

4. Interpretive Methods

1. Plate Tectonics and Landscape Formation:

Building Oregon

Cascadia Subduction Zone

Columbia Plateau Basalt

2. Ongoing Coastal Processes:

Dynamic Duo: Uplift and Erosion

Coastal Headlands

3. Coastal Geological Hazards:

Earthquakes

Tsunamis

Landslides

4. Interpretive Methods:

Presenting Coastal Geology to Coastal Audiences

The Dynamic Landscape of Oregon's Coast: A Tale of Beauty and the Beast

Bob Lillie

Professor of Geology

Certified Interpretive Trainer

Oregon State University

Oregon Coast Region of the Oregon Master Naturalist Program

Unit 9: Geology of the Oregon Coast

Cape Perpetua Scenic Area, Oregon

February 26, 2011

Marine Gardens, Newport, Oregon

Robert J. Lillie

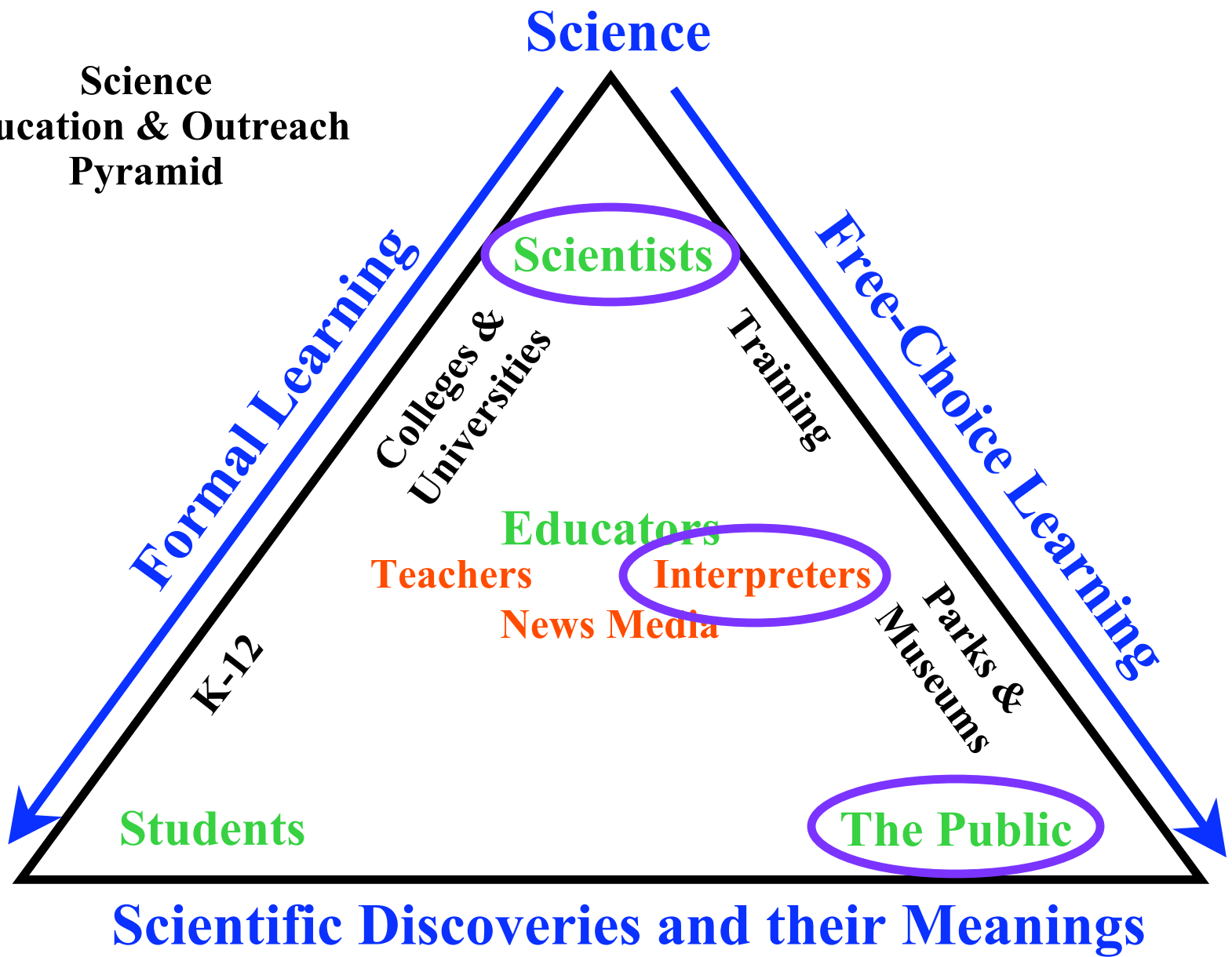
“Interpretation involves translating the technical language of a natural science or related field into terms and ideas that people who aren’t scientists can readily understand.”

From: “Environmental Interpretation: A Practical Guide for People with Big Ideas and Small Budgets” (Sam Ham, 1992)



Ranger Shelton Johnson, Yosemite National Park, California

**Science
Education & Outreach
Pyramid**



Geology for Normal People

Normal Person:

“Anyone who is not a geologist.”

National Park Service

Kenai Fjords National Park, Alaska

Comments Overheard:

- From park staff:
 - “Gee, it’s wonderful you’re here. We had a geologist here a couple years ago. A nice guy who really knew his stuff. Unfortunately, we didn’t understand a word he said.”
- From a geologist:
 - “Yea, I went to a ranger talk. But the ranger knew nothing about geology. Didn’t even know the difference between a granite and a granodiorite.”



Robert J. Lillie

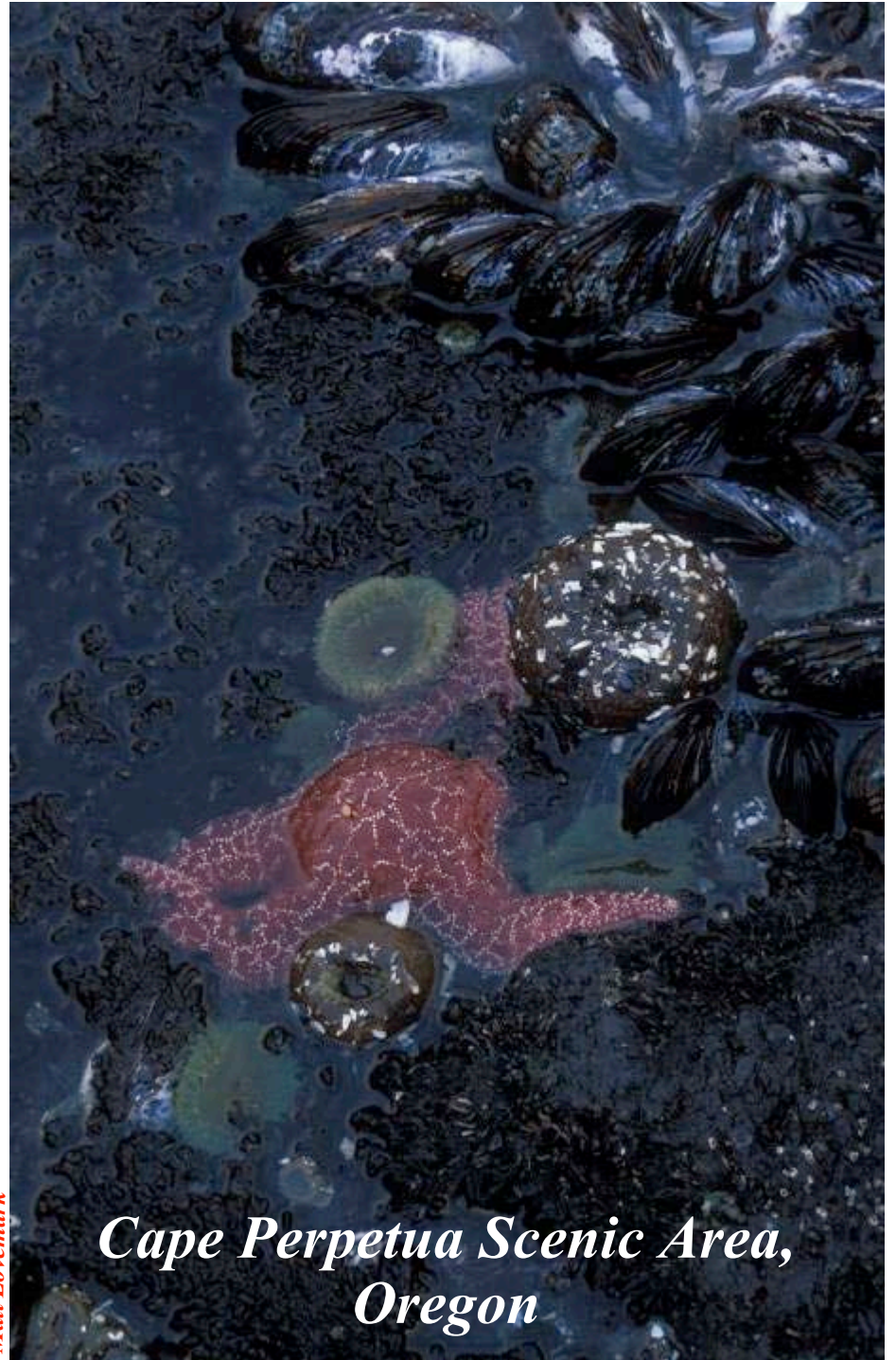
*Yosemite National Park,
California*

Fortune Cookie:

*“Your romantic
life is interesting
only to you.”*

Matt Lovemark

*Cape Perpetua Scenic Area,
Oregon*



Why National Parks?

- National parks have incredible geology just begging to be explained to the public.
- Park interpretation ranger backgrounds:
 - Commonly life sciences.
 - Geology degrees rare.
- Very little earth science is covered in K-12 school system.
 - Typically one course in 7th or 8th grade.
- Parks are one of the few places kids might go with their families, where:
 - Geology is right there.
 - There might be someone to explain it to them.

“Geology” → “Landscape” → “Scenery”

The geological landscape is the stage upon which episodes of natural and cultural history are played out.

If your park has scenery, it has geology! 😊

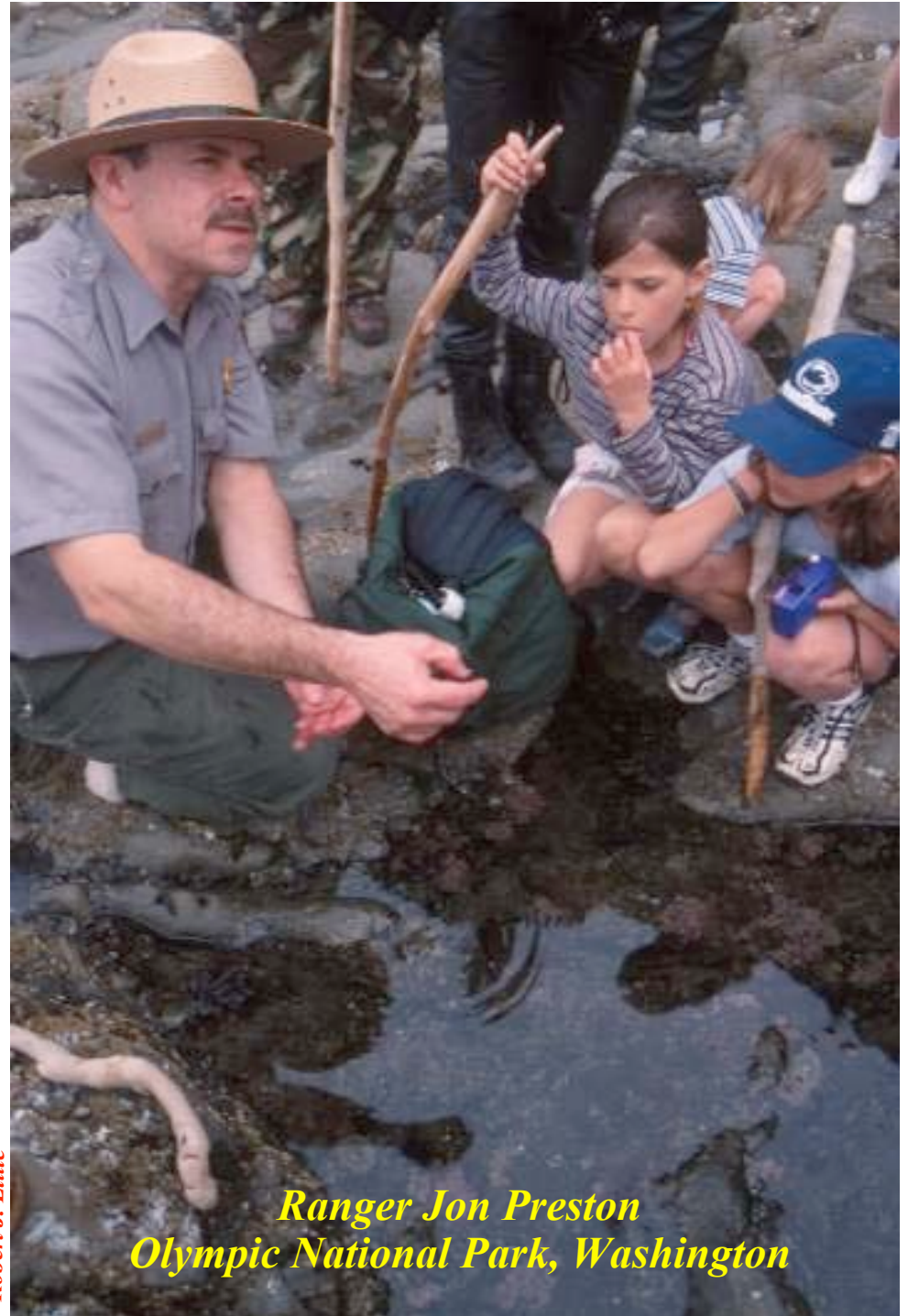
Ken Bennick

Cape Perpetua Scenic Area, Siuslaw National Forest, Oregon



Effective Ranger Program

- Personal experience of the ranger
- Good factual content
- Level appropriate for audience
- Relates factual content to people's lives



Robert J. Lillie

*Ranger Jon Preston
Olympic National Park, Washington*

PAIRing People with Parks



Park
Visitors

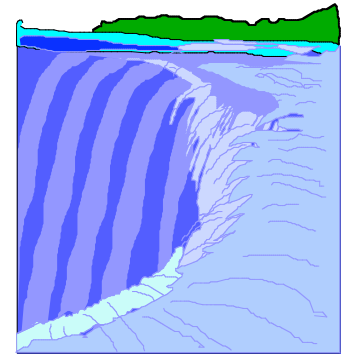
PAIR

**Presentation
Setting**

**Audience
Characteristics**

**Interpretation
Methods**

**Resource
Information**



National
Park

Adopted from Allyson Mathis, Grand Canyon National Park

PAIRing People with Parks



Park
Visitors

P

Presentation
Setting

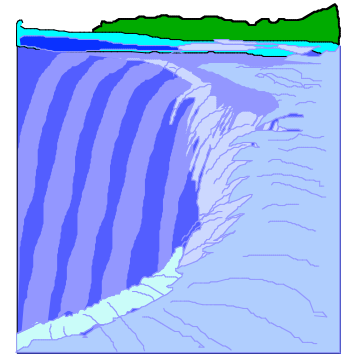
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Interpretation
Methods

A

Audience
Characteristics

Resource
Information



National
Park

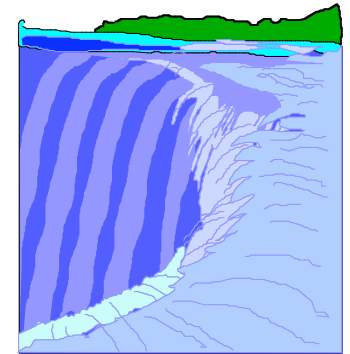
*Won't work
if any link
is missing!*

Adopted from Allyson Mathis, Grand Canyon National Park

Knowledge and Skills for effective communication:
- Audience background in geology
- Ways to make geology meaningful to your audience



Park
Visitors



National
Park

P
A
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Presentation
Setting

Audience
Characteristics

Interpretation
Methods

Resource
Information

Situation to engage visitors:
- Guided Hike
- Formal Program
- Beach Encounter
- Visitor Center

Content to share:
- Basic Geology
- Ongoing Research Results

Adopted from Allyson Mathis, Grand Canyon National Park

Golden Gate National Recreation Area, California

Interpretation (NPS):

Creates opportunities for an audience to form their own intellectual and emotional connections to the meanings of a resource.

During field trip, Red Cross ship sails beneath Golden Gate Bridge headed for New Orleans.

Interpretive Training, August 30-31, 2005

Which statement would people most likely remember? Why?

- A tsunami is a seismically generated wave with an amplitude of less than one meter in the open ocean, growing to 10 meters or more in shallow water.
- More than a quarter million people were killed when a broad sea wave, caused by an undersea earthquake, raced across the Indian Ocean and swelled to great heights as it approached coastal communities.

Robert J. Lillie

Olympic National Park, Washington

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Robert J. Lillie

Intellectual Connections

Olympic National Park, Washington

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Intellectual Connections Emotional Connections

Olympic National Park, Washington

Interpretation vs. Formal Instruction

Audiences

- Captive
 - Have to be there
- Non-captive
 - Want to be there



Captive vs. Non-Captive Audiences

- Captive Audience
 - **Formal Education**
 - Students in Classroom
 - Trainees in Workshop
 - Taught by Instructor
- Non-Captive Audience
 - **Informal Education**
 - Visitors to Parks, Museums, Beaches
 - Watching Sporting Event; Television Program; Play
 - Engaged by Interpreter



Captive vs. Non-Captive Audience (Ham, 1992, p. 7)

Captive Audience

Involuntary

Accept formal approach

Must pay attention if bored

Motivations:

Grades

Diplomas

Jobs

Certificates

Advancement

Non-Captive Audience

Voluntary

Expect informal atmosphere

Switch attention if bored

Motivations:

Interest

Fun

Self-Improvement

Self-Enrichment

Entertainment



Geology Interpretive Workshop, Point Reyes National Seashore, California

Free-Choice Learning

All about the motivation.

Participants:

- Want to learn
- Want to facilitate
- Want to be enlightened
- Want to be inspired

*Don Byerly
engaging
workshop
participants*

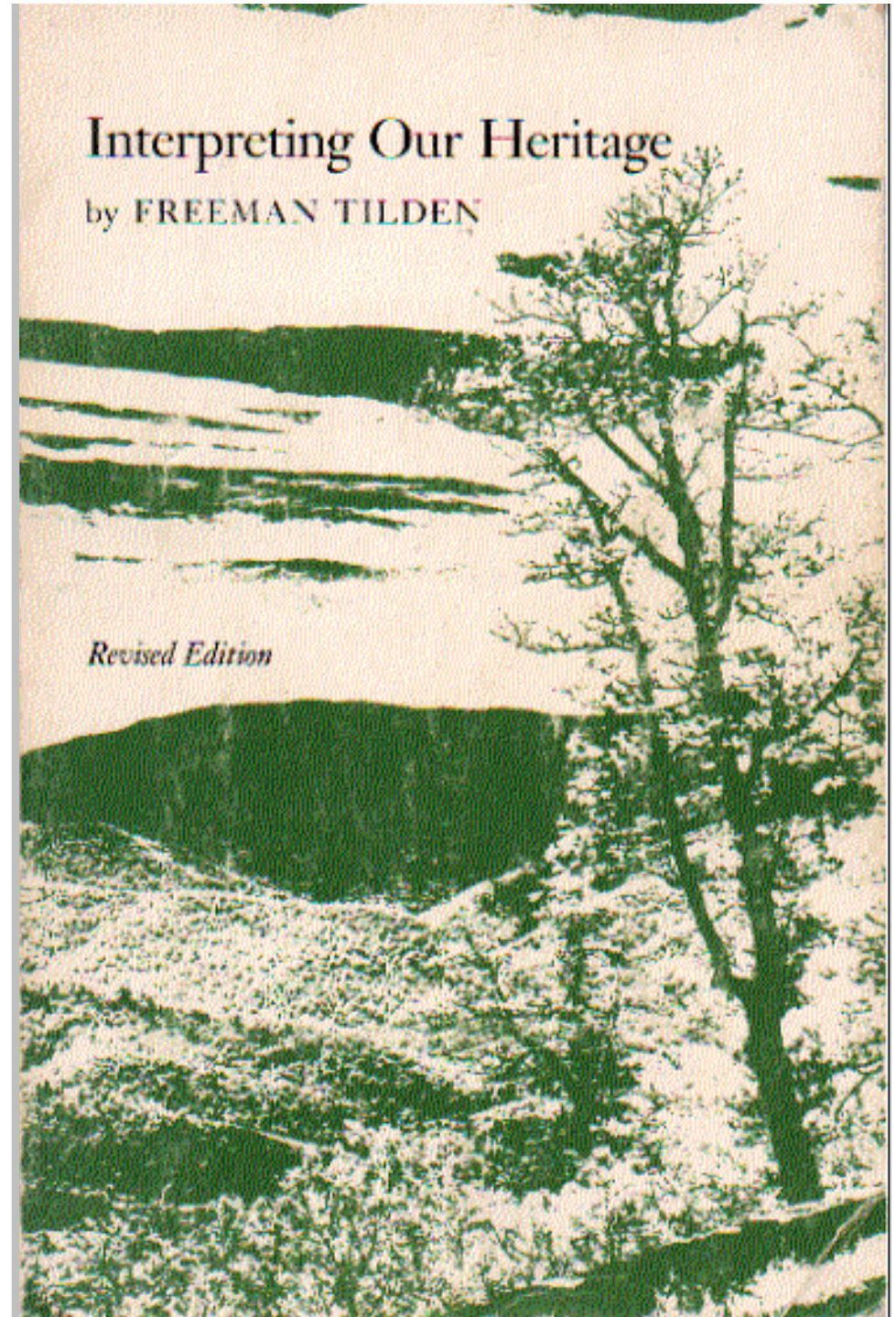
Robert J. Lillie

Great Smoky Mountains National Park, Tennessee



Freeman Tilden

- Formalized and recorded the principles of effective interpretation in *Interpreting Our Heritage*, first published in 1957.



Tilden's Principles of Interpretation

1. Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile.
2. Information, as such, is not interpretation. Interpretation is revelation based upon information.
3. Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical, or architectural. Any art is to some degree teachable.
4. The chief aim of interpretation is not instruction, but provocation.
5. Interpretation should aim to present a whole rather than a part, and must address itself to the whole man rather than any phase.
6. Interpretation addressed to children should not be dilution of the presentation to adults, but should follow a fundamentally different approach.



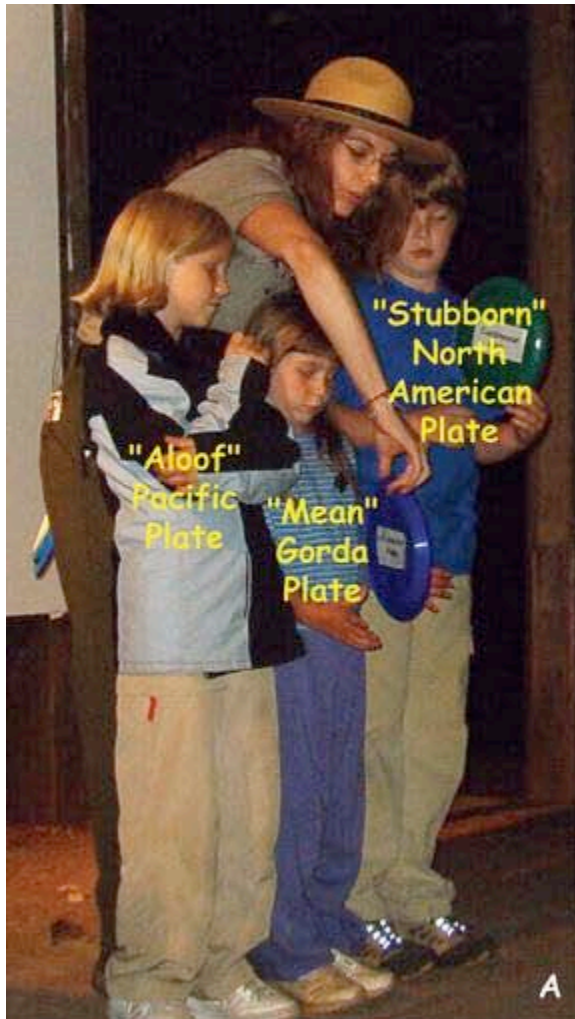
Tilden's Sixth Principle

Interpretation addressed to children should not be dilution of the presentation to adults, but should follow a fundamentally different approach.



Jen Natoli
OSU Geosciences Grad Student and Park Ranger,
Redwood National and State Parks, California

You've heard of "Fun with Phonics?" This is fun with, Plate Tectonics ☺

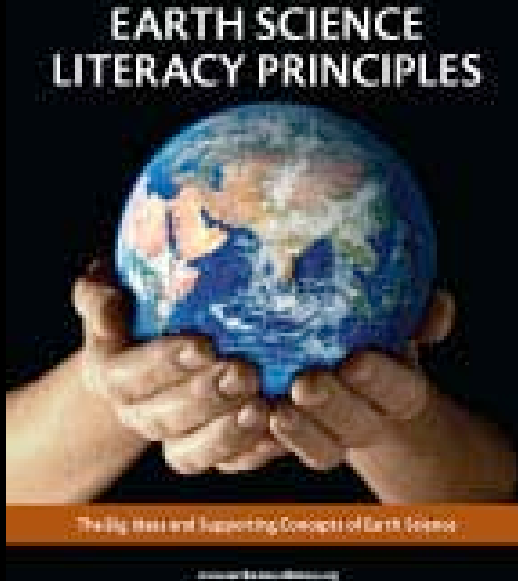


*Jen Natolli, OSU Geosciences Graduate Student
Park Ranger, Redwood National and State Parks, California*

Earth Science Literacy Principles

Big Ideas

- 1. Earth scientists use repeatable observations and testable ideas to understand and explain our planet.**
- 2. Earth is 4.6 billion years old.**
- 3. Earth is a complex system of interacting rock, water, air, and life.**
- 4. Earth is continuously changing.**
- 5. Earth is the water planet.**
- 6. Life evolves on a dynamic Earth and continuously modifies Earth.**
- 7. Humans depend on Earth for resources.**
- 8. Natural hazards pose risks to humans.**
- 9. Humans significantly alter the Earth.**



Your Task

Present “Big Ideas” of the Oregon Coast to Coast Visitors

- Tangibles:
 - Actual geological observations
- Intangibles:
 - Connections that make the observations relevant to the audience
- Theme:
 - Concise statement that links the tangibles and intangibles

Wendy Kelly

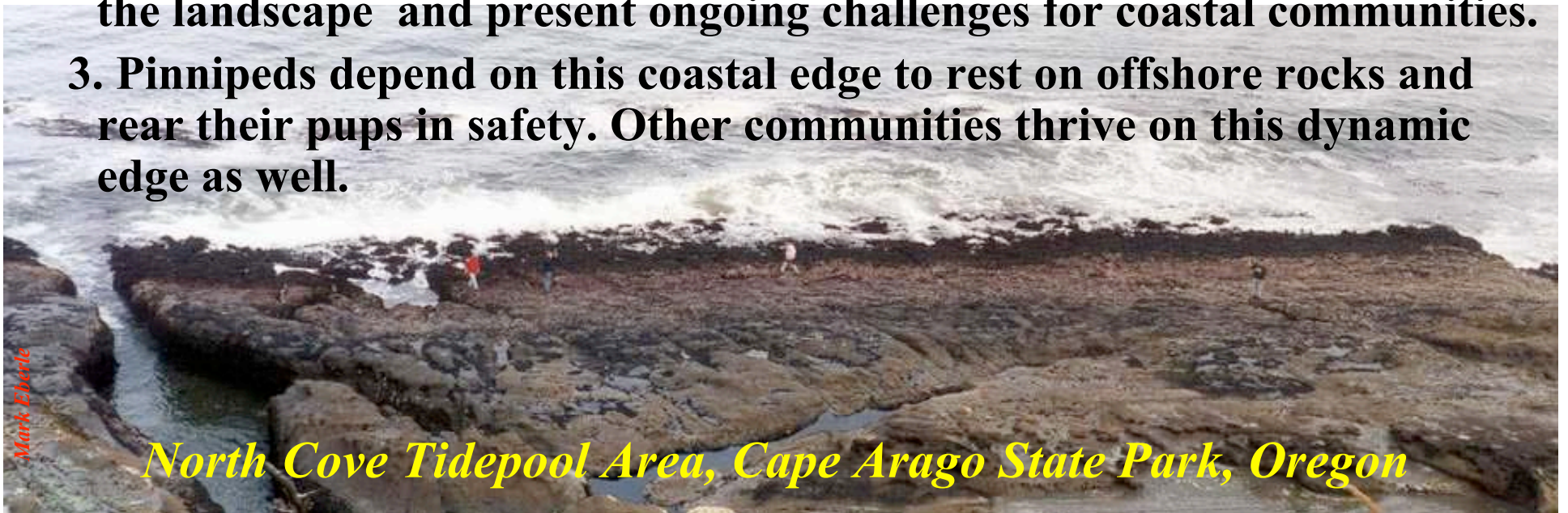
Cape Perpetua Scenic Area, Oregon

What does this mean in terms of Geology on the Oregon Coast?

- Information (Observations; “Tangibles”)
 - Coastal Landscape
 - Types of Rocks
 - Frequency of Earthquakes and Tsunamis
 - Results of Scientific Studies
- Meanings (Interpretation; “Intangibles”)
 - Earth processes responsible for the observed features
 - How the features and processes affect people’s lives
 - Aesthetically
 - Practically

Themes for Cape Arago Region State Parks: Geological Connections

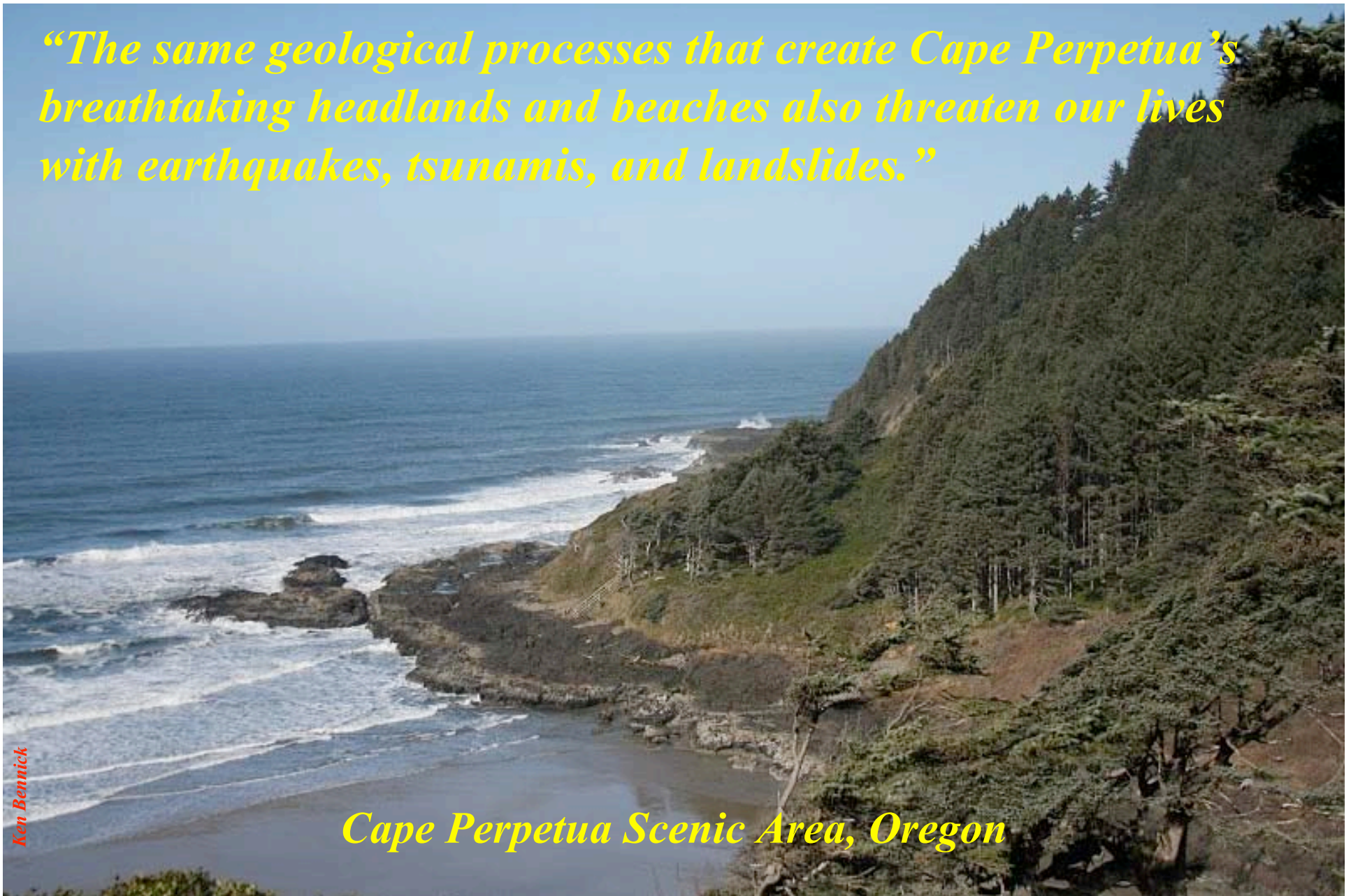
- **Theme:** The Cape Arago Region is a dynamic edge where powerful forces shape the land and create a resource-rich environment.
- **Sub-themes:**
 1. At this coastal edge, landforms shift slowly but constantly through the interplay of natural processes and cycles that occur on a spectrum of scales from large to small.
 2. Sudden, cataclysmic events such as earthquakes and tsunamis change the landscape and present ongoing challenges for coastal communities.
 3. Pinnipeds depend on this coastal edge to rest on offshore rocks and rear their pups in safety. Other communities thrive on this dynamic edge as well.



North Cove Tidepool Area, Cape Arago State Park, Oregon

A Theme revolving around “Beauty and the Beast”

“The same geological processes that create Cape Perpetua’s breathtaking headlands and beaches also threaten our lives with earthquakes, tsunamis, and landslides.”



Ken Bennick

Cape Perpetua Scenic Area, Oregon

Cape Perpetua Scenic Area, Oregon

Can we design an effective interpretative brochure on geology for the Oregon Coast?



Geology Trail Guide

Cape Perpetua Scenic Area, Oregon: A Tale of Beauty and the Beast

• Overall Theme:

- The same geological processes that create Cape Perpetua's breathtaking headlands and beaches also threaten our lives with earthquakes, tsunamis, and landslides.

• Develop a theme (and write-up) for your stop:

- Stop 1
- Stop 2
- Stop 3
- Stop 4
- Stop 5



Trail of the Restless Waters

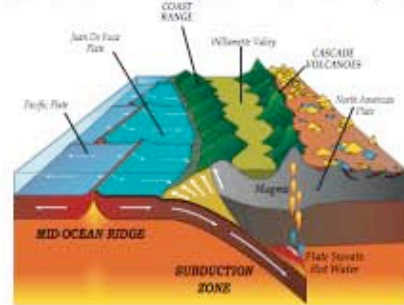
Geology Brochure

Geologic Processes in Action

You are standing on a developing coastline. Earth's dynamic processes have been in action here for millions of years and continue to shape the landscape of Cape Perpetua National Scenic Area. The Trail of the Restless Waters shows many important geological processes encompassed within a one-mile hike. Starting on the deck of the Interpretative Center and gazing at the rugged coastline and out to sea, you can visualize how **plate tectonics** has shaped the landscape. As you start down the trail, you'll see the effects of **uplift** and **erosion**. Rock layers you'll walk on were manufactured far out in the Pacific Ocean, and were only recently lifted out of the sea to become part of Oregon's Coast Range mountains. At the second stop you'll observe a giant crack, one of many along the Oregon Coast. Such chasms provide insight into erosional processes that continue to modify Cape Perpetua. The next stop provides a glimpse of the effects of ancient **volcanism** and the **deposition** of sedimentary layers. Some of the ancient lava flow rocks are rough and jagged, while others are rounded and smooth, providing clues to the development of volcanic islands out in the Pacific Ocean. Deposition is easily seen when you look back toward the beach and see the enormous sand dunes, some on which buildings have been constructed. The last two stops focus on geologic hazards, including **tsunamis** (pronounced "soo-nah-me"), **earthquakes**, and **landslides**. Tsunamis, mistakenly called "tidal waves," are caused by seafloor movement; the waves become destructive when they reach shallow water. Earthquakes are an important hazard to understand because they can be devastating, yet are hard to predict. Landslides, occurring where erosion and heavy rains act on steep slopes, are common on the Oregon Coast. Take your time as you follow this geological interpretation guide to one of Oregon's most beautiful coastal scenic areas!

Stop #1 - Plate Tectonics

- Located on the deck of the Interpretative Center
- Look out at the landscape: *What types of processes occur beneath Earth's surface to create these landforms?*



Geological Observations

Tangibles:

-
-
-

Ecological/Human/Other Connections

Intangibles:

-
-
-

Theme Statement (Message)

Theme:

“
”

Stop #2 - Uplift and Erosion

- Located directly after going through the tunnel.
- Look out at Good Fortune Cove: *What causes such chasms to form along the Oregon Coast?*



Geological Observations

Tangibles:

-
-
-

Ecological/Human/Other Connections

Intangibles:

-
-
-

Theme Statement (Message)

Theme:

“
”

Stop #3 - Volcanism

- Located at the top of the staircase along the trail.
- Look at the dark rock in front of you: *Would you want to be standing here when this rock was forming?*



Geological Observations

Tangibles:

-
-
-

Ecological/Human/Other Connections

Intangibles:

-
-
-

Theme Statement (Message)

Theme:

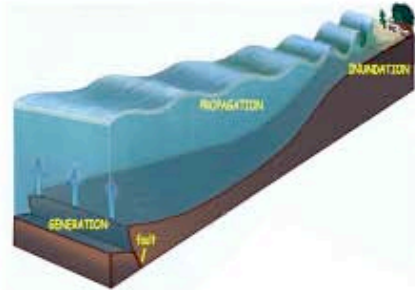
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Trail of the Restless Waters Geology Brochure

Name _____

Stop #4 - Earthquakes and Tsunamis

*Located at the top of the next staircase along the trail.
*Look at your height above sea level: *Do you think you could reach a safe height if a tsunami hit the coast?*



Geological Observations

Tangibles:

-
-
-

Ecological/Human/Other Connections

Intangibles:

-
-
-

Theme Statement (Message)

Theme:

“.....
.....”
.....

Stop #5 - Forces of Nature

*Located at the viewpoint just below the parking lot.
*Look at the hillside to the right of Devil's Churn: *How do big earthquakes affect this area?*



Geological Observations

Tangibles:

-
-
-

Ecological/Human/Other Connections

Intangibles:

-
-
-

Theme Statement (Message)

Theme:

“.....
.....”
.....

View from Cape Perpetua Visitor Center - On the edge of the sea.



Scientist and nature writer Rachael Carson summed up the power and beauty of the coastline in her classic book *The Edge of the Sea*.

"Now I hear the sea sounds about me; the night high tide is rising, swirling with a confused rush of waters against the rocks below..... Once this rocky coast beneath me was a plain of sand; then the sea rose and found a new shore line. And again in some shadowy future the surf will have ground these rocks to sand and will have returned the coast to its earlier state. And so in my mind's eye these coastal forms merge and blend in a shifting, kaleidoscopic pattern in which there is no finality, no ultimate and fixed reality - Earth becoming fluid as the sea itself."
(Houghton Mifflin Company, 1955).

We hope this brief guide has helped you visualize and appreciate some of the processes that continue to shape the Oregon Coast. Enjoy your visit to Cape Perpetua Scenic Area!

Cape Perpetua Scenic Area Trail of the Restless Waters

Geology Trail Guide



Department of Geosciences
Oregon State University

Group Projects: Cape Perpetua Scenic Area, Oregon

Can we design an effective interpretative brochure on geology for the Oregon Coast?



Cape Perpetua Field Trip

Stop 1: Plate Tectonics



Cape Perpetua Field Trip

Stop 1: Plate Tectonics



Cape Perpetua Field Trip

Stop 2: Uplift and Erosion



Cape Perpetua Field Trip

Stop 2: Uplift and Erosion



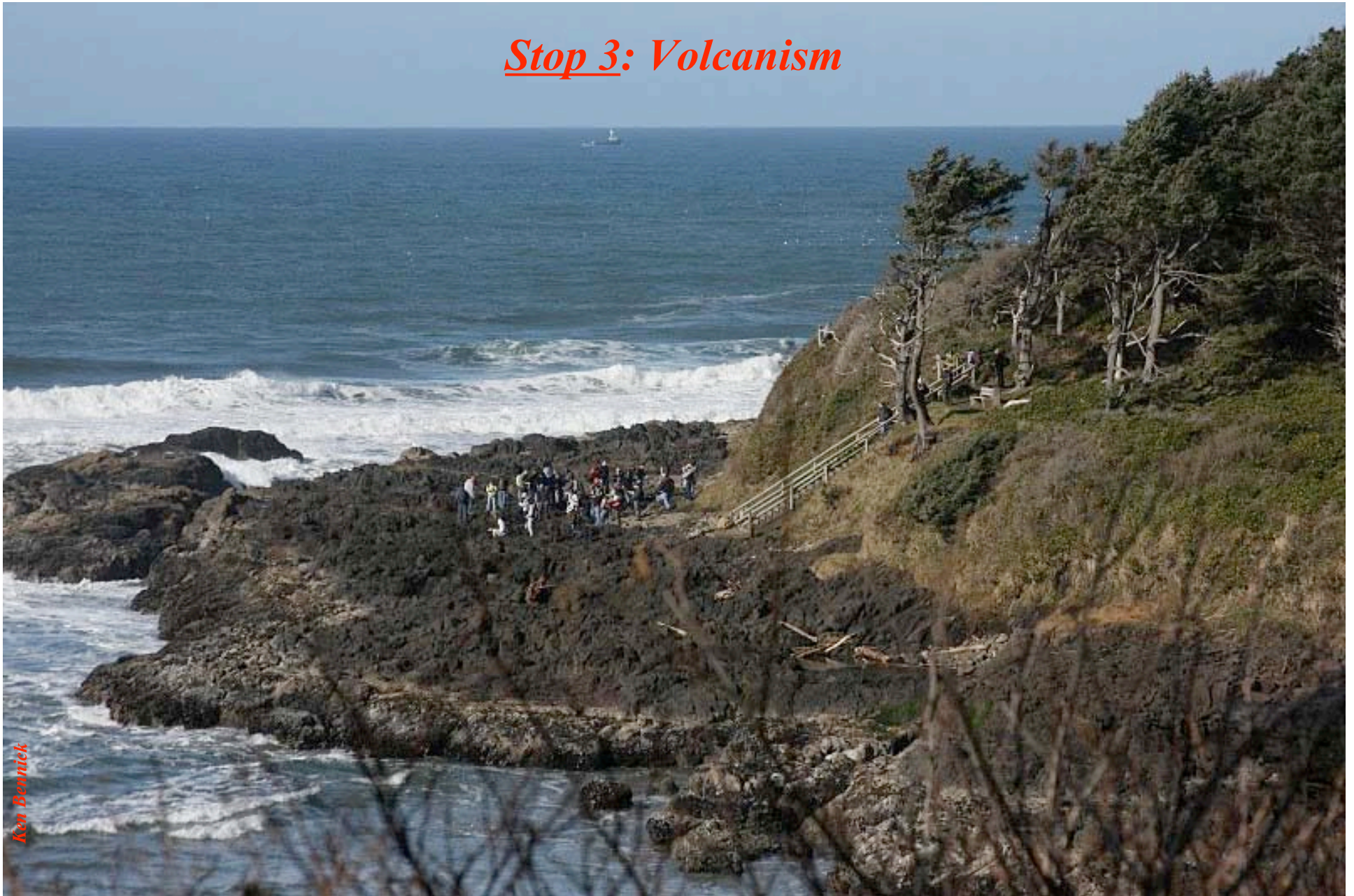
Cape Perpetua Field Trip

Stop 2: Uplift and Erosion



Cape Perpetua Field Trip

Stop 3: Volcanism



Cape Perpetua Field Trip

Stop 3: Volcanism



Cape Perpetua Field Trip

Stop 4: Earthquakes and Tsunamis



Cape Perpetua Field Trip

Stop 4: Earthquakes and Tsunamis



Cape Perpetua Field Trip

Stop 5: Forces of Nature



Just a Spark

“Do not try to satisfy your vanity by teaching a great many things. Awaken people’s curiosity. It is enough to open minds; do not overload them. Put there just a spark. If there is some good inflammable stuff, it will catch fire.”

Anatole France

(“The Earth Speaks, p. 112)



National Park Service



Stacy Wagner

*OSU Geosciences Graduate
Student*

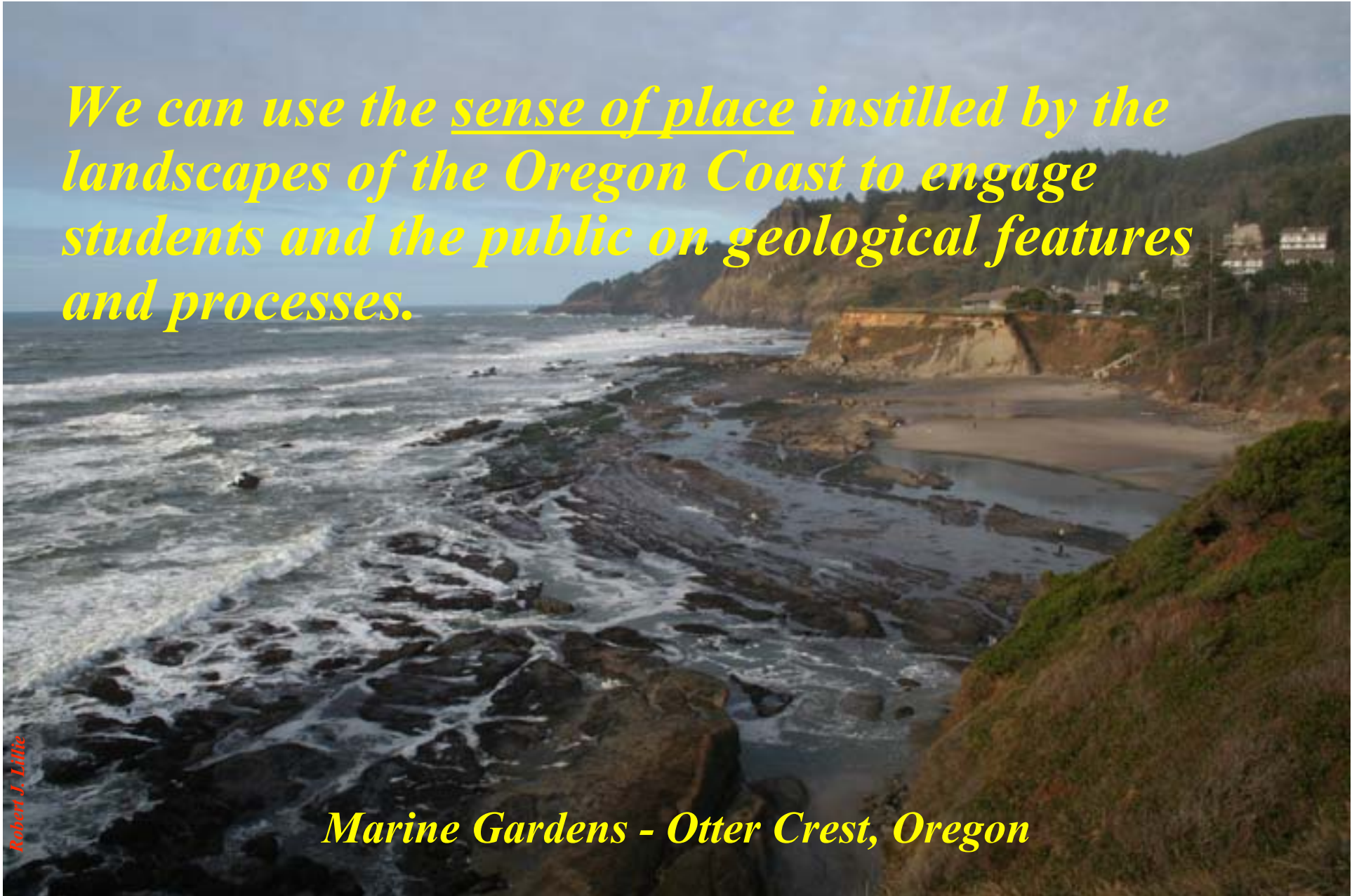
*Park Ranger, Grand Canyon
National Park*

Parks and Beaches are Special Places

We can use the sense of place instilled by the landscapes of the Oregon Coast to engage students and the public on geological features and processes.

Robert J. Lillie

Marine Gardens - Otter Crest, Oregon



A Sense of Place

by Allan Gussow (“The Earth Speaks,” p. 45)

- *There is a great deal of talk these days about saving the environment. We must, for the environment sustains our bodies.*
- *But as humans we also require support for our spirits, and this is what certain kinds of places provide. The catalyst that converts any physical location - any environment if you will - into a place, is the process of experiencing deeply. A place is a piece of the whole environment that has been claimed by feelings.*
- *Viewed simply as a life-support system, the Earth is an environment. Viewed as a resource that sustains our humanity, the Earth is a collection of places. We never speak, for example, of an environment we have known; it is always places we have known - and recall.*
- *We are homesick for places, we are reminded of places, it is the sounds and smells and sights of places which haunt us and against which we often measure our present.*