2011 International Conference on Ecology & Transportation

August 21-25 • Seattle, Washington, USA

ICOET

Sustainability in Motion

CTE

Organized and Co-sponsored by the Center for Transportation and the Environment

Co-hosted by the Washington State Department of Transportation

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ICOET extends a **Special Thanks** to lead sponsor **Federal Highway Administration** for providing significant travel support funding to enable many of our presenters and resource agency participants to attend the conference.

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ICOET 2011 Co-Sponsors are listed on the back cover of this program. We appreciate their support!

Please visit the sponsor exhibits in the Grand Foyer to learn about their products and services, and to thank them for their generous support of ICOET. Morning and afternoon refreshment breaks will be served in the exhibit area, and *free wireless Internet service* is accessible in the Grand Foyer for your convenience. Enjoy the conference!

Welcome from the Conference Chair

Paul J. Wagner
Biology Branch Manager, Environmental Services Office
Washington State Department of Transportation

Welcome to the 2011 International Conference on Ecology and Transportation in Seattle Washington. You are joining the conversation with experts from around the world to share the most current knowledge and best practices at the intersection of transportation and the ecological sciences. This is the sixth biennial ICOET and the biggest gathering yet. We're pleased to include in this year's program over 170 technical and poster presentations from 21 countries.

Our conference theme is *Sustainability in Motion*. This can seem like a contradiction, but it speaks to the importance of making infrastructure decisions today which incorporate the needs of the future. ICOET provides an excellent forum to explore the challenges, lessons and solutions that come as we consider approaches that meet people's mobility needs while being sustainable for the long term in both ecological and social measures. This conference brings together ecologists and engineers, researchers and managers, planners and advocates, because the challenges we face require the synergy of diverse perspectives. We welcome your insights into the conversation.

On behalf of our host agency, the Washington State Department of Transportation, I am honored to welcome you to the Pacific Northwest. This region is known for spectacular and diverse natural places such as ancient forests, glaciated mountains, wild rivers and thousands of miles of marine shoreline. We have a high societal value for enjoying and protecting the natural environment here. At the same time, we also have a growing population, expanding urban areas and development pressures which have placed many species and habitats at risk. Washington is a remarkable setting for our discussion of sustainable transportation. Three field trips this week provide opportunity to experience firsthand some of the ecoregions of the Great Northwest and see some of the environmental factors that are part of providing safe and efficient transportation here.

Many people, organizations and sponsors – governmental, non-profit, and private – deserve our sincere thanks for organizing and bringing us together at ICOET 2011. You'll find these groups listed in this program booklet, and you will see them throughout our time in conference. I encourage you to take time to visit with them and express appreciation for their hard work and contributions.

ICOET 2011 offers a special opportunity to learn and interact with other professionals. Our host city, Seattle, on the shore of Puget Sound with views of the Olympic and Cascade Mountains, provides a beautiful setting. I hope this is a rewarding and memorable experience for you.

Paul J. Wagner
ICOET 2011 Conference Chair

2011 Conference Theme
Sustainability in Motion

Sustainability is the capacity to endure into the future. In many ways our future is linked to the health of the natural environment for clean air and water, food supply, natural resources, economic security, and quality of life. There is a growing recognition that providing for human needs in the long term requires consideration of the natural environment. Nowhere is this concern more prominent than in addressing the interaction between surface transportation systems and ecosystems. The ICOET 2011 theme focuses this year's conference on moving us toward sustainable transportation solutions that protect natural ecosystems while supporting our economy and communities.

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Photo Courtesy WSDOT - Kelly McAllister

What's New at ICOET 2011

Each ICOET brings new and exciting elements to the program thanks to the many organizations and professionals who participate. Here are some of the highlights at ICOET 2011:

- We are pleased to welcome this year presenters from 21 countries: **Australia, Brazil, Canada,** the **People's Republic of China,** the **Czech Republic, France, Germany, Hungary, India, Ireland, Italy, Japan, Lithuania, Mexico, Portugal, Spain, Sweden, Switzerland, Taiwan, The Netherlands,** and the **United States.** ICOET also is honored to welcome Native American presenters from Montana's **Confederated Salish and Kootenai Tribes**. Participation from the international community at ICOET greatly enriches the body of research presented at the conference, and provides a vital global perspective on both the state of the art and state of the practice in addressing ecological issues associated with transportation infrastructure.

- ICOET is privileged to again serve as host for the **USDOT Federal Highway Administration Environmental Excellence Awards** ceremony. Twelve award winners in ten environmental categories will be recognized at the Monday luncheon. FHWA sponsors this biennial awards program to honor state and local organizations, projects, and professionals from across the United States who excel in forging creative solutions and innovations for balancing the needs of a safe and efficient transportation network with protecting and enhancing the environment. More information on the awards program and winners will be included in the official Environmental Excellence Awards program booklet available at the luncheon.

- **Facilitated sessions** are a new format in the 2011 conference program. These sessions are organized around a specific topic, with speakers invited by the session organizer, and include a combination of presentations, panel discussion and audience participation. Facilitated sessions begin on Sunday at 7:00pm with **The Language of Sustainability — What You Said and What Others Heard.** Three more facilitated sessions in the program will explore **Integrating Resilient Transportation Systems with Ecological Restoration** on Monday, **Innovations of the ARC International Wildlife Crossing Infrastructure Design Competition** on Tuesday, and **Eco-Logical in Action** on Thursday.

- Conference co-host Washington State Department of Transportation has organized three engaging field trips for Wednesday. Participants will explore ecological connectivity aspects of the **I-90 Snoqualmie Pass East Project**, learn about aquatic ecosystems issues on the **Olympic Peninsula and Puget Sound**, and look at urban sustainability efforts in a tour of **Seattle Metropolitan Area** projects. Each field trip showcases the exceptional work of WSDOT and its partner organizations in seeking sustainable solutions to the ecological impacts of transportation.

- ICOET 2011 offers an expanded program of technical and poster sessions from previous conferences. Eighty-eight technical papers will be presented within four parallel session tracks organized around **Connectivity; Construction, Operations and Maintenance; Crossings and Barriers**; and **Sustainability**. Extended poster sessions on Monday and Tuesday will feature 80 poster presentations also organized by tracks. Adding in our speakers in the plenary session, facilitated sessions and field trips, you'll find more than 200 outstanding presentations packed into this year's program.

Your Keynote Speaker

Tuesday, August 23, 12:00 – 1:15 PM

Dr. Mark L. Shaffer
National Climate Change Policy Advisor, US Fish and Wildlife Service

ICOET is honored to welcome Dr. Mark Shaffer to provide the keynote remarks for our 2011 conference. In his remarks Mark will speak on "Completing a Nationwide Habitat Conservation System."

Mark serves as the national climate change policy advisor for the US Fish and Wildlife Service. A key focus of his position is the development of the National Fish, Wildlife and Plants Climate Adaptation Strategy, an agreement among major conservation interests that will provide a unified approach — reflecting shared principles and science-based practices — for reducing the impacts of climate change on fish, wildlife, plants, habitats, and associated ecological processes across geographic scales.

Mark is a biodiversity conservationist with extensive experience in population viability analysis, conservation biology, resource economics and environmental philanthropy. Prior to his current work with FWS, Mark held leadership positions at the Doris Duke Charitable Foundation and with Defenders of Wildlife. As program director for the environment at the Doris Duke Charitable Foundation, Mark provided strategic direction for the investment of nearly $100 million in land conservation projects and promoting the implementation of state wildlife action plans. All told, the Foundation's investments have assisted in the conservation of nearly 2 million acres of high priority habitat nation-wide. As senior vice president of programs for Defenders of Wildlife, Mark provided direction, oversight, and administration of the organization's species, habitat, and legal work, while managing a regional staff in eight states. He has also worked with other major conservation organizations The Nature Conservancy, The Wilderness Society, and in an earlier role at the US Fish and Wildlife Service.

Mark received a bachelor of science degree from Indiana University of Pennsylvania and his PhD from Duke University School of Forestry and Environmental Studies. His doctoral research on grizzly bears helped to pioneer population viability analysis in conservation biology. Mark has also served as a consultant for federal and state agencies on various endangered species issues.

Join us for the Tuesday luncheon to welcome Dr. Mark Shaffer to ICOET.

Agenda at a Glance

SUNDAY August 21

2:00 PM – 6:00 PM	**Registration Open** and Sponsor Exhibits Set-up *(Grand Foyer)* Poster Session 1 Presenters Set-up *(Grand II)*
3:00 PM – 5:00 PM	ICOET Steering Committee Meeting *(by invitation — Vashon)*
3:00 PM – 6:00 PM	TRB ADC10 Steering Committee Meeting *(by invitation — Blakely)*
Dinner on your own	
SPECIAL SESSION 7:00 PM – 8:30 PM	**The Language of Sustainability: What You Said and What Others Heard** *(Fifth Avenue Room)*

MONDAY August 22

7:00 AM – 8:30 AM	**Continental Breakfast** *(Grand Foyer and Grand II)*				
7:00 AM – 3:30 PM	Poster Session 1 Presenters Set-up *(Grand II)*				
7:00 AM – 5:30 PM	**Registration and Sponsor Exhibits Open** *(Grand Foyer)*				
8:00 AM – 10:00 AM	**Registration and Sponsor Exhibits Open**	**Conference Welcome and Opening Plenary Session** *(Grand III)*			
10:00 AM – 10:30 AM		**Refreshment Break to Preview Posters and Visit Sponsor Exhibits** *(Grand Foyer and Grand II)*			
PARALLEL SESSIONS 10:30 AM – 12:00 PM		**CNT-1 Strategic Approaches to Mitigation** *(Vashon)*	**COM-1 Safety First: Reducing Wildlife-Vehicle Collisions** *(Grand I)*	**CRB-1 Long-Term Perspectives on Ecology and Sustainable Transportation** *(Fifth Avenue)*	**SUS-1 Greening the Gray** *(Grand Crescent)*
12:00 PM – 1:15 PM		**FHWA Environmental Excellence Awards Ceremony and Luncheon** *(Grand III)* Sponsored by USDOT Federal Highway Administration			
PARALLEL SESSIONS 1:30 PM – 3:00 PM		**CNT-2 Integrating Resilient Transportation Systems with Ecological Restoration** *(Grand I)*	**COM-2 Ecological Enhancement and Compliance in Construction, Operations and Maintenance** *(Vashon)*	**CRB-2 Understanding Barrier Effects and Crossing Design** *(Fifth Avenue)*	**SUS-2 Partnerships for Linkages** *(Grand Crescent)*
3:00 PM – 3:30 PM		**Refreshment Break to Preview Posters and Visit Sponsor Exhibits** *(Grand Foyer and Grand II)*			
3:30 PM – 5:30 PM		**Poster Session 1** *(Grand II)* Presenters, please take down posters by 6:00 PM before attending the Welcome Reception Dinner.			
6:00 PM – 10:00 PM	Poster Session 2 Presenters Set-up *(Grand II)*				
6:30 PM – 9:00 PM	**Welcome Reception Dinner at Seattle Aquarium** (*1483 Alaskan Way*) 0.6 mile walk from Westin. Shuttle bus available from 6:00 PM – 9:00 PM.				

***(Room name)* listed with session title. See pages 8-18 for details on Sunday-Monday sessions.**

SESSION TRACKS	CNT Connectivity	COM Construction, Operations and Maintenance	CRB Crossings and Barriers	SUS Sustainability

ICOET 2011

TUESDAY August 23

7:00 AM – 8:30 AM	**Continental Breakfast** *(Grand Foyer and Grand II)* FHWA State and Resource Agency Liaison Managers Meeting *(by invitation — Blakely)*				
7:00 AM – 3:30 PM	Poster Session 2 Presenters Set-up *(Grand II)*				
7:30 AM – 5:30 PM	**Registration and Sponsor Exhibits Open** *(Grand Foyer)*				
PARALLEL SESSIONS 8:30 AM – 10:00 AM	Registration and Sponsor Exhibits Open	**CNT-3** **Habitat Connectivity: Measuring and Planning the Critical Links** *(Grand I)*	**COM-3** **Improving Stormwater Management through Better Analysis and Design** *(Grand Crescent)*	**CRB-3** **Planning and Design Considerations for Small Animals and Herptefauna** *(Vashon)*	**SUS-3** **Using Context Sensitive Solutions to Deliver Sustainable Projects** *(Fifth Avenue)*
10:00 AM – 10:30 AM		**Refreshment Break to Preview Posters and Visit Sponsor Exhibits** *(Grand Foyer and Grand II)*			
PARALLEL SESSIONS 10:30 AM – 12:00 PM		**CNT-4** **Breaking Down Barriers: Project Level to International Scale** *(Vashon)*	**COM-4** **Vegetation Management for Road and Rail Corridors** *(Grand Crescent)*	**CRB-4** **Planning and Designing Effective Crossings** *(Grand I)*	**SUS-4** **Show Me the Money: Effective Mitigation and Costs of Impacts** *(Fifth Avenue)*
12:00 PM – 1:15 PM		**Keynote Speaker Luncheon** (Grand III) Dr. Mark L. Shaffer, National Climate Change Policy Advisor, US Fish and Wildlife Service			
PARALLEL SESSIONS 1:30 PM – 3:00 PM		**CNT-5** **New Considerations for Habitat Connectivity** *(Vashon)*	**COM-5** **Turn It Down! Noise Impacts** *(Fifth Avenue)*	**CRB-5** **New Methods, New Materials, New Thinking: Innovations of the ARC International Wildlife Crossing Infrastructure Design Competition** *(Grand I)*	**SUS-5** **Delivering Sustainable Infrastructure: Programs and Tools** *(Grand Crescent)*
3:00 PM – 3:30 PM		**Refreshment Break to Preview Posters and Visit Sponsor Exhibits** *(Grand Foyer and Grand II)*			
3:30 PM – 5:30 PM		**Poster Session 2** *(Grand II)* Presenters, please take down posters by 6:00 PM before attending dinner and evening activities.			
Dinner on your own					
5:00 PM – 6:00 PM	TRB ADC10 and ADC30 Joint Committees Meeting *(Cascade II)*				
5:00 PM – 7:00 PM	Green/Gray Infrastructure Leadership Training Development Round Table *(Orcas)*				
5:00 PM – 7:30 PM	US Fish and Wildlife Service Biologists Meeting *(by invitation — Vashon)*				
7:00 PM – 10:00 PM	TRB ADC10 Committee Meeting *(Cascade I-A)* TRB ADC30 Committee Meeting *(Cascade I-C)*				

***(Room name)* listed with session title. See pages 19-30 for details on Tuesday sessions.**

SESSION TRACKS	CNT Connectivity	COM Construction, Operations and Maintenance	CRB Crossings and Barriers	SUS Sustainability

WEDNESDAY August 24

Breakfast on your own			
7:30 AM – 5:30 PM **CHECK-IN AT WESTIN LOBBY** **NOTE BUS BOARDING AND DEPARTURE TIMES FOR EACH TRIP**	**Field Trips hosted by Washington State Department of Transportation** Buses will depart promptly at the times listed below. Lunch and snacks will be provided during each field trip.		
	FIELD TRIP 1 **Interstate 90 (I-90) Snoqualmie Pass East Project – Ecological Connectivity** ***Boarding 8:00 AM*** ***Depart 8:30 AM***	**FIELD TRIP 2** **Olympic Peninsula and Puget Sound – Aquatic Ecosystems** ***Boarding 7:30 AM*** ***Depart 8:00 AM***	**FIELD TRIP 3** **Seattle Metropolitan Area – Sustainability in Urban Environments** ***Boarding 8:30 AM*** ***Depart 9:00 AM***
Dinner on your own – Free evening for social and networking activities			

See page 31 for details on Wednesday field trips.

THURSDAY August 25

Breakfast on your own					
7:30 AM – 12:30 PM	**Registration and Sponsor Exhibits Open**	**Registration and Sponsor Exhibits Open** *(Grand Foyer)*			
PARALLEL SESSIONS 8:30 AM – 10:00 AM		**CNT-6** **Sustaining Hydrologic Connections** *(Fifth Avenue)*	**COM-6** **Unwelcome Guests: Invasives and Pests** *(Vashon)*	**CRB-6** **Road Effects on Biodiversity and Species** *(Grand Crescent)*	**SUS-6** **Landscape Scale Planning for Transportation and Conservation** *(Grand I)*
10:00 AM – 10:30 AM		**Refreshment Break to Visit Sponsor Exhibits** *(Grand Foyer)*			
10:30 AM – 12:00 PM		**Eco-Logical in Action** *(Grand I)*			
12:00 PM – 12:30 PM		**Conference Wrap-up** *(Grand I)* Paul J. Wagner, ICOET Conference Chair, Washington State Department of Transportation Debra Nelson, ICOET Chair-Elect, New York State Department of Transportation			
End of Conference – Lunch on your own					
1:00 PM – 4:00 PM	FHWA Transportation Liaisons Meeting *(by invitation — Grand Crescent)* USDA Forest Service Round Table *(Vashon)*				

***(Room name)* listed with session title. See pages 32-33 for details on Thursday sessions.**

SESSION TRACKS	**CNT** **Connectivity**	**COM** **Construction, Operations and Maintenance**	**CRB** **Crossings and Barriers**	**SUS** **Sustainability**

Session Details

SUNDAY August 21 special facilitated session 7:00 pm – 8:30 pm

The Language of Sustainability: What You Said and What Others Heard

Moderator: Larry Ehl, Transportation Issues Daily, Edmonds, WA, USA

- Lloyd Brown, American Association of State Highway & Transportation Officials, Washington, DC, USA
- Mike Rosen, PRR, Seattle, WA, USA
- Patricia White, Defenders of Wildlife, Washington, DC, USA

Have you ever tried to convince someone about a sustainability initiative only to meet the 'Berlin Wall' of resistance? We have. Then we learned some skills to improve our connection with our audience and increase the odds for a positive outcome. In this session you'll learn more about connecting with your direct and indirect audiences, and the biases and listening context of those audiences — how your words are interpreted and mischaracterized. We'll discuss tools and strategies to positively influence conversations and proposals about sustainability in transportation.

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MONDAY August 22 plenary session 8:00 am – 10:00 am

Conference Welcome

- Paul J. Wagner, ICOET Conference Chair, Washington State Department of Transportation, Olympia, WA, USA
- James B. Martin, Center for Transportation and the Environment, North Carolina State University, Raleigh, NC, USA

Opening Session

Sustainable Transportation in Washington State
Paula J. Hammond, Secretary of Transportation, Washington State Department of Transportation, Olympia, WA, USA

Federal Highway Administration Perspectives on Ecology and Sustainability
Gerry Solomon, Director, Office of Project Development and Environmental Review, USDOT Federal Highway Administration, Washington, DC, USA

Infra Eco Network Europe (IENE): Conclusions from the 2010 International Conference, Velence, Hungary
Andreas Seiler, IENE Secretariat, Swedish University of Agricultural Sciences, Riddarhyttan, Sweden

MONDAY August 22 parallel sessions 10:30 am – 12:00 pm

CNT-1 – Strategic Approaches to Mitigation

Moderator: Leonard Sielecki, British Columbia Ministry of Transportation, Canada

Elkhorn Slough Early Mitigation Partnership: Watershed / Conservation Approach to Mitigation for Transportation Projects
Nancy Siepel, Caltrans, San Luis Obispo, CA, USA
The Elkhorn Slough Early Mitigation Partnership is a collaborative partnership between transportation agencies, regulatory agencies, resource agencies and conservation organizations working in the Elkhorn Slough watershed. The partnership provides the forum for developing funding strategies and conservation agreements that promote early regional-scale mitigation for multiple transportation projects within the Elkhorn Slough watershed.

Successfully Using Alternative Forms of Mitigation
Sandra Manning, US Army Corps of Engineers, Seattle, WA, and Dan Corlett, Washington State Department of Transportation, Vancouver, WA, USA
Washington State Department of Transportation (WSDOT), the US Army Corps of Engineers and Washington Department of Ecology have successfully worked together in developing alternative approaches to mitigation to maximize the potential and environmental benefits of mitigation sites, and provide cost savings to projects. WSDOT and the Corps will present a variety of mitigation approaches that are becoming common in permit proposals including banking, advance mitigation, preservation, and intertidal consolidated mitigation. We will discuss specific mitigation examples, and the pros and cons of using these types of mitigation. We will also provide useful tips to achieving success in permitting these innovative approaches, and provide examples of permit conditions that are used by the Seattle District Corps.

A Statewide Caltrans Mitigation Needs Assessment in Support of the Statewide Advance Mitigation Initiative (SAMI)
Patrick Huber, Information Center for the Environment, University of California, Davis, CA, USA
In support of a statewide, advance mitigation planning initiative, we estimated the total amount of compensatory mitigation that will be required to meet the needs of planned Caltrans road projects across the state of California. These results were summarized by county, Caltrans district, and Metropolitan Planning Organization in order to inform future advance mitigation planning efforts and to identify regions where they will provide the greatest benefit.

Development and Implementation of a Programmatic Agreement for Endangered Species Act Consultation in Nebraska

Eric Zach and Jason Jurgens, Nebraska Department of Roads, Lincoln, NE; Melissa Maiefski, Federal Highway Administration-Nebraska, Lincoln, NE; and Brooke Stansberry, US Fish and Wildlife Service, Grand Island, NE, USA

This presentation focuses on the programmatic process of species consultation and the assessment tools that were created in Nebraska. The presentation will explain the advantages to all partners and natural resources from the tools and program consultation. With limited staffing and funds, creative strategies are imperative if habitat and species conservation are to be included into programs that do not have conservation as part of their core business. This consultation and resulting processes are an example of a creative, win-win solution.

COM-1 – Safety First: Reducing Wildlife-Vehicle Collisions

Moderator: Michelle Meade, Washington State Department of Transportation

Using Wildlife-Vehicle Collision Data to Plan and Implement Transportation Mitigation: Case Studies from Utah

Ashley Green, Utah Division of Wildlife Resources, Salt Lake City, UT, USA

Over the last decade, Utah has seen a major increase in the number of wildlife mitigation projects built into major transportation projects. The collection and use of wildlife-vehicle collision data has been instrumental in transportation and wildlife officials being able to collaborate on the planning and implementation of mitigation features, including state-of-the-art crossings and exclusionary fencing. Case studies will be presented for Utah's Highway 6 and Interstate 70, including preliminary results from a long-term study aimed at monitoring the success of these mitigation features.

Identification and Evaluation of Sites for Low-Cost Wildlife Mitigation

Frank Craighead, Craighead Institute, Bozeman, MT, USA

The Bozeman Pass transportation corridor between Bozeman and Livingston, Montana, includes Interstate 90, frontage roads, and a railroad. Data collected indicate the highway had become a hazard to wildlife and a partial barrier to animal movements in the Bozeman Pass area, which is considered a corridor for wildlife moving north and south between the Greater Yellowstone Ecosystem and other habitat. Studies were begun with the objective of identifying areas of elevated roadkill and employing mitigation measures whose success could then be measured. Because wildlife mitigation measures were added to a bridge structure replacement project, the costs of this project were lower than they would have been to construct a new wildlife crossing structure. Increased usage under the bridge and through other structures suggests that wildlife fencing leading to existing crossing structures is an effective method of reducing the risk to both motorists and wildlife while improving wildlife connectivity. Incorporating wildlife connectivity measures into scheduled road projects early in the planning stages can be a cost-effective way to reduce animal-vehicle collisions.

Reducing Mule Deer-Vehicle Collisions with Underpasses: A Case Study from Nugget Canyon, Wyoming

Thomas Hart, Wyoming Department of Transportation, Cheyenne, WY, USA

The Wyoming Department of Transportation constructed a total of seven concrete box culvert underpasses and associated 8'-high game fence along US 30 in Nugget Canyon. Since December 2008, high-speed digital game cameras have documented over 35,000 mule deer passing through the crossing structures during spring and fall migrations. Average deer crossing success rate among the underpasses increased during the second migration cycle, and mule deer-vehicle collisions were substantially reduced. Documented crossings by elk, moose, pronghorn, mountain lion, and bobcat indicate that these species have also benefitted from the construction of the underpasses.

The Reliability of Two New Animal Detection Systems and Recommended Requirements for System Reliability

Marcel Huijser, Western Transportation Institute, Montana State University, Bozeman, MT, USA

Animal—vehicle collisions affect human safety, property, and wildlife, and the number of animal—vehicle collisions has increased in many regions across North America. Animal detection systems can help reduce the number of wildlife-vehicle collisions and allow for safe crossing opportunities for wildlife. These systems detect large animals when they approach the road and once a large animal has been detected, warning signs are activated. Drivers can then respond by becoming more alert, reducing the speed of their vehicle, or both. For animal detection systems to be effective in reducing collisions, reliable systems are essential. For a previous project we investigated the reliability of nine systems from five manufacturers. The current study reports on the reliability of two new systems.

Photo Courtesy WSDOT

CRB-1 – Long-Term Perspectives on Ecology and Sustainable Transportation

Moderator: Marion Carey, Washington State Department of Transportation

15 Years of Banff Research: What We've Learned and Why It's Important to Transportation Managers Beyond the Park Boundary

Anthony Clevenger, Western Transportation Institute, Montana State University, Harvie Heights, Alberta, Canada

Since 1996, a long-standing program of research, monitoring, and evaluation has played a critical role in assessing the performance of mitigation measures on the Trans-Canada Highway (TCH) in Banff National Park, Alberta. This is the longest-running research project in the world that specifically investigates solutions that help reduce the conflicts between busy highways, wildlife conservation, and habitat connectivity. The quality of science that went into their design and construction and the contribution it is has made to the critical and emerging field of road ecology is undisputable. The long history of TCH mitigation projects, the unrivaled number and types of mitigation measures, all embedded within a study area teeming with baseline ecological data, securely places Banff on the leading edge of road ecology research.

Maintaining Wildlife Connectivity across Roads through Tested Wildlife Crossing Designs

Patricia Cramer, Utah Transportation Center, Utah State University, Logan, UT

This overview takes a species and taxa approach to wildlife crossing structure designs and modifications to existing infrastructure. The designs are tested through wildlife monitoring done by the author and others across North America, and cover all types of wildlife species known to use wildlife crossings.

High, Wide and Handsome: A Review of Wildlife and Aquatic Crossing Technology Over the Last Decade (2001-2011)

William Ruediger, Wildlife Consulting Resources, Missoula, MT, USA

An overview of many of the parameters that engineers often consider when planning wildlife crossings such as height and width of underpasses, natural appearance, structure bottom materials, light and openness effects on animals use, moisture conditions, noise factors, human activity, structure location, types of crossings and cost considerations. The paper also looks at some new aspects of wildlife crossings in view of the ability of animals to adapt to many factors, including human use. There is a discussion of whether wildlife crossings are "single species" solutions to non-essential environmental problems or potential critical elements of species diversity and conservation. The two authors have extensive experience in application of habitat connectivity assessments for highways and have worked on well over 100 wildlife crossings in the United States.

Environmental Performance Standards (EPS): Cost and Time Savings by Teaming with Regulatory Agencies and Utilization of EPS after the OTIA III Program

Shelley Richards, HDR, and Geoff Crook, Oregon Department of Transportation, Salem, OR, USA

After six years of implementation of the OTIA III Bridge Program, Oregon Department of Transportation (ODOT) has found the utilization of EPS has provided both a significant time and cost savings to ODOT as well as increased collaboration with the regulatory agencies. This savings and overall environmental stewardship program has provided ODOT the benefit of utilizing EPS in a new program through the Jobs in Transportation Act (JTA).

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SUS-1 – Greening the Gray

Moderator: Martin Palmer, Washington State Department of Transportation

Assessing the Ecological Footprint of Surface Transportation in the Fifty States

Chris McCahill, University Of Connecticut, Storrs, CT, USA

The ecological impacts associated with different types of transportation systems are of growing importance to policymakers at all levels — from the local to the national level — but these ecological impacts are not widely understood. This study provides a framework for assessing the environmental impact of transportation systems at all scales. The framework is based on concepts of sustainability adapted from *Haughton's Equity Principles* and the *Green/Brown Agendas* as well as from a definition of sustainability provided by the Canadian Centre for Sustainable Transport (CST).

Examination and Consideration of Non-Evident Ecological History and Opportunities in a Heavily Urbanized Transportation Corridor: I-75 Reconstruction and Expansion in the Mill Creek Valley of Cincinnati, Ohio

Richard Record, RL Record LLC, Cincinnati, OH, USA

This paper examines ecological history and current opportunities in a heavily urbanized "grey" transportation corridor undergoing major interstate highway expansion, and offers suggestions for better approaches in ultra-urban settings.

Ecological and Social Challenges Associated with Constructing an Arterial Roadway in an Environmentally Complex Landscape: A Case Study from St. Albert, Alberta, Canada

Lynn Maslen, Spencer Environmental Management Services Ltd., and Steve Melton, ISL Engineering and Land Services Ltd., Edmonton, Alberta, Canada

How to plan, design and construct an award-winning arterial road that crosses through sensitive habitat, adjacent to a globally-significant Important Bird Area, passes over a landfill, crosses a sewage lagoon and traverses a well-used municipal park. All of this under the watchful eye of environmental groups.

New Growth in Older Communities: A Case Study of Sustainable Development in Chicago's South Suburbs

David Chandler, Center For Neighborhood Technology, Chicago, IL, USA

A case study of community redevelopment efforts that leverage transportation assets, infill development sites, and a skilled workforce in order to reduce transportation costs for residents and industry, decrease air pollution and greenhouse gas emissions, invest in local economies, and create jobs.

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CNT-2 – Facilitated Session on Integrating Resilient Transportation Systems with Ecological Restoration

Moderator: Ann Costanza, Anchor QEA, LLC, Seattle, WA, USA

- Peter Hummel, ASLA, Anchor QEA, LLC, Seattle, WA, USA
- Margaret Clancy, ESA Adolfson, Seattle, WA, USA
- Theresa Mitchell, Washington Department of Fish and Wildlife, Olympia. WA, USA
- Allison Hanson, Washington State Department of Transportation, Seattle, WA, USA
- John Small, ASLA, Anchor QEA, LLC, Seattle, WA, USA

This session highlights new ways that transportation agencies in Washington are partnering with natural resource agencies on ecological restoration efforts in their communities. As the Puget Sound area is recognized for its abundance of natural features, as well as its chronic traffic congestion, the emerging programs and efforts from the region are worthy of further evaluation.

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COM-2 – Ecological Enhancement and Compliance in Construction, Operations and Maintenance

Moderator: Cindy Callahan, USDOT Federal Highway Administration

Intercounty Connector (ICC) Contract A: Environmental Compliance Management using Geofusion Center

Holly Shipley, KCI Technologies, Inc., Sparks, MD, USA

The Intercounty Connector, an 18.8 mile, limited access, new highway in Maryland has its first contract open to the public. After 50 years of planning, a memorandum of understanding between federal, state and local agencies resulted in the most environmentally committed project ever constructed in the state. With over 500 permit conditions and commitments, the Intercounty Constructors Environmental Compliance Team developed a web-based application GeoFusion Center© that integrates project GIS data with the base data of Google Earth along with GeoRSS feeds providing real-time information such as weather. This application maintained project compliance and will earn the design/build team over $3.1 Million in incentive compensation for erosion control "A" ratings and impact avoidance and minimization.

Monitoring Environmental Compliance in the Construction of the Cuyutlan Lagoon Railroad in Manzanillo, Mexico

Norma Fernández Buces, Grupo Selome SA De CV, Mexico City, Mexico

The compliance of all ecological requirements is a task, as hard as the construction itself. Therefore, an environmental supervision company is needed to assure action coordination, compliance and updating of all environmental requirements for an ecological successful project.

Establishing Native Plants on Roadsides: An Integrated Approach

David Steinfeld, USDA Forest Service, Ashland, OR, and George Fekaris, Western Federal Lands Highway Division, Vancouver, WA, USA

When engineers and revegetation specialists collaborate on road projects, the outcome is often an innovative approach to roadside revegetation. This presentation highlights the partnership between revegetation specialists with the USDA Forest Service and engineers and environmental specialists with Western Federal Lands Highway Division that has resulted in successful establishment of native plant communities on roadsides for over the past decade.

Culturally-Sensitive Dogbane Transplanting, Collaboration and Public Outreach

Kurt Roedel, Oregon Department of Transportation, Salem, OR, USA

Successful tribal and agency collaboration to relocate culturally-sensitive plant community from a busy state highway to a wildlife refuge.

Photo Courtesy WSDOT

CRB-2 – Understanding Barrier Effects and Crossing Design

Moderator: Christine Maguire, Oregon Department of Transportation

Buckshot Versus the Silver Bullet, A Regulatory Perspective: Utilizing Low Cost Wildlife Friendly Designs Everywhere vs. Constructing a Few Expensive Crossings

Peter Leete, Minnesota Department of Natural Resources, St. Paul, MN, USA

In Minnesota, cooperative efforts have led to an incentive based regulatory approach to reducing road impacts on local ecology. This includes the development of a 'Best Practices Manual' where many designs or procedures have been developed to ease road design.

Landscape Features Associated to Roadkill of Three Mammal Species in the Brazilian Cerrado

Simone Freitas, Universidade Federal do ABC, Sao Paulo, Brazil

We evaluate spatial patterns and landscape characteristics associated to causalities due to mammal-vehicle collisions for three mammal species, including *Chrysocyon brachyurus*, intending to improve decisions on mitigation measures using a multi-species approach needed in tropics.

Use of Underpasses by Moose in 2009 and 2010 along Highway 175 in Quebec, Canada: Box Culverts with Natural Floor Can Be a Cost-Effective Passageway

Yves Leblanc, AECOM Consultants Inc., Quebec City, Quebec, Canada

This presentation addresses high use of open span bridges and concrete box culverts as passageways by North American moose along Highway 175 in Quebec, Canada.

Wildlife Fencing Research for I-90 Snoqualmie Pass East: Not Just an Animal Commitment

Randy Giles, Washington State Department of Transportation, Union Gap, WA, USA

Granted, the use of exclusionary fencing to keep wildlife off of a roadway is not a new practice. But, building a fence that could would withstand 140 inches (or more) of snow and rain each winter, require low maintenance and costs, look aesthetically pleasing, and contain wildlife is. Learn about the Washington State Department of Transportation's three-year wildlife fencing study and what types of fence design can hold up to the I-90 Snoqualmie Pass East Project's extreme climate conditions.

SUS-2 – Partnerships for Linkages

Moderator: Jen Watkins, Conservation Northwest

Where Jaguar and Black Bear Meet: Tracking the Pathway of Temperate and Tropical Species in an International Sky Island Corridor

Jessica Lamberton, Sky Island Alliance, Tucson, AZ, USA

Join Sky Island Alliance biologist Jessica Lamberton on a ten-year tour of a citizen empowered monitoring program in the Sky Island region of the southwestern United States and northern Mexico, and explore how the art of wildlife tracking and citizen involvement can shape policy and result in conservation action for wildlife linkages.

California Central Coast Wildlife Connectivity Project: Identifying and Implementing Connectivity for Wildlife Movement throughout the Central Coast of California

Tanya Diamond, Connectivity for Wildlife, Los Gatos, CA, USA

The California Central Coast Wildlife Connectivity Project is being conducted in collaboration with The California Department of Transportation and the Big Sur Land Trust. Through this research, habitat linkages have been identified for multiple species, which is resulting in a regional landscape map of conservation priorities and ground truthed linkages for collaborating land trusts and transportation agencies to use for land acquisition, conservation easements, land use planning, and mitigation.

Biotope Networks: A 20,000 Km Forest Corridor System in Germany

Mark Hörstermann, BUND Friends Of The Earth Germany, Berlin, Germany

Science, Trees, and Public Relations: After the "wild cat corridor map" was drawn up, the German NGO Friends of the Earth/BUND is now reconnecting forests through the planting of trees and shrubs along migration routes and the construction of wildlife crossings in order to develop 20,000 kilometres of migration corridors for the European wild cat.

Developing and Implementing a Comprehensive Wildlife Monitoring Program for the I-90 Snoqualmie Pass East Project

Craig Broadhead, Washington State Department of Transportation, Union Gap, WA, USA

Questions always arise about the effectiveness of ecological connectivity investments — specifically wildlife crossing structures. The Washington State Department of Transportation wanted scientifically defensible baseline and post-project wildlife data as a way to measure the success of the I-90 Snoqualmie Pass East Project's investments in connectivity. Learn about how WSDOT worked with national and state wildlife experts to develop a long-term, multi-tiered wildlife monitoring plan that identifies basic project-level performance standards and the information needed to answer large-scale questions regarding the long-term success of enhancement measures.

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Cascade Land Conservancy's Land Acquisition Strategy to Advance I-90 Project Goals [CNT-P02]
Jill Arango and Andrea Mojzak, Cascade Land Conservancy, Ellensburg, WA, USA
Learn how the Cascade Land Conservancy worked with the Washington State Department of Transportation and other state and federal partners to acquire 1,600 acres of high-habitat value land in the Central Cascades of Washington State to ensure the long-term success of the I-90 Project's wildlife crossing structures. Important partnerships such as these can make or break the ecological connectivity investments of a project.

Why Do We Need Road Crossing Structures? An Agent Based Modeling Approach [CNT-P03]
Fernando Ascensão, Centre for Environmental Biology, Lisbon, Portugal
We developed the REPoP model (Road Effects on Population Persistence), a spatial-dynamic agent based model to test for population persistence in roaded landscapes. Here we applied the model to stone marten (*Martes foina*). We were interested in identifying which biological features and road-related characteristics may drive carnivore species to be more or less vulnerable to roads. Our results clearly demonstrate that implementing crossing structures is necessary for mitigating road effects, but in some circumstances these measures are not sufficient to prevent population extinction and/or gene flow breakdown.

Large-Scale Modeling of Wildlife Movement and Placement of the Crossing Structures in the Highways: Case Study for Lithuania [CNT-P04]
Linas Balciauskas, Nature Research Centre, Vilnius, Lithuania
Wildlife movement simulation helped to mitigate environmental impacts of highways in Lithuania via planning of crossing structures for animals.

Characterizing Volitional and Forced Fish Swimming Abilities under Changing Flow and Temperature Regimes [CNT-P05]
Matt Blank, Western Transportation Institute, Montana State University, Bozeman, MT, USA
Culverts and other in-stream structures like irrigation diversions or dams can create barriers to upstream and downstream movements of fish and other aquatic species. Knowledge of fish swimming abilities and behaviors is important for assessing barriers, prioritizing removals or designing fish passage ways. This poster presents information about a fish swimming ability research facility and initial results from volitional and coerced swimming experiments on wild rainbow and wild westslope cutthroat trout.

Thoroughly Complete Streets: The Intersection of Equitable Transportation Planning and the Design of Urban Wildlife Habitat [CNT-P06]
Hayley Bonsteel, University of Minnesota, Minneapolis, MN, USA
Thoroughly Complete Streets bridge the gap between streets designed with cyclists and pedestrians in mind and urban wildlife habitat design. They are a safe, attractive, viable alternative to standard street design, combining equitable transportation planning with the creation of habitat corridors.

Conservation and Management of Habitat for Maternity Colonies of the Indiana Bat: Possibilities for Transportation Projects [CNT-P07]
Dale Sparks and Virgil Brack, Environmental Solutions & Innovations, Inc., Cincinnati, OH, USA
This presentation documents the planned movement of a maternity colony of the endangered Indiana bat from an area of intense airport, intestate, and associated commercial developments to a designated conservation area shaped using classical habitat management and manipulation techniques.

Mapping Success: Using the Conservation Registry to Integrate Transportation and Conservation Planning [CNT-P08]
Megan Brown, Defenders of Wildlife, Washington, DC, USA
This poster discusses the Conservation Registry (www.conservationregistry.org) and explains how transportation and conservation professionals can use the Registry to showcase ecologically conscious projects on this nationwide database.

Enhancing Wetlands Information to Improve Mitigation and Transportation Outcomes [CNT-P09]
Jason Bulluck, Virginia Department of Conservation and Recreation, Richmond, VA, and James Kagan, Oregon State University, Portland, OR, USA
A project funded by the TRB SHRP C06b program developed a nine-step *Integrated Eco-Logical Conservation and Transportation Planning Framework*. This framework supports integrated transportation and conservation planning while expediting project delivery via easier collaboration between state transportation agencies, metropolitan planning organizations, and resource agencies. Step 2 of the framework entailed the work of three US states to improve the processes used in identifying and prioritizing wetland and stream mitigation opportunities. These goals are reached via methods tailored to the data available, regulatory environment, needs of transportation planners and active working partnerships in each state.


Photo Courtesy WSDOT - Kelly McAllister

Predicting Effects of Roads and Land Use on Connectivity of Wildlife Populations in the American Great Plains [CNT-P10]

Samuel Cushman, US Forest Service, Flagstaff, AZ, USA

We evaluated the effects of road network and land use patterns on population connectivity for a broad range of native wildlife species across a vast area of the United States Great Plains, encompassing areas of seven states. Our results (1) provide estimates habitat area, fragmentation and corridor connectivity under current climate and land use/road network patterns for a large number of native wildlife species expressing a range of habitat requirements and dispersal abilities; and (2) identify key geographical locations that are most important to maintaining population connectivity and facilitating movement for each group of species.

Transportation Pressures on Primates: A Case Study in China [CNT-P11]

Benjamin Dorsey, Montana State University, Banff, AB, Canada

Many lesser developed countries are increasing infrastructure in remote regions to foster economic development and alleviate poverty. Enormous economic and societal shifts are occurring in some countries with high primate endemism such as China, Brazil, and India. Unprecedented increases in infrastructure development and vehicle ownership are occurring which will likely further threaten non-human primates and counteract efforts to curtail poaching and deforestation. China provides a relevant example, with the highest growth rate of vehicle ownership. Published national transportation, social behavior, and economic growth statistics were used to rank the pressure on primate species due to the status and trends in transportation infrastructure development (transportation network density and gross domestic product) and social behavior (vehicle ownership and vehicle miles traveled). Pressures were compared to richness and threat status of wild primate populations. China is used as a case study to highlight a region and species likely affected.

Creating Detailed Endangered Species Distribution Maps Using Inductive Modeling Methods [CNT-P12]

Emilie Henderson, Institute for Natural Resources, Portland, OR, USA

We show how species distribution modeling techniques can help fill TRB's need for information on potential locations of federally-listed threatened and endangered species. We share maps from New York, Florida, Wyoming and Oregon maps to show probability of occurrence of endangered species. We also discuss the methods used to build the maps, from input data needs to statistical procedures used in generating probabilities. We display maps of two species, the Karner blue butterfly, and Bradshaw's desertparsley.

Striving for Sustainability: Wood Bison Recovery Projects in Northeastern British Columbia, Canada [CNT-P13]

Gayle Hesse, Wildlife Collision Prevention Program, British Columbia Conservation Foundation, Prince George, BC, Canada

Wood bison (*Bison bison athabascae*) historically occupied the boreal forest of northwest North America, Canada, but were extirpated from British Columbia by 1906. Wood bison reintroduced in 1995 and 1999 have demonstrated a preferential, non-traditional resource selection for road right-of-way forage along the Alaska Highway where collisions with vehicles has become the primary cause of mortality. This poster describes various management actions (collaring and tracking, prescribed burning, pyric herbivory research, mowing, snowplowing, diversionary salting and public education) that have been undertaken to increase population sustainability, increase bison forage away from roadsides and reduce vehicle-caused mortality.

New Approaches and GIS Tools for Transportation Planning and Design [CNT-P14]

Kris Hoellen, The Conservation Fund, Shepherdstown, WV, and Maya Coleman, Texas Department of Transportation, Austin, TX, USA

The American Association of State Highway and Transportation Officials (AASHTO) Technology Implementation Group (TIG) Program identifies and champions nationwide use of new, high-payoff, ready-to-use technologies. Maryland and Texas were selected to form a single Lead States Team to promote the expanded use of Environmental Planning GIS Tools for Transportation Planning and Design. This poster presents information on the Texas Department of Transportation's use of a GIS Screening Tool (GISST) that scores multiple databases allowing ecologically sensitive areas to be targeted in early in the process for avoidance, minimization or mitigation; and Maryland State Highway Administration's (SHA) use of a suite of decision support tools to identify smart mitigation and/or environmental stewardship opportunities that leverage multiple benefits, are cost-effective through the use of an optimization tool, and provide SHA with a transparent, defensible decision-making process.

Ecological Impacts -of Transportation Infrastructure: A Spatial National Assessment For Sweden [CNT-P15]

Marziyeh Karimpour, KTH Royal Institute of Technology, Stockholm, Sweden

There is no doubt that transportation infrastructure has major impacts on ecosystems, ecological processes and biodiversity at a landscape scale. This study aims to picture probable impacts of noise in the current transportation infrastructure at a national scale in Sweden by mapping of potential conflict zones between roads and ecological networks by defining road-effect zones around roads based on traffic volume and type of disturbance.

Photo Courtesy WSDOT - Tom Mohagen

Highway Undercrossing Design for the California Tiger Salamander (*Ambystoma californiense*) in Santa Barbara County, California [CNT-P16]

Steve Kirkland, US Fish and Wildlife Service, Ventura, CA, and Virginia Strohl, Caltrans, Fresno, CA, USA

The federally endangered California tiger salamander (*Ambystoma californiense*) is known to move across an existing two-lane highway in Santa Barbara County, California, from breeding ponds on the north to upland habitat on the south side of the highway. The California Department of Transportation (Caltrans) proposed to widen the highway from two to four lanes by adding two passing lanes. We investigated the potential to both lessen the effects of the proposed project and to develop an undercrossing design that could contribute toward the recovery of CTS by reducing, and perhaps eliminating, their encounters with vehicles and improving their ability to move between aquatic breeding and upland habitats.

Evaluating Highways as Barriers to Carnivore Movement in the Washington Cascades [CNT-P17]

Robert Long, Western Transportation Institute, Montana State University, Ellensburg, WA, USA

Washington's North Cascades Ecosystem (NCE) presents a rare opportunity to host all carnivores native to the region. Unfortunately, I-90, Route 2, and Highway 20 are potential barriers to carnivore movement in the Cascades. The Cascades Carnivore Connectivity Project is using noninvasive methods (i.e., methods that do not require that study animals be captured) to collect genetic material from two focal species: American black bears and American martens. DNA extracted from hair and scats will allow us to assess connectivity for carnivores across the NCE, to identify barriers to animal movement, and to detect rare carnivores such as grizzly bears and wolves. This highly collaborative research will help to ensure that transportation planners, land managers, conservationists, and citizens have the scientific information necessary to make sound decisions on behalf of carnivores in the region.

Use of a Habitat Linkage Corridor along the San Joaquin Hills Toll Road to Improve the Movement of Cactus Wrens in Orange County, California [CNT-P18]

Valarie McFall, Transportation Corridor Agencies, Irvine, CA, USA

In partnership with the Nature Reserve of Orange County and the University of California, Irvine, the Transportation Corridor Agencies implemented a restoration and enhancement project to increase native habitat for the Cactus Wren, a federally-listed species of conservation concern and one of three target species in the Coastal and Central Natural Community Conservation Plan (NCCP) of Orange County. Separated breeding populations of Cactus Wren within the NCCP are being connected to increase the opportunity for dispersal between populations by following a habitat linkage corridor originally established as environmental mitigation for the San Joaquin Hills (State Route 73) Toll Road.

Northern Alligator Lizard Habitat Along the I-90 Corridor: If We Build It, Will They Come? [CNT-P19]

James Meidell, Central Washington University, Ellensburg, WA, USA

Northern Alligator Lizard habitat assessment will inform the design of wildlife bridges to encourage this species and other low mobility species with similar habitat requirements to use the bridges. This study will also serve as a baseline to which future studies may be compared to determine the effectiveness of these bridges as avenues of gene flow.

A Comparative Analysis of Natural and Human-Made Rock Habitats for American Pikas (*Ochotona princeps*) Along Interstate 90 in the Central Washington Cascade Range [CNT-P20]

Raychel Parks, Central Washington University, Ellensburg, WA, USA

American pikas (*Ochotona princeps*) are small mammals that have been characterized as obligate inhabitants of alpine talus. However, pikas do occur in disturbed and human-made rocky sites and have recently been found living in roadfill and riprap along Interstate 90 in the central Washington Cascade Range. Common features among different habitat types occupied by pikas, and differences between occupied and unoccupied sites, will provide critical information to Washington State Department of Transportation in their design of wildlife crossing structures suitable for pikas.

Cost-Effective Intra- and Inter-Agency Partnerships for the Conservation of the Eastern Hellbender (*Cryptobranchus alleganienesis*) in New York State [CNT-P21]

Sarah Piecuch, New York State Department of Transportation, Rochester, NY, USA

Long-term planning and a thorough understanding of NYSDOT's capabilities and a sister agencies' needs, allowed for the cost effective utilization of all available resources. This allowed NYSDOT's involvement in a regional conservation effort for a rare species, Eastern Hellbenders (*Cryptobranchus alleganiensis*), which at first glance appeared ancillary and cost imprudent to the Department's core mission, particularly in light of the current financial constraints.

Using Passive Infrared Trail Cameras to Characterize Baseline Conditions for Wildlife Crossing Design [CNT-P22]

Todd Martin, King County Department of Transportation, Seattle, WA, USA

Undertaking a "Before and After" impact study to determine whether or not a new roadway has changed wildlife movements, species composition, and population densities. A wildlife underpass will be placed beneath this roadway and by utilizing passive infrared trail cameras we can assess whether or not wildlife actively use this crossing. This data will help guide future wildlife crossing design.

State-Scale Wildlife-Road Observation Systems [CNT-P23]

Fraser Shilling, Road Ecology Center, University of California, Davis, CA, USA

With the California Roadkill Observation System, the Maine Audubon Wildlife Road Watch system, and the nascent Colorado Road Wildlife Watch system, citizen and professional scientists can now report and visualize live and dead wildlife observations at state scales. These observations can inform wildlife movement studies and mitigation, understanding impacts to populations and biodiversity, and nurture public education.

Planning for an Ecological Integration in a Traffic Complicated Peri-Urban Area [CNT-P24]

Xiao Jun Wang, Department of Landscape Architecture, Southeast University, Nanjing, Jiangsu, China

In the period of the fast urban expansion in China, we hope to find a reasonable planning framework to maintain an ecological integrity of nature spaces in the traffic complicated peri-urban region, which is based on the traffic network impact and potential ecological suitability analysis.

Roadside Plants Get New Specifications for Tough Roadside Conditions [COM-P25]

Inez Arlene and Susan Buis, Washington State Department of Transportation, Olympia, WA, USA

Learn how WSDOT horticulture and landscape architecture staff have transformed the standard specifications and details for plant quality, planting techniques, and soil preparation, in order to improve survival and growth in the difficult environmental conditions on our roadside and mitigation sites. On-demand training for construction inspectors was created to improve enforcement of the new specifications. Specifications and details are available online to download and use as-is or adapt for your own projects.

Photo Courtesy WSDOT - Kelly McAllister

ODOT's Biology and Wetland Monitoring: An Improved Approach to Data Collection and Reporting [COM-P26]

Bob Carson, Mason, Bruce and Girard, Inc., Portland, OR, USA

The Oregon Department of Transportation (ODOT) and Mason, Bruce & Girard have developed software applications to document mitigation site conditions and maintenance prescriptions. These applications standardize data collection and create consistency in monitoring and maintenance documents which ultimately reduce costs and facilitate regulatory compliance.

Roads Impact on the Vegetation in the Three Rivers' Parallel Region of Yunnan, China [COM-P27]

Xueping Chen, China Academy of Transportation Sciences, MOT, PRC, Beijing, China

This presentation addresses how roads impact the vegetation loss and subsequent natural restoration with no slope stabilization measures taken in the Three Parallel Rivers of Yunnan Protected Areas, and how the roads impact differed on landforms, road grade and latitude. Measurements were taken of the roads' disturbing width and revegetation coverage in four different landforms including river terrace, mountain landform, and planation surface. The authors analyzed the correlation of vegetation loss and vegetation coverage with construction factors such as degree of cut slope and that of background, degree of rock weathering etc., based upon which suggestion was given to alleviate the impact of roads.

Evaluating Road-Stream Crossings for Fish Passage Effectiveness [COM-P28]

Kim Clarkin, US Forest Service, Bow, WA, USA

This poster reports on progress in developing a standard protocol for evaluating whether crossings constructed for fish passage are achieving their goals. How can we monitor effectiveness when crossings have multiple and varying physical and biological objectives?

WSDOT I-405/SR 167 Corridor Program: New Enhanced Treatment BMP [COM-P29]

Angela Deardorff, Washington State Department of Transportation, Bellevue, WA, USA

The Washington State Department of Transportation (WSDOT) I-405/SR 167 Eastside Corridor Program Team faces many challenges including stormwater quality treatment in a highly urbanized area. To address the areas where standard approved Best Management Practices (BMP) are not feasible, the Team is working to adapt the Media Filter Drain BMP. A new "Modified Media Filter Drain" (MMFD) was first installed and monitored during the 2009-2010 wet season. It came very close to meeting Ecology's "enhanced treatment" performance but fell short in dissolved metals removal. This poster session will provide a summary of what was done, lessons learned, and how the MMFD has been modified to improve performance for continued monitoring through the next wet season.

The Environmental Implications of Composting Roadkill [COM-P30]

Bridget Donaldson, Virginia Center for Transportation Innovation and Research, Charlottesville, VA, USA

Through an analysis of leachate constituents and pathogen destruction in deer mortality compost windrows, this study seeks to determine the feasibility of roadkill composting as a more cost efficient and environmentally responsible form of carcass management for transportation departments.

The I-90 Snoqualmie Pass East Project Team's Approach to Developing A New Stormwater Treatment System for a Fully Constrained Area [COM-P31]

Scott Golbek, Washington State Department of Transportation, Union Gap, WA, USA

Ever try to build a six-lane interstate in a narrow corridor situated between rock cliffs and a lake? Add in 140 inches and rain and snow annually and you get stormwater treatment challenges. Learn about the Washington State Department of Transportation's innovative approach to solving the stormwater treatment design challenges of the I-90 Snoqualmie Pass East Project through interagency collaboration and the application of new science.

Determining Potential Hydroacoustic Impacts to ESA-Listed Fish from the Columbia River Crossing through Quantifying Run Timing, Duration, and Abundance [COM-P32]

Bill Hall, Parametrix, Portland, OR, USA

The Columbia River Crossing project will span the Columbia River, a migratory corridor for 13 ESA-listed salmon and eulachon species. Up to 1,200 temporary steel piles will be installed through impact pile driving to support work platforms. Impact driving could result in injury or death of fish in the project area. A novel method to quantify the extent of injury on an annual basis for each listed species was developed by the project team, using. This method relied on detailed fish run data and pile driving assumptions. Its use resulted in the ability to model specific driving activities in relation to fish presence. By using this method, additional in-water work could occur, and construction times were shortened by several years.

Metrics for Assessing LID BMP Performance in a Highway Setting [COM-P33]

Liv Haselbach, Washington State University, Pullman, WA, and Aimee Navickis-Brasch, Washington State Department of Transportation, Spokane, WA, USA

This poster presentation illustrates a simple metric and decision process for assessing Low Impact Development (LID) BMP performance to the maximum extent practicable in a highway setting.

Roundabouts: A Sustainable Transportation Solution [COM-P35]

Patrick McGrady, Reid Middleton, Everett, WA, USA

Emphasis is being placed on constructing intersections and roadways that minimize impacts to the ecosystem. Historically, the progression of intersection improvements has been to add pavement to accommodate increasing traffic demand. This method often increases the capacity of vehicles without much regard for safety, or consideration of other users such as pedestrians and bicyclists. In addition, this type of intersection "improvement" often demands widening not just at the intersection, but for the entire roadway network, creating greater intrusion and impact to the environment. Introducing roundabouts as the intersection control on roadway networks is a sustainable transportation alternative that can achieve several objectives while still preserving future capacity.

Wildlife-Train Accidents and Interactions: Results from a Locomotive Engineers Questionnaire [COM-P36]

Mattias Olsson, EnviroPlanning AB / SLU, Swedish University of Agricultural Sciences, Gothenburg, Sweden

Among the engine drivers, wildlife-train accidents and interactions are a well-known problem. In this study, we examined baseline information about the driver's knowledge and experience in this issue, in order to find sustainable mitigations that reduce the number of accidents.

FHWA Indicators of Wetland Compensatory Mitigation Study: Percentage Cover Invasive Plant Species and Wildlife Use of Mitigation Sites [COM-P37]

Mike Ruth, USDOT Federal Highway Administration, Washington, DC, and Mark Matthies, ICF International, Seattle, WA, USA

This poster presents the results of a nationwide study of DOT mitigation banks comparing invasive plant species cover and wildlife use in higher quality reference wetlands compared to established mitigation banks. This study was conducted to determine whether invasive plant performance standards are realistic and if wildlife usage at mitigation sites can be considered successful in sustaining plant and animal communities.

Photo Courtesy WSDOT

Using River Reach Assessments During Planning and Design to Build Local Partnerships [COM-P38]
Jim Park and Jason Smith, Washington State Department of Transportation, Union Gap, WA, USA
Have you experienced reoccurring flooding problems with your roadways or public facilities? Are there underlying characteristics in the area that keep the problem coming back? The Washington State Department of Transportation has developed a river reach analysis process to help define the holistic nature of reoccurring flooding areas. Come visit with WSDOT staff and learn how past land use decisions, development, and infrastructure can play a significant role in the choices we have today.

WSDOT's Multi-Agency Approach to Mitigating Environmental Impacts During the SR 410 Nile Valley Landslide Emergency Response [COM-P39]
Jason Smith and Mark Reynolds, Washington State Department of Transportation, Union Gap, WA, USA
On October 11, 2009, a massive landslide buried a half-mile section of SR 410 and the Naches River in Yakima County, Washington. Learn about how the Washington State Department of Transportation and Yakima County mobilized a multi-agency response effort within hours of the devastating landslide to quickly and efficiently develop plans to minimize further damage to the Nile Valley, ensure the safety of the area for residents and emergency response crews, and restore access to this transportation corridor.

Tennessee's Effort to Control the Spread of Cogongrass and Other Invasive Pest Plant Species [COM-P40]
Jennifer Thompson, Tennessee Department of Transportation, Nashville, TN, USA
The Tennessee DOT is working as part of the Tennessee Cooperative Weed Management Area (TNCWMA) to prevent the establishment of cogongrass (*Imperata cylindrica*) and other invasive exotic plant species in the state of Tennessee through early detection and rapid response. Cogongrass is a federally-listed noxious weed. It is considered one of the most invasive pest plants in the country.

Medina to SR202: Eastside Transit and HOV Project Fish Passage and Ecological Enhancement [COM-P41]
Jenna Friebel, Parametrix, Bellevue, WA, USA
The SR 520 Eastside Transit and HOV Project will build and improve approximately 3 miles of highway in a highly urban environment. Environmental scientists and engineers worked closely together to avoid, minimize, and mitigate impacts to streams and wetlands using an ecosystem approach.

Photo Courtesy WSDOT - Gretchen Lux

CNT-3 - Habitat Connectivity: Measuring and Planning the Critical Links

Moderator: Barb Aberle, Washington State Department of Transportation

Measuring Ecological Change from Transportation Projects

Kevin Halsey, Parametrix, Portland, OR, USA

Transportation planning involves a range of analysis at increasingly fine scales that do not always relate to each other in terms of measurement and data. This presentation describes an approach that fits with FHWA's framework and insures that the transportation planning process occurs in a continuous manner that builds on different scales inherent in said process. This research resulted in a database of environmental and ecosystem service based crediting methods and best practices for developing and implementing these systems in a transportation context.

Maintaining Maya Forest Connectivity in a Changing Landscape: Calakmul Biosphere Reserve and Mexico's Highway 186

Gerardo Garcia-Contreras and Efraim Acosta-Lugo, Pronatura Peninsula De Yucatan, AC, Yucatan, Mexico

In recent years, settlement pressure in the Maya Forest has resulted in the conversion of tropical forest to agriculture and ranching, road construction and tourism development. To the west of Calakmul, the state of Campeche has targeted the forests and archeological sites as a new tourism destination. The Escarcega–Calakmul Highway 186 has begun expansion to four lanes, and the resultant habitat fragmentation threatens both reserves and the diversity of life they support. A coalition of Mexican non-profit organizations, working closely with the Mexican government, has produced a series of recommendations and mitigation measures to improve technical and legal practices applicable to the Highway 186 expansion and future road projects in other ecologically sensitive areas of Mexico. This is the first time that such an analysis has been done in Mexico. The methods used can be replicated for other regions working on better integrating transportation and conservation needs.

Bay Area Critical Linkages: Habitat Connectivity Planning for the San Francisco Bay Area and Beyond

Kristeen Penrod, Science & Collaboration for Connected Wildlands, Fair Oaks, CA, USA

The Bay Area Critical Linkages Project is developing linkage designs for several priority landscape linkages whose protection is crucial to maintaining ecological and evolutionary processes throughout the region. Our goal is to secure functional connections between existing wildlands to maintain landscape-level ecosystem processes, including movements of such wide-ranging species as mountain lion (*Puma concolor*) and American badger (*Taxidea taxus*). The linkage conservation plan generated by this project will be based on several analyses (e.g., landscape permeability, habitat suitability, patch size and configuration analyses; Beier et al. 2006) and field work that evaluate the habitat suitability and movement needs of the selected focal species. This approach delineates the best potential movement routes between targeted areas but also addresses whether suitable habitat occurs in large enough patches to support viable populations and whether those patches are close enough together to allow for inter-patch dispersal.

Integrating Habitat Connectivity in WSDOT Practices

Kelly McAllister, Washington State Department of Transportation, Olympia, WA, USA

To make habitat connectivity a meaningful principal being applied throughout the agency, the Washington State Department of Transportation (WSDOT) has developed policy, funded research, participated in collaborations, defined a set of best practices and enabled its employees through access to a wealth of information on a GIS workbench.

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COM-3 - Improving Stormwater Management through Better Analysis and Design

Moderator: Carl Ward, Washington State Department of Transportation

Analyzing Stormwater Impacts Created by Indirect Effects of Transportation Projects

Marion Carey, and Angie Haffie, Washington State Department of Transportation, Olympia, WA, and Vancouver, WA, USA

Two of the most complicated Endangered Species Act (ESA) consultation issues in Washington State are stormwater and indirect effects analyses. To address these issues, staff from the Washington State Department of Transportation, Federal Highway Administration, US Fish and Wildlife Service, and National Oceanic Atmospheric Administration Fisheries, and a consultant with expertise in stormwater worked together to develop methods to conduct stormwater effects assessments and indirect effects analyses for inclusion in Biological Assessments. The development and application of these methods will be discussed.

Key Design Issues for Managing Infiltration of Stormwater

Jim Bailey, Shannon & Wilson, Inc., Seattle, WA, USA

Transportation projects must consider the need to evaluate infiltration of stormwater as not only a disposal method but an approach to aquifer recharge, and mitigation or enhancement to impacted wetlands. This presentation provides some key factors to consider when planning or conducting an infiltration site evaluation for a facility design.

Jamaica Bay Watershed, Queens, New York Infrastructure Improvement Project

Brian Sayre, Dewberry, Parsippany, NJ, and Dana Gumb, New York City Department of Environmental Protection, Flushing, NY, USA

As part of this New York City Infrastructure Improvement Project, New York City agencies and private consultants are collaborating to develop a solution for the chronic flooding and poor roadway conditions in the Springfield Gardens section of southeastern Queens. New York City may be one of the most challenging forums on the planet to advance a project of this nature that will leverage ecological restoration to improve traffic, relieve flooding, and enhance open space-a remarkable precedent-setting accomplishment.

Establishing and Maintaining Environmental Compliance in a Sensitive Context

Chuck Howe, Arizona Department of Transportation, Phoenix, AZ, USA

Arizona Department of Transportation (ADOT) developed and constructed a 3-phase highway reconstruction project in an extremely sensitive mixed urban and rural community with numerous regulatory constraints. ADOT and its construction contractor had to work hand-in-hand to establish and maintain compliance within the regulatory parameters.

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CRB-3 - Planning and Design Considerations for Small Animals and Herptefauna

Moderator: Mark Bakeman, Washington State Department of Transportation

Road Planning and Mitigation Design for Small Animals: Concepts and Applications

Kimberly Andrews, UGA Savannah River Ecology Lab, Aiken, SC, USA, and Kari Gunson, Eco-Kare International, Peterborough, Ontario, Canada

Even though assessments of roads have shown significant negative impacts on small animals, this group has received little attention in the transportation planning process. In response to this knowledge gap, a resource manual has been developed to maximize the effective use of ecological knowledge in transportation decision-making while raising the profile of small animal considerations among transportation professionals. This paper will provide an overview of the concepts associated with road planning and mitigation design for small animals, including some applicable examples of their application from Canada. We will also briefly address the challenges and emerging considerations associated with transportation planning for small animals, such as the implications of climate change on movement and connectivity.

Performance of Wildlife Crossing Enhancements to Existing Roadway Culverts and Bridges in Central Florida

Stephen Tonjes, Florida Department of Transportation, Deland, FL, and Daniel Smith, University of Central Florida, Orlando, FL, USA

This study examined the effectiveness of, bridges and culverts in central Florida that were upgraded with wildlife crossing accommodations, such as ledges, built as an alternative to expensive dedicated wildlife crossing structures. A discussion of the shortcomings of the conventional design process and a description of the multidisciplinary Wildlife Crossing Design Team created by the Florida DOT are presented.

Design Considerations and Effectiveness of Fencing for Turtles: Three Case Studies along Northeastern New York State Highways

Tom Langen, Clarkson University, Potsdam, NY, USA

A report on the design, cost, durability, and effectiveness of three roadside wildlife barriers along state highways that are intended to prevent turtle trespass onto roads. The author concludes that when combined with an effective process to identify the road segments that are the most severe hotspots for nesting turtle mortality, wildlife fences designed for turtles can be an effective and relatively inexpensive measure to conserve aquatic turtle populations within a roaded landscape.

Standards for Fauna Friendly Culverts

Marguerite Trocmé, Federal Road Office, Bern, Switzerland

Culverts, at the junction of transport infrastructure and ecological networks, have an essential role to play in road ecology. The new standards for fauna friendly culverts developed by the Swiss association of road and transport experts will be presented. These standards give design requirements to ensure that both aquatic and terrestrial fauna pass through culverts. A distinction is made between retrofitting existing structures and building new ones.

SUS-3 - Using Context Sensitive Solutions to Deliver Sustainable Projects

Moderator: Christina Martinez, Washington State Department of Transportation

Measuring Context Sensitive Solutions Benefits

Nikiforos Stamatiadis, University of Kentucky, Lexington, KY, USA

Context Sensitive Solutions (CSS) provides a systematic and comprehensive approach to project development from inception and planning through operations and maintenance. This paper presents a framework for transportation officials and professionals that allows for the comprehensive quantification of benefits resulting from CSS through all phases of project development. Guidelines emphasizing the fact that CSS is a principle-driven, benefit-justified process have been developed to provide transportation agencies with a set of recommended practices for assessing benefits.

Wildlife Crossings Within the Cultural Landscape of the Flathead Indian Reservation: US 93 from Evaro to Polson, Montana

Dale Becker, Confederated Salish And Kootenai Tribes, Pablo, MO, USA

Wildlife crossings yield more than ecological benefits; they can have a profound influence on the health and identity of indigenous cultures. We examine the design and implementation of wildlife crossings on the Flathead Indian Reservation to compare transportation planning and engineering perspectives with the rooted, place-based perspective of the Confederated Salish and Kootenai Tribes.

Sustainability and the Columbia River Crossing Project

Heather Wills, Oregon Department of Transportation Columbia River Crossing, Vancouver, WA, and Scott Richman, David Evans and Associates, Portland, OR, USA

This paper describes the precedent-setting sustainability strategy for the Columbia River Crossing project in the Portland, Oregon/Vancouver, Washington metropolitan area. This bi-state, multi-modal transit, bridge, and highway improvement project is developing and implementing its sustainability strategy with a goal of being one of the most sustainable transportation projects in the country. The holistic, systems approach to sustainability will allow the Columbia River Crossing to serve generations of future users, join communities, and integrate with the natural environment by incorporating sustainable components and adapting to future innovations.

Sustainability in Bridges: The Art and Community of Celebrating our Landscape

Linda Figg, FIGG, Tallahassee, FL, USA

Bridges for the future are being achieved today using advanced materials and modern designs that respect the environment, embrace a community's sense of place, and promote an enhanced quality of life. Sustainable success includes positive results with social, environmental, and economic benefits. This paper and presentation will evaluate several case studies to examine the sustainable benefits of modern bridges.

CM I 1.5

TUESDAY August 23 parallel sessions 10:30 am – 12:00 pm

CNT-4 - Breaking Down Barriers: Project Level to International Scale

Moderator: Rhonda Brooks, Washington State Department of Transportation

Wildlife Crossings Along the Ring Changbai Mountain Scenic Highway, China

Yun Wang, China Academy of Transportation Sciences, Beijing, China

The first paper to quantitatively discuss the topic of wildlife passage settings along highways in China.

Providing Connectivity Across Roads for Tree-Dwelling Mammals

Miriam Goosem, James Cook University, Cairns, Queensland, Australia

This presentation discusses how linear clearings for roads can impact populations of forest tree-dwelling mammals by fragmenting populations of canopy species that will not move at ground level; therefore, adequate conservation of tree-dwelling species requires provision for safe means of crossing roads. The mortality and fragmentation impacts of roads and highways for a group of rain forest arboreal mammals living in the uplands of north Queensland, Australia are examined, including whether these mammals will use inexpensive rope canopy bridges above roads and a highway. The observations made suggest that canopy bridges can assist rare arboreal mammals to cross roads through rain forest, thereby reducing both the risk of road-kill and the potential for sub-population isolation.

Targeting Ecological Investigations to Help Select Effective Mitigation Options for Vehicle-Caused Mortality of a Threatened Butterfly

Catherine de Rivera, Portland State University, Portland, OR, USA

This presentation discusses an evaluation of several proposed management options to reduce vehicle-caused deaths of the Oregon silverspot butterfly (OSB) along Highway 101 in Oregon. Behavioral sampling found that OSBs crossed the road in areas with more flowering plants. This approach represents an effective, quick, and inexpensive way to identify how to respond to road impacts.

Infrastructure Obstruction Profiling: A Method to Analyse Ecological Barriers Formed by Transport Infrastructure

Bernardino Romano, University of L'Aquila, L'Aquila, Italy

The present study proposes a methodological approach to compare the technical characteristics of roads with their impact on wildlife movement. The analytical procedure is called "Infrastructure Obstruction Profiling" (IOP). It is presented as a longitudinal diagram of the transportation infrastructure along which the degree of interference is expressed in consideration of the entity and the typology of obstacles that are present. The data obtained could support studies of environmental evaluations and inform mitigation measures to reduce habitat fragmentation.

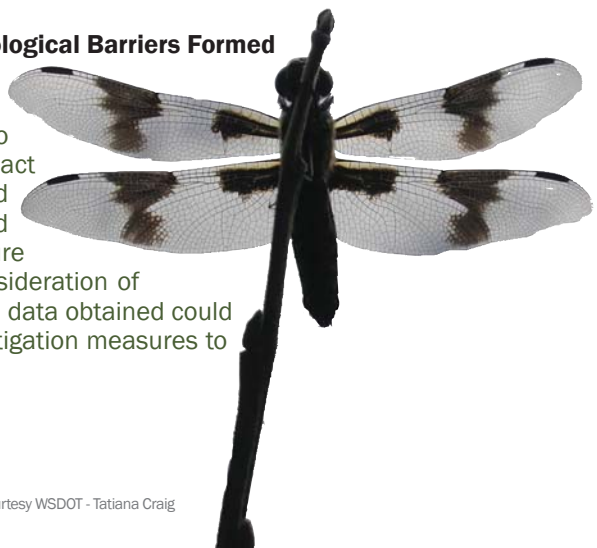

Photo Courtesy WSDOT - Tatiana Craig

COM-4 - Vegetation Management for Road and Rail Corridors

Moderator: Larry Mattson, Washington State Department of Transportation

Railway Environments Produce Ecosystem Services if Managed Properly

Magnus Stenmark, Faunistica, Jonkoping, Sweden

Railway environments deliver ecosystem services if the vegetation is managed properly. Encouraging new and innovative vegetation management methods increase the abundance of a number of important organism groups, such as pollinators and decomposers.

Vegetation Management of the Adirondack Wild, Scenic, and Recreational Railroad Corridor

Ed Frantz, New York State Department of Transportation, Utica, NY, USA

The Remsen-Lake Placid Railroad corridor extends 119 miles from Remsen to Lake Placid, NY, and lies primarily within the Adirondack Park, the largest wilderness park east of the Mississippi River. Following the railroad's decline New York State took ownership of the abandoned corridor in 1974 to preserve this historical transportation resource. The corridor crosses many sensitive aquatic resources creating numerous challenges. Vegetation growth created one of the greatest challenges in stabilizing the corridor, limiting access and leading to major washouts that could not be prevented. This presentation will focus on the integrated vegetation management efforts starting in 1997 that have returned to corridor to a stable condition and have led to a sustainable approach that includes the use of herbicides. The importance of public education/involvement and using good science will be highlighted as a model that can serve other DOTs where controversial vegetation management objectives are a concern in corridor management.

Assemblage Structure of Plant Communities Along the Road Corridor: Rock and Scree Slopes - Planting versus Natural Recolonization?

Rosalyn Thompson, University College Cork, Co. Cork, Ireland

The landscaping of embankments or cuttings — created during the construction of any new primary road in Ireland — has been, until relatively recently, an exercise in horticulture. Such an exercise is unsustainable. In 2006, new guidelines were adopted which focus on a more ecological approach: in the case of rock faces and scree slopes, this is natural recolonization. This research compared the floral biodiversity of the older (horticultural) approach with that of natural recolonization.

Ecological Restoration of Transportation Projects as a Successful Mitigation Measure

Sergio López Noriega, Grupo Selome SA De CV, Mexico City, Mexico

One of the most important environmental impacts caused by roads is the loss of vegetation cover within the right of way and hillsides. This impact can be successfully restored as long as appropriate timely actions are considered. The area to be affected should be carefully studied, previous to the construction of the road, in order to identify types of nearby vegetation and their characteristics. An ecologically based restoration program should be developed, in which all actions required are pointed out and adequately planned.

CRB-4 - Planning and Designing Effective Crossings

Moderator: Kelly McAllister, Washington State Department of Transportation

A Regional Ecosystem Framework for Terrestrial and Aquatic Wildlife Along the I-70 Mountain Corridor, Colorado: An Eco-Logical Field Test

Paige Singer, Rocky Mountain Wild, and Julia Kintsch, ECO-resolutions, LLC, Denver, CO, USA

Interstate 70 (I-70) is considered a major obstacle to wildlife movement in Colorado. The Colorado Department of Transportation just finished the first step in long-term planning for the highway from Glenwood Springs to Denver, providing a unique opportunity to apply the Eco-Logical framework, an ecosystem based approach developed by the Federal Highway Administration to better integrate wildlife considerations and engage stakeholders in transportation planning.

Monitoring Fish and Low-Mobility Vertebrates Along a Major Mountain Highway: A Snapshot Before Construction of I-90 Wildlife Crossing Structures

Paul James, Central Washington University, Ellensburg, WA, USA

We monitored low-mobility vertebrates before construction of wildlife crossing structures on the I-90 Snoqualmie Pass East project in the Washington Cascades. To address connectivity patterns and habitat requirements, we mapped current distributions, monitored movements, and quantified habitat traits for select taxa: fish (trout and salmon), amphibians (frogs, toads, salamanders), reptiles (alligator lizards), and small mammals (pikas). Ecological connectivity for low mobility species has not been completely interrupted by the interstate, but crossings seem to be infrequent. Our pre-construction monitoring allows us to make recommendations on habitat features to be built into the crossing structures and adjustments to specific locations of smaller crossing structures to link existing populations or critical habitat.

Elk Movements Associated with Interstate 17 In Northern Arizona

Jeff Gagnon, Arizona Game and Fish Department, Phoenix, AZ, USA

Interstate 17 in northern Arizona is a significant barrier to wildlife movement and a substantial source of mortality. Arizona Department of Transportation and Arizona Game and Fish Department have teamed up to evaluate the effects of this highway on elk and to identify both short and long-term solutions for reducing wildlife-vehicle collisions, while maintaining habitat connectivity along Interstate 17.

Planning a Wildlife Crossing at the Urban/Rural Interface: Challenges and Opportunities

Todd Martin, King County Department of Transportation, Seattle, WA, USA

Most available literature relates to rural or wilderness areas as opposed to more urban environments. Our three-tiered system of site-screening criteria is tailored specifically for urbanizing landscapes. It is site-independent and useful for rapid assessment in lieu of long-term monitoring data.

SUS-4 - Show Me the Money: Effective Mitigation and Costs of Impacts

Moderator: Megan White, Washington State Department of Transportation

Ecosystem-Based Protocols for Systematic and Sustainable Roadside Development

John Walewski, Texas A&M University, College Station, TX, USA

Central Texas is one of the nations' fastest growing regions and has experienced significant levels of roadway construction in environmentally sensitive locations that have contributed to systematic roadside failures following environmental degradation. In response, Protocols for Sustainable Roadsides were developed to expand the long term success rate of central Texas roadsides and reduce or avoid financial and environmental costs. This effort demonstrates the life cycle benefits and costs associated with an ecosystem based framework of roadside development that includes a benefit and cost evaluation with planning, design, construction, and maintenance guidance and specifications.

Moving Forward, a Review of California's Approaches to the Challenges and Solutions for Successful Regional Advance Mitigation Planning

James Thorne, University of California, Davis, CA, and Elizabeth O'Donoghue, The Nature Conservancy, San Francisco, CA, USA

Early integration of regional planning principles into mitigation processes is recognized as a best practices objective for action agencies such as transportation departments. Some state transportation agencies have already begun taking advantage of the project delivery efficiencies and ecological and economic benefits that a regional advance mitigation approach permits, but no state has fully implemented the practice, as significant technical, cultural, regulatory, and financial roadblocks remain. Here we present the challenges and possible solutions to full implementation of this approach, using ongoing projects from California as the point of departure.

Does Wildlife Transportation Mitigation Make Cents: A Case Study of Highway 3 in the Crowsnest Pass in the Southern Canadian Rockies

Tracy Lee and Danah Duke, Miistakis Institute, Calgary, Alberta, Canada; and Rob Ament, Western Transportation Institute, Montana State University, Bozeman, MT, USA

The Crowsnest Pass is a low elevation pass through the Canadian Rocky Mountains, where the full diversity of large mammal species needs to cross the busy Highway 3 transportation corridor. A synthesis of wildlife vehicle collision data and carnivore modeling helped to identity crossing locations and the application of a cost benefit analysis, where we compared costs of wildlife vehicle collisions to costs of mitigation infrastructure, justify the implementation of mitigation at many of the crossing sites.

Comparing the Ecological and Economic Outcomes of Traditional vs. Programmatic, Multi-Resource Based Mitigation Approaches

James Kagan, Institute For Natural Resources, Portland, OR, USA

A study was undertaken to compare the ecological and economic outcomes of traditional mitigation verses progressive mitigation approaches which include multiple resource assessments. Characterizing the economic values which result from progressive mitigation approaches provides a mechanism to encourage policy makers, regulators, and transportation agencies to move towards implementing these approaches. This talk evaluates traditional and progressive programs, and documents the significant increase in economic, social, and ecological outputs that can be gained if mitigation can be focused in areas in which these benefits are most efficiently generated.

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Photo Courtesy WSDOT

CNT-5 - New Considerations for Habitat Connectivity

Moderator: Alison Berry, University of California, Davis

Evolving Towards Sustaining Ecosystem Processes Across Highways: Beyond Deer Fences and Fish Ladders

Sandra Jacobson, USDA Forest Service, Bend, OR, USA

Most terrestrial and aquatic passage structures currently narrowly target species or guilds, which are now generally accepted as effective. It is time to raise the bar towards building in sustainability of ecosystem processes that also need connectivity across landscapes. This presentation suggests questions to consider and systems that have promise for connecting some ecosystem processes.

The Balanced Growth Program as a Tool for Implementing Eco-Logical

Tracy Engle, URS Corporation, Cleveland, OH, USA

Eco-Logical helps guide agencies and partners to work proactively in developing and implementing an ecosystem approach for mitigating the effects of infrastructure projects. Ohio's Balanced Growth Program provides one example of a useful tool when implementing Eco-Logical. In 2007, several Lake Erie watershed groups were awarded grants to develop pilot projects to help implement the Balanced Growth Program. Each project identified Priority Conservation Areas (PCAs) and Priority Development Areas (PDAs). PCAs were ecologically important areas in maintaining water quality in the watershed and Lake Erie. PDAs were areas where development was appropriate, from both economic and ecological perspectives. Selection of PCAs and PDAs was refined using a variety of GIS based data sets, and landscape ecological metrics were used to help connect PCAs into larger, potentially more functional ecosystems. PDAs represent areas on the landscape where development is less likely to impact ecosystem functions, while PCAs offer DOTs potential mitigation opportunities, both features that are useful in their efforts to implement Eco-Logical.

Should We Worry About Predator-Prey Interactions at Wildlife Crossing Structures?

Cristina Mata, Universidad Autonoma De Madrid, Madrid, Spain

This paper discusses how road and railway construction on a landscape scale entails a transformation of ecosystems including interactions between predators and their prey. Wildlife passages are currently built at these transport infrastructures to re-establish connectivity within the habitats intersected by them. The co-occurrence patterns of predator-prey species-pair are evaluated and the results show that both predator and prey species use the same structures to cross fenced roads. However, the spatial and temporal patterns of crossing use strongly suggest that there were predators that attended crossings to hunt prey and that prey species avoided using crossings in the presence of predators. The results support two recommendations to avoid crossing structures loosing effectiveness or becoming prey traps.

Multiuse Overpasses: Does Human Use Impact the Use by Wildlife?

Edgar Van Der Grift, Alterra WUR, Wageningen, Gelderland, The Netherlands

Wildlife overpasses have been proven effective means to mitigate habitat fragmentation due to transport corridors. They allow animals to cross roads safely and hence avoid populations from becoming isolated. Currently questions are raised whether also people could be allowed to make use of wildlife overpasses. Will this work? How will animal use be affected? And what adaptations in overpass design can be recommended?

COM-5 - Turn It Down! Noise Impacts

Moderator: Emily Teachout, US Fish and Wildlife Service

Influence of Bridge Structural Arrangement on the Noise Induced by Traffic and its Effect on the Use of the Migration Route by Wildlife

Marek Foglar, Czech Technical University, Prague, Czech Republic

This paper presents outcomes of an original noise measurement program which was developed for quantifying the effect of noise induced by traffic on the usage of underbridges for migration of wildlife. The program covered 8 bridges along the D47 and R35 motorways in the Czech Republic. The measurements provided very useful data, which helps to understand the influence of bridge structural arrangement, mainly bearings and expansion joints, and location of the bridge in the countryside on the noise induced by traffic.

Traffic Noise Disturbance in Important Bird Areas in Sweden

Jan Olof Helldin, Swedish Biodiversity Centre, Uppsala, Sweden

This paper describes a method for assessing traffic noise impact on areas of importance for bird conservation, and present results pointing at the significance of traffic noise for nature conservation.

Minimizing Impact Pile Driving Hydroacoustic Effects on 14 Species of Endangered Species Act Listed Fish: Tales from a Mega-Project

Sharon Rainsberry, Columbia River Crossing Project, Vancouver, WA, USA

The Columbia River Crossing is a large, complex project with multiple years of in-water construction to replace bridges spanning a migratory corridor for 14 fish species listed under the Endangered Species Act. Impact driving of steel pile for the replacement bridges results in noise levels that are considered detrimental to listed fish which occur year-round in the project area. Obtaining a time period for in-water impact pile driving that four resource agencies would approve, while maintaining a construction timeline that would result in a viable project, presented a considerable challenge. This presentation focuses on the collaborative inter-agency effort to minimize or avoid exposure of listed fish to impact pile driving noise through changes to bridge foundation design, construction techniques, and the timing of in-water impact driving. Through this collaboration, a unique analysis for estimating potential fish exposure was developed that facilitated permitting success.

Puget Sounds: A Summary of Recent Underwater and Airborne Noise Measurements from Marine Waters of Washington State

Jim Laughlin, Washington State Department of Transportation, Shoreline, WA, USA

Underwater and airborne sound level data for both vibratory and impact driving of steel piles were collected at three ferry terminal locations in Puget Sound to address the sound impact thresholds for marine mammals and provide site specific information. Sound levels measured near the pile as well as simultaneous measurements collected approximately one-half mile or more away are used to calculate the transmission loss over that distance. The source sound levels and transmission loss values are used in three standard spreading loss models (Practical, Spherical, and Cylindrical) to determine which model fits most closely to the measured data. Underwater background sound levels were measured at four ferry terminals in Puget Sound to further reduce the biological monitoring area for our projects.

CRB-5 - Facilitated Session on New Methods, New Materials, New Thinking: Innovations of the ARC International Wildlife Crossing Infrastructure Design Competition

Moderator: Roger Surdahl, FHWA Federal Lands Highway Division, Lakewood, CO, USA

- Angela Kociolek, Western Transportation Institute, Montana State University, Bozeman, MT, USA
- Monique DiGiorgio, Western Environmental Law Center, Bozeman, MT, USA
- Anthony Clevenger, Western Transportation Institute, Montana State University, Bozeman, MT, USA
- Rob Torsing, Zwarts & Jansma Architects, Amsterdam, The Netherlands
- Tiffany Beamer, OLIN, Los Angeles, CA, USA
- Janet Rosenberg, Janet Rosenberg + Associates, Toronto, Ontario, Canada
- Valerie Yaw, Bluegreen (Balmori Associates team), Aspen, CO, USA
- Steven Apfelbaum, Applied Ecological Services, Inc. (HNTB with Michael Van Valkenburgh Associates team), Broadhead, WI, USA

Some of the world's top engineers, ecologists and design professionals participated in the ARC competition. Their innovations may transform how we as a society approach the next generation of wildlife crossing infrastructure. This session offers the exciting opportunity to interact directly with members of the ARC finalist teams and see their models which will be on display.

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SUS-5 - Delivering Sustainable Infrastructure: Programs and Tools

Moderator: Carol Lee Roalkvam, Washington State Department of Transportation

Federal Highway Administration Infrastructure Voluntary Evaluation Sustainability Tool (INVEST)

Heather Holsinger, USDOT Federal Highway Administration, Washington DC, and Lisa Reid, CH2M HILL, Bellevue, WA, USA

This presentation will summarize an initiative by the Federal Highway Administration (FHWA), as part of their Sustainable Highways Program, to define best practices for the planning, design, construction, and operations and maintenance of sustainable highways and to develop a tool for transportation practitioners to integrate sustainability best practices into highway projects and programs.

Sustainability in Project Delivery

Margi Bradway and Liz Hormann, Oregon Department of Transportation, Salem, OR, USA

The Oregon Department of Transportation (ODOT) is integrating sustainability into its project delivery process. The Sustainability in Project Delivery Committee is working to determine the best tools and processes to manage and implement sustainability within projects.

Incorporating Sustainability into New York State DOT's Decisions

Debra Nelson, New York State Department of Transportation, Albany, NY, USA

New York State Department of Transportation (NYSDOT) is taking sustainability to a new level. NYSDOT's recent focus incorporates the sustainability "Triple Bottom Line" beyond the operational level (the "how") and more tactical level (the "what") by expanding it to a strategic level (the "why"). This presentation will highlight emerging efforts to factor sustainability into its transportation asset management, capital program update and capital investment decisions.

MOSAIC: A Comprehensive Tool for Sustainable Highway Corridor Planning in Maryland

Lei Zhang and Mingyang Ji, University of Maryland, College Park, MD, USA

As part of its Comprehensive Highway Corridor (CHC) and Sustainability initiatives, the Maryland State Highway Administration (SHA) has funded a research project, titled "Comprehensive Highway Corridor Planning with Sustainability Indicators." This project developed a Model Of Sustainability and Integrated Corridors (MOSAIC) to integrate sustainable highway planning into existing SHA processes, streamline the environmental screening procedure, and help SHA achieve its mobility, safety, social-economic, natural resources, energy and emissions, and cost objectives. MOSAIC has been applied to the US 15 corridor with two improvement types: adding a general-purpose lane and converting at-grade intersections to grade-separated interchanges. Future research will enhance MOSAIC by including multimodal improvement types, and will integrate MOSAIC into SHA's Enterprise GIS system for state-wide applications in Maryland.

Photo Courtesy WSDOT - Kelly McAllister

Engineers and Biologists: We Can Work Together [CRB-P41]
Kristee Booth, Greenhorne & O'Mara, Deland, FL, and Daniel Smith, University of Central Florida, Orlando, FL, USA
This describes the new process the Florida Department of Transportation District 5 utilizes to handle wildlife crossings for their roadway projects by involving both engineers and biologists from state and federal agencies, private corporations, universities and non-profit organizations in data collection, analysis and decision-making.

Roads Differentially Affect Movement Behavior and Survivorship of Small Mammals and Lizards [CRB-P42]
Cheryl Brehme, US Geological Survey, San Diego, CA, USA
This poster addresses an analysis of the movement patterns and the survivorship of three small mammal species and two lizard species next to three road types in southern California: unimproved dirt, secondary paved, and a primary highway. We found that movement behavior was both species and road specific, but that avoidance generally increased with road improvement. Survivorship increased by the highway for a few species, possibly due to lower predation pressures.

Incorporating Freshwater Biodiversity into New York State Transportation Planning [CRB-P43]
Michelle Brown, The Nature Conservancy, Keene Valley, NY, USA
The Nature Conservancy worked with the New York State Department of Transportation (NYSDOT) to identify the most important culverts for aquatic biodiversity and connectivity. These results have been entered directly into NYSDOT's databases and will direct resources for fish and wildlife-friendly culverts to the most important places.

Habitat Connectivity in North Carolina [CRB-P44]
Anne Burroughs, North Carolina Department of Transportation, Apex, NC, USA
This presentation covers the ongoing evolution of wildlife crossings in North Carolina transportation projects.

Monitoring Results for Railroad Crossing Structures for Spotted Turtles [CRB-P45]
Lars Carlson, Jacobs Engineering Inc., Boston, MA, USA
Massachusetts Bay Transportation Authority (MBTA) Greenbush Line Project resulted in the restoration of commuter rail to a 17 mile corridor in southeastern Massachusetts. As mitigation for project impacts to ecological resources, the MBTA installed 52 wildlife crossings of three main types within the project area. A monitoring program involving radio tracking of spotted turtles (*Clemmys guttata*) documented the distribution and movement patterns of approximately 32 adult spotted turtles prior to and after construction. The results indicate similar patterns in turtle movement (including across right of way movements) and similar female nesting activities between pre- and post-construction surveys. The use of the wildlife crossings by a variety of other wildlife species also was documented.

Bats and Transport Infrastructure [CRB-P46]
Jérôme Cavailhes, Ministry of Ecology, Technical Department for Transport, Roads and Bridges, Bagneux, France
The purpose of the study is to draw up and implement a methodology to take account of chiroptera during construction and infrastructure maintenance and others engineering structures.

Roadkill Hotspots Change Over Time: Are Spatially Static Mitigation Measures Enough? [CRB-P47]
Igor Pfeifer Coelho, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil
Analysis on the spatial distribution of roadkills on a highway in south Brazil indicated that hotspots location varied in a period of seven years. Hotspots stability over time has important implications for mitigation planning.

Amphibian Occurrence on South Okanagan Roadways, British Columbia: Realizing Movement Corridors and Improving Connectivity [CRB-P48]
Jonquil Crosby, University of Waterloo, Ontario, Canada
Increased traffic and highway expansion within British Columbia's south Okanagan valley likely exacerbates barriers to annual amphibian migration and dispersal events. Our study assesses amphibian movement, population threats, and roadway permeability efforts across this highway-bisected landscape during pre and post highway expansion.

Ungulate Responses to Multimodal Pathway Construction and Use in an Existing National Park Road Corridor [CRB-P49]
Amanda Hardy, Colorado State University, Fort Collins, CO, USA
This poster summarizes the results of a four-year repeated measures field study of elk and pronghorn antelope responses to construction and use of a multi-use pathway for non-motorized travel next to a roadway in Grand Teton National Park. We measured behavioral responsiveness, numbers of ungulates observed and their distribution in a control and a treatment region along 12 miles of Teton Park Road, before, during and after construction and public use of the pathway. Results are discussed in the context of ungulate learned responses to repeated exposure to human activities within a national park transportation corridor, and how park travel corridors may be managed to reduce impacts to ungulates while providing visitors opportunities to see ungulates in national parks.

Photo Courtesy WSDOT - Kelly McAllister

The MassDOT Stream Crossing Handbook [CRB-P50]

Timothy Dexter, Massachusetts Department of Transportation, Boston, MA, USA

The Massachusetts Department of Transportation recognizes the importance of providing new and replacement bridges and culverts to accommodate fish and other wildlife passage. To this end, MassDOT has published *The Design of Bridges and Culverts for Wildlife Passage at Freshwater Streams*, (a.k.a. the MassDOT Stream Crossing Handbook) to assist project planners and designers to develop wildlife accommodation at these structures, while maintaining transportation system safety, mobility, and sustainability.

Pronghorn Highway Permeability and Relationships to Traffic Volume on Two Northern Arizona Highways [CRB-P51]

Norris Dodd, AZTEC Engineering, Pinetop, AZ, USA

We tracked 52 pronghorn (*Antilocapra Americana*) with GPS telemetry along 2 northern Arizona highways to develop strategies to enhance permeability in future highway reconstruction. We assessed pronghorn movements and permeability across the highway and investigated relationships of to traffic volume; we compared the results to similar research on 4 other ungulate species on 4 other Arizona highways. Only a single pronghorn crossed each highway, and both highways were near total barriers to passage. A concurrent companion study found strong support for reduced gene flow associated with these highways tied to increasing highway age and traffic volume. We will present strategies to promote highway permeability and gene flow using the GPS telemetry data.

Does Size Matter? Animal Crossings in Roads of Tropical Ecosystems in Mexico [CRB-P52]

Norma Fernández Buces, Grupo Selome, SA de CV, Mexico City, DF, Mexico

In Mexico there is not one single road that includes overpasses for fauna crossing, mainly due its high costs. A more appropriate alternative for the economic reality of our country could be the use of modified drainage structures to work as combined passes for water and fauna, jointly with other modified drainage structures, strategically included along the project at sites confirmed as fauna corridors and between attractor features; as they could be a good and less expensive mitigation solution.

Planning Roads to Protect Australia's Southern Cassowary (*Casuarius casuarius johnsonii*) — A Large, Ancient and Endangered Species of Bird [CRB-P53]

David Francis, Chenoweth Environmental Planning and Landscape Architecture, Brisbane, Queensland, Australia

The Southern Cassowary of the northern Australian rainforests is one of the world's largest birds. Road strike is one of major causes of mortality of this endangered species. This poster explores some of the ways that roads are being planned to address this problem.

Vertebrate Road Kills in Southeastern Brazil: Determinants and Economic Evaluation [CRB-P54]

Carlos Henrique de Freitas, University Center of Araxa, Araxa, Minas Gerais, Brazil

In Brazil there are between 6 and 7 million wildlife deaths by collision with vehicles year round. We estimated some determinants of these events and the economic costs for two highways in the southeastern region of the country.

Alternatives to Barriers and Ecopassages in Reducing Turtle Road Mortality [CRB-P55]

Glenn Johnson, State University of New York, Potsdam, NY, USA

Road mortality may be the most critical threat today for many turtle populations across North America. Potential mitigating measures such as barriers and ecopassages may be unfeasible, too expensive, or ineffective for species whose movement patterns are not highly predictable. Several alternative measures are explored, including turtle crossing signs, which may reduce turtle mortality by increasing driver awareness, and targeted nest enhancement that are placed in the landscape to reduce the need for road crossing. Both show promise to reduce mortality, particularly to nesting female turtles.

Restoration, Roads and Wildlife: A Study of How Habitat Restoration Influences Wildlife Road Mortality in an Urban Park [CRB-P56]

Mandy Karch, Toronto Zoo, Toronto, Ontario, Canada

The Ontario Road Ecology Group at the Toronto Zoo surveyed roads in Canada's first urban national park, Rouge Park. The Park has an extensive road network with traffic volumes that increase annually due to population growth in neighboring towns. In the first year of the Restoration, Road & Wildlife project, a study aimed at informing best roadside habitat restoration practices to mitigate wildlife road mortality, over 2200 vertebrate/road interactions, including Species At Risk milksnakes, were documented. Taxa-specific hotspots were identified in the Park and we observed that road segments bisecting restored wetland habitat yielded more wildlife/road interactions than segments bisecting agricultural land. In 2011, we will continue to monitor the same road segments and expand the study by four additional sites in the Park.

Restoring Channel Processes and Habitat Connectivity at a Mountain Highway Stream Crossing [CRB-P57]

Gregory Laird, Otak, Kirkland, WA, USA

The thorough evaluation of all historic data in light of the geomorphic characteristics of the current conditions supported the selection of an alternative that best met the multiple objectives for the new highway crossing as a connectivity emphasis area.

The Territory Characteristics of Eurasian Otters in Kinmen, Taiwan [CRB-P58]

Shyh-Chyang Lin, National Quemoy University, Jinning, Kinmen, Taiwan

We have yet to spot otters in Kinmen but many spraints were found. The territorial characteristics may help us to find ways to save this precious but endangered species.

Construction and Monitoring of the Crabs Underpass on Green Island, Taiwan [CRB-P59]
Wei-Ting Liu and Wei-Ling Su, Observer Ecological Consultant Co., Ltd., Taipei, Taiwan
This crab conservation project aims to balance ecological concern for crab habitats economic development, and the local government plans for Green Island in Taiwan. To decrease the habitat fragmentation effect of crabs, several underpasses were constructed, with the combined efforts of the Green Island tourism and environmental education, which not only involved ecological experts and the local government, but also the local tourism businessmen.

The Mid-Bay Connector: A Road Toward Okaloosa Darter Recovery [CRB-P60]
Mary Mittiga, US Fish and Wildlife Service, Panama City, FL, USA
The Mid-Bay Bridge Connector is an example of leveraging partnerships and combining environmental stewardship and the Endangered Species Act section 7 consultation process to achieve listed species recovery goals.

Europe Road 18: How To Practice Connection [CRB-P61]
Lars Nilsson, Swedish Transport Administration, Borlänge, Sweden
A new section of the road E18 is built with adaptations to reduce wildlife accidents and to reduce fragmentation. Road E18 cuts Sweden in two parts, a southern and a northern when it stretches from Stockholm to Oslo. Yearly, more than 1 million mammals and over 10 million birds are killed in traffic accidents in Sweden.

Use of Wildlife Crossing Structures on US Highway 93 on the Flathead Indian Reservation in Montana [CRB-P62]
Kylie Paul, People's Way Partnership, Missoula, MT, USA
Our poster highlights images of a wide array of wildlife species using 40 underpasses and one overpass in northwestern Montana. It provides information on the development and monitoring of the crossing structures. Our outreach efforts are a partnership (People's Way Partnership) between the tribes, a research institute, and a non-profit organization.

Spatial Patterns and Factors Influencing the Mortality of Avifauna on the National Highway-7 Passing Through Pench Tiger Reserve, Madhya Pradesh, India [CRB-P63]
A. Pragatheesh, Wildlife Institute of India, Dehradun, Uttarakhand, India
Although roads traverse about 27,000 km of wildlife habitats in India, the nature of their impacts on wildlife is still poorly understood. This study evaluated the impacts of an existing highway on bird species. Bird hits were recorded and analyzed during August 2008-July 2010 along a 10 km stretch of National Highway-7 passing through the Pench Tiger Reserve. Variables influencing road use such as the distance from the village, water body and drainage were generated using the Euclidean distance method in Arc Info. Altitude and degree of slope was derived from 30m resolution Digital Elevation Model (DEM). Distance to cover and visibility between animal and vehicle were additional variables on which data was collected during the course of field studies.

Message of a European Infra-Eco PR Programme: The Future Generation Knows and Cares About Road Ecology Issues, Supports Conservation and Wants a Wide Range of Animals to be Saved [CRB-P64]
Miklós Puky, Hungarian Danube Research Institute, Göd, Hungary
As a programme of the 2010 IENE conference, a year-long PR campaign was organised in Hungary including a children's competition called "On Dangerous Roads" giving kids a chance to send roadkill-related messages to professionals and decision-makers. There were marked differences among the three age groups involved but all of them want a wide-range of animals, from invertebrates to megavertebrates, to be saved. Besides expressing their care for animals, children also invented several new mitigation measures such as snail ladders, snake cable cars and monkey overpasses.

Quantifying the Characteristics of Successful Wildlife Crossing Structures in Utah [CRB-P65]
Megan Schwender and Daniel Olson, Utah State University, Logan, UT, USA
This poster represents three years of research conducted by Utah State University research assistant professor, Dr. Patricia Cramer regarding the effectiveness of culvert structures to facilitate the movement of wildlife under highways in the state of Utah. Dr. Cramer's graduate student, Megan Schwender will be presenting the findings. The poster represents preliminary results regarding the ability of 14 culvert structures to pass wildlife in Utah.

Train-Deer Collisions in Sweden [CRB-P66]
Andreas Seiler, Swedish University of Agricultural Sciences, Riddarhyttan, Sweden
The first official statistics on Swedish train-deer collisions describe a considerable increase in recent years, despite shrinking game bags. We analyze collision patterns in time and space, and discuss how the results can be used to tackle the problem.

Monitoring Wildlife Safety Crossings on US Highway 93 in Elko County, Nevada [CRB-P67]
Nova Simpson, University of Nevada, Reno, NV, USA
The University of Nevada, Reno has been monitoring several newly constructed wildlife safety crossings on U.S. Highway 93 between Wells and Contact, Nevada; a hotspot for deer-vehicle collisions. Preliminary results indicate that the overpass is visited by the largest number of individuals, has few retractions, and has a higher percentage of successful crossings when compared to the underpasses. This study is a collaborative effort with the Nevada Department of Wildlife (NDOW) and the Nevada Department of Transportation (NDOT).

Evaluating the Effectiveness of Road Mitigation Measures for Wildlife: How Much Monitoring is Enough? [CRB-P68]
Kylie Soanes, Australian Research Centre for Urban Ecology, Melbourne, Victoria, Australia
This research aims to assess of the effectiveness of road mitigation measures for arboreal mammals and explore the reliability of different monitoring methods used to evaluate the success of mitigation projects. Data on population density, survival rates, movement and gene flow collected using a BACI monitoring program will be used to quantify the impact of crossing structures on population viability.

Using the iPhone™ Mobile Digital Device to Involve the General Public in Wildlife Observation Reporting [CRB-P69]
Joel Ware, The RoadKill Team, Seattle, WA, USA
"Millions downloaded" is true in the mobile online applications market — literally millions of users of the iPhone™ mobile digital device have downloaded their choices from among over 300,000 applications available online. How can we use this phenomenon to benefit the aims of enhancing Road Ecology, especially in and around our urbanized areas?

Educating the Public about the I-90 Project through the Bridging Futures Art And Essay Contest [CRB-P70]
Jen Watkins, Conservation NW, Seattle, WA, USA
Learn how the Washington State Department of Transportation and I-90 Wildlife Bridges Coalition developed and implemented a statewide art and essay contest to educate elementary-aged school children, teachers, parents, and general public about the I-90 Snoqualmie Pass East Project and importance of considering wildlife when designing roads. This unique partnership and educational strategy has generated positive publicity and recognition for the project since 2004.

Experimental Tests of Tunnel and Barrier Options for Reducing Road Mortalities of Freshwater Turtles [CRB-P71]
Derek Yorks, Department of Environmental Conservation, University of Massachusetts, Amherst, MA, USA
We present the results of our work testing experimental road passage systems on freshwater turtles. Research was conducted primarily with painted turtles (*Chrysemys picta*), but preliminary results of recent tests with spotted turtles (*Clemmys guttata*) and Blanding's turtles (*Emydoidea blandingii*) will be presented as well.

Can We Use Mammal Roadkill Hotspots as a Surrogate to Identify the Hotspots of Other Vertebrate Groups? [CRB-P72]
Fernanda Zimmermann Teixeira, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil
Evaluation of the similarity among mammal roadkill hotspots and the hotspots of other vertebrate groups showed that mammals are not a surrogate for hotspots of other taxonomic classes.

The Effectiveness of Vertebrate Passage and Prevention Structures: A Study of Boeckman Road in Wilsonville, Oregon [CRB-P73]
Leslie Bliss-Ketchum, Portland State University, Beaverton, OR, USA
This study examines an important habitat linkage area between the Rock Creek segment of the Tualatin River National Wildlife Refuge system and the Willamette River. An evaluation of different sized passages under Boeckman Road in Wilsonville, OR, was conducted with twenty-five species detected, and twenty-three of those species found to be utilizing passages.

Construction Waste Management for Oregon's OTIA III State Bridge Delivery Program [SUS-P74]
Geoff Crook, Oregon Department of Transportation, Salem, OR, USA
The Oregon Transportation Investment Act (OTIA) III State Bridge Delivery Program is part of a 10-year program to repair or replace hundreds of state-owned bridges. To meeting the Program's environmental stewardship and sustainability goals, a Construction Waste Management reporting process was implemented in 2008 requiring contractors to plan for and track reuse, recycling and disposal for a variety of waste streams. As of 2010, the Program has successfully accounted for tens of thousands of tons of recycled asphalt paving, clean fill, concrete, metal and wood-all diverted from landfills statewide. The reporting process was developed in collaboration with the Oregon Department of Environmental Quality, and the Association of General Contractors. ODOT has implemented a unique set of environmental performance standards which have been critical to our success in managing project outcomes, capturing data from contractors, and enhancing reuse and recycling on projects statewide.

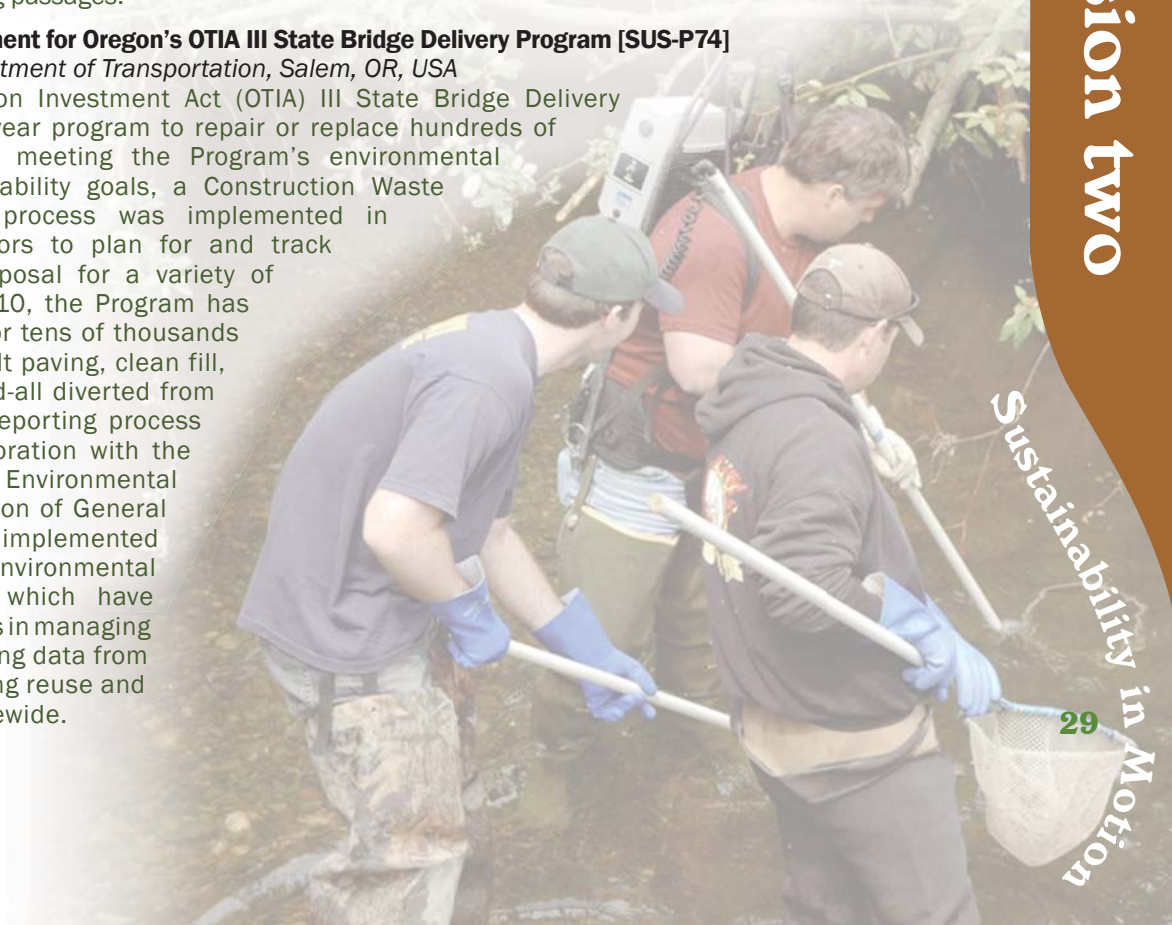

Photo Courtesy WSDOT

Mitigation for Transportation: Forecasting Statewide Needs to Reduce Project Delays and Costs Due to Mitigation Requirements [SUS-P75]

Olen Daelhousen and C. Jordan Myers, ARCADIS, Atlanta, GA, USA

Forecasting stream and wetland mitigation credit needs is important to reduce or eliminate costs associated with project delays due to mitigation requirements. Learn how ARCADIS, under contract to the Georgia Department of Transportation (DOT), successfully developed a model to forecast stream and wetland impacts using geographic information systems (GIS), National Wetlands Inventory (NWI) data, the Georgia DOT project database (TPRO), and Georgia DOT project mapping.

Building a Low Carbon Society: Approaches Focusing on Lifestyle and Transport [SUS-P76]

Dami Moon, Nagoya University, Nagoya-city, Aichi-prefecture, Japan

We aimed to identify the policy contexts that may guide households to choose transport options that are environmentally sound and less carbon intensive, whilst being cognizant of the social and cultural values attached to household choice.

Economic Evaluation of Environmental Conditions Early in the Transport Planning Process [SUS-P77]

Jennifer Lee and Fraser Shilling, University of California, Davis, CA, USA

Society values community, transportation, and environmental attributes and processes to varying degrees and in different ways, including using fiscal equivalents. We describe a method for measuring and normalizing these values to support transportation decision-making.

Road Infrastructure and Wetlands [SUS-P78]

Elise Trielli, Ministry of Ecology, Bagneux, France

"Road Infrastructures and Wetlands" is a technical guidebook addressed to the French Ministry for Road Transportation department, and more widely to the linear infrastructure designers. It provides wetlands knowledge, practical recommendations and tools to ensure that infrastructures do not threat features and the functioning of these sensitive areas at each stage of an infrastructure project implementation.

Repurposing Existing Infrastructure: A Vision for Ayd Mill Road [SUS-P79]

Colleen Finn, University of Minnesota – Twin Cities, St Paul, MN, USA

As underutilized transportation corridors become apparent, communities will have the opportunity to repurpose their existing infrastructure to better meet the needs of human and natural systems. Integration of these systems will strengthen connectivity for residents and wildlife, and present a complete street that regenerates the open and hidden landscapes of the city into a living part of the community. This study links ecosystem restoration and watershed recovery to transportation planning within the existing infrastructure of Ayd Mill Road, and focuses on a multifunctional approach to design driven by landscape connectivity, historic waterways, and Saint Paul's multimodal transportation network.

Identifying Sustainable Dust Control for Low-Volume Roads [SUS-P80]

Bethany Williams, USGS Columbia Environmental Research Center, Columbia, MO, USA

Although chemical dust control on unpaved roads is becoming increasingly popular, application of chemical dust suppressants may negatively affect roadside plants, wildlife, and water quality. Our project compares the potential toxicity of 15 dust suppressants under laboratory and field conditions to help road managers select effective and environmentally responsible dust control products.

Photo Courtesy WSDOT - Joseph Williams

Field Trips hosted by Washington State Department of Transportation

PLEASE NOTE the Bus Boarding and Departure Times below for each Trip. Check-in in the Westin Lobby prior to boarding.

Field Trip 1: I-90 Snoqualmie Pass East Project — Ecological Connectivity

Boarding 8:00 AM - Depart 8:30 AM

Improvements are now underway on Interstate 90 (I-90) near Snoqualmie Pass in the Cascade Mountains, about 50 miles east of Seattle. This field trip will explore how ecological connectivity is also being improved for terrestrial and aquatic species as an integral part of this project. We will view the project under construction, including several wildlife crossing structures, and learn about the extensive planning and coordination involved as well as the engineering challenges. The partnership approach for ecological monitoring and landscape level connectivity planning will also be featured. A picnic lunch will provide participants with opportunities to enjoy the surroundings and talk with presenters.
Participating agency partners: US Forest Service, Western Transportation Institute, Central Washington University, Conservation Northwest, and I-90 Wildlife Bridges Coalition.

Field Trip 2: Olympic Peninsula and Puget Sound — Aquatic Ecosystems

Boarding 7:30 AM - Depart 8:00 AM

The protection and restoration of aquatic ecosystems is a critical natural resource concern in the Pacific Northwest where salmon are an iconic species, but also critically imperiled. This excursion over land and sea will focus on the issues related to Puget Sound and its watersheds, important restoration work now underway and how this plays out for transportation projects. Crossing Puget Sound by Washington State Ferry, we will learn about measures used to reduce environmental effects of ferry terminals, then travel on to see projects on the Olympic Peninsula to remove barriers to fish passage and restore estuary and stream habitat. This trip will include a lunchtime visit to the Jamestown S'Klallam Tribal center and an award-winning partnership project at Jimmycomelately Creek. Returning via the new Tacoma Narrows bridge, we will view construction work on the Manette Bridge and wetland restoration in the Hylebos basin, near the Port of Tacoma.
Participating agency partners: Washington State Ferries, City of Pouslbo, Jamestown S'Klallam Tribe, and Port of Tacoma.

Field Trip Photos Courtesy WSDOT

Field Trip 3: Seattle Metropolitan Area — Sustainability in Urban Environments

Boarding 8:30 AM - Depart 9:00 AM

Seattle is renowned for its beautiful natural setting between the sea and the Cascade Mountains, and environmental health is an important regional value. How can you protect the natural environment while meeting the transportation needs of a thriving metropolitan area? This field trip will explore solutions including habitat protection, wetland mitigation banking and stormwater management, as well as some of the unique issues addressed in planning the Highway 520 floating bridge replacement on Lake Washington. This trip includes lunch at the Washington Park Arboretum and a nature trail walk (approximately 1 mile) to view the shore of Lake Washington and the 520 highway corridor. Current active construction on the east side of this project, including culvert replacement for fish passage, will be viewed.
Participating agency partners: City of Seattle, Washington State Department of Ecology, HDR Engineering, and Washington Park Arboretum.

For All Trips: Plan for a full day. Wear good outdoor walking shoes and dress for the weather. Summer temperatures are typically 70–80°F (21–27°C) with a low chance of rain. Be prepared with sun protection, and bring an extra layer of clothing if the weather cools down. Lunch and snacks will be provided. Please advise the trip organizers at check-in if you require any special accommodation.

CNT-6 - Sustaining Hydrologic Connections

Moderator: Bill Ruediger, Wildlife Consulting Resources

WSDOT Fish Passage Program

Jon Peterson, Washington State Department of Transportation, and Susan Cierbiej, Washington Department of Fish and Wildlife, Olympia, WA, USA

The Washington State Department of Transportation (WSDOT) has partnered with the Washington Department of Fish and Wildlife (WDFW) since 1991 to help sustain and restore aquatic ecosystems by improving fish passage and natural stream functions at road crossings through a statewide program for the Washington highway system.

Critical Linkages: Assessing Connectivity Restoration Potential for Culvert Replacement, Dam Removal and Construction of Wildlife Passage Structures in Massachusetts

Scott Jackson, University of Massachusetts, Amherst, MA, USA

The Conservation Assessment and Prioritization System (CAPS) is a computer model developed by the University of Massachusetts Amherst that incorporates biophysical and anthropogenic data to develop an index of ecological integrity. Three metrics are used to assess landscape connectivity: isolation, connectedness and conductance. Within the framework of CAPS these three metrics are used to model various scenarios and quantify the differences among them. Using this approach we conducted a comprehensive statewide assessment of restoration potential for (1) dam removals, (2) culvert replacements and (3) construction of wildlife passage structures on roads, railroads and highways.

Maintaining Hydrologic Connectivity Across I-90 East of Snoqualmie Pass

Rob Schanz, Washington State Department of Transportation, Olympia, WA, USA

The Washington State Department of Transportation worked with the US Forest Service, US Fish and Wildlife Service, and Washington Department of Fish and Wildlife early in the NEPA phase of the I-90 Snoqualmie Pass East Project to define and address hydrological barriers. Learn about the creative research WSDOT and partners have used over the last five years to develop innovative stream crossing, subsurface drainage, and road fill designs for this high-elevation mountain pass project located within the Wenatchee National Forest.

Real-Time Data Acquisition for the Monitoring of River Water Quality During Motorway Construction in Ireland

Letizia Cocchiglia, University College Dublin, Dublin, Ireland

This paper describes a pilot scale study using a real-time water quality monitoring system. The system was deployed to monitor the effects of motorway construction activity on the water quality of adjacent watercourses. The primary finding of this study is that a relatively low-cost, state of the art real-time data acquisition system is invaluable for monitoring the effects of motorway construction, particularly in ecologically sensitive catchments.

COM-6 - Unwelcome Guests: Invasives and Pests

Moderator: Joseph Burns, USDA Forest Service

Invasive Alien Species Introductions with International Trade and Domestic Transportation: Identifying Primary Vectors and Cross-border Pathways in North America

Denys Yemshanov, Natural Resources Canada, Canadian Forest Service, Sault Ste. Marie, ON, Canada

We present a methodology to predict pathways of human-mediated establishment of alien forest insects with commercial freight transportation. We have developed a stochastic model of how these species may be moved with commodity flows through a network of international marine ports, major road corridors and border crossings. The study makes use of a Canadian roadside survey and statistical data on both Canadian and U.S. imports, complemented with geo-referenced information on North American ports of entry and populated places. The model offers the potential to analyze pathways from both existing and anticipated infestations and is designed to work with a wide range of transportation, traffic load and commodity flow data.

Managing Invasive Species Risks for Bridge Pontoons Stored in Estuaries

Philip Bloch, Washington State Department of Transportation, Seattle, WA, USA

Constructing and storing SR 520 floating bridge pontoons in Grays Harbor, Washington creates a risk that exotic marine organisms will hitch-hike into Puget Sound as part of the biofouling communities that will develop on the pontoon hulls during moorage. WSDOT evaluated the risks associated with biofouling on pontoons by first identifying exotic species that occur in Grays Harbor, but not Puget Sound and subsequently evaluating the characteristics of the biofouling communities likely to develop on pontoons during storage. These studies led to management strategies that limit the risks that exotic organisms will be transported into Puget Sound.

Evaluating the Forest Pest Invasion Potential of Trade-Related and Recreational Transportation Pathways

Frank Koch, USDA Forest Service, Research Triangle Park, NC, USA and Denys Yemshanov, Natural Resources Canada, Canadian Forest Service, Sault Ste. Marie, ON, Canada

A lack of empirical data regarding human-mediated spread of invasive organisms impedes the realistic prediction of invasion patterns. In this paper, we present two studies in which we separately examined aspects of forest pest movement via commercial-trade-related and recreational transportation. These studies represent initial steps toward improved depiction of human-assisted dispersal potential, and provide important functional inputs for quantitative models of invasion.

USDA-APHIS-Wildlife Services Bridging the Migratory Bird Gap for Oregon Department of Transportation

Diane Winterboer, USDA-APHIS-Wildlife Services, Portland, OR, USA

This presentation is about the journey USDA-Wildlife Services (WS) and Oregon Department of Transportation (ODOT) has taken together to address the Migratory Bird Treaty Act. For the past five years WS has worked with ODOT, struggled against swallows, dueled with dippers and challenged cormorants and even given bats the “boot” all in the name of conservation. Come learn about the trials and tribulations (and did I mention trials?) we’ve encountered during our road trip.

CRB-6 - Road Effects on Biodiversity and Species

Moderator: Joanne Schuett-Hames, Washington Department of Fish and Wildlife

Population and Evolutionary Consequences of Roads on Two Amphibians

Steven Brady, Yale University, New Haven, CT, USA

I will report results from a combination of field experiments, surveys, and road salt exposure experiments, which were aimed at developing understanding of the long-term consequences of road proximity and runoff on the spotted salamander (*Ambystoma maculatum*) and wood frog (*Rana sylvatica*).

Genetic Differentiation of Selected Eastern Box Turtle (*Terrapene carolina*) Populations in Fragmented Habitats, and a Comparison of Road-based Mortality Rates to Population Size

Susan Hagood, The Humane Society of the United States, Washington, DC, USA

As a group, turtles are particularly vulnerable to road mortality, and terrestrial species especially so. The eastern box turtle must contend with habitat loss, high rates of egg and hatchling mortality, collection from the wild, and fragmented habitats increasingly hemmed in by heavily travelled roads. Population isolation can lead to reduced genetic diversity - are eastern box turtle populations in isolated habitats less genetically diverse than those in intact habitats? And how is road-based mortality, the most serious direct threat to box turtles, affecting their populations?

The Influence of Roadkill on Protected Species and Other Wildlife in Lithuania

Linas Balčiauskas, Nature Research Centre, Vilnius, Lithuania

Results of investigations into wildlife-vehicle accidents in Lithuania (2007-2009) showed that roadkill is a limiting factor for moose and lynx, whilst its influence is negligible on other forms of wildlife, including threatened species of mammals.

How Important is Infrastructure for the Conservation of Threatened Biodiversity? A Case Study of Red-Listed Species in Sweden

Jörgen Wissman, Swedish Biodiversity Centre, Uppsala, Sweden

This presentation discusses the Swedish Species Gateway observation database which is used to analyze the effectiveness of road verges in preserving biodiversity as compared to other conservation measures. Infrastructure habitats are found to make significant contributions to the preservation of threatened biodiversity.

SUS-6 - Landscape Scale Planning for Transportation and Conservation

Moderator: Jason Smith, Washington State Department of Transportation

Integrating Transportation Planning, Conservation, and Regulatory Actions

Roberta Gerson, US Fish and Wildlife Service, Sacramento, CA, USA

This presentation explores the zen and the art (and the Science) of conservation in transportation.

Road Ecology Status in China: The Effect of Roads on Wildlife and Corresponding Solutions

Qi-Lin Li, Beijing Normal University, Beijing, China

This paper provides an overview of the road ecology status in China, a country with swift transportation expansion, especially the road net. Road avoidance and roadkill may be the most severe effects of traffic. In order to mitigate the various harmful highway impacts, road builders put up speed limit signs, banning horns, wildlife warning signs, reduced angle of subgrade slopes, designed and set up wildlife channels (including bridges, tunnels, culverts). Among them, animal passages were the most successful measure.

Large Scale Infrastructure and Spatial Planning - A Landscape Approach: The Götaland Line Example

Henrik Wahlman, Swedish Transportation Administration, Jonkoping, Sweden

A project that shows that Landscapes might be the solution that gives both higher resilience and a reduction of bottle-necks and cost increases.

California High Speed Rail: Early Agency Coordination for Enhanced Environmental Benefit

Clifton Meek and Sarvy Mahdavi, US EPA Region 9, San Francisco, CA, USA

California's High Speed Rail project has stimulated a slew of early inter-agency coordination activities on both regulatory and non-regulatory initiatives with the goal of reducing the environmental impact and increasing the environmental benefit of the project to the greatest extent possible. This presentation will look at these inter-agency initiatives including early coordination on nine project-level Environmental Impact Statements, development of comprehensive mitigation strategies, and partnerships to promote sustainability throughout the High Speed Rail system.

CM I 1.5

THURSDAY August 25 facilitated session 10:30 am – 12:00 pm

Eco-Logical in Action

Moderator: Mary Gray, USDOT Federal Highway Administration, Olympia, WA, USA

- Julianne Schwarzer, USDOT Volpe Center, Cambridge, MA, USA
- Gabe Epperson, Envision Utah, Salt Lake City, UT, USA
- David Leopold, Chicago Department of Transportation, Chicago, IL, USA
- Deb Wambach, Montana Department of Transportation, Helena, MT, USA

Through "Eco-Logical in Action," conference attendees will learn how to successfully implement the Eco-Logical approach in a variety of settings, using lessons derived from the FHWA Eco-Logical grant program and related research. Most importantly, this session will stress the value of considering the larger ecosystem in infrastructure planning and highlight how this type of planning can and should be used in a variety of applications.

CM I 1.5

Professional Development Opportunities at ICOET 2011

This year's conference includes many sessions that may qualify for professional development hours (PDHs) from the following and other licensure and certification agencies. To help participants document and report their attendance at ICOET, certificates of attendance will be provided upon request following the conference.

American Fisheries Society — Certified Fisheries Professional (FP-C)

FP-C attendees should track their session participation and submit the required documentation to AFS as part of their Certification application or renewal. For more information see the AFS website at **www.fisheries.org/afs**.

American Institute of Certified Planners (AICP)

AICP members can earn Certification Maintenance (CM) credits for many ICOET sessions. When CM credits are available, they are noted at the end of a session's description – for example, CM I 1.5 – in the Session Details pages of this booklet. More information about AICP's CM program can be found at **www.planning.org/cm**.

American Society of Landscape Architects

Both ASLA member and non-member licensed landscape architects should track their session participation and submit documentation for PDHs as required by their state. For more information about continuing education see the Professional Practice/Licensure section of American Society of Landscape Architects Website at **www.asla.org**.

Green Building Certification Institute

LEED Professionals attending ICOET sessions may report these as "Live Presentations" for GBCI CE hours. LEED Green Associates and LEED APs should track their session participation and submit documentation for CE hours as required by GBCI. For more information see "Earning and Reporting CE Hours" in the Credential Maintenance section of the Green Building Certification Institute website at **www.gbci.org.**

State Professional Engineers Licensure

The licensure of professional engineers is handled by individual states. Professional engineers should track their session participation and submit documentation for PDHs as required by their state.

The Wildlife Society — Certified Wildlife Biologists (CWB)

The Wildlife Society awards a maximum of 42.5 contact hours in Category I of the Certified Wildlife Biologist Renewal/Professional Development Certificate Program for participation in the 2011 International Conference on Ecology and Transportation. Participants should track their session participation and submit the required documentation for Professional Development Certification or CWB Renewal. For more information see the Certification section of The Wildlife Society website at **www.wildlife.org**.

Photo Courtesy WSDOT - Tom Mohagen

Business Meetings

The following business meetings are being conducted by ICOET 2011 sponsors and partners in conjunction with the conference. Some of the meetings are open to all interested ICOET participants; others are open only to affiliated groups or by invitation. If you are not a member of these professional groups but are interested in attending a meeting, please request permission from the appropriate organizing person listed below. CTE staff at the registration desk can assist you in connecting with the organizer.

ICOET Steering Committee Meeting (*by invitation*)

Sunday, August 21, 3:00 - 5:00 PM — **Vashon**

Organizer: Paul Wagner, Washington State DOT, Committee Chair

TRB ADC10 Steering Subcommittee Meeting (*by invitation*)

Sunday, August 21, 3:00 - 6:00 PM — **Blakely**

Organizer: Martin Palmer, Washington State DOT, ADC10 Mid-Year Workshop Chair

FHWA State and Resource Agency Liaison Managers Meeting (*by invitation*)

Tuesday, August 23, 7:00 - 8:30 AM — **Blakely**

Organizer: Mary Gray, Federal Highway Administration

TRB ADC10 and ADC30 Joint Committees Meeting — Cascade II
ADC10 Committee on Environmental Analysis in Transportation Meeting — Cascade I-A
ADC30 Committee on Ecology and Transportation Meeting — Cascade I-C

Tuesday, August 23

Joint Committees Meeting 5:00 - 6:00 PM
Separate Committee Meetings 7:00 - 10:00 PM

Organizers: Martin Palmer, Washington State DOT, ADC10 Mid-Year Workshop Chair, and Alex Levy, ARCADIS, ADC30 Committee Chair

All interested ICOET participants are welcome to attend the TRB committee business meetings. The joint committee meeting agenda will be to develop proposals for joint presentations at the annual TRB meeting in Washington, DC in January, and begin processes for identifying common research interests. If time allows, we will set the stage for joint planning of the 2012 mid-year meeting in Little Rock, Arkansas. Following a one-hour dinner break the two committees will reconvene in separate business meetings.

Green/Gray Infrastructure Leadership Training Development Round Table

Tuesday, August 23, 5:00 - 7:00 PM — **Orcas**

Organizer: Fraser Shilling, University of California, Davis

All interested ICOET participants are welcome to attend this round table meeting. We will be discussing leadership skills necessary for infrastructure and natural resource managers and others using the principles of Transitioning to Sustainability, CSS, Eco-logical, multi-sector asset management, and the like.

US Fish and Wildlife Service Transportation Biologists Meeting (*by invitation*)

Tuesday, August 23, 5:00 - 7:30 PM — **Vashon**

Organizer: Catherine Liller, US Fish and Wildlife Services

FHWA Transportation Liaisons Meeting (*by invitation*)

Thursday, August 25, 1:00 - 4:00 PM — **Grand Crescent**

Organizer: Mary Gray, Federal Highway Administration

USDA Forest Service Round Table

Thursday, August 25, 1:00 - 4:00 PM — **Vashon**

Organizer: Joseph Burns and Sandra Jacobson, USDA Forest Service

This meeting will discuss new developments, insights and research results presented at ICOET that are pertinent for USDA Forest Service employees associated with transportation projects. Other public land management agency staff are welcome to attend. We will discuss possibilities for distributing lessons learned from ICOET and action plans for attendees.

ICOET 2011 Planning and Organizing Committees

We extend our sincere gratitude to the many volunteer professionals and organizations which support ICOET. These individuals have contributed valuable time and expertise to planning and organizing this conference. Their dedicated service — along with our many presenters, moderators, sponsors, and participants — continue to make ICOET a success. Thank you all!

Steering Committee

Paul Wagner, Washington State Department of Transportation (Chair)
Debra Nelson, New York State Department of Transportation (Chair-elect)
Robert Ament, Western Transportation Institute, Montana State University
Laura Bachle, US Environmental Protection Agency
Hans Bekker, Centre for Traffic and Navigation, The Netherlands, and Infra Eco Network of Europe (IENE)
Alison Berry, Road Ecology Center, University of California, Davis
Joseph Burns, USDA Forest Service
Gregg Erickson, California Department of Transportation
Mary Gray, Federal Highway Administration
Susan Hagood, Humane Society of the United States
C. Leroy Irwin, Florida Department of Transportation (retired) and Mulkey Engineers and Consultants (Emeritus)
Sandra Jacobson, USDA Forest Service
Alex Levy, ARCADIS US
Catherine Liller, US Fish and Wildlife Service
Thomas Linkous, Transportation Research Board ADC30 Committee on Ecology and Transportation
Lynn Malbrough, Arkansas State Highway and Transportation Department
James Martin, Center for Transportation and the Environment, North Carolina State University
Eugene Murray, Center for Transportation and the Environment, North Carolina State University
Frank Pafko, Minnesota Department of Transportation
William Ruediger, Wildlife Consulting Resources
Christopher Servheen, US Fish and Wildlife Service
Vicki Sharpe, Florida Department of Transportation
Leonard Sielecki, British Columbia Ministry of Transportation
Trisha White, Defenders of Wildlife

Program Committee

Debra Nelson, New York State Department of Transportation (Chair)
Laura Bachle, US Environmental Protection Agency
Hans Bekker, Centre for Traffic and Navigation, The Netherlands, and Infra Eco Network of Europe (IENE)
Alison Berry, Road Ecology Center, University of California, Davis
Joseph Burns, USDA Forest Service
Scott Bradley, Minnesota Department of Transportation
Cindy Callahan, Federal Highway Administration, Washington Division
Mary Gray, Federal Highway Administration
Susan Hagood, Humane Society of the United States
Michael Lamprecht, US Army Corps of Engineers
Catherine Liller, US Fish and Wildlife Service
Shyh-Chyang Lin, National Kinmen Institute of Technology, Taiwan
Martin Palmer, Washington State Department of Transportation
Vicki Sharpe, Florida Department of Transportation
Leonard Sielecki, British Columbia Ministry of Transportation
Paul Wagner, Washington State Department of Transportation
Trisha White, Defenders of Wildlife

Outreach and Public Relations Committee

Trisha White, Defenders of Wildlife (Chair)
Ann Hartell, Center for Transportation and the Environment, North Carolina State University
Amanda Sullivan, PRR

Abstract Review Subcommittee

Linda Anderson, Federal Highway Administration, Florida Division
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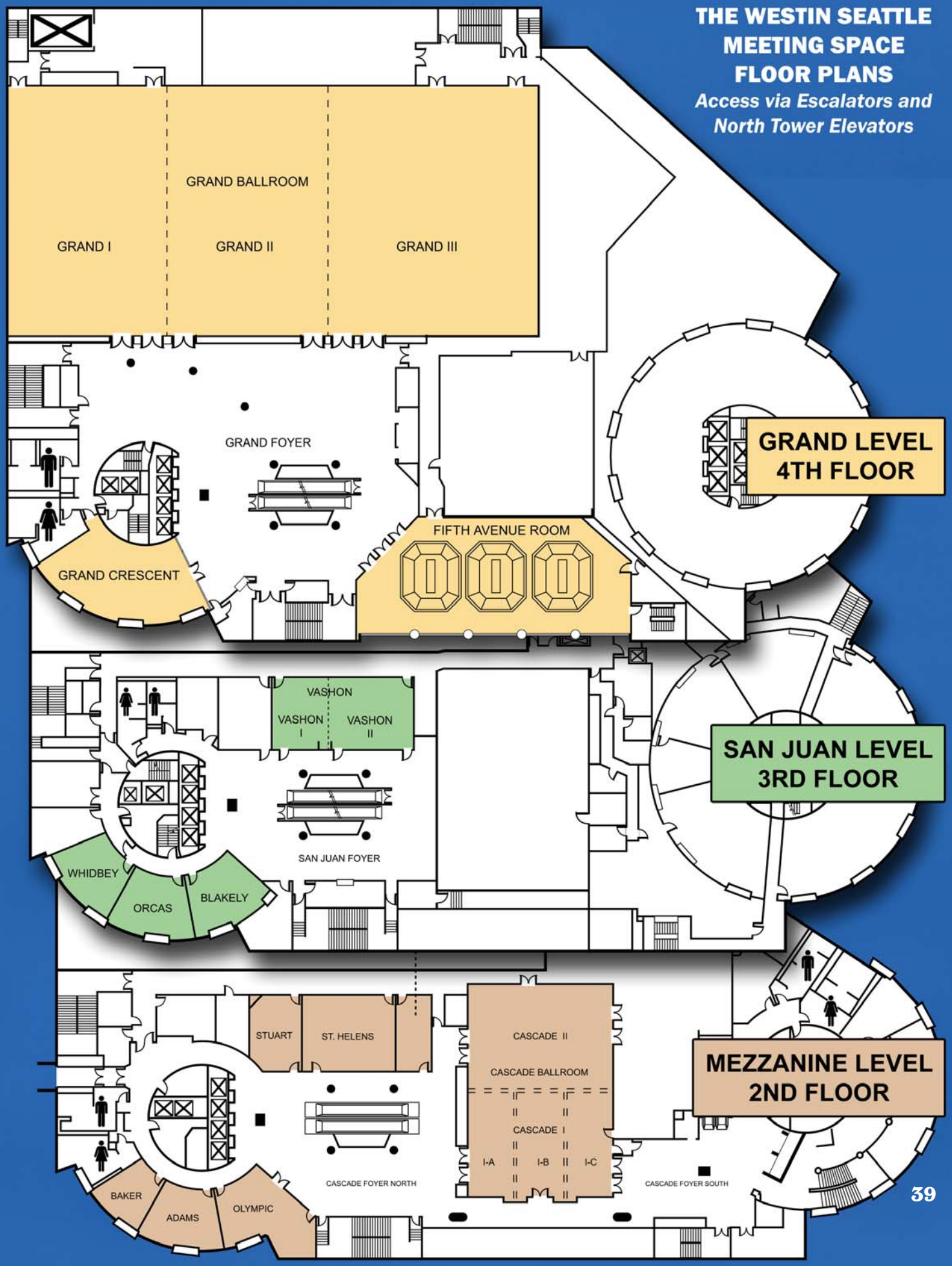

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