Active Deer Warning

Roadside Detection and Active Warning to Reduce Deer-Vehicle Crashes
Background

Project Location –
• South of Marshall, MN, Near Camden S.P.
• ~1 Mile along TH 23
Deer-Vehicle Collisions

- Over 1,000,000 DVCs/year nationally
- 200 Fatalities
- $1.2 billion in property damage only accidents
- MN: insurance company estimates 35,000 DVCs/year
- MN: 3 – 9 fatalities / year attributed to DVCs
Deer Characteristics

- Frequent movements across TH 23 during May and November
- May be more than 100 crossings per day
- More than 100 deer killed per year
Previous Attempts at Mitigation

- Active system installed in 2001
- Driver-focused warnings of deer presence
- No attempt to modify deer behavior
- Equipped ~1 mile stretch of road
- Used 11 detection zones and 11 signs in each direction
Previous System Characteristics

• Detection used IR LASER beam interruption
• Beacons were incandescent lamps with rotating reflectors
• Power supplied by rechargeable batteries
• Detector outputs hard wired to beacon relays
Issues With Previous System

• System did not include a recharging system for batteries
• High power consumption drained batteries in 3-4 days in peak seasons
• No mechanism for activating opposing-direction traffic.
Mn/DOT& SRF New Approach

• Began as a Mn/DOT Innovative Ideas proposal in 2004

• Focused on several aspects
  – Reduced power consumption
  – Sustained power supply
  – Two-direction notification
  – Flexible sign/detector relationships
  – Ease of installation and configuration
  – Low install and maintenance costs
Reduced Power Consumption

- Detectors have very low power draw (70mW)
Reduced Power Consumption

• Solution was to replace with LED beacons for ~ 85% reduction in power demand
Sustained Power Supply

- Multiple devices and remote location made AC power unattractive
- Low power demand from devices made solar power workable
- Each sign and detector location fitted with a one sq. ft. panel, battery and charge controller
Two Direction Notification

• Need to alert drivers in both directions of travel
• High cost made “pushing” under pavement unattractive
• Needed a simple, low power, wireless solution
Flexible Sign/Detector Relationships

- Needed to activate any combination of signs based on a detection
- Needed to be able to change sign to detector associations
- Hard-wiring was complex and difficult to reconfigure
- Needed a software-based approach
Ease of Installation and Configuration

• A general, as opposed to site specific, solution was needed
• Complex wiring or physical construction was to be avoided
• Should avoid any roadside infrastructure needs (AC power, guardrail, telephone service, etc.)
• Physical components should be familiar to DOT maintenance personnel
Low Install and Maintenance Costs

- System should be self-contained
- Components should be “off-the-shelf”
- Components should be easily replaced if damaged or failed
- Maintenance of components should be minimized
The Solution
Notes:
1) Type 1 sites have two transmitters and two Wavelogs
2) Type 2 Sites have as single transmitter and Wavelog

Active Deer Warning System Layout
The Solution

- Low-cost mesh network (ZigBee) devices
- System uses wireless modems
- ~3 year lifespan on internal battery
- ~1000m LOS range
- Internal processing of detection data
- Sign can be activated by any one of 15 detectors
- Low cost, sealed design
• Simple Installation uses existing structures
• Low power devices powered by solar/battery system
• Mesh network eliminates need for cabling
• Low cost makes system suitable for large areas
Set-Up Software

- Runs on PocketPC for ease of use in field
- Allows for configuration of sign/detector relationships
- Has wireless diagnostic functions
Installation

- Installed April 2007
- Removed several existing signs
- Added flashers
- Added power and communications to detectors
Evaluation

- System Operational 4/26/07
- Four (4) DVCs as of 9/14/04
- 80% - 85% reduction in DVCs
Evaluation

• Next peak movement season is November
• System will be monitored for functionality and performance
• Will compare 2006 DVCs with 2007
• If effective, system may be expanded to other locations
System Schematic

Roadside Deer Warning Sign
- Solar Panel
- Charge Controller
- Battery
- Power Inverter
- Wavenis Comms Device
- NEMA 4 Enclosure

Detection System
- Solar Panel
- Charge Controller
- Battery
- Wavenis Comms Device
- NEMA 4 Enclosure
Sample System Layout

Three Detection Zones and Two Active Signs Per Direction

1000 – 1500 feet
Contact Information

Brian Scott, P.E.
SRF Consulting Group, Inc.
763-475-0010
bscott@srfconsulting.com