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A report to park managers of recent and on-going research in parks with emphasis on its implications for planning and management.

Guest Editorial

By Dick Briceland, Associate Director of Natural Resources

The Washington Office of Natural Resources is embarking on a new era — new directions, new emphasis, new approach. Over the past few months there have been three specific Washington Office management actions that will shape all future WASO activities and responsibilities in the science/natural resources area. These management actions involve *organizational changes, role and mission changes, and realignment changes* and can be summarized as follows:

I. Organizational Changes

In late February, the Department approved a major structural and functional reorganization of the Washington Office. This reorganization abolished the Office of Science and Technology (S&T) and created a new Office of Natural Resources comprised of four Divisions:

- The Air and Water Quality Division, formed by consolidating the Air Quality Division and the Water Resources Division, both from S&T. This Division has two field components —the Denver Air Quality Field Unit and the Fort Collins Water Resources Field Unit.



Dr. Richard H. Briceland

- The Biological Resources Division, formed by consolidating the Natural Science Division from S&T and the Natural Resources Management Division from the Office of Park Operations.
- The Special Science Projects Division, transferred intact from S&T.
- The Energy, Mining and Minerals Division, a totally new organizational unit formed by consolidating energy, mining and minerals functions from within WASO, the Regional Offices and DSC. This Division has one field component, the Denver Energy, Mining and Minerals Field Unit.

Responsibility for the Servicewide Energy Conservation Program was shifted in the reorganization from S&T to the WASO Office of Park Operations. Responsibility for the Fire Management Program was retained within the WASO Office of Park Operations.

II. Role and Mission Changes

In early March, the Director distributed the approved WASO reorganization plan to the Washington Office and defined the future role and mission of the WASO staff as follows:

"The Washington Office, in consultation with Regional Directors, will be responsible for establishing and maintaining the adequacy of Servicewide policy; establishing nationwide priorities for Service activities; and for coordinating Service matters with the Department, the Congress, national organizations and the public."

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Cover Photo: Coring sediment with a piston sampler through the ice on Stockton Island, as part of a program for forest vegetation management on Apostle Islands National Lakeshore. Al Swain and Ray Steventon are pictured. (See p. 3)

Forest and Disturbance History At Apostle Islands National Lakeshore

By Albert M. Swain and Mariorie Winkler

A program for management of the forest vegetation on the Apostle Islands National Lakeshore requires an assessment of the present forests and also knowledge of the changes in forest composition prior to European settlement. Some estimates of the frequency of forest disturbance (*i.e.*, fire) before and after settlement also is important because periodic fires have played a dominant role in shaping the composition of the hardwood-conifer forests in the Apostle Islands as well as in other parts of Wisconsin and in Minnesota.

The forest composition immediately before settlement can be obtained by identifying old stumps that still remain from the time of cutting or by studying logging histories and cover-type maps made from land survey records. For a longer term paleoecological record, the analysis of pollen and charcoal from lake and bog sediments and of tree rings from fire-scarred living trees and charred stumps provide the basis for reconstructing former environmental conditions. This kind of analysis can be done for time scales ranging from a few centuries to several thousand years.

Our study examined the recent and past fire and vegetation history on Stockton Island, Bear Island and the Bayfield peninsula. The paleoecological record is most complete from Stockton Island and will be emphasized in this report. This island has areas of contrasting soils, vegetation, and disturbance history that require varied management plans.

THE STUDY AREA

Stockton Island can be described as two islands connected by an area of low sandy beach ridges. The area of beach ridges that connect the two upland areas is called a tombolo and is largely dominated by forest vegetation that includes red and white pine. The upland areas have soils derived from glacial till that overlie bedrock. Unlike the forests on the tombolo, hardwood species such as sugar maple, red maple, yellow birch, red oak, paper birch, and aspen species presently dominate the upland forests. Hemlock, white cedar, and balsam fir also are present in minor quantities. Numerous white pine and hemlock stumps indicate that these species were dominant forest types on the uplands prior to cutting. The soil differences probably account in part for the contrasting vegetation on the island.

Two bogs were cored on Stockton Island for pollen and microscopic charcoal analysis. Stockton Bog is located at the north end of the tombolo and its surface is only slightly above the present level of Lake Superior. Brander Bog is located about 2

km northeast of Stockton Bog on the northeast end of the island at about 30 m above present lake level. The bogs were assigned names to aid in discussion of research findings.

TREE RING ANALYSIS

Tree-ring cores from 53 red pines and cross-sections from three fire-scarred stumps were collected from the tombolo on Stockton Island. The results from the counts showed evidence for at least 9 fires between 1765 and 1940. The dates of these fires were interpreted mainly from scars (or pitch rings) present on the cores, and

total tree ages, but abrupt changes in ring growth also were noted as possible evidence of a fire. Because red pine and jack pine both regenerate within the first few years (often less than five years) after a fire, total ages from stands of these trees were used to estimate fire dates. To obtain total tree ages one or more years were added to ring counts from each core to adjust for the height at which the trees were cored. The fire history based on tree rings represents a minimum estimate of fire frequency, because at least one historically-dated ground-fire resulted in no scarred trees.

Fire frequency on the upland areas north

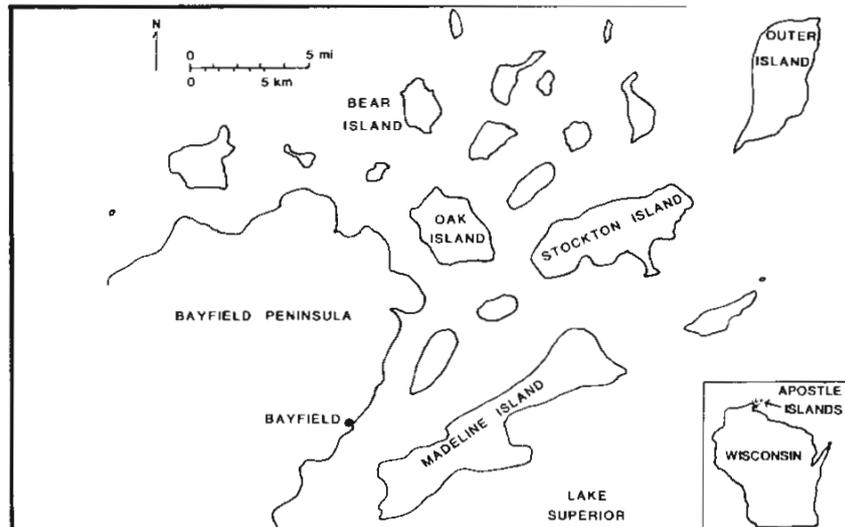


Figure 1. Map of the Apostle Islands and a portion of the Bayfield Peninsula.

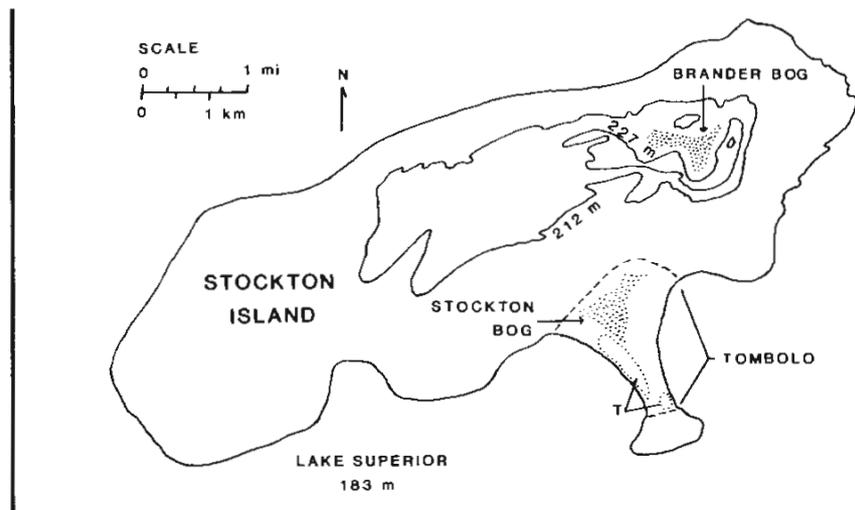


Figure 2. Map of Stockton Island. Contour intervals are in meters. The dashed lines mark the north and south boundaries of the tombolo. The dotted lines enclose tree-ring coring sites (T). The dotted area represent bogs.

Forest and Disturbance - Continued

and south of the tombolo was quite different from the tombolo itself. Tree cores from hemlocks suggested that some remnant stands of hemlock, yellow birch and white cedar have not burned for over 250 years. Other areas of the island showed evidence of only one to three fires during the past 250 years. The most recent fire on the uplands followed logging, since the remaining pine and hemlock stumps are charred.

POLLEN AND CHARCOAL ANALYSIS

The records of pollen and charcoal from Stockton Bog and Brander Bog were about 6,000 to 7,000 years long. The chronologies were based on five radiocarbon dates for Stockton Bog and two for Brander Bog. The two records showed general similarities but also some distinct differences. The local differences of the bogs were enhanced in the pollen record by the isolation of the island from the masking influence of regional mainland pollen. The most recent portion of each record (0-50 cm for Stockton Bog and 0-30 cm for Brander Bog) reflects agricultural and logging disturbances during the past century both on the islands and on the mainland. The pollen diagrams show increased percentages of weed pollen such as ragweed and pigweed and marked decreases in the percentages of white pine and hemlock pollen, particularly at Brander Bog. Cutting of white pine and hemlock appears to have been extensive around Brander Bog while only limited amounts of white pine were removed from the tombolo. The forests on the tombolo may have been too young for harvesting at the time of initial logging because of recent fires. The drastic decrease of hemlock and white pine in the Brander Bog area during the past century allowed maple, oak, birch, (perhaps both yellow and paper birch) and aspen to increase in importance.

The pollen record at Stockton Bog (Figure 4) showed that the forest vegetation on the tombolo has been dominated by red and white pine and paper birch through most of its 6000 year history (as it is now) except that white pine may have been more common prior to logging. The pollen record at Brander Bog illustrated that hemlock, birch (probably yellow birch), and other hardwoods were more common on the upland areas of the island than on the tombolo during the past several thousand years. The differences in the forest vegetation between the two areas appears to be

related to fire frequency which is higher on the tombolo based on the generally lower charcoal values and very few prominent

charcoal peaks (Figures 4 and 5) from local fires during the past several thousand years at Brander Bog compared to Stockton Bog. Reduced fire frequency would favor the growth of hemlock and yellow birch which are relatively sensitive to fire damage compared to pines and paper birch. Pines have fairly resistant bark and paper birch will resprout after a fire.

Both pollen records from Stockton Island show an increase in spruce during the past 2000 years. This increase suggests a somewhat cooler climate com-

pared to earlier periods. The spruce trees are confined to the bog surfaces.

MANAGEMENT APPLICATIONS OF HISTORICAL RECORD

The Apostle Islands National Lakeshore and adjacent areas in Bayfield County provide contrasting environmental settings for studying the history of forest vegetation. The records of pollen and charcoal

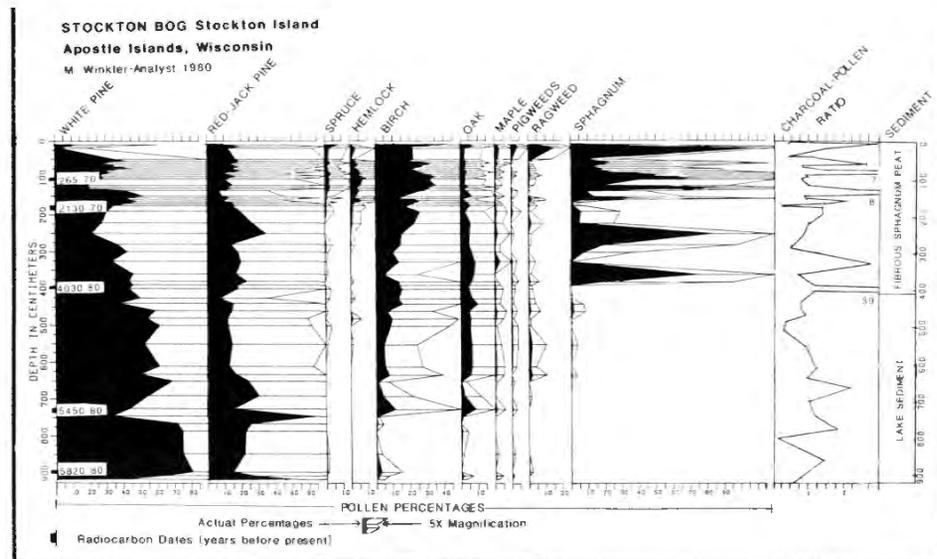


Figure 4. Pollen and charcoal diagram from Stockton Bog. The percentages of Sphagnum spores are based on pollen sums that exclude Sphagnum. The charcoal-pollen ratio represents charcoal surface area divided by pollen abundance within a known area of a microscope slide

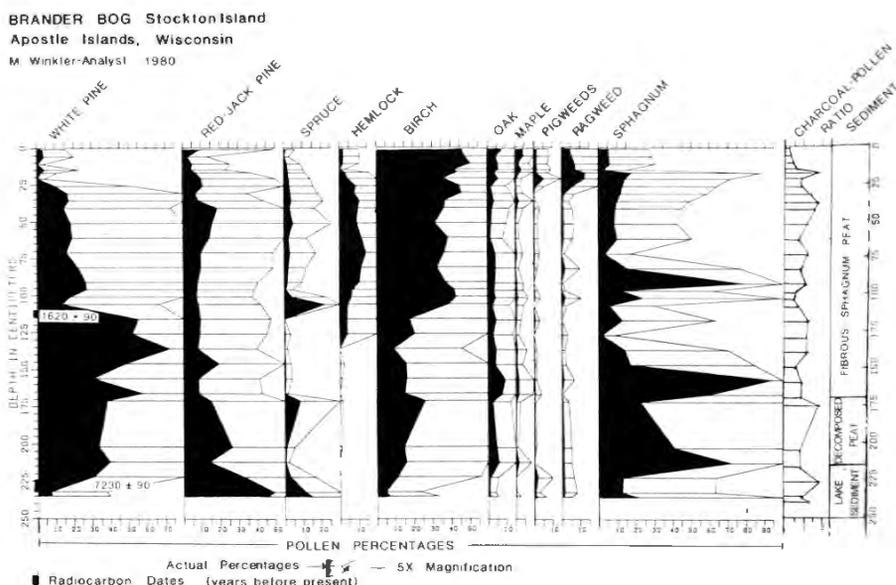


Figure 5. Pollen and charcoal diagram from Brander Bog. See the caption for Figure 4 for the explanation of the Sphagnum percentages and the charcoal-pollen ratios.

From these different settings showed distinct differences in forest composition and disturbance effects during the past 6000-7000 years. These historical differences affect management decisions that involve maintaining or restoring the natural forest communities on various sites within the Apostle Islands National Lakeshore. The Stockton Island tombolo and the adjacent upland areas of the island are excellent examples where management decisions will vary because of different soil types, vegetation and disturbance frequency.

The pollen record from Stockton Bog showed that forest composition changed relatively little on the tombolo following European settlement. In this case no tree species need to be planted to restore the presettlement forests on this part of the island, but periodic fires may be required to maintain dominance of the pine species. With complete fire protection, the pine forests on the tombolo will eventually be replaced by hemlock, fir, and hardwood species that are common in upland areas adjacent to the tombolo.

The tree-ring record of past fires showed that at least nine fires occurred during the past 250 years on the tombolo. Many of these fires occurring within the past 100 years appear to have been ground fires because fire-scarred trees were common and the original forests were left largely intact. The patterns of the tree-age distributions and of the locations of trees with particular fire scars suggests that the fires were relatively small in area with no single fire burning the entire tombolo.

A somewhat different management approach is required for the upland areas of Stockton Island that are adjacent to the tombolo. Compared to the tombolo, these upland areas have heavier soils of glacial drift rather than beach sands, were dominated by hemlock, white pine and northern hardwood species, and were subject to relatively fewer fires (1-3 fires) during the past 250 years. Both the pollen record from Brander Bog and the abundance of cut stumps on the island demonstrated that the dominance of hemlock and white pine was greatly reduced as a result of logging. Restoring white pine and hemlock into the present hardwood-dominated forest may involve either direct planting or natural seeding from the few remaining remnant stands of hemlock and white pine. Natural seeding may be a very long-term process, but further research on the islands is needed to establish if natural seeding is occurring and at what rate. Compared to the tombolo, fire protection may be required on these upland sites of Stockton Island in order to restore the presettlement forests.

Swain is a professor of climatology at the Center for Climatic Research, Institute for Environmental Studies, University of Wisconsin at Madison. Winkler is a specialist for the same organization.

Wilderness Campsite Selection- What Should Users Be Told?

By Dave Cole and Jim Benedict

Recreational use of National Forest wilderness in 1981 exceeded 10 million visitor days (a 12-hour stay by one person) . . . an increase of more than 25 per cent over 1980. Backcountry use in the national parks for the last several years has remained fairly constant at between 2 and 3 million overnight stays per year.

While these measures are not comparable, together they clearly indicate increasing numbers of people crowding into America's wilderness areas, threatening wilderness values and leading some to suggest that we are loving wilderness to death.

The resource damage resulting from this use is particularly pronounced on campsites, where visitors spend most of their time. Managers have responded in a variety of ways, ranging from encouraging adoption of minimum impact camping techniques to strict regulation of both numbers of users and permitted practices.

The only real means of avoiding both resource damage and irksome restrictions is to increase public awareness of the nature and importance of campsite impacts and the means for minimizing damage. Recognition is the first step. Most visitors don't even notice wilderness campsite damage, let alone recognize its undesirability.

Initial impacts on a campsite include trampling of vegetation, movement and blackening of rocks used to build firerings, removal of firewood from the vicinity, deposition of charcoal and ash in the fire-ring, and addition of nutrients from human wastes and other pollutants. Use of horses intensifies these impacts.

On substantially impacted sites, vegetation disappears from large portions of the campsite and the kinds of plants that survive are very different from those that grow under undisturbed conditions. Trampling compacts soil, restricts movement of air and water and the growth of plant roots. Thus, less moisture can percolate into the soil, surface runoff increases, and the soil erodes. The organic horizons of soil (decomposing leaves, needles, cones, twigs, duff, humus) disintegrate and erode, exposing bare mineral soil.

On the most heavily damaged campsites, such impacts reach alarming levels. In the Eagle Cap Wilderness in northeastern Oregon, we found over 90 percent of the tree seedlings and a similar percentage of the ground vegetation had been destroyed by trampling. More than 95 percent of the overstory trees had been damaged, either

from collecting firewood or from malicious or thoughtless acts. Particularly disturbing was the discovery that one-third of the trees had actually been cut down. Most of these sites will remain forested only until the present generation of trees dies.

Soil organic horizons on these campsites were only one-third as thick as normal; bare mineral soil was 30 times that of undisturbed sites. Compaction and erosion of soil were prominent; roots had been exposed on over one-third of the trees. Size of the campsites was large; some sites were coalescing to form huge disturbed areas.

Campsites can deteriorate to this point very rapidly. Dr. Lawrence Merriam and associates at the University of Minnesota found on newly opened campsites in the Boundary Waters Canoe Area that most site deterioration occurred in the first few years. Once pronounced deterioration occurs, recovery takes a very long time. Estimated recovery periods for disturbed alpine sites in Rocky Mountain NP are as high as 1000 years! This is why it is so important either to avoid campsite impacts entirely, or to be very selective about where they occur.

Frequency of use is only a partial explanation for why some campsites are more seriously damaged than others. Many frequently used sites are in better condition than sites used less often. A night or two of use every year is often insufficient to do considerable damage. In subalpine forests in both Oregon and Montana, additional use of sites already being used about 10 nights per year is unlikely, by itself, to lead to further deterioration.

This suggests that the most useful options for minimizing campsite damage are either never to allow sites to be visibly impacted by spreading people so widely that no site is used more than one or two nights per year, or to convince people they should camp over and over again on the same small number of sites — recognizing that these sites will be significantly impacted, but confining impact to a very small part of the wilderness. A moderate number of lightly impacted sites actually is not a realistic option, because such sites are vulnerable to extremely rapid deterioration with only minor increases in use.

The condition of campsites is more a result of the characteristics and camping practices of users and of local site conditions than of amount of use. Large parties and parties with packstock do the most damage and special efforts should be made to encourage them to select sites that already have been substantially

Wilderness Campsite - Continued

altered and are large enough to accommodate their party size.

Most wilderness visitors travel on foot and in small groups. About 90 percent of wilderness users are hikers; parties of less than five persons are two to three times as common as parties of five or more. For this vast majority of users, campsite damage can be reduced by following minimum impact camping procedures.

1. Go without a campfire. This eliminates the need to scour the area for firewood and leaves behind no charcoal, ash, and blackened rocks.

2. If you must have a fire, try to select a site with an existing firering. If no ring exists, choose a fire site with no vegetation cover and, if possible, no humus or litter. Dig a shallow pit, away from stones that might be blackened. Burn only dead and down wood that you can break by hand. Larger pieces do not burn readily to ash. They are critical as habitat for many plant and animal species and in maintaining the water relations and nutrient balance of the campsite. When through, burn all wood to ash, make sure the fire is out, fill in the pit, and camouflage the disturbance with appropriate materials.

3. Minimize site pollution by packing out all garbage and by using only biodegradable soaps, in small quantities and away from water sources.

4. Never flatten a site, trench a tent, or build rock walls as windbreaks. Engineering is not appropriate in wilderness and should not be necessary if sites are carefully selected.

5. Leave the campsite at least as clean and attractive as you found it. In established sites, pay particular attention to the campfire area. Remember you want to encourage others to use your site rather than damage a new area. In pristine areas, try to leave no trace at all of your visit. Try to make it unlikely that the site will be used again until the effects of your stay have been cancelled out.

When using pristine sites it is critical to allow yourself sufficient time and energy at the end of the day to find an impact resistant site. Take an early break — stash your packs — explore a little. Ecosystems are extremely complex and our knowledge of site resistance and fragility needs to be greatly improved, but most wilderness hikers are knowledgeable enough to make good choices if they stop in time to survey their options and use their best judgment.

A general rule for site selection that applies anywhere is to obey existing regulations about where NOT to camp. Usually this involves a reasonable distance from water, trails, and other camps. It is meant not so much to keep you off fragile sites as to keep you from invading the solitude of other groups.

In developing the accompanying table

and figures, we have slightly modified the campsite rating system developed by Dr. Sidney Frissell at the University of Montana. The table describes six campsite

conditions and recommends appropriate user responses. Some responses require an evaluation of how much use the area receives and how proficient your party is

Table: Campsite Condition and Recommended User Responses

CONDITION CLASS	VISIBLE INDICATORS	RECOMMENDED USER RESPONSES
1. PRISTINE	The site appears never to have been used before.	USE WITH CAUTION IN CERTAIN SITUATIONS The keys to proper use of these sites are minimum impact, selection of resistant sites away from attractions, and <i>no</i> repeat use. These are ideal sites in lightly used areas <i>if</i> you are careful to minimize impacts. In high use areas, it is preferable to select a moderately impacted site unless your party is small, has no packstock, uses a stove, is highly experienced in low impact camping, and chooses a resistant site away from more popular locations.
2. SEMI-PRISTINE	Sites are barely recognizable as campsites. Vegetation has been flattened, but bare areas have not been created.	DO NOT USE These sites will rapidly deteriorate if used repeatedly. In low use areas select a pristine site; in high use areas, select a moderately impacted site.
3. LIGHTLY IMPACTED	Ground vegetation worn away around the fireplace or center of activity.	USE ONLY IF NECESSARY Unless these sites are particularly resistant (e.g., sandy beaches, rocky outcrops, dry meadows, or grasslands), they will deteriorate rapidly if use increases. Moderately impacted sites are always preferable and in low use areas, pristine sites are preferable.
4. MODERATELY IMPACTED	Ground vegetation worn away on most of the site, but humus, litter decomposing leaves and needles are usually present on much of the site.	USE WHERE POSSIBLE These sites are not highly susceptible to further damage. They retain most of their desirable attributes and site impact is not irreversible. If possible, choose screened, forested sites, out of sight and sound of other parties. Do not damage overstory trees. For campfires, collect only dead and down wood that you can break by hand. Avoid trampling seedlings.
5. HIGHLY IMPACTED	Ground vegetation, humus and litter has been worn away on most of the site exposing gritty, dusty, or muddy bare mineral soil. Tree roots may be exposed if stock have been tied to trees but soil erosion is not obvious. Firewood is usually scarce in the vicinity of the campsite. Some overlapping of campsites may occur.	USE ONLY IF NECESSARY Where possible, these sites should be avoided to encourage site recovery. In low use areas these sites should never be used. Managers should be encouraged to close and rehabilitate them. In high use areas, this level of deterioration may have to be accepted as the norm. However, select moderately impacted sites if they exist. When using these sites, avoid spreading out or any other practice that might contribute to site enlargement. Minimize the use of wood fires.
6. SEVERELY IMPACTED	Soil erosion is obvious. Exposure of tree roots and rocks is pronounced and widespread. Trees may be reduced in vigor or dead. Individual campsites may coalesce to create large disturbed areas with multiple fire rings. Firewood is scarce for a considerable distance around the campsite.	DO NOT USE Unless managing agencies require the use of such sites, they should never be used. Damage is already almost irreversible. Managers should be encouraged to permanently close these sites to use.

at minimum impact camping.

The table and figures could be used by managers as camper handouts.

The basic rationale behind all the suggestions is to direct use either to pristine sites or to moderately impacted sites that are unlikely to deteriorate further. Semi-pristine and lightly impacted sites should be avoided. They deteriorate rapidly with use, and left unused, usually recover fairly quickly. Severely and highly impacted sites should be avoided because they are

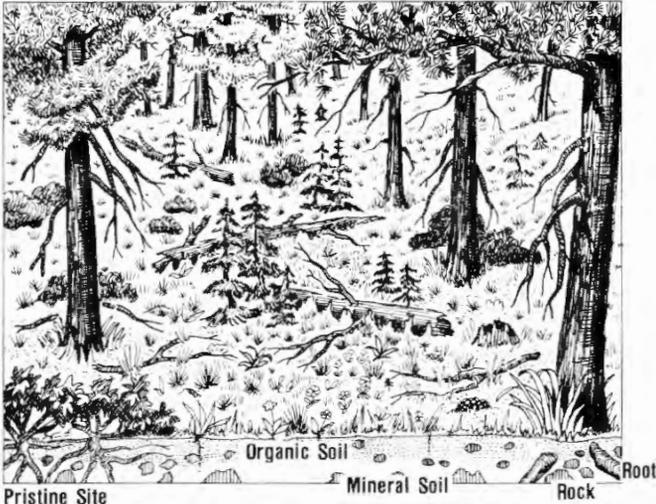
either poorly located or have suffered as a result of poor camping practices. If possible, they should be closed permanently and allowed to recover.

Pristine sites, with few exceptions, should be used only in light use areas with a large number of potential campsites. This is where selecting resistant sites is important and leaving no trace of your visit is essential. Camping on moderately impacted sites is appropriate everywhere. Such sites should not deteriorate dramati-

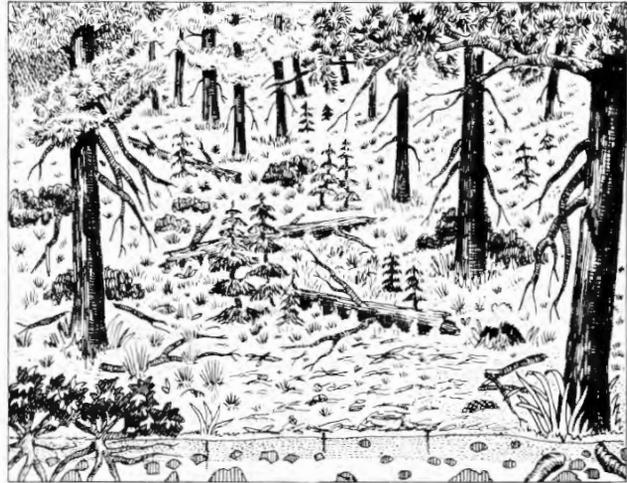
cally if properly used. Avoid unnecessary damage, keep these sites clean and attractive and they will continue to offer desirable camping opportunities for generations to come.

Benedict, until recently, was a research biologist at Yosemite NP; Cole is a research ecologist with the USDA Forest Service Intermountain Forest and Range Experiment Station at Missoula, MT.

Drawings by Walter Sydorik, research technician, Yosemite NP



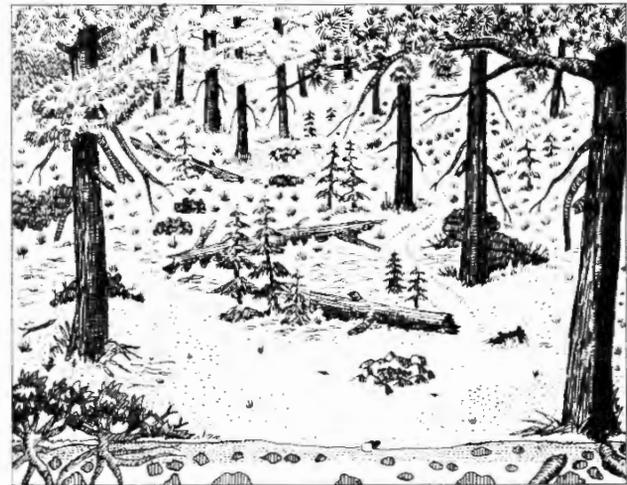
Pristine Site



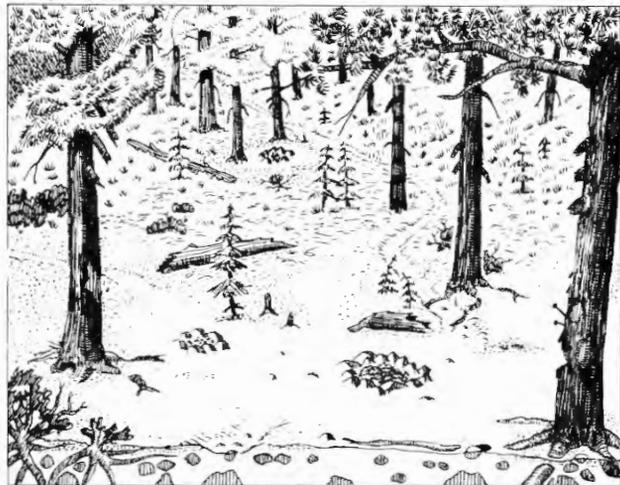
Semi-Pristine Site



Lightly Impacted Campsite



Moderately Impacted Campsite



Heavily Impacted Campsite



Severely Impacted Campsite

Wild Fish Conference Takes Wide Measure Of Olympic Research

More than 250 people — mostly fishery scientists but including sportsmen, Indian tribal representatives, commercial fishermen, and representatives of state and federal agencies involved with Olympic fisheries — attended the first Olympic Wild Fish Conference at Peninsula College in Port Angeles, Wash., on March 24-26.

Jointly sponsored by Olympic National Park and the College's fisheries technology program, the meeting consisted of nine sessions, ranging from discussions of genetic differentiation among wild fish stocks to strategies for managing the various stocks and the major habitats. Thirty-eight scientific papers were presented, in addition to which key agency officials, authors, and other interested parties were heard from. Doug Houston and John Aho of the ONP staff and Jim Walton of Peninsula College were in charge of the conference arrangements.

The conference was a top-level slice of the research and management processes that will determine the fate of native wild stocks of fish on the Peninsula. Many questions were, of necessity, left unanswered, underlining the need for additional research. But a number of areas of consensus also emerged.

No. 1: The native stocks that once provided truly fabulous runs of salmon and trout up into the interior of the Olympic Peninsula are greatly reduced.

No. 2: Hatchery fish are a poor substitute for the richness that is gone.

No. 3: The whole idea of hatchery "enhancement" needs careful study and evaluation. Conferees refused to reject the hatchery concept out of hand, but insisted that the uses of hatchery fish be stringently assessed, with an eye to the effect on remaining native stocks.

Some Conference quotes:

Bill Wilkerson, director of Washington Dept. of Fisheries: Conserving fish resources is the Washington Department of Fisheries' main goal; providing harvestable fish for the sports angler and commercial fisherman is the second priority.

John D. McIntyre, National Marine Fisheries Service: A stock is a process. The species is the means by which a stock maintains its genetic diversity. We're talking here about taking a slice out of a dynamic, changing situation. Change a well-defined stock to another habitat, and by our own definition of a species, it should be maladapted.

Jim Johnston, Washington Department of Game: We must address the concept of labeling certain wild stocks as "non-viable." The long term implications of this concept should lead to its abandonment. If I have one criticism of my own profession it's that we tend to think in time frames no longer than our own lifetimes, and that isn't long enough.

C.J. Cederholm, Washington Department of Natural Resources: We have to get back to regulating the runs and guaranteeing adequate escapement. The best enhancement is regulation of the harvest.

Doug Houston, National Park Service research biologist: Escapement of fish beyond the numbers required to produce the future maximum sustained yield, tend to be viewed as "wasted" — i.e. it does not pass through either (a) the human digestive tract, or (b) the human pocketbook. This view is entirely inappropriate within a National Park.

Ernest Salo, University of Washington (in answer to an audience question "How do you get rid of pork barrel projects?"): You go in with a bulldozer early on a Sunday morning when everyone in town is down with a hangover, level the hatchery, and get out of town."

Dick Goin, Olympic Outdoor Sportsmen's Club: The rivers, all of them, literally came to a roiling, madly energetic life when the runs were on. Huge steelheads, chinooks, chums — honest 20-pounders, skunks, bears, gulls, eagles — incredible numbers of fish of unbelievable size. The Elwha once was the greatest river on the Peninsula. Its geology and components dictated

that it would have the greatest fish runs because it was the river that most severely tested those runs. Now the whole process is on its last legs because of two dams — constructed without fish passage facilities. These fish have waited 70 years to come home. Isn't it time?

From a National Park Service perspective, an important objective of this conference was to force various people to pull together and interpret information that had been accumulating in agency files — information on the ecology and management of the populations of wild fish that occur in this unique corner of the world. The need was to see what it was, how good it was, whether it supported the interpretations that had been made of it. From this perspective, the conference was rated by NPS personnel in attendance as a "considerable success."

Sponsors, in addition to Olympic NP and Peninsula College, were Olympic Outdoor Sports Association, Peninsula Plywood, Peninsula Fly Fishers, Crown Zellerbach, ITT Rayonier, Inc., American Fisheries Society (Pacific Northwest chapter), and the PNW National Parks and Monuments Association.

Publication of the papers, in a *Proceedings*, is underway.

Contor Gives 'Super's' View Of ONP Native Fish Picture

The level of aquatic biomass in Olympic NP is "unnaturally low," according to Park Supt. Roger Contor. "What we are experiencing is a literal silent spring. With the introduction of exotic stocks of fish to the park streams and rivers, we no longer represent 'a primitive vignette.' Hatchery fish indirectly cause extermination of some wild stocks, and when wild fish don't go upstream then everything else that depended on those fish simply fades out of the picture."

Contor described "the whole vibrant tapestry that once buzzed with life" — the Dolly varden, whitefish, cutthroat trout, and steelhead that ate salmon eggs; the black bear, wolves, skunk, bobcat, eagles, ospreys, even the ravens and seagulls. All these life forms once were present in teeming numbers around the salmon runs. Now they are much less abundant."

Olympic is the only national park in the contiguous 48 states with major anadromy, yet "we have no built-in understanding or concern for salmon and the sea-run trout," he said. "We have been asleep at the switch at Olympic. We have had no fishery biologist, no involvement in court

disputes, no close role in setting the seasons."

Whereas other parks of major natural significance have taken leading roles in shaping public policy that affects these parks, Olympic NP has not. This is so, Contor said, "despite the fact that our policies are clear enough. Fisheries management shall be specifically aimed toward preservation or restoration of the full spectrum of native species, including fish; and regulated for native species so that mortality is compensated by natural production. Artificial stocking . . . may be employed only to reestablish native species."

That is our major — our only — mandate, Contor said. And it allows us to establish gene pools of wild stocks, allows much more rapid changes in sport fishing regulations than is possible outside the park, and makes possible more experimental kinds of regulations which would be difficult for State fish commissions to approve.

"To get our heads out of the sand," Contor told the conferees, "we have promulgated new special fishery regulations for Olympic NP, contracted for research, cooperated with Washington State Game and

Ruffed Grouse Comeback At Buffalo National Forest

By Steve W. Chaney

State Fisheries departments and the local sportsmen's clubs, and gotten acquainted with most of the tribal fishery biologists on the Peninsula."

With some glee he added, "And now we're going to hire a fulltime fishery biologist at the park and work him to death."

A three-pronged approach to solution of the problem was proposed by Contor. "It has become clear to me," he said, "that the 1974 Boldt decision created a role for the National Park Service and that role will be exercised either by action or by default."

"Until the present, the so-called 'escapement' of fish has been a matter decided by two parties — the Indians and the State — and refereed by the judge. The solicitor who represented the Indians is now going to represent the National Park Service too."

Whenever the State and the Indians disagree on what the fishing seasons should be, they have to go to the court for decision. The court, said Contor, "has a lot of advisors, and the decision is made on the basis of all the advice."

In effect, what the judge has said is this: "You people cooperate, and set your seasons, or I will set them, and neither one of you will like it."

Faced with this reality, Contor devised his own holistic approach to what is essentially a holistic problem: "The problem is biological, legal, and political," he said, "and only an approach that matches the problem will make headway toward solving it."

In the biological area, the park is getting into contracted research with the U.S. Fish and Wildlife Service, and hiring its own full-time fish biologist.

"We're getting involved in the legal court decisions concerning fisheries, and we're making a heroic effort to communicate with all the user groups who have a stake in the fisheries."

"The facts are forcing us into all three areas," Contor went on. "With the exception of the Queets, we don't have control over the full length of a single river. We can't have our way alone. We have to cooperate with others who have what (to them) seem equally valid claims."

Northwest Assn. of Interpretive Naturalists will hold a 3-day workshop Oct. 5-7 in Moscow, ID, focusing on interpretation, the future, and you. Contact is Sam Ham, (208) 885-7911.

The Arkansas Ozarks that surround Buffalo National River once echoed each spring with the drumming sound that is part of the mating ritual of the ruffed grouse (*Bonasa Umbellus*). Occurrence of ruffed grouse in Arkansas was noted by the earliest travelers of the region, mainly along streams and river bottoms which created edges or ecotones between disturbed areas and the climax forests.

The land-use practices of the earliest settlers of the Ozarks — clearing followed by desertion of small patches of land — created ideal habitat for the ruffed grouse, which prefers a habitat niche made up of forest species in the 5 to 40 year successional stage. During this time period, the species flourished in the Ozarks.

Around the turn of the century, the area's human population had substantially increased, and land-use practices changed drastically. Hills were denuded of their timber, cattle and hogs were stocked far beyond the capacity of the land, and extensive burning was done to remove logging debris and to try to improve grazing and eliminate vermin. This sealed the fate of the ruffed grouse in the Arkansas Ozarks, and the last drummer drummed around the turn of the century.

Trends began to reverse around the period of World War I. As rural populations migrated to urban areas and as large tracts of land were converted to federal ownership, the abused Ozark lands started to revert to habitat once again favorable to the grouse. Wildlife biologists recognizing this, attempted restoration projects in Missouri (where a small remnant population remained) and in Arkansas in the 1940's and 1950's. These attempts were disappointing. The pen-reared grouse obtained from Sand Hill Game Farm in Wisconsin lingered for several years but demonstrated poor reproductive and survival capabilities. The last birds in Arkansas from these stockings were observed in 1959.

The curtain for Ozarks grouse had not completely closed, however. Persistent biologists, convinced that habitat suitability was not the limiting factor of a reintroduction program, further researched the ruffed grouse's needs and habits and refined trapping techniques. The effort eventually paid off, and an approach of using wild grouse for restocking proved successful for the Missouri Department of Conservation. Ruffed grouse populations in Missouri have multiplied from these reintroductions to the point that in some areas a limited hunting season may be allowed in 1983. This success, along with that of other states, rekindled interest in



Keith Whisenant introduces a Shenandoah grouse to his new Arkansas home.

restoring ruffed grouse in Arkansas.

Although the state of Arkansas attempted in 1981 to negotiate agreements with other states to barter turkey, fish or similar wildlife commodities for grouse, the states either were not interested, were already obligated to other states for grouse trades, or felt that wild trapping ruffed grouse in quantity was not feasible in their state. These circumstances led to a plan formulated by National Park Service staff at Buffalo National River and funded by the Southwest Region Office of Natural Resources to wild-trap ruffed grouse from another NPS area and reintroduce them at Buffalo River.

The program was started rolling by initiating contacts with other NPS areas that might be potential grouse donors. Both state and federal wildlife biologists agreed that grouse from areas of similar habitat and climatological conditions would adjust and fare better to relocation



The author picks up a shipment of eight ruffed grouse delivered by Arkansas Game and Fish Commission aircraft. The grouse were transported in containers designed for shipment of live poultry.

Ruffed Grouse Comeback - Continued

than those races or subspecies that might have developed some sort of interrelationship with specific foods, habitats or physical conditions that might not be present in the Ozarks. These conditions limited the search to the southern edge of the ruffed grouse's range. At the same time, the grouse biologist for the Missouri Department of Conservation was invited to Buffalo National River to help identify and prioritize potential stocking sites.

In August, 1981, an agreement was made between Buffalo National River and Cumberland Gap National Historic Park to allow Buffalo National River staff, with the support of Arkansas Game and Fish Commission personnel, to trap wild ruffed grouse from the rugged backcountry of the historic area located on the boundary of Virginia, Kentucky and Tennessee. Outstanding cooperation, without which the entire program would have failed, was exhibited among numerous areas and agencies throughout the entire operation that followed. Thirty specialized grouse traps constructed of net and wire were loaned to Buffalo National River by the Missouri Department of Conservation. Arrangements were made with the Indiana Department of Natural Resources, which was engaged in a grouse trade agreement with the state of Missouri, to allow Buffalo National River and Arkansas Game and Fish Commission staff to accompany the Department's grouse trappers to learn specific trapping, holding and shipping procedures.

After this on-the-job training was completed and formal clearance was received from the Virginia Department of Game and Inland Fisheries, the trappers traveled to Cumberland Gap and began organizing a trapping program. With the assistance of Cumberland Gap personnel, potential trapping sites were identified and holding and shipping logistics were worked out.

The first four days of trapping were damp, overcast and rainy and proved totally unsuccessful. Morale and confidence in newly learned trapping skills began to wane, and the discouraging accounts and pessimistic predictions of researchers and state agencies that had been consulted regarding the potential for trapping ruffed grouse in the Appalachian Mountains were recalled all too clearly. On the fifth day of trapping the weather turned clear and sunny, grouse activity increased, and a large male ruffed grouse, destined to be the first of his species to be wild-trapped and relocated to Arkansas, was captured. This was the beginning of a trapping program that resulted in the relocation of 50 grouse to Buffalo National River.

After capture, each bird was sexed, aged, banded and weighed, then held in a specially constructed pen for one to four days before being shipped via commercial airlines, Arkansas Game and Fish Commission aircraft and four-wheel drive vehi-

cle to the release site. An optimum goal of 80 to 100 birds per release site had been set during the formulation of the reintroduction project based upon research from the successful projects of other states.



Trapper Mike Widner watches as Charles Chadwell of Cumberland Gap removes a grouse from the capture pen. Netting and leaves used on top of the trap serve to minimize avian predation.

In order to attain this goal, another trapping program was conducted in 1982 in the Virginia mountains of Shenandoah NP. With outstanding cooperation and help from the park's staff and Arkansas Game and Fish Commission personnel, Buffalo National River resource management technician Mike Widner coordinated the trapping and relocation of another 43 birds resulting in a total of 93 grouse released at the Buffalo National River site.

Although the trapping programs were successful, the agencies have been even more pleased with the apparent survivorship and adaptive abilities of the birds since their release. Survival, dispersal and

reproduction have been closely monitored by way of snow track and flushing census spring drumming counts and brood surveys. Initial indications show survival rates better than expected, substantial reproduction, and dispersal at a rate slow enough not to cause breeding problems through species' density levels. Additional intensive studies already are underway to attempt to more closely quantify reproductive rates. Habitat usage and dispersal research using telemetry equipment is also planned.

Pending a firmer verification of success at this first reintroduction site, an expanded program is in the planning to carry out such projects at similar habitat sites at Buffalo National River. The Arkansas Game and Fish Commission also has made progress, and in 1982 began a reintroduction program of its own in other parts of the Arkansas Ozarks.

All this is extremely good news for the grouse, the National Park Service, the people of the Ozarks, and the entire state of Arkansas. We at Buffalo National River are optimistic that one day soon we may be able to revise our park brochure, telling visitors that the drumming of "ole ruffie" is once again a common sound in the hills 'n hollers of the Arkansas Ozarks.

Chaney is a Resource Management Specialist Trainer at Buffalo National River.

Capture Success / Moon Phase Comparison

New Moon Periods

	Days	Captures
September 27 - October 1	5	0
October 24 - October 31	8	5
Total	13	5
Average	.38 Captures / Day	

First Quarter Periods

	Days	Captures
October 2 - October 9	8	8
November 1 - November 7	7	10
Total	15	18
Average	1.2 Captures / Day	

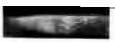
Full Moon Periods

	Days	Captures
October 10 - October 16	7	8
November 8 - November 18	7	7
Total	14	15
Average	1.07 Captures / Day	

Last Quarter Periods

	Days	Captures
October 17 - October 23	7	15
November 15 - November 18	4	3
Total	11	18
Average	1.64 Captures / Day	

Higher trapping success level during one quarter to full moon phases seemed to indicate increased activity levels during these periods.



Kudzu Eradication In Southeast Parks

By Susan Power Bratton

One of the most widespread resource management problems in the upland parks of the southeast is the invasion of exotic plant species, particularly exotic vines. Field surveys have shown, for instance, that 90 percent of the exotic woody plant cover at Cumberland Gap NHP is Japanese honeysuckle and kudzu, both vines introduced from Japan. Seventeen southeastern parks report difficulties with kudzu and 34 have Japanese honeysuckle. These species also are present in parks outside the Southeast Region, including Rock Creek Parkway and Prince William Forest Park.

Although Japanese honeysuckle has larger populations and more total acreage in most parks, kudzu has a greater impact on the surrounding vegetation. Once kudzu colonizes a road or disturbed site, native tree and shrub species are usually unable to reinvade the location and displace the kudzu. Kudzu climbs into the tops of nearby trees, eventually killing them by shading, and expanding the total area of its population. Due to the density of its thick mats of leaves and vines, very few native species can grow under kudzu. The species diversity and the potential for natural recovery of kudzu patches are both low.

In the past, many of the efforts to control kudzu have failed or have proven extremely expensive or labor intensive. Park staffs have experimented with both hand cutting and herbicide application. Frequently, however, the kudzu has reappeared season after season and remained a chronic management problem, requiring repeated attention.

In effort to convert kudzu management in parks from partial control to eradication, Aaron Rosen, a graduate student from the University of Tennessee, Knoxville, worked under the supervision of scientists from Uplands Field Research Laboratory on experimental removal of kudzu from large roadside populations in Cumberland Gap NHP and at Chickamauga-Chattanooga NMP. The methods also have been used at Shiloh NMP and Cowpens National Battlefield. The study was divided into two phases: 1) removal and control of kudzu, and 2) recovery of native vegetation on the sites. Working with student volunteers, Rosen established test plots on steep road cuts with very heavy kudzu cover, and divided the plots into smaller test blocks for both control and revegetation treatments.

At Cumberland Gap, Jack Collier, the park resources manager supervised a controlled spring burn of one test plot, but fire did little other than remove old foliage, and may actually have stimulated kudzu

growth. Kudzu is very difficult to burn during the summer, when it is in full leaf, so no further burns were attempted. Rosen then tested two different herbicides: Roundup, a general plant toxin that operates through foliar-uptake and Velpar a selective toxin (conifers are not susceptible) that operates through root-uptake. Roundup is applied using a backpack sprayer and Velpar is applied by placing gridballs directly in the soil. Both herbicides are relatively safe if properly used, but Roundup has a much shorter half-life and breaks down into non-toxic substances a few days after application. Velpar persists in the soil from one to six months.

Four initial treatments were tested: 1) June application of Roundup, 2) August application of Roundup, 3) May application of Velpar, and 4) May application of Velpar followed by Roundup. researchers used cover estimates and counts of live kudzu crowns to determine treatment effectiveness. Roundup alone was much more effective than Velpar alone, and late season (August) application of Roundup was more effective than early season application. Perhaps because it was a dry year, initial placement of Velpar gridballs in the soil had almost no effect on the kudzu. At Lookout Mountain, at Chattanooga, 93 percent of the kudzu survived the first Velpar treatment. June Roundup left 59 percent of the kudzu in

test plots at Lookout Mountain and 25 percent at Cumberland Gap. August Roundup left 7 percent of the kudzu at Lookout Mountain and 9 percent at Cumberland Gap. Velpar-Roundup was more effective than either Velpar or June Roundup alone, leaving 22 percent cover at Lookout Mountain and 11 percent at Cumberland Gap.

After all the test plots had received one additional Roundup treatment and had a spot treatment applied just to surviving crowns, Lookout Mountain had from 10 to 25 percent kudzu cover remaining and Cumberland Gap had from 1 to 8 percent. At the latter site, none of the surviving kudzu crowns were vigorous; continued spot treatment will probably eradicate the few remaining plants.

Since the removal of the kudzu left the steep, erosion prone road cuts with little live vegetative cover and it was thought quick establishment of native woody plants might inhibit regrowth of kudzu, Rosen tested several techniques for slowing erosion and speeding revegetation. With the help of a student volunteer, he planted three different species of native tree seedlings, with and without a straw mulch and with and without a seeded rye grass ground cover. In all, 12 different combinations of recovery treatment were tried.

The presence of the straw mulch had a slightly positive effect on seedling survival and the rye grass (*Lolium*



Park maintenance staffer uses a backpack sprayer to apply Roundup to kudzu. Control teams must carefully determine how and when herbicides are to be applied, if a control program is to be fully effective.

Kudzu Eradication - Continued

multiflorum) had a slightly negative effect. (Rye grass is an exotic, but it was decided it was safe to use because it is an annual and unlikely to spread or self seed). Of the three species of seedlings planted, short leaf pine (*Pinus echinata*) had the best survivorship, followed by tulip poplar (*Liriodendron tulipifera*). Black walnut (*Juglans nigra*) had about 10 percent greater mortality than the other two species, and showed visible signs of insect damage through the first season. Spot spraying with Roundup to remove remaining kudzu crowns did result in some pesticide drift and in some seedling mortality. At Lookout Mountain seedling survival dropped from 90 percent to 75 percent after further herbicide treatment and at Cumberland Gap it fell from 92 to 86 percent. The remaining seedlings should still produce more than enough saplings to recover the plots, however.

The mulch and the rye grass did relatively little to suppress the kudzu. The only statistically significant effect was the difference between the mulched and unmulched plots at Cumberland Gap,

where the former had 6 percent cover of kudzu and the latter 10 percent. The mulch and the rye grass did significantly suppress natural recovery of herbaceous vegetation on the test sites, particularly at Cumberland Gap. Plots without mulch or rye grass had between 50 and 60 percent herb cover the first season after treatment. This natural regeneration probably does little to retard kudzu growth, but appeared to inhibit surface soil erosion. (Note, however, that erosion was not quantified). In most cases, the addition of mulch or rye grass is probably not worth the extra expense and effort.

The results of this study indicate that 80 percent control or better can be achieved in a single growing season if repeat herbicide applications are used and timed far enough apart for foliage to resprout. Roundup proved to be much more effective than Velpar, especially in late season application. The resources manager should note that some of the past problems with kudzu control through herbicides are probably the result of once a year treatment without follow-up. If kudzu is given a chance to resprout and begin to

add much new foliage it will quickly reoccupy a site. Timing is very important in optimizing control strategies. Also, if the control team applies too much foliar herbicide, they will top kill the plant without killing the roots. If too little is applied the leaves will yellow but the plant will survive.

The manager needs to consider the recovery of native vegetation. In the first two general applications of Roundup, almost all the vegetation in direct contact with the spray will die. Thus after the major portion of the kudzu is gone, it is important to switch to spot spraying to allow native species to recover. Some problems with drift are to be expected even if chemicals are carefully applied. A control team working on spot spraying needs to search thoroughly for all kudzu crowns and needs to be able to distinguish native from non-native plant species. Careful general application of herbicide at the beginning, repeated as soon as necessary and followed by spot spraying can greatly reduce the amount of herbicide used through time, because of the immediate and species specific nature of the control.

Throughout the project, records were kept on the costs of material and the man hours necessary for each treatment. Roundup cost more per acre than Velpar for materials (\$128 per acre versus \$83 per acre, in 1980) and took twice as much time to apply (20 man hours per acre versus 10 person hours per acre.) Estimating labor at \$5 an hour, Roundup cost \$228 per acre as opposed to \$133 for Velpar. Mulch cost \$360 per acre for materials and \$50 for labor, totaling \$410, and ryegrass cost \$8 per acre for materials and \$15 for labor, totaling \$23. The tree seedlings varied in price from \$190 per acre for pine, to \$220 for tulip poplar, to \$475 per acre for black walnut. Cost of planting was estimated at \$1,050 per acre, although during the research project this was accomplished by volunteers. It is still too soon to see if the plantings have accelerated recovery enough to make the extra expense worthwhile.

In order to make the results of this study generally available to interested park managers, the Office of the Chief Scientist, Southeast Region has had copies printed for distribution. These may be obtained from: Uplands Field Research Laboratory, Great Smoky Mountains National Park, Gatlinburg, TN 37738 by requesting: Feasibility Study: Eradication of Kudzu, Research/Resources Management Report SER-59.

Bratton is a research scientist with the National Park Service Cooperative Unit, Institute of Ecology, University of Georgia, Athens, GA 30602



A population of kudzu climbing into the trees at Cowpens National Battlefield. The park staff had attempted to remove the kudzu by hand-cutting but the vine returned.

Regional Highlights

Pacific Northwest Region

Three impressive paintings by National Geographic illustrator Roy Anderson will comprise panels 4, 5, and 6 of a new trail-side exhibit entitled "Island In Time Trail" at the Blue Basin Overlook of John Day Fossil Beds NM in Eastern Oregon. The full-color paintings depict oreodonts, tortoises, and stabbing cats in their natural habitat some 28 to 35 million years ago. Also part of the half-mile trail will be bubble-covered exhibits of the fossils themselves, replicated to look as though they were just emerging from the local soil. Panel No. 1 is the trail head orientation; No. 2 is "Island in Time" in a poetic mode; No. 3 is the fossil record, and No. 4 is entitled "The Next Chapter." All line illustrations were done by Daniel D. Feaser, a retired Harpers Ferry illustrator. The exhibits will be mounted on basalt rock pedestals; the trip time is estimated at one hour.

* * *

A specimen of the rare *Grylloblatta chirurgica* — the Cave Basalt Grylloblattid — was found in early April (1983) at the Grand

Column of the Oregon Caves National Monument by Charles Davis, employee of the Caves concessionaire. The insect occurs in a single lava flow and its caves, and the type population may be extinct. The largest remaining population is threatened by the indirect effects of Mount St. Helens' volcanic activity, according to an article in the March 1983 issue of *The Speleograph* (Vol. 19, No.3). The journal article quotes Rod Crawford's contribution to *The Invertebrate Red Data Book* (a project initiated in 1979 by the IUCN), whose purpose is to provide the best possible information on threatened species of organisms so that government and organizations can make informed judgments about land use and other activities.

The Red Data book article describes several caves in which the insect occurs, all of them on National Forest lands, and all threatened by results of the 1980 St. Helens eruption.

* * *

Brad Griffith of the University of Idaho NPS/CPSU is the author of a new CPSU publication, *Ecological Characteristics of Mule Deer: Craters of the Moon National Monu-*

ment, Idaho. The document, CPSU/UI 83-2, is available from the University of Idaho CPSU, College of Forestry, Moscow, ID 83843

* * *

Flash! A 2-day workshop on Microcomputer Applications for Environmental Interpretation will be held at Oregon State University Aug. 23-24, covering use of software in administering, developing, and evaluating interpretive programs. Fee \$220. Contact Ed Starkey, NPS/CPSU, OSU, Corvallis, OR 97331. (503)754-2056.

Western Region

Sixteen NPS Rangers from the Western Region took part May 2-6 in a salt water diving workshop and underwater archeological assessment of the wreck site of the *Winfield Scott*, located in Channel Islands NP. Western Region Dive Officer Dave McLean and Western Regional Archeologist Roger Kelly set up the workshop, led by Dan Lenihan, Jerry Livingston, and Larry Murphy of the NPS Submerged Cultural Resources Unit from Santa Fe, N.M.

In addition to teaching Western Region divers how to undertake an underwater archeological survey using proper mapping techniques, magnetometers, metal detectors, video systems, and cameras in an open ocean environment, the workshop staff directed the gathering of data from the wreck site to prepare a nomination for the National Register of Historic Places. Map, slides, and summary data will be ready for submission by mid-July.

Southwest Region

Crews from the U.S. Fish and Wildlife Service and the Brownsville (TX) Zoo were in Mexico in June gathering Atlantic Ridley turtle eggs on the east coast for use in the 1983 reintroduction project at Padre Island NS. (See cover story, *Park Science*, Winter 1982). About 2,000 eggs will be hatched in the Padre Island sands, imprinted in the surf there, and then recaptured to spend a year at a Galveston hatchery before being reintroduced to the Gulf of Mexico and freedom at Padre Island.

* * *

For the first time in a number of years, a



Ben Ladd, Superintendent of John Day Fossil Beds NM, stands next to the John Day Monument's Cant Ranch bunk house, now housing the Fossil and Fossil Hunters Exhibit. Inside are historic photographs of the 1889 Princeton Expedition. Also featured are Thomas Condon, pioneer minister and naturalist from The Dalles (who worked the area in 1862), Othniel Marsh of Yale, Edward Cope of Philadelphia (both there in the 1860's), William Scott of Princeton (1870's), and John Merriam of U/Cal, Berkeley, (1899). The simple, effective presentation captures much of the high drama of those early digs, some of which reached the front pages of the *New York Times* of that day.

Regional Highlights - Continued

pair of peregrine falcons has taken up residence in a previously occupied aerie at Big Bend NP. NPS personnel watching the nest area feel that the pair may not produce this year, but that they may be establishing a home for the future.

Midwest Region

The Research and Science Division met in April with five social scientists to discuss potential roles sociology might play in short- and long-term planning for dealing with visitor-related problems in Midwest Region park units. The discussion panel consisted of Don Field (PNR), David Lime (USFS, Minneapolis), Tom Heberlein (Univ. of Wisc.), Gordon Bultena (Iowa State Univ.), and Ken Chilman (Univ. of Ill., Carbondale.)

Mid-Atlantic Region

Shenandoah NP, in May, hosted its 7th Research Symposium, featuring papers on research and resource monitoring projects in the park. The meeting was attended by academicians, scientists, and resource managers. Park Supt. Robert R. Jacobsen noted that the symposiums always prove "of great value in providing a forum for everyone involved in park studies to become informed about current study results and to exchange up-to-date information and ideas."

* * *

With the full support of the superintendent, Gateway NRA natural resource management personnel are proceeding toward establishment of the Gateway Institute for Natural Resource Sciences — a cooperative project with other institutions in the New York metropolitan area, dedicated to comprehensive research, maintenance, and monitoring of the park's natural and cultural resources.

The effort involves and integrates the activities of funding agencies, scientific researchers, industry, concerned citizens, academia, and policymakers . . . all in a manner designed specifically to create sound decision making.

The Institute is being shaped to coordinate the approaches of researchers into the study of significant resource management problems identified in the Park's RMP. Social scientists at the Institute will be involved in historical, sociological, and planning aspects of Gateway, tying together many of the Institute's studies into long term cost/benefit analysis and conducting cause/effect relationship analyses.

Three different groups of researchers will be drawn on: (1) those participating group faculty members collaterally assigned to the Institute's facility; (2) those who come to study as visiting professors or on sabbaticals, and (3) those who have laboratories at other institutions participating in the Institute. An analysis of the social, political, and economic implications of following the various policy options will be carried out concurrently with the experimental research. The Gateway NRA Natural Resource Management Specialist, together with the research team, will be responsible for producing a document integrating this information into a comprehensive model.

CPSU Unit Established At Clemson

By Jim Wood
Science Editor, SER

A new Cooperative Park Studies Unit has been established within the College of Forest and Recreation Resources, Department of Parks, Recreation, and Tourism at Clemson University, Clemson, S.C. Dr. Dominic Dottavio was named Director of the unit, according to G. Jay Gogue, Southeast Regional Chief Scientist.

Dottavio brings impressive credentials, experience, and background to the Clemson CPSU. For two years prior to undertaking his new responsibilities, "Dom" was Director of the Center for Natural Areas in Washington, D.C. This Center was formerly a part of the ecology program of the Smithsonian Institution. Dom also served as silviculture instructor at Purdue University, West Lafayette, Ind. from 1974 to 1979, and was graduated with a B.S. in Natural Resource Management from Ohio State University. He also holds an M.S. in Forestry from Yale University and a Ph.D. in Forestry from Purdue.

At Clemson, Dom will be conducting several high-priority projects for the Southeast Region. These involve:

1. Assisting the Region in the development of microcomputer capabilities, including training and development of software programs. These computer programs relate to park resource management plans, general information on park facilities and services, time and attendance sheets, cost tracking, and the computerization of the TAP System (Track, Analyze, and Program) at Great Smoky Mountains NP.

2. Coordinating the development of strategies and policies for dealing with encroachments to Southeast Region parks. A series of workshops will be held throughout the region to accomplish this.
3. Developing a Leadership Training Program for park managers in the Southeast Region. This program is being established to assist leaders to think comprehensively and to apply their communication skills in the resolution of problems and the identification of future economic, environmental, and social issues that will affect the Park Service.
4. Coordinating a regional effort to assess the impacts of travel and tourism-related activities and developments on the parks.
5. Conducting research studies as a part of the Southeast Region Social Science Center. Three research projects are currently underway: (a) a study of visitation patterns on Playalinda Beach at Canaveral National Seashore; (b) an assessment of visitor impacts, use patterns, and characteristics at Big South Fork National River and Recreation Area; and (c) a study on the reaction of visitors to reduced roadside maintenance levels at Blue Ridge Parkway.

Persons interested in Dr. Dottavio's work can contact him at:

National Park Service CPSU
Park/Recreation Management
263 Lehotsky Hall
Clemson University
Clemson, South Carolina 29631

Southeast Region

The Southeast Region is conducting five science/resource management conferences this Spring and Summer. On April 29-30, the second annual Chattahoochee River Research/Resource Management Conference was held at the park's Island Ford Center; a Workshop on Biosphere Reserves and Other Protected Areas for Sustainable Development of Small Caribbean Islands took place May 10-12 at Caneel Bay, St. John, U.S. Virgin Islands (Virgin Islands National Park); the Ninth Annual Scientific Research Meeting for the upland parks of the Southeast Region convened at Great Smoky Mountains National Park on May 19-20; the Northern Gulf of Mexico Estuaries and Barrier Islands Research Conference was held June 13-14 at the Gulf Coast Research Laboratory, Biloxi, Miss.; and a science/resource management symposium is planned for late summer or early fall at Cumberland Island National Seashore. The proceedings for all five conferences will be published by the Science Division, Southeast Regional Office.

* * *

A "Sea Turtle Monitoring Handbook" has been published by the Southeast Region Science Division for in-house field use at Cape Lookout, Cumberland Island, and Canaveral National Seashores to serve as a guide for NPS personnel and volunteers who monitor the nesting activities of sea turtles there. The handbook outlines survey methods, data collection procedures, and equipment necessary to conduct the surveys. It is hoped the handbook will result in improved, uniform and standardized procedures for monitoring the sea turtles at the three seashores, and thus result in useful site comparisons.

* * *

Ro Wauer, most recently chief of the WASO Division of Natural Resource Management, moved on April 17 to Great Smoky Mountains NP and into a newly created position — assistant superintendent for science and resource management. Wauer has been a ranger and/or naturalist at Crater Lake, Death Valley, Zion and Big Bend NPs, and he served as chief scientist and chief of resource management for the Southwest Region when John Cook, the new superintendent at Great Smokies, was Regional Director.

Information Crossfile

Editor's Note: As part of an effort to over more journals around the country, **ark Science** is seeking people who will volunteer to read and report on articles of interest to our readership. The Pacific Northwest Region has come up with the following self-assignments:

Don Field, **American Demographics, Demography and Leisure Sciences**; Gerry Wright, **Environmental Management and Journal of Environmental Management**; Doug Houston **Ecology and Journal of Applied Ecology**; Darryll Johnston, **Harvard Business Review and Administrative Science Quarterly**; Jim Agee, **Journal of Forestry and Canadian Journal of Forestry**; Jim Larson, **Science and BioScience**; Ed Starkey, **Journal of Wildlife Management**; Gary Machlis, **Journal of Interpretation**.

* * *

The Summer of 1983 issue of **Western Wildlands**, quarterly publication of the Montana Forest and Conservation Experiment Station, (University of Montana School of Forestry, Missoula 59812) is devoted to recreation management in the West. Included are articles on "The National Parks and Local Communities: A Problem Analysis," "In Search of Balance: A No-Rescue Wilderness Proposal," "The National Parks in Post-Industrial America," and "The Role of Regulations in Recreation Management."

This issue of the publication is available for \$2.50 from the Experiment Station.

* * *

The **Journal of Interpretation** (official publication of the Association of Interpretive Naturalists) carries, in its Vol. 7 No. 1 (1982) issue an article on "The Role of Interpretation in Managing for Recreational Carrying Capacity." The authors, Joseph W. Roggenbuck, William E. Hammitt, and Deborah L. Berrier, describes how interpreters can assist in carrying capacity management by acquiring information about public preferences, helping visitors find recreation areas that meet their needs, fostering more realistic visitor expectations, and promoting low impact behavior at recreation sites. Suggestions are included as to how interpreters might best perform these tasks.

* * *

Australian Ranger Bulletin, Spring 1982 issue, is devoted to feral animals and how to deal with them. "Control Methods for Wild Pigs," "Feral Cat Control On Tasman Island," "Introduced Fishes of Victorian

Inland Waters," "Feral Goat Control — Danggali Conservation Park," and "Management of Feral Buffalo in Kakadu National Park" are merely a few of the titles.

Also contained in the Spring Bulletin is word from WWF/IUCN, World Conservation Centre, 1196 Gland Switzerland, to the effect that "the North American appetite for hamburgers is directly responsible for the destruction of large areas of Latin America's rainforests." Two thirds of Central America's tropical forests already have been destroyed, "much of it due to large scale cattle ranching geared at providing low cost beef to the North American markets. This process turns forests into hamburgers . . ."

* * *

The final report on their work at Glacier NP has been published according to word from R. Gerald Wright, Kurt Jenkins, B. Butterfield, and C. Key. The 192-page document is entitled **Riparian habitat study, North Fork and Mainstem Flathead River, Montana. Final Report Flathead River Basin Environmental Impact Study, EPA.**

* * *

The Oregon Department of Fish and Wildlife is compiling a massive amount of data on the bobcat — its population density, range, reproductive levels, population age structure, and behavior. Live-capture, ear-tagging, and radio transmitter collaring have been used, with monitoring done from aircraft. Volunteer houndsmen have contributed hundreds of hours to the study, which began in 1979 and is continuing this year.

* * *

William Tucker, whose book **Progress and Privilege** equates environmentalism with elitism, has an article in the June 1983 issue of **Inquiry** magazine in which he describes "the environmentalists' new-found romance with the market." He quotes Grant Thompson of the Conservation Foundation as follows: "There's a whole logic that says that economics and environmental considerations are compatible. After all, a smoothly working economy is simply getting the most bang for the buck. And that's what resource conservation and environmental protection are all about as well. There's no reason why we can't make it all work together."

* * *

Environmental Management, Vol. 7, No. 2, carries an article by John T. Tanacredi on

Information Crossfile - Continued

"Coastal Zone Management Practices at an Urban National Park." Tanacredi, who is Natural Resources Management Specialist at Gateway NRA, describes the range of coastal experiences available to visitors at Gateway, the problems that these opportunities include, and the current management approach which is to permit the evolution of the dominance of natural forces and the resulting landscapes and ecological scenes. To do this, Tanacredi suggests, the inter-relatedness of all natural events must be presented to visitors in a way that bridges "the gap between scientific research in parks and traditional interpretive skills."

The April 1983 issue of *BioScience* (Vol. 33 No. 4 pp 248-254) contains an article by Paul Ehrlich and Harold Mooney entitled "Extinction, Substitution, and Ecosystem Services." The article focuses on the loss of services to humanity following extinctions — the effects ranging from trivial to catastrophic — and recommends "a conservative approach to the maintenance of services through minimizing anthropogenic extinctions." The authors contend that the degree to which genetic library functions can be replaced is hard to evaluate, but they cite wheat, maize, rice, horses and cattle, plus an array of other foods, medicines, industrial products and aesthetic treasures to back their statement that "humanity has already withdrawn from the library the very basis of civilization . . ." As for mankind's new-found ability to engineer genes and fabricate substitute organisms, their observation is that "if geneticists could fashion an organism precisely 'to order,' ecologists would not know what to ask them to make."

"Is Acid Rain Harming the Smokies?" is the title of an article by Jim Wood, *SER Science* Editor, in the February 1983 issue of *Parks and Recreation* magazine. The article describes, in lay terms, the problem, the vulnerability of the many parks situated in acid-sensitive regions, and the federal agencies (NPS among them) that have joined the National Atmospheric Deposition Program to monitor acid rain nationwide. Sixteen of the 93 monitoring stations are located in National Parks.

A call for a new study of outdoor recreation in the United States was sounded by Rexford A. Resler, executive vice-president of the American Foresters, in an article in the April 1983 issue of *American Forests*.

"Clearly," Resler writes, "we are at an important crossroads of public policy. It is time for change — but what kind of change? How much? In what direction? On

these questions there is no discernible consensus. To help provide answers, it is time for another comprehensive, objective study of the scope and magnitude of the ORRRC (Outdoor Recreation Resource Review Commission) effort . . ."

Resler describes a preliminary analysis of what such a study would entail, prepared by a group chaired by Henry L. Diamond and including Emery N. Castle, president of Resources for the Future, Inc.; Sheldon Coleman, chairman of the Coleman Company; William Penn Mott, Jr., president of the California State Parks Foundation; Patrick F. Noonan, president of Conservation Resources, Inc.; William K. Reilly, president of the Conservation Foundation; and Laurance S. Rockefeller, former chairman of the ORRRC. The report is available from Resources for the Future, 1755 Massachusetts Ave., N.W., Room 700, Washington, D.C. 20036, at a cost of \$2.

An outstanding paper describing plant adaptation in an ecosystem context appears in *Ecology*, Vol. 64, No. 2, 1983, pp. 307-318. S.J. McNaughton and colleagues discuss their research on *Kyllinga* in a semi-arid location, Serengeti region, Tanzania. Doug Houston, who called the paper to our attention, terms it "a splendid example of using lab studies in support of extensive field work."

The principal objectives were (1) to evaluate the importance of interaction among environmental factors as regulators of plant growth and yield, and (2) to determine how adaptations of a native forage plant might regulate primary production and energy flow in a natural grassland ecosystem. (Nitrogen, water, and defoliation intensity were chosen as environmental variables.)

It was found that "(1) factor interaction, in the statistical sense, was less important to the performance of *Kyllinga* than was the multifactorial nature of environmental regulation . . . (2) principal adaptations of *Kyllinga* to the severe grazing that it experiences in nature and that characterized this experiment were an ability to sustain active leaf tissue by a proliferation of active meristems, more rapid rates of leaf growth in defoliated plants, and a reduced rate of leaf senescence in the defoliated plants. It was also capable of maintaining a constant allocation of biomass to various organs, largely independent of environmental control."

In summation, the authors state: "We believe the result of this experiment that is most important for understanding ecosystem organization in grasslands where herbivory is intense and involves a long coexistence with native plants and animals, is that the trophic web based on grazing may be sustained with no net loss to the plant. That is, destroying the animal fauna of the Serengeti would not result in

greater residual plant biomass in regions where plants like *Kyllinga* dominate the foliage layer. Rather, it would result in a net diminution of total energy and nutrient flow through the system. Plants capable of compensating for herbage removal may support a dense and complex trophic web with no cost to themselves. In fact, such a web is likely essential to their existence."

"Acid Rain: A Water Issue for the 80's" is the title of an 84-page paperback book, edited by Raymond Herrmann and A. Ivan Johnson for the American Water Resources Association. The 11 papers it contains are re-printed from *Proceedings of the AWRA International Symposium on Hydrometeorology* and published this year by AWRA, 5410 Grosvenor Lane, Suite 220, Bethesda, MD 20814. Cost is \$5.95 per copy. The Foreword states: "These 11 papers, taken together, set the stage of ongoing U.S. activities within an arena of interdisciplinary relationships and also put in perspective the significance of the acid deposition problem as a national water, and related riparian, resource issue."

The March 1983 issue of *Science* carries a summary of the history of fires entitled "Fire Mosaics in Southern California and Northern Baja California," by Richard A. Minnich. To compare areas where fire suppression has been practiced with uncontrolled areas, wildfires of southern California and adjacent northern Baja California are evaluated for the period 1972 to 1980 from Landsat imagery. Suppression was found to have divergent effects on different plant communities depending on successional processes, growth rates, fuel accumulation, decomposition rates, and length of flammability cycles. Suppression has minimum impact on coastal sage scrub and grassland. Fire control in chaparral reduces the number of fires, not the burned hectareage. The Baja California chaparral fire regime, it is suggested, may serve as a model for prescribed burning in southern California.

"Assessing Air Quality with Lichens and Bryophytes" is the title of one symposium to be presented Aug. 8, 1983, at the annual meetings of the American Institute of Biological Sciences. The meetings will take place at the University of North Dakota, Grand Forks, ND, Aug. 7-11. This symposium is sponsored by NPS in cooperation with the American Bryological and Lichenological Society, and will address various methods of using lichens and bryophytes in air quality monitoring — summarizing techniques presently in use and evaluating their reliability and usefulness in assessing air pollution damage.



A report titled **Problems and Practices in Wilderness Management: A Survey of Managers** has been published by the USFS Inter-mountain Forest and Range Experiment Station. The authors are Randel F. Washburne, social scientists, and David N. Cole, research ecologist. They surveyed the managers of all units within the National Wilderness Preservation System — 269 wilderness areas, and their report is a compendium of a broad range of topics including use characteristics, management techniques and nonconforming uses. Most information is organized by managing agency — the Forest Service, the National Park Service, the Fish and Wildlife Service, and the Bureau of Land Management. The report also is structured by status of the area (wilderness, proposed wilderness, or primitive area), and by region of the country.

Single free copies are available from the Station, 207 25th St., Ogden, UT 84401.

Three New Reserves Accepted by MAB

Three new nominations for World Biosphere Reserves in the United States have been accepted by the Man and the Biosphere Bureau, UNESCO Paris, according to Bill Gregg, Co-chairman of the U.S. Biosphere Reserve Directorate, Washington, D.C.

The new Reserves followed the multiple site approach, whereby ecologically and functionally complementary sites are included within a biosphere reserve which bears the name of a biogeographic region. The sites and their components are:

California Coast Ranges Biosphere Reserve (Oregonian Biogeographic Province), comprised of Redwoods NP, three California state parks (Jedediah Smith, Del Norte Coast, and Prairie Creek Redwoods), the U.S.F.S. Redwood Experimental Forest

and Western Slopes of Cone Peak, The Nature Conservancy's Northern California Coast Range Preserve, the BLM Northern California Coast Range Preserve Research Natural Area, the BLM Elkhorn Ridge-/Brush Mountain area, and the University of California's Landela-Hill Big Creek Preserve;

South Atlantic Coastal Plain Biosphere Reserve (Australoriparian Biogeographic Province), comprised of Pinelands National Reserve in the New Jersey Pine Barrens and the Congaree Swamp National Monument; and

Central Gulf Coastal Plain Biosphere Reserve (Australoriparian Biogeographic Province), consisting of the Lower Apalachicola River Basin in Florida.

A Quarter Million Years Stands Still For Photo

A five-column 15-inch photograph in the May 1, 1983 *Oregonian* (page C-4) shows 200,000 years of history in about 80 feet of sediment along the steep bank of the Ana river, northwest of Lakeview, Oregon.

"The world is a giant sandbox to Rob Negrini and Jonathan Davis," the story, by Richard Read, begins. Negrini is a doctoral candidate in geology at the University of California at Davis; Davis is an associate research professor at the University of Nevada's Desert Research Institute's Social Science Center.

The spectacular photo was taken by Bob Ellis, Oregonian staff photographer, from across the river, and shows the two scientists at work — one at the top and the other at the bottom of the gash. Arrows point to various identified layers, beginning with the surface, which consists of Mount Mazama ash deposited by the eruption that formed Crater Lake, a mere 6,800 years ago.

Only inches below lies the Trego Hot Springs bed, formed 23,400 years ago by a Cascade volcano. Directly beneath, is the Wono bed, 24,800 years old — resulting from a blast from Mount Mazama or Mount Shasta.

A dramatic five-inch thick layer of white

— the Marble Bluff bed — is the result of a Mount St. Helens eruption 34,000 years ago. The blast was somewhere between 10 and 100 times as powerful as the volcano's 1980 eruption. Ash from the 1980 explosion left only 1 centimeter of residue at equivalent distances.

At the photo's bottom is Negrini, cleaning off the river bank to reveal the "salt and pepper beds," a puzzling layer about 210,000 years old, whose basalt and coarse white-grained composition testifies to either the simultaneous eruption of two volcanoes, or else a single volcano that spewed more than one material.

Refuge Pocket Guide

A pocket-sized guide to the 413 National Wildlife Refuges is available for \$2.25, or \$31 per 100 copies, from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 2042. The **Visitor Guide to the National Wildlife Refuges**, complete with map, includes a list of major public uses on each refuge, addresses, and other information.

Holden Keeps Snowing — We Get the Drift

Out of the quagmire of scientific equations, like Aphrodite rising from the sea, comes a "bemused, bespectacled and bearded geologist — a dropout who headed for the hills of north central Washington in 1974," poking fun at scientific stuffed shirts and getting paid to do it.

John Holden of Winthrop, Wash., was written up recently by the Associated Press — an article accompanied by a photograph of Holden displaying one of his own designer T-shirts. The shirt's legend, under a formula that reads πR^2 , declares: "No! Pi are round. Cake are square."

A serious geologist, writer and illustrator, Holden frequently contributes to the Chicago-based *Journal of Irreproducible Results* — all, according to the AP, "in the lofty cause of needling." He also produces such bumper stickers as "Stop Continental Drift" — a theme that inspired his cartoon of people aboard the North American continent screaming, in panic, "Look out — here comes Africa!" Holden has suggested bolting the continents in place to end the worry. He also has counter-theorized "continental drip" . . . postulating that all continents "dribbled off the South Pole." He is the founder of the International Stop Continental Drift Society, whose goal, he said, is "immediate cessation of sea-floor spreading, cooling of orogenic magmas, quiescence of large volcanoes, damping of seisms greater than 4.0 on the Richter scale, and the ending of subduction and other crustal discriminations." It costs \$5 to belong.

Scientists at St. Helens Study Natural Systems Recovery

Detailed measurements of Spirit Lake, in the Mount St. Helens "red zone," indicate that deep water oxygen depletion still is occurring but at a decreasing rate, according to Doug Larson, limnologist with the U.S. Army Corps of Engineers.

Scientists from the U.S. Forest Service, the National Park Service, and various Universities in the Pacific Northwest have been accompanying the bi-weekly monitoring teams on their helicopter flights into the Red Zone — taking advantage of the research opportunities offered by the May 1980 cataclysm.

On June 6, for instance, Bacteriologist Mike Glass of the Washington Department of Social and Health Services, found large numbers of tadpoles in various stages of development swimming in pools along a stream just below Spirit Lake.

Larson and Steve Sumioka of the U.S.G.S., in a day of monitoring out on the lake, observed numerous flies, beetles, butterflies, and other evidences of strongly returning life in and around the lake.

The June 6 readings showed substantial heating of the upper 20 feet of water — 11.8 degrees C. on June 6 at the surface compared to 5.3 degrees on April 25. (Temperature at the 132-foot level stayed approximately the same, at 4.2 to 4.4 degrees C.). Dissolved oxygen readings for top and bottom of the lake on June 6 were 8.8 mg per litre at the surface and 4.9 at 125 feet compared to 8.1 at 46 feet and 6.7 at the bottom on April 25.

The deep water oxygen depletion is a result of the loads of organic material in suspension and in the bottom sediments, which are being consumed by bacteria — using up the oxygen in the process of assimilation. At the same time, thermal stratification caused by the heating of the upper layer of water is preventing full circulation and reoxygenation of the lake

waters.

"Over the next two or three years, we should see oxygen depletion become less and less severe," Larson said.

Regular measurements are being taken at Spirit Lake for temperature, dissolved oxygen, pH, conductivity, chlorophyll a, phytoplankton, Secchi disk readings, photometer readings, hydrogen sulphide, total organic carbon, alkalinity, and various metals such as lead, zinc, copper, and mercury.

Larson, who did his doctoral thesis on the limnology of Crater Lake, will be spending his 10th year on the lake this year as principal limnologist for the NPS. He will be establishing a limnological water quality monitoring program and coordinating research by other investigators.

In collaboration with Dr. Cliff Dahm of Oregon State University, Larson will focus his specific research activities this summer on the effects of ultra violet radiation on lake phytoplankton populations.



Doug Larson, principal limnologist for Crater Lake this summer, directs the transfer of monitoring gear from station wagons to helicopter as scientists prepare to enter St. Helens' Red Zone.



Steve Sumioka, USGS, balances his combination temperature and dissolved oxygen probe and records information from the surface to the 132-foot deep bottom of Spirit Lake.

MAB Workshop Precedes V.I. Reserve Dedication

The Workshop on Biosphere Reserves and Other Protected Areas for Sustainable Development of Small Caribbean Islands was held May 10-12 at Caneel Bay, USVI, and climaxed with dedication of the Virgin Islands International Biosphere Reserve.

Co-sponsored by NPS, Man and the Biosphere, and the Caribbean Conservation Association, the workshop provided an opportunity to familiarize scientists, resource managers, and administrators from the region with the multiple functions of biosphere reserves in baseline monitoring, restoration, experimental research, demonstration, and training.

Agreement was reached to set up a coordinating group to develop detailed recommendations for establishment of a multinational, multisite Lesser Antillean biosphere reserve. Working groups were named to identify and evaluate potential baseline study sites, assess regional trends, designate priority areas of research emphasis, and come up with areas where experimental research, restoration projects, and demonstration activities could most productively be established. Proceedings are being published by NPS.

NPS Director Russell E. Dickenson addressed the May 12 dedication, as did Dr. Bernd von Droste of UNESCO, Parks, Senator Viridin C. Brown of the Virgin Islands, and William P. Gregg, Jr., co-chairman of the U.S. Biosphere Reserve Directorate, Washington, D.C.



Bleak landscape is offered by the north side of Mount St. Helens, its slowly building crater cone looming over the devastated remains of Spirit Lake.

Threatened Shorebirds Get Help From Volunteers At Gateway NRA

By John Tanacredi

In direct competition for use of open beach areas, some concerned people are throwing a punch on behalf of struggling shorebirds.

At Gateway National Recreation Area, two species of colonial nesting shorebirds, both of which are on the New York State threatened and endangered species list, can be found nesting and breeding within the park boundaries. The Common and Least tern (*Sterna hirundo* and *S. albigrons*, respectively) are determinedly building their nests there, within the shadow of the urban skyline.

During the 1983 spring, the park put out a call to the local community to lend a hand in increasing and protecting necessary habitat for these species by isolating areas within the park for their exclusive use. Some 25 volunteers from the New York City chapters of Audubon and Sierra Club aided in fencing off portions of the ocean beachfront to pedestrian and ORV access, thus expanding by approximately one-third the area previously available for these species.

The problem at Gateway is only one slice of the larger situation that prevails around the ocean-lapped edges of the country. With 54 percent of the population living within 50 miles of our coastline, the colonial nesting shorebirds must compete for habitat with recreationists and developers.

Adult terns return from their Latin American wintering areas in late April and early May. As with most Larids, common terns locate their colonies on islands and isolated beaches. Their colonial nesting hab-

its make good site selection important. A predator, or humans, stumbling into a colony can easily eliminate large numbers of eggs and chicks.

In addition to isolation, good tern habitat normally is characterized by some form of low vegetation. Older chicks, when not guarded by the parents, crouch under nearby plants for protection from predators and the sun's heat. Another essential for a tern colony is adequate food supply within several miles.

Tern nests vary in quality from well-constructed groups of twigs and grasses to slight depressions in the sand lined with shell fragments. The eggs are really well camouflaged, their color light brown or grey-green with darker spots.

About three weeks after the clutch is completed, the eggs hatch into small balls of down. The young chicks are able to walk almost from birth and require up to 10 minutes a day. This parent-pooing diet boosts the chicks to adult size in only 24 days, at which point they have shed their down and grown adult-like feathers.

Adult terns continue to help their young learn to fish and will feed their young during migration and throughout their first winter in the warm, temperate, and tropical regions.

The greatest danger to tern survival has been from human beings. Tern eggs once were collected for human consumption. These birds now are protected against such human predation by Federal legislation; however man still causes many problems to these struggling species. Dune buggies, scavenging gulls from nearby landfills, and repeated disturbance by

nature lovers with good intentions — all are disrupting factors within the tern colonies and can lead to exposure death of the chicks or outright desertion by the adults.

Toxic chemicals in the environment have been linked directly to developmental problems and feather loss. An indirect pressure is the reduction in fish populations that limit shorebirds' food sources.

The Gateway effort to improve the terns' survival chances is a heartening example of the accommodation that can occur when information about a situation is made known to the public, when management acts to bring the public into the conservation effort, and when human beings elect to throw some of their topheavy advantage into the light side of the scale.

The operative principle here is that good terns deserve a good turn.

Tanacredi is Natural Resource Management Specialist at Gateway NRA

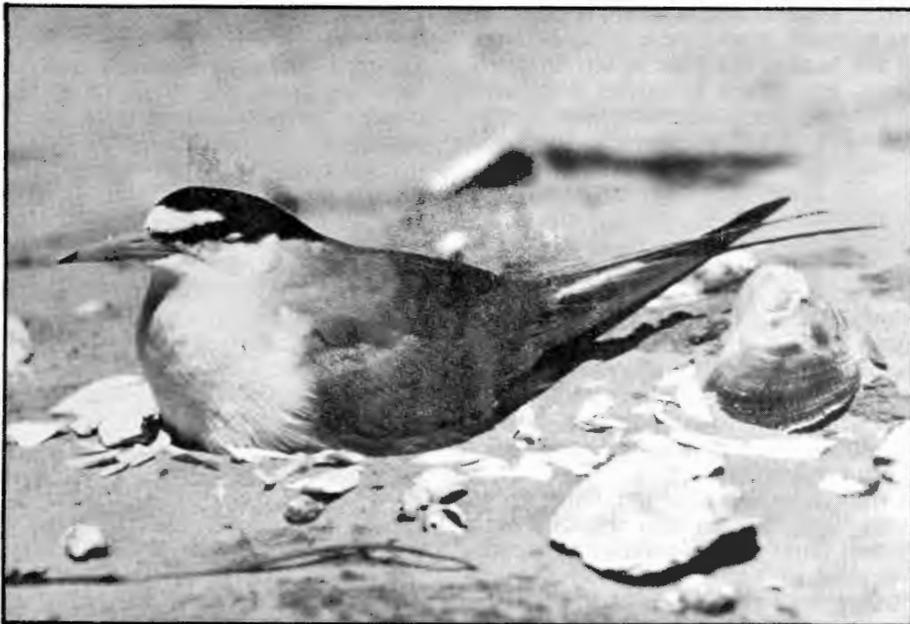
Feral Horses

A feral horse population census and a preliminary study of habitat division between horses, marsh rabbits, and white-tailed deer were conducted March 19 to 27, 1983, on Cumberland Island National Seashore by a team of graduate students under the leadership of Dr. Frank Golley and Dr. Susan Bratton. The students, all specializing in ecology or wildlife management, worked on a volunteer basis and contributed over 1000 person hours of field and data analysis time to the projects.

Supervised by the NPS Cooperative at the Institute of Ecology, University of Georgia, the horse census is part of a program designed to:

- 1) monitor the size, structure, and condition of the feral animal populations on Cumberland Island;
- 2) provide information on the ecosystem impacts of feral animals, and
- 3) quantify interactions between native and non-native animal species.

The horse herd first was censused by Mark Lenarz in 1981. Lenarz located 144 individual animals, largely in small family groups of one stallion and one or more mares with subadults and foals. He also described several bachelor troops. The 1983 census located 154 horses, with an estimated error of plus 10 to 20 animals. Since foaling was still in progress during the 1983 census, possible increases in the population were calculated by comparing the adult and subadult numbers to Lenarz's figures. The 1983 census found 34 more adult animals but a slight decrease in the subadult population. It was estimated the population had increased by about 20



Least tern is shown here, on her nest in the sands of Breezy Point, part of Gateway Nat. Rec. Area.

feral horses - Continued

animals. Although the differences between the 1981 and 1983 could be due to sampling error, similarities between the sex ratios and the herd locations for the two sampling periods strengthen the conclusion the Cumberland horse population has increased in numbers.

Lenarz also studied food habits in 1981 and made observations on habitat utilization. As was the case in Lenarz's study, the 1983 census team observed extensive horse use of spartina marsh, but unlike Lenarz's study (which concentrated on

horses on the south end of the island) also found horses using interior forests.

The preliminary analysis of horse, deer, and rabbit habitat use, using scat counts, indicated the horses used inter-dune, salt-marsh and oak forests with open grassy understories but that they rarely used oak forests with dense palmetto understories. Little evidence of deer activity was found in the horses' preferred salt marsh feeding areas, but concentrations of both deer and horses sign were found in the interdune grasslands. The majority of rabbit scat

was found in the ecotonal areas between the forest and the dunes and the forest and the salt marsh. Observations made during the census and the habitat study indicate the feral horses use all types of upland habitats on the island at least occasionally.

More studies presently are planned for Cumberland including an analysis of horse interactions with salt marsh ecosystems and a detailed analysis of large mammal impacts on interdune and live oak forest vegetation.

Human Impact On Arctic Vegetation Gates Of The Arctic National Park

By Ann Marie Odasz

While collecting field data in 1978 for a doctoral thesis, I observed impacted areas in the Arrigetch Creek Drainage, within the newly designated Gates of the Arctic National Park, Alaska. Similar impact also was observed on the shores of Circle Lake — the main float-plane access to the popular Arrigetch Peaks — and photographs were taken to record the conditions.

In addition, vegetation cover and species composition were recorded. Areas outside of the impacted sites were monitored also, as a control for data base use in future measurements of representative pre-impacted vegetation. Detailed data and close-up photographs recorded the inside of both control and impacted vegetation areas.

In 1981, I returned to investigate the many side-tributaries to the Alatna River. I



revisited Arrigetch Creek and rephotographed all sites investigated in 1978. The area covered included the shores of Circle Lake, the lichen knolls (a series of dissected terminal moraines at the mouth of the Arrigetch Creek), the main base-camps at the headwaters area of the Arrigetch Creek, and various campsites at the base of the Arrigetch Peaks themselves. Photographs 1 and 2 compare the impacted areas, 1978 and 1981. Close up photographs 3 and 4, taken outside of the impacted vegetation, contrast with photograph 5, and show the effect campers can exert on the extremely fragile vegetation of the arctic. Centuries old spruce trees were chopped down for evening campfires and lichens were trampled. In addition, such remnants of civilization as mole-skin wrappers, foil bits, twisties, old tin cans, and a stash of books and clothes were found scattered around the upper Arrigetch Creek Valley.

With concerned foresight, Gates of the Arctic Supt. Richard Ring and Chief Park Ranger Bruce Collins, initiated a cooperative study conducted during the summer of 1982. Monitoring of human impact was expanded to include other heavily used areas of the Park such as Summit Lake and

Environs, Doonerak Mountain and Bombardment Creek, and other popular backpacking, boating, and camping areas. In subsequent field seasons, additional heavily used areas will be monitored and added



to the existing data base.

Park Service personnel participated in the 1982 data collection. Seasonal Park Rangers Cheryl Green, David Buchanan, Maggie Yurick, Rob Hayden, and Geoff Smith received training in site location, vegetation mapping and analysis, and description of natural and disturbed habitat conditions. They quickly became proficient at identifying the sensitive vegetation types and the species occurring in areas that are most easily damaged.

Permanent transects were established in impacted areas with additional transect series running perpendicular to the main transects. Vegetation samples were located and read at regular intervals along the transect lines. Vegetation composition, percent cover, trail formation, species change, and other site characteristics were recorded following popular European methodologies. These transects could be monitored on a regular basis by the Park Service in order to detect changes in rates of impact.

The Park Service can use these empirical data for managerial decision making. Such studies can help avoid the "crisis-study" approach, where solutions to problems are sought only after alterations already have occurred.

Wise base-line inventory data collection at the early stages of park policy-making and management planning can provide a sound basis for mitigating the effect of human use. Human visitation to the area has increased since the establishment of the National Park. Visitor influx will expand considerably in the coming years.

Paradoxically, the very act of designating a new wilderness or park area involves an announcement that threatens newly proclaimed wilderness. Such areas excite and attract the venturesome spirit in man. In fragile ecosystems, like the arctic, man's rejuvenation of spirit and purpose is directly proportional to the destruction of other species of life. Mathematically : without controls nature is playing a "zero-sum" game.

This "Gem" of the National Parks System is probably our last true wilderness. Only by increasing visitor awareness and appreciation for the uniqueness and fragility of arctic vegetation can we hope that the visitors might respect the land — might want to preserve its wild integrity by "treading lightly."

If all else fails, controls and rationing might be the reluctantly arrived-at answer. Planned controls — such as already are in effect on some wild areas in the lower 48 states, can generate a "non zero-sum" game.

Odasz worked on contract for the NPS in the summer of 1982. She is completing her doctoral dissertation at the University of Colorado, Boulder, on "Patterns in Vegetation at the Treelimit Ecotone, Alatna River Drainage."

Prairie Management Perpetuates Historic Scene at Pipestone

By Gary Willson

National historic sites and monuments administered by the National Park Service in the Great Plains were established primarily to preserve cultural resources or to commemorate historical subjects or events. The historic scene of these parks — the landscape, the native plant and animal life, and the miscellaneous marks of human activity — constitutes an important resource. It is the policy of the National Park Service to perpetuate the historic scene in a manner appropriate to each of these historic places (**Management Policies 1979**).

Native prairie is an important facet of the historic scene at Pipestone National Monument (NM) where red-colored claystone known as pipestone or catlinite was quarried by American Indians to make ceremonial pipes since A.D. 900. Frontiers-

man George Catlin, while approaching the quarry in 1836, wrote: "There is not a tree or a bush from the highest summit of the ridge, though the eye may range . . . over a surface covered with a short, short grass, that is green at ones feet . . . but changing to blue in the distance." He continued with a description of the quarry: "On the top of the ridge, we found the quarry of the Red Pipe. The most striking feature is a perpendicular wall of close-grained, compact quartz, twenty-five and thirty-five feet in elevation, running nearly north and south with its face to the west, on a front nearly two miles in length. It then disappears at both ends by running under the prairie, which probably covers it for many miles both north and south. The depression of the brow of the ridge has been caused by the wash of a little stream, produced by several springs on the top, a little back from the wall . . . At the base of this wall



Shrub and tree cover increased dramatically between 1889 (top) and 1983 (bottom) as these photographs of the quartzite ridge show.



Prairie Management - Continued

there is a level prairie half a mile in width and running parallel to it."

Catlin painted a panoramic picture of the quarry, including several Indians working to extract pipestone. Although Catlin did not mention the presence of shrubs and trees along the ridge of quartzite, they appear in his painting. His pencil sketch shows little woody growth and is believed to be a more accurate presentation of the landscape of the quarry and ridge as it appeared in the 1830's.

Although well over half of the 283-acre park consists of original prairie, one is impressed today not only by the prairie, but by the trees and shrubs along the quartzite ridge and Pipestone Creek. Tree-ring evidence from a study in 1979 aged most trees sampled at around 1880. Records of land settlement in the area suggest woody plants began to grow because of the cessation of prairie fires. An article in the *Pipestone County Star* of June 24, 1880, noted the beginning of tree growth near the creek and along the quartzite ridge and expressed the hope that prairie fire will "leave the place alone" for the next few years. Photographs of the quartzite ridge taken in 1889 and in 1983 show the dramatic increase in shrub and tree cover.

Since 1973, prescribed burning has been used annually in the park's prairie management program, probably in response to the removal of woody vegetation and the enhancement of prairie grass by a wildfire which burned along Pipestone Creek in 1971. Spring burning has been conducted in each of six management units on a 4- to 5-year rotation. It has been successful in

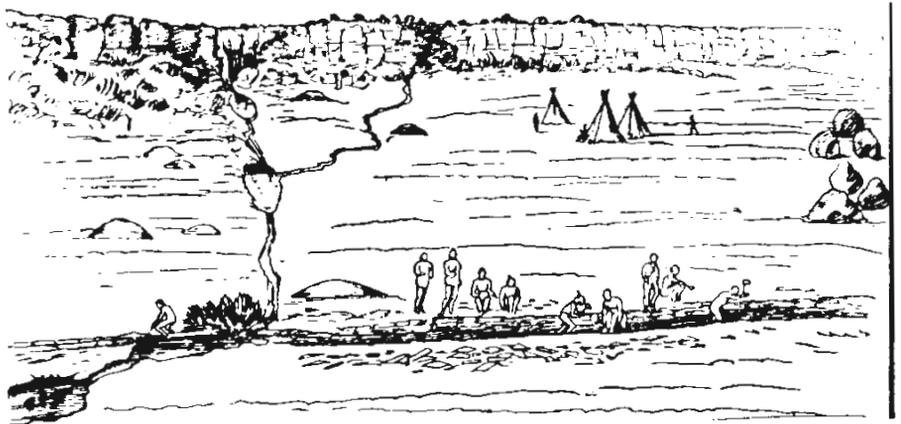
removing woody plants and restoring the dominance of native prairie species, such as big bluestem, in some areas of the monument. No attempt has been made to burn into the wooded areas along the quartzite ridge or to clear vegetation along Pipestone Creek.

In 1982, a study was begun to assess objectively the effect of current vegetation management practices, including prescribed fire, on the vegetation at Pipestone. Permanent plots and fixed point photography will be used to document vegetation changes and successional trends in the six management units. The distribution, composition, vigor and sea-

sonal periodicity of the vegetation will be determined over a 3-year period and historical factors which have impacted the vegetation will be identified and evaluated.

Results will likely influence prairie management through recommended changes in the frequency, intensity and seasonality of future prescribed fires and may lead to a decision to remove woodland vegetation in certain areas of the monument so as more closely to approximate the historic scene.

Willson is an ecologist with the NPS at Pipestone NM.



Pencil sketch of the pipestone quarry made in 1836 by George Catlin, courtesy of the National Archives.

Dwarf Nightshade At Crater Lake NP

Editor's Note: The following article is taken from a report to Resource Management Specialist Mark Forbes, Crater Lake NP, by Ron and Joy Mastrogiuseppe. The full report, with literature cited, is available from the Park.

On a recent autumn visit to the Crater Peak Burn of August 1978, Ron Mastrogiuseppe and John White confirmed the presence of colonies of dwarf nightshade, *Chamaesaracha nana* A. Gray in the portion of burn which crowned-out in Shasta red firs and exposed the volcanic substrate on the steep southwestern slope. A member of the nightshade family, Solonaceae, the plant is locally rare in the Crater Lake NP area.

Dwarf nightshade is adapted to well-drained, dry, sandy, or gravelly volcanic substrates, and may be favored by certain kinds of disturbances. Its general geographic distribution ranges from south central Oregon southward into the Lake Tahoe Region of east central California, from

approximately 5,000 to 8,500 feet elevation.

Other notable members of the Solonaceae include potato, tomato, tobacco, and the pepper.

Mastrogiuseppe's report discusses at some length a revisionary study of the genus *Chamaesaracha*, recommending that dwarf nightshade be called *Leucophysalis nana* (Gray) Averett, making it a natural, closely related genus restricted to desert regions of the southwestern U.S.

They also describe searches of herbaria within the Pacific Northwest to determine if any voucher specimens exist from within or near Crater Lake NP. (A voucher specimen is one that has been verified and placed in a permanent collection as a standard against which new finds may be checked.) The park collection includes only one sheet displaying two small non-flowering plants, collected by Elmer Ivan Applegate on July 24, 1934, on a dry slope of Bald Crater in the northwestern portion

of the park. No other vouchers are known, except for a possible sighting within the old Greyback Burn (by Richard Brown in 1982) and a specimen collected by Joy Mastrogiuseppe on Aug. 14, 1978 in the middle strip of the old firroad along the southeastern flank of Crater Peak.

The report describes other searches and the species' general distribution and concludes that "disturbance may be the key in the general perpetuation of dwarf nightshade." This is presented as a hypothesis only, with more evidence required for substantiation.

The Mastrogiupes recommend that *Leucophysalis nana* be placed on the Watchlist of the Oregon Rare and Endangered Plant Project.

Ron Mastrogiuseppe is plant ecologist at Redwoods NP; Joy is with the Marion Ownbey Herbarium, Department of Botany, Washington State University.

III. WASO Central Office Realignment Changes

In mid-March, the Director announced formation of a WASO Realignment Coordinating Committee and directed that WASO functions be consolidated and streamlined to reduce overhead costs and improve organizational efficiency. The Director simultaneously advised each Associate Director to prepare and submit a realignment plan that would shift a minimum 12 percent of WASO central office staff positions and dollar resources to park units or approved Field Units.

Impacts of these management actions

When fully implemented, these three management actions will result in a major restructuring of WASO natural resource functions. Consider, for example, the following:

- *Line vs. staff role.* Effective immediately, the WASO Office of Natural Resources will function strictly in a *staff support* capacity, not in a line operating mode. Natural resource *management* responsibilities are reserved exclusively to the Director's Office and to Region and park field units; WASO staff will *not* assume responsibility for natural resource *management* functions. To emphasize this point, the term "management" deliberately has been eliminated from WASO Office and the Division of titles.
- *Natural Resource Management Plans.* WASO no longer will review and comment on park Natural Resource Management Plans (RMP's) unless requested to do so by the Regions. RMP's exist to help field personnel set programmatic and budget priorities and make informed natural resource management decisions; as such, RMP's properly are the joint responsibility of the Regions and the individual parks, not the Washington staff. The RMP Guidelines issued in December, 1980, will not be revised by WASO unless the Regional Directors determine that changes are necessary.
- *Cooperative Park Study Units.* The Office of Natural Resources no longer will be involved in maintaining or funding any Cooperative Park Study Units, or any research projects at CPSU's, without the explicit concurrence of the area Regional Director.
- *Biological Resources Division.* The Biological Resources Division will function primarily in a field liaison mode. Responsibility for ongoing technical assessment projects currently sponsored by WASO will be transferred together with appropriate funding resources to the Regional Offices, provided the Regions approve these shifts. No new research or special studies will be initiated by the Division except as may be needed for developing Service policies or guidelines . . . for example, as relate to exotic or endangered species, special protection zones, collection permits, etc. Furthermore, WASO will look to the Regions to help design such research or special studies, and, where possible, to accept a management role in implementing these projects.
- *Special Science Projects Division.* The Special Science Projects Division has been assigned lead NPS responsibility in support of the Secretary's Barrier Island legislative initiative. This activity will represent the principal work assignment for this Division for the next two years. Ongoing commitments to the MAB program will be continued. Any future social science activities that may be initiated by the Division will be coordinated fully with the Regions.
- *Air and Water Quality Division.* The Air Quality staff will continue to function essentially as it has in the past. A new Water Resources Field Unit has been established at Fort Collins, comprised of staff from the Fort Collins Water Research Lab together with former Regional Office hydrology personnel transferred to Fort Collins under the Region's

realignment plans. The Fort Collins Field Unit will continue to provide water related technical support to park units as requested by the Regional Offices.

- *Energy, Mining and Minerals Division.* The EM&M Division represents a consolidation of energy, mining and minerals functions previously distributed among various WASO and Regional Offices and in the DSC. The majority of the Division staff, including the Division Chief, will be duty stationed at the Denver EM&M Field Unit. The Division will be responsible for policy and legislative matters, for interagency coordination on regulatory and leasing activities, for development of training agendas, and for providing technical support to the Regions on such matters as mining and drilling operations plans, title certification of mineral ownership interests, examination and valuation of mining claims, and EIS support.
- *Staff levels.* It currently is anticipated that the transfer of responsibilities under the WASO reorganization, coupled with the reassignment of personnel to approved Field Units under the WASO realignment plan and the phaseout of non-essential temporary employees, will result in a 25 - 35 percent reduction in staffing levels within the immediate WASO Office of Natural Resources.
- *Field-WASO Task Forces.* A major initiative has been implemented to expand and improve the working partnership between the Washington Office of Natural Resources and the Regional Office Resource Managers and Chief Scientists. A series of ad hoc working groups comprised of these senior Regional Office field personnel will be convened to address important natural resource issues of Servicewide interest . . . for example:
 - pest management issues and procedures;
 - grazing policies;
 - elimination of non-essential Field reporting requirements;
 - Servicewide natural resources information management systems;
 - natural resources budget formulation procedures;
 - criteria for selecting and prioritizing Significant Resource Problems (SRP's) for funding under the PRIP Natural Resources account;
 - training programs for both entry level and experienced natural resource specialists; and
 - career ladder and professional advancement opportunities for field natural resource personnel.

Summary

The future role of the WASO Office of Natural Resources will be limited to precisely those functions that have been prescribed for the Office by the Director, i.e., formulating policies; establishing priorities; and providing coordination support. WASO personnel will serve in a staff support capacity and will *not* attempt to function as natural resource *managers*. Nor will WASO staff initiate research projects or study activities that can and properly should be the purview of field scientists and natural resource specialists.

Every effort will be made to eliminate the sense of competition that sometimes has existed between the Washington Office and the field with respect to budgetary and project management issues. Particular attention will be given to building improved working relationships between the WASO Office of Natural Resources and the Regional Chief Resource Managers and Chief Scientists.

It is hoped that these changes within the WASO central office will help assure a strengthened and more effective Servicewide natural resources program.

* * *



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