ENVIRONMENTAL QUICKIES

Pacific Northwest Region, National Park Service
523 - 4th & Pike Building, Seattle, Washington 98101

SOME IDEAS ON ENVIROMENTAL INTERPRETATION TECHNIQUES

The following quotes are from a survey of environmental interpretation techniques used by seasonal interpretive personnel in field areas of the Pacific Northwest Region, National Park Service.

Guided Walks

The Straight of Juan de Fuca on Big Meadow . . . contrast between the Olympic Mountains to the south and the pollution from the paper and pulp mills in Port Angeles to the north . . .

Michael Sipes
Olympic

Pollution (air) Awareness: A stop at the cirque on the north side of Big Meadow at Hurricane Ridge can produce a situation whereby the visitor can distinguish between air pollution and normal summer haze . . .

S. Tassio
Olympic

Water Pollution: On Spruce Nature Trail at the Hoh I point out the murky, cloudy river and say "That water's polluted! – pause – with glacial flour!, but it's perfectly drinkable" and then I go down to the river, and, cupping my hands, I drink some of it. This leads into the subject of glacial action, pollution and everything else. If it's drinkable – drink it yourself – they remember actions – not words.

Enjoying the Forest: . . . to really enjoy the forest one might find it wise to temporarily put all that you know about the forest aside and just look at it very directly, with full attention, listen intently, feel the mossy draperies (with care) and not name the plants, not play back memory's tapes.

Be extraordinarily aware of the light patterns on the leaves and against the incredibly blue sky, of the softness and three dimensionality of the mosses as they sway in the breeze or hang silently motionless. And if one can so look at the incredible loveliness in this natural area, one can do the same thing at home, looking at an African Violet in a pot, or a small tuft of grass between the curb and the street.

David Essel
Olympic

When giving nature walks I use the "community" approach as the theme of the activity. We discuss our own community at home and then compare it to the natural community that we are walking through.

Along the Rim Valley area where we have visitors feeding the ground squirrels and the GMGS numbers are abundant, I ask a youngster to count the number of ground squirrels; . . . . and then we take another out on the trail proper. Maybe we'll see one on the remainder of the trail as compared to 20-25 in the visitor saturated area. This is a good object lesson on man's impact on the natural community and how we upset nature's balance.

On the walk we talk about erosion, human and natural . . .

On the boat trip I invite the people to dip in and have a "Crater Lake Highball". Then we talk about the purity of the water, etc.

Theodore E. Arthur
Crater Lake

Enjoying Nature's Wonders: A slide program to show visitors to a National Recreation Area some of the activities they can participate in. Emphasis is upon self study and imagination . . .

Providing Breakfast on Morning Nature Hikes: Along with the normal presentation of the Nature Hike, the ranger will show the group various plants and animals, such as ants, that are edible . . . it demonstrates that nature provides our needs, if we are willing to try her treats.

Arnold F. Shoech
Fort Spokane

Ask the group to look at a modern scene and describe the appearance of the same scene as it was several hundred years ago. Usually this really starts people to thinking about the changes that have taken place in our environment. The reaction ranges from "hard to believe" to "it would have been nice to live back in those days before pollution."

Fort Vancouver

On my walks I have used bits of poetry to convey to the visitor the different ways of looking at nature. I would like to develop a walk that is based on poetry where the interpreter would look at the phenomena of nature and comment on it thru the words of the poet . . .

Theodore E. Arthur
Crater Lake

Several times the ideas involved in camouflage have taken on an immediacy as I have had kids momentarily capture green and brown tree frogs . . . the green frogs are set down on a substrate with a brown background and the brownfrogs set down on one with a green background. There are lots of "Ohs' and' "Ahs" when they switch places. . .

At times I have asked the visitors to predict what would be found under a rock and what the creatures might be like that would prefer this habitat. . . the main lesson I have drawn from this is that the average person does not put the rock back the way it was and kills the attendant organism by changing the environment. . .

R. Frazier
Olympic

Unmarked Nature Trail: I am currently compiling a brochure to be provided at each trailhead. It describes the natural events (i.e. a rotting log, wildlife behavior, man's influence, tree growth, etc.) occurring in the community through which the trail passes. Instead of a visitor looking for the next stake or plaque along some nature trail, he will be using all of his senses to locate the items discussed in the brochure. Thus he will be more alert and sensitive to that which is around him.

Man's Trust In The Wilderness: Along my guided hikes I invite people to eat the vegetation and drink the clean mountain stream water. After coming from a polluted city, so many people do not trust the wilderness as a source of food and water. If they can trust it, then maybe they'll respect it.

John N. Wilkerson
Olympic

Sensory Perception Technique: Ask the group to be still and listen for a full minute to the sounds of the wilderness. Then discuss the sounds during the follow-up discussion.

Carl Torkko
Olympic

Tree– one of nature's ways of recycling: Look at tree's life – when it's alive it produces seed which forms new trees and food for animals; branches and leaves add organic matter to the soil; describe how tree is broken down by fungi, beatles, ants; show how during trees life it is always adding to the environment and how it is completely recycled. Now mention how much man could learn from nature if he could recycle his used resources so he could live in a better environment – junked cars, tin cans, bottles, etc.

Crater Lake

Discuss the efficiency of nature in returning everything to the soil to be reused. Nothing goes to waste out in the wilderness, i.e. nature doesn't have any garbage dumps.

Ask visitors to compare the "action" going on in their home communities with the subtle, quiet action of the forest community.

Crater Lake

Overnight hikes, led by a naturalist. Visitors could be taken into the backcountry and shown actual wilderness.

Crater Lake

In each of my walks, esthetic values are discussed as a question, "How much nature is enough?" And, why is having a trail from here to there important? Why not drive? Or, why not walk with a dog?

Glen Walthall
Olympic

The visceral experience with nature is what I try to achieve when doing any of the naturalist activities, using somewhat standard gimmicks of feeling things, touching things, smelling things, and hearing things . . .

And don't forget that man too is natural, and what he does is natural, but just toss out the question, how far? Don't answer it. Let them do the thinking and maybe some of them will come up with an answer of part to the puzzle. And, also remember that there is nothing wrong with the city. It is where 7 out of 10 of us live. It is the most ecologically sound, stable and efficient method man has found to live in a high technological state. But, let's just say, by looking at nature, we can perhaps be a little happier, more well adjusted, and then the city becomes "just a little nicer place in which to be".

L. Scott
Crater Lake

Campfire and Illustrated Slide Talks

We should continue to discuss the most urgent environmental problems as they relate to the visitors home environment, and as they will eventually realize these problems are affecting the parks, also. . . . I believe it is time to discuss solutions to these problems through our everyday interpretive programs. Give them facts they can comprehend: the mammoth Sunday edition of the New York Times (each Sunday) consumes 64 acres of trees. The San Francisco Examiner uses only recycled paper for its daily newsprint. The upper end of Yosemite Valley has been

closed to private vehicle traffic. The parking lot at the end of Hoh Road is filled to the brim on many summer days. Etc. Etc.

The campfire program is an excellent activity to discuss environmental problems and especially solutions. Emphasis in discussion and solutions.

Bob Kaune
Olympic

Campfire program— creating an awareness of man's influence on the environment. . . . "The Story of the Olympics" is designed not only to acquaint the visitor with the Olympics, but also to show some contrasts between the natural environment and man's presence in this natural environment. Two examples in point follows:

1. (Slide of beaver cut logs) — "These residents have used the available material to build their homes as protection against the elements."
2. (Slide of the freeway and surrounding skyline near San Jose, California) — "However; man has outdone all other residents of earth in his ability to fashion not only homes but entire cities on this beautiful earth."

Michael Sipes
Olympic

Approaches I Use: Slide talk entitled "Wildlife Then and Now". Tells what plants and animals were found in southeastern Washington and northeastern Oregon in three different life zones: Mountain zone, Foothill and Palouse Prairie zone (Bluebunch Wheatgrass zone), and Sagebrush zone. Tells what species are here now and why the change: . . .

Approaches I Would Like to Use:

1. Have the kids paint pictures using the colors from nature. Smear blueberry on paper for sky, green leaf or grass for green, carrot or something yellow for fall colors. Then, if possible, use dyes made from natural sources, then use purchased paints and compare the results.
2. Have kids listen to noises in schoolroom, on a city street, in a factory, on a farm, in the timber, on the desert, close to a lake, next to a stream. Compare the various sounds. Discuss what is most relaxing, which is most bothersome, etc. Which location is most conducive to studying?
3. Take kids to forest, desert, estuary, pond, etc. Have them sit quietly and observe all the animals they see, all the different plants they see, all the sounds they hear, the smells they smell, the feel of things they touch.

J. Winchell
Whitman Mission

Compare the visitor as a guest in the National Parks and the animals as the hosts. Using illustration of the park as the animals living room and how they wouldn't like anyone to dump any garbage in it, or set fires in it, or they wouldn't like things to be missing from it as the humans wouldn't like this either. I try to tell the visitor to put himself in the animal's place.

Nancy Affoller
Crater Lake

Place ourselves into the ecological cycle. . . . Both the water and energy cycles are good ideas when trying to fit man into the picture and when trying to show how we have, and are disrupting their cycle.

Charles Grimwood
Mt. Rainier

GPO 986-135

ENVIRONMENTAL QUICKIE

A PUBLIC SERVICE PROJECT

from the

Pacific Northwest Region, National Park Service
601 - 4th & Pike Building, Seattle, Washington 98101

LEADING CHILDREN IN THE FIELD

A THUMBNAIL SKETCH

EFFECTIVE OUTDOOR ACTIVITIES WITH CHILDREN ARE ACHEIVED THROUGH GOOD ORGANIZATION AND PROCEDURES. HERE ARE SOME TIME-TESTED REMINDERS SET DOWN BY CHARLES J. GEBLER, CHIEF OF INTERPRETATION AND VISITOR SERVICES IN THE PACIFIC NORTHWEST REGIONAL OFFICE OF THE NATONAL PARK SERVICE. ILLUSTRATIONS WERE DONE BY RICHARD S. TOUSLEY.

BEFORE THE TRIP PREPARE

PREPARE YOURSELF - AND GROUP

1. HAVE AN OBJECTIVE
2. KNOW YOUR TRAIL
3. KNOW YOUR SUBJECT
4. STUDY ECOLOGY
5. CORRELATE CONSERVATION CONCEPTS

1. CREATE AN OBJECTIVE
2. RELATE TO OTHER SUBJECTS
3. BUILD UP ANTICIPATION

DURING THE TRIP
RULES AND REGULATIONS

ORDER

1. EXPLAIN WHAT, WHERE, WHEN, WHY AND HOW
2. DEFINE THE RULES
3. KEEP ORDER
4. KEEP THEM BEHIND YOU
5. GATHER AROUND ON STOPS
6. ENCOURAGE QUESTIONS (WITHIN REASON)

SAFETY

1. STAY ON THE TRAIL
2. WATCH WHERE THEIR FEET GO
3. WALK - DON'T RUN
4. BE PREPARED FOR EMERGENCIES

CONSERVATION

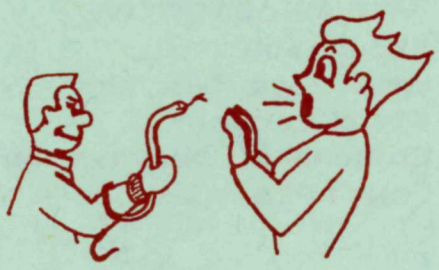
1. USE GOOD OUTDOOR MANNERS
2. PRACTICE CONSERVATION

DURING THE TRIP
TECHNIQUES

FACTS

1. EXPLAIN OBJECTIVES
2. MOVE OUT RAPIDLY TO FIRST STOP
3. WALK CASUALLY
4. STOP TO LOOK AT SOMETHING
5. ALL GATHER 'ROUND
6. KEEP STOPS SHORT

FUN



7. SPEAK CLEARLY
8. TALK CONVERSATIONALLY
9. INTERPRET ON THEIR LEVEL
10. USE SERIAL METHOD
11. CONTRAST AND COMPARE
12. RELATE TO WHAT THEY KNOW

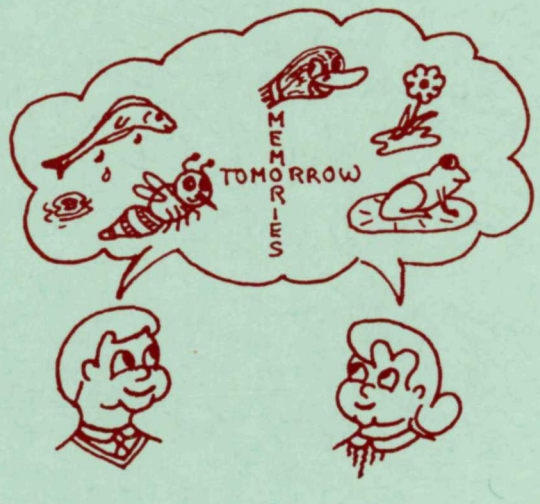
FATIGUE

13. USE GAMES
14. PREPARE FOR SURPRISES
15. ENCOURAGE DISCOVERY
16. USE ALL SENSES
17. CLIMAX THE TRIP
18. CONCLUDE WITH IMPACT
19. WATCH THE LENGTH

AFTER THE TRIP
LET THE MEMORY LINGER ON

FOLLOW-UP

1. SUMMARIZE THINGS AND EVENTS
2. FOLLOW-UP WITH PROJECTS
3. RELATE TO OTHER SUBJECTS
4. BUILD TOWARD OTHER TRIPS
5. ENCOURAGE INDIVIDUAL INTEREST



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INQUIRIES SHOULD BE DIRECTED TO THE REGIONAL DIRECTOR, PACIFIC NORTHWEST REGION, NATIONAL PARK SERVICE, 601 FOURTH AND PIKE BUILDING, SEATTLE, WASHINGTON 98101

FIELD NOTES

ENVIRONMENTAL UICKIE

A PUBLIC SERVICE PROJECT

from the

Pacific Northwest Region, National Park Service

601 - 4th & Pike Building, Seattle, Washington 98101

ENVIRONMENTAL AWARENESS PROGRAMS FOR HANDICAPPED YOUTH

When Patricia A. Milliren was an Environmental Education Assistant with the Pacific Northwest Region, National Park Service, her backgound as a Peace Corps instructor in Fiji and her special training in environmental awareness education for children provided the impetus for this study. For three summers the Cooperative Activities staff of the Pacific Northwest Regional Office worked with handicapped children in the Seattle City Parks and Recreation Specialized Program to gather and evaluate information about environmentally oriented programs for the handicapped that could be useful to Park Rangers. The Seattle City Parks Specialized Programs staff were an integral part of this process.

WHAT CAN YOU DO?

What can you do with a little girl who will probably never understand how fish swim, or why water flows, but who loves to go fishing and wade at the water's edge? What can you do with a child who cannot stand, yet whose mind and spirit urges her to explore everything around her? What can you do with a young man who speaks so slowly and indistinctly that it is painful to listen to him, but who longs to carefully explain to you the marvels that he sees under his hand lens?

These children have mental, physical and/or emotional handicaps. Still, they are children who benefit from and enjoy the out-of-doors. When park interpreters and teachers receive requests for services to handicapped groups, inexperience may generate a fear of the unknown. "Who are they? How can one prepare for them? How should a program be presented? What kind of program should be presented?"

WHO ARE THE HANDICAPPED?

Handicapped children are people who have lost use of some part of their mind or body. Each is still a child similar to other children but each is also unique; no individual can be fitted into a preconceived mold of what a handicapped child ought to be. It is helpful, however, to be generally familiar with the broad categories of handicaps in order to ask the right questions of counselors and aides, and become prepared for the children.

Physically handicapped children have lost use of some part of the body, but they may be able to use the rest very effectively. A child may be able to use his hands and eyes well to examine something, but be unable to sit up straight to do so. Such children may require being lifted, carried, led, or pushed in wheelchairs. These difficulties should not suggest that their minds are slow. One may have to work hard to keep ahead of their mental pace.

Mentally retarded children learn at a slower rate, but they can, and **do** learn. Their behavior may not reflect their chronological age, but they should not be treated like infants. They need challenges.

Emotionally disturbed children may not appear aware of their environment at all. Some may be very passive, or extremely active, subject to tantrums, or just hard to manage and direct. Each child is different, with his own capabilities, special needs and special qualities. Whatever their handicaps, contact with these children can be a rewarding experience—both for them and for you.

HOW CAN YOU PREPARE FOR THEM?

Determine the characteristics of the group. Learn their types of handicaps—the general mental and chronological age span, special emotional problems, and the general mobility of the group. Impaired or slow walkers, the need for wheelchairs, crutches, etc., must be considered. Special requirements for meal facilities, proximity to medical services, protection from direct sunlight, and frequent availability of restroom accommodations are examples of other needs that may be encountered. Determine the numbers of staff members and children for which such logistical support must be provided. Be sensitive to **their** tentative plans and objectives for the visit.

Visit the children and their counselors at their own school, hospital, or other facility in advance if at all possible. This will provide a more ample opportunity to learn the predominant characteristics of the group. Spend the time 'interning' with counselors to develop an understanding of the special techniques needed for handling the logistics and the children. Such a visit will prepare you for the wide variety of behaviors that may surface during a presentation. The children are used to these distractions and will probably be less disturbed by them than you will be. You will find you can depend on the counselors who accompany the group to contain these incidents. They are professionally trained to handle such matters.

Test out program ideas with the counselors during the advance visit. They will help adapt them to the specific needs of the group. With prior knowledge of the activities you have planned, the counselors will be invaluable in assisting during the program. They will also use their advance knowledge to prepare the children for their visit, and build anticipation for it. Your visit will demonstrate that the children are sensitive to your reaction to them. Most handicapped children do not want pity, but would like to be treated just as any other children. Handicapped children need especially large helpings of love and attention.

If an advance visit is not feasible, one must try to achieve as many of these objectives as possible under constraints of time and communications. Upon their arrival meet the group quickly, to greet the children informally, then spend some time talking with counselors and developing a plan of action. Previous experience with such groups will be your most valuable asset.

Once you have identified the handicaps and logistical requirements of a group, it takes only a little common sense and imagination to develop a program format. It need not be complicated, but you may need to spend some extra time in preparation until you gain experience.

HOW SHOULD YOU PRESENT THE PROGRAM?

Give a personal greeting. A hello, a smile and a handshake are very important to handicapped children. Spend some casual time getting to know them or renewing old acquaintances. Eat lunch with them, perhaps, play with them, and try to learn their names.

Involve the children in some preliminary activity familiar to them—a game or songs. This will help break the ice, make your program run more smoothly later, and give you some valuable last-minute insights.

Present a short introduction. Explain who you are and what you plan to do. If you are a Park Ranger, the novelty of your uniform will draw the children's attention and be fun for them. Take advantage of this and explain what a Park Ranger does that might relate to them. The introduction should lead everyone into the activities you have planned. This is especially important for the counselors and aides, who will help you involve all of the children to the best of their capabilities.

Use basic interpretive principles and put your best skills into the task. When you are presenting a program to handicapped youth you will need to make adjustments in technique, even to the point of over-emphasizing some.

Be friendly. Use lots of eye-contact, bend down, touch the children, speak personally and laugh with them.

Be flexible. Flexibility is essential for both the interpreter and the program content. If a portion of the program is not holding the children's interest, modify it. Be prepared to abandon an activitiy that does not work. Several pre-planned back-up activities will come in handy. Expect interruptions and disturbances. Extra patience and a smile help a lot.

Involve as many senses as possible. Encourage the children to see, touch, listen, smell and perhaps even taste the natural and man-made environments around them.

Use over-dramatization, body language, voice inflections and role-playing to hold attention. If you are talking about bears, play the role of the bear. When the children get noisy, whisper so that they have to be still to understand you, or do something special to recapture their attention.

Ask open ended, participatory questions. Use exploratory questions to stimulate ideas that lead to action answers: "What does this leaf feel like?" Get them to feel it. When the children respond, remember that positive reinforcement is important.

Use as much active participation and involvement as possible. Involving children is a very effective method of communication, and it helps hold attention. Remember to include the counselors. Keep the children continually occupied—mimicking or listening to sounds, making hand gestures, answering questions, handling interpretive objects, etc. People learn better by actively doing things. In situations concerning mobility and participation, do not hesitate to ask the child how you can help. His disability may require some assistance.

Try to get a one-to-one child/adult ratio at times in order that each child may become involved. It is recommended that more than one Park Ranger or other special leader be present for each group of eight or more. While one Ranger is leading the program, the others can mingle with the children to reinforce the leader and provide more individual attention. Be sure all counselors and other adults present participate along with the children.

Keep the program moving. Allow time for each child to get involved in each program segment, but watch that it doesn't lag—you can lose control fast. Keep everyone occupied by changing pace. For instance, progress from a sitting activity to a moving activity to a game played together in one spot. Variety is especially important if the group includes mixed types of handicaps, since variety can insure that everyone will be included in some activity. Individual activities should be kept short, as should the total program length. An involvement-activity campfire program, for instance, should probably never exceed forty minutes—twenty minutes may be an optimum time for the average handicapped group to remain strenously involved. Attention spans vary with individual, of course—often it is as short as five to ten minutes per activity.

Keep underlying concepts simple. Abstract concepts, such as growth from a seed or a geological progression, which the child cannot actually see or take part in immediately, are difficult to get across, especially for those with mental handicaps. If the concept selected is somewhat foreign, use familiar examples to introduce the new idea. Don't hesitate to restate and repeat—reinforcement is a basic technique.

Use the National Service NEED Program STRANDS concepts for the major themes of your environmental interpretation programs: **Similarities and Differences; Patterns; Interaction and Interdependence; Continuity and Change; Adaptation and Evolution.** These are major themes that apply to all life and to all environments. The most appropriate one or two should be selected and interpreted through games, activities and sensory experiences that illustrate the ideas. STRAND concepts can be used to arouse curiosity without using scientific terminology or formal classifications. (See **Environmental Quickie**, "The National Park Service NEED Program—The Context and Rationale").

Have a good time and keep your enthusiasm up. Above all, your facial expressions and tone of voice are important. Handicapped children may be especially perceptive of your attitudes and mannerisms. When you are enthusiastic and interested in them, they will be enthusiastic and interested in you. Their gratitude for your time and concern will bring you a special kind of personal satisfaction.

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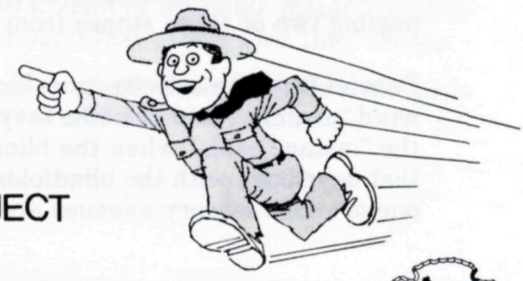
For more information about the National Environmental Education Development Program and associated services for schools and other agencies, write to:

Pacific Northwest Regional Office
National Park Service
601 4th and Pike Building
Seattle, Washington 98101

Division of Interpretation
National Park Service
Department of Interior
Washington D.C. 20204

☆GPO 697-380

ENVIRONMENTAL QUICKIE



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601 - 4th & Pike Building, Seattle, Washington 98101

THE NATIONAL PARK SERVICE **NEED** PROGRAM

ACTIVITIES THAT ILLUSTRATE CONCEPTS

The National Park Service National Environmental Education Development (NEED) Program bases its general approach to the instructional process on five fundamental educational concepts, called STRANDS. These are: *Similarities and Differences, Patterns, Interaction and Interdependence, Continuity and Change,* and *Adaptation and Evolution.*

These concepts are intended to relate all "subject matter content" to the pupil's learning mechanisms in more effective ways. One of these important ways is a re-emphasis of sensory investigations—the optimum use of the pupil's sensory equipment, which is often suppressed in conventional instruction, however unintentionally, in the interest of "efficiency" or "dicipline," and because formidable teacher-pupil ratios negate independent activity. The following short games are designed to involve children in activities that heighten awareness and illustrate STRAND concepts. They should suggest many more similar activities:

THE STONE GAME

Materials: 1) Large walnut-size, similar stones—a few more than the number of players, 2) a small bucket to contain the stones, 3) blindfolds, and 4) an opaque bag to contain the blindfolds.

Procedure: Arrange 7-15 players cross-legged on the ground in a circle (tell them to make a tipi ring), close enough together to touch hands conveniently. Keep the blindfolds out of sight. Pass the stone bucket around the circle with instructions for each player to select one stone, then place the bucket out of the circle and say, "Examine your stone. When you are satisfied, pass it back to me." When the stones have all been returned, produce the blindfolds and instruct the players to put them on. Say, "Now I am going to pass stones to the player on my left. He will take his stone out of circulation when he finds it, and pass the others so all may do the same. We will continue until each player has his own stone again." Allow time for all fruitful effort, then instruct the players to

remove their blindfolds and check their performance. The game can be made more difficult by passing two or three stones from the bucket that were not selected by players in the beginning.

Debrief from the activity by asking the players what the instructions were. Call attention to the word "examine" and ask *how* they examined the rock and *why* they did it that way. Inquire about the "instant panic" when the blindfolds were revealed. Talk about the communications problems that developed with the blindfolds in place. Discuss the compensating behavior that occurs when one or more sensory avenues are withdrawn.

THE WEB OF LIFE GAME

Materials: 1) A ball of stout string, 2) blank 3" x 5" cards, and 3) felt tip markers with washable ink.

Procedure: Arrange 7-15 players cross-legged on the ground in a circle (tipi ring) which includes the leader. Dispense the cards and felt tip markers. Ask players to select some object from their environment—animal, vegetable or mineral—and write its name big on the card. Collect the felt tip markers when this has been done. Produce the ball of string and hand the loose end to a player. Keep the ball in hand while explaining that the first player, holding the loose end, will toss the ball to any other player, who will hook the string behind his finger and toss it to still another player. This continues until all players have tossed the ball and are holding the string as described. When the ball returns to the player holding the loose end, the "web of life" is completed.

Direct all players to role-play the object they elected to name on their card and react the way they feel about other objects represented by the other players. The leader gently directs the ensuing discussion to a consideration of the merits or demerits of each object represented in terms of the group consensus about what is desirable. The process ends when the group has decided to eliminate some unwanted object, or add something to their sample, such as a predator or a tertiary treatment plant. The pay-off is the realization that *any* deletion or addition changes every relationship in the web, because every player must move to keep tension in the web when something is deleted, or move differently to accommodate an addition. There is no such thing as a "side effect!"

Alternative: Place names on the cards, or part of them, before the game starts to get the kind of environmental sample desired, or to determine a particular emphasis.

ANIMAL VIEWPOINTS

Materials: 1) Adhesive tape, 1½" x 2" wide.

Procedure: Tape each player's thumbs securely to the hands so they cannot be used in opposition to the fingers. Direct the players to gather fruit, dig, climb, etc., or, just leave the thumbs taped during a half hour of any other sort of activity that requires use of the hands, so the players will experience loss of the thumbs and the effect that has on dexterity. Most animals do not have opposed thumbs.

Debrief by discussing individual problems encountered and the player's reactions to them.

Materials: 1) A grassy outdoor environment with overstory vegetation and water available—in general, any good bird habitat.

Procedure: Assign players singly or in pairs. Direct them to inventory available materials, then collect the materials needed and construct a bird nest resembling that of any bird they choose.

Debrief by sharing observations about difficulties encountered, and speculate about how the birds acquire the necessary skills. Explore ways they use their beaks, feet and bodies to get the job done.

Materials: 1) Suitable clothing for rough outdoor wear.

Procedure: Assemble players in one place and ask them to think of an animal other than birds. When each player has announced a choice, direct all players to move to another near-by place, using the method of locomotion of the animal selected to get there—creep, wriggle, leap, hop, etc. Leader goes first!

Debrief by discussing whether methods of locomotion influence life-styles, diet, home sites, etc.

Materials: 1) Toothpicks, 100-500, dyed red, yellow, blue, green and brown with food coloring dye, 2) string, white, for temporary boundary markers, and 3) paper and pencil for tabulating experimental results.

Procedure: Select a terrain with a heavy, varied ground cover. Secretly broadcast equal numbers of colored toothpicks randomly over the site as far in advance of the game as is feasible. Allow players about two minutes to find as many toothpicks as they can. Tabulate results by both number and color to see what percentage of each color was found.

Alternative: Mark off a square yard of grassy terrain for each 6-8 players. Thrust equal numbers of each color of toothpicks into the ground until only the tip can be seen, with difficulty, down in the grass. On signal, players kneel on the perimeter of the plot, marked with string, and recover toothpicks as fast as possible for thirty seconds. Tabulate the results as above. Walk over each plot with heavy shoes on to force unrecovered toothpicks flush into the ground.

Debrief by discussing camouflage colors, visual acuity and color perception as it affects the lives of all animals. Discuss the probable results of using still different colors.

BLINDFOLD WALKS

Materials: 1) Blindfolds, 2) yardsticks, 3) 3-foot lengths of string.

Procedures: Select a reasonably varied terrain with only moderate undulations. Ramps and stairways are all right with proper precautions. Explain the method of daisy-chaining to be used—hands on shoulders, holding hands, etc. A very safe way is for each player to grasp the players on either side just above the elbow. This "splints" the chain so any off-balance player can be assisted by two other players instantly. Instruct the group not to talk. Blindfold all players. Lead the chain slowly through as much variation in terrain as time allows: sunlight and shadow, ground cover, sources of odors, sources of sound, etc. Silent pauses to listen are fruitful.

Alternative: Blindfold one player. Direct a sighted partner to lead him from the rendezvous point by a circuitous route designed to confuse his orientation, and then place him in contact with some reference object—a tree, stone, bush, log, etc.—in a safe environment. The sighted partner tells

him to explore his environment as thoroughly as possible with the blindfold in place for ten minutes. At that time the sighted partner returns to lead the player by still another circuitous route back to the rendezvous point. Challenge the player to locate the reference point used. Reverse roles.

Alternative: Blindfold one player. Direct a sighted partner to lead him about at the end of a yardstick, which transmits elevation, depression and lateral direction information that permits difficult terrain. Allow no voice clues except to avoid danger. Reverse roles.

Alternative: As above, but use a length of limp string to reduce directional clues and heighten the sense of isolation and dependence. Requires gentler terrain. Reverse roles.

Debrief by sharing and discussing sensory data accumulated, and individual reactions to the process. Arrange to have a person who is really blind talk to the pupils about adaptations to blindness.

SOUND SYMPHONY

Materials: 1) Pencil and paper for each player, and 2) a battery-powered tape recorder.

Procedure: Take 7-15 players to a predetermined quiet, secluded location. Establish absolute quiet in the group, then ask players to identify all the sounds they can hear in three minutes. Record lists of sounds heard at the end of the intense listening period. Share lists, discuss differences in audio-perception that are demonstrated, and consider the positive or negative effects of sounds heard in terms of the local environmental fabric.

Alternative: From the initial lists, above, players select or the leader assigns a sound each player will attempt to reproduce. Choose a "Symphony Director" who will try to balance and orchestrate the sound reproductions to produce the best effects. After a practice warm-up session or two, record the results and immediately play them back for critique. Two or three re-recordings will produce a "best effort" that will please everyone!

ENVIRONMENTAL ART

Materials: 1) 8" x 10" sketch paper, 2) drawing supplies at the discretion of the leader, from pencils on up.

Procedure: Dispense sketch paper. The leader goes to each player's position and makes a large random mark on the sketch paper. Then, each player is given fifteen minutes to identify a similarly shaped mark in the local environment and draw in the surrounding scene.

Debrief by sharing sketches, discussing the techniques and significance of close scrutiny of the surrounding environment, and the artistic harmony of environmental components.

Materials: 1) 8" x 10" rough-textured sketch paper.

Procedure: Direct players to look for something in an outdoor environment they would like to sketch. Instruct them to then find in nature the pigments they need. Some that work are

chlorophyll for green; bark, earth or rotted wood for brown; dandelion blooms for yellow; rust for reds, etc. Use discretion—don't endanger the integrity of the environment in the process of becoming aware of it!

Materials: 1) Construction paper in neutral to sky-blue shades, 2) glue similar to white casein glue or contact cement, 3) medium-size paper bags, 4) newsprint or similar table coverings, and 5) debris and litter collected on the site.

Procedure: Groupings of one to three people, at the leader's discretion, are issued a paper bag and directed to collect a pound or so of debris and litter indigenous to the site, of whatever kind. Paper, cans, bottle caps, dead wood, bark, grass—all are grist for this mill. When the collection is returned to the work area, empty it onto spread newspapers where each group can keep its collection separate from others. Dispense glue and construction paper, and direct players to produce a "work of art" by using their collection to create a composition glued to the construction paper base.

Debrief by conducting a judging of the results and a discussion of the environmental impact of the litter collected from the site. Discuss the biodegradability of the various kinds of trash.

ENVIRONMENTAL POETRY

Materials: 1) Pencil and paper, 2) pre-prepared poetry forms if desired.

Procedure: Write a cinquain poem. In the strict poetic sense, cinquain (pronounced san-kane) poems have five lines, with a set number of syllables per line: 2, 4, 6, 8, 2. For younger groups, "word cinquains" of 1, 2, 3, 4, 1 words per line are less taxing and still acceptably poetic. Form is not the primary objective; expression and feeling are! The directions are: Line one: Write one word naming what you want to write about. Line two: Write two words to describe what you are writing about. Line 3: Write three words about what your subject is doing. Line 4: Use four words to tell how you feel about your subject. Line 5: Write a word that means the same thing as the word on Line 1.

Alternative: Prepare a cinquain outline with the lines numbered and provided with the appropriate number of blanks to hold the words or syllables on that line. Print the directions below the outline. Give the players a prepared card when it is time for them to write.

Debrief by sharing poems and commenting on the feelings expressed. Explore other subjects to write about, and different ways to say the same things.

Materials: Pencil and paper.

Procedure: Write a Haiku poem. Haiku is a three line verse form which originated in thirteenth century Japan. Authentic Haiku in Japanese contains three lines and seventeen syllables: 5, 7, 5. English translations frequently do not follow this syllable pattern. Each poem includes the season, location and a reference to nature. The subject matter deals with simple, ordinary things. The words do not rhyme. There are few articles or pronouns—syllables serve the purpose better. The thought comes first, the syllables are adjusted to fit the form. It is recommended that beginners be provided with sheets having the form demonstrated by samples.

Sample Haiku:

Departing spring
Hesitates
In the late cherry blossoms
Buson

The old pond;
A frog jumps in,—
The sound of water.
Basho

Debrief from the exercise as with cinquain poetry. Suggest the value of mentally creating Haiku triplets to summarize thought patterns and clarify feelings and viewpoints.

Good sources of really effective, purposeful environmental games designed to heighten awareness and increase environmental sensitivity are difficult to locate. It is important to avoid references that merely reiterate the traditional content of outdoor education curricula or day camp programs or physical education manuals. The old adage is true: "You must teach for the effect you want." To achieve environmental awareness in pupils, one must make certain that their preoccupation with the mechanics or physical stress or dramatic impact of an activity does not foreclose the real objective. Two recent books are helpful in clarifying objectives and developing such activities: Steve Van Matre's "Acclimatization" (1972), and "Acclimatizing" (1974), both published by the American Camping Association, Bradford Woods, Martinsville, Indiana 461551.

The best experiences are those that can be provided in the pupil's usual habitat, where he "knows the ground," and spends most of his time. There is no doubt about the value of the once-a-year school camp experience that transports him to a new, distant environment, but without systematic attention to refinement of the concepts and skills in the context of his normal work-a-day world, it will seldom have a significant residual effect.

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ENVIRONMENTAL QUICKIE

A PUBLIC SERVICE PROJECT

from the

Pacific Northwest Region, National Park Service

523 - 4th & Pike Building, Seattle, Washington 98101

THE NATIONAL PARK SERVICE **NEED** PROGRAM

The NEED Program is a system of environmental education developed by the National Park Service. Glenn L. Hinsdale, former teacher and school administrator, is now an environmental education specialist with the Pacific Northwest Regional Office of the National Park Service. He developed this application of the NEED Program for educators and Park Rangers.

Three Semi-hypothetical Teachers—a Legend

Principal Jim John considered himself an Advanced Thinker, because he often worried about things that seemed obscure to others. His staff often wondered, "What will he think of next?"

Sometimes Jim had truly original ideas. Frequently, they were just new to Parkston Elementary School, and it was not unusual for some incident to cause Jim to re-think old ideas, like the one about the floating study hall. Jim also had many ideas keyed to events on the school calendar or the seasons of the year, like the first PTA meeting of the fall, or the need for expelling Bobby Kiltflatcher again. And that is what this story is really about—one of those ideas that seemed to be triggered by the Spring Equinox!

Because Jim believed that children should be allowed to learn in many different ways, in many different places, he was reminded every spring when he saw water striders on the pond and anemones blooming in old Mrs. Johnson's yard, to go down to the Elementary Wing and knock on doors.

Elsie was an attractively blond, petite fourth grade teacher whose room was the first one in the Wing. Everyone who met Elsie remarked about her great, transparent, deep blue eyes. But, in their depths there always lurked a faint, shadowy premonition of trouble. Sometimes her friends affectionately called her Miss Diffident, just to tease her!

When the door was opened and Elsie saw Mr. John, her beautiful eyes clouded up at once. A visit from the Principal always did that. With a great deal of deferential body language and much smiling, Jim began,

"Elsie, it is spring! Just look out the window at all that green grass! Do you hear the robins singing? The whole world is bursting with new life. This is an Important Event that should be treated as an Educational Opportunity!

"It would please me very much if you could find time in your busy schedule—sometime in the next ten days—to take your children out among the wonders of spring and make specific note of some of the remarkable things that are taking place. Just lead them through our back campus, if you wish, or take them to Prentiss Park, or maybe down to the River, below the bend. I don't care where—I just want to make our children *aware* of their community environment.

"Help them know and enjoy the natural things in it, and try to develop in them a sense of healthy respect for the delicate things that are going on in such an exciting way! Make them happy and pleased about the beauty there is to see and understand."

But, by the time Jim finished, Elsie's head was shaking in gentle agitation from side to side and, as his voice trailed off, she lifted delicate fingers on which to keep score as she replied,

"Mr. John! When I was in college *I* didn't take any biology! *I* didn't take any botany, or even any earth science. I don't know the *names* of things out there. Why, it wouldn't . . . I can't . . . Why should it . . . Oh, . . ."

And as Jim drifted toward the door in embarrassed retreat from her beautiful, brimming eyes and tremulous voice, Elsie administered the Final Argument,

"What's more, Mr. John, when I was in school getting my credentials to teach, *no*body ever told me I would *have* to do that!"

The next door in the Wing opened into a roomful of fifth graders with Ms. Susy. Susy has been on the staff nearly ten years — a short, stocky brunette with dark-brown shoe-button eyes with no visible pupils. Jim had never been able to look into them and see if Susy was really there! But Susy had seen the spring's effect on Principal John before. She fixed him with a level stare and waited:

"Susy, look out the window. It is spring! The whole world is bursting with new life. This is an Important Event that should be treated as an Educational Opportunity. It would please me very much if you would . . !"

"No."

"What?"

"No. I know what you want. I'm three weeks behind in the syllabus right now, thanks to all the *other* things that keep children out of school! There isn't time. Excuse me."

"But, Ms. Susy . . !"

Susy already wasn't listening. She turned away and shuffled some papers to let Mr. John know he had been dismissed. She already knew what she was going to do for the next ten days—the same way she did last year!

Now, Mary had been added to the staff in November, to take the sixth grade when Mrs. Pettigrew's pregnancy began to unsettle the Board Members. Actually, Mary only finished her degree during the holidays, by special dispensation from Westly State Teachers College. She was young, vivacious, eager, and loved every child in class. She was delighted to see Jim, and said so, rattling on excitedly. Jim broke in,

"Mary, it is spring. Just look out the window at all that green grass! Do you hear the robins singing? The whole world is bursting with new life. This is an Important Event that should be treated as an Educational Opportunity! It would please me very much if you would find time in your busy schedule—soon—to take your children out among the wonders of spring and . . !"

"Oh, yes!"

"I beg your pardon?"

"That's just wonderful! I *understand*, and I can do it *Friday*! Oh, that will be so much fun! Thank you!"

And she did. Friday morning the school bus was parked right behind Mary's room—tank full, driver at the wheel, motor running. There was a big box on the back seat to hold the sack lunches. As soon as she called the role, Mary put her class on the bus and they drove a hundred and seventy-five miles that day—looking at all the beautiful spring things through the school bus windows instead of through the classroom windows!

Why did Jim get two flat refusals and one end-run from three professional teachers for making what seemed to him such a simple, straight-forward request?

The sacred ox that gored these poor unfortunates was, of course, the Linnaean system of classification. At every turn in the educational maze all three had been conditioned to the conviction that only those favored few science specialists who know Latin names and have the taxonomy for everything in nature are competent to talk about grass and trees and water and flowers and fauna. By the time they had earned certification to teach they knew *they* were not going into any hostile outdoor environment to expose their ignorance. That could only result in painful loss of face!

But, we are ahead of the story: It was 10:00 A.M. when Jim finished talking with Mary that day. At 10:30 A.M. Susy, Mary and Elsie had a coffee break together. In the women's lounge they compared notes.

"What did he say to you?" asked Susy as she arched an eyebrow. Mary told her.

"Well, he only said part of it to *me*," Susy snapped.

"Oh," wailed Elsie, "He said *all* of it to me! What are we going to do?"

"Follow me," said Susy.

Together the three marched up the stairs and through Mr. John's outer office. Jim rose to greet them, focused on Susy's wagging finger:

"We want to talk."

"All right."

"Now look, Mr. John," said Susy, using her heavy-firm voice, "if you want all those outdoor things to happen, you should go get Sam! *He* teaches the science in this school. *He* knows the names of all those things out there, and he should do it! He can have my class any time."

There was much more. Eventually, in knowing resignation, Jim agreed to talk to Sam. On Thursday he went to what the elementary kids called "The High School Part," and took Sam's biology class. Sam took the fifth grade to the back campus for Outdoor Education. Susy got a cup of coffee and started grading papers.

A thoroughly disgruntled Sam, separated from his stronghold among the lab tables and formaldehyde fumes—no apparatus to manipulate—stood behind the school surrounded by the hot, squirmy hyper-activity of the whole fifth grade. He had *never* tolerated kids that age! Sam was a bachelor. Looking about, he spotted a likely-looking tree and a specially scruffy pupil. He grabbed a handful of the latter.

"Come over here, Kid," he said, dragging him through the class. "Do you see that old tree?"

"Yes," Kid admitted.

"*That* is a Douglas-fir—don't you ever forget it!"

"Yes, Sir!"

So it went.

On Monday Elsie, Mary and Susy were lingering over a cafeteria lunch when Jim ambled over.

"Susy, how did it go last Thursday with Sam and your people?"

Susy studied a fingernail.

"Sam won't speak to me. The children made a list of the things Sam identified, but they forget which is which. Sam went too fast. You should have heard what Bobby Kiltflatcher said! That kid!"

"I did."

"Oh-Boy!"

"Yeah! He told me he wished that tree could fall on Sam! Of course, Bobby forgot the name of it in about fifty-five seconds! What is worse, the next time he hears "Douglas-fir," the name will have an emotional charge on it that will firmly block it from assimilation. By the time Bobby finishes Teachers College and gets his own certificate, he too will be convinced that he is incompetent to handle natural science or environmental education, or even go outside with his class. The risks are too great!

"You see, I happen to believe if Bobby was permitted to meet a Douglas-fir on his own terms, his learning techniques would be much different: He would, first of all, establish physical contact and use his sensory equipment to learn about it. He would smell the tree. Almost certainly he would break off a bit to taste. He would probably chew a dead needle from the duff, and burrow in and roll about on the sweet-smelling earth. He would cling to the bark with his hands and lean 'way back—while he stared up the tree trunk into the crown, listening to the breeze and maybe finding a bird in the branches. He would throw some 'pine cones' about—preferably at another kid—but, those distinctive little papery bracts would be discovered, and also some of the seeds. Bobby may wander away and apparently forget, but he will return periodically to repeat some of his experiments, do some new ones, and re-think Old Tree. Thus, Old Tree acquires an identity with Bobby that is pleasant and personal and sensory. Because Bobby now understands the tree and likes it, Old Tree's real name becomes a matter of much more importance. Bobby does not forget the names of his friends, or remember those of strangers. A good teacher can really help with this process, but not by inverting it, or suppressing it!

"Don't you see? Bobby is just doing what comes naturally, in the best sense of the term. Each species on Spaceship Earth is endowed with a genetic inheritance that determines its specific behavioral mechanisms. Bobby arrived endowed with a set of sensory perception apparatus. He started solving problems with those tools on his first day! So, faced with a new stimulus, he does

what he has always done—he conducts a sensory investigation to determine its *similarities* with past experiences, and its *differences*. With that data he searches for a *pattern* that will categorize the stimulus and allow him to make extrapolations—educated guesses—about its significance. On this basis he decides how to react to it, or *interact* with it, and then he learns what *interdependencies* may be involved. Bobby is tirelessly interested in stimuli, and in his own reactions to them, because he has a genetically induced need to acquire the *continuities* that give his life security, direction and a sense of permanence. This need makes him increasingly aware of, and somewhat negative to, most *change*. However, he has an ingenious talent, when properly motivated, for capitalizing on changes in ways that convert them into additional continuities. Another word for this talent is *adaptation*. Obviously, the quality of Bobby's whole life is a function of his adaptive skills, because continuous change is the nature of the universe.

"As he matures, he will acquire better and better orientation in time—a sense of place and history—and realize that the distant past is not at all like the present, nor does the present much resemble whatever the distant future may hold. *Evolution* is only the long-range, incremental adaptation of life forms to an ever-changing world. Probably, evolution will acquire dramatic impact for Bobby only when he scrutinizes the evidence in a compressed time-frame that seems to ignore the accretionary ages actually separating the significant artifacts.

"I wish we could somehow be of more help to Bobby in understanding these underpinnings of his life!

"Hey! I'm overdue somewhere else. See ya!"

Susy leaned back in her chair and stretched, then shook her head at Elsie with a tight little smile.

"I wonder," she said, "what will he think of next!"

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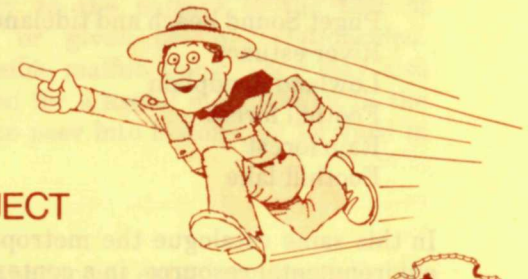

A PUBLIC SERVICE PROJECT

from the

Pacific Northwest Region, National Park Service

601 - 4th & Pike Building, Seattle, Washington 98101

THE NATIONAL PARK SERVICE **NEED** PROGRAM On the Interpretation of Nature

The NEED Program is a system of environmental education developed by the National Park Service. Glenn L. Hinsdale, former teacher and school administrator, is now an Environmental Education Specialist with the Pacific Northwest Regional Office of the National Park Service. He has developed this application of the NEED Program for educators and Park Rangers.

THE CONTEXT

The National Park Service National Environmental Educational Development (NEED) Program concepts provide a philosophy and educational thrust designed to help teach from traditional environmental education subject matter — indeed from all curriculum content — values that do effectively alter awareness, change life-styles and develop a unifying environmental ethic. By relating discrete information or 'lessons' directly to the broad underlying principles, this can be done. These principles, called STRANDS, are the framework for the NEED Program. They describe the way man thinks and learns — in terms of *similarities* and *differences, patterns, interaction* and *interdependence, continuity* and *change,* and *adaptation* and *evolution.*

THE PROBLEM

The problem is, that in confrontation with the overwhelming variety in our environment, it is not often easy to choose a manageable sample, or to develop for it an interpretive treatment that realizes the hope of achieving a lasting influence upon the visitor or student.

In *Encounter with the Northwest Environment,* the Washington State Department of Education has identified seventeen 'environmental types' of distinctly different natural components of Washington State:

Ocean beach and tidelands	River floodway
Sound waters	Mountain forest
Puget Sound beach and tidelands	Subalpine meadow
River estuary	Alpine meadow
Lowland floodplain	East Cascades forest
Foothill forest	Grasslands
Rain forest	Desert scrub
Foothill lake	Desert lake
	Ocean waters

In this same catalogue the metropolitan Seattle complex is also interpreted, as a special urban environmental resource, in a context that could easily be adapted to many other cities. This brief environmental-types survey illustrates the complexities that a teacher-interpreter in the Northwest faces in selecting the subject matter content of a given lesson or public presentation.

The objective should be to produce a more effective level of awareness of environmental resources, and to provide basic insights about them that will result in changed behavior and fuller appreciation — to make a lasting contribution to a personal environmental ethic!

THE PROCESS

A child arrives in this world ready to learn. As with all species, his methods are determined by his genes: they determine the tools he brings to the task, and the environmental niche he occupies. From the first, he finds out whatever he learns by applying the only tools he has — his sensory equipment. Through experience with these tools, each child soon 'invents,' or discovers for himself, the species system of learning techniques. In addition to the usual survival mechanisms of mammals, man possesses unique capabilities for learning to manipulate abstractions, for extending his sensory capabilities through technology, and for concerning himself with altruistic, metaphysical and spiritual concepts. However, we should not be surprised that whenever he is confronted with a challenging new situation — set of stimuli — on any level of complexity, he re-applies the same basic mechanisms with which he has always coped. Long practice greatly improves his efficiency, but it does not change his inherent mechanisms. The STRANDS concepts provide a basic, integrating definition of this learning system.

SIMILARITIES AND DIFFERENCES

With whatever degree of skill former experiences have afforded him, man reacts to new stimuli by first searching them for evidence of *similarities* to past experiences. It is in the nature of things that he usually finds some: there is not really all that much new under the sun! To the extent that similarities can be discovered, the impact of the new challenge is reduced and the problem elements in it are more clearly identified. They become the *differences* that require creative attention and, perhaps, innovative treatment.

This is of the first order of significance to those whose task is to move the audience from a posture of wary confrontation with the unknown to a position of confident understanding and mutualism: Establish first the similarities that inevitably exist between the present subject matter and previous experiences the audience has had! A hallmark of the skilled practitioner is the unobtrusive efficiency and pleasant dispatch with which he extracts information from his audience about their present state of knowledge, then leads them in a discovery of 'new' similarities that become the point of departure for his presentation. Evaluation by cataloguing similarities and differences can be a rewarding approach to the treatment of unfamiliar subject matter, and that treatment may sometimes comprise the entire presentation or 'lesson.'

PATTERNS

In any process of evaluation and judgment, most of the information digested assumes a firm relationship with past experiences. This information, synthesized in the memory with previous accessions, represents a refinement of the similarities-differences process: The essential content of those catalogues becomes condensed into systems of mental images, or *patterns*. These conceptual patterns, or templates, are the over-learned — permanently memorized — attributes of the

people, objects or concepts one needs most often to manipulate and respond to efficiently, without the delays of conscious-level research and re-evaulation. They are the sharp, permanent mental images that allow the instantaneous processing of large amounts of superficially diverse stimuli, and the detection of identities and relationships. Conformity to the pattern is the test of authenticity for any specific object, stage in a process, or given set of relationships. Non-conformities may be cause for alarm and attention to possible malfunctions. They may also indicate new areas for investigation, and thus merely the need for a useful modification in the pattern. Well-tested patterns may be extrapolated backward to peer into history, or forward in prediction of future events!

INTERACTION AND INTERDEPENDENCE

There is no such thing as a side effect! Interactions and interdependencies exist in an inextricable, web-like complexity that ties together every creature and all the inanimate parts of the world — at all times, forever. Mankind consistently under-estimates this fundamental truth! Though he errs far more through naivete than through premeditation, his dissonance with spaceship Earth is no less raucous or inevitably terminal. In the zestful exercise of his uniquely beautiful and awesomely powerful cerebrations, he is too often the world's most gross parasite. It behooves him, then, to fine-tune his perceptions to the unseen, unheard, inescapable web of consequences that vibrates to his slightest twitch! On such sensitivity to his own power, and to his concomitant responsibilities, hangs the future of the species — perhaps of the planet!

It is in this difficult ecological mystery-land of interactions and interdependencies that the best products of our physical, biological and social scientists are so urgently required. Yet, in their translation into the vernacular, they are often lost in the pedagogical mires of taxonomy, preoccupation with the remarkable mechanics of isolated sub-systems, or stuffy exhaltations of the "discipline." Pedagogy, mechanics and the scientific method must certainly be preserved; it is just that the product must say something definitive about human interactions and interdependencies, and the alternative consequences of available courses of action! We must strive for all the pure and applied research possible, but that is not enough: The teacher-interpreter must build a carefully correct, intellecutally convincing rationale that will intrigue the visitor or student into personal acceptance and changed behavior. It is the quality of individual interaction and interdependence that ultimately determines the environment of Spaceship Earth.

CONTINUITY AND CHANGE

Each individual has his own motivational base for his life's objectives. This base consists of a unique set of personal values and convictions that describe his personality; they are his "eternal verities" — firm convictions about good, bad, home, God, mother, religion, politics, apple pie, philosophy, etc. These personal values are as varied as life itself, but they do have a common denominator: They must all contribute to the *continuity* of life! Man is acquisitive by nature. By far the greatest portion of his life energy is spent on the acquisition and maintenance of his continuities. Some, held too tightly for too long, become obsolescences that eventually may seriously reduce the quality of his interactions and interdependencies.

Too much *change* is dangerous! Even as obsolescence interferes with competency at one end of the continuum between complete obsolescence and total chaos, so too much change at the other can bring about personality disintegration, result in the failure of economic, philosophical and political systems, and cause wars. These degrees of change also represent serious threats to the natural environment. For each of us there is a personal fulcrum somewhere on this continuum between obsolescence and chaos. It is delicately balanced and daily maintained at the point of maximum personal comfort. Man's degree of tolerance for change is variable, as is his essential portion of continuity on a given day!

In fact, the only continuities in the world are the stable, often very slow rates of change. In terms of the life-span of man, however, these nearly imperceptible changes do not interfere seriously with his concepts of continuity, even while he is fully aware that all things do change over geologic time. Thus, the great mountains, seas, prairies and forests of the world become the touchstones of a sense of permanence and reorientation that has great value to mankind.

The interpreter can provide important service through the skillful development of insights into these ideas. Most of the healing qualities of a wilderness experience — the renewal of physical energy, the regeneration of mental vitality, and the general aura of well-being that comes from a sensitive communion with the delights of nature — are born of man's phychological needs for continuity. Continuity and permanence may be found not only in the great, granite inscrutability of a mountain, but also in the cyclic nature of many natural mechanisms that, to the untrained observer, appear to be events of totally unpredictable change. Change itself can thus be translated into a satisfactory sort of continuity simply because it can be shown to be repetitive, and therefore predictable.

Often it is through man's unknowing spoilage of nature's cyclic systems that the most devastating destructions and irreversible changes are unleashed. At least as important to interpretation are the reassurances that man *can* learn to better manage both the maintenance of wise continuities and the rate and quality of change!

ADAPTATION AND EVOLUTION

The relentless changes that are the nature of the universe in general, and of Spaceship Earth in particular, demand essential compensating adjustments in all her life-forms: When the basaltic holocausts that buried and sterilized southern Idaho — and much more — cooled, life-forms began immediately encroaching upon the pristine lavas. Now one can find there grasshoppers that are almost black, and chipmunks more dull than their bright counter-parts living to the north, which was also, longer in the past, raw black cinders and pavement-like lavas. Now these hills are green again, carpeted with the persistent grass. And here the self-same grasshopper whose dark counter-part lives in the black southern lowlands is once more green and artfully obscure from the prying eyes of his predators. Whether evident or obscure, *adaptation* is always cumulative, accretionary change!

When mountains rise to heights above the climatic tolerance of a species, or seas divide the habitual range, populations thus isolated sometimes represent gene pools that will eventually be specialized beyond the ability to mingle sexually with other trees or bison or bugs. These instances of isolated adaptation over long time-spans result in physical changes and different chemistries that are best described as evolutionary. Often such species become so specialized that when, inevitably, the world has turned a few hundred or thousand times around the sun, their environment has changed too much and they become extinct. But, in more successful *evolution* and kinder chance, perhaps, other life-forms take their place and life continues.

THE IMPORT

Environmental interpretation is a primary tool for developing an understanding of man's natural heritage in a manner that contributes more directly to his basic needs and to the development of lasting changes in his personal ethics. While we have here addressed some considerations in dealing with "nature" as an entity, there is nothing inherent in the STRANDS concepts that limits them to this context; they are universally applicable to all of the problems and preoccupations of mankind!

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601 - 4th & Pike Building, Seattle, Washington 98101

THE NATIONAL PARK SERVICE **NEED** PROGRAM

The NEED Program is a system of environmental education developed by the National Park Service. Glenn L. Hinsdale, former teacher and school administrator, is now an Environmental Education Specialist with the Pacific Northwest Regional Office of the National Park Service. He developed this resume of the NEED Program for educators and Park Rangers.

THE CONTEXT AND RATIONALE

After the neglects of World War II, it took ten years to rehabilitate the visitor facilities and interpretive programs of the National Park Service. In that same time, visitation to the national parks increased at more than twice the expected rate. These unprecedented visitor densities brought intense levels of nonconforming uses that threatened irreparable damage to some of the nation's finest parks. Thus, in the early growth of a sweeping national concern about environmental quality, the National Park Service found itself at the forefront. This National Park Service concern was later developed as a commitment with the Department of Health Education and Welfare to develope educational programs bearing directly on problems of environmental quality and ecological integrity. It was apparent that the development of such model national programs required the professional skills of highly qualified educators. A curriculum specialist from one of the nation's largest universities was selected as the prime contractor. Presented below are the concepts which his task force and National Park Service specialists formulated, developed and refined into the basic rationale of a new, universal approach to environmental education. The STRANDS are the framework of the National Environmental Education Development Program — NEED. The specific human behavioral interpretation here applied to these STRANDS was developed in the Pacific Northwest Regional Office of the National Park Service. It is routinely used in the conduct of workshops for National Park Service personnel and professional educators.

THE CONCEPTS

SIMILARITIES AND DIFFERENCES

Man acquired citizenship on Spaceship Earth by being born. No one remembers being born, and when people are old enough to consider birth in the abstract they have already learned that birth is normally well safeguarded. It occurs in the presence of instinctive parental behaviors. It is usually surrounded by a highly refined technology, a skilled medical staff, and an environment that insures an impressively high survival ratio. However, the event is entirely different for a child experiencing the trauma of birth. He has no assurances, no intellectual insights — no understandings that there are helpers and good technology at hand. He has just been summarily ejected from an environment he considered perfect! He is cold and exposed and threatened and outraged. Instinctively, he wants to survive. To that end he bends every quivering ganglion in his small, intense body.

Of the many incredibly swift, complex learning activities that occur in the first moments and hours of independent life, few yield to simple observation or casual description. Of those that do, the child's unerring, total and absolute identification of his mother is among the most interesting. With only his sensory equipment — and that not fully functional — he imprints himself with her most personal physical and psychological components; there is never a serious question in his mind about her identity. This is often accomplished in an environment saturated with females, yet the infant quickly learns that while they are all quite similar to mother, they are also different, and for most purposes not interchangeable with her.

Yet, these other females are useful, and the child learns ways to communicate his needs to them. Father, in apposition to fatherlike figures, is also soon identified. The principle is simultaneously extended to the inanimate world. As perception increases, cascades of stimuli from every source are avidly processed — processed on arrival into two piles: a catalogue of *similarities* and a catalogue of *differences*. On this basis — comparison and differentiation — he copes with and learns to manipulate his environment effectively.

PATTERNS

To be accosted by a strange toddler and accused of being his 'Mommy' or 'Daddy' is startling and often embarassing. Still, it is a common occurence. Why does a child who can usually quickly sort his real parents from a large sampling make so obvious a mistake?

By the time a child has reached the age of nine to eighteen months, he has experienced many stimuli. He is encountering many new ones to which he wishes to make immediate response — as in greeting a parent. Confronted with an individual who bears a strong parental resemblance, he feels uncertain, but sorting through his now-cumbersome catalogues of similarities and differences for positive identification is tedious. The child is frustrated by the process and bored with the time it takes. As older children do in thousands of classrooms every day when process fails and boredom prevails, he guesses! Wrong guesses, however, bring negative, unpleasant responses. The negative results of too much guessing begins to force changes in the system that until now has served so well. Thus, of necessity, he invents the concept of *patterns*. Patterns dramatically condense the content of similarity-difference catalogues. A pattern is a template — a predigested, permanently memorized set of information that serves as a model, or stereotype, against which new stimuli can be tested. Now, when a parent prospect appears, he can be tested against a mental template synthesized from all the overlearned attributes of the parental pattern. If there is some point at which the prospect does not conform to the template — voice, eye color, size, etc. — that attribute is immediately obvious as a non-fit. Judgment can quickly be made without reference to an inventory of parts, because the child's creative attention and judgment are now focused only on that small, nonconforming fraction of the total stimuli radiated by the event. Later, this technique will allow routine handling of complete episodes — even whole days — because they conform to elaborate templates perfected through long use. Patterns accelerate process and save much energy, but they can be allowed to rule and limit lives too much.

INTERACTION AND INTERDEPENDENCE

High voltage tension instantly grips the delivery room if, at the moment of birth, a new child does not react vigorously to the trauma of that experience. He is immediately recognized as a deviate and becomes the focal point of great anxiety and concern. Instinctively, we know he requires special handling if he is to survive. There are calls for resuscitative equipment and special procedures.

All life forms interact with and are dependent upon their environments. From the moment of conception a child is captive to the principles of *interaction* and *interdependence*. If a life is to be successful it must be the product of constant improvement in the quality and the scope of the interactions and interdependencies which shape it. Each individual must learn to manage his relationships with Spaceship Earth and its other residents. This is the whole business of education!

CONTINUITY AND CHANGE

In beginning psychology freshmen learn that man's basic needs are food, shelter, love, security, procreation, etc. The lists vary slightly with the texts and the instructors. While many spend lifetimes in the pursuit of these primitive goals, for most there is some time for sublimated levels of concern. Creative fulfillment, professional competency, self-indulgence, public service — the list is endless. Everyone has his own unique motivational base for selection and pursuit of these secondary goals, but they do have a common denominator: They must all contribute to the *continuity* of life! Continuity is provided by the eternal verities. Continuity is the sun rising and setting reliably each day. It is firm concepts of good, bad, home, God, mother, apple pie, philosophy, religion, politics, etc. Continuities are absolutely essential for mental, emotional and physical stability. Man is acquisitive by nature; by far the greatest portion of his total life energy is spent on the acquisition and maintenance of continuities. Some, held too tightly for too long, become obsolescences which may eventually seriously reduce the quality of his interactions and interdependencies!

Preoccupation with the maintenance of cherished continuities underscores man's prevalent insecurity in the face of *change*. Changes threaten continuities! Change demands energy, and man does not lightly yield his life energy. At least on the subliminal, reactive levels, change is bad by simple, universal definition. Much time is spent in mutual reassurances that change can be good — even actively desired. In truth, it is always suspect and is accepted reluctantly unless the benefits are real, immediate, and fully compensating.

Too much change *is* dangerous! Even as obsolescence interferes with competency at one end of the continuum, so an unacceptable rate of change at the other brings about aberrant behaviors that may result in personality disintegration. More broadly, change can result in the failure of economic, philosophical and political systems and cause wars. For each of us there is a personal fulcrum somewhere on his continuum between total obsolescence and total chaos. It is delicately balanced and daily maintained at the point of maximum personal comfort. Man's degree of tolerance for change is variable, as is his essential degree of continuity on a given day. Instruction in the mechanics of the process of acquiring and maintaining this equilibrium enhances personal stability and facilitates its maintenance. Only when this facility has been individually achieved is one equipped to contribute intelligently and creatively to the placement and maintenance of the collective fulcrum of his society!

ADAPTATION AND EVOLUTION

Science fiction has often presented the hypothesis of time travel. Unexpected instantaneous transport through a significant time span would certainly result in a nonfunctional individual. Confused, frightened and not able to comprehend his new environmental relationships, he would wish most desperately to be back in an old familiar context again. Yet, ten years ago, all mankind was as unprepared as that for what is transpiring in the world today. Instead of time travel, however, people have lived the intervening years, making small daily incremental changes in behavior that compensated for small daily changes in their environment. Most of these behavioral changes were too small to notice, but they continuously allowed retention of orientation and permitted subtle shifts in response to new stimuli — through the process of shedding a few obsolescences and picking up a few new skills. In sum, *adaptation* has occurred. Mankind is still coping, but nothing remains unchanged!

In the early Eocene days of mammalian life, there was among the grasses of some pre-continent a fox-sized animal scurrying about on tippy-toes, avoiding predators, finding food, and coping with the climate. So dedicated was his effort that millions of years went by, as did impressive but unnoticed changes in predation patterns, food supplies and climate. And still Tippy-toes survived.

In the last flicker of an instant of the age of mammals, when humans came on the scene, some of the more clever ones found skeletons of Tippy-toes and, in moments of insight, saw patterns emerge: Except for the vast difference in size, Eohippus fits the template of the modern horse! However, with the success of Eohippus' adaptations to eons of changing environments came the loss of virtually all traces of his personality and physical identity. Only the experts could trace his history.

Is it possible that some future sequence of events might permit a modern Percheron to experience the history of Eohippus in reverse — to one day become a nervous, fox-sized animal scurrying timidly through the grasses of some future continent? Most people intuitively reject that thesis. History is not reversible. For the great degree of adaptation that Eohippus has accomplished, and for that attained by thousands of other ancient species, the concept of *evolution* is useful.

THE IMPORT

Thus, a hierarchy of learning processes has been defined. Any teaching-learning experience will be more effective if what is taught is taught in harmony with the child's early self-developed systems of coping — the STRANDS concepts. Subject matter then has a much higher potential for becoming permanently embedded in the student's value system, because he is more effectively oriented to its significance.

In professional education it is appropriate and effective to select one or more of the STRANDS concepts as specific teaching objectives for each lesson plan, unit of work, or semester curriculum. The STRANDS concepts can be used to teach any subject matter. In the National Park Service environmental interpretation has been made more effective, lucid and palatable through the thematic use of the STRANDS.

People *do* think and learn in the context of similarities and differences; patterns; interactions and interdependencies; continuity and change; adaptation and evolution. Nothing in the experience of man fails of inclusion in one or more of these concepts. Because they describe and constitute man's inherent learning mechanisms from the moment of birth, better education (interpretation) results when the process does not do violence to the hierarchy — whether by suppression of sensory investigations, artificially contrived interactions, confusion of patterns, or other unintentional tamperings. Rather, the concepts should be reinforced through conscious-level definition and practice until each becomes a working tool, bringing harmony, efficiency and awareness to the selection of life-styles and continuity systems. Individuals thus educated will contribute with creativity and precision to the placement and maintenance of the collective fulcrum of their society. They will possess and exercise their full portion of an effective national environmental ethic!

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For more information about the NEED Program and associated services for schools and other agencies, write to:

Regional Director
Pacific Northwest Region
National Park Service
601 Fourth and Pike Building
Seattle, Washington 98101

Division of Interpretation
National Park Service
Director
Department of Interior
Washington, D.C. 20240

GPO 995-888

ENVIRONMENTAL QUICKIE

A PUBLIC SERVICE PROJECT

from the

Pacific Northwest Region, National Park Service

601 - 4th & Pike Building, Seattle, Washington 98101

THE NATIONAL PARK SERVICE NEED PROGRAM IN THE PACIFIC NORTHWEST REGION

The National Environmental Education Development (NEED) Program is a system of environmental education developed by the National Park Service. Glenn L. Hinsdale, former teacher and school administrator, is now an Environmental Education Specialist with the Pacific Northwest Region of the National Park Service. He has developed a human behavioral interpretation of the NEED Program's STRANDS for use by professional educators and National Park Service Rangers.

A functional environmental ethic is lacking in many segments of the world's cultures because the attainment of such an ethic has not become a matter of national educational concern. The idea does not yet command the funding or professional quality of instruction provided for other major educational necessities in most curricula. The NEED Program is based on the assumption that an effective national environmental ethic can be attained whenever the need for one has become strong enough to produce these conditions.

The five basic concepts of the NEED Program make it possible to attain such an ethic without deleting from, or adding specific subject matter to, existing curricula. Quite simply, NEED concepts change the presentation of traditional subject matter in such a way that a consideration of environmental ethics is developed as an integral part of the teaching process.

In this framework "outdoor education" becomes merely an extension of the teaching-learning procedures commonly used in the pursuit of other knowledge. A nontaxonomic approach to the natural sciences removes most of the cultural inhibitions and disciplinary inadequacies that many elementary teachers fear when faced with a more traditional format. Taxonomic considerations are treated with all due respect, but later in the development of a rapport between the student, teacher, and resource.

Materials developed for the program under the auspices of the National Park Foundation include a kindergarten through grade six series of books. There is a teacher's manual, classroom book, and outdoor book for each grade level. Those for grades three, four, five, and six are now available. Those for kindergarten and grades one, two, seven, and eight will be published in 1975. However, the materials for the two upper grades will be in an audiovisual

format rather than in book form. All are published by the Silver Burdett Publishing Company, 250 James Street, Morristown, New Jersey 07960. The National Park Service does not realize any monetary or other discrete benefit from the sale of these materials.

Within the Pacific Northwest Region, National Park Service personnel routinely provide workshops designed to interpret these materials to professional educators, student teachers, resource managers and interpreters, and a variety of organized youth program directors and their counsellors. The workshops demonstrate techniques and applications and emphasize that NEED Program materials are not subject matter in the usual sense, but rather present a *process* to be used in the teaching of all subject matter.

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Inquiries should be directed to the Regional Director, Pacific Northwest Region, National Park Service, 601 Fourth and Pike Building, Seattle, Washington 98101.

GPO 995-886

ENVIRONMENTAL UICKIE

A PUBLIC SERVICE PROJECT

from the

Pacific Northwest Region, National Park Service
523 - 4th & Pike Building, Seattle, Washington 98101

THE ENVIRONMENTAL STRANDS

The National Environmental Education Development (NEED) Program approach to environmental awareness is through thematic strands, or major concepts, that apply to everything in nature and tie large notions about the universe in packages that can be easily recognized. Unlike specific taxonomic phraseology, the NEED strands apply to all environments—the viewer may apply these strands to any object in the environment.

THE CONCEPTS

SIMILARITIES AND DIFFERENCES: Insights concerning function, size, structure, degree of novelty, etc., that enable man to quickly process large volumes of seemingly diverse stimuli into useful understandings and responses.

PATTERNS: Recognition of identities, rhythms, cycles, recurrences or systems useful as templates on which to test new stimuli. One can then efficiently concentrate on evaluation of only the new factors encountered.

INTERACTION AND INTERDEPENDENCE: Realization that Spaceship Earth is a closed system in which there are no "side effects." Every unit of matter and energy has eternal ties to all creation. Man will always be the product of the skills he develops in handling his interactions and interdependencies.

CONTINUITY AND CHANGE: A sense of place and purpose described by the location of one's personal fulcrum along the continuum between stagnation and total chaos. Continuities are essential to man's systems and to his sanity; change is essential to his pertinence and vigor. On man's placement of his personal fulcrum, and society's collective one, the future depends.

ADAPTATION AND EVOLUTION: The ability to cope with changes inherent in the evolution of Spaceship Earth. This ability is a function of reasoned flexibility and good stewardship of the environment, lest the nature and extent of change exceed our resilience.

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For further information about the NEED Program, write to the Regional Director, Pacific Northwest Region, National Park Service, Seattle, Washington 98101.

☆ GPO 698-891

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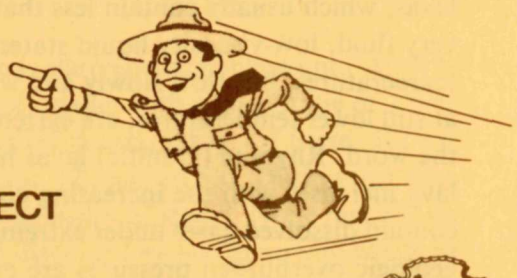

A PUBLIC SERVICE PROJECT
from the
Pacific Northwest Region, National Park Service
601 - 4th & Pike Building, Seattle, Washington 98101

INCIDENT AT
Mount St. Helens

Glenn L. Hinsdale

The cataclysm that was the May 18, 1980 eruption of Mt. St. Helens stunned the imagination and overloaded the systems placed to monitor the event. Its magnitude so far exceeded expectations that not even a tentative sequence of eruption events could be established. Scientists spoke with great reluctance for want of data. News was necessarily constructed of fragmentary, often hysterical accounts from too close to ground zero, too soon. Still now, curiosity about the geologic events defers to urgent preoccupation with first-aid measures for the public safety, and the social and economic crises the eruptions precipitated. A scholarly, definitive description may be many months, even years away.

This report was motivated by a recognized need for reliable information about the eruption for use in National Park Service areas in the Pacific Northwest. It was assembled after weeks of gleaning the public media, technical reports, and professional sources for direct quotes from scientists and experts, for actual computations and measurements, analyses and reasonable deductions. Each statement is based on at least one specific documented reference. Most are corroborated several fold. Understandably, all the data is tentative, and subject to refinement. It is the best available at this writing.

Mt. St. Helens was named in 1792 by British explorer Captain George Vancouver, after the then English ambassador to Spain, Alleyne Fitzherbert Baron St. Helens. About 40,000 years old, Mt. St. Helens is the youngest and most active member of the Cascades series — the volcanoes stretching between Mt. Garibaldi in southern Canada, and Lassen Peak, in northern California. Mt. St. Helens has a history of over 20 significant eruptive events since 2,500 B.C. Its last previous eruption terminated in 1857 with the gradual extrusion of a feature on the north-facing elevation known as Goat Rocks. A mile east is a feature of similar appearance called the Dog's Head.

LAVA IS OFTEN DIFFERENT

The viscosity of the lavas is possibly the most significant determinant of volcanic behavior. Basalt lavas, which usually contain less than 55 percent silicon dioxide, have very high melting points and very fluid, low-viscosity liquid states. Andesite lavas of about 56-62% silicon dioxide melt at lower temperatures, but flow slowly and with difficulty. Dacite lavas, about 62-68% silicon dioxide, melt at still lower temperatures, are extremely viscous, and can be said to flow only in a technical sense of the word. Rhyolite (granitic) lavas have the most melting point rigidity. The explosive potential of lava increases with the increasing content of silicon dioxide, and proportionately greater ability to contain dissolved gases under extremely high pressures without deforming. Thus rhyolite lava, when geologic overburden pressures are exceeded at the time of eruption, explodes in place as its gases come out of solution, and is carried away with great violence. On an explosive scale of 1 to 10, dacite lavas would be about a 7 or 8.

Mt. St. Helen's May 18, 1980 eruption consisted of dacite, with much mixing in of material in the cone accumulated from previous events, not all of which were dacitic. Dacitic lavas, in addition to silicon dioxide, contain about 12-15% aluminum oxide; 4-5% sodium oxide; 3-5% calcium oxide; and 4-5% potassium oxide. Iron, chromium, magnesium and other metalic compounds are often present. Mt. St. Helens ash was slightly richer in aluminum than average. It is not possible to be precise without reference to a specific sample. These ingredients are in the form of a variety of minerals, with feldspars predominating.

Volcanoes have individual behavior patterns, most of which are not understood with predictive accuracy. All volcanoes do have detectable symptoms of activity or stress prior to a major event.

WARNINGS

The first stirrings of Mt. St. Helens appear to date from a 4.1 Richter scale magnitude earthquake at 3:48 p.m. on March 20, 1980 that caused avalanches to plunge down its northern slopes. The Richter scale for measuring seismic events is arranged so each whole number represents an intensity 10 times that of the next lower whole number. A 4.0 - 4.5 Richter scale event in urban areas could be expected to produce moderate damage.

At Mt. St. Helens after March 20, there was a bustling of scientists intent on placing additional monitors on and near the mountain. There was a flurry of "microquakes" beneath the peak that reached frequencies of more than one per minute, and soon saturated the instrumentation so individual quakes could not be identified. During the night of March 25, however, the activity slowed dramatically.

On March 27, at 12:36 p.m., a boom heard 20 miles away announced a thick black plume of steam and ash that shot 7,000 feet through low cloud cover over the mountain. At 2:01 p.m. a 4.5 magnitude quake shook the peak. Weather delayed news of a crater 200 feet in diameter that opened just north of the main summit. Cracks, some 3 miles long, radiated around the summit. Ash blackened the northeast slopes. Eight more quakes between 2.4 and 4.5 were recorded as the eruption continued. On the north flank of the mountain above the 7,000 foot level, between and above the features known as the Dog's Head and Goat Rocks, a bulge began to grow.

At 3:45 a.m. on March 28, a new blast announced another eventful day with ash plumes to 16,000 feet, more than a dozen distinct explosions, and 130 earthquakes between 3.2 and 4.9. Ash avalanches cascaded down slope, mixed with ice and melt water.

This intermittent but busy "venting" of the mountain continued relatively unchanged until April 1. During the March 22 - May 15 period, there were over 2,785 earthquakes with a magnitude of 3.0 or greater, recorded against a background activity of almost constant microquakes. Of these, 371 exceeded 4.0 on the Richter scale. Three of them on April 8, 9, and 12 reached 5.0. During this time more than 50 eruptions occurred, often accompanied by large quantities of steam. None reached an altitude of more than about 20,000 feet, and therefore were not dispersed by the jet-stream winds of the stratosphere. Most of the ash was relatively coarse material that fell close to the mountain. However, a dusting fell 150 miles away on Bend, Oregon on March 30. Ash was detected in Portland the next day. Shifting weather also sprinkled it on Kelso, Longview, and other communities west and northwest of Mt. St. Helens. Historically, however, studies show that 90 percent of the tephra emitted has fallen eastward from the mountain.

On April 1 scientists detected an anticipated new activity: Between 7:40 p.m. — 7:55 p.m. seismometers began picking up the first faint "harmonic tremors." Unlike short, sharp quake signals, they extended over several minutes and indicated the stiff, tortured movement of molten rock beneath the mountain as the earth pulsated with its flow. These harmonic tremors were to become common events. It was not until mid-April that scientists were able to confirm that the bulge on the north face, more than 320 feet thick, six-tenths of a mile wide and a mile long, was moving north and slightly west away from the peak at an average 5 feet per day. The movement was powered by fresh magma, slowly squeezed into the mountain from below like some cosmic toothpaste.

THE QUICK MAIN EVENT

All the ingredients for a major seismic event were in place. Through the first half of May, quakes, steam vents, ash eruptions, and harmonic tremors continued on a more-or-less regularly intermittent basis. The Forsyth bulge (partly beneath the Forsyth glacier) continued its protrusion from the north face. On May 15 alone, 39 quakes over 3.0 were recorded beneath Mt. St. Helens, but there were no eruptive events.

On Saturday May 17, by special order from Governor Dixie Lee Ray, 20 home owners of the Spirit Lake area were granted 4 hours to evacuate property beyond the blockades on State Route 504. Escorted by state troopers and deputy sheriffs, with a state patrol plane circling above and National Guard helicopters on alert, the determined caravan completed its mission without incident, under the very lip of the volcano.

Sunday May 18 dawned clear and bright. All around the mountain professional volcano watchers, campers, hikers, and timber workers appreciated the exceptional weather as the new day began. The mountain was quiet.

At 8:32:10 a.m. a 5.1 earthquake rattled Mt. St. Helens. Photographs of that moment show a thin, dusty haze over the upper part of the mountain, as though it vibrated. About 31 seconds later, simultaneous with a first quick, spurting black plume from the mountain's top, a looping shear line

circumscribed the north face of the mountain down to 7,000 feet — from just east of the north rim of the crater, to the Dog's Head and Goat Rocks, and back to the south rim of the crater. That huge portion of mountain, a mile wide on the central surface with 2,600 feet of vertical rise in its mass, including all of the Forsyth bulge, slid off the mountain with almost free-fall quickness.

The cork was out of the bottle. Directed downward along the path of least resistance — the shear line beneath the slide — a 10 megaton shock wave shot out of the north flank of the mountain. Behind it a 300 mile-per-hour blast of superheated steam flashed from the intensely hot, pressurized groundwater trapped inside the mountain above the intrusive magma. Almost a quarter cubic mile of mountain top disintegrated in a colossal, oblique spray of ash, ice, snow, rocks and pumice. Simultaneously the now-open throat of the volcano exploded a thick, 2 mile wide tower of gunmetal-black ash, smoke and gas 63,000 feet — 12 miles — into the bright sky.

The exact details of these events are still not clear. Towering old-growth cedar and hemlock and fir forests within a 69° fan-shaped area as far as eight miles distant in the blast zone, disappeared. They are no longer there. Valleys and south-facing slopes of three watersheds were stripped to mineral soil by the shock wave and following blast, their forests dumped on the lee slopes behind each successive ridge. The ridges deflected some of the blast upward: Climbers on Mt. Adams, 35 miles east-northeast, later reported falling debris — including a tree limb 5 feet long. Beyond the total obliteration in the primary blast zone is a second area of 140° arc, up to 8 miles long (depending upon slope exposure), where all the trees are down—stripped clean of their branches and laid in orderly, scorched rows that point the wind—a macabre finger painting. Over all of this, a smothering layer of ash from a few inches to many feet deep, extended into the fringe areas of the blast. Here were standing forests a few hundred yards to several miles wide, desolated by the searing heat and the fires set by lightning and the sizzling ashes. Gone are more than one hundred fifty square miles of forest, representing two billion board feet of lumber.

Curiously, the tremendous blast noise was directed by the north-facing, pocket-shaped crater, and erratically deflected by mountainous terrain, so that many near-by survivors reported hearing nothing. Yet, it was clearly heard by others—often as a multiple report—as far as 200 miles distant. Three hours and 20 minutes later the sound wave reached the National Oceanographic and Atmospheric Administration laboratories in Silver Springs, Maryland. Ten minutes after that it was confirmed at the Lamont-Doherty Geological Observatory at Pallisades, New York. The wave averaged 695 miles per hour, had a period (wave length at that point) five minutes long, and established that the energy Mt. St. Helens transmitted to the atmosphere alone in that initial blast was equal to a 10-megaton bomb.

ACT TWO

Pyroclastic (fire-formed) material is dry, superheated rock and ash, made effervescent and mobile by the hot air and escaping gases within it. It may travel very fast on steep slopes, and is accompanied by clouds of thick smoke and gas that give the appearance of an eruptive event. Such slides poured down the northern flanks of Mt. St. Helens for at least 3 hours Sunday.

Mud slides are essentially ash and volcanic rock mixed with water from rapidly melted snow and ice. They often have the look of wet cement, and some of the same behavior. It is easy to underestimate their mass and power, and the distance they may travel down watersheds.

Spirit Lake, just north of Mt. St. Helens, is four miles long, with a northeastern arm and a shorter one to the northwest. Large quantities of the exploding mountain top literally fell into it, followed quickly by huge avalanches and slides. Enough of these materials went into Spirit Lake to raise its 185-foot deep bottom by 300 feet, and move its southern shore line a quarter mile north. Its surface was raised 200 feet behind a new volcanic dam which rests atop an earlier one. It plugs the north fork of the Toutle River with a deposit a mile wide and 200-feet deep, which gradually tapers away downstream for 17 miles. A wall of mud and water as much as 20 feet high rammed down the canyon at the front of this slide, engulfing, crushing, sweeping everything in its path. In Spirit Lake, as much as 80 billion gallons of mud and water reached a temperature of 95° Fahrenheit.

There was a sudden increase in seismic activity in the mountain at 11:43 a.m., triggering massive new slides. They engulfed both forks of the Toutle River and added to the deposits in Spirit Lake. The previous north fork valley of the Toutle River was now essentially a flat plain for seventeen miles, lost in a landscape of other changes. Interstate Highway 5 was closed at the Toutle River crossing 35 miles west of the mountain as millions of cubic yards of logs and ash threatened the I-5 bridges. During this same period, its timing and size obscured by the smoke and ash east of the mountain, a great slide plunged thirteen miles down the Muddy River and the north fork of the Lewis River into Swift Creek Reservoir, south of Mt. St. Helens, before noon. More followed. The nine-mile long reservoir, pulled down 25 feet in anticipation, rose two feet—representing deposits of about 13,000 acre-feet.

Something of the magnitude of the mud flows was realized late Monday when the 657-foot Norwegian container ship Hoegh Mascot, steaming in the Columbia River 50 miles from the mountain, ran aground in 15 feet of water, where a 45-foot deep channel 600-yards wide had been. Mt. St. Helens built a shoal nine and one-half miles long containing 22-million cubic yards of cement-like mud, trees and debris that stopped all ocean-going vessels from reaching Portland for weeks, until the Corps of Engineers scraped out a 25-foot deep emergency channel. By July 1, shipping was essentially back to normal. The same mud flows reduced 15 miles of the Cowlitz River between the Toutle River and the Columbia River to 20% of its previous capacity, raising the bottom 15 feet and making the towns of Kelso and Longview highly susceptible to flood. Scientists calculated that in addition to airborne ash, Mt. St. Helens dumped more than one and one-third billion cubic yards (a cubic kilometer) of pyroclastic and mud-flow materials in Spirit Lake and the Toutle River valley. The mud deposits washed into the Cowlitz and Columbia River were a small additional fraction of the total ejecta deposited around the mountain.

The 11:43 a.m. "event" in the volcano was accompanied by a color change—from dark grey to lighter grey—in the huge ash cloud thundering into the stratosphere. Fresh magma reached the surface for the first time after three hours and eleven minutes of eruption. Until then, escaping gases were heating, reworking and ejecting essentially all old material from the mountain itself.

ASH ON THE LAND

The dark, ominous clouds of gas, steam and ash spread quickly east-northeastward through Washington. By 10:30 a.m. Yakima was in total eclipse. In mid-afternoon the 160-mile wide cloud had advanced as far as the northern Idaho border. The deepest falls were 20 miles wide along a cen-

tral axis that ran from the mountain directly through Spokane, where ash fall was heavy by 2:30 p.m. Ritzville, slightly south of the early primary axis of the cloud, got between two and four inches of ash. Like Moses Lake and Spokane, it was one of the hardest hit communities. Record ash falls occurred between Ritzville and Spokane. By midnight there was a quarter-inch in Missoula, Montana, and Great Falls was under the edge of the cloud. It had advanced steadily across the country at about 40 miles per hour all day.

Monday a light dusting of ash settled on Denver, Colorado, and prevailing winds continued to spread the thinning cloud northeastward into North Dakota and southern Canada, and southeastward into Arkansas. By now it appeared as a faint but noticeable haze in the sky. Tuesday night it approached the east coast as far south as Georgia and the Carolinas, and swept into Manitoba, Canada, to the north. Ash stopped falling Tuesday on states nearest the volcano. Noticeable amounts touched at least 34 states, with varying degrees of after-effects confined essentially to Washington, Oregon, Idaho, Montana, Wyoming, and Colorado. On June 2, ash particles were confirmed in Seattle, having circumnavigated the globe.

On June 25 observers in Kyushu, Japan, reported finding microdust from Mt. St. Helens six miles above the earth, where particulate densities were up to 30 times normal. The dust was distributed in a layer from two-tenths to six-tenths of a mile thick, and was judged by the Kyushu scientists to be capable of significant climatic effects.

On May 18, in the ash clouds over eastern Washington, scientists had found one-micron-size particles of quartz, which have a free-fall rate in the atmosphere of .003 centimeters per second. At that rate, a particle at the 8,000-foot level would take 800 days to settle to earth, and would circle the earth 20 times. Many particles of ash were much higher than this example; research aircraft found it more than 100,000 feet high the same day — carried there by 100 mile-per-hour jet-stream winds.

Ash measurements are not static. The stuff settles and compacts. Its composition and behavior varies with distance from the volcano and the sorting action of the atmosphere. Local air currents make the fall uneven. Reports from the same area therefore often seem confused and contradictory. All the ash is difficult to deal with because parts of it are light and easily disturbed when dry, but surprisingly heavy in total, weighting down and smothering vegetation, and endangering roofed structures. On the average, it is harder than window glass, fine enough to penetrate and destroy machine bearings, and it clings persistently to virtually all materials. The chemical pH of most of it is essentially neutral; it will have beneficial long-range effects on soil fertility. It is a direct threat to health, with potential to cause long-range respiratory malfunctions.

The amount of airborne Mt. St. Helens ash was quite moderate by past Cascade volcano performances. Still, nearly 3 billion cubic yards (2.2 cubic kilometers) was produced in less than twenty-four hours.

On Friday May 23, below-the-surface temperatures of the material first blasted out of the mountain were obtained by direct measurement. The highest temperature was 279° Centigrade, or 554° Fahrenheit. Initial temperatures of the steam blast that threw it out and leveled the forests have been estimated at more than 900° Fahrenheit.

EPILOGUE

About 2:45 a.m. on May 25, seismic activity in the mountain again increased dramatically, and an ash-rich plume of juvenile (new magmatic) ash shot up to 46,000 feet. This activity began to decrease almost immediately, but variable winds deposited troublesome amounts of ash west and north of the mountain during the day.

On June 12 another eruptive episode beginning at 8:45 p.m. with light south-southwest winds dropped about .2 inches of ash on Portland, and some marble-sized tephra on the town of Cougar, only 18 miles south of the mountain.

On June 15, U.S. Geological Survey scientists confirmed the presence of a dacite dome over the crater vent. It soon grew to a diameter of about 600 feet and a height of 200 feet, then continued more slowly—the degassed magma oozing slowly from the vent, cooling, and flaking off chunks of still glowing rock. There was explosive activity on July 22. After a day of "swarms" of quakes beneath the peak, an eruption blew away the part of the dome directly over the vent, raised an ash cloud, and deposited tephra on the crater floor. The dome will probably rebuild. Such behavior is a textbook example of Cascade volcano regeneration. At this writing the mountain is quiet. However, no one believes the events of this eruption period for Mt. St. Helens have been concluded.

Adjusted for density changes, conservative estimates of material thrown out by the mountain are a close fit to the volume of the new crater, calculated at 2.7 cubic kilometers, or more than six-tenths of a cubic mile. With a specific gravity of 2.2, that much ejecta would weigh in at about 3 billion tons. Other estimates range as high as four cubic kilometers—almost one cubic mile—and over 4 billon tons. The problem is simply that the quantity is very large, and dispersed in conventionally measurable amounts over more than 125,000 square miles. The estimates vary.

The energy expended in the May 18 eruption is closely equivalent to that of a 50-megaton atomic bomb. The release time for that energy, of course, is *not* equivalent.

The incident at Mt. St. Helens may teach a new respect for natural phenomena, and for the resiliency of natural systems.

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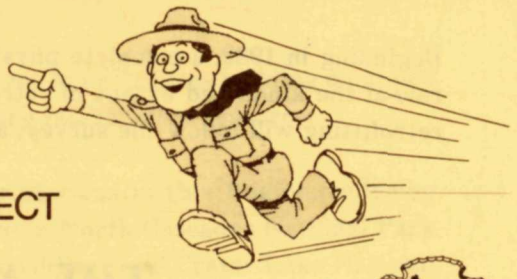

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601 - 4th & Pike Building, Seattle, Washington 98101

ENERGY CONSERVATION
in
The Pacific Northwest Region

. . . to significantly reduce the demand for exhaustible energy . . . and set an example for the rest of the nation in conserving energy . . .

– Department of Interior

SPACE AND THE BTU

If one walks north three blocks from the corner of the downtown Post Office in Seattle to the far corner of the Bon Marche; then east three blocks to the Washington Plaza Hotel; and south to the Washington Athletic Club at 6th and Union, a right turn will bring you back to the Post Office! That ten-city-block perimeter contains about 1,100,000 square feet, which is just about the area inside heated buildings managed by the National Park Service in the Pacific Northwest Region.

If this space were in a circular one-story building, it would have nearly twice the diameter of the Kingdome Stadium. From its center, one could walk two city blocks in any direction and still be inside the building. That much space takes a lot of heat! In 1978 some of this space–about a city block–got heated almost for free, because retrofitting and other low-cost energy management techniques cut the heat required 10% below 1975 costs. That is impressive, and one of the best Regional performances in the Service!

Perhaps partly because of that, the Region received $400,000 in 1979 to retrofit additional buildings. The work will continue well into 1980. Average expected "pay-off time" for this investment in heat conservation is a bit less than five years. Direct benefits to the Service will continue an average of fifteen years – until the buildings are retired. The most lasting benefit, of course, is the conservation of important unrenewable resources.

By the end of 1979 all the data generated by energy conservation projects in 1978-79 were reworked and validated. This provides a firm, reliable base-line for the management of future conservation measures, and suggests ways in which data banks may be improved.

Beginning in 1980, a complete physical survey of all Service-managed buildings, heated or not, will reveal the kinds and extent of retrofitting needed to make every building energy efficient. Actual retrofitting will follow the survey, and may continue into 1985.

THE AUTOMOTIVE FORCE

In this Region, the National Park Service owns and operates about six types of vehicles, ranging from sub-compact sedans to colossal snowploughs. If we started parking them at normal curb-side intervals in the street north of the Post Office, there would be enough to go around the ten city blocks of space twice, and triple-park another row past the Bon Marche, over to the Washington Plaza again! In 1978 these vehicles travelled about 1,351,000 miles. Had each vehicle travelled the same distance, the entire fleet could have been moved to Mexico City.

Between April 1979 and April 1980 use of transportation fuel dropped 10%, or about 135,000 miles. This year, the entire fleet would stop 335 miles short of Mexico City -- the distance across an average western state. Some things the fleet has been doing will not get done, or we will find a better way to do them!

Mount McKinley National Park is doing this by replacing fifteen obsolete vehicles -- 4 sedans and 11 pick-ups -- with lighter, small vehicles. Fuel savings are about 30%.

Cushman 3-wheel scooters have replaced Olympic National Park pick-up trucks for roadside clean up, campground maintenance and other appropriately light work. No fuel savings data yet.

MORE APPROPRIATE TECHNOLOGY

Parks and the Regional Office, supplementing $100,000 of special Washington Office monies with their own operating funds, produced more than 30 Demonstration Projects by the fall of 1979. The objectives are to conserve energy, improve efficiency and stimulate additional conservation projects. Here are some of them.

Six parks are using bicycle transportation for campground management, interpretive activities and administrative duties. They are Coulee Dam National Recreation Area, Craters of the Moon National Monument, Fort Vancouver National Historic Site, Glacier Bay National Park, Nez Perce National Historical Park, and Olympic National Park.

About 65% of the staff housing in this Region is now equipped with wood-burning stoves, including Crater Lake National Park, which was among the first to accomplish this. At Crater Lake wood is collected by residents on permit from surrounding National Forest lands.

An industrial trash compacter at Sunrise Visitor Center in Mount Rainier has reduced the garbage haul to one 80-mile round trip per week instead of three or four previously required. Saving three trips per week saves 360 gallons of fuel per operating season-- in addition to operator costs and vehicle maintenance.

Spring Canyon Campground in Coulee Dam National Recreation Area has a utilities building equipped with a solar hot water heater. The installation is used as a primary interpretive resource.

Solar power is now driving five radio communications repeater stations in this Region, reducing maintenance and increasing reliability in remote areas. Three are in North Cascades National Park and National Recreation Area; one each is in Mount Rainier National Park and Crater Lake National Park. At this writing, nine other solar energy projects are in the planning stages. These include a solar space heating system and two kinds of solar hot water systems at Craters of the Moon National Monument, both space and hot water solar systems at John Day Fossil Beds National Monument, and solar hot water systems at Nez Perce National Historical Park and Whitman Mission National Historic Site.

Craters of the Moon National Monument has emerged as the most energy efficient park in the Region. They have accomplished a retrofit insulation project for the visitor center and all staff housing, and installed wood burning stoves in the winter quarters. There is also a solar powered message repeater station, where bird calls are reproduced. As the battery is being charged, visitors may throw shadows on the solar panel and watch a built-in voltmeter fluctuate with the energy flow.

THE VIEW

One national spokesman for the oil industry has said it was not until mid-November in 1979 that a majority of American people believed the energy shortage is real. The evidence strongly indicates the prudence of behaving as though it is!

In 1980-81 the National Park Service will continue its current emphasis on vehicle fleet economy and buildings retrofitting. Already some parks have reduced the number of vehicles they operate, in addition to using smaller vehicles. More attention is being given to high quality maintenance. By the third quarter of 1980 the Service expects to have an individual vehicle record system in place, so performance and use patterns can be analyzed for improvement. An additional 5% reduction in fuel used during 1980 seems within reach.

The mandatory 65 degree thermostat setting for public buildings has already produced significant savings in space heating costs. Completed retrofittings increase this saving. As additional buildings are processed and building use patterns improve, performance will continue to rise.

New park demonstration projects will in 1980 produce more and better conservation in park operations, and contribute to public awareness of energy management. The Service is doing a good job. It will get better.

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