



Designing beyond the norm to meet the needs of all people.

Working toward  
universal access  
through research,  
design & education

December 2010

## Dear Friends & Supporters,

The Beneficial Designs' team had a busy year.

Our powered wheelchair test lab was quite busy this year, and we continue to devote time and resources to wheelchair standards development. The trails and pedestrian access component of Beneficial Designs continues to grow. We are developing new technologies with USDA and FHWA government-funded research and development that will improve the efficiency of conducting assessments of trails and public rights-of-ways.

We would like to share with you the status of our current projects and our successes over the last year. Thank you for your continued support of our work. We wish you the very best for the New Year!

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### STAFF

- ❖ **Peter Axelson**, Founder and Director of R&D, presents our work worldwide. He loves spending time with his family and is an avid mono-skier and pilot.
- ❖ **Denise Axelson**, Research Engineer, assists with standards development work. She loves being a mom and enjoys playing volleyball, skiing, and cooking.
- ❖ **Bill Blythe**, Technical Assistant, likes to cook, play guitar, work with computers, and leads worship at church.
- ❖ **Barton Cline**, Software Developer and Electronics Technician, enjoys in-depth Bible study, family time, languages (incl. computer lang.), and loves his job.
- ❖ **Antigone Gregory**, Office & Project Assistant, loves hiking, snowboarding, cooking, live music, and spending quality time with her family.
- ❖ **Dana Helwig**, Software Developer, loves spending time with his wife and baby and snowboarding.
- ❖ **Harmony Hilderbrand**, Office Manager, is an avid photographer, loves baking, Bible study, and spending time with her husband and their dog.
- ❖ **Stephen Pieters**, Shop Assistant, enjoys riding motorcycles, off-roading trucks, and fishing.
- ❖ **Rachel Rauber**, Office Assistant, is a senior in high school who enjoys fashion, dance, surfing, and reading.

- ❖ **Samuel Schnorbus**, Shop Assistant, graduated high school and enjoys snowboarding, paintballing, and shooting.
- ❖ **Sharon Schnorbus**, Office Assistant, is in college working toward her A.A. Degree in Deaf Studies to become an interpreter.
- ❖ **Sierra Stulac**, Office Assistant, is a junior in high school, and loves to dance and run. She does long jump and short sprints in track.

### CONSULTANTS

- ❖ **Ben Hubbard**, Graphic Artist, loves to do performance paintings.
- ❖ **Seanna Kringen**, Research Associate, focuses on accessible projects, enjoys traveling with her husband and three children.
- ❖ **Patti Longmuir**, Research Scientist, focuses on accessible recreation, enjoys paddling and cross-country skiing.
- ❖ **Mike Passo**, Trails Project Specialist, provides technical expertise in trail accessibility and sustainability.
- ❖ **Carla Shepard**, Bookkeeper, enjoys four-wheeling, playing piano, singing, and camping.
- ❖ **Jeremy Vican**, Trails Assistant, enjoys hiking, photography, and trail related projects.

## UTAP & TrailWare<sup>2.0</sup> Workshops

NIH/NICHD SBIR Phase II Grant #2 R44 HD29992-02

NIH/NICHD SBIR Phase II Grant #2 R44 HD36538-02

There are currently 1,050 trail enthusiasts trained to lead assessments using the UTAP. Workshops were recently held in Chattanooga, TN at the National Trails Symposium.



Florida continues to lead the way in providing training to their trails personnel and was presented a "Best Trails State In America" award by American Trails in 2009. Trail assessment coordinators are involving various groups to assist in the UTAP process, including Girl Scouts, 4-H Clubs, and high school and college students. Beneficial Designs provides the training materials and tools through Pax Press while American Trails coordinates most UTAP training courses. TrailWare 2.0 is used to generate trail access information, signage, and trail management reports. Data is uploaded to <www.trailexplorer.org>, the TrailExplorer Website. For more information, contact <trails@beneficialdesigns.com> or visit <www.americantrails.org>.

## Nevada Recreation Trails

NVRTP Grant #FY 2008-22

We are finishing our third Nevada Recreational Trails Program project to provide signage in Northern Nevada. The goal is to continue making Trail Access Information (TAI) widely available in Northern Nevada for a variety of trails and trail users. In our current grant, we have assessed 113 miles of trail, creating 13 different maps and over 100 TAI signs in 12 different park areas.

## Tahoe Meadows (near Lake Tahoe)

NVRTP Grant #FY 2008-24

This project improved trail access and opportunities while protecting the natural and archeological resources within and around Tahoe Meadows. In cooperation with the U.S. Forest Service, Tahoe Rim Trail Association, and Nevada State Parks, three

new loop trails totaling 3.4 miles have been built or improved, including 1,200 feet of boardwalk along Ophir Creek. Two new stair sets and a new turnpike have also been constructed along with a new bridge over Ophir Creek. New maps, directional signs, and an interpretive sign have also been installed. Additional funding may occur to improve trail conditions on the Upper Meadow Loop in 2011.

## Nevada State Parks

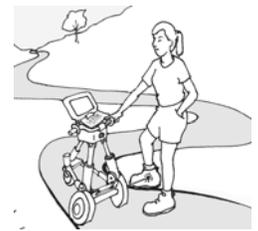
NVRTP Grant #FY 2010-11

This year we were awarded another Nevada Recreational Trails Program grant to assess all trails in 14 of our Nevada State Parks. Approximately 58 trails totaling 87 miles will be assessed. Full color panel maps and Trail Access Information artwork will be created for these parks.

## High Efficiency Trail Assessment Process

USDA SBIR Phase II Grant # 2005-03226

This project created the Wheeled Instrumentation Sensor Package (WISP) to collect more accurate, objective information about trails, including shared-use paths, backcountry single-track trails, and cross-country ski trails. Multiple HETAP systems have been purchased by state and city land managers and the National Park Service in Florida, Arizona, Texas, Virginia, and Canada. This system has been commercially available through Beneficial Designs since 2009. HETAP workshops have also been conducted in Texas, Arizona, Nevada, and Ontario, Canada to help train personnel on using the HETAP program and the WISP.



### Nature Trail

Fort Churchill  
State Historic Park

Length 1.6 mi (2.5 km)

Elev Gain 45.2 ft (13.8 m)

Elev Loss 265.7 ft (81.0 m)



Hikers



Bikes



Dogs on Leash



No Equestrians



No Motorized Vehicles



Grade

Typical Grade 3.8%

8% of trail is 10% to 20%

132 ft (40 m) is 20% to 37%

Standard Ramp Grade 8.3%

### Trail Access Information Signage Sample

## Accessible Trail Gate Barrier

USDA SBIR Phase II Grant # 2005-00325

This year, the Pedestrian and Motorized Vehicle Trail Traffic Counter was commercialized. The counter is designed to identify and count trail entry and exit by both pedestrians and motorized vehicles. A mechanical trail gate barrier is also available to be used on its own or with the electronic system.

## **A Standardized Assessment Process of Outdoor Recreation Facilities**

USDA SBIR Phase I Grant # 2008-33610-18906

This project will create methods for assessing the accessibility of recreation elements used for outdoor recreation, picnic, and camping facilities, such as picnic tables, fire rings, and water pumps.

## **Public Rights-of-Way Assessment Process to Determine Accessibility**

US DOT Grant #DTRT57-08-C-10058

US DOT Grant #DTRT57-10-C-10081

Beneficial Designs is developing an automated assessment process (PROWAP) to systematically measure elements within the pedestrian environment, such as curb ramps and driveway crossings. In phase I, we were able to reduce the time to perform assessments to 20% of the time required to perform assessments manually. We have added technology to measure transition heights to detect tripping hazards. Phase II work has commenced to develop an automated commercial system for measuring the sidewalk environment for safety and accessibility.

## **Surface Accessibility**

NIH/NICHD SBIR Phase II Grant #2 R44 HD30979-02

The Rotational Penetrometer (RP) measures the firmness and stability of trail surfaces, carpet, and other pedestrian routes. The RP is commercially available through Beneficial Designs. It is currently under review as an ASTM standard test method for the measurement of surface firmness and stability.



## **Universal Design Guidelines for Fitness Equipment (UDFE)**

NIH/NICHD SBIR Phase I Grant #1 R43 HD049236-01

RERC NIDRR Grant #H133E070029

In phase I, draft guidelines for the universal design of aerobic and strength training equipment for greater accessibility were developed. We are now in year four of a



five-year RERC on Recreational Technology and Exercise Physiology (RecTech) with the University of Illinois at Chicago. We are developing ASTM UDFE Standards with input from the Inclusive Fitness Initiative (IFI) in the U.K. This work will provide universal design specifications for the manufacturers of accessible fitness equipment.

## **Development of Uniform Standards for Cognitive Technologies**

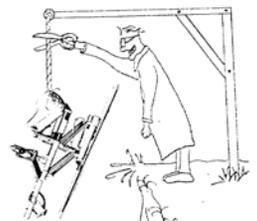
RERC NIDRR Grant #H133E090003 and the Coleman Institute for Cognitive Disabilities.

We are in year two of a five-year RERC on the Advancement of Cognitive Technologies (ACT) through the University of Colorado. We are working closely with the RERC and cognitive disability groups and individuals in order to develop Universal Design standards for common products used daily such as cell phones and other consumer products. This project will work with projects underway internationally that address website accessibility, including Fluid, AEGIS, and the Raising the Floor initiative.

## **Adaptive Ski Equipment Standards**

Rehabilitation Engineering and Assistive Technology Society of North America (RESNA)

Peter is Chair of the RESNA standards committee that developed test methods and specifications for adaptive ski equipment. The standard was published in December 2007 as a RESNA American National Standard. The committee meets each year in December in conjunction with the Ski Spectacular event in Breckenridge, Colorado.



## **Wheelchair Standards**

Paralyzed Veterans of America Research Program (PVA) Rehabilitation Engineering and Assistive Technology Society of North America (RESNA)

As Chair of the RESNA Assistive Technology Standards Board (ATSB), Peter oversees the work of the RESNA Assistive Technology Standards Committees. Denise continues to serve as the Secretariat for the RESNA ATSB. Next year's annual meetings will take place in Toronto, Canada in conjunction with the RESNA & FICCDAT Conferences. The new

RESNA WC-1:2009 and WC-2:2009 standards were published in September of 2009.

## Wheelchair Testing & Design

We continue to provide testing and design services on a consulting basis for the wheelchair industry. In addition, we perform accessibility assessments and consultation. Contact <mail@beneficialdesigns.com> for more information.

## Wheelchair Training Guides

PVA Research and Education Foundation

The Manual and Powered Wheelchair Selection & Training Guide books provide wheelchair users and therapists with step-by-step instructions for selecting wheelchairs and negotiating various environments. These books are available through PaxPress, a division of Beneficial Designs. For more information contact <paxpress@beneficialdesigns.com>.

## FlexRim®

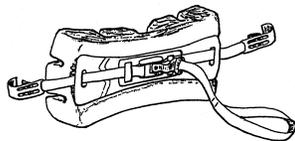
NIH/NICHD SBIR Phase II Grant #2 R44 HD36533-02A2

The FlexRim® is a compliant handrim that replaces the rigid interface between the wheelchair wheel and the handrim, reducing the gripping force and the impact forces. The FlexRim is manufactured by Spinergy and has been commercially available since September of 2007! For more product information, please contact Spinergy at (303) 823-6299 or visit <www.spinergy.com>.

## PaxBac

NIH/NICHD SBIR Phase II Grant #2 R44 HD29983-02

The PaxBac is a lightweight back support that provides lumbar/sacral back support on wheelchairs with sling upholstery. It was manufactured by Invacare for a limited time. It will soon be manufactured again by BES Rehabilitation, Ltd. and will be distributed in the U.S. by Bodypoint <www.bodypoint.com>.



## Canoe Seating System

NIH/NICHD SBIR Phase II Grant #2 R44 HD36944-02A1

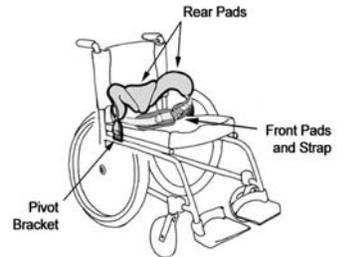
The Universal Design Canoe Seat is finished and is now commercially available! The seat replaces the existing bench seat. It provides

adjustable pelvic, back, and lateral supports to improve balance and comfort. For more product information, please contact Chosen Valley Canoe Accessories at (507) 867-3961 or visit <cvca@gear4portaging.com>.

## HipGrip

NIH/NICHD SBIR Phase II Grant #2R44 HD36156-02A2

The HipGrip is a dynamic spring-loaded pelvic support device for people who have difficulty maintaining pelvic positioning in their wheelchair. The HipGrip allows the user to lean forward and provides variable resistance to assist the user back into an upright position. The HipGrip is manufactured and distributed worldwide by Bodypoint. For more information, contact Bodypoint at (800) 547-5716 or visit <www.bodypoint.com>.



## Funding Agencies and other Acronyms:

DOT Department of Transportation  
ISO International Organization for Standardization  
NICHD National Institute of Child Health and Human Development  
NIDRR National Institute on Disability and Rehabilitation Research  
NIH National Institutes of Health  
NVRTP Nevada Recreational Trails Program  
PVA Paralyzed Veterans of America  
RERC •Rehabilitation Engineering Research Centers  
RESNA Rehabilitation Engineering and Assistive Technology Society of North America  
SBIR Small Business Innovation Research  
USDA United States Department of Agriculture

## Special Thanks & Acknowledgments

We would like to thank our summer intern Ally Frietas and past employees Jaime Skilling and Joey Gmuender, who are now in college. Their work on our projects was invaluable. We are also grateful to our technical consultants, Eric Class, Kent Nelson, and Steve Stockwell for their assistance with all of our trail projects. We are also grateful to our project consultants, Mary Axelson, Chris Lynskey, Martin Clemons, and Don Brockhage.