Roads and Wildlife: Impacts and Solutions

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This agent is unique

- It kills outright
- It removes habitat and replaces it with expanses of barren surfaces
- It slices habitat by creating a barrier to movement
- It's noisy and carries frequently noisy people into remote habitat
- It creates noxious fumes and salts

How do you know if roads are adversely impacting wildlife?

When does it become serious enough to mitigate those impacts?

….and HOW?

Three Scales of Population-Level Impacts to Wildlife from Highways

- Genetic interchange
- Demographic rescue
  - Repopulating unoccupied habitat
  - Colonizing new habitat (think Climate Change!)
  - Vacating newly unsuitable habitat
- Daily or seasonal movements necessary for life history requisites

Identifying the type of impact will help identify the appropriate mitigation measure to apply.

Safety is an Issue, too

- 200 people killed annually
- Billions of dollars lost in lives, injuries, property damage
- Over 1 million large animals killed each year

Impacts from Roads to Wildlife

- Direct loss of habitat
- Barrier effect
- Habitat fragmentation
- Mortality from vehicle collisions
- Pollution
- Introduction of invasive species
- Disturbance
- Increased human access

Characteristics of Roads that Influence Level of Impact

- Proximity to good habitat
- Size of road
- Traffic volume: Type and frequency of use
- Speed of vehicles
- Road density
- Season of use
- Surface type
- Ability of vehicles or people to leave road edge
- Proximity to human development

Low Vs High-Volume Roads

- Same type of impacts but to different species
- An effects continuum from low to high volume
- Higher volume roads accumulate all adverse impacts that low volume roads experience
- Generally, low volume roads affect smaller animals; high volume roads affect all species
- Increased road density increases impacts

Functional Classes of Highways and Summarized Effects *(How Roads Evolve)*

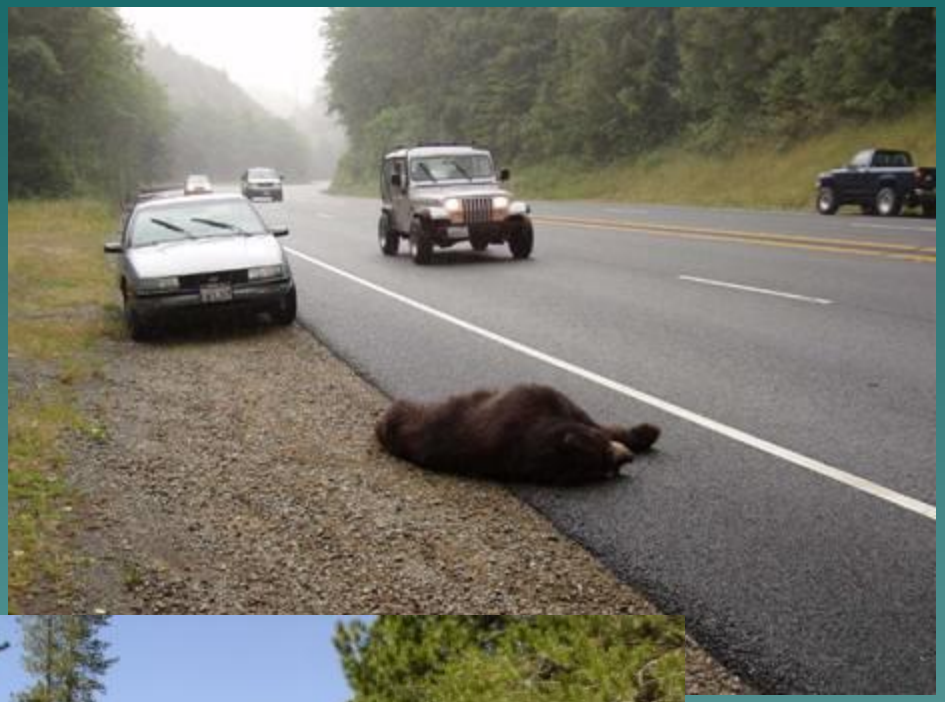
1. Local roads: Effects to slow or wary species
2. Minor collectors: Highest collisions for the rate of traffic volume
3. Major collectors: Declining crossing attempts but fast species can sometimes cross
4. Minor arterials: Major avoidance except by non-responding species
5. Interstates: Complete barrier

First Step in Road Evolution: Local Roads

- Effects to slow or wary species
- Mortality can affect 10% of population at 300 vehicles/day
- Increased human access often key impact

2. Next Step: Minor Collector

- The most lethal of stages for rate of traffic volume
- Animals think they can cross but can't make it through gaps
- The majority of highways through public lands



3. Thinking Twice About Attempting to Cross: Major Collector

- Many species will avoid trying to cross
- Swift species can exploit decreasing gaps between vehicles
- Mortality high in swift species

4. Avoidance: Minor Arterials

- Most species avoid area, or mortality is very high
- Begin around the clock traffic

5. Complete Barrier: Interstates

- Traffic heavy 24/7
- Few gaps
- Large expanses of pavement
- Median barriers
- Noise affects habitat use

Species Categories at Risk of Population-level Impacts

- Movement Issues: Examples
  - Wide-ranging species
  - Slow or immobilizing species

Photo courtesy of Kerry A. Gunther, Yellowstone National Park

Species Categories at Risk of Population-level Impacts

- Movement Issues
  - Wide-ranging species
  - Slow or immobilizing species
- Habitat Issues:

  Examples
  - Attracted to clear zone
  - Requiring dense cover

Species Categories at Risk of Population-level Impacts

- Movement Issues
  - Wide-ranging species
  - Slow or immobilizing species
- Habitat Issues
  - Attracted to clear zone
  - Requiring dense cover
- Biological Issues: Examples
  - Wary of humans
  - Low reproductive potential

Impact: Habitat Loss

- 4 million miles of public highways in US
- Vast majority are 2 lane roads
- Additional 375,000 miles on National Forests
- Worldwide: 18 of 20 million miles of public roads are low volume roads

- *That's the size of South Carolina!*

Impact: Habitat Loss

- Roads may be parallel to other built infrastructure
- Road may physically alter habitat
- Invasive species may alter habitat or reduce habitat quality
- Footprint extends to cuts and fills

Habitat Loss

- Habitat loss in sensitive habitats
  - Habitat loss from footprint, cuts and fills

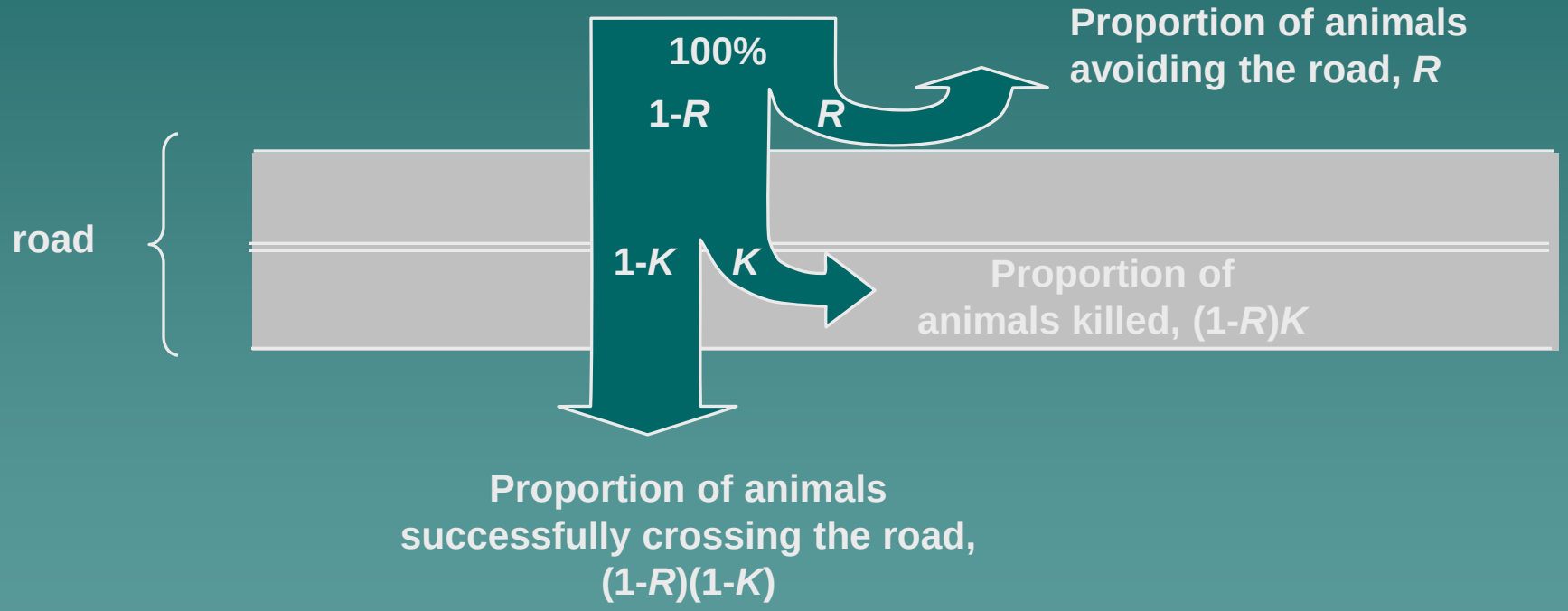
Habitat Alteration from Road Prism

Roads/Riparian Restoration Team

Meadow Damage by Vehicles

Impact: Barrier Effect and Habitat Fragmentation

Relationship between Mortality and Avoidance



Jaeger, J. A. G., and L. Fahrig. 2004. Effects of Road Fencing On Population Persistence. Cons. Bio. 18(6): 1651-1657. Used by permission.

Loss of habitat connectivity

- Permeability: The landscape's ability to allow an animal's free movement to all parts of its range
- Different species have different tolerances to roads, so roads act as 'filters' that change an area's species mix

How Roads Affect Landscape Permeability

- Fragment habitat
- Frighten or intimidate wildlife from crossing
- Cause habitat loss from footprint
- Roadway surface is inhospitable or intimidating

Small Unsurfaced Roads Can Fragment Habitat

- …For beetles
- …or salamanders

TES burying beetle; newt
FS images


McArthur Lake
Wildlife Corridor
Highway
Powerline
Another
railroad
Dam
Railroad

Impact: Vehicle-caused Mortality

- Mortality effect is specific to species and population
- Watch for impacts as smaller roads evolve into larger roads or more traffic volume
- Generally, mortality impacts are on higher volume roads

Mortality Can Affect Populations

- Snake density in high road density areas is much lower than in low road density areas
- Slow, long lived species such as snakes and turtles can be affected

Vehicle-caused Mortality Can Affect Populations

- And that can mean fewer recreational opportunities for humans

Impact: Pollution

- Dust abatement can cause death in amphibians
- Deicing agents cause direct and indirect mortality
- Exhaust components can accumulate along roadside
- Storm water discharges reduce water quality

Winter Finches and Deicing Salts

Winter Finches and Deicing Salts

Impact: Disturbance and Increased Human Access

Photo USDA Forest Service: Dave Herr

- Noise
- Access into sensitive areas
- Increased legal harvest
- Poaching
- Wildfire starts

Increased Access by OHVs and Other Vehicles

- Leopard frog juveniles in puddle caused by OHV

Images: USFS

Human Disturbance on Roads Can Reduce Productivity…

- Spotted Owl
- Trumpeter Swan

…Especially if people are visible

- On foot
- Stopping cars
- Cyclists
- OHVs
- Hikers

Northern Goshawk nestlings
FS Image

Human Disturbance Can Reduce the Value of Habitat Close to Roads

- Bighorn Sheep

- Blue/Dusky Grouse

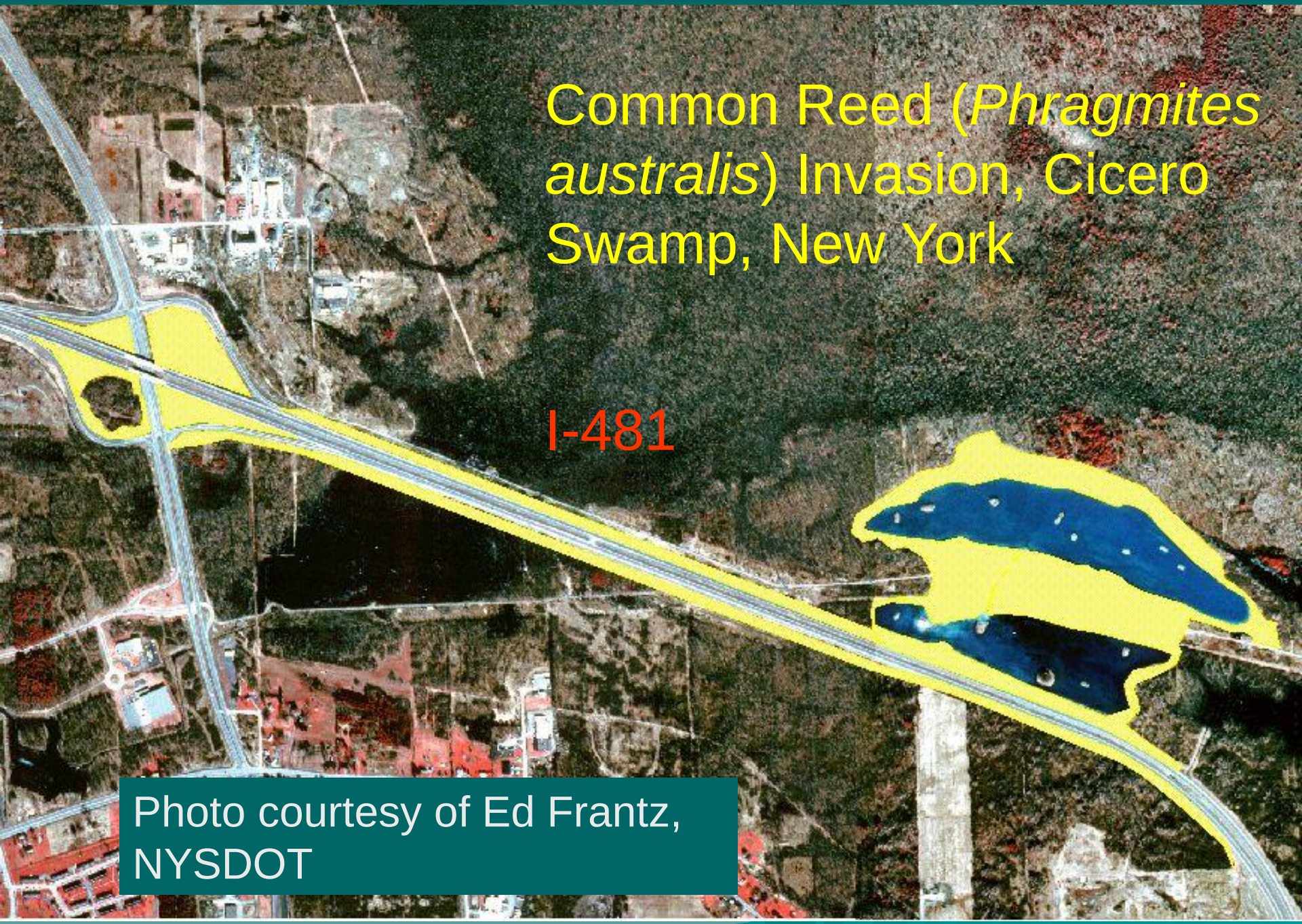
Large and Small Species are Affected by Human Presence

Grizzly Bear

Townsend's Big-eared Bat on concrete bridge

Impact: Introduction of Invasive Species

Images USDA FS


Common Reed (*Phragmites australis*) Invasion, Cicero Swamp, New York
I-481
Photo courtesy of Ed Frantz, NYSDOT

Mitigation Measures

- Close roads or adjust seasons
- Barrier sensitive areas from use
- Decommission roads
- Limited operating periods
- Watch road density
- Build roads away from sensitive habitats, especially riparian systems
- Consider growth potential
- Add wildlife crossing structures when possible
- Retrofit existing structures

Human Disturbance Can Be Managed

Birders on guided tour to see endangered Kirtland's Warblers on nesting grounds, Huron Manistee NF

Legal hunting on open/closed road system

FS images

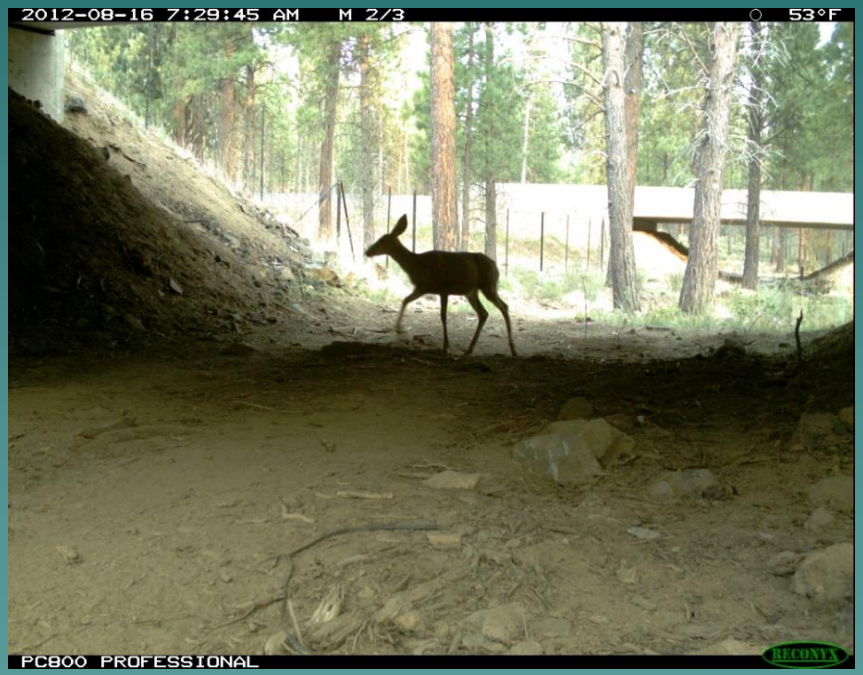
Consider Wildlife Crossing Needs in New Structures

Boulder armament can restrict passage

Allow for unsubmerged pathways along streams

Wildlife Crossing Structures

- The most effective solution to animal-vehicle collisions and animal movement needs
- Very effective when properly designed and placed



Wildlife Crossing Structures

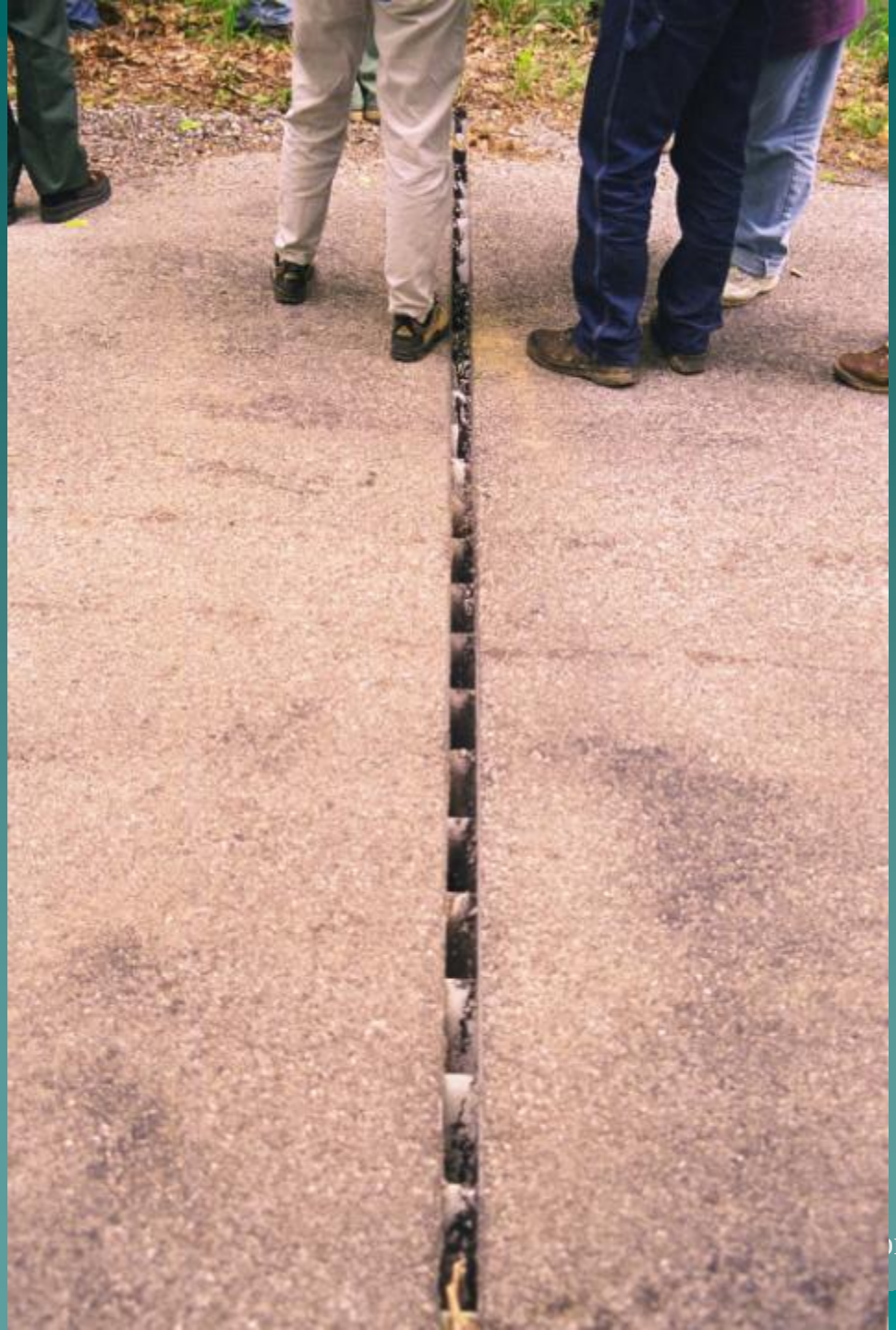
- Must be suitable for target species
- Location is important
- At least a million documented crossings by wildlife of numerous species


2008-04-24 4:54:21 AM M 4/4 37°F
RAVALLI HILL 1
WWW.RECONYX.COM


2008-09-06 06:29:28 M 3/4 52°F
POST CREEK 3
WWW.RECONYX.COM


2008-07-24 18:59:40 M 1/4 75°F
RAVALLI HILL 1
WWW.RECONYX.COM


2008-01-09 6:48:04 AM M 1/6 30°F
RAVALLI HILL 2
WWW.RECONYX.COM



Slotted Drain Culvert

- Shawnee NF
- For rattlesnakes
- Used for salamanders too

Take Opportunities to Allow Wildlife AND Fish Passage

- Undersized Culvert
- Bridge allows better hydrologic function, fish and wildlife passage

Avoid Fish-Only Passages

- Baffles can be dangerous to some animals

Retrofitting Existing Structures

- Use when structures can be modified but not replaced

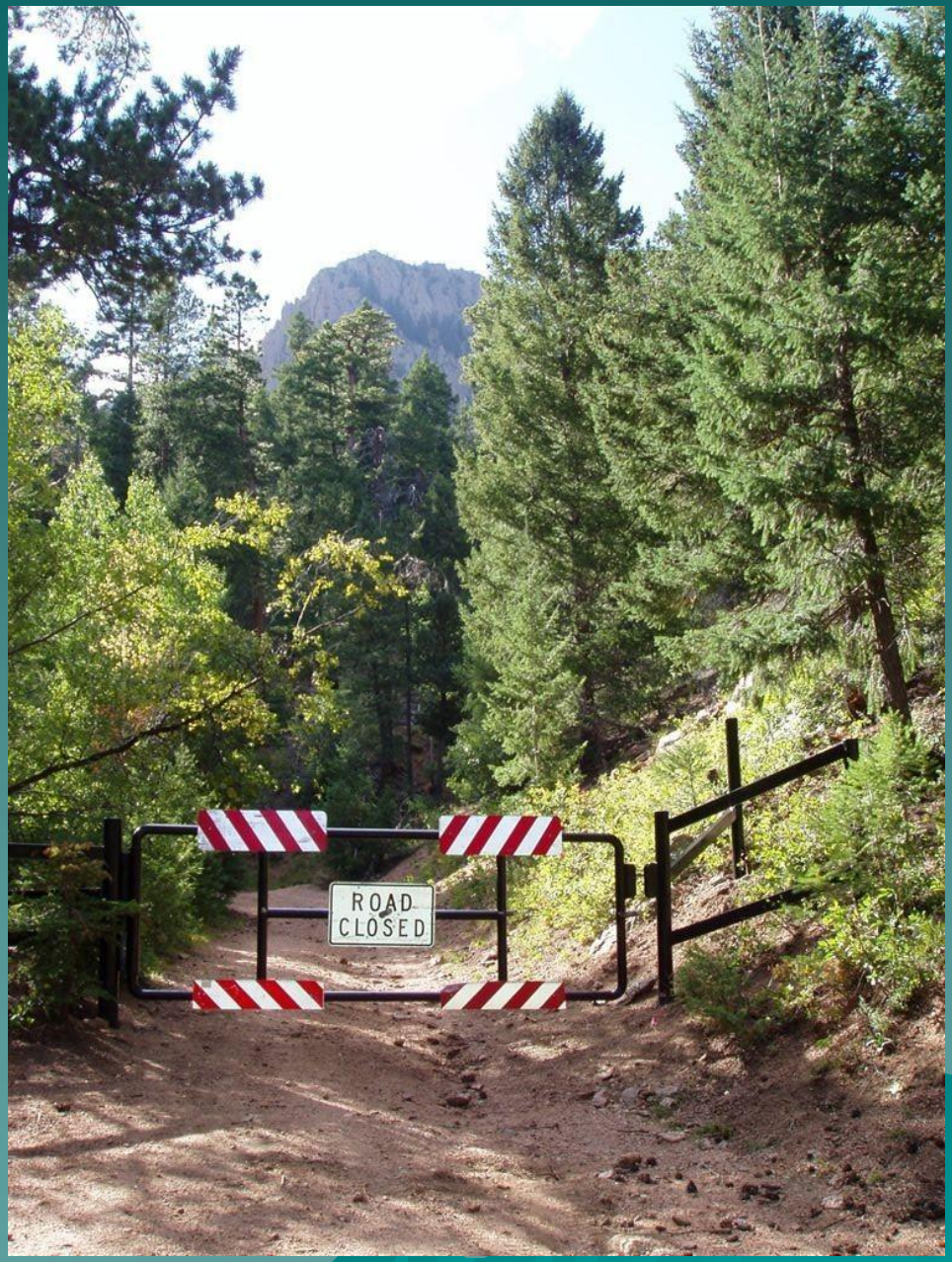
Retrofits

Temporary Fencing

- Silt fencing keeps turtles off park road while grant to fund turtle crossings with permanent fencing is completed

Gates—Seasonal or Permanent

- Reduces noise
- Reduces human presence
- Reduces wildfire risk
- Does not change substrate impacts



Road Decommissioning

Decommission-ing unneeded roads restores habitat

Boulders to Protect Meadow

Restoration by Filling in and Regrading away from Stream

- Hoosier NF

Repair to habitat from OHV damage

Thank you for your interest!

Questions?