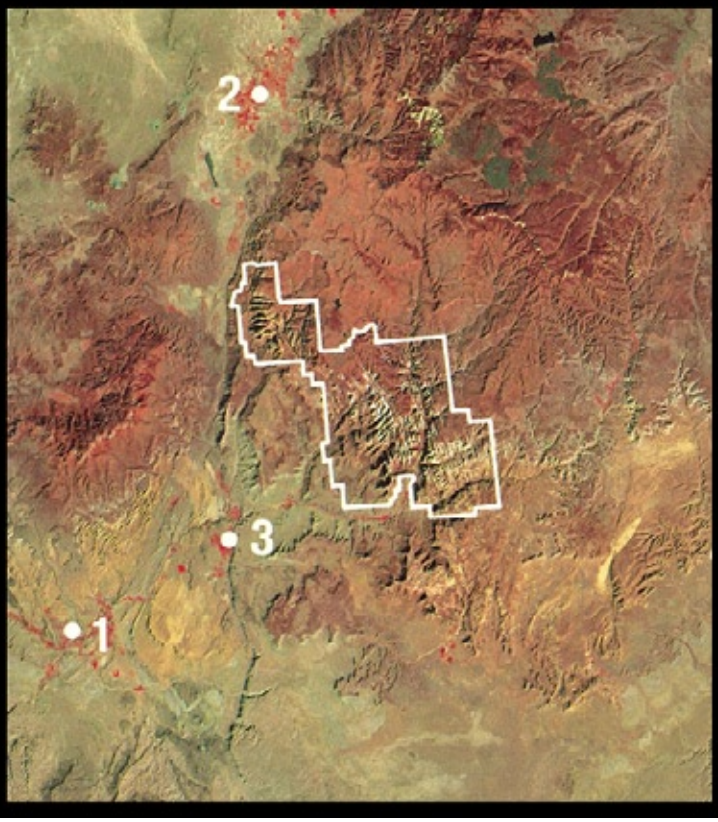
Contrasts with Rocky Mountains and Basin & Range
which are highly faulted



4. Erosion

The removal of sediment , which is transported away by water, wind, ice, &/or gravity.

water = main agent of erosion at Zion



4. Erosion (continued)

Ice is another important erosional force

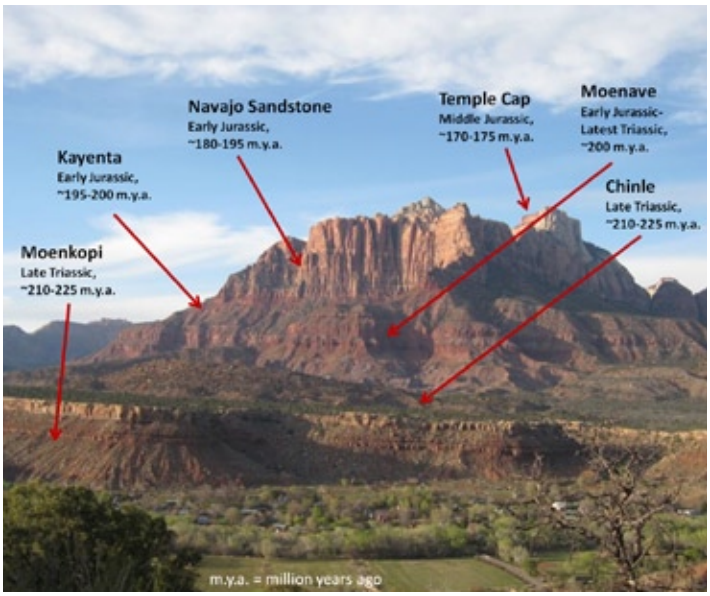
Freeze-thaw cycle is important

Wind - less important; sandblasts

Teacher's Key to the Subsequent Images

1. Rock layers (uplift, erosion)
2. Rock layers labeled
3. Southwest desert (sedimentation, uplift, erosion)
4. Meandering river (sedimentation, erosion)
5. Canyon overlook rock layers (uplift, erosion)
6. West Temple rock layers (uplift, erosion)
7. Virgin River flash flood (erosion, weathering)
8. Subway (erosion)
9. Aerial view of canyon & river (sedimentation, erosion)
10. The Narrows (erosion)
11. Water (erosion)
12. Echo canyon (erosion)
13. Aerial view (uplift, depostion)
14. Aerial view (erosion)
15. Observation Point (uplift, erosion)
16. Virgin River (erosion, sedimentation)
17. Virgin River (sedimentation)
18. Virgin River (sedimentation)

1.


Navajo Sandstone
Early Jurassic,
~180-195 m.y.a.
Temple Cap
Middle Jurassic,
~170-175 m.y.a.
Moenave
Early Jurassic-
Latest Triassic,
~200 m.y.a.
Kayenta
Early Jurassic,
~195-200 m.y.a.
Chinle
Late Triassic,
~210-225 m.y.a.
Moenkopi
Late Triassic,
~210-225 m.y.a.
m.y.a. = million years ago

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