Eco-Logical and Wildlife Crossings: Concepts in Innovative Planning
Tuesday, May 24, 2011
1:00 – 2:30 PM Eastern

Presenters

• Mary Gray, FHWA Office of Project Development and Environmental Review
• Peter Kozinski, Colorado Department of Transportation
• Sarah Barnum, Normandeau Associates, Inc.
• Angela Kociolek, Western Transportation Institute

Moderated by Haley Peckett, Volpe National Transportation Systems Center/USDOT
Ways in which FHWA is Protecting and Enhance Wildlife Habitat

Mary Gray

FHWA Office of Project Development and Environmental Review
What We Do

Studies and Research
Webinars and Trainings
Guidance, Conferences
Research and Studies

• STEP Research Program
  - ROCS
  - Deer Crash.com
  - Wildlife Crossing Structure handbook
• ARC Competition
• Wildlife Congressional Study
  - On-line Training Course
• Eco-Logical
The Roadkill Observation Collection System (ROCS)
Deer-Vehicle Crash Information Clearinghouse (DVCIC)

Data
Research
Information exchange
Wildlife Crossing Structure Handbook

Planning
Placement
Design
Guidelines
ARC International Wildlife Crossing Infrastructure Design Competition
Wildlife Vehicle Reduction Study

WVC Impacts
- Focused on large animals
- Trends
- Locations and costs

WVC Mitigations
- No single solution
- Design guidelines
Best Practices Manual

- Regional and statewide tools
- Guidance on incorporating into roadway design
- Best management practices for reducing WVCs w/ large animals.
- Best management practices for reducing WVCs w/T&E species.
- Monitoring and evaluating
Trainings, Webinars and Guidance

On-Line Training
Webinars
ICOET

Keeping It Simple:
Easy Ways to Help
Wildlife Along Roads
FHWA Wildlife Vehicle Collision Reduction Online Training
The 2011 International Conference on Ecology & Transportation

Seattle, Washington
August 21-25, 2011
The Westin Seattle
Eco-Logical

Pilots
Research
Interagency Exchange
More Information

Wildlife Vehicle Collision Reduction Training

Congressional Report: Wildlife Vehicle Collision Reduction Study


Website: Deer Vehicle Crash Information Clearinghouse:
http://www.deercrash.com

Website: Keeping It Simple Toolkit
http://www.fhwa.dot.gov/environment/wildlifeprotection/index.cfm

Critter Crossings:

Eco-Logical

I-70 Mountain Corridor & FHWA Eco-Logical Grant

Presented By
Peter Kozinski
Colorado Department of Transportation
I-70 Mountain Corridor Context Statement

The I-70 Mountain Corridor is a magnificent scenic place. Human elements are woven through breathtaking natural features. The integration of these diverse elements has occurred over the course of time. This corridor is a recreational destination for the world, a route for interstate and local commerce and a unique place to live.

It is our commitment to seek balance and provide for 21st century uses.

We will continue to foster and nurture new ideas to address the challenges we face.

We respect the importance of individual communities, the natural environment, and the need for safe and efficient travel.

Well thought-out choices create a sustainable legacy.
How does the Eco-Logical Grant Integrate into the I-70 Mtn. Corridor?

• Alternatives to minimize footprint impacts in Tier 2 processes
• Four agreements/commitments
  – Context Sensitive Solutions process
  – Section 106 Programmatic Agreement
  – SWEEP and ALIVE Memoranda of Agreement
• Other mitigation strategies presented in Chapter 3 of the PEIS
The CSS Website

www.i70mtncorridorcss.com
ALIVE Implementation Matrix

- Inputs, considerations, and outcomes for five life cycle phases of corridor improvements

- Five life cycle phases:
  1. Corridor Planning
  2. Project Development
  3. Project Design
  4. Project Construction
  5. Operations, Maintenance, and Monitoring

- Two primary considerations for each phase:
  1. Connectivity/Permeability and Wildlife Habitat
  2. Information Needs and Data Updates

ALIVE Implementation Matrix

The following matrix outlines specific inputs, considerations, and outcomes during each of the five life cycle phases for improvements in the I-70 Mountain Corridor that are needed to improve, protect, or restore permeability for wildlife and important habitat components, as put forth in the ALIVE Memorandum of Understanding. As activities in the corridor move from corridor planning to project development to project design and on, the outcomes from the previous phase become inputs for the subsequent phase. This approach is consistent with the Life Cycle Phases and 6-Step Process in the CSS Guidance for the I-70 Mountain Corridor.

Each Life Cycle Phase is represented in a separate column in the implementation matrix. For each phase, two primary considerations, as indicated by the ALIVE MOU, have been identified: 1) Connectivity/Permeability and Wildlife Habitat, and 2) Information Needs and Data Updates. Users should identify the Life Cycle Phase(s) of interest and then read down the appropriate column to view all Inputs, Considerations and Outcomes and Products for that phase. Life Cycle Phase columns may flow onto multiple pages.

<table>
<thead>
<tr>
<th>CONNECTIVITY (PERMEABILITY) AND HABITAT</th>
<th>Corridor Planning</th>
<th>Project Development</th>
<th>Project Design</th>
<th>Project Construction</th>
<th>Operations, Maintenance and Monitoring</th>
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<tr>
<td>Objectives</td>
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<td>Connect/disconnect permeability of the I-70 Corridor to natural and adjacent areas</td>
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I-70 Mountain Corridor CSS
Partnership Powered by Context
I-70 Eco-Logical Project

Goals:
1. Compile baseline information on the presence of and use of existing crossing structures by wildlife along I-70;
2. Develop recommendations for mitigating the impacts of roads and traffic on wildlife;
3. Facilitate environmental review processes and stakeholder engagement in terrestrial and aquatic connectivity along the corridor.
Methods:
1. Roadway Inventory
2. Camera Monitoring
3. Incorporation of connectivity concerns in stakeholder processes & CDOT planning
4. Identification of connectivity zones and recommendations development
I-70 Eco-Logical Project

Results:
• LIZs-2011
• Aquatic connectivity locations

www.I-70WildlifeWatch.org
I-70 Eco-Logical Project

Project Outcomes and Implementation

- Recommendations and BMPs for improving terrestrial and aquatic connectivity
- All data layers, databases and recommendations available for project planning via CSS website
- Framework for ongoing stakeholder engagement
- Project completion: Sept. 2011
Using Hotspot Analysis to Plan Wildlife Crossing Opportunities

Sarah A. Barnum, Ph.D.
Senior Wildlife Ecologist
This Project is Funded by

- The Deer Vehicle Crash Information and Research Center (DVCIR) Pooled Fund
  - Contributors are: Connecticut, Iowa, Maryland, Minnesota, New Hampshire, New York, Ohio, Texas, Wisconsin, and the FHWA.

- The FHWA is the manager of the study.
Overview

• This project looked at methods to identify AVC hotspots
• The findings are applicable to all types of point data – AVC, carcasses, tracks, radio collar locations, live animal sighting
• This was a desktop study
• AVC data was acquired from the Iowa DOT and the New York State DOT
Iowa Study Areas
The Basic Questions...

• What is a Hotspot?
  – A location where crossing/AVC are significantly clustered  OR
  – A location where more crossings/AVC occur than expected by chance

• How do you know if a cluster is significant?

• How do you know how many AVC to expect at a given location?
Methods to Identify Hotspots

• Methods to Identify Significant Clusters
  – Visual Analysis
  – Spatial Statistics
    • Getis-Ord Gi*
    • Hierarchical Nearest Neighbor Analysis (HNN)

• Methods to Identify More AVC than Expected by Chance
  – Density-based Measures
  – Models
Identifying Significant Clusters

First, determine if your data is clustered!

• **Average Nearest Neighbor**
  - “Regular” average nearest neighbor doesn't work
  - Linear nearest neighbor routines can be created

• **Moran’s I**
  - Moran’s I is a spatial statistic, other spatial approaches are also available
Visual Analysis

Figure 3a. Individual DVC Points along roadway

Figure 3b. Roadway divided into mile-long segments and labeled with DVC/Mile counts

Figure 3c. Roadway segments color-coded by DVC/Mile counts

DVC/Mile Counts

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<thead>
<tr>
<th>Cnt_Id</th>
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</table>
Spatial Statistics – Getis-Ord Gi*
Identifying Locations with more AVC than Expected by Chance
Density-based Measures

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<tr>
<th>Figure 4a. Mean</th>
<th>Figure 4b. Upper 95% Confidence Interval</th>
<th>Fig 4c. One Standard Deviation from the Mean</th>
<th>Fig. 4d. Two Standard Deviations from the Mean</th>
<th>Fig. 4e. Three Standard Deviations from the Mean</th>
</tr>
</thead>
</table>

**Hot Spots**
- **No**
- **Yes**
Models

Variation in the location of hotspots identified using a 95% CI, based on the binomial distribution, and a moving windows analysis with different sized windows.
Best Method?

• All approached have strengths and weaknesses
  – Density-based measures may be weakest - require normally distributed data (rare).
  – Spatial statistics may be strongest - provide objective significance values (but results are heavily dependent on user inputs and assumptions).
• There is no single “best” method, instead look for hotspots repeatedly identified by multiple methods
Examples
Final Thoughts

• Use multiple methods
• Vary parameters within methods
• Create visual maps of the results to aid in interpretation
• Combine results with landscape variables to identify best crossing locations
Announcing the winners of the ARC International Wildlife Crossing Infrastructure Design Competition

Angela Kociolek
ARC Technology Transfer Initiative Leader
Western Transportation Institute-MSU
Outline

1. Origins and inspirations
2. Partnerships
3. Finalists, designs & jury
4. Continuing mission of ARC Partnership
ARC name & visual identity

developed by
Studio: Blackwell;
Chris Harrison, Carnegie Mellon University; &
Dr. Tony Clevenger, WTI-MSU
Origins & inspirations

Dr. Tony Clevenger, initiator of ARC, at work in Banff, Canada.
The ARC challenge

1. Lower cost
2. Reduce ecological footprint
3. Adapt to changing climate
ARC Competition Partnership

**Founding Sponsors**
Organizations that developed, sustain or serve on the competition’s Steering Committee

- Woodcock Foundation
- Montana State University Western Transportation Institute
- Montana Community Foundation
- U.S. Department of Transportation Federal Highway Administration
- Forest Service
- Federal Lands Highway
- Nebraska Community Foundation

**Organizing Sponsors**
Organizations providing the site, information or major funding

- DOT
- CTIP
- National Park Service
- Fish & Wildlife Service
- Indian Affairs
- Research and Innovative Technology Administration
- Western Environmental Law Center

Continued...
ARC Competition Partnership

Supporting Sponsors
Organizations providing additional funds or in-kind support

Endorsing Sponsors
Organizations providing a public endorsement of the competition's goals
Partnership among disciplines

Engineering          Ecology          Architecture

Landscape Architecture

Wildlife Biology          Transportation

Landscape Design          Graphic Design

ARC
NEW METHODS • NEW MATERIALS • NEW THINKING
Phases & stats

Phase 1 - Call for Expressions of Interest
- 100 firms
- 9 countries
- 36 teams

Phase 2 – Invited
- 5 finalist teams

qualifications and design approaches

model, panels & booklet

ARC
NEW METHODS • NEW MATERIALS • NEW THINKING
Finalist teams

Balmori Associates (New York)  
with StudioMDA, Knippers Helbig Inc., David Skelly, CITA, Bluegreen,  
John A. Martin & Associates, & David Langdon

HNTB with Michael Van Valkenburgh & Assoc. (New York)  
with Applied Ecological Services, Inc.

Janet Rosenberg & Associates (Toronto)  
with Blackwell Bowick Partnership, Dougan & Associates, & Ecokare International

The Olin Studio (Philadelphia)  
with Explorations Architecture, Buro Happold, & Applied Ecological Services

Zwarts & Jansma Architects (Amsterdam)  
with OKRA Landscape Architects, IV-infra, & Planecologie
Vision for the competition

Specifically, ARC seeks innovation in feasible, buildable, context-sensitive and compelling design solutions for safe, efficient, cost-effective, and ecologically responsive highway crossings for wildlife. In the broadest context, ARC will challenge competitors to reweave landscapes for wildlife using new methods, new materials, and new thinking. In doing so, the ARC competition aims to raise international awareness of a need to better reconcile human and wildlife mobility through a more creative, flexible and innovative system of road and habitat networks in our landscapes.
Jury

Prof. Charles Waldheim (Jury Chair), John E. Irving Professor and Chair of Landscape Architecture, Harvard University, Graduate School of Design

Jane Wernick, Structural Engineer and Director of Jane Wernick Associates, London.

William L. Withuhn, Curator Emeritus, History of Technology and Transportation, Smithsonian Institution

Prof. Jane Wolff, Associate Professor and Chair of Landscape Architecture, John H. Daniels Faculty of Landscape, Architecture and Design, University of Toronto

Dr. Anthony Clevenger, Senior Research Scientist (Road Ecology), Western Transportation Institute, Montana State University
Jury assessment:

“the winning proposal by HNTB Engineering with Michael Van Valkenburgh & Associates was not only eminently possible; it has the capacity to transform what we think of as possible.”
Crux of the HNTB + MVVA design

Model showing the construction phase of the hypar vault bridging structure, for maximum visibility of the modular construction system. The hypar modules are optimized for being efficient to transport, erect, combine, and recombine. No on-site concrete work is required, and bridges can be added to or removed as animal migration pressures shift over time.
Winning ARC entry by HNTB + MVVA
To join the ARC Partnership, contact angela.kociolek@coe.montana.edu.
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Eco-Logical Website:
Upcoming Webinars

1. June Eco-Logical Webinar
   Date: Tuesday, June 21, 2011
   Time: 2:00 – 3:30 PM Eastern

   Topic: Best practices in advance mitigation and conservation banking

   Watch your email for web conference link and call-in line or email haley.peckett@dot.gov to be added to the Eco-Logical Webinar Email List

2. June NHI Innovations Web Conference
   Transportation Innovations: Linking Transportation and Natural Resource Planning through Environmental GIS Tools
   June 16 from 2:30-4 PM Eastern

   Visit the NHI Web Conference Calendar to register: