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Accessibility workshop participants show off the new large print park brochure for the C&O Canal. Standing (left to right): C&O Canal NHP superintendent Kevin Brandt and chief of interpretation Bill Justice. Sitting: Ray Bloomer, Marsha Mazz, Patricia Beech, and Bill Morgan. See related articles on Page 4 and Page 9. (NPS Photo by David T. Gilbert)

From HFC's Director

How can we make media more accessible? The National Park Service is committed to bringing its messages to everyone, but there are many barriers (physical, cultural, language, geographic, etc.) that must be overcome to achieve this goal. This issue of *HFC onMedia* discusses some of Harpers Ferry Center's efforts to help parks develop media that is accessible to people with disabilities.

The Center has always been a leader in developing standards and guidelines for accessible media. The recent release of our revised *Programmatic Accessibility Guidelines for National Park Service Interpretive Media* is the latest edition of guidelines we have maintained for years. These updated guidelines have been reviewed by accessibility professionals from both inside and outside the NPS. They represent current best practice, and help us meet today's policy and regulatory requirements. These guidelines, and other accessibility tools, are available on the Harpers Ferry Center website at www.nps.gov/hfc/accessibility.

Clearly the National Park Service has an obligation—and an opportunity—to improve programmatic accessibility in all our media: audiovisual programs, exhibits, publications, and wayside exhibits. In this issue you will find information on Principles of Universal

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Principles of Universal Design

No discussion of accessibility can take place without an understanding of universal design. Universal design is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.

These guidelines were established to guide a wide range of design disciplines including environments, products, and communications. The seven principles may be applied to evaluate existing designs, guide the design process, or educate both designers and consumers about the characteristics of more usable products and environments.

Principle 1: Equitable Use

The design is useful and marketable to people with diverse abilities.

Guidelines:

- Provide the same means of use for all users: identical whenever possible; equivalent when not.
- Avoid segregating or stigmatizing any users.
- Provisions for privacy, security, and

safety should be equally available to all users.

- Make the design appealing to all users.

Principle 2: Flexibility in Use

The design accommodates a wide range of individual preferences and abilities.

Guidelines:

- Provide choice in methods of use.
- Accommodate right- or left-handed access and use.
- Facilitate the user's accuracy and precision.
- Provide adaptability to the user's pace.

Principle 3: Simple and Intuitive Use

Use of the design is easy to understand, regardless of the user's experience,

Continued on next page



Erin Broadbent, superintendent of Kings Mountain National Military Park, explores a touchable topographic map from her wheelchair. (NPS Photo by Michael Paskowsky)

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Send questions and comments to David T. Gilbert either by email at david_t_gilbert@nps.gov or call 304 535 6102.

Secretary of the Interior
Dirk Kempthorne

**Director,
National Park Service**
Mary A. Bomar

**Associate Director,
Partnerships and Visitor
Experience**
Chris Jarvi

**Director,
Harpers Ferry Center**
Don Kodak

Editor
David T. Gilbert

Art Director
Robert Clark,
Office of NPS Identity

Designer
David T. Gilbert

Contributors
Melissa Cronyn
Betsy Ehrlich
Winnie Frost
Michele Hartley
Bill Justice
Caitlin McQuade
Michael Paskowsky
Lori Simmons
Anita Smith
Ed Zahniser

HFC Website
www.nps.gov/hfc

The National Park Service cares for special places saved by the American people so that all may experience our heritage.

EXPERIENCE YOUR AMERICA™

knowledge, language skills, or current concentration level.

Guidelines:

- Eliminate unnecessary complexity.
- Be consistent with user expectations and intuition.
- Accommodate a wide range of literacy and language skills.
- Arrange information consistent with its importance.
- Provide effective prompting and feedback during and after task completion.

Principle 4: Perceptible Information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Guidelines:

- Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
- Provide adequate contrast between essential information and its surroundings.
- Maximize "legibility" of essential information.
- Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
- Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

Principle 5: Tolerance for Error

The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Guidelines:

- Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
- Provide warnings of hazards and errors.

- Provide fail safe features.
- Discourage unconscious action in tasks that require vigilance.

Principle 6: Low Physical Effort

The design can be used efficiently and comfortably and with a minimum of fatigue.

Guidelines:

- Allow user to maintain a neutral body position.
- Use reasonable operating forces.
- Minimize repetitive actions.
- Minimize sustained physical effort.

Principle 7: Size and Space for Approach and Use

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

Guidelines:

- Provide a clear line of sight to important elements for any seated or standing user.
- Make reach to all components comfortable for any seated or standing user.
- Accommodate variations in hand and grip size.
- Provide adequate space for the use of assistive devices or personal assistance.

Please note that the Principles of Universal Design address only universally usable design, while the practice of design involves more than consideration for usability. Designers must also incorporate other considerations such as economic, engineering, cultural, gender, and environmental concerns in their design processes. These Principles offer designers guidance to better integrate features that meet the needs of as many users as possible.

Kings Mountain Exhibit Receives Accessibility Achievement Award

The Kings Mountain National Military Park interior exhibit design team received a 2007 NPS National Accessibility Achievement Award for Design Project Achievement: Making Exhibits and Waysides Accessible. The award is for the park's new visitor center exhibits, which interpret the October 7, 1780 victory by American Patriots over American Loyalists during the Southern Campaign of the American Revolution.

Harpers Ferry Center staff members who participated on the exhibit design team include Michael Paskowsky (project manager), Anita Smith (exhibit producer), Michele Hartley and Ed Boutte (audiovisual production), Dave McLean and Bill Brown (exhibit design).

The massive trees that provided crucial cover for advancing Patriot troops are now gone. To help provide better context for the original battlefield, the overall exhibit design evokes the historic landscape of a broad virgin forest that was a significant factor in the battle.

The exhibits use graphics, text, artifacts, video programs, audio programs, touchable objects, topographic models, dioramas, props, and mannequins to convey the interpretive messages of the park in an immersive, multi-sensory way. They provide universal access to all visitors, and succeed in meeting the diverse needs of persons with disabilities.

A visitor who is blind or has low vision can actually feel the trees, comprehend their size, and listen to audio programs that interpret the battle. They can also experience other tactile elements within the exhibit area. Visitors who are deaf or have hearing loss can view open captions for all the exhibit's audio elements. And visitors who use wheelchairs have access to all elements in the exhibit space.

Learning from the Experts

Harpers Ferry Center, NCR, and C&O Canal Host Accessibility Workshop

On September 5-6, 2007, Chesapeake & Ohio Canal National Historical Park, Harpers Ferry Center, and the National Capital Region jointly hosted an accessibility workshop to review exhibit plans for the Great Falls Tavern and Georgetown Contact Station, both units of the C&O Canal. The workshop was held at the National Conservation Training Center (NCTC) in Shepherdstown, West Virginia.

The Workshop Participants

The purpose of the two-day workshop was to gather feedback on the two proposed exhibit designs from accessibility experts, with the intent of developing recommendations for enhancing programmatic accessibility. In order to gain a variety of perspectives, members of the community with disabilities were invited to serve on a panel to provide input from their perspectives. The panel included Patricia Beech (Veditz Chapter of the American Sign Language Teachers Association), Ray Bloomer (National Center on Accessibility at Indiana University), Marsha Mazz (U.S. Access Board), Bill Morgan (League for People with Disabilities, Inc.), and Beth Ziebarth (Smithsonian Institution Accessibility Program).

David Edquist and Charlie Davis of EDX, the exhibit planning and design contrac-

tor for the two exhibits, presented proposed designs to the group on the first day of the workshop. The presentation included a 3D animated walkthrough of the Great Falls Tavern exhibits using ArchiCAD software, schematic plans and graphic representations of the tavern's principal exhibit components, and schematic plans and drawings of the Georgetown Visitor Center exhibit space.

With comments and feedback in hand from the first day of the workshop, Edquist and Davis made design adjustments to enhance exhibit accessibility. The firm then presented their proposed revisions on the second day of the workshop, soliciting further comments on the revised designs from the panel of accessibility experts. The other workshop participants, including C&O Canal park staff, Harpers Ferry Center staff, and staff



David Edquist of EDX takes workshop participants on a virtual tour through the Great Falls Tavern exhibits. (All Photos by David T. Gilbert)



Facilitator Jan Gauthier (far left) captures feedback on the Great Falls Tavern exhibits from accessibility experts Beth Ziebarth, Ray Bloomer, and Marsha Mazz.



C&O Canal chief of interpretation Bill Justice (left) and HFC exhibit planner Caitlin McQuade (right) listen to comments on the use of assistive audio by Ray Bloomer.

from the National Capital Region, also offered comments for consideration in a facilitated setting (*for a complete list of workshop participants, see sidebar*).

Exhibit Lighting

Comments from the accessibility experts covered a wide range of issues. Several panel members asked about the exhibit lighting, pointing out that strong, focused lighting can create “pools of light” surrounded by darkness. According to Marsha Mazz of the U.S. Access Board, “Different levels of light present physical barriers to visitors with low vision.” According to panel members, even glare from ambient sunlight or reflection from shiny floors can adversely impact some visitors with low-vision. All the panel members stressed the importance of even lighting in areas where visitors will be moving through the exhibit.

Tactile Models and Panels

Panel members applauded the use of many tactile models and raised-surface panels in the proposed exhibits. These included a tactile topographic model of the entire C&O Canal, touchable fiberglass

resin sculptures holding “props” that relate to a particular canal theme or story, and tactile items on a drafting table that help explain how the canal was designed. Based on feedback from the panel members, EDX proposed additional tactile elements on the second day of the workshop: an orientation panel with tactile extrusions of the three exhibit rooms in the Great Falls Tavern, and a touchable scale model of a canal boat.

Bill Morgan of the League for People with Disabilities particularly liked the use of different textures and tactile elements. According to Morgan, “Offering different textures not only engages visitors who are blind or have low vision, but also aids visitors with autism.” Beth Ziebarth of the Smithsonian Institution Accessibility Program also praised the use of tactile models and surfaces, but stressed that some form of audio should be available to further explain such exhibits. “Providing multi-sensory experiences,” she said, “is good for all types of visitors.”

Ray Bloomer of the National Center on Accessibility at Indiana University liked

Workshop Participants

Accessibility Experts

- Patricia Beech
Veditz Chapter of the American Sign Language Teachers Association
- Ray Bloomer
National Center on Accessibility, Indiana University
- Marsha Mazz
U.S. Access Board
- Bill Morgan
League for People with Disabilities, Inc.
- Beth Ziebarth
Smithsonian Institution Accessibility Program

Exhibit Contractor

- David Edquist & Charlie Davis
EDX

Facilitator

- Jan Gauthier

C&O Canal

- Kevin Brandt
Superintendent
- Bill Justice
Chief of Interpretation
- Alyssa Baltrus
Supervisory Park Ranger

Harpers Ferry Center

- Cindy Darr
Associate Manager for Workflow Management
- Tara Edwards
Administrative Technician
- Winnie Frost
Project Manager
- Dave Gilbert
Web Manager
- Debbie Haarman
Project Specialist
- Michele Hartley
Audiovisual Producer/Director
- Don Kodak
Director
- Paul Koehler
Exhibit Producer
- Krista Kovach
Exhibit Planner
- Michael Lacome
Exhibit Designer
- Caitlin McQuade
Exhibit Planner
- Joyce Morris
Exhibit Producer
- Michael Paskowsky
Project Manager

continued on next page

the use of the tactile tabletop topographic map. “This map may be the only way a blind person or person with low vision will be able to comprehend the geography and scale of the C&O Canal.” But he added that, if colors being used on the map represent geologic zones or different types of land cover, then these zones should be represented with different textures as well. Bloomer was also concerned about the size of the map, pointing out children and visitors in wheel chairs should be able to reach the surface of the entire map. He recommended a maximum reach of about 18 inches.

Too Much Text

Marsha Mazz was worried about the large amount of text on many of the exhibit panels. “Foreign visitors and visitors who have low vision will have trouble reading and comprehending so much text,” she said. She added that titles and primary text should typically be positioned at eye level—between 48 inches and 60 inches above the floor.

HFC exhibit planner Caitlin McQuade agreed. “Written text is probably the least effective way to communicate with our visitors,” she said. “Multi-sensory exhibits clearly are more accessible, engaging, and enjoyable for all visitors, regardless of ability.”

Assistive Audio

The discussion then turned to the use of audio in exhibits. People who are blind or have low vision rely on assistive audio for a range of needs, from simple wayfinding to the delivery of in-depth interpretive information. Said Mazz, “Audio is an essential component of an accessible experience.”

Panel members pointed out that audio can be used to describe a tactile map, guide a user around a model or touchable object, or describe text and graphics. People who are deaf or hard of hearing

rely on amplified audio when text and captioning can’t adequately convey such content as music, sound effects, and sounds of nature. “There is no effective text equivalent for the howl of a coyote or crack of thunder,” said Ray Bloomer.

Several audio delivery systems were discussed. Beth Ziebarth described how the Smithsonian Institution has used focused hypersonic sound—commonly known as sound cones—to deliver audio in one exhibit area while minimizing noise bleed into other parts of an exhibit. Ray Bloomer pointed out that whenever sound cones are being used, the same audio should be transmitted to visitors who have T-coil compatible hearing aids via a wireless location-sensitive induction loop system. Ziebarth added that a universal jack can also be provided on

- Justin Radford
Project Manager
- Lori Simmons
Accessibility Coordinator
- Anita Smith
Exhibit Producer
- Janice Wheeler
Supervisor of Design and Production

National Capital Region

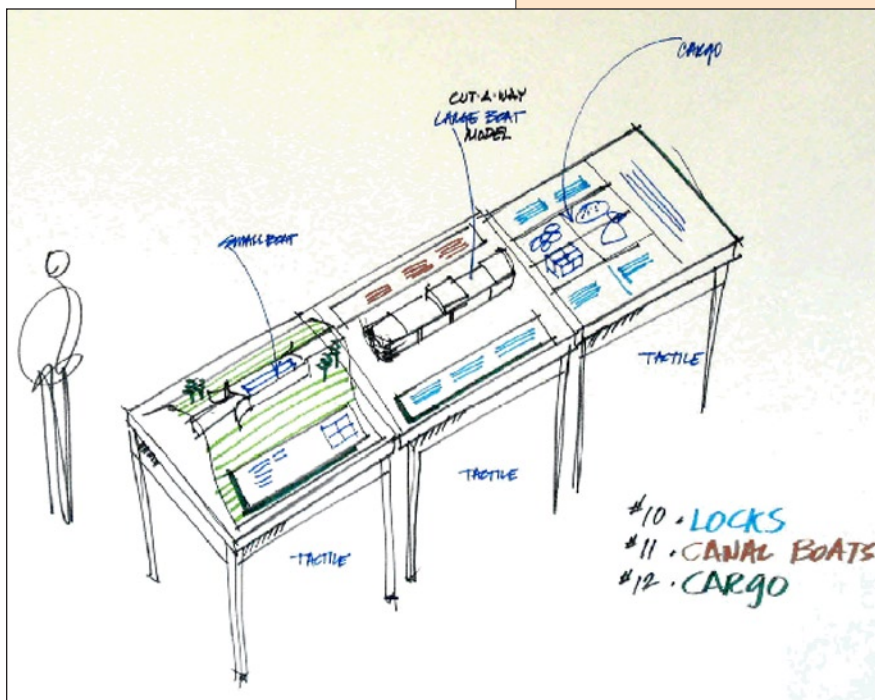
- Stan Briscoe
Chief of Professional Services
- Sue Hansen
Chief of Interpretation

Pacific West Region

- Lynne Nakata
Interpretive Specialist

WASO

- Dave Park
Accessibility Coordinator
- Sandy Weber
Interpretive Specialist



an exhibit panel so a user can connect a patch cord to their own assistive listening device such as earphones or a headset.

Cell Phone Tours

Cell phone tours offer another way to deliver on-site audio to all visitors. By dialing a specified number and using the keypad to make selections, users can ac-

Above: Based upon comments made during the first day of the accessibility workshop, EDX redesigned these three tabletop exhibits to improve the tactile components available in the Great Falls Tavern visitor center. The three components include a model of a lift lock, a cutaway model of a canal boat, and samples of cargo.



cess various layers of audio information. And because visitors use their own cell phones, parks and museums don't need to provide or maintain any equipment.

But Marsha Mazz offered some words of caution. "Cell phone tours provide an easy solution for parks and museums, but not necessarily for low-vision visitors." First, cell phones require the use of both hands, which is not convenient for low-vision users who might also be carrying a magnifier, site brochure, walking stick, or other material. Second, cell phones are a life-line for people who are blind or have low vision—particularly when they are in a new or unfamiliar place. "They will be extremely reluctant to deplete their battery or use valuable minutes for a cell phone tour," said Mazz. Ray Bloomer added that any audio device, whether it's a cell phone or other assistive listening device, needs to be hands-free if you want your visitors to touch and explore tactile exhibits.

The audio device should also be relatively easy to use. "Don't expect a visitor with low vision to read the screen or make selections on an iPod Nano," said Mazz. "The user must be able to command the device."

Mazz does endorse the delivery of audio material via podcast or MP3 download from a website. "If you can deliver audio information to a visitor who is blind or has low vision before they come to your site," she said, "you can really alleviate a lot of their anxiety." Also, providing a text download that helps make an exhibit more accessible to a person who is deaf or has hearing loss is just as valuable.

Other Audio Devices

Sound sticks are common devices used in interior exhibits. These devices, which resemble telephone handsets, typically provide a volume control dial, and are tethered to an exhibit with heavy-duty cabling. Sound sticks reduce problems with ambient noise bleed in small exhibit spaces, allow for the use of multiple sound sticks in the same area, and can be associated with a specific exhibit. But they also present maintenance issues. According to Beth Ziebarth, "The cables can break, and you have to really keep them clean."

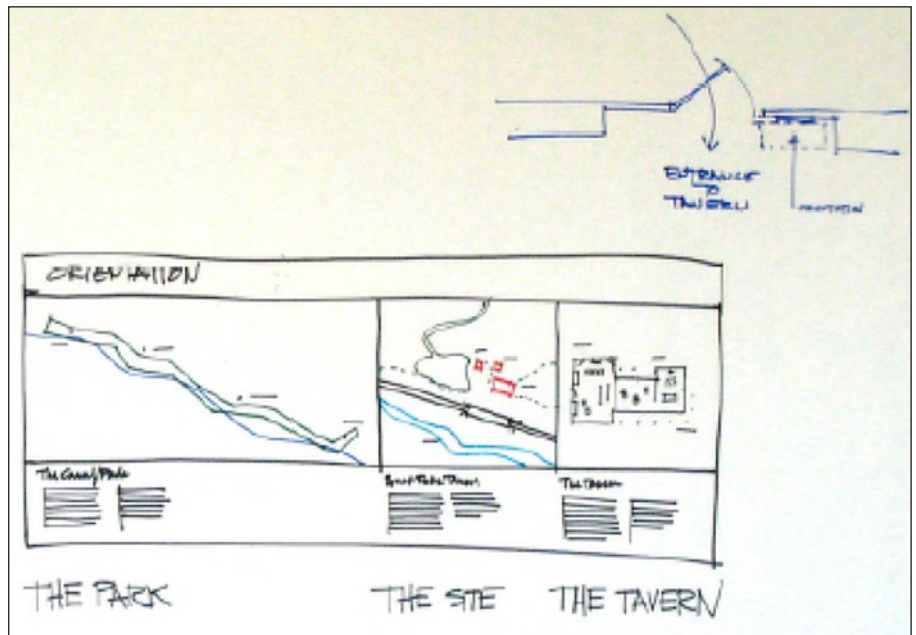
HFC project manager Justin Radford described the Sennheiser GUIDEport®, a portable receiver and headset that a park visitor can carry in their hand or hang around their neck. As the visitor pro-

Accessibility experts discuss ways to improve access to a topographic map of the C&O Canal. Comments addressed audio, lighting, table height and reach, and the use of textures to differentiate land cover and geologic zones. Seated at the front table are (left to right) Beth Ziebarth, Ray Bloomer, Marsha Mazz, Bill Morgan, and Patricia Beech.



Caitlin McQuade and HFC project manager Justin Radford discuss elements of the Great Falls Tavern visitor center exhibits.

ceeds through an exhibit, a wireless identifier unit placed near a selected exhibit triggers the GUIDEport receiver to play a segment of audio associated with that particular exhibit. Because there are no buttons to press, the device is hands-free, and the user can proceed through an exhibit at their own pace. One disadvantage of the device is that visitors with disabilities have to request the device—which many are reluctant to do. Another disadvantage, according to the C&O Canal’s Bill Justice, is that park staff would have to manage the distribution and care of the devices. “We just don’t have enough staff at Great Falls Tavern or Georgetown Visitor Center to do this,” said Justice.



The range and complexity of the various audio options—and their associated costs—clearly present complex challenges for parks everywhere. The group ultimately recommended that the exhibit planning and design team explore a combination of audio delivery systems, focusing on which audio solutions best fit the individual exhibit spaces at Great Falls Tavern and Georgetown Visitor Center.

Know Your Visitors

Panel members concluded the accessibility review with some final thoughts. Just like any group of visitors, they agreed, people with disabilities have different preferences. Some of their preferences might depend on the type of disability they have. The panelists also revealed the many different ways people with disabilities might enjoy an exhibit, regardless of their vision, hearing or mobility. There are no “one-size-fits-all” solutions for accessibility.

Marsha Mazz expressed another concern: “While the audio and tactile elements of these proposed exhibits are wonderful, they only appear to be conveying bits and pieces of your larger story.” Other panel members agreed. Do all the “accessible”

pieces of the exhibit add up to a complete and equivalent visitor experience? If the answer is “no,” then you’ve failed to reach this audience.

HFC’s Caitlin McQuade was quite pleased with the feedback offered to exhibit contractor EDX. “The process really demonstrates the value of universal design” said McQuade. “By making these exhibitions more accessible to people with disabilities, this workshop will improve the experience for *all* visitors.”

HFC director Don Kodak offered his final thoughts. In addition to improving the programmatic accessibility of these two exhibits, he pointed out, the results of the workshop will be used to develop protocols for addressing accessibility concerns across the Service. “Clearly, this workshop has demonstrated the importance of identifying accessible features before exhibit design begins,” he said. “Otherwise extensive—and *expensive*—redesigns will be necessary to integrate them later.”

A report and executive summary of the workshop will be published in December 2007.

Based upon comments made during the first day of the accessibility workshop, EDX suggested that a tactile orientation exhibit be positioned near the entrance to the Great Falls Tavern. The panel would include three separate maps: 1) a map of the entire C&O Canal, 2) a map of the Great Falls Tavern site including the locks, building, and nearby falls, and 3) a map of the interior of the visitor center. The visitor center map would include tactile representations of the three rooms and exhibits, and serve as a guide to the space for both sighted and sight-impaired visitors.

A Unigrid Brochure for Low-Vision Users

C&O Canal and Harpers Ferry Center Team Up to Develop Innovative Brochure

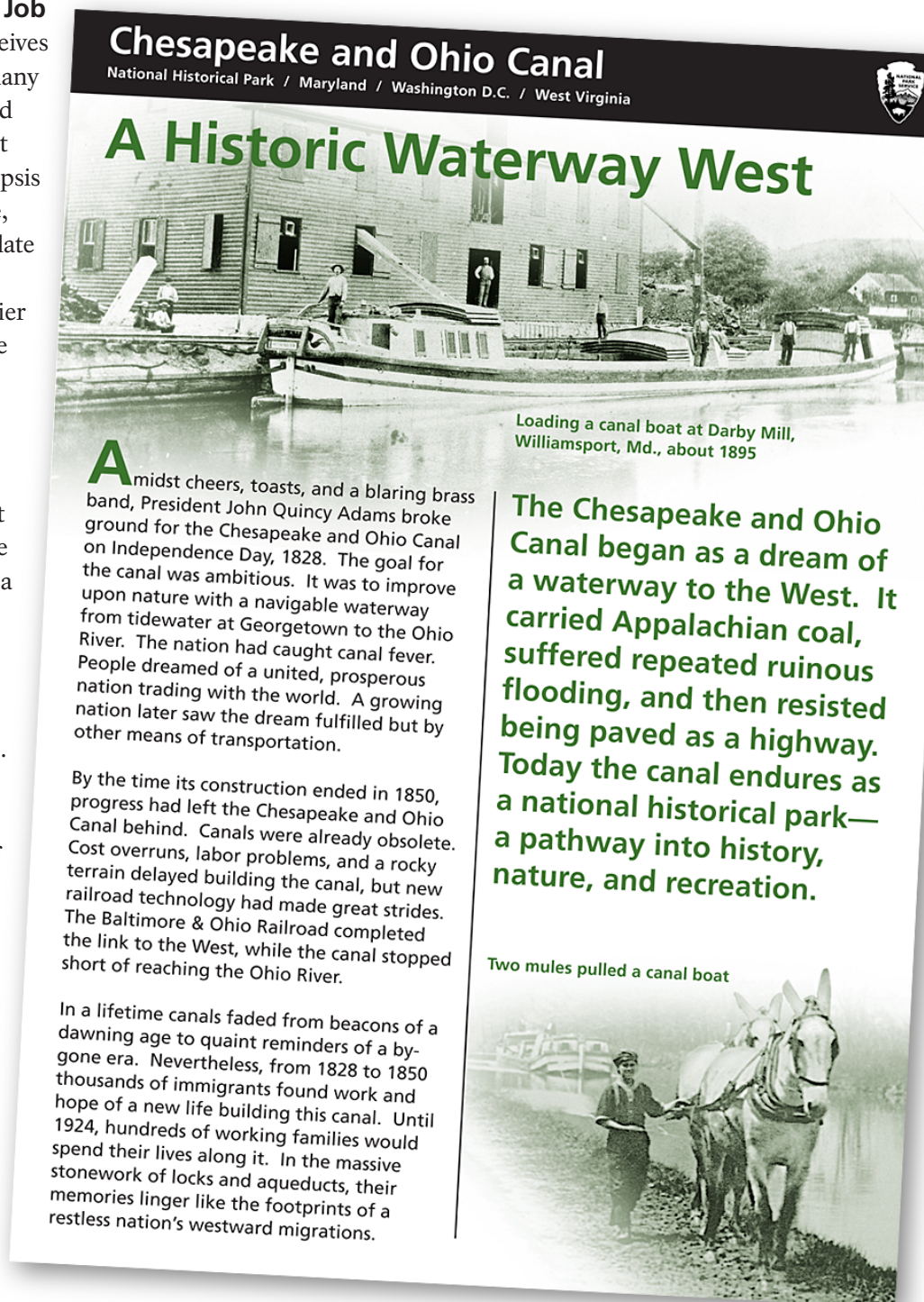
Marsha Mazz of the U.S. Access Board is used to getting large-print photocopied text versions of park brochures when she visits her favorite national parks. Mazz suffers from macular degeneration, a condition predominantly found in elderly adults. The condition severely restricts her ability to see fine details and to read standard size print.

Photocopies Just Don't Do the Job

The park photocopies she often receives have been copied or re-copied so many times that the text is rarely sharp and the contrast is usually poor. The text typically comprises just a brief synopsis of a park's official Unigrid brochure, and usually hasn't been kept up to date like the standard brochure. Photographs, which Mazz has a much easier time seeing and comprehending, are almost never included.

So when Mazz was handed a copy of the C&O Canal's new large print Unigrid park brochure, she couldn't believe her eyes. The 17½ point type was easy to read. The text provided a perfect mix of historical interpretation, points of interest, and safety information. Photographs complemented the text, and a drawing even showed how a lock gate works. More surprising was a large-print full-color map that allowed her to identify where she was and how her location related to the rest of the 185-mile-long canal.

"I don't even need my magnifier," she said with a broad grin, explaining that having her hands free to handle, fold, and maneuver the brochure made it much more usable. She then bent the brochure toward the overhead light. "And you used dull coated paper!" Glare from glossy coated paper can be very distracting for low-vision readers.





C&O Canal chief of interpretation Bill Justice talks about the park's large print brochure during the accessibility workshop in Shepherdstown, West Virginia. (NPS Photo by David T. Gilbert)

C&O Canal Takes the Lead

Bill Justice, Chief of Interpretation at Chesapeake & Ohio Canal National Historical Park, couldn't have been more pleased. Bill's passion for accessibility dates back to the 1980s, when he installed a captioning system for the film at Fort McHenry. In August 2002, he approached Harpers Ferry Center to help create a large-print version of the C&O Canal's Unigrid brochure. But as staff from the park and HFC worked through the brochure's many challenges, the project evolved into something much more.

To understand more fully the needs of the various users with low vision disabilities, the project members assembled a multi-disciplinary team of National Park Service staff, graphic design contractors, and national experts in low-vision print media. The project members also realized that the learning process guiding the design and development of the C&O Canal large print brochure should be applied to a Unigrid-style template that could be used to meet the needs of low-vision park visitors Servicewide.

Large Print Guidelines & Experts

The brochure team first reviewed guidelines from organizations that have established standards for materials printed for people with low vision (*see Bibliography of Standards on page 11*). For instance, in their "Guidelines for Optimal Readability," the American Printing House for the Blind (APH) recommends that the beginning of each paragraph be separated from the previous paragraph by an extra line space instead of a paragraph indent. APH stresses several other guidelines:

- type size should be at least 18 point
- leading or line spacing should be at least 125% of the line height
- headings and subheads should be larger and bolder than regular text
- columns and divided (e.g. hyphenated) words should be avoided
- paragraphs should be block style with one-inch margins
- left margins should be justified and right margins should be ragged
- text should appear black on white, ivory, cream or yellow paper with a dull finish

Large Print Brochure Receives Accessibility Achievement Award

C&O Canal National Historical Park and Harpers Ferry Center received a 2007 NPS National Accessibility Achievement Award for Programmatic Accessibility for the "development of a brochure suitable for low-vision users that can be adapted by other parks."

Large Print Brochure Team

Chesapeake & Ohio Canal NHP

- Bill Justice
Chief of Interpretation
- Geoffrey Suiter
Park Ranger

Harpers Ferry Center

- Melissa Cronyn
Associate Manager for Publications
- Magaly Green
HFC Accessibility Coordinator
- Linda Meyers
Printing and Production Officer
- Mark Muse
Prepress Specialist
- Lori Simmons
Cartographer
- Ed Zahniser
Editor

Reviewers

- Dr. Aries Arditi
Lighthouse International
- Ray Bloomer
National Center on Accessibility, Indiana University
- Elaine Kitchel
The American Printing House for the Blind (APH)
- Phil Maggio
Library of Congress, Division of the Library of the Blind
- Jan Majewski
Department of Justice
- Dr. Lorraine Marchi
National Association of the Visually Handicapped (NAVH)
- Susan Ostby
National Center on Accessibility (NCA)
- Ike Presley
American Foundation for the Blind (AFB)

Design Contractor

- Kirilloff Design

- text should *not* appear over a background photo, artwork or other graphical material
- large print users should have access to graphics that are not only enlarged, but maintain the same contrast, clarity, and appropriate coloration as those prepared for sighted users

In “Large Print Publications,” the National Association for the Visually Handicapped (NAVH) recommends that whenever columns of text do appear on a page, a vertical line be used to separate these columns. Because many people with low-vision hold reading material very close to their eyes—seeing only a very small segment of a page at a time—virtually all the guidelines stress the use of visual clues in the page design to help low-vision readers find their way across the page.

The team also consulted accessibility experts in the field of large print media (*for a complete list of these experts, see Large Print Brochure Team on page 10*). They had a number of fruitful discussions with Ray Bloomer of the National Center on Accessibility at Indiana University. Dr. Aries Arditi of Lighthouse International and Elaine Kitchel of The American Printing House for the Blind (APH) reviewed brochure and map mockups. These low-vision experts provided great professional advice as well as a window into the realities of being visually impaired.

Providing an Equivalent Experience

Bill Justice recognized early on that it was important to create the large print brochure from scratch. “We didn’t want to impose our current Unigrid brochure on sight-impaired visitors,” he says. “Our goal was to provide an equivalent experience.” Justice and the rest of the team, through their discussions with the accessibility experts, realized that various reasons and conditions lead to sight impairments, and that the needs of visitors with low-vision vary widely. Everyone

agreed that, while a large print brochure would not meet the needs of every sight-impaired person, they needed to provide a folder that would reach the broadest possible range of sight-impaired visitors.

The team concurred that the approved National Park Service typefaces NPS Rawlinson and Adobe Frutiger—with their generous x-heights and open letterforms—met all the criteria for optimal readability. To ensure the brochure content addressed the needs of low-vision visitors, C&O Canal interpretive ranger Geoffrey Suiter crafted new interpretive text that focused very tightly on the park’s key interpretive themes, stories, and visitor information. Harpers Ferry Center editor Ed Zahniser helped to rewrite and further refine the text.

The large print brochure includes two historic photographs of boats operating on the old canal. Artwork reused from the *Chesapeake and Ohio Canal* handbook clearly shows and explains how a lift lock and its lock gates worked, allowing readers to understand one of the key structures common along the entire length of the canal. Photos and artwork

Bibliography of Standards

American Foundation for the Blind (AFB)

- Tips for Making Print More Readable

American Printing House for the Blind (APH)

- Large Print: Guidelines for Optimal Readability

Lighthouse International

- Simple Steps to More Readable Type Through Universal Design
- Effective Color Contrast: Designing for People with Partial Sight and Color Deficiencies

Center for the Partially Sighted

- Print Guidelines

National Association for the Visually Handicapped (NAVH)

- Large Print Publications

National Federation of the Blind (NFB)

- Standards and Criteria

Smithsonian Institution

- Guidelines for Accessible Exhibit Design/Checklist for Publications

Society for Environmental Graphic Design (SEGD)

- Accessible Text Guidelines

(NPS Photo by David T. Gilbert)



were carefully manipulated to obtain the best possible clarity and contrast.

Selecting a Brochure Format

The page size of the large print brochure was predetermined by the existing NPS printing contract, which provides cost-efficient bulk pricing on a large range of Unigrid page sizes. The team settled on the B6 Unigrid—the largest sheet-size available at 23-7/16 inches by 16-9/16 inches. The brochure also includes a B3 insert for the C&O Canal map.

After experimenting with a variety of folds, the team chose a simple tabloid newspaper format to allow for the largest possible type size, reduce any visual interference, and keep the folds simple and easy to understand. A two-column format was ultimately adopted, with a vertical line separator, to keep sentence length short. This would help avoid problems many low-vision readers have following long lines of text across a page and then finding their way back to the next line of text. While most large print guidelines discourage the use of side-by-side text columns, several reviewers agreed that low-vision users would be able to easily fold the page in half and avoid any confusion with the adjacent column.

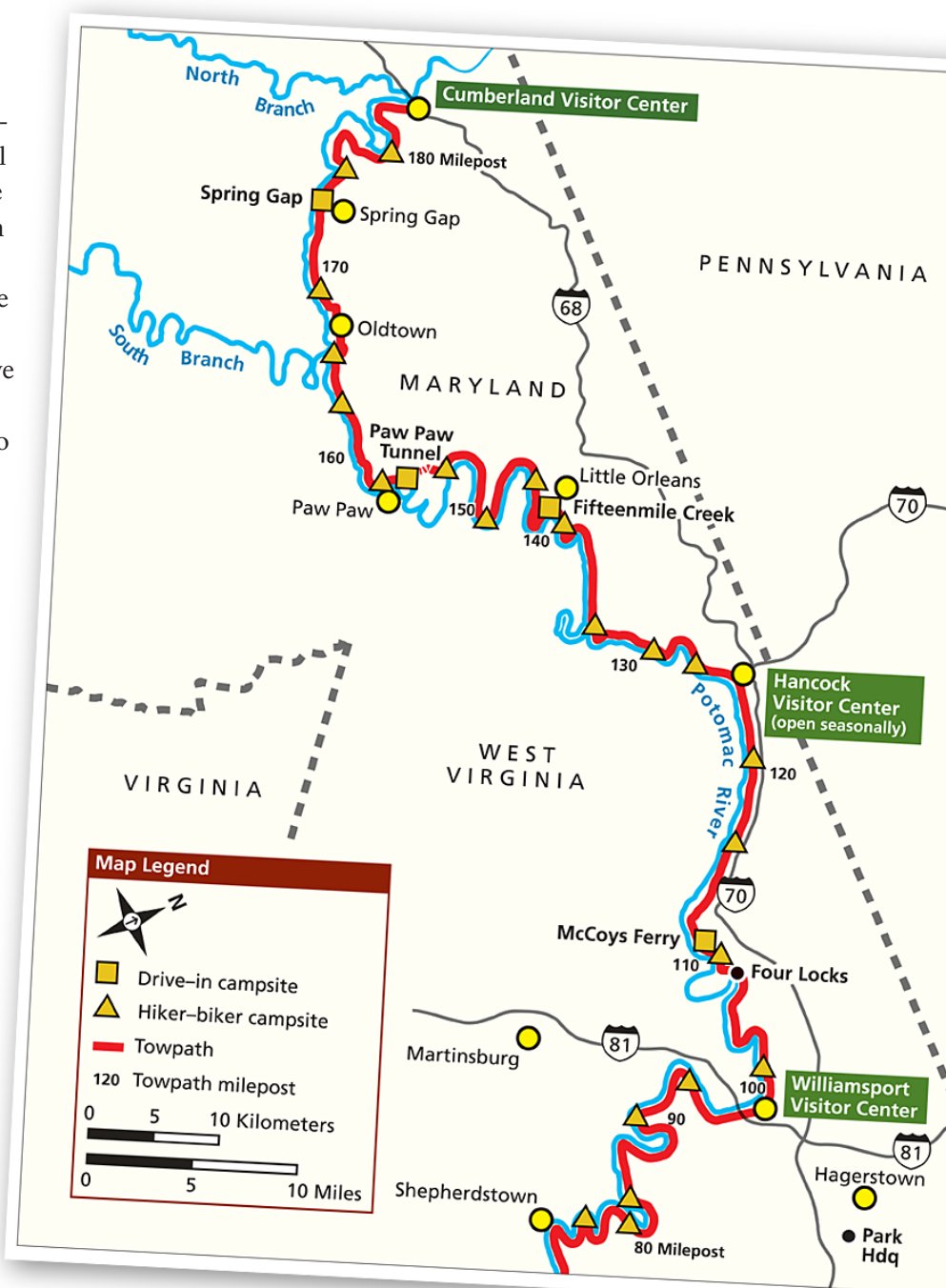
Designing a Map That Works

The final challenge for the large print brochure team was the park map. HFC cartographer Lori Simmons, in an effort to demonstrate the challenges of creating a suitable map, printed out the C&O Canal's existing Unigrid map at a size large enough to render the smallest type readable to low-vision users. As Simmons pulled the map off the plotter and spread it across the floor, it stretched 14 feet in length!

The expert reviewers, however, insisted that the large print brochure

should include a park map. The purpose, they pointed out, was not to provide directions or minute park details, but to give low-vision park visitors context. The map needed to provide these visitors with a sense of scale, allowing them to see where they were within their surrounding environment, and the relationship between their present location and the rest of the park. In the case of the C&O Canal, a map could quickly orient low-vision visitors to the linear nature of

Large print brochure map of the Chesapeake & Ohio Canal.



the park, and to key places and points of interest along the 185-mile towpath.

To help Simmons, Chief of Interpretation Bill Justice created a prioritized list of geographic categories to include on the park map. As he and Simmons reviewed successive iterations of the large print map, more and more categories were dropped, until both were satisfied that a manageable amount of important and useful information was provided.

Breaking New Ground

Simmons relished the challenge, exploring new ways to depict geography and visitor information in an accessible format. “I’ve worked on hundreds of maps for park Unigrid brochures,” she says, “but this map really forced me to explore some new and different ideas.” To help distinguish between river, towpath, campsites, and towns, Simmons chose to render the map in four-colors. She laboriously experimented with colors, asking for feedback from the expert reviewers, and making subtle adjustments to ensure that low-vision users could comprehend the map.

Simmons was especially careful with her color selection, ensuring that the map was readable to people with red/green color blindness—the most common type of color blindness (*see examples on right*). Says Simmons, “While the choice of colors makes the map a bit odd, it ensures that more people can read it. That’s the real goal.” The result is a color palette and graphic style quite different from the traditional Unigrid park map.

Simmons also took a new approach to the use of map data. While standard Unigrid maps are derived from precise Geographic Information System (GIS) and USGS Digital Line Graph (DLG) data, Simmons made some subtle but important changes. She exaggerated the thickness of both the Potomac River and the adjacent canal towpath, for instance, to make each of them more distinct. Where primary roads were too close to the river and towpath, she moved them apart to ensure visual separation.

While HFC cartographers typically separate geographic labels along a length of river or mountain range (e.g. Potomac . . . River, Blue . . . Ridge), Simmons made sure to keep these labels close together so low-vision readers could readily connect the words. Even simple things like the use of dashes required careful attention. To improve readability both in the brochure text and on the maps, longer en dashes (–) replaced standard hypens (-).

If the reaction of Marsha Mazz is any indication, the C&O Canal’s large print brochure is a resounding success. But proof will only come with time. Staff at the Chesapeake & Ohio Canal National Historical Park have made a huge commitment to accessibility in all of their interpretive media. By continuing to work with Harpers Ferry Center, they hope to take lessons learned from their low-vision park visitors and recommend changes and improvements to the large print brochure format in the years to come.



Two views of the same map. The bottom view shows how a person with red/green color blindness sees the C&O Canal map.

Getting in Touch with a Barrier Island

HFC Helps Develop Tactile Wayside Exhibits for Gulf Islands

Visitors who are blind or have low vision often rely on their sighted partners to help them explore our national parks. But this presents a big challenge: how can visitors who rely on other visitors form their own connections to park stories and resources?

Provide Alternate Methods of Communication

Ray Bloomer of the National Center on Accessibility at Indiana University has some ideas. According to Bloomer, “There should be mechanisms in place to allow non-sighted or sight-impaired visitors to make their own discoveries—and in turn their own connections—to park stories and resources.” Bloomer, who spent two days at Gulf Islands National Seashore as part of a Harpers Ferry Center wayside exhibit planning team, stressed the need to provide alternate methods of communication for *all* park visitors. “Non-sighted park visitors,” he says, “should not be forced to rely on sighted visitors for all their information.”

Gail Bishop, Chief of Interpretation at Gulf Islands National Seashore, agreed. Bishop specified “accessible” wayside exhibits when the park obtained funding to replace waysides damaged or destroyed by Hurricanes Ivan, Dennis, and Katrina. The challenge for the planning team, which first met in March 2006, was to agree on what an “accessible” wayside exhibit was. Team members included Gail Bishop and park staff from Gulf Islands National Seashore; Betsy Ehrlich, Terry Lindsay, and Lori Simmons from Harpers Ferry Center; contractors Bruce Hopkins, and Nick and Irene Kirilloff; and Ray Bloomer from the National Center on Accessibility.

After much discussion and research, the team agreed to create 45 tactile wayside exhibits out of 269 total waysides. These would include 14 parkwide orientation



panels, 21 site-specific orientation panels, and 10 low-profile interpretive panels fabricated with resin-based bas-relief type tactile elements.

A Braille Primer

The next challenge was to fabricate prototype tactile panels that could be evaluated. To test the alternatives, the wayside design team worked with Ray Bloomer, who is legally blind, and with three park rangers who are also blind: Buddy Woods and Edison Woods at Gulf Islands National Seashore, and Chuck Dennis at Harpers Ferry National Historical Park. Two prototype panels were created for testing. Grade 1 (Uncontracted) Braille was used for prototype A. Grade 2 (Contracted) Braille was used for prototype B.

Ray Bloomer of the National Center on Accessibility at Indiana University and Marsha Mazz of the U.S. Access Board explore the map on the prototype tactile wayside exhibit panel for Gulf Islands National Seashore. (NPS Photo by David T. Gilbert)

According to the Braille Authority of North America (BANA), there are three principal types of Braille: Grade 1 (Uncontracted) Braille, Grade 2 (Contracted) Braille, and Jumbo (Large Dot) Braille. BANA's Judy Dixon recommended against the use of Jumbo Braille, saying that most people who can read standard size Braille have considerable difficulty reading Jumbo Braille.

Of the two other types of Braille, Contracted Braille is a form of shorthand. For example, the phrase "You like him", which is entirely spelled out using individual letter cells in Uncontracted Braille, is spelled "y l hm" in Contracted Braille. Contracted Braille can be read more quickly, and meets the legal requirement for use in federal facilities.

The park maps and Braille labels for the two prototype panels were created in Adobe Illustrator by contractor Judy Nielson of International Mapping. The Illustrator files were then imported into CAD software, which was used to create the raised surfaces for the Gulf Island landforms, map symbols, map lines, and Braille.

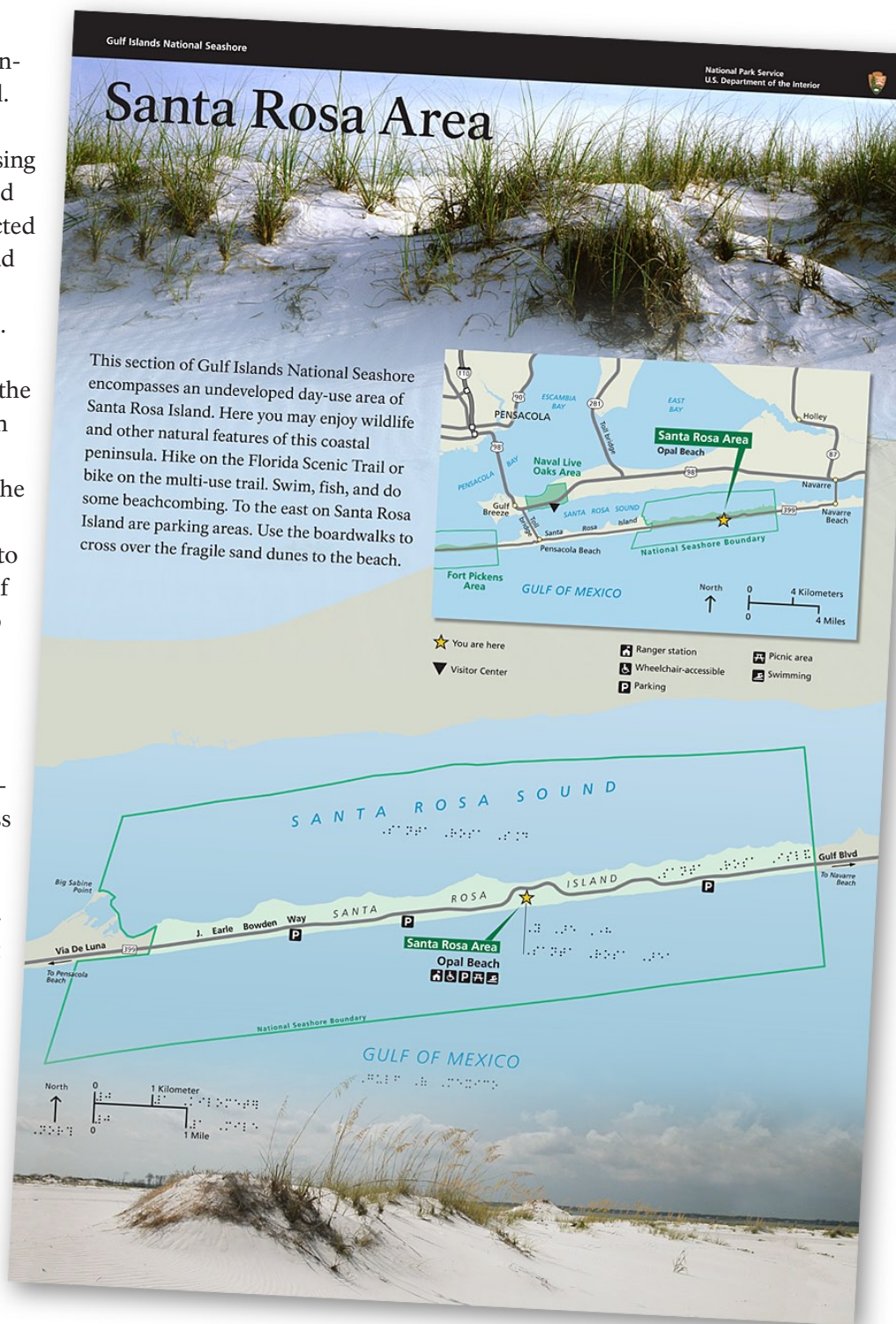
Fabricating the Panels

Servicewide sign contractor Bunting Graphics fabricated the tactile prototypes, using a thermoforming process to create the panels. Through thermoforming, an inkjet imprinted insert is encapsulated by thermo-compressing the formed acrylic panels at 300°. A mold for the raised surfaces is created by a CNC (Computer Numerically Controlled) machine that translates the dimensional map data from the CAD file. The end result is a solid, single piece construction which virtually eliminates any concern with environmental failure. No adhesives, coatings, or separate components are used. According to Bunting Graphics, the process en-

sures long term durability for the Braille and raised image structure on the panel, alleviating park concerns about how well the panels will stand up to the harsh climate along the Gulf Coast.

Evaluating the Panels

The team asked Harpers Ferry Park's Chuck Dennis to review the two proto-



types. Dennis, who has been blind from birth, explained that he had no visual history of exploring or interpreting maps. A map scale, for instance, was a foreign concept to him. However, he has very sensitive fingers, and can read Braille, so he quickly concentrated on reading the text on each prototype.

Dennis explained that the Grade 1 (Uncontracted) Braille on prototype A was extremely tedious for him to read, because he had to read each Braille letter cell. Conversely, he sped through the Grade 2 (Contracted) Braille on prototype B, quickly comprehending the content of the panel. He was clearly much more enthusiastic about reading prototype B, and showed no interest in returning to prototype A.

After this initial review of the two Gulf Islands prototypes, a third panel was fabricated with several changes. This panel was reviewed by Ray Bloomer, who did have vision up to about age 20. Bloomer does understand maps, and found the raised relief edges of both the mainland and the barrier islands very helpful to his visualization of the landscape. Said Bloomer, "The raised relief gives me both context and scale, and really adds to my understanding of the site."

Marsha Mazz of the U.S. Access Board also reviewed the third panel during an accessibility workshop at the National Conservation Training Center in Shepherdstown, West Virginia. "An absolute literal translation of text and labels is not necessary," she said, "particularly if space for Braille is an issue." For instance, she pointed out that Braille readers will generally assume capitalization at the beginning of a sentence. This can save space, since one letter rendered in Braille comprises a 6-dot cell, whereas a capital letter comprises a 7-dot cell. While proper names should be capitalized, words shown on the map such as "NORTH"

or "Visitor Center" can be rendered in Braille as "north" and "visitor center".

Guidelines For Using Braille

Mazz also offered important advice on the layout and placement of Braille on upright orientation panels. "Don't place Braille below a person's waist." Mazz demonstrated how she reads Braille, rotating her wrist as the Braille extended below her waist near the bottom of the upright panel. "Having to rotate my wrist to read Braille," she said, "is like forcing a sighted person to stand on their head and read the text upside down."

The Braille Authority of North America offers additional guidelines for the use of Braille. The size at which Braille is rendered should always be the same, regardless of the size of the typography being translated. The standard space between lines of Braille (center to center from dot 1 on the top line to dot 1 on the following line) should be .400-inch. Finally, a line of Braille should not exceed one foot in length.

As for which of the wayside exhibit prototypes to choose, the designers ultimately settled on Grade 2 (Contracted) Braille. This form of Braille, while not meeting the needs of everyone who reads Braille, would clearly appeal to the broadest cross-section of the Braille-reading park visitor. And while most accessibility experts the team talked to admitted that only a small percentage of blind people read Braille, many states have recently placed a renewed emphasis on learning Braille in classrooms for the blind.

Says Ray Bloomer, "Braille provides tremendous independence to users who can read Braille. And by offering the tactile thermographic maps, you will help engage a whole new population of park visitor." Stay tuned. The park hopes to begin installing their new wayside exhibits during the summer of 2008.

Wayside Prototype Information

This prototype panel was developed for Gulf Islands National Seashore. The purpose of this wayside is to orient visitors to the recreational activities available in the Santa Rosa area of the park.

Size: 36" high x 24" wide

Material: Cyro Acrylite® FF acrylic sheet. This material will withstand exposure to sun, extreme cold, sudden temperature changes, and salt water spray. It meets the requirements of ANSI Z97.1 for use as a Safety Glazing Material in Buildings. It is more impact resistant than glass. If subjected to impact beyond the limit of its resistance, it does not shatter into small slivers, but breaks into comparatively large pieces.

Print: Inkjet print on HP5500 printer. This prototype shows the Braille in both printed and tactile form. The Braille will not be printed in the final version.

Panel fabrication process: The inkjet print is encapsulated by thermo-compressing formed acrylic panels. The end result is a solid, single panel with no adhesives, coatings or separate components.

Tactile fabrication process: A mold is created by CNC machining which is used in the thermo-compression forming.

Cost: This prototype panel cost \$3713.90 based on an expedited request. Additional panels should cost less than this prototype, but prices are not available yet.

Tactile Wayside Map Guidelines

A comprehensive white paper on making tactile maps for wayside exhibits is available on the Harpers Ferry Center website at www.nps.gov/hfcl/accessibility.

Accessibility & Audiovisual Media

Frequently Asked Questions

Captioning

What are captions?

Captions display spoken dialogue as printed words on television screens, computer monitors, projection screens, caption boards, and other visual displays. Captions are specifically designed for viewers with hearing loss to enable their full participation when viewing video or multimedia productions. They include information regarding on- and off-screen sound effects such as music or laughter. Captions also hold secondary benefits for people who are learning a foreign language, learning how to read, or watching TV in a noisy area, as well as those who understand best by processing visual information.

What is the difference between open and closed captions?

Open captions are displayed automatically as part of the video, without having to be selected by the user.

Closed captions normally do not appear on screen unless the viewer has selected them to appear. The person viewing the presentation must be using technology that includes a closed caption decoder. The decoder will allow the otherwise-hidden data within the television signal to be displayed on the user's TV screen or computer monitor. Many newer television models allow viewers to toggle captions on or off with ease.

What is the difference between captions and subtitles?

Subtitles are used to translate dialogue into a different language. They are primarily intended for hearing audiences, while captions are primarily intended for people with hearing loss. Subtitles rarely convey nonverbal sounds such as music

or sound effects, whereas captions identify speakers and sound effects using text such as a "phone ringing" or "footsteps," and use symbols to indicate other sounds such as music.

Captions are typically displayed on-screen as white letters within a black box. Subtitles are generally not displayed within a black box and do not have standardized font requirements.

What is a caption board?

A caption board is an LED screen that displays the captions. It is a separate piece of equipment placed underneath, above, or beside the projection screen or video monitor. Caption boards come in a variety of sizes. The correct size is determined by the size of the room, the size of the screen, and the distance between audience and screen. Caption boards require a caption decoder.

What is the difference between showing captions on screen or on a caption board?

If you do not use a caption board, captions must be displayed over the picture on the monitor or screen. The smallest caption board costs at least \$3,000 and therefore adds to the overall equipment and installation budget.

HFC recommends the use of caption boards because they allow for captions to be continually displayed without covering any on-screen program material. The correct size and placement of the caption board is essential for proper readability.

Do I have to display captions at all times?

Yes. Captions help us reach an even wider audience—from visitors with very moderate hearing loss to visitors

Audio Description: A Closer Look

Section 508 of the Rehabilitation Act requires federal agencies to make their training and informational video and multimedia productions accessible to people with disabilities. These productions must include an audible description of the video content if they contain visual information necessary for the comprehension of the content (see **Audio Description** on page 18).

Developing audio description is both fun and challenging, according to HFC producer/director Michele Hartley. Hartley recently completed a five-day described media training program at the National Captioning Institute (NCI) in Vienna, Virginia. "Standards for audio description are still evolving," she says, "and the process is still relatively new when compared to other accessibility features like captions."

Audio describing a dramatic film, for instance, will probably be different from audio describing a natural history documentary film. Such details as the color of a person's clothing would probably not warrant as much attention in a natural history film, where the focus would instead be on descriptions of the landscape and wildlife.

There's also an important distinction between literally describing a scene versus interpreting a scene for the viewer. "Describe what you see," says Hartley. "Don't try to explain the scene. It's really important to provide literal, descriptive information that allows viewers to use their own imagination."

Hartley also stresses the importance of carefully coordinating the use and placement of audio description. Because audio description is inserted in between pauses in the original soundtrack, it must be brief and concise. "It's a somewhat subjective process," says Hartley. "You have to carefully choose what you

continued on next page

who cannot hear at all. Always displayed, captions also automatically assist visitors who would otherwise not ask for this accessibility feature. Harpers Ferry Center recommends displaying captions at all times on a caption board or on-screen so that visitors requiring this assistance will not have to ask, and park personnel will not have to be trained to turn captions on and off upon request.

Audio Description

What is audio description?

Audio description describes the visual content of video or multimedia programs. It provides individuals who are visually impaired with information that further describes the visual content not provided in the primary audio track. Audio description is a separate audio track synchronized with the program's primary audio track. An audio description narrator describes such things as characters in the scene, location of the scene, who is speaking, what the characters are doing, what the characters are wearing, facial expressions and body language, text shown on objects in a scene or as subtitles, and colors. Audio description should be

carefully scripted and is best produced by trained professionals (*see sidebar on page 17*).

Does everyone have to hear the audio description if it is selected?

No. The audio description is recorded on a separate audio track and is not heard over the main loudspeaker(s). Visitors requesting audio description will typically receive a headset and receiver. The audio description track is then transmitted to the headset via a radio frequency or infrared signal. Only those with headsets will hear the audio description track.

Assistive Listening

What is assistive listening?

Assistive listening utilizes various devices that amplify volume for individuals who have mild to profound hearing loss and may or may not use a hearing aid. Assistive listening devices (ALDs) include headsets, earbuds, and induction loops. The amplified sound is transmitted via radio frequency, infrared, or induction loops to the user's headset, earbuds or hearing aid.

Continued from previous page

can describe and how you describe it." If there isn't enough breathing room or pauses within the original soundtrack, audio description can be difficult, or even impossible, to insert. "Sometimes there just isn't enough room between the soundtrack's narration, significant sound effects, and music."

According to Hartley, developing a script for audio description requires that trained professionals be part of the audiovisual planning and production process. The National Captioning Institute is just one of many sources for such expertise. And because standards for audio description are still evolving, Hartley also emphasizes the importance of including users of these services in the process.

From HFC's Director

Continued from page 1

Design, a Large Print Brochure for C&O Canal, Tactile Wayside Exhibits for Gulf Islands, and other recent efforts the Center has made in the area of media accessibility for people with disabilities.

As Director of Harpers Ferry Center—the NPS Center for Media Services—I can assure you that we will continue to find new ways to plan, design, and develop media that is both accessible and engaging to *all* our park visitors.

—Don Kodak