WILDLIFE SHENANIGANS

Zane Pannell
Michelle Hunt

August 2, 2018
History of the Great Smoky Mountains

1923

1936
Economic Benefits to the Region

• Great Smoky Mountains National Park creates $953 Million in Economic Benefit
  – 11,421,203 visitors in 2018
  – Spending supported 13,737 jobs in the local area in 2018
Animal Mortality

- I-40 From MM 440 (near Pigeon River) to the TN/NC State Line
- 16 recorded deer crashes (2014 to 2018)
- 1 recorded coyote crash (2014 to 2018)
- 19 recorded bear crashes (2014 to 2018)
  - All Property Damage Crashes
  - All occurred at nighttime between 7:30 PM and 4:00 AM
  - All but 4 bear crashes occurred in October, November, December
  - Area has the highest vehicle-bear collisions in the state
- Research states 2/3 of all vehicle-animal collisions are not recorded
Project Area

Existing and Potential Wildlife Corridors Across I-40 in Pigeon River Gorge

- Foothill Parkway Bridges and Overpasses
- Pigeon River Bridge and Underpass
- Big Creek Underpass and Bridges
- Waterville Structures
- Double Tunnel Landbridge
- 12-Mile Project Area
- Harmon Den Bridges and Underpass
- East Bound Tunnel
- Fines Creek Bridges and Underpass
- Stevens Creek Tract
- Cataloochee Elk Population

Legend:
- National Park Lands
- USFS Lands
- State Forest
- SAHC Existing and Potential Cem Easements
- 2017 Wildlife Camera Placements
- Appalachian Trail
- State Boundary
- I-40 Structures
  - BRIDGE
  - CULVERT
  - OVERHEAD BRIDGE
  - UNDERPASS
- Roads
  - Other Roads
  - Interstate
  - US and State Hwy

Miles
Camera Locations

- Waterville Bridge
Elk 216 and Calf at Waterville
Elk 216 Collar Tracking
Camera Locations

- Mill Creek Culvert
Bear at Groundhog Creek
Two Part Mitigation Strategy

+ [Diagram of flood control structure]

+ [Diagram of fence]
## Species Specific Design

<table>
<thead>
<tr>
<th>Wildlife</th>
<th>Open-span bridge</th>
<th>Large-mammal underpass</th>
<th>Medium-mammal underpass</th>
<th>Small-to-medium-mammal pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deer sp.</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
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<tr>
<td>Elk</td>
<td>●</td>
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<td>●</td>
<td>○</td>
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<tr>
<td>Moose</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
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<tr>
<td>Mountain goat</td>
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<td>○</td>
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<tr>
<td>Bighorn sheep</td>
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<tr>
<td>Pronghorn</td>
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### Ungulates

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</tr>
</thead>
<tbody>
<tr>
<td>Weasel</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Pine marten</td>
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<td>○</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Fisher</td>
<td>●</td>
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<tr>
<td>Striped skunk</td>
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<td>●</td>
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<tr>
<td>Badger</td>
<td>●</td>
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<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Wolverine</td>
<td>●</td>
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<tr>
<td>Bobcat</td>
<td>●</td>
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<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Canada lynx</td>
<td>●</td>
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</tr>
<tr>
<td>Cougar</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Fox1 (V. vulpes, Urocyon)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Fox2 (V. macrotis, V. velox)</td>
<td>●</td>
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<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Coyote</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Wolf</td>
<td>●</td>
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</tbody>
</table>

### Carnivores

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</tr>
</thead>
<tbody>
<tr>
<td>Black bear</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Grizzly bear</td>
<td>●</td>
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</tr>
</tbody>
</table>

- ● Recommended/Optimum solution
- ○ Possible if adapted to local conditions
- × Not recommended
- ? Unknown, more data are required
Effectiveness of short sections of wildlife fencing and crossing structures along highways in reducing wildlife–vehicle collisions and providing safe crossing opportunities for large mammals

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ABSTRACT

Wildlife fencing in combination with marking structures is commonly regarded as the most effective and robust strategy to reduce large mammal–vehicle collisions while also maintaining wildlife connectivity across roads. However, fencing and associated measures applied in landscape-ecological settings are sometimes considered costly and unpopular. Therefore, length and costs are minimized. We investigated whether short fence sections were equally effective in reducing large mammal–vehicle collisions as long fenced roads (literature review) and, and 2) whether fence length influenced large mammal use of underpasses (two field studies). We found that 1) short fences (5 km road length had lower (52%) and more variable (0-100%) effectiveness in reducing collisions than longer fences (> 5 km) (typical ~80% reduction), 2) wildlife use of underpasses was highly variable regardless of fence length (split between studies), and 4) the proportional use of underpasses (vs. road surface) compared to fencing strategy varied (at least). Neither fence length (up to 25 km) nor underpasses (road surface) significantly increased or decreased use of wildlife. However, larger fence lengths do not necessarily guarantee a higher wildlife use of underpasses as seen varies greatly between locations, wildlife fencing can improve wildlife use as an individual substitute.

1. Introduction

Large mammal–vehicle collisions are abundant in many parts of the world (e.g., Great Britain and Ireland, 1965; Converse et al., 1995). Collisions with large animals typically result in the injury or death of the animals involved, substantial vehicle damage, and, in some cases, human injuries and fatalities (Allen and McGhie, 1990; Beraudier et al., 2007; Converse et al., 1995). Wildlife fencing in combination with marking structures is commonly regarded as the most effective and robust strategy to reduce these types of collisions while also maintaining connectivity across highways for wildlife (review by Huijser et al., 2009). If wildlife fencing and crossing structures are designed based on the requirements of the larger species, and if they are implemented and maintained correctly, the measures can reduce large mammal–vehicle collisions by 80–97% (Glaubig et al., 2003; Gagnon et al., 2015; Sawyer et al., 2012). In addition, the number of animal movements across underpasses or through underpasses, as well as the percentage of animals out of a local population that use the structures, can be substantial (Cowperg and Wallitt, 2000; Sandberg et al., 2013; Sawyer et al., 2012). Despite the benefits described above, wildlife fencing and crossing structures are sometimes considered a problem for under- and large mammal species such as bats, birds, and small mammals or other animal species that may be present. Further, the wildlife crossing structures may be considered aesthetically unappealing and disruptive to the environment.

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Unique Approaches

Multi-species approach
Unique Approaches

Cattle (Texas) Gates

Electrified Cattle Guard

Electo-Mat
I-40 over Pigeon River
I-40 over Pigeon River

STRUCTURE NUMBER: 15100400021

STRUCTURE NUMBER: 15100400024

PROPOSED FENCING

EB  ↓   40   ↑   WB
I-40 Exit 443 Interchange

PROPOSED FENCING

STRUCTURE NUMBER: 191004000312

STRUCTURE NUMBER: 191004000291

LOCATION 2

EB  ↓  WB
I-40 Curve near Rest Area
I-40 Curve near Rest Area

PROPOSED FENCING

STRUCTURE NUMBER: 181004000331

N

WB

EB
I-40 Exit 447 (Hartford) Interchange
I-40 Exit 447 (Hartford) Interchange
I-40 S-Curve

[Map showing the I-40 S-Curve with points of interest.]
PROPOSED FENCING
I-40 Exit 451 (Waterville) Interchange
I-40 Exit 451 (Waterville) Interchange

PROPOSED FENCING

EB

WB
I-40 at TN/NC State Line
I-40 at TN/NC State Line

PROPOSED FENCING
Partnerships