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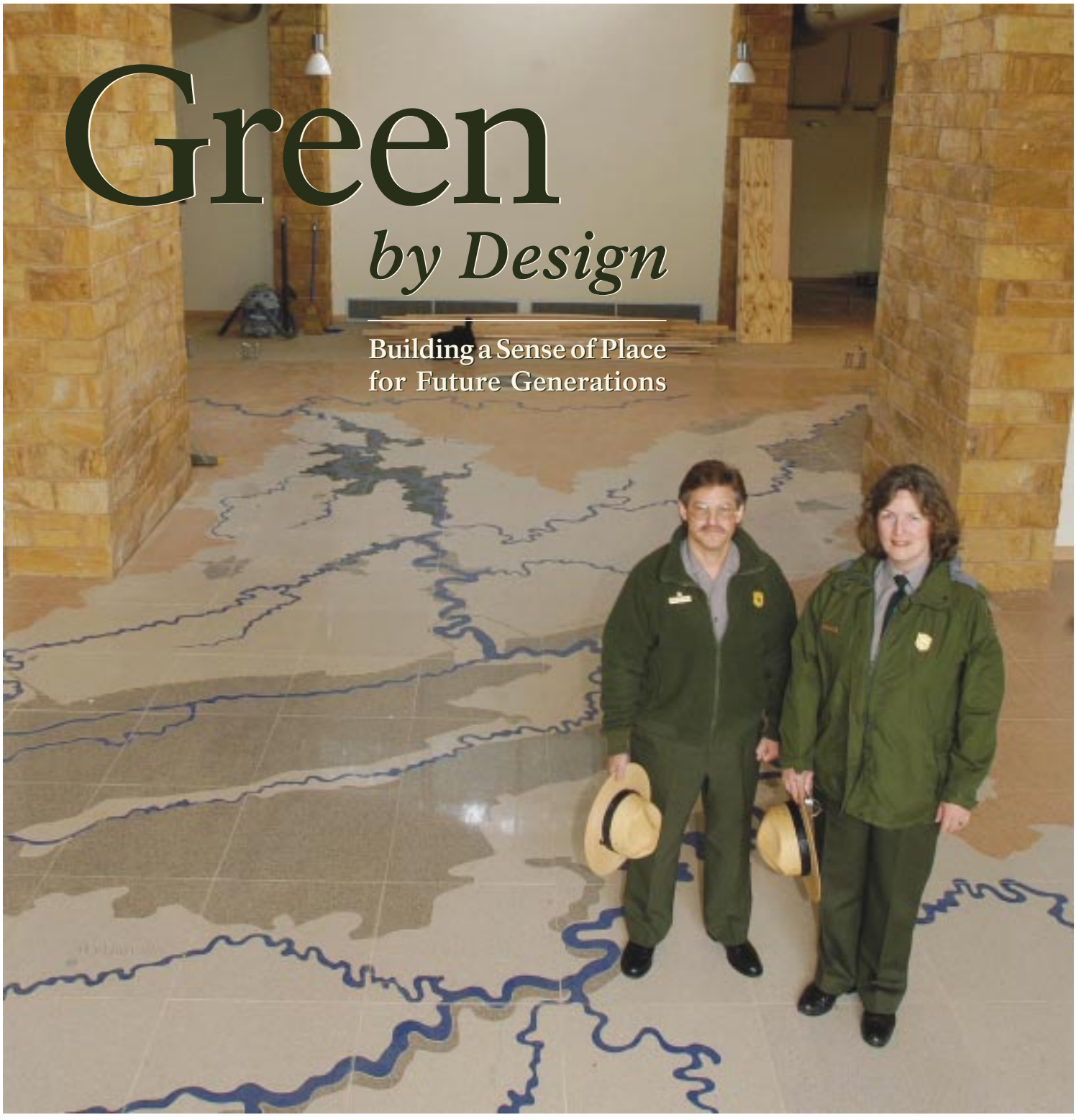
Summer 2003



Green by Design

Building a Sense of Place for Future Generations

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On the Internet
See *www.nature.nps.gov/sustainabilitynews* for additional information including points of contact, news briefs, and specific park updates.

Cover: Even the floors provide an educational message at West Virginia's New River Gorge National River where a terrazzo tile mosaic of the New River watershed serves as a primary interpretive exhibit in the Sandstone Visitor Center. Pictured are Project Manager Chuck Ross and District Interpreter Lynn Loetterle.
PHOTO BY CHUCK GARVIN

Features

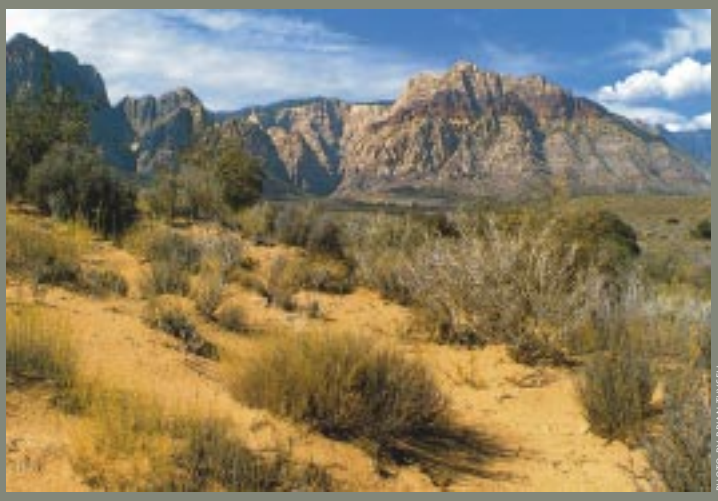
PHOTO BY BRIAN THYSELL


PHOTO BY CHUCK GARVIN


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National Park System Leads in Green Design

These are exciting times for sustainable building in the national parks, where the level of green design activity remains strong. Green structures are presently being planned or constructed at many parks, including New River Gorge, Bandelier, and Point Reyes.

The NPS has been a leader in improving the environmental performance of buildings for some time, but why has the idea of building using sustainable practices become associated with higher costs? Why aren't all NPS buildings green?

Part of the reason the NPS has not fully implemented green building practices is that we are still learning how to account for savings in energy, water, and waste management. Other challenges include our inability to fully account for enhanced educational opportunities that a building can provide, or improvements in employee health and productivity. Such benefits are difficult to measure, but should be considered to protect natural and cultural resources as well as to accurately assess a building's cost.

Buildings have a profound impact on our natural environment, economy, health, and productivity. The National Park Service spends as much as 100 million dollars a year on renovating existing facilities and new construction. Using this money for sustainable building materials and systems while fostering public outreach regarding green design and sustainable living will help the national parks protect resources unimpaired for years to come.

Shawn Norton, Coordinator
National Park Service
Environmental Leadership Program

A Message from the Federal Environmental Executive

Our national parks offer an outstanding opportunity to experience the grandeur of the great outdoors and, increasingly, the great indoors. This issue of **Sustainability News** explores this opportunity and highlights National Park Service sustainable building work—what Assistant Secretary of the Interior Lynn Scarlett calls "facilities ecology."

My office has adopted sustainable building as one of our priorities for two reasons. First, buildings—in their design, construction, operation, maintenance, use, and removal—affect our indoor activities, land use, energy use, communities, and the environment. As stewards, we have the opportunity and responsibility to reduce these impacts. Using sustainable principles in buildings can reduce these impacts, as well as improve working conditions and worker productivity, increase energy efficiency, and reduce costs and risks.

Second, sustainable buildings can be showcases to educate people about environmental issues, possible solutions, partnerships and creativity, and opportunities for reducing environmental impacts in our everyday lives. Moreover, the National Park Service has the opportunity to educate 280 million visitors each year!

Sustainable design is growing around the world, and the Federal Government is leading by example. Our recent report to President Bush *(see* www.ofee.gov*)* highlights some of our sustainable building successes to date.

The National Park Service has long been a federal leader in "greening" its operations and facilities through such practices as more sustainable building. In 1990 National Park Service Regional Director John J. Reynolds initiated the NPS sustainable design initiative; in 1994 the NPS adopted its Guiding Principles of Sustainable Design; and, in 1997 the NPS and Department of Energy created "Green Energy Parks" to promote energy efficiency and renewable energy. At present, 20 national parks model the best environmental, conservation, and sustainable practices as Centers for Environmental Innovation.

The National Park Service Design Board requires most construction projects to incorporate sustainable design principles. Six National Park Service facilities are registered to receive certification for Leadership in Energy and Environmental Design (LEED™), and many other NPS facilities already have incorporated sustainable building principles in their design, materials usage, energy systems, water use, transportation systems, and deconstruction. In addition, in 2001, the American Institute of Architects recognized the new Zion National Park Visitor Center as one of the 10 best examples of environmentally responsible design.

My hope is that these stories will serve as the foundation for others to make progress in the area of sustainable design. For this, we need your help—to partner with us, to be innovative and persistent, and to continue offering best practices. For example, we would like to see "high performance" and "whole building" design guide principles, life-cycle costing, and environmental, health, and safety management systems used for buildings. Together we should continue educating others about our personal responsibility as stewards of precious resources.

National Park Service buildings offer us the opportunity to walk *and* talk sustainability. Embracing this opportunity will help us fulfill the President's pledge to "restore and renew" our parks, educate others who will restore and renew other areas, improve our quality of life, and deepen our appreciation for Earth's resources.

John L. Howard, Jr.
Federal Environmental Executive

There's much to admire and appreciate in the works of man. But come here and you're reminded of a design that is not our own. Here we find a grandeur beyond our power to equal.

—PRESIDENT GEORGE W. BUSH, *SEQUOIA NATIONAL PARK, MAY 30, 2001*

PRESIDIO TRUST PHOTO

NPS PHOTO

Top: Trained in historic preservation and sustainable practices, trade workers rehabilitate a historic residence in The Presidio. Salvaged, renewable, and nontoxic materials are used whenever possible.

Bottom: Bathhouses at Assateague Island National Seashore were replaced by lightweight changing rooms, or cabanas, made of stainless steel tubes and synthetic canvas.

Opposite: Chris Finlay, Assateague Island Architect and Facility Manager, inspects a photovoltaic system installed on a portable trailer. Such solar-powered systems are part of a sustainable bathhouse project that includes lightweight cabanas, passive-vent vault toilets, PV-pumped rinse water, salvaged wood boardwalks, and crushed clam shell paving.

NPS Invests in Environmental Design

The U.S. Green Building Council facilitated a Senate Green Building Roundtable in 2002. The resulting report concluded that a major market transformation is underway that will change the way we design, construct, and operate buildings. It determined that most green buildings can be constructed at comparable or lower costs than conventional buildings, but that integration of high-end performance features can increase initial costs about five percent.

Most of these preliminary costs can be recovered within five to ten years, making it possible for NPS facilities to demonstrate green systems to a large public audience. The **White House** itself became a tool for educational outreach concerning green design last year when the NPS installed a nine kilowatt-hour photovoltaic (PV) system on the roof of the main grounds maintenance building. The PV system directly feeds solar-generated power into the White House groundskeeping system, and two additional solar thermal systems provide domestic hot water and heat the presidential pool.

Historic Buildings Feature Timeless Design

National parks protect more than 26,000 historic and prehistoric structures that are valuable not only for their heritage, but also as examples of the progression of design techniques. Green design and construction at a park with National Historic Landmark status presents exceptional challenges at **The Presidio of San Francisco**, where more than 450 structures are historic buildings. "It became apparent early in our sustainability efforts that we would need to develop guidelines that focused on rehabilitation of existing buildings taking both sustainability and historic preservation into account," says Presidio Sustainability Coordinator Aimee Vincent. "At first many felt that the two disciplines were mutually exclusive. Over the past four years, we have learned differently."

Presidio staff realized that building rehabilitation, by its very nature, is an inherently sustainable practice. Existing structures represent energy that has already been expended, materials that have already been mined or harvested, and components that have already been manufactured—the embodied energy of past generations. Reusing existing buildings rather than constructing new buildings provides an opportunity to meet real estate needs while conserving resources and preserving open space.

"Every historic building is unique in its potential for sustainability," adds Vincent. Each building should be evaluated for historic features that must be preserved, and for opportunities and constraints those features provide for improved performance. "Often we find that original building materials are more durable and of higher quality than materials that are readily available today. Retaining these materials meets preservation and sustainability goals," she says.

In many cases, a historic building's features are more efficient than later modifications to the building. For example, original operable windows provide natural ventilation and cooling, while newer technologies, such as ventilating systems, consume energy to operate and require specialized maintenance.

"One of the first strategies we've learned to implement is clearing away past modifications that have obscured natural ventilation and lighting," comments Presidio historic architect Chandler McCoy. At The Presidio, operable exterior windows coupled with interior transoms are ideal for passive air circulation. Such techniques reduce mechanical system costs by minimizing penetrations required for duct work and promoting independent occupant control. Automatic lighting controls with sensors can maximize lighting efficiency.

"Capitalizing on existing efficient features and designing for long-term flexibility are important issues that should consistently inform design decisions throughout the project," according to Vincent. Rehabilitation projects that allow buildings to "learn" by easily adapting over time use fewer resources now and leave a legacy of adaptability. "By using existing building features as fixed criteria that govern design decisions, substantial resources will not be required to accommodate changes in space-planning configurations," advises Vincent.

The original architects of the historic Presidio buildings designed structures that limited reliance on electric light and utilized natural ventilation. "By preserving these buildings, we capture the wisdom of the past and implement sustainable practices today," says Vincent.

U.S. Green Building Council Leads National Consensus

A coalition of national leaders from the building industry known as the U.S. Green Building Council (USGBC) promotes buildings that are environmentally responsible, profitable, and healthy places to work.

According to the council, "green design" includes practices that significantly reduce or eliminate the negative impact of buildings on the environment and occupants in the following areas:

- Sustainable site planning.
- Safeguarding water and water efficiency.
- Energy efficiency and renewable energy.
- Conservation of materials and resources.

Benefits of green design and construction include:

Environmental
- Enhance and protect ecosystems and biodiversity.
- Improve air and water quality.
- Reduce solid waste.
- Conserve natural resources.

Economy
- Reduce operating costs.
- Enhance asset value and profits.
- Improve employee productivity and satisfaction.
- Optimize life-cycle economic performance.

Health and Community
- Improve air, thermal, and acoustic environments.
- Enhance occupant comfort and health.
- Minimize strain on local infrastructure.
- Contribute to overall quality of life.

The result of the council's work is a new generation of high-performance structures designed or renovated according to the council's Leadership in Energy & Environmental Design (LEED™) program *(see sidebar page 12)*.

Visit www.usgbc.org *for further information about green building and LEED™.*

PHOTO BY GRANT L. GURSKY

National Parks Provide Prototype Facilities

A sustainable bathhouse project located in the Tom's Cove District of **Assateague Island National Seashore** in Virginia is one of several environmentally sustainable design construction projects underway at the park. According to Assateague Architect Chris Finlay, "The cost-effective design solution was developed with the assistance of a multidisciplinary team. It includes several innovative elements such as environmentally responsible roadways, parking lots, and visitor facilities."

A rapidly moving shoreline and the unsuitability of conventional structures prompted the design of lightweight cabana structures fabricated with stainless steel tubes wrapped with synthetic canvas to provide changing rooms that are quick, safe, and easy to set up or dismantle during pre-storm evacuations. The PV systems for the solar-powered rinse showers were chosen for the fiscal and environmental benefits of renewable energy, and also because the systems are portable. "The PV modules and the mechanical equipment that we specified are installed in an easily transportable trailer," explains Finlay. The solar-powered water pumping trailers feature self-contained power and controls that power well pumps and lighting systems for mobile toilets and cabanas.

"The PV systems also enabled the removal of unsightly and dangerous overhead power lines, which were tenuously strung along a rapidly moving landform," adds Finlay. "Removing the power lines has helped to restore a more natural coastal landscape to Assateague. This reestablishment of the island's natural barrier conditions is critical to preserve habitat for the piping plover, a bird which is on the list of federally-protected threatened and endangered species."

Other features of the Assateague Island bathhouse project include prefabricated vault toilets equipped with a passive ventilation system and roadway pavement made from crushed clam shells, a waste product from local seafood industries. "Our tests of this paving system have proven the material to be an appropriate, reliable alternative to traditional, petroleum-based asphalt paving," comments Finlay. Regarding the overall project he adds, "Our ultimate intention is to design a model of sustainable facilities that other National Park Service units can implement."

One of the largest photovoltaic water pumping stations in the United States is located at one of the sunniest locations in the nation: **Joshua Tree National Park**. The solar-powered water pumping system replaced a diesel generator that was the sole power source for the Cottonwood Campground water system. Located away from the developed area, the system can produce 10,000 gallons of water a day for an 80,000-gallon storage tank, which serves the campground's daily needs of 2,500 gallons. Designed not to be seen by visitors—allowing for panoramic desert views unspoiled by facilities—the installation provides another demonstration that solar power can be used to pump water, and major energy projects can be successfully accomplished at the park level, even in the most remote locations. ■

PARADIGMS *through* PARTNERSHIPS

Denver Service Center Merges Conservation, Culture, and Communities

By Michelle Burkhart, Columbia Cascades Support Office

PHOTO BY BRYAN THYSELL

Public lands west of Las Vegas, Nevada, feature abundant natural and cultural resources that exist in great contrast to increasing development on the desert landscape's eastern horizon.

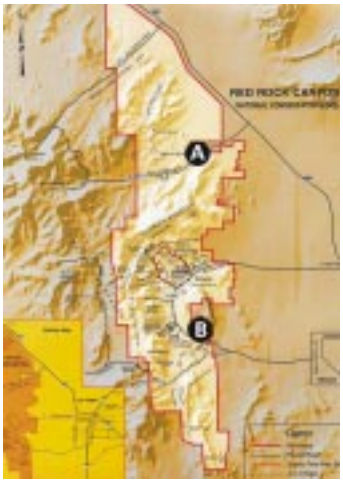
Just twenty minutes west of Las Vegas, Nevada, a development known as the "Nel Property" rests at the base of the Spring Mountains. Once destined to become a commercial recreational complex, the unfinished facility now exists in stark contrast to the surrounding beauty of alpine forests and mountains. Within the ruins of this deserted dream lie a golf course, a 20,000-square-foot building designed for video arcades and fast food vending, a metal canopy covering a large ice-skating rink, and an 80-foot pine imported from Oregon to serve as a Christmas tree. Approximately 60 percent of the 128-acre complex was complete before its recent abandonment by developer Alan Nel.

Partners Commit to Conservation

Denver Service Center (DSC), a planning, design, and construction support office for the National Park Service, is presently working with community organizers and federal agencies to research new ways to use the valuable complex. Recently acquired by the U.S. Forest Service (USFS), the Nel Property seems an unlikely place for DSC to conduct a feasibility study. However, NPS Director Fran Mainella's partnership initiative clarifies the goals behind this collaborative study. The NPS partnership initiative strives to increase collaboration among public lands across the nation to create a network of parks. Such alliances can improve efficiency and information exchange, expand recreational opportunities, and generate new resources to achieve common stewardship goals.

Denver Service Center Assistant Director Linda Moery became involved in the Nel Property study (now referred to as the "Gateway Project") to help launch the NPS partnerships initiative and explore how DSC could make NPS sustainability principles and values available to partners. "We're all in similar businesses with similar missions related to conservation and infusing the broader community with our commitment to conservation," explains Moery.

This commitment to conservation, sustainability, and partnerships resulted in DSC teaming up with the Outside Las Vegas Foundation (OLVF) to help complete two feasibility studies near Las Vegas. Four federal land agencies (NPS, USFS, Bureau of Land Management [BLM], and U.S. Fish and Wildlife Service [USFWS]) presently collaborate on southern Nevada projects through OLVF. The foundation strives to preserve federal public lands in the area, while



Top: Red Rock Canyon National Conservation Area is located just west of Las Vegas, Nevada. The Nel Property (A) is situated at the mouth of Kyle Canyon just west of U.S. Hwy 95. Oliver Ranch (B) is reached from State Hwy 159, a short drive from the Las Vegas Strip.

enriching the visitor experience, enhancing quality of life for local residents, and promoting community stewardship of valuable resources. Alan O'Neill, Executive Director of OLVF, describes the foundation as the "philanthropic forum, or the citizen forum, of the public lands."

O'Neill was reminded of DSC while brainstorming ways to obtain planning support for two projects: (1) the acquisition of the Nel Property and (2) master planning for a residential field science school at the nearby Oliver Ranch. "I had worked with Linda and the group in the past and really admired the work that they did," says O'Neill. He invited DSC to assist in the conceptual planning of these projects, and Moery agreed. The resulting partnership proved critical in advancing the two ventures, and Denver Service Center remains involved in developing the scope, schedule, and budget for both projects.

"One of the key reasons people seek DSC to support partnerships is that we help in place-making that creates a great visitor experience," says Moery. "The other nice thing about DSC is that it is 'one-stop shopping' for sustainable principles and technology." This "one-stop shopping" is the result of DSC's wide range of skills and expertise related to sustainability and the center's ability to tailor staff expertise to the precise needs of parks and park partnerships.

The southern Nevada projects are unique in the large number of partners collaborating to support holistic planning that integrates environmental, social, and economic sustainability. The close proximity of the Nel and Oliver Ranch properties to Las Vegas also offers strong potential for these places to serve as transition zones from the fast-paced life of the city to the stunning natural beauty of the desert and mountains. Such proximity is especially vital to lower-income citizens who rarely have the resources to travel outside of the city.

Design Integrates Sustainable Learning

The Nel Property is situated within the Spring Mountain National Recreation Area where it occupies a prime location for a portal facility into the Spring Mountains. "The existing facility has good sitting in this long valley, but architecturally is completely inappropriate for what the USFS wants to accomplish," explains Moery.

As a result, DSC joined forces with the USFS and the community in a feasibility study to design concepts for reinventing the existing on-site development. Efficiency was important in the study because OLVF wanted to show that the property could be converted into a public resource at a reasonable cost. Part of the OLVF vision is to connect public lands around Las Vegas and implement the Gateway Project in a way that is beneficial to the community. This could help relieve high impacts on nearby public spaces such as Red Rock Canyon National Conservation Area. Readapting the Nel Property has the potential to positively affect the entire network of public lands around Las Vegas.

Plan Will Meet Community Needs

Working as a team on the Gateway Project, Linda Moery, DSC architect Ed Nieto, and DSC landscape architect and transportation planner Kevin Percival have envisioned opportunities to convert the commerce-oriented development into a sustainable learning campus. Plans include the use of native landscaping to return the golf course to more natural conditions and create a sustainable camping area. An outdoor festival area is planned for the ice rink, including conversion of the existing building into a visitor education center with administrative offices.

The DSC team designed the visitor center to display environmentally sustainable principles such as daylighting, natural ventilation, and green materials. "The building itself is meant to be a learning tool, so sustainability was the baseline in our approach," says Nieto. The future visitor center will introduce local and international visitors to the full array of public lands surrounding Las Vegas. The architects have also proposed trailheads, picnic areas, a winter recreation area, a native plant nursery, and a riparian restoration and education area.

Social and economic sustainability are also integrated into planning for the Nel site. Foundation Executive Director Alan O'Neill hopes the area will be an active space that the local community will return to many times. He envisions festival events, nights under the stars, concerts, art, and other elements that will serve the diverse Las Vegas community.

To ensure that the interests of the entire local community are met, Moery introduced Bruce Hutton, a professor in marketing and business ethics at the University of Denver, to the Gateway Project. Hutton specializes in economic, social, and environmental sustainability, and is involved in a sustainability partnership with the NPS Intermountain Region.

Moery contacted Hutton when she realized that the Gateway Project extends beyond green design planning. "That's where DSC has played

PHOTO BY ALAN O'NEILL

PHOTO BY ROBERT WINFREE

Top: A precious resource in Nevada's arid Mojave Desert landscape, water nourishes a variety of plants and animals at Coal Spring on the Nel Property.

Bottom: Unfinished recreational facilities on the abandoned Nel Property near Las Vegas, Nevada, are being redesigned as part of an innovative partnership.

a key role too," O'Neill explains. "Not only did they do the conceptual planning for the Gateway Project, but they continue to provide advice on resources that will address sustainability in all three areas of economic, social, and environmental design."

Hutton will conduct a stakeholder and economic analysis of the Las Vegas community. "My job is to show that from the stakeholder perspective, from the community-member perspective, from the federal agency perspective, and from a natural and cultural perspective, that it's important for that land to be preserved for the public," says Hutton. If Hutton's analysis shows that the property should be preserved for public use, then the next step will be to decipher the best use of the property in consideration of community needs and values.

Denver Service Center evaluated additional methods to ensure that the Gateway Project is accessible and welcoming to the entire community, such as a public transportation system and visitor shuttle to ensure that all citizens in Las Vegas enjoy access to the park.

Instrumental work was also accomplished in the Gateway Project feasibility study by DSC advancing the land acquisition through "round three" of the Southern Nevada Public Lands Management Act. During this phase, The Conservation Fund allocated and set aside money for acquiring the property. Executive Director O'Neill emphasizes that DSC's work was especially helpful since the Nel Property is not the typical USFS acquisition of a natural site with threatened and endangered species. "This was essentially a site that had been adversely affected by development, yet had immense potential," says O'Neill. "Their work helped this project score high enough, under criteria that wouldn't necessarily favor this type of project, to get funded."

Ranch Provides Science Study Setting

Denver Service Center also participated in planning for the nearby Oliver Ranch, a 1934 settlement acquired by BLM in 1993. Since the 300-acre ranch is located on federal property, land acquisition was not part of a feasibility study. In this case, DSC assisted in a study to complete planning for a residential field science school for local students. The Southern Nevada Public Lands Management Act provided $100,000 to complete the feasibility study for the school, and DSC assisted in development of a plan for integrating the proposed campus with the natural environment and existing facilities on the Oliver Ranch site.

A wealth of cultural history surrounds the Oliver Ranch, enhancing the educational opportunities associated with the desert ecosystem. "There is an extensive Native American history," explains Alison Hill, Director of Education and Outreach at Yosemite National Institutes (YNI). This includes Native American sites occupied by the prehistoric ancestral Puebloan and the Pinto/Gypsum groups, and more recently, by the Patayan and southern Paiute. Artifacts discovered in the area include agave roasting pits, rock shelters, petroglyphs, and tool shards. Other history includes early exploration, missionary influence, prospecting, mining, and ranching.

According to Hill, who assisted in the educational portion of the Oliver Ranch feasibility study, YNI recommended that the school connect the local community with "wild Nevada" and help students understand the cultural and natural history of the area. One of the exciting aspects about the campus feasibility study for Hill was working with Clark County educators. "The superintendents gave a unanimous letter of support, endorsing the idea," she says. "That would mean that they would try to get all the fifth graders in Clark County to attend the program." Such attendance will benefit the future environmental and social sustainability of the area by ensuring that local children learn about the value of natural and cultural resources. Broad participation supported by the educational system will also provide an opportunity for students who may never visit otherwise. While at the Oliver Ranch, fifth graders will not only encounter the cultural history of the area and the natural sciences, they will also learn about sustainable living and building practices from the campus design.

"We know that we want Oliver Ranch to be a totally green facility," says OLVF Executive Director O'Neill. According to O'Neill, DSC stimulated the idea that the built environment should be a teaching tool in itself, as is the natural environment. "Not only are the kids immersed in nature and getting the understanding of their sense of place in the Mojave Desert, but when they are in the dorms or in other buildings, they also learn about sustainable design, sustainable maintenance, and sustainable operation of these facilities," adds O'Neill.

To recognize the sustainable potential of the campus, DSC organized a charette—an intensive design exercise where people brainstorm ideas and then translate them into design concepts on paper—with BLM and the firm David Jay Flood Architect. "As part of the charette, we came up with planning concepts which were based on

PHOTO COURTESY OLVF

Redesign of existing Oliver Ranch facilities will minimize environmental impacts by utilizing existing structures and vegetation. The proposed science school campus will reflect a sustainable design that provides a learning experience for participants.

sustainable design alternatives," says Robert Rotman, an architect with the firm. "Then we did some initial, very conceptual ideas of what the building might look like, what kind of materials we might use, and how they might be oriented." At the charette, the planning team identified specific environmental factors to consider during the design process. Sustainable design concepts for the site include water, building materials, energy, and air quality.

Oliver Ranch designs include enhancing preservation by utilizing existing structures and limiting proposed development to impacted areas. Building footprints will be minimized to reduce land impact and maximize open space. Plans also consider trees and other existing vegetation. "We were very cognizant of where the trees were and we tried to place buildings in relationship to the trees to benefit from the shade that they can offer," explains Rotman. Deciduous trees on the ranch have the potential to help with passive solar energy. In the summer they provide shade, and after their leaves fall in autumn, they allow sunlight to help heat buildings. Site designs also limit road access and include a gray water system to utilize runoff from the parking areas.

Concepts Conserve Energy, Water, and Air

Water conservation is especially important in the arid Las Vegas climate. According to Alison Hill, the natural springs in the Las Vegas Valley are being depleted. As a result, plans include an on-site wastewater treatment plant for the Oliver Ranch location to recycle gray water for non-potable uses. All plumbing will use water-conserving fixtures and landscaping will be drought tolerant native vegetation.

Planners worked diligently to minimize energy consumption that will decrease operating costs and reduce effects on the environment. Building orientation is an important consideration for such energy efficiency. To invite the winter sun in—and block out the summer sun— architect Rotman believes it is important to orient the buildings on an east-west axis and include an overhang to shade the south face. Planners also discussed installing light shelves, which are positioned under south-facing windows to reflect light into rooms and magnify natural lighting. The facility will also utilize natural ventilation and lighting, and photovoltaic cells on the roofs. "Photovoltaic cells help create power which can be tied into the electrical grid, resulting in rebates from the utility company," says Rotman.

Building materials also play a decisive role in reducing energy consumption. The designers proposed using stone obtained from local sources to match existing ranch buildings. Stones are energy-efficient because they delay heat from transmitting into buildings during the thermal peak of the day and slowly release heat into buildings during cooler nights, a process known as radiant heating. Rotman explains that stone would also reinforce a sense of place at the old Oliver Ranch. Reusing available buildings, and incorporating similar materials when new buildings are necessary, will help any new structures blend with existing buildings. When not using stone, designers recommend recycled materials. Plans include a recycling and composting program to be implemented as a learning opportunity at the school.

Regional Support and Funding Increase

Local community members have already shown a solid base of support for the field science school identified in the feasibility study. "There were a number of organizations that were very excited about partnering or participating with the program," notes Hill. This included BLM, NPS, USFWS, Las Vegas Astronomical Society, Community College of Southern Nevada, University of Nevada, Las Vegas, National Wild Horse Association, Nevada Commission for the Preservation of Wild Horses, Wild Horse Foundation, Clark County School District, Red Rock Interpretive Association, Friends of Red Rock Canyon, Desert Research Institute, and Las Vegas Master Gardeners.

Funding for the project is also progressing. The Southern Nevada Public Lands Management Act is supplying more than 22 million dollars to the Bureau of Land Management for construction of the campus. In addition to construction funding, OLVF will fundraise private money for equipment, operation, and maintenance costs. Beyond the immediate benefits of setting the projects in motion and securing funding for the Gateway Project and Oliver Ranch, these partnership networks are creating an innovative design model that integrates social, environmental, and economic sustainability. The holistic designs are the result of an openness to share and learn between agencies and the community.

For Linda Moery, the partnerships made the projects unique and valuable. "It's about collaboration and communication, and optimizing skills and knowledge across partnerships to meet common goals," says Moery. "We now have this network of partnerships to further the learning and knowledge of sustainability." ■

For further information contact Linda Moery (linda_moery@nps.gov) at 303.969.2411.

Seeking a Restroom—Finding a Watershed

By Donald E. Briggs, National Capital Region

The New River is not so new. Often cited as one of the oldest rivers in the world, the New is a remnant of the ancient Teays River system and one of the few north-flowing rivers in North America. The health of the river, the well-being of communities in the region, and the experiences of visitors depend on the condition of the entire watershed. To Warren Snyder, Chief of Interpretation at West Virginia's New River Gorge National River since 1991, these conditions, combined with the need to construct a visitor center, presented an exceptional opportunity. The facility itself would become an integral part of the interpretive program.

From Old Schoolhouse to New School

The opening of the new Sandstone Visitor Center in summer 2003 realizes a vision, like the New River Gorge itself, of considerable depth. "Everything about the visitor center—everything—is intertwined with the primary story associated with New River," says Snyder. In other words, the medium is also the message: the site, the design, the operation, and the interpretive media are completely integrated.

Located at an interchange along Interstate 64 between White Sulphur Springs and Beckley, West Virginia, the 11,800-square-foot Sandstone Visitor Center is a model of sustainability, part of a new generation of building designs that, among other attributes, are built with materials from within the immediate region, use geothermal energy to reduce the cost of heating and cooling, and feature landscaping appropriate to the locale. The visitor center is also connected to the community. Representative of local partnerships, the information desk is to be staffed by the Summers County Convention and Visitors Bureau as well as the National Park Service. Most significantly, though, the Sandstone Visitor Center integrates programming into the design of the structure, and the design reflects the theme central to the interpretive program at New River Gorge. Visitors experience not only a well-conceived space, but also a set of ideas and concepts that relate to everyday life. Everything about the visitor center supports the legislative intent in the designation of New River Gorge National River while employing principles associated with sustainability.

Immediately adjacent to an existing highway interchange, the location of the visitor center provides convenient access to the southern region of the park for an average of 12,000 vehicles traveling on Interstate 64 each day. The Sandstone facility complements the Canyon Rim Visitor Center in the northern—downstream—portion of the park. The Sandstone Visitor Center is built on a filled quarry—a previously disturbed or impacted site—that served until 1994 as the location of a schoolhouse, originally built in 1932.

As described by Randy Copeland, Project Manager for the National Park Service, restoration of the site is a prominent feature of the project, tied to the conservation and interpretation of the park. "We regraded the site, creating drainage swales to capture runoff from the parking lot. These contours retain storm water, cleaning the water before it reaches the river and creating mini-wetland habitats for wildlife." In addition, the project included cultivation of native plants by a local nursery. "The investment

Right: New River Gorge National River was established to conserve and interpret the outstanding natural, scenic, and historical values and objects in and around New River Gorge. At the Sandstone Visitor Center, a detailed floor map made of terrazzo tile places visitors conceptually and physically in the New River watershed.

PHOTO BY DAVID CALDWELL

NPS PHOTO

TAYLOR STUDIOS PHOTO

Top: New River Gorge Chief of Interpretation Warren Snyder envisioned a visitor center where the facility itself would become an integral part of the interpretive program.

Bottom: Sandstone Visitor Center exhibits focus on the New River watershed using a great blue heron to link interpretive elements. A primary objective of the exhibit design is to help visitors understand " . . . this is my park, it is all about the river, we all live downstream."

in habitat restoration will pay off many years into the future," explains Copeland. "We recreated three old-field successional stages, and in about three years, woody plants will begin to take over. The only maintenance will be mowing a small area once each year."

To reduce the amount of energy required for operation, the building uses geothermal energy, features a light-colored roof to reflect sunlight and reduce the costs of cooling in summer, and employs down-facing and auto-dimmed lighting operated by a sophisticated system that compensates automatically for sunlight. Copeland estimates that the building uses 60 percent less energy than the industry standard, due to the combination of superb insulation, use of geothermal energy, and a south-facing design that takes full advantage of the sun's rays.

In addition, the project employed recycled and regional source materials, reducing the amount of energy required in the production and transportation of materials. Overall, the building and its environs would likely achieve a gold rating if subjected to the Leadership in Energy and Environmental Design (LEED™) Green Building Rating System, a voluntary system developed by the broad-based U.S. Green Building Council. To maximize flexibility, the center comprises three connected but discrete spaces to allow 24-hour access to restrooms and also provides secure office space for south district staff.

Exhibits Promote Conservation and Education

Entering the building, visitors encounter the primary message of New River Gorge National River: a mosaic of terrazzo tile, a prelude to 1,850 square feet of exhibit space, places visitors conceptually and physically in the New River watershed. Exhibits explain the origin of the "New," a 65-million-year-old remnant of the Teays River buried for most of its length by advancing glaciers. Topography is a big part of the story. The river, which existed before the formation of the Appalachians, cuts through the Allegheny Plateau.

Further into the building, a 45-seat multipurpose room features a video, shown every 15 minutes, to introduce visitors to the significance of and activities found within the park. "Green messages" associated with the principles of sustainable design and operation are placed throughout the building, and models of great blue herons—large wading birds associated with riparian ecosystems—link displays throughout the exhibit space. Interpretation is issue-oriented, presenting positive as well as negative consequences of certain actions and conditions, and suggesting ways that individuals can make a constructive difference. In addition, the exhibits are participatory, emphasizing the sense of touch. As a whole, the experience of a visit to Sandstone is built upon the theme used to guide development of the exhibits:

> "What greater responsibility than to protect water, the most valuable resource on Earth . . . here, you and the National Park Service work together to protect the New River, which carves the landscape, connects the people, and sustains life in the watershed."

The fundamental need for clean water—for survival as well as recreation—provides the basis for connections among resources, the story of New River Gorge, and the way that story is told.

Collaboration Emphasizes Sustainability

The path to construction of this state-of-the-art facility, a lot like the winding New River, was neither direct nor constant. Congress estab-

LEED

LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

The U.S. Green Building Council developed the LEED™ Green Building Rating System to (1) establish a common standard of measurement for green building, (2) promote integrated, whole-building design practices, (3) recognize environmental leadership in the building industry, (4) stimulate green competition, (5) raise consumer awareness of green building benefits, and (6) transform the building market. The result is a leading-edge system for designing, constructing, operating, and certifying green buildings worldwide. LEED™ presently provides a complete framework for assessing the building performance of commercial, institutional, and high-rise residential new construction and major renovation. Pilot versions of the rating system are being evaluated for existing building operations and commercial interiors projects. Four levels of certification encourage and guide a collaborative, integrated design and construction process: Leed Certified (26-32 points), Silver Level (33-38 points), Gold Level (39-51 points), and Platinum Level (52-69 points). Point distribution depends on water efficiency (8%), materials and resources (20%), sustainable sites (22%), indoor environmental quality (23%), and energy and atmosphere (27%). Achievements are recognized through state and local government incentives as well as increased marketing exposure.

Visit www.usgbc.org/LEED/LEED_main.asp *for further details.*

NPS PHOTO

The location of New River Gorge National River's Sandstone Visitor Center was once a disturbed area adjacent to an interchange along Interstate 64. The site was formerly occupied by a 1932 schoolhouse built on a filled quarry (upper right) .

lished New River Gorge National River in 1978 to preserve the free-flowing waterway, protecting an excellent fishery, some of West Virginia's rarest plants, and premier opportunities for whitewater boating. The 1988 legislation that established Bluestone National Scenic River to the south and Gauley River National Recreation Area to the north—designations which recognize the significance of other rivers that combine with the flow of the New in the upper Kanawha River watershed—also authorized construction of a visitor center located along Interstate 64 at Glade Creek, a pristine natural area one mile from a highway interchange.

Meanwhile, the National Park Service was formally adopting a set of principles associated with the concept of sustainability *(for examples, see Director's Orders #13: Environmental Management [draft] and #90: Value Analysis)*. Such emphasis is evident in the characteristics of those selected to work on NPS projects. Like others working on contract to the NPS, Susan Maxman & Associates, the architectural firm that designed the Sandstone Visitor Center, was chosen for its sensitivity to the issues of energy conservation and sustainability. In contrast to a more conventional process, the architectural design for the Sandstone facility was purposely delayed pending award of the interpretive exhibit contract. The two design teams were then able to collaborate, creating a strong and complementary exhibit space.

As one might imagine, such an innovative approach—weaving the concept of sustainability into the interpretive message, and the interpretive messages into the design—required political support. Fortunately, Congressman Nick J. Rahall, II, and (former) Superintendent Pete Hart also shared Snyder's vision. In 1998 the Transportation Equity Act for the 21st Century included funding for the facility. From there, staff from the north and south districts of the park, the Denver Service Center, and the architectural and exhibit design companies were involved in the planning and design of the center.

Total cost of the project was $10.8 million, including $1.5 million for planning and design and $0.8 million for interpretive exhibits.

"No question that it took a while," Snyder recounts, describing the history of the project leading up to the anticipated opening, "but we ended up with an exceptional facility in a perfect location, telling a story in a holistic way." ■

Green Survey Highlights Successes

By Kevin Leichner, National Parks of New York Harbor

PHOTOS © 2001 PRAKESH PATEL

Top: Chesapeake Bay Foundation's Philip Merrill Center offers panoramic bay views, reflecting an open and direct connection to the surrounding landscape.

Bottom: Chesapeake Bay Foundation used a workshop design process involving design professionals, energy analysts, government experts, and other interested individuals.

Left: Located on 31 acres of Chesapeake Bay shoreline, the Philip Merrill Environmental Center features a dramatic roof line that drains rainwater into catchment cisterns. The foundation spent $1.5 million to green the design of the building, costs estimated to be recovered over the next 10 years.

A new generation of green buildings is accelerating innovation and inspiring an eager public. The results are better places in which to live and work, new learning opportunities, and a reconnection to our heritage and to the natural world. National Park Service policymakers, planners, and designers can now draw from such motivating examples in the private and nonprofit sectors.

While these endeavors differ in scale, there are a number of common themes. Each organization began with a shared vision. For example, Ford, a National Park Foundation "Proud Partner," wanted to renew its relationship, even at great initial cost, with the natural world and communities surrounding its Dearborn, Michigan, home.

Strong partnerships, consensus decisions, and stakeholder connections made these projects possible. At Maryland's Chesapeake Bay Foundation, a broad coalition of agencies, organizations, volunteers, and donors helped to realize the new program center. The workshop design process included design professionals, energy analysts, government experts, and end users, many of whom contributed their own green expertise.

Each of these organizations has adopted the goal of contributing to the green knowledge base through outreach and education, providing resources, demonstrating technologies, and even creating dedicated visitor centers. The Natural Resources Defense Council (NRDC), for example, has documented their green office experiences, producing a body of work available to design professionals and the public.

Foundation Builds Of the Chesapeake, By the Chesapeake, For the Chesapeake

The Chesapeake Bay Foundation (CBF) was founded with the rallying cry of "Save the Bay!" Thirty-five years and 110,000 members later, the immediate connection to this public treasure is reflected in the new headquarters building, inaugurated in 2000. Located near Annapolis, Maryland, the open plan 32,000-square-foot Philip Merrill Environmental Center, with views of the Chesapeake Bay and Black Walnut Creek, welcomes visitors, volunteers, and members—and is home to nearly 100 employees.

The foundation encourages the protection and restoration of the Bay, as well as sustainable regional development. Because of this philosophy, materials used in the building originated within the watershed, a 300-mile radius around the Bay. All existing structures were recycled into the new building. The award-winning design, first to be receive a platinum certification from the U.S. Green Building Council, celebrates its earth-friendly features. Examples include the composting toilets and solar water heaters that were field-tested by CBF staff on remote islands in the Chesapeake Bay. In addition, the building form is dramatically shaped by the shed-type roof that drains rainwater into three prominent 7,000-gallon cisterns adjacent to the public entrance. The water is used for fire suppression, irrigation and mechanical systems, and filtered for use in laundry, janitor sinks, and outdoor faucets.

The U.S. Department of Energy conducted a post-occupancy evaluation on the Chesapeake building, facilitating discussion groups in 2002. The foundation's employees expressed pride and largely positive comments, sharing how the building made them feel, their new appreciation of the play of light and the change of seasons, the connection to the natural world, and the improved office culture due to the complete openness of the work space. Comments received in the survey reflected the inspiration the employees felt. "You almost feel like you need to come out of meeting rooms with something magnificent due to the views," a participant observed. This seems true for everyone who sees the building, especially for the tens of thousand of annual visitors. According to a Chesapeake Bay Foundation senior executive, "Now we see everyday what we are working *on* and what we are working *for*."

NRDC Advances Stealthy Designs

The Natural Resources Defense Council has constructed a succession of offices during the past 15 years. Each reflects lessons learned from the last, as well as a particular aspect of sustainable design, while subtly maintaining the look and feel of a typical office.

The New York NRDC headquarters, located in a renovated loft in the Flatiron District, opened in 1989 and demonstrated the latest in easily available green technologies and materials. The most striking departure from late-1980s office design was the emphasis on natural lighting, particularly with the addition of a three-story atrium in the heart of the space.

The Washington, D.C., office that opened in 1996 showcases new materials in traditional applications. Examples include compressed straw wall panels, gypsum board made from industrial waste, countertops made of soybeans and recycled newspaper, and high-recycled glass content ceramic tiles.

NRDC PHOTO BY ROB WATSON

Top: Natural Resources Defense Council offices in Washington D.C. seem typical to the untrained eye. However, ultra-low VOC paint, walls made from compacted waste straw, a lighting system that uses 75 percent less than conventional ones, and other advances are estimated to save approximately $15,000 a year in energy costs.

Bottom: A $2 billion overhaul of Ford's River Rouge factory includes a 10.4-acre blanket of sedum and native grasses to capture rainwater and cool the building. Large roof monitors and skylights will flood the plant's assembly area with natural light.

The new Santa Monica office, scheduled to open at the end of 2003, has been built from the ground up. The design capitalizes on NRDC's accumulated expertise and focuses on maximizing natural systems such as daylighting, natural ventilation, renewal and reuse, and integrated water recycling, especially important in southern California.

Ford Renews River Rouge

Ford Motor Company is undertaking a cultural transformation while renewing the River Rouge plant near Dearborn, Michigan, the place where Ford began one hundred years ago. At the start of Ford's second century, Chairman and Chief Executive Officer Bill Ford has shared a powerful new vision, influenced by his collaboration with sustainability expert William McDonough, to be showcased by the renovated factory.

Known for manufacturing innovations such as the assembly line and vertical integration, the Ford Corporation will now lead world industry by embracing values such as reconnecting to the natural world, reinvesting in Dearborn, and celebrating an institutional heritage tightly intertwined with the history of the nation.

Choosing to remain at River Rouge, a "brownfield site" contaminated by decades of auto manufacturing, is a remarkable departure from the typical cradle-to-grave industrial approach. Ford has transformed its relationship to the land it occupies by rebuilding a productive natural landscape including wetlands, orchards, and swaths of native vegetation. While cutting costs, the project has addressed site drainage by creating swales (low areas to collect runoff), the world's largest porous parking surface, and the world's largest living roof on top of the retooled Dearborn truck plant. Through a partnership with Michigan State University, Ford is experimenting with phytoremediation by planting cardinal flower, bulrush, monkey flower and cordgrass—all demonstrated to remove toxic by-products from steel production—next to a coke oven in operation since 1917.

The River Rouge plant also reflects a focus on education, outreach, and historic preservation and reuse. The Gate 4 Overpass on Miller Road, recognized by the National Park Service as one of the ten most significant sites in the history of the American labor movement, has been rebuilt to appear as it did at the time of the 1937 "Battle of the Overpass." Forty thousand square feet of interior space and the south façade of Albert Kahn's 1922 glass factory have been preserved, and thousands of tons of debris recycled into the foundation of the new truck body shop. Where historic smokestacks once stood, four vegetated spires (large trellis-type installations) now contribute to "vertical landscaping." The site, which once received 250,000 annual visitors, will soon reach expanded audiences at a new visitor center that will open in 2004. ■

Acknowledgments: Kyle Copas, Director of Communications, William McDonough + Partners; Rob Watson, Senior Scientist, Natural Resources Defense Council; Greg Mella, AIA, LEED™, SmithGroup. For more go to www.ford.com*;* www.nrdc.org*; and* www.cbf.org.

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Last summer National Park Service Intermountain Regional Director Karen Wade and her staff began collaborating with Dr. Bruce Hutton of Daniels College of Business at the University of Denver to create a sustainable region of national parks and protected lands. The resulting National Parks Center for Sustainable Conservation Ethics is presently developing educational programming based on sustainability themes, researching methodologies for park and program managers to determine which functions are integral to the sustainability of parks, and establishing collaborative partnerships by convening stakeholder groups to address specific issues.

NPS REGIONAL DIRECTOR

Karen Wade

" We can set the pace, provide the leadership, and use ourselves as an example of what can be achieved by employing sustainable practices. The essence of our mission is sustainability . . . "

Sustainability News: The National Park Service mission gives future generations equal consideration with present stakeholders. Did the National Parks Center for Sustainable Conservation Ethics evolve from this organizational tenet?

Wade: Yes. At its most basic, sustainability means simply that the way we live now ensures that we will leave the world in good shape for future generations—that we will not cheat our kids. And as you point out, that is an essential part of the National Park Service mission. The Center for Sustainable Conservation Ethics at the University of Denver is one way we can help parks be true to their mission. Its purpose is to help parks solve problems using the principles of sustainability. The connection to the university community is an important relationship for sustainability because it connects parks to a source of needed ongoing research, education, program development, and relationship building with all of the stakeholders commonly associated with the park system.

Sustainability News: Do you believe that the NPS mission must be reexamined as it relates to our emerging role in sustainable conservation?

Wade: We don't have to reexamine our mission, we simply need to be true to it. We can set the pace, provide the leadership, and use ourselves as an example of what can be achieved by employing sustainable practices. The essence of our mission is sustainability, and the concept of sustainability can help us articulate clearly what our mission commits us to. The International Institute for Sustainable Development defines sustainability as the "adoption of strategies and activities that meets the needs of the enterprise and its stakeholders today while protecting, sustaining, and enhancing the human and natural resources that will be needed in the future." If we follow that guiding principle, we are very close to fulfilling our non-impairment standard.

In the Intermountain Region (IMR), we set out our vision two years ago. It stated that: "The National Park Service is uniquely positioned as a citizen-centered agency to help voice the nation's conservation conscience. This conscience manifests itself as a conservation ethic with respect for land, heritage, cultural diversity, and human needs. This ethic reaches beyond the significance of any one unit of our system or the system itself. It lies in the intrinsic values that help us understand who we are as Americans and the systems that support and sustain us."

If we live by that vision and take into account the world around us, we will be well on our way to helping chart a sustainable future not just for the parks (the parks are not sustainable on their own) but also for the world around us. And there really is no other kind of sustainability. No piece of our heritage is sustainable in isolation.

NPS PHOTO

Intermountain Regional Director Karen Wade and the University of Denver's R. Bruce Hutton, Ph.D., have spearheaded the National Parks Center for Sustainable Conservation Ethics.

Sustainability News: The National Parks Center for Sustainable Conservation Ethics encourages an entrepreneurial spirit to create a sustainable region of parks and protected lands. What new paths will the National Park Service be taking in this direction? How will the Center inspire others to be risk-takers?

Wade: Entrepreneurial spirit is a mindset. In fact, there are many examples of National Park Service personnel—managers, superintendents, line and staff employees—that have taken on challenges and seized opportunities in creative ways. One of the things the Center will do is increase the awareness of the rest of the park system about just how creative a culture we have in the NPS. Sustainability requires a spirit of creative problem solving. Changing circumstances call for new thinking and new solutions. The Center will work with the IMR on ways to encourage and reward such thinking. It will develop case studies and lessons learned from real life park examples, and it will help to get that information distributed throughout the region and the rest of the service so that employees can build on each other's successes.

Sustainability News: Education is an important component of the NPS and the Center's objectives. How will the Center assist park personnel in developing values and activities that, in turn, help the public understand the connections between the parks and equitable social, environmental, and economic systems?

Wade: The Center will develop, and support the development of, a variety of educational tools devoted to sustainability. It will work collaboratively with the parks, interpretive staff, and other world-class sustainability experts. The mission of the Center is to facilitate the sustainability of parks. Sometimes this means developing and implementing programs with and for the parks. However, more often it means that the Center's role is to connect the best educators and researchers with parks to get the job done. The Center understands parks, their needs, and their culture. The programs of the Center will not be off-the-shelf programs that were developed for some other market or audience. One of the signature dimensions of the Center is to develop programs based on the rich culture and tradition of the Park Service. Examples of the kinds of programs and tools that might be developed are on-site custom training programs for leadership development, best practices, strategic planning, and partnership development and maintenance. In all programs, ethical and socially responsible conduct will be a central theme.

Sustainability News: What is your idea of a model sustainable national park? What do you believe is the role of the public in creating these models?

Wade: A sustainable park is a park that has reached out beyond its borders and helped people understand the values and mission the

"A sustainable park or park system is one that develops a process for allocating values that assures environmental and cultural integrity, social and community equity, and economic viability."

park represents. A sustainable park is one that forms partnerships with local communities and interested groups, and engages people through communication and education. A sustainable park is a park that understands and is actively involved in its community's economy at the local (gateway) and regional level. A sustainable park is one that realizes that, without a broad base of understanding for and appreciation of its mission, it cannot be sustainable.

A park or the park system itself becomes unsustainable when one or more of its core values is given so much weight that the other values suffer irreparable harm. For example, if park budgets are cut so severely in the drive for greater efficiency that natural and cultural resources cannot be preserved (protection), that people don't feel safe in visiting a park (sharing), that the best of the park employees leave (effectiveness), and gateway communities suffer economically from the lack of visitation (community), then the value placed on efficiency has made the park(s) unsustainable.

A sustainable park or park system is one that develops a process for allocating values that assures environmental and cultural integrity, social and community equity, and economic viability. It is easy to see that this type of process depends heavily on the public for input, cooperation, and assistance. Gateway community members, visitors, educators, school children, government leaders, business, and nonprofits all play an integral role. Engaging them, getting them involved, and increasing their knowledge and support for the values inherent in our parks is essential to a sustainable park system.

Sustainability News: How will the National Parks Center for Sustainable Conservation Ethics work with the Intermountain Region to design, enable, and participate in park projects?

Wade: The Center and the parks will have a collaborative partnership in the truest sense. The Center is working in four main areas of activity: (1) educational programming around sustainability themes, (2) several specific projects touching on different aspects of sustainability, (3) research to support and measure the impact of sustainable strategies, and (4) providing a convening function to bring different stakeholder groups together around specific issues.

Sustainability News: Which on-the-ground projects are currently underway? Do you believe these are priorities that should be established Servicewide?

Wade: The Center has undertaken some basic research around a sustainability context for competitive sourcing. How can the process of competitive sourcing be used as a tool to achieve sustainability? The research for this context was completed and shared with the National Leadership Council in Bar Harbor last September. The next step in this research is to figure out how to prepare a tool for park and program managers to use in tight fiscal situations or in advance of working through the competitive sourcing process. It is a methodology that helps park and program managers figure out which functions are mission-critical to the sustainability of parks.

Other projects include work with the U.S. Forest Service involving the issue of sustainability in planning and the use of economics as a fundamental planning tool. As the Center evolves and grows into relationships that are more complex with parks in the Intermountain Region and throughout the NPS (as well as with other land managing agencies), it is a possibility that priorities could be developed collaboratively between leadership in the National Park Service and the Center. ■

Decision Processes Lead to Sustainability

The National Parks Center for Sustainable Conservation Ethics is seeking to understand the fundamental character of the interactions between nature and society. These interactions occur at two levels. Interdependency of economic, environmental, and social dimensions is the first level. Second is the impact on this interdependency caused by the actions of private, public, and nonprofit sectors of society.

The result is a complex system in which the level of sustainability depends on the decision processes that simultaneously consider environmental, economic, and social consequences. Balance depends on the relationships and power between business, government, and the community. Success requires adequate levels of trust, cooperation, and integrated action.

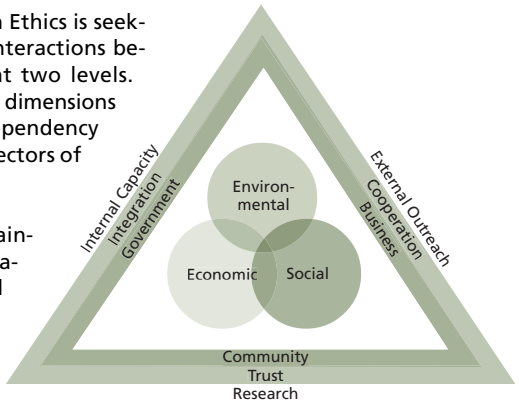

DIAGRAM BY UNIVERSITY OF DENVER

By Kay Howe, North Cascades National Park

PHOTOS BY KAY HOWE

Top: Recycled polypropylene feed sacks are filled with soil excavated locally. Filled bags are laid with strands of barbed wire between each course to provide stability. Bags were filled in place using 75 tons of dirt lifted in #10 cans.

Bottom: Earthbags are placed over arched wooden forms to create doorways and windows using the familiar keystone technique. This *flexible-form* construction refers to the ability to create circles, curves, domes, and other non-linear shapes.

Earthbag Construction Maximizes Flexibility

A new Bureau of Land Management (BLM) permitting station in Bluff, Utah, provides a strong conservation message to boaters in advance of any trip on the San Juan River. An alternative construction built with local soil, the 700-square-foot facility demonstrates how collaboration and attention to community and economy can successfully conserve resources.

Termed *flexible-form rammed earth*, *superadobe*, or *earthbag*, the construction technique was pioneered by Iranian architect Nader Kahlili, whose buildings surpassed current standards for load capacity and earthquake resistance when tested at an experimental site in California.

Bureau of Land Management civil engineer John Lewis chose this type of construction for several reasons. Bluff is a remote community just north of Monument Valley where traditional materials must be shipped from communities several hours away. Earthen construction allowed for the use of inexpensive local materials. Walls ranging from 15 to 24 inches in thickness create a thermal mass, which produces a soundproof and energy-efficient structure. Earthbag buildings are resistant to fire, flood, and rot, making them permanent structures that are less expensive to insure.

Earthbag construction technology uses simple methods and few resources. Polypropylene feed sacks are filled with dirt and compressed by tamping them with long-handled, homemade cement tampers. The sacks are misprinted bags (considered rejects) that can be purchased at a low cost. Earthbags are laid with two strands of four-pronged barbed wire between each course as in masonry. The wire provides tensile strength and keeps the bags from slipping.

Ideally, structures are sunken three to four feet into the ground, and dirt excavated from the site is used to fill the bags. Soil used for the permitting station originated at a gravel yard about one mile from the site and was donated to the BLM. Building dirt was comprised of sand with 10 percent clay content. Other suitable soils are sand, stabilized sand, or crushed limestone.

Lewis recruited a construction crew of five BLM employees with no previous earthbag construction experience, one National Park Service employee on interdivisional training, and two skilled earthbag builders contracted from Moab, Utah. The crew was instructed on site by the Moab team and aided by the NPS trainee, who possessed some previous experience in earthbag construction.

Wooden forms were placed to establish openings for doorways and windows. Nails were shot into a concrete pad next, and sacks of QUICKRETE® were placed on the nails to bond the bags with the pad. The QUICKRETE® sacks were then perforated and watered to set up the concrete. This produced a 5-inch concrete stemwall atop the pad. Barbed wire was then laid on top of the concrete sacks, and the first row of earthbags followed. After a full row of bags was laid, the soil-filled sacks were tamped, compressing 10-inch bags into 5-inch bags. A rod welded to a steel plate and bolted through the front framewall joined the bag wall to the front of the building.

Nailing plates were set between bags where door or window frames would be added. These consisted of short two-by-fours nailed to oriented strand board (OSB), and secured with nails to the bag. Nailing plates were also used to fasten electrical boxes in the wall system. Longer plates were placed higher in the walls for pictures to be hung in the finished building. Electrical conduit was installed between bags.

In only 80 hours, the small crew constructed 132 linear feet of 9.5-foot-high earthbag wall. A 6-inch cement bond beam was later poured on the top row of bags, raising the wall height to 10 feet. The finished building includes a pueblo-style roof and an interior featuring natural earth plaster detailed with colors from locally harvested clays. The exterior is sheeted with OSB board (secured by plastic fasteners inserted between the bags) and 2-inch foam finished with a synthetic plaster. Traditional cement stucco provided the slightly irregular appearance of an old adobe building.

Cost of materials for the wall construction averaged $1.20 a square foot, resulting in a combination of comfort, low cost, and architectural beauty. ■

Contact Gerry Cook (gerry_cook@nps.gov) for more information about earthbag construction.

NPS PHOTO

Workshop Greens Bandelier
Third in a series cosponsored by the NPS and U.S. Environmental Protection Agency, the spring Bandelier National Monument greening workshop included park staff as well as personnel from other national parks, state parks, and national experts. Northwest of Santa Fe, New Mexico, Bandelier contains wilderness trails, cliff dwellings and other structures built by ancestral Puebloans, and 1930s buildings constructed by the Civilian Conservation Corps.

Bandelier is already greening its operations, but issues remain such as crowded parking lots, maintenance of historic CCC buildings, renovation of the snack bar and renegotiation of the concessions contract, and construction of a new maintenance facility at the present "boneyard."

Working in groups, participants developed a vision for Bandelier, including formation of a green team and collaboration with organizations such as Green Zia and Los Alamos and Sandia National Laboratories to accelerate changes identified during the workshop.

Major issues addressed also include: better transportation options, a new green visitor center, numerous sustainable education opportunities, and park planning that is comprehensive and focused on a sustainable future.

Beyond Sustainability: Cradle to Cradle
In *Cradle to Cradle* (North Point Press, New York, 2002), authors McDonough and Braungart envision a future where every design decision ultimately benefits all children of all species for all time. This could be dismissed as idealistic except for the inspiring progress the authors have made as they overcome entrenched attitudes in design, engineering, industrial production, and institutional policy.

Cradle to Cradle encourages us to evaluate our choices in terms of aesthetics, cost, performance, ecological intelligence, justice, and fun. We must avoid repeating the past or blind acceptance of initial constraints because, according to the old axiom, all of the biggest design mistakes are made on the first day. The authors provide high-profile examples to demonstrate how their criteria, or design filters, have improved project economies, efficiencies, and satisfaction.

Especially notable in these tight fiscal times, the authors' valuation of humanity challenges the current definition of efficiency characterized by downsizing, mechanization, and artificially cheap material inputs. Instead, as waste is minimized, and material prices are adjusted to reflect true environmental and social costs, more intelligent use of resources and greater employment of local labor become feasible, creating meaningful jobs.

Similarly, sharing knowledge, pooling capabilities, and empowering team members and end users at the project level makes innovation possible. Successful green design depends on a complete and accurate understanding of the lifetime use and eventual reuse of a building, product, or application. While easy to dismiss talking in favor of hasty action, real conversations build awareness, inspire action, and—in due course—conserve resources and maximize long-term performance.

Additionally, McDonough and Braungart challenge some widely accepted truths:

- "Downcycling" (processing products into different, lower-grade items), or even recycling, is a destructive and dangerous process by which products are reused in ways not originally intended, destroying the material integrity of the original components and releasing toxins.
- To achieve "upcycling," we must separate the waste stream into biological and technical nutrient cycles. Organic wastes should be decomposed by natural processes. Inorganic materials should be reused indefinitely.
- We must avoid monstrous hybrids that irretrievably meld organic and inorganic substances, even in partially recycled items.
- Mere stewardship allows destructive processes to continue just to the legal threshold of injury or death. Instead of causing a sudden shock from which recovery is possible, we slowly poison ourselves and comprehensively destroy natural systems. We must renew places instead of simply preserving them.

The easiest decision-making criterion of all is to consider the legacy we will leave for future generations. In this respect, National Park Service mission, goals, and planning efforts clearly correspond to the *Cradle to Cradle* worldview. McDonough and Braungart press us, both with urgency and inspiration, to more fully realize our potential. ■

Book review by Kevin Leichner, Public Affairs Specialist, National Parks of New York Harbor.

Plastic Paper Features Infinite Life Cycle
A prime example of the design philosophy mandated in *Cradle to Cradle* is the hard copy of the book itself. Manufactured through a partnership using Melcher Media's patent-pending "Durabook" technology, *Cradle to Cradle* consists of plastic polymer pages that are soft to the touch and waterproof as well.

The standard cradle-to-grave life cycle of a traditional cellulose paper book ends in a landfill or descends through toxic industrial recycling (or "downcycling") processes, consuming additional virgin wood pulp to yield newsprint or toilet paper. By contrast, *Cradle to Cradle* can be indefinitely "upcycled" as a "technical nutrient." The book could lead a new life altogether after being enjoyed by many interested readers. The plastic, which retains material integrity, could be reborn as a new DuraBook, as part of a solar-powered car or, eventually, as both.

Spectacle Island has been transformed from an eyesore to a vision of reclamation and resource protection.

PHOTO COURTESY CENTRAL ARTERY/TUNNEL PROJECT

NPS PHOTO BY ROGER ARCHIBALD

Shards of history surface on the sand like colorful gems released to the sea from a pirate's sunken plunder. Polished smooth and battered by decades of harbor currents, luminescent fragments of 19th-century pottery and glassware belie their origin on Spectacle Island, once a city landfill for the burgeoning metropolis of Boston.

On Spectacle Island, both trash and treasures tell the isle's tale. Debris from a midden (an archeological trash pile) on Spectacle Island reveals artifacts and food refuse discarded over a period of approximately 1,000 years by native people from the mainland who visited the island to fish and gather clams or other food. By 1620, European sailors and settlers had introduced diseases that practically destroyed the native population. English colonists named the island for its resemblance to a pair of eyeglasses and harvested firewood from the site. Later, entrepreneurs from Boston established out-of-the-way businesses ranging from hotels and gambling dens to garbage dumps and a horse-rendering plant.

One of 30 islands that comprise Boston Harbor Islands National Recreation Area, 105-acre Spectacle Island has been transformed from an eyesore to a vision of reclamation and resource protection. Recently, long-neglected Boston Harbor received acclaim for an unprecedented cleanup operation that has reversed the effects of centuries of watershed degradation and pollution in Massachusetts Bay.

Spectacle Island was identified in 1978 as a site for the deposit of more than three million cubic yards of excavated soil and materials from the Central Artery/Tunnel project, otherwise known as the "Big Dig." A dike was built to contain the island's mountain of trash and prevent erosion. Dirt and gravel transported by barge were used to reshape the island, which was capped with 18 inches of clay. Two to five feet of topsoil over the cap has allowed for revegetation with plants and trees, setting the scene for a future recreational destination that includes water transportation, hiking trails, and a visitor center for the entire 50-square-mile national park area.

Spectacle Island has become part of the mission to protect Boston Harbor Islands historical, ecological, and recreational resources and make the island system an integral part of the life of the surrounding communities and region. Managed by a dedicated partnership of current managers and owners including the National Park Service, Spectacle and its neighboring islands now offer a wealth of knowledge and access for education and enjoyment. ■

Calendar | 2003

EVENTS AND OPPORTUNITIES

August 17-24

Energy 2003: Real World, Real Solutions
Orlando, Florida, is the location for the sixth annual national energy management workshop and trade show. For information go to *www.energy2003.ee.doe.gov*.

September 14-17

National Recycling Congress Annual Exposition
Recycling coordinators, business and industry leaders, and others committed to recycling will attend this Baltimore, Maryland, event. Go to *www.nrc-recycle.org/congress/* for details.

September 17-20

Architectural Engineering 2003: Building Integration Solutions
This first Architectural Engineering Conference focuses on the integration of building design, construction, and operation. Go to *www.aeinstitute.org* for more on this Austin, Texas, event.

October 1-3

Sustainable Energy Expo and Conference
This Los Angeles, California, event is designed for commercial and government energy consumers who need to understand sustainable energy options. Visit *www.sustainableexpo.com*.

October 12-15

GIN2003: Innovating for Sustainability
San Francisco, California, is the location for the 11th International Conference of the Greening of Industry Network. Phone 781.646.4596 or go to *www.greeningofindustry.org*.

November 12-14

Greenbuild International Conference & Expo
The Greenbuild conference features the latest green developments, an exhibit hall, green tours, and networking opportunities at the Lawrence Conference Center in Pittsburgh, Pennsylvania. For full details visit *www.usgbc.org/expo*.

November 15-19

EVS-20: Powering Sustainable Transportation
This Long Beach, California, symposium represents the largest gathering of the battery, hybrid, and fuel cell industry. Phone 202.508.5995 or visit *www.evs20.org*.

November 17-20

Joint Ventures: Partners in Stewardship
This Los Angeles, California, interagency conference includes representatives from state, federal, and private sector organizations. A major theme of the conference is sustainable practices. Visit the conference website at *www.partnerships2003.org*.

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National Park Service
The National Park Service is a bureau within the Department of the Interior. We preserve unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. We also cooperate with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

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