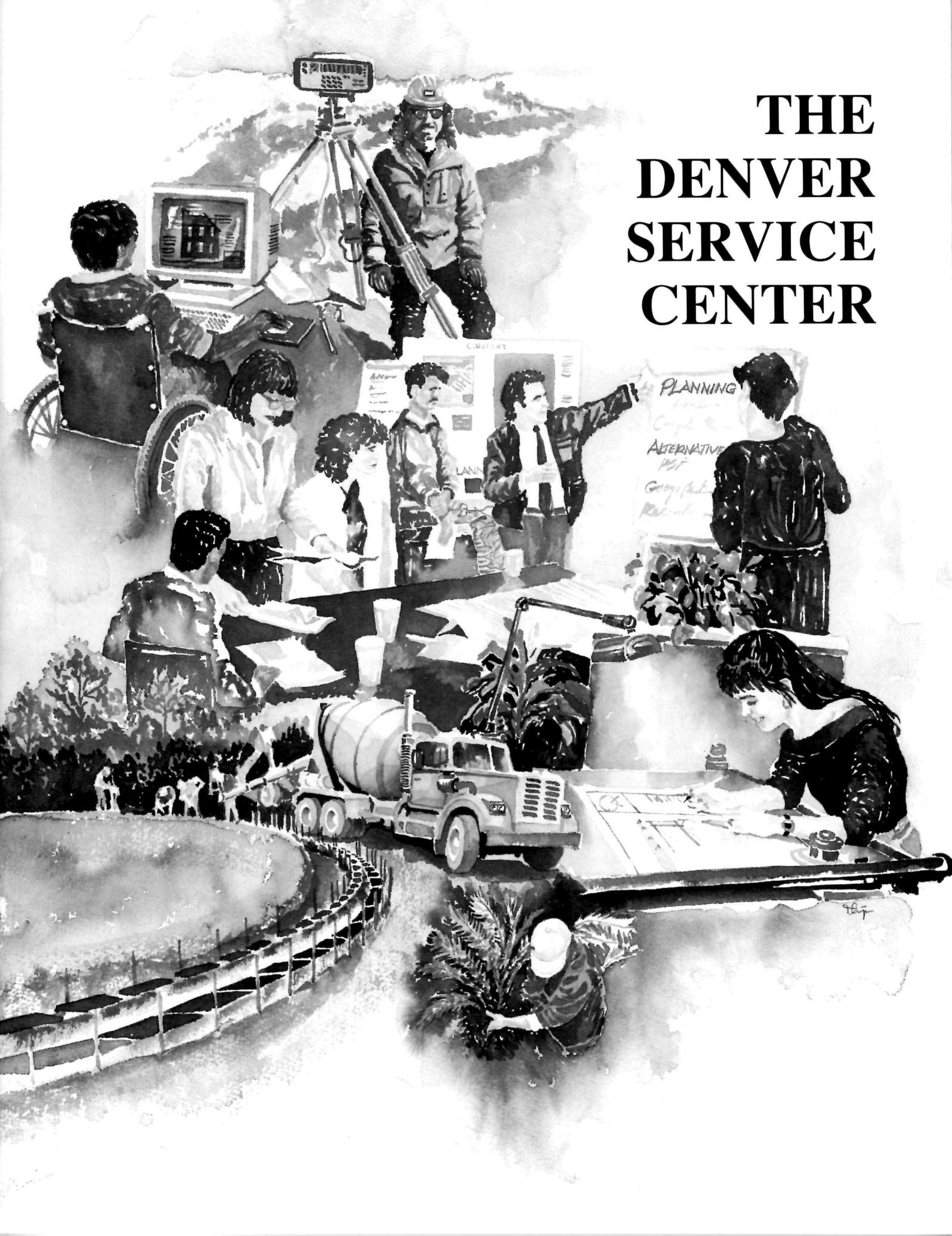


# THE DENVER SERVICE CENTER



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*Watercolor by Philip Thys*

## SERVING PARKS THROUGH PLANNING, DESIGN, AND CONSTRUCTION.

People in both the parks and the Denver Service Center (DSC) share expectations about professional NPS planning, design, and construction. To fairly represent the park perspective, Yosemite NP Superintendent Mike Finley helped write this introduction. During this process we realized how important it is for everyone in the Park Service to understand how our roles and functions within the agency are changing, as well as how our customers and cooperators are changing.

The NPS family is an extremely varied collection of people working in both the field and in support offices across the nation. These people possess an immense array of skills—all necessary to the successful management of a national park system. They also bring to their jobs various and often dissimilar levels of understanding about issues as well as the skills, expectations, and frustrations their fellow employees bring to the organization.

However, one belief ties everyone together—a deep commitment to the mission of the National Park Service, and to the preservation and enjoyment of the parks.

As the National Park Service has grown and matured, the associations and common experiences binding us together in the past have diminished. The perspectives of people at DSC may

differ dramatically from those of people in the parks, who similarly may not appreciate the values and expertise that DSC people bring to solving problems. These different perspectives result from past experiences, training, and legends.

As we move toward the 21st century, it is the time to build on commonalities, on our shared mission. We all need to work together as part of the NPS family and to be valued by each other for our professional expertise and commitment to park values. We at DSC are very proud of our many successes, and we are deeply concerned when things go awry. It is a commitment and a dedication we share with others in the NPS family.

The following articles provide an overview of the innovative ways DSC people are meeting park planning, design, and construction needs. Naturally, the story is incomplete—the variety of work is far greater than can be portrayed here. However, after you finish this issue, I hope your curiosity will be piqued. I hope you will look at us with an open mind. I am encouraging DSC employees to do the same with you. We have a strong vision of where we fit in the NPS family, and we have a deep and abiding respect for our fellow employees and their responsibilities. Working together we can improve communication and understanding, and we can create a better future for the National Park Service.

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*John Reynolds is Assistant Director, Design and Construction, Denver Service Center.*

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# THE ROLE OF DSC

The Denver Service Center is the primary office for planning, design, historic preservation, and construction activities. Its role is to help parks and regions preserve natural and cultural resources, and provide essential facilities for visitor enjoyment. Three geographic teams provide professional planning, design, and construction services: the Eastern Team supports the North Atlantic, Mid-Atlantic, National Capital, and Southeast regions; the Central Team works with the Midwest, Rocky Mountain, and Southwest regions; and the Western Team coordinates activities for the Alaska, Pacific Northwest, and Western regions. In addition, each team has established branches for park roads and trails in response to the increased workload associated with the Federal Lands Highway Program.

Five divisions support the teams: concessions planning and analysis, contract administration, engineering services, information and production services, and program control. In addition, the Office of Value Engineering develops cost-effective

engineering approaches applicable Servicewide during planning, design, construction, and maintenance projects; and the newly created Office of Professional and Employee Development trains employees, offers professional leadership, and promotes positive relations for DSC.

DSC shares office space in Lakewood, CO, with the Rocky Mountain Regional Office, which provides administrative services, and with various Denver-based Washington offices. A satellite office has been established at Falls Church, VA, and another in Denver for various team and division functions.

DSC has no program of its own. It works on planning, design, and construction projects identified by parks and regional offices, using funds provided by Congress. Each year DSC produces an annual report that describes program accomplishments in detail. DSC and the Harpers Ferry Center (HFC) are now working on a "Desk Kit for Superintendents," a Servicewide guide for understanding and effectively using both service centers.

## Planning, Design, and Construction—Past and Future

Except for the period 1937 to 1954, the National Park Service has had a central office of professionals to guide its planning, design, and construction. A landscape architecture division was established in 1918, and by 1927 it was located in San Francisco. In 1971 the Denver Service Center was consolidated from offices in Washington, DC, and San Francisco. These professional offices have influenced the history and growth of the Service.

Centralization confers more than the efficiencies associated with one location. It also provides a measure of separation from the decision-maker. While this can cause conflict, it permits challenge and creative decision-making also. It is a tribute to the courage of the National Park Service that it has permitted such a relationship to flourish.

But it is the results of the process that count—and they are impressive. The national parks provide the opportunity for truly aesthetic design, but they also require ingenious, innovative engineering solutions. As the parks are diverse, so are their facilities. At units as dissimilar as Lowell and Yellowstone, planning, design, and construction have produced a built environment cherished by the nation.

Some years ago I attended a colleague's retirement. He spoke of his ability to visit parks and see what he had designed. Something of him had endured and had been enjoyed

by thousands of visitors. He was gratified. The opportunity to pursue these activities in national parks is a privilege, for the results endure, a legacy from the past to the future.

As for that future, some trends are emerging. One is a growing concern for proper resource management at all levels of the Service. This has led to the collection of more detailed scientific data to help us better understand the resources we manage. Future decisions increasingly will be based on this information, and DSC can play a crucial role in collecting, archiving, retrieving, and using such data for better planning.

Another trend is a new kind of park conserving places closer to home, places that have shaped us and our history. These parks will be established, developed, and managed through partnerships, with the NPS as only one of the partners. Already DSC skills are being used in planning, historic research, transportation analyses, and sign studies to support these partnership parks.

As the National Park Service moves into the 21st century, it will find itself challenged to meet new kinds of problems. DSC brings together an incredible range of talent that can help to meet those challenges successfully.

Denis P. Galvin

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# PLANNING, DESIGN, AND CONSTRUCTION WORK TOGETHER

**P**lanning, design, and construction are three separate phases of closely related work. Probably the best way to explain their integration is to describe what happens in each.

DSC does not initiate a project on its own. Projects are based on needs identified by park superintendents. These may range from an improved visitor circulation pattern or an upgraded campground, to new park housing. Superintendents receive project approval from their regional office, and priorities are established both within the region and Servicewide. Congressional funding may be provided as part of the overall NPS budget; alternatively, Congress can authorize line-item appropriations for specific projects. Once funded, a project may be assigned to DSC, or the park and region may undertake it on their own. If DSC is involved, the Program Control Division tracks incoming funds, assigns account numbers, and oversees charges against the accounts.

**PLANNING.** When DSC begins a project, a planning team is assembled, consisting of specialists in all fields critical to the project, as well as people from the park and regional office. DSC works with the park and the region to define the scope of work and its cost. The resulting task directive becomes a contract between all parties.

The next step is a search for all available information, using the Technical Information Center as the source for reports, designs, and construction data about a park, along with any other technical information. The team decides how to collect additional information, and whether it should be done in-house or contracted out. Specific planning services also may be provided by DSC support offices: traffic analyses by the Branch of Transportation; economic feasibility of concession operations by the Concessions Planning and Analysis Division; or on-site surveys and topographic maps by the Branch of Surveys.

Planning teams meet with the public, concerned agencies, and organizations to define a plan's scope. They consider alternative approaches to problem solving and the impacts of implementing them. The park superintendent, consulting with the planning team and the region, recommends an alternative to the regional director, who makes the final decision.

Another phase involves estimating the cost of a specific construction or historic preservation project. Based on general cost guidelines developed by the Branch of Estimating, gross estimates are prepared for initial funding purposes.

During planning, the Branch of Publications and Graphic Design gives editorial and graphic support to ensure that docu-

ments clearly convey the needed information to readers. The Branch of Micrographics provides in-house printing services.

**DESIGN.** Once a plan has been approved, and construction money has been programmed by the regions, design begins. Depending on the DSC workload, design may be handled in-house or contracted out to architectural and engineering firms (called A&Es). If the work is contracted, the Branch of Professional Services Contracts handles that process, and a designer on the team is assigned to manage the work. DSC also provides Servicewide technical overview for projects funded by the Federal Lands Highway Program, and in some cases DSC personnel do design work for road projects.

As alternative preliminary designs are developed, professionals from the Branch of Engineering Specialists may be called in to advise on specific problems, such as water supplies and sewage treatment. Once again, parks and regional offices review the alternatives and make a decision. A new estimate based on the preliminary designs is prepared to be used in the budget process to request construction funds from Congress.

Once a design approach has been selected, preliminary and construction drawings are made, detailing civil, landscape architectural, architectural, structural, mechanical, and electrical work. At this stage, the Branch of Drafting can assist the team, especially with computer-aided design and drafting (CADD). Master specifications, based on data from the Branch of Specifications, complete the construction package, and more detailed costs are prepared in cooperation with the Branch of Estimating. The Branch of Construction Contracts then advertises for bids and awards the project.

**CONSTRUCTION.** Once the construction contractor is selected, a DSC project supervisor oversees all phases of the work on-site. This individual makes sure that the plans and designs are carried out as specified in the construction documents. If something cannot be done as designed, project supervisors make changes, in consultation with the park, the region, the original design team, and the DSC contracting officer. Supervisors also take responsibility for safety management, with assistance from the Branch of Safety Management, and for compliance with building codes as well as environmental and cultural resource protection laws.

The following articles illustrate how these steps relate to actual projects.

# PLANNING LOOKS TO THE FUTURE



**P**ublic planning meeting. Watercolor by Philip Thys

**T**o plan is to look at alternative futures—to create scenarios for what may happen in a park over the next five or ten years, then to select the best one to implement. The consequences of such decisions may well last ten times as long as the plans that conceived them. So planners can't look at only one aspect of a problem. They must consider an array of interrelationships—from the effects of development and use on natural ecosystems, to protecting fragile cultural resources, to determining what kinds of visitors probably will come to parks. In essence, planners are "loaned" to a park superintendent to help define and analyze that park's future. Planners also work with communities to conserve resources in ways that help revitalize local economies.

DSC planners' backgrounds include outdoor recreation planning, natural sciences, landscape architecture, community planning, history, sociology, concessions, and economics. And the variety of planning documents is just as diverse, from new area studies and boundary studies, to general management plans and development concept plans, to trail plans and road studies.

**GIS IMPROVES PLANNING AT BIG CYPRESS.** Geographic Information Systems (GIS) use computer programs to visually display information and help planners understand complex issues. It has been pivotal in planning for Big Cypress National Preserve, an area once viewed as Florida's last frontier, insulated by its rugged terrain from mainstream pressures, but that way no longer.

In establishing Big Cypress NPre, Congress called for the

protection of the preserve's "natural and ecological integrity in perpetuity." This includes the freshwater flow, key to the survival not only of this area, but of Everglades NP and the entire south Florida ecosystem. But Congress also allowed certain existing uses to continue, subject to reasonable regulation, including off-road vehicles; exploration for and extraction of oil, gas, and other minerals; and hunting, fishing, and trapping. These uses had to be provided for without impairing natural or cultural resources.

Before any alternatives were developed, outdoor recreation planner Bart Young and natural resource specialist Nat Kuykendall, working with former superintendent Fred Fagergren, identified and mapped significant vegetation types, habitat for threatened or endangered species, and cultural resources—collectively known as important resource areas. In addition, information on off-road vehicle trails, grazing allotments, land-ownership boundaries, private development, and oil and gas development was collected by various NPS offices. Once this information was digitized and maps were created, the team could more easily establish planning units and management zones, identify planning objectives, and assess impacts.

Alternatives for hunting, off-road vehicle access, overnight backcountry camping, and oil and gas development were based on the distribution of important resource areas in each planning unit. The Washington-based Mining and Minerals Office worked with DSC to prepare a minerals management plan, ex-

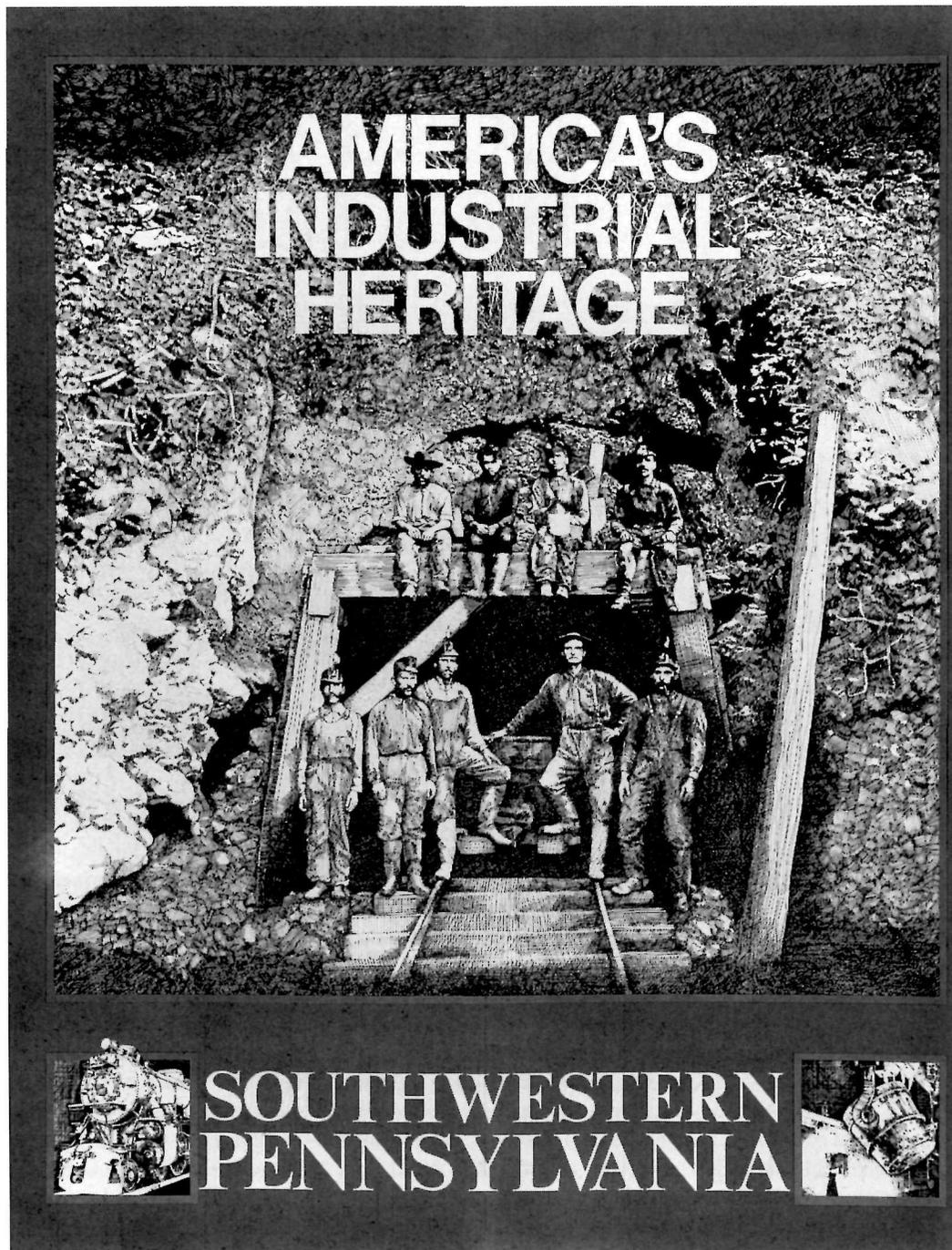
America's Industrial Heritage Project is highlighted in posters like this which have helped stimulate community support for local projects.

cluding future oil and gas development from important resource areas. According to Nat, the GIS database helped establish credibility with oil and gas interests. The park continues to use GIS data in operations.

**SOLVING REGIONAL PLANNING ISSUES.** One of the first examples of a comprehensive plan for three national park areas is the new winter use plan for Yellowstone and Grand Teton NPs, and the John D. Rockefeller, Jr., Memorial Parkway. Activities in these parks are linked during winter. Flagg Ranch along the Rockefeller Parkway stages oversnow trips into Yellowstone, and a recently proposed long-distance Continental Divide snowmobile trail will traverse all three parks, tying in with Yellowstone snow roads.

The planning team, led by outdoor recreation planner Ric Alesch, worked with the parks, the Rocky Mountain Regional Office, local interest groups, the Forest Service, the Wyoming Recreation Commission, and the Greater Yellowstone Coordinating Committee. The resulting plan aims to preserve and emphasize the national park experience, focusing on scenery, geothermal features, and wildlife. Although it does not prescribe activities for adjacent national forest lands, it does consider how winter activities in the parks and forests affect and complement one another.

The plan also establishes a visitor use management process to be initiated if winter use exceeds present forecasts. To keep impacts within acceptable limits, park staffs will identify specific visitor experience and resource protection objectives, along with key indicators of resource or experience degradation. A monitoring program will be established, and specific actions will be in-



stituted to manage impacts within acceptable limits.

Ric believes DSC helped provide an objective approach to these multi-park issues in a politically charged environment. The plan will be implemented in cooperation with the U.S. Forest Service, other agencies, and local communities in the greater Yellowstone area.

**DEVELOPING PUBLIC/PRIVATE PARTNERSHIPS.** America's Industrial Heritage Project (AIHP) in southwestern Pennsylvania is a primary example of NPS assistance with local preservation and economic development efforts. In 1985 DSC planners completed a reconnaissance survey of resources in

this multi-county area. Under consideration was the way tourism could help revitalize historic communities and conserve resources. The study led to the creation of AIHP.

The project focused on the region's iron, steel, coal, and transportation industries, which fostered U.S. development and westward expansion. In 1987 DSC planners helped the Southwestern Pennsylvania Heritage Preservation Commission produce an action plan of 48 projects that could be done in partnership with local businesses, organizations, and governments.

In this effort to tell the history of a region, the Park Service is just one participant. Sites are linked by interpretive themes and stories, not by ownership, an arrangement that has brought interested parties together to provide a forum for achieving a common vision. Responsibilities are shared among all the members of the partnership.

At Johnstown, a plan, jointly developed by NPS and the Johnstown Flood Museum Association, was a consensus-building model. DSC planner Mike Bureman sees the plan as setting the stage to implement community-based plans. Elements of the town's cultural and historical heritage will be preserved and adaptively used to revitalize the economy. The overall success of the effort will depend on a partnership of area residents and organizations, plus local, state, and federal officials. The Park Service will provide technical advice, while managing, interpreting, and preserving the Cambria Iron Company facilities as part of the iron and steelmaking theme. A local nonprofit corporation is being set up to provide preservation incentives targeted to historic districts on or eligible for the National Register of Historic Places. As described by Richard Burkert, executive director of the Johnstown Area Heritage Association, "We are hoping to use public incentives to maximize private investments."

**NEW AREAS & INTERNATIONAL PARKS.** Planners also study potential new areas and international parks. One new area study recently supported the designation of former copper mines on Michigan's Upper Peninsula as Keweenaw NHP. Besides administration by the National Park Service, other available management options for this area include a national heritage area administered by a federal commission, an affiliated area of the national park system with on-site management by a local group, or a national historical reserve, with management by federal, state, and local governments.

To find ways to commemorate the life and work of Georgia O'Keeffe, a symposium of art experts from museums, universities, and foundations was convened to assess O'Keeffe's significance to the art world. The conclusion reached in the symposium—that O'Keeffe was one of the best painters America has produced—formed the basis for the statement of significance in the alternatives study. Three alternatives will be presented to Congress: (1) interpret O'Keeffe's landscape paintings at the painting viewpoints, (2) honor her artistic spirit by providing a contemplative place in a landscape associated with her, or (3) interpret her life and work at a facility in a setting associated with her.

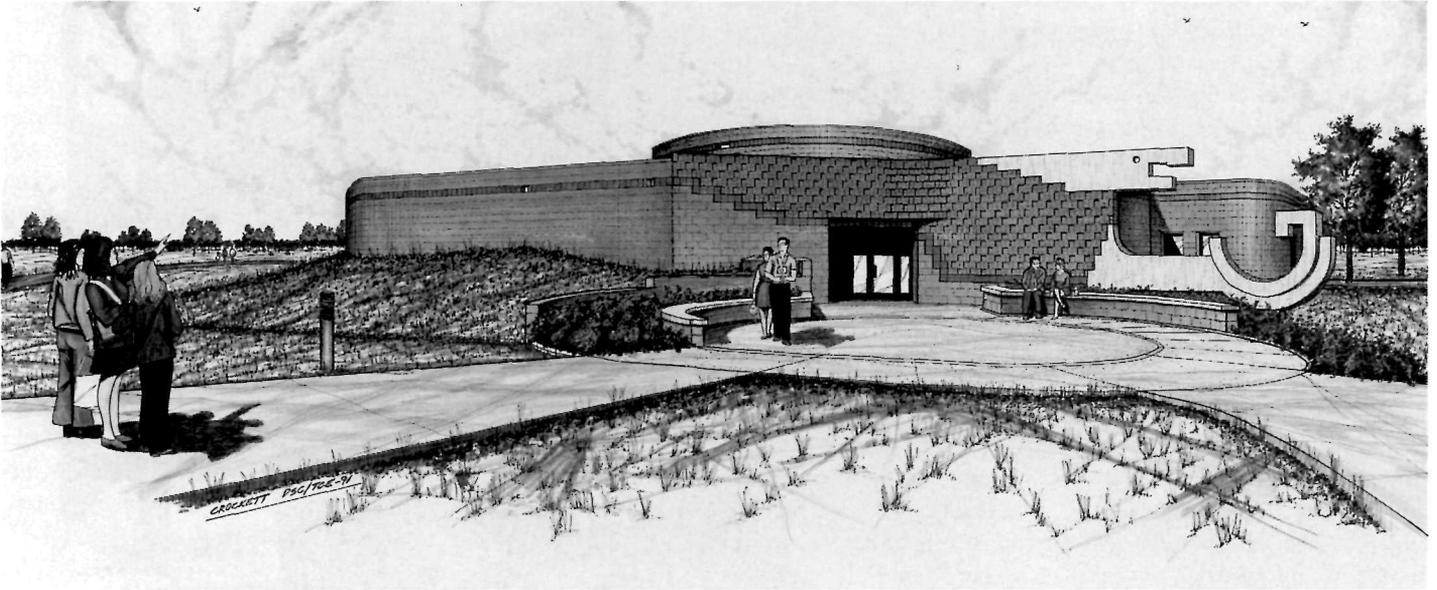


The reconnaissance survey for a Beringia International Park was illustrated with block prints that reflected Eskimo themes.

One of the most intensive international study efforts has been the proposal to establish a Beringia International Park with Russia, recognizing the two nations' natural and cultural links across the Bering Strait. The U.S. study team toured potential Siberian and Alaskan sites in September 1989. Then, both U.S. and Russian team members wrote a reconnaissance survey to report their findings. DSC's Branch of Publications and Graphic Design prepared the manuscript for printing in both Russian and English. Maps were drawn, and linoleum block prints created for illustrations. Released at a Joint Soviet-American Commission meeting in Washington, D.C., on January 10, 1990, it has received wide acclaim, as well as an award from the American Society of Landscape Architects.

In 1991 a status report was prepared, with the theme, "Bridge of Friendship." Legislation is scheduled to be introduced in Congress for Bering Land Bridge NPre to be designated as the U.S. component of the international park when a comparable area has been established on the Chukotskiy Peninsula in Russia.

# DESIGN BRINGS PLANS TO LIFE



**V**isitor Center, Knife River Indian Villages NHS.

**D**enver Service Center designers bring conceptual plans to life. Working with planning proposals, they determine ways to introduce visitors to parks, or to preserve and interpret historic structures. Like planners, designers involve park staffs and outside groups in the process. Whatever the project—a new visitor center or a National Register property—designers seek innovative, cost-effective ways to meet park needs.

**CREATING A MEMORABLE FIRST IMPRESSION.** The new visitor center at Knife River Indian Villages NHS (North Dakota) opens to the public this spring. The design fosters understanding of the Hidatsa and Mandan Indian cultures, shows reverence for the site, and provides a functional park facility. The Hidatsa, Mandan, and Arikara tribes contributed to the early design phase; and three tribal members served as consultants throughout the project.

DSC landscape architect Jack Gordon and architect Tom Busch wanted symbolically to link the building to the earth. A third of the 8,400-square-foot structure is underground, anchored by surrounding earth berms. Native grasses planted on the berms will suggest that the prairie flows right up to the building.

The corners are rounded to soften the visual impact and give the appearance of weathering. A sculptural wall at the front of the building features an abstract eagle head and talons, with the eagle's wings wrapping around the entrance. Incorporating a design by Denby Degán, an American Indian consultant, this wall

focuses attention on the entrance and also screens the service area. The eagle is set apart by a blue tile band, symbolizing both the meandering Missouri River and the sky. The color of the band was matched to Indian beads found on site, and each tile is glazed with an Indian pottery motif.

The heart of the visitor center is a round lobby that abstractly represents an earthlodge and the spiritual circle of life. Framing for the rough-sawn cedar roof is laid in a radial pattern, duplicating earthlodge construction techniques. The ends of the roof beams are carved eagle heads, bringing the eagle motif inside. In the center of the lobby floor a black slate circle represents a fire pit, and a skylight directly overhead symbolizes the smoke port. As a multipurpose space that can be used for demonstrations, storytelling, and traveling exhibits, the lobby will provide an interesting contrast to an earthlodge reconstruction planned to the east of the visitor center.

Inside the center, a window wall on the far side of the lobby creates openness, offering views of Knife River and a Hidatsa village archeological site. The sales area and other functions are placed unobtrusively so as not to interfere with interpretive programs in the exhibit area or auditorium. The basement contains a curatorial laboratory and storage for the extensive archeological collection.

DSC completed construction drawings between fall 1989 and spring 1990, under the direction of structural engineer Barry Welton. Construction occurred in two phases: site preparation,

utilities, and trail construction in 1989, and visitor center and entrance road construction, beginning in fall 1990. Scott Jacobson, the construction supervisor onsite, noted that even though the building's curvilinear design complicated the work, change orders were minimal.

Knife River's archeological integrity also made it necessary to ensure that fill dirt for berms did not contain outside artifacts. Archeological clearances and borrow site locations were coordinated with the Midwest Archeological Center.

Involved throughout the project, Superintendent Mick Holm is pleased with the unique design and the way the building fits into its prairie setting. "Everybody has made a real effort to produce an excellent product, with quality workmanship and craftsmanship." Mick thinks public involvement has contributed to the success. The Tribal Council of the Three Affiliated Tribes also has passed a resolution applauding the sensitive design.

**PRESERVING THE PAST.** Harpers Ferry, at the confluence of the Shenandoah and Potomac rivers, was the site of the nation's first armory and an important manufacturing and commercial town. In 1859 John Brown led his famous raid on the armory, hoping to use the captured weapons to liberate slaves. During the Civil War the town was occupied intermittently by both sides. A series of devastating floods in the late 1800s prevented the town's reemergence as a manufacturing center. The founding of Storer College after the war highlights the prominent role the town has played in black history. NPS is now in the middle of a multi-year project to preserve and interpret historic structures in Lower Town (on the tip of the peninsula between the two rivers). The work involves a cross section of NPS offices: National Capital Region for overall project coordination; the DSC Eastern Team for design and construction; Harpers Ferry Center (HFC) for interpretive exhibits; Williamsport Preservation Training Center (under HFC) for assistance with historic structure reports, analysis of historic fabric, and building restoration; and the Water Resources Office in Fort Collins for flood studies. In addition, the Federal Highway Administration built the Shoreline Road, used for shuttle access between the new visitor contact station and parking area at Cavalier Heights and Lower Town. The Universities of Maryland and West Virginia also have been involved through cooperative agreements for historical architecture and archeology.

Approximately 18 buildings in Lower Town are scheduled for preservation treatment and adaptive use. Coping with recurring floods was a major design consideration early on. A flood-warning system, installed in cooperation with the U.S. Army Corps of Engineers, gives six to eight hours notice of a flood. Designs allow for exhibits and materials to be removed from areas most likely to be flooded, and a storm drain system is being installed beneath ground floors so that once floodwaters recede, buildings can be cleaned easily and put back in shape.

In a pilot program the DSC Branch of Drafting has prepared measured historic resource drawings for two sets of buildings. Dennis Sikes and Maggie Groves incorporated data from on-site measurements and photographs of interiors and exteriors into the computer-aided design and drafting (CADD) system.

Designers now can select these drawings and complete their work on the CADD system.

For architect Susan Shufelt, one of the biggest design challenges has been providing access for disabled visitors. Some buildings simply cannot be made accessible because too much historic fabric would be lost. In these cases interpretive themes are covered in other buildings. Where possible, however, the front entrances of buildings have been modified, with raised brick sidewalks sloped up to the door or with ramps incorporated into existing wooden entrance platforms. Some buildings have been made accessible from the back, and in one case a building with a rear entrance has been connected to two other buildings by means of elevators and an inside connecting corridor.

Just how far to go with restoration is another design concern. At Harpers Ferry, this issue has a range of solutions. At one end of the spectrum are buildings that have been practically rebuilt, with steel framing and reproduced materials replacing wooden framing and historic fabric. At the other end, some buildings have been preserved just as they were. In fact one building is used as an interpretive exhibit to show structural changes over the years. Because the building's condition does not allow access to the upper floors, a new second-level



**A**t Harpers Ferry NHP a new path and opening in the historic masonry wall makes the first floor of the Tearney Building accessible to disabled visitors.

Measured drawings for some Harpers Ferry buildings are being done on the CADD system. Designers can use this computerized information to decide preservation treatment and adaptive uses.



porch lets visitors look through windows.

**REMOVING DEVELOPMENT TO PRESERVE.** Older national parks sometimes contain facilities whose long-term resource impacts were not fully evaluated. Now that adverse effects are apparent, the Park Service is relocating facilities and returning areas to natural conditions. The 1,800-acre Giant Forest grove at Sequoia NP is an example. Development within the grove, which includes the General Sherman Tree, has injured individual trees, hampering the ability of the grove to perpetuate itself.

The 1980 development concept plan proposed relocating major development, converting Giant Forest to a day area, and reestablishing natural conditions. Preliminary designs have been approved for lodging and associated facilities at Wuksachi Village, formerly Clover Creek. The preferred design alternative includes overnight accommodations, eating facilities, parking areas, and roads.

Superintendent Tom Ritter challenged the design team to use state-of-the-art computer techniques to study all aspects of the preferred alternative. Bob Welch, who administered the project, contracted a Denver design firm to digitize detailed site drawings, along with the concessioner's conceptual sketches. Three forms of computer simulation gave the team the informa-

tion it needed: a wire frame image showed skeletal outlines; a color shaded image used color tones to show solid planes; and a computer paint image combined photo and computer images. The computer shaded/wire frame images made it possible for the team to study more than 20 viewpoints of the site, and the computer paint system, 10 viewpoints.

During work sessions the concessioner's architect, DSC landscape architects, and park and regional office representatives reviewed the proposed design, selected viewpoints, and made modifications. The benefits of computer simulation became obvious: design changes became easy to make; specific viewpoints could be studied before final production; and decision-makers could view the final design in detail from numerous angles before construction. The park, the region, and DSC have been enthusiastic about the simulation images because they provide a more accurate perception of the completed project.

## Using Sustainable Design to Conserve Nonrenewable Resources

Sustainable design was a concept discussed at the Vail Symposium, and Director Ridenour has endorsed it as an emerging NPS policy. DSC is now working with others inside and outside the Park Service to ensure the implementation of sustainable design guidelines.

Sustainable design recognizes that human civilization is an integral part of the natural world and that humankind's survival is rooted in the perpetuation of that natural world. All life is maintained on a functional community basis, and these distinctive communities or bio-regions have self-sustaining life systems. The concept of sustainable design holds that future technologies must function primarily within these bio-regional systems. Decisions must maintain biological diversity and environmental integrity; contribute to the health of air, water, and soils; incorporate design and construction that reflect bioregional conditions; and reduce the impacts of human use.

To discuss the application of sustainable design within the Park Service, DSC landscape architect Rich Giamberdine and architect Bob Lopenske organized a workshop in November 1991. Hosted by Maho Bay Resorts, the workshop brought together people from NPS, American Institute of Architects, National Parks and Conservation Association, other government agencies, and private firms. The following guidelines were established:

**Natural Resources.** Facilities should function as much as possible within the surrounding ecosystem, without placing additional stresses on natural resources or processes.

**Cultural Resources.** Designs should incorporate methods to protect and preserve significant cultural resources over the long term. New developments should reflect the cultural heritage of a locality or region.

**Site Planning & Design.** This involves the location of roads, trails, structures, and utilities in ways that protect and preserve natural and cultural resources. Both ecosystem dynamics and resource carrying capacities must be understood to preserve resource values and to minimize the disruption of natural systems.

**Architectural Design.** The long-term goal of sustainable design is to minimize resource degradation and consumption on a global scale. Sustainable developments should become a model and teaching tool for a new ethic.

**Building Ecology.** To be sustainable, each development should have close-to-zero global impact or no net environmental loss. The origin of building materials should be considered. Even recycled materials that release toxic gases or hydrocarbon-based products should be avoided.

**Interpretation.** Interpretation provides the best single tool for educating the public about the values of sustainable development in parks and for encouraging visitors to incorporate those values into their daily lives.

**Energy & Utilities.** Responsible energy use is fundamental, and existing technologies offer cost-effective alternatives to conventional power and water utilities. Using renewable energy on-site should be the goal of energy sustainability.

**Waste Disposal.** All forms of disposal have some negative environmental impacts. Planning should minimize solid waste generation and maximize recycling.

**Facility Maintenance & Operation.** Sustainable development must be maintainable. Designers need to work with managers to define acceptable maintenance and operational practices, as well as employee training requirements that will allow facilities to continue to function at the same level as originally designed.

**Heating & Cooling.** An important element of sustainable design is minimal energy use for heating and cooling. DSC architect Janet Youngberg is working with park personnel and A&E contractors to incorporate sustainable design elements into park housing in Grand Canyon, Yosemite, and Sequoia-Kings Canyon NPs.

At Grand Canyon, a pilot project with the National Renewable Energy Laboratory will study advanced low-energy designs, as part of the International Energy Agency's solar heating and cooling program. Prototype low-energy houses will be designed to eliminate or minimize the use of purchased energy while maintaining acceptable comfort levels. Strategies will include improved insulation, air-tight construction with controlled ventilation, and passive solar heating through the use of direct gain, sunspaces, and thermal storage walls. Designs will maximize natural cooling and use daylight for general lighting.

# CONSTRUCTION MAKES PLANS AND DESIGNS WORK



**C**anyon Rim Visitor Center New River Gorge National River.

Once planning and design have been completed, DSC construction personnel take over. Construction supervisors not only work in their specialty areas, but also as ambassadors to the communities where projects are located and as liaisons between parks and DSC. The most important part of their jobs is communication. They make quick (but well thought-out) decisions affecting projects, people, and the reputation of the NPS. Successful project supervisors communicate effectively with contractors, park staff, the community, and DSC.

These multi-talented people ensure quality control in projects ranging from sewage treatment facilities and campgrounds to multi-million dollar visitor complexes. They ensure compliance with environmental laws and historic preservation regulations, and they attempt to minimize conflicts with visitor services and with natural resources while maximizing the effectiveness of the built environment. They are responsible for safety, for adherence to codes, and for the quality of the finished product.

**CANYON RIM.** Canyon Rim Visitor Center, the first major NPS facility in New River Gorge NR (WV), opened to the public Memorial Day weekend 1991. The 8,700-square-foot building takes advantage of impressive views of the river and gorge. Decks allow visitors to experience the ruggedness of the canyon. Sandstone and wood building materials tie the building to the

site, and the architectural forms are harmonious with regional building styles. The successful completion of this building challenged designers and construction personnel to develop innovative solutions within a compressed time frame.

Final design and construction drawings were completed by an A&E firm within nine months, based on an initial design by DSC architect Judson Ball (now deceased), and with contract management by DSC architects Bob Berman and Jack Cook. Lizzie Watts from New River Gorge worked with design and construction personnel to ensure that visitor and park needs were met. HFC design staff remained involved during the process to develop the interpretive exhibits.

The construction contract was awarded September 1989, and DSC project supervisor John Rarus worked on-site to make sure the project was built as specified and to solve problems as they emerged. A major problem was the foundation. Initial soil borings ran into what was thought to be bedrock at 4 to 5 feet. But when excavations began for the footers and foundation walls, test borings appeared to have hit isolated boulders, and bedrock was lower than expected. As a result, portions of the foundation had to be redesigned. As work proceeded, John kept the park informed of changes and helped ensure that those changes would not adversely affect visitor or park needs.

On-site water and sewage treatment turned out to be another issue. Senior environmental engineer Tom Harrington worked with the design firm and the state to solve these problems. Water in a flooded, abandoned coal mine proved to have excellent quality (requiring only disinfection to be suitable for drinking), and the West Virginia Health Department permitted the use of this source.

Only limited water is available, so water-conserving measures were incorporated into the design, including ultra low-flush toilets in the visitor center. Even though these measures reduced volumes for sewage treatment, the state required a full-sized treatment system, consisting of an aerated lagoon and polishing pond. Since the discharge eventually flows into the New River, the West Virginia Department of Environmental Regulation established strict discharge quality standards. The design system has been more than adequate for treatment, and the quality of discharged water has consistently met state standards. The park has an excellent staff to operate the utilities, and DSC post-construction and follow-up programs have been well received.

Even though the compressed design and construction schedule caused problems, park interpreter Lizzie Watts is enthusiastic about the building because it meets visitor needs. Visitation has exceeded expectations — with 8,000 people per day on summer weekends. DSC outdoor recreation planner Linda Romola, the team captain for the development concept plan, has observed that what was envisioned in the plan carried through to the finished visitor center because of cooperation between the park, the design firm, the construction contractor, and DSC.

**RAINY LAKE.** The Rainy Lake Visitor Center in Voyageurs NP (MN) is nearly on the Canadian border. Located at the tip of a peninsula, the center has a warm, welcoming exterior that beckons visitors from both land and water while blending into forested surroundings. The harsh northern climate dictated the construction approach. The visitor center is well insulated, using state-of-the-art design and materials to minimize energy consumption. The adjacent marina was built to withstand the crush of deep ice forming on Rainy Lake each winter.

An earthen coffer dam was the first phase of marina construction. Fill for the dam was trucked in and, when the dam was in place, the water behind it pumped out. The original design called for H-piles to be anchored in bedrock so the bulkheads could

withstand pressure from ice. However, when the contractor couldn't drill into the hard Canadian shield granite and still remain on schedule, the design was changed. H-piles were welded to steel plates rock-bolted to bedrock; then 8-inch by 8-inch wood beams were placed between the



pilings to form the bulkhead. Once the bulkheads were constructed and high spots on the harbor bottom were removed, the coffer dam was dismantled, with much of the rock crushed on-site to provide a base for the parking area.

Stone walls are an essential design element at Rainy Lake. Aesthetics called for irregularly shaped carnelian granite to be laid in a random ashlar pattern. This required the contractor to find skilled masons. Project supervisor Douglas Porter enjoyed working with the contract craftsmen, and the contractors took great pride in what they did.

Park staff praise the final product. Chief of Interpretation Bill Gardiner likes the building's design, orientation, and insulation as well as the workmanship. Picnic areas and boat-launching ramps are well integrated with the building. The only problem has been water leakage in the basement. Building and utilities foreman Raoul Lufbery inexpensively corrected the problem with plastic sheeting beneath a granite-paved patio.

**BARATARIA.** Deep in the Louisiana bayou, Jack Dollan is working on the Barataria environmental education center, part of Jean Lafitte NHP. Though he may not care for the steaming climate and the poisonous snakes, he is excited about the project. Despite delays from torrential rains, the center is scheduled to open in August 1992. Named for the bay and for privateers who sailed with Jean Lafitte, the center is built on concrete columns supported by wooden pilings driven into the swamp.

The design lends itself to environmentally sound education, blending with its surroundings and functioning as a part of the landscape. Vines and other plants eventually will grow over the rough-textured building, constructed of materials that will not deteriorate in this environment. Equipment, materials, and exhibits have been designed so visitors can conduct scientific experiments and learn how to protect the fragile delta.

**FANEUIL HALL & OLD STATE HOUSE.** This spring marks the completion of historic preservation work on two national historic landmarks—Faneuil Hall and the Old State House in Boston NHP. Known as the Cradle of Liberty, Faneuil Hall was built as a two-story structure in the 1740s to house public markets and a meeting hall. Burned in 1761, it was rebuilt two years later, then tripled in size by architect Charles Bulfinch in 1805. The building was fireproofed in 1898 by replacing the wood structure with steel and concrete. Today it is cooperatively managed by the city of



aged by the city of Boston (the owner) and the NPS. The Old State House was built in 1713 as the colonial seat of government. From 1776 to 1798 it served as the Massachusetts state house and at various times after 1798 as Boston's city hall and a commercial market. In 1882

it was saved from demolition by the Bostonian Society and, since then, has been used to store, maintain, and exhibit the society's growing collection of historic artifacts. The building will continue to be the Bostonian Society's home, jointly managed by the city (the owner) and the NPS.

Both buildings were closed for a year and a half while historic preservation work was underway. Design work started in 1987 under historical architect Richard Turk. Mike Williams, a civil engineer, has supervised on-site construction work. Design and many construction inspection services were provided under a contract with a Boston firm.

Biweekly design meetings were held while construction drawings were prepared to address concerns of the park, the North Atlantic Regional Office, city and state agencies, and other client groups. This critical step produced consensus on the work to be done and smoothed the construction process. The final designs coordinated all elements of the project, including a \$1 million interpretive program. Exhibit designs were arranged through a DSC design contract, administered by HFC.

The national significance of the two structures demanded special care in selecting the construction contractor. Based on contract documents prepared by the design team, the DSC Contract Administration Division structured a competitive procurement process, which allowed each contractor's qualifications to be evaluated in detail. Technical proposals were evaluated by a five-person technical evaluation panel, and price proposals by an independent business evaluation panel. Technical criteria for this project included the qualifications and experience of the prime contractor and subcontractors, the qualifications and experience of key personnel, and the contracting team's ability to schedule and manage a project of this nature. Over a five-month period five proposals were evaluated before a contractor was selected. The construction contract was awarded in September 1990.

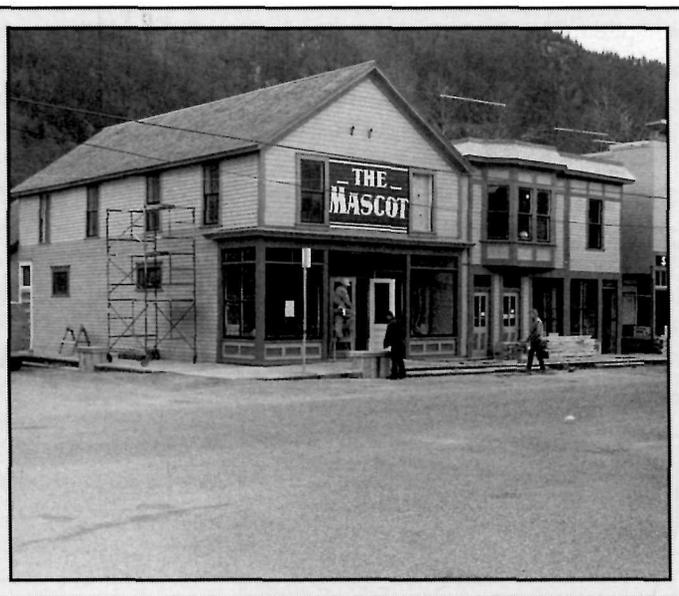
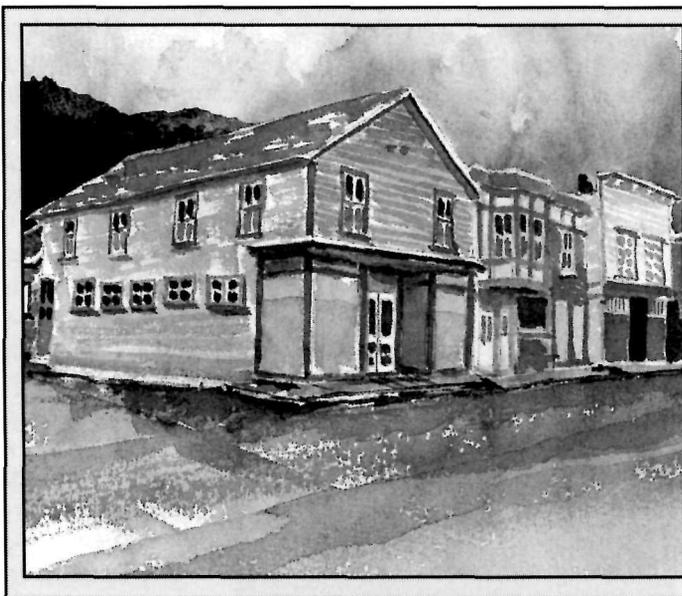
Outside work focused on preservation: masonry restoration, brick repair and repointing, and wood trim conservation. More than \$200,000 went to preserve and restore historic decorative elements, including a lion, a unicorn, and an eagle on the Old State House and a grasshopper weather vane on Faneuil Hall. These large ornaments were painstakingly removed, repaired, releafed in gold or aluminum, and remounted.

Interior work concentrated on preserving the historic functions of the structures. Work included new means of access for disabled visitors, new mechanical systems, offices for contemporary uses, and the preservation of historic fabric. Mechanical systems at Faneuil Hall have been carefully fitted into the basement and attic, and ducts dating from the 1898 renovation have been relined and used for the air-conditioning system. A new chiller, placed on Boston's City Hall, with coolant piped more than 500 feet beneath one of Boston's busiest streets, further reduces the impact of the updated mechanical system.

At the Old State House a new wheelchair lift allows access to the ground floor; special interpretive techniques have been designed for visitors with disabilities; and new offices and storage facilities have been provided for the Bostonian Society.

**SKAGWAY.** On the other side of the continent, at Klondike Gold Rush NHP in Alaska, 15 NPS-owned buildings are being restored and rehabilitated. Virtually a ghost town by the 1970s, Skagway now annually hosts more than 250,000 people, who come to relive a bit of gold rush history. The NPS buildings, historically significant because of their use during the gold rush of 1898, range from a 300-square-foot homestead cabin to a 12,000-square-foot depot and administration building. When work has been completed, building exteriors will be interpreted so that visitors can learn about their historical past. Interiors will be adapted for park or commercial business uses.

The Skagway Historic District Commission, consisting of



**T**he Mascot, Klondike Gold Rush NHP, before and after restoration. Watercolor by Philip Thys.

city and park representatives, is responsible for the historic district. According to project historical architect Paul Cloyd, the park and the community work together to preserve not just buildings, but a community and a unique heritage. Work has included new foundations, new heating systems, automatic fire suppression and detection systems, interior rehabilitation, and exterior restoration. Historians, archeologists, planners, historical architects, engineers, park staff, and city and state officials have been involved. Use of local labor has helped the economy and created a strong park/city relationship.

**SOLEDUCK VALLEY ROAD.** The 1987-88 reconstruction of 12 miles of the Soleduck Valley road (Olympic NP) required extra effort to protect the ecologically significant landscape and reduce impacts on old-growth Douglas-fir and hemlock stands. The Federal Highway Administration cooperated on the project, funded by the Federal Lands Highway Program.

According to Cam Hugie, the park's liaison for the project, the road layout was staked four times before NPS personnel felt satisfied that the least possible damage would be done. The cross section was kept to the minimum width to allow for unrestricted traffic. Wooden retaining walls eliminated the need for fill in areas where trees would have been damaged or removed, and in one spot an old-growth Douglas-fir was incorporated into the retaining wall in place of a steel upright. Vista clearing was done only at interpretive pullouts.

To promptly mitigate construction impacts, an intensive re-

vegetation program was undertaken. Program goals included reducing visual impacts, restoring native plant communities, and preserving genetic resources. Natural resource specialist Nancy Dunkle organized the revegetation program. Working with assistant superintendent John Teichert, botanist Ed Shreiner, and other park employees, she developed a plan for replanting native species on 14 acres of highly visible cut slopes. The remaining 30 acres were seeded with short-lived grasses for erosion control. As these grasses died out, natural regeneration was allowed to take its course.

Revegetation preparations included collecting native seeds and cuttings, salvaging more than 10,000 native plants from the construction zone, propagating native shrubs in a small nursery (developed cooperatively with the park), initiating a native seed increase program with the U.S. Soil Conservation Service, and contracting for the propagation of additional native shrubs and trees. By the time the road was reopened to the public in summer 1988, park planting crews, assisted by Port Angeles High School students and other volunteers, had successfully restored the road corridor. A post-construction evaluation in 1990 found the plantings to be surviving well.

*Next page: Before and after photos illustrating the rehabilitation of the National Park Inn at Mount Rainier NP.*

## Post-Occupancy Evaluation—Working to Improve Results

What happens when a project ends—when the DSC representative goes off to another project and the park staff begins to use the finished product? How does the product work? To continually improve project results and services, DSC and HFC have initiated an experimental learning program called post-occupancy evaluation. Bill Koning describes the approach as a way to measure the effectiveness of interpretive facilities and media after facilities have been operating for more than a year. The success of DSC/HFC projects is evaluated by how well visitors are served. Some of the questions being asked are:

- Do people enjoy themselves?
- Has the park purpose been complemented?
- Does the built environment enhance use of the park?
- Are unnecessary distractions removed?
- Are visitor needs met?

Comments on the success of a project from park employees should help measure planning and design effectiveness from concept to construction, thus assisting DSC and HFC personnel to design better projects while avoiding past pitfalls. All normal project elements will be included in the eval-

uation: site planning, architecture, historic architecture, engineering, interpretive media, visitor services, transportation, resource preservation, and compliance.

Two post-occupancy evaluations have been completed. The one for the Russian Bishop's House in Sitka NHP highlighted strengths and weaknesses that affect the visitor experience. For instance, the entry to the house was found to be so unobtrusive that visitors could miss it. On the other hand, the evaluation of the Paul H. Douglas Center for Environmental Education at Indiana Dunes NL found the entry to be so successful that one young enthusiast compared it to "walking into Oz."

Post-occupancy evaluations have been done inexpensively and efficiently, with minimal intrusion on visitors or park employees. One method is as simple as videotaping visitor use areas to document traffic flow and apparent ease of use. In its final form the videotape can be used with an accompanying text to train professionals, to assist in new design processes, and to improve overall project quality. Another method uses visitor and employee comments. In either case, the success of the evaluations depends on the support and involvement of park management and staff.



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