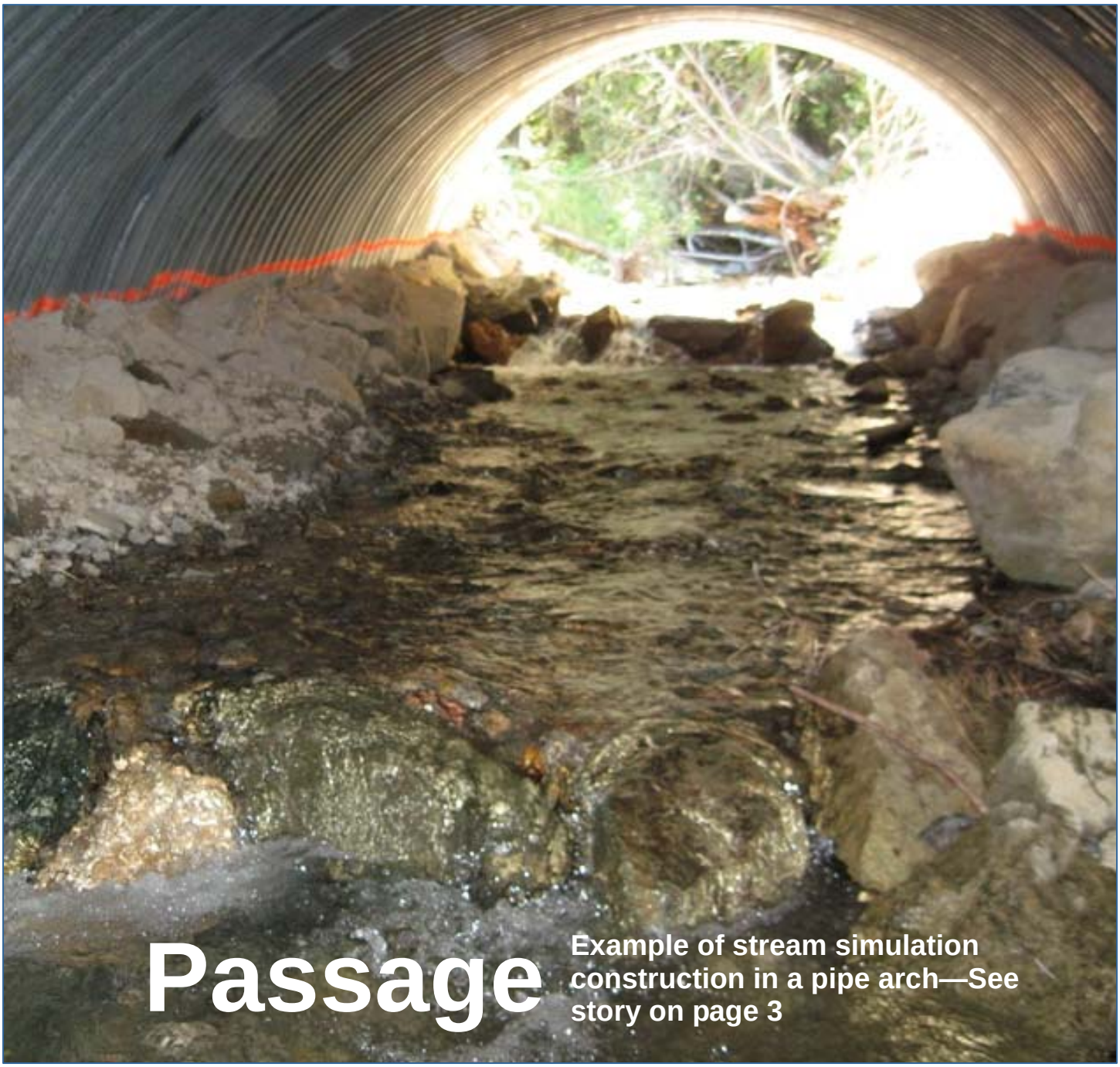
ACE RESOURCES

A Newsletter for the Association of Conservation Engineers

MARCH 2008

Enhancing Our Natural Resources



Passage

Example of stream simulation construction in a pipe arch—See story on page 3

also inside...

Something for everyone at annual conference

President's Message

Included in this issue is a variety of information that will ultimately lead to a successful Fall Conference. I'm sure all of us have taken part in the development of a successful project in the past year. The awards competition provides all members the opportunity to showcase their achievements and be suitably recognized and applauded by their peers. I urge everyone to seriously consider participating in the competition.

The heart of any successful conference is the presentation of papers highlighting the good work of all of our members. The quality of presentations at past conferences has been outstanding. Everyone should accept the challenge of submitting papers that maintains this high standard.

Finally, the Conference provides an opportunity to recognize the Conservation Engineers of the future. I'm sure that there are many engineering students in need of financial support. We need to increase our effort to bring more students into the competition. These students may be our future members.

Eugene Comoss
President

Send in news of your projects!

Editor's Note

A huge thank you to Traci Sylte for submitting the article on Passage. Our newsletter needs more articles like this one. Please make a note to send in news, articles, photos, and graphics for publication in the June newsletter—deadline for submittals will be June 1, 2008! If you don't consider yourself an author, send me your notes and I'll write it up into an article.

Lynda Cliburn
Editor

Association of Conservation Engineers

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Aquatic Organism Passage: An Interdisciplinary Design

Historically, water has been viewed as a liability in road design that needs to be managed to avoid destroying an investment such as the road. Despite many standards and guidelines that address the importance of fish movement, the number of culverts either partially or fully impeding passage is high. Although the impact of any one culvert in most cases is not substantial, cumulatively, impacts can be significant.

As the number and range of many aquatic species have declined, the importance of protecting the remaining populations has multiplied. The term "fish passage" inadequately characterizes the need. Rather "aquatic organism passage" appropriately describes the issue as it includes other species such as amphibians, reptiles, and, even mollusks (Warren et al., 2000; Williams et al, 1992).

Bank undercutting at culvert outlet effectively preventing the passage of fish and other aquatic organisms.

Historical Perspective

Four primary issues explain the large number of existing inadequate culverts:

- Former design approaches,
- Lack of cross-disciplinary communication and understanding,
- Salmo- and adult-centric knowledge and application, and
- New knowledge and awareness.

In the past, engineers focused on hydraulic efficiency as the dominating criteria in culvert design. In most instances, little regard was given to other passage considerations such as bedload, debris, and fish. Culvert size primarily resulted from calculating how much discharge the culvert could accommodate.

Engineers often were unaware of passage issues, or they lacked the information needed to design a structure that would allow fish passage. Typically, fish biologists lacked the culvert hydraulics information needed to make an informed recommendation. In other words, the paths of fish biologists and engineers simply failed to cross frequently enough and other priorities and emphasis areas impeded active communication.

When fish passage was a focal issue, engineers and fish biologists tended to focus on salmon and trout species. In addition, passage of adult life-stages was given primary importance because it was thought that if the adult species could reach spawning areas, juvenile species did not need consideration.

Research in the past ten years has provided much insight into the timing of fish movement, swimming capabilities, and metapopulation dynamics. This knowledge has increased our awareness of the problem extent and how cumulative impacts are fragmenting populations. Passage considerations of species such as amphibians, mollusks and even reptiles have largely gone unrecognized. Combined with other mechanisms of resources impacts (primarily movement impediment, habitat alteration and fragmentation), culverts are now considered an issue for these species as well.

Fundamental Interactions

Generally speaking, the highest stream velocities occur in the middle of flow volume with much lower velocities occurring along channel margins. In many streams, the boundary is highly irregular – dominated with different substrate sizes, bedform irregularities, large wood, root matter, and bank irregularities. Consequently, velocities near the channel bed and bank are commonly 0-3 ft/sec under normal runoff conditions.

Fish and other aquatic organisms live and travel primarily along these channel margins. This is the environment under which they evolved and developed their swimming capabilities, although some species such as salmon have evolved into stronger fish because of the long distances and obstacles encountered along long migration routes.

Understanding that average stream velocities are 3-6 ft/sec for bankfull flow conditions, helps to understand how velocities inside the culvert can

(Continued on page 4)

Passage

Photo on Left: Culvert failure resulting from water piping. Photo on right: Example of stream simulation construction in bridge

(Continued from page 3)

easily exceed average stream velocities when culverts constrict the active channel width. If roughness differences between the stream and culvert bottoms are considered, velocities during runoff conditions may exceed 4-5 ft/sec even for culvert gradients as low as 1-2 percent, even if the active channel width is not constricted. One does not need sophisticated knowledge of culvert hydraulics or models to look at a culvert and assess the likelihood of organism passage difficulties.

Stream and Culvert Interaction

Culverts commonly constrict the active (e.g., bankfull) stream channel width. The stream has developed this width in response to the sediment, debris, and water produced in the watershed. When culverts constrict this width, a series of stream adjustments frequently occurs and culvert failure risk increases. Culverts more commonly fail due to capacity reductions associated with debris or bedload blockage upstream of the inlet. Having the culvert span the active channel width can prevent the majority of these failures. If the culvert is wider than the channel width, most debris will pass through the culvert.

Spanning the active channel width can also minimize aggradation due to bedload deposition upstream of the inlet. As flow begins to pond above the culvert inlet, velocity decreases and bedload is deposited. Stream flow correspondingly erodes the stream banks causing stream widening upstream of the inlet.

These backwater conditions increase inlet headwater depths and velocities within the culvert, eroding the culvert outlet (photo on page 3). This scour can lower local stream base levels and result in undercutting of adjacent slopes.

Backwater conditions can also saturate the road fill, which can cause culvert piping and/or road overtopping conditions (photo above on left). Debris torrents from one failed crossing can cause failure of the next lower crossing, setting in motion a series of domino-effect failures.

Fish Needs and Capabilities

Culverts commonly impede fish movement by one of the following mechanisms:

- Excessive velocities,
- Excessive outlet perch heights,
- Inadequate depths for fish migrating during lower flow conditions, or
- Debris blockage at the inlet.

Fish move for a variety of reasons, including feeding, avoidance of unfavorable conditions, optimization of reproductive success, and optimization of colonization. Due to differences in evolution, fish commonly move to access desirable spawning areas at different times of the year. Considering multiple species and spawning times with the need for fish to avoid undesirable conditions leads to the conclusion that fish need to migrate during all times of the year. Consequently, culverts should provide passage whenever fish are present.

The swimming capabilities of fish differ greatly by species and between life-stages. Generally, weaker swimming fish are the limiting factor in passage considerations. Depending on the site conditions, fish commonly must use a combination of darting and/or sustained swimming speeds to negotiate through a culvert. Both consume a large quantity of energy and can only be maintained for short distances.

Conclusions

Properly designed culverts do not produce water velocities that exceed fish swimming abilities. Properly designed culverts also accommodate stream structure and function, which in most cases means at least spanning the active channel width. Installing adequately-sized structures such as bottomless box culverts or arches (photo on cover), countersunk culverts,

(Continued on page 5)

Passage

(Continued from page 4)
bridges (photo on page 4 on right), or fords accomplishes these tasks.

Due to the integration of multiple physical and biological elements, an interdisciplinary approach is essential. New, user-friendly tools for assessing and modeling culvert hydraulics are available. Software packages, such as FishXing (USDA Forest Service, 2000) for example, allow for the modeling of culvert hydraulics concurrently with fish swimming capabilities. Additional information, field inventory forms, and an annotated bibliography for designing fish crossings are available at the Web site http://www.stream.fs.fed.us/fishxing.

For the engineer, planner, and manager, the initial costs of designing for aquatic passage will likely increase because the culvert will be larger and thus more expensive. However, failure risks will be reduced and structure life will be optimized. Maintenance levels and replacement frequency will decrease creating more economic opportunities with limited budgetary resources.

Integrating culverts, streams, and aquatic organism passage is a win-win scenario that ultimately will lead to more viable aquatic populations, healthier streams, and engineering maintenance budgets that can focus resources elsewhere.

Traci L. Sylte
U.S. Forest Service
Missoula, MT

References

USDA Forest Service 2000. FishXing, software and learning system for fish passage through culverts. Interactive CD-ROM. (http://www.stream.fs.fed.us/fishxing)

Warren, M. L. et al., 2000. Diversity, distribution, and conservation status of the native freshwater fishes of the Southern United States. Fisheries Vol. 25, No. 10.

Williams, J.D., Warren, M.L., Cummings, K.S., Harris, J.L., and Neves, R..J. 1992. Conservation status of freshwater mussels of the United States and Canada,. Fisheries, Vol. 19, No. 9.

Traci L. Sylte, Hydrologist and Professional Engineer, U.S. Forest Service, Lolo National Forest, Missoula, MT. (970) 295-5987, tsylte@fs.fed.us. Traci presented on aquatic organism passages at the 2007 ACE annual conference.

ACE Association of Conservation Engineers 47th Annual Conference

Preparations continue for the 47th Annual Association of Conservation Engineers Conference.

Anyone interested in submitting abstracts of papers on the engineering practices of fish, wildlife and recreation development for consideration of presentation at the Conference, should contact Greg Mihalevich (address at right) as soon as possible. Conference presentations are scheduled for 30 minutes each—long presentation times are available. Full papers will be required for publication of the conference proceedings; PowerPoint presentations are acceptable. The announcement of selected papers will be made on June 1, 2008. Further instructions for speaker preparation will be provided upon a paper's acceptance.

Registration for the Conference will open May 1, 2008 and continue through September 12, 2008. However, individuals are responsible for making their own reservations and can do so at anytime by contacting the Holiday Inn Springfield directly at (417) 865-8600 and ask for the Association of Conservation Engineers. Rooms have been set aside with a special group rate for the Conference of $73 plus tax per night, single or double occupancy. All reservations must be made on or before September 5, 2008.

This year's Conference will include a tour of the Shepherd of the Hills Trout Hatchery and the opportunity to enjoy Branson Landing located on the waterfront of Lake Tanycomo and featuring waterfront shopping, dining and entertainment.

Complete Conference Registration and the Guidelines and Entry Forms for the 15th Annual Carl Anderson Conservation Project Engineering Awards Competition are included on the following pages (pages 6-11).

Greg Mihalevich, P.E.
Mechanical Engineer
MO Dept. of Conservation
PO Box 180
Jefferson City, MO 65102
Phone: (573) 522-4115
Fax (573) 522-2324
Email: Greg.Mihalevich@mdc.mo.gov

Sponsorship and Exhibitor Information

In the continuing effort to bring together the knowledge and experience of those who have a community of specialized interests in the areas of fish, wildlife, parks, and related conservation and recreation fields, companies and agencies are invited to display information regarding their services and/or products at the ACE Conference.

Sponsorships are only $350 and include on conference attendee registration and a free 1-year ACE membership. Sponsors will also have their names listed in conference publications and on the Conference website.

Exhibitor cost is $425 prior to September 12, and $500 for late registration. Each exhibit space is 10ft x 5 ft and includes 1 table (if needed), 2 chairs and power. Exhibitors will also receive one conference attendee registration and a free 1-year ACE membership. Names of exhibitors will be listed in conference publications and on the Conference website.

If interested in sponsorship or exhibiting, please contact
ACE Conference
Meetings Northwest, LLC
PO Box 2083
Missoula, MT 59806-2083
Toll Free Phone: 1-866-633-8110
Email: info@2008aceconference.org

PURPOSE

The purpose of this design awards competition is to give recognition to those members and/or their departments whose work, as judged by their peers and associates, best exhibits the goals and objectives of The Association of Conservation Engineers. These goals and objectives are presented on the Association of Conservation Engineers Web site at *www.conservationengineers.org*.

CATEGORIES

PROJECT CATEGORY A

STUDIES / RESEARCH PROGRAMS

Non-design services including, but not limited to:

Pilot/experimental projects

Bioengineering

Electrical heating

New products and materials

Basic research on new technology

Fuels and water

Properties and uses of fuels

Research in natural resources

Hazardous waste studies

Resource recovery

Environmental impact studies

Soils and other subsurface geotechnical investigation and evaluation

Damage correction

Computer services

Technical papers.

All of the entries in Category A are involved with non-construction document design services.

PROJECT CATEGORY B

CONSERVATION / ENVIRONMENTAL

Energy generation, transmission, distribution, conversion, conservation and storage-mitigation

Dams (water supply, irrigation, flood control, recreational, fisheries management)

Drainage systems

Incineration

Mine Reclamation

Parks and Wildlife facilities

Resource recovery

Waste treatment facilities

Water resources and supply

Wetlands treatment

PROJECT CATEGORY C

SPECIAL PROJECTS

Any project that does not fit into other categories including, but not limited to:

Erosion protection and control

Recreational-theme parks, zoos, marinas, aquariums

Site development

Structures including bridges

Historical restoration

Construction projects resulting from unique studies or research of the type in Category A.

ELIGIBILITY

ENTRANT:

Any governmental agency or department, or its selected consultant, engaged in the fields of recreation, wildlife preservation, tourism, and/or conservation of the natural and historical environment, who is a member of or has made application for membership in the ACE, is eligible for participation in this awards program.

PROJECT:

The project entered must be the completed work of the agency or owner making the submission.

Up to two project entries may be submitted by each participant.

The project must have been completed and in its intended use within the 36 months preceding its submittal.

2008 Competition Announcement and Rules

ENTRY

Making your submittal for the ACE Conservation Project Engineering Award is a simple two-step process as follows:

FIRST: Send your Declaration of Intent to submit by fax, email or mail postmarked no later than Monday, **May 5, 2008**.

SECOND: Prepare your Entry packet. Entries must be postmarked no later than Monday, **June 2, 2008**.

Winners will be notified on or before August 1, 2008, to prepare a Project Panel to bring for display and presentation at the ACE 47th Annual Conference in Springfield, Missouri on October 5-9, 2008.

Submit to:

ACE Committee Chairman
Randy Knott
Mactec Engineering and Consulting, Inc.
3200 Town Point Dr., NW
Kennesaw, Georgia 30144
FAX: 770-421-3486
Phone: 770-421-3400
Email: raknott@mactec.com

Note: The entry fee for the 2008 awards competition has been waived. No entry fee will be required.

Each entry shall be submitted individually in one standard 1-1/2 inch 3-ring binder, on 8 ½ x 11, or 11 x 17 folded sheets, and shall include the following information in the order stated. Five **(5) original copies for each entry must be provided.**

1. A copy of the ACE Declaration of Intent form as previously submitted.

2. Letter from the agency or owner giving written permission allowing for publication of any feature or innovation found to be of interest to the members of the Association.

3. ACE Data Sheet 1 (attached).

4. ACE Data Sheet 2 (attached).

5. Drawings or prints on paper no larger than 11 x 17; up to a maximum of 4 sheets as needed to delineate project.

6. Colored photographs any size up to 8 x 10 mounted *or color printer pages to 8½ x 11* (to a maximum of six) may be utilized to complement the written description. (Note: no slides can be accepted)

Note: Entries shall be postmarked ***on or before June 2, 2008***, and mailed to the Awards Committee Chairman at the address above.

PROJECT PANEL

A project panel will be required of those winning entries receiving an Award of Excellence or an Award of Merit, and is requested, but optional, from the winner of the Award of Honor. The project panels will be on display during the annual conference for viewing by all those in attendance. Project panels will be returned after the conference.

Project panels will be restricted to one 30" x 40" heavy weight crescent or mat board, or two 20" x 30" boards hinged and capable of standing on an easel. Material displayed shall be either B/W or colored photos, printed texts or drawings which best describe the features of the entry. Project panels shall be identified with the name of the submitting department or agency, the name of the project and its location.

For use of award chairperson only

*PROJECT REG. NO.*_____

DECLARATION OF INTENT TO SUBMIT
FOR
ACE CONSERVATION PROJECT ENGINEERING AWARDS

(This page is due by fax, Internet or mail postmarked on or before May 5, 2008)

Date submitted:_____

Note: Please furnish all information requested below for each entry. If additional forms are required, copy this format.

I intend to submit an entry to the Association of Conservation Engineers Design Awards Program in the following category and division designated.

Category (Check One)

A. Studies/Research Program _____

B. Conservation/Environmental _____

C. Special Projects _____

Budget Cost of Project: _____ Scheduled Completion: _____

Actual Cost of Project: _____ Actual Completion: _____

Name of Submitting Entity: _____

Address: _____

Contact Name: _____ Phone No: (___) _____

Fax No: (___) _____

E-mail: _____

Name of Project: _____

Location: _____

Owner's Name: _____

***Note:** Remember to get Owner's approval for use of project award nomination*

Name of Consultant(s): _____

(if applicable) *May be the same as submitting entity*

Address: _____

Note: The submitting entity or the owner of the project must be a member of the ACE organization or must have made application for membership at the time the Declaration of Intent is filed.

JUDGING

The judging panel shall consist of not less than three nor more than five judges. All judges will be qualified design professionals such as engineers, architects, biologists, botanists or others involved in the conservation / preservation or environmental field. At least two of the judges will be a member of ACE. The judges will be selected by the Awards Committee and may reside in the state hosting the conference. The judges will meet soon after the submission deadline to evaluate and select the projects to receive awards. The judges' decision shall be final.

None of the judges may submit entries nor be identified with any submitted entry.

All entries will be judged on their own merit, and within their selected category, based on their meeting or exceeding all of the requirements of the rating guidelines.

DEFINITIONS OF RATING GUIDELINES

1. ***Originality / Innovation / New Application of Existing Techniques:***
   - ☑ Does the entry represent any new branch of conservation engineering or some type of breakthrough in general knowledge of our environment?
   - ☑ Does the entry represent a unique mix of different techniques, materials or equipment?
2. ***Technical value to the Conservation Engineering Profession:***
   - ☑ Does the entry advance the state of the conservation engineers' art?
3. ***Complexity:***
   - ☑ Does the entry involve very complex criteria or types of problems to be addressed?
   - ☑ Were extraordinary problems of site, location, hazardous conditions, project requirements, or similar elements present?
   - ☑ Does the entry require out-of-the-ordinary technology and ingenuity for achievement?
4. ***Meeting and Exceeding Owner's Needs:***
   - ☑ Is it an economical and cost-effective solution?
   - ☑ How did final cost relate to original budget estimate?
   - ☑ How closely does the entrant's solution meet the total goals of the owner?
   - ☑ Does the entry meet and justify its original concept?
   - ☑ Did the entrant meet the owner's time schedule?
5. ***Natural Resources and Environmental Considerations:***
   - ☑ Does the entrant's solution bring into play an improved program, i.e., are additional benefits realized as a spin-off?
   - ☑ Does the entrant's role provide society with any useful advancement in the area of conservation and environmental sciences?
   - ☑ Is the public health, safety, or welfare enhanced as a result of the entrant's role in the project?

AWARDS

The jury shall make awards to three meritorious entries. At the discretion of the jury, the number of awards may be limited or expanded. The following awards will be issued:

Award of Excellence……...Special Award
Award of Merit…….. Plaque
Award of Honor ……Plaque

A certificate of participation may be presented to all other qualified entries. From time to time a letter of recognition or certificate may be awarded to other entries as the judges may recommend.

Awards will be presented during the 47th Annual ACE Conference in Springfield, Missouri October 5-9, 2008

For use of award chairperson only

*PROJECT REG. NO.*_____

*Received*_____

ACE 2008 DESIGN AWARDS DATA SHEET #1

PROJECT NAME:_____

1. Agency / Firm Making Submittal: _____

2. Address:_____

3. Contact Name:_____ Contact Phone No: _____

   Fax No: _____

   E-mail:_____

4. Project Location: _____

5. Project Category: _____

6. Outside Consultant(s): _____

7. If a winning entry, please give exact name(s) or title(s) as they should appear on the plaque or certificate:

   _____

   _____

   _____

Note: The information from the submitting entry must be confined to this sheet only.

To maintain anonymity during the judging, this data sheet, and the declaration of intent copy will be removed from the submitted material. All other submitted material will be signed or marked with the project registration number copy.

For use of award chairperson only

*PROJECT REG. NO.*_____

*Received*_____

ACE 2008 DESIGN AWARDS DATA SHEET #2

PROJECT NAME:_____

In approximately 500 words (total), write a short summary of the project features and solutions that best answer the following rating guidelines:

1. Originality/Innovation/New Application of Existing Techniques:	15%
2. Technical Value to Conservation Engineer's Profession:	20%
3. Complexity of Program:	15%
4. Meeting and Exceeding Owner's Needs:	25%
5. Natural Resources & Environmental Considerations:	25%
	100%

Note: The unnecessary use of names of agencies, departments, consultants, or individuals should be avoided.

47th Annual Conference

For more information:
Greg Mihalevich, P.E.
Missouri Department
of Conservation

Phone: (573) 522-4115 ext. 3739
Fax: (573) 522-2324

E-mail:
Greg.Mihalevich@mdc.mo.gov

Holiday Inn Hotel and Suites Springfield, Missouri

ACE RESOURCES

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5201 South Sixth Street Road
Springfield, Illinois 62703-5143
217.585.8300 or 217.585.8333

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