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QUICK FIXES: WORKING TOGETHER TO ADDRESS HERPTILE ROAD MORTALITY IN NEW YORK STATE

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Abstract: Traditionally, state transportation agencies have designed and built environmental enhancements in response to regulatory requirements to mitigate project impacts. More recently, state transportation agencies have embraced an environmental ethic that goes beyond compliance and encourages agencies routinely to incorporate environmental enhancements into projects and activities. Generally, in-house staff or resource/regulatory agencies identify opportunities to address concerns regarding high-profile species (e.g., large mammals, endangered species).

Taking stewardship one step further, the New York State Department of Transportation (NYSDOT) has demonstrated innovative responses to problems brought forth by concerned citizens regarding a lesser-studied group of wildlife—amphibians and reptiles (collectively termed “herptiles”). These responses have resulted in valuable partnerships with private citizens, colleges, and resource agencies, thus increasing the agency’s credibility in its commitment to an environmental ethic and its reputation for getting things done.

This paper will establish how NYSDOT demonstrated its environmental stewardship on a working level with a quick response to expressed public concerns by highlighting two projects. In each instance, a private citizen alerted NYSDOT about their concern for high mortality rates of salamanders, frogs, and turtles in “hot spots” along the state highways. Common factors in these projects include: NYSDOT paid credence and a speedy response to a private citizen’s concern; maintenance forces applied their practical skills to develop an in-the-field solution to the problem; NYSDOT formed fruitful partnerships with colleges, private citizens, and resource agency experts; and costs were minimized by using surplus material, on-hand equipment, and simple designs.

By highlighting two specific examples, we will demonstrate that some problems can be solved quickly by bringing the right group of people together with a variety of skills and knowledge and a determination to get the job done. Methodology, results, and lessons learned will be presented and discussed.

The Canandaigua Lake Herptile Crossing was built in 2002 in response to expressed citizen concerns regarding the high rate of turtle mortality. This project included constructing suitable nesting habitat for turtles on private property and constructing a physical barrier to funnel turtles to existing culverts. NYSDOT formed partnerships with Finger Lakes Community College, the New York State Department of Environmental Conservation, and a private landowner. The Labrador Hollow Herptile Crossing was installed in 2003 in response to a 2002 posting on an internet listerv soliciting help in the “simply phenomenal” herp movement. A 12-inch culvert was installed to serve as a “critter crossing” and surplus w-beam guide rail was imbedded into the ground to guide salamanders and frogs to the culvert.

NYSDOT formed partnerships with the State University of New York’s College of Environment Science and Forestry (SUNY-ESF) and private citizens. These projects demonstrate how collaboration, flexibility, and responsiveness result in simple, creative designs with tangible benefits, fostering good will and a sense of stewardship.

This paper will also discuss research initiated by NYSDOT to identify and address the impacts of transportation on herptiles populations to guide future decision to address herptile-mortality concerns.

New York State DOT’s Road to Stewardship

The New York State Department of Transportation (NYSDOT) is the state’s largest public works agency. As such, the Department recognizes its obligation and responsibility to the people of New York State to protect, improve, and enhance the environment in the course of its business of planning, building, and maintaining a transportation system. Environmental stewardship builds on the values of the Department’s employees to protect the natural and cultural resources of the state. Caring for the environment while providing a transportation network allows NYSDOT employees to feel good about being “good neighbors” that a community or an individual will welcome rather than shun. Environmental stewardship builds credibility, trust, and goodwill, as well as building staff enthusiasm and morale.

NYSDOT’s environmental ethic has evolved over the last decade. In 1996, NYSDOT revised its mission statement to include “environmentally sound” alongside safe, efficient, and balanced transportation system. In 1998, the Department Environmental Initiative was launched (see <http://www.dot.state.ny.us/eab/envinit.html>). Since that time, NYSDOT has undertaken deliberate actions and adopted a more proactive approach to addressing environmental matters, including issuing Department-wide Environmental Initiative Guidelines and Procedures (<http://www.dot.state.ny.us/eab/eieab3.pdf>) and an Environmental Policy (<http://www.dot.state.ny.us/eab/files/policyen.pdf>).

In 2001, NYSDOT adjusted its organizational structure to establish environmental expertise on the ground to sustain its efforts of proactive environmental stewardship. Environmental support within NYSDOT has traditionally been provided by the Regional Landscape/Environmental Units housed in the Design Bureaus.

As environmental requirements and expectations increased, the need for maintenance and construction-phase assistance in the environmental field increased. To meet environmental-stewardship demands, the Department hired 22 seasoned environmental managers to work within the regional construction and maintenance units.

These managers' primary role is to identify and seize environmental stewardship opportunities, address various regulatory agency concerns, and make critical on-site decisions. This field presence of environmental staff maintains credibility with resource agencies and operation staff and provides ready access to machines, material, and manpower.

Presently, NYSDOT is undergoing a Transformation effort which continues to recognize the importance of environmental stewardship. This is evident in that "improving environmental conditions" has been identified as a priority result area, along with improving mobility and reliability, increasing safety, promoting economic sustainability, and enhancing security.

Herptiles and Roads in New York

New York State is host to 67 species of amphibians and reptiles. The state's diverse and widespread herptofauna includes most species present in New England and several additional species from adjacent northern, southern, and western regions. Each year, virtually all species of frogs, toads, and salamanders migrate from forest and fields to wetlands to breed. Turtles, in contrast, travel in the spring from waters to uplands in search of suitable nesting sites. This seasonal migration, along with their small size and slow rate of movement, make herptiles particularly susceptible to road mortality along NYSDOT's 16,500 miles of highway.

Efforts to Reduce Turtle Mortality--Canandaigua Lake Area Project

In New York State, turtles nest from late May to early July, depositing eggs in sandy or gravelly soil, lawns, mowed fields, roadsides, sphagnum moss, or sedge tussocks. During the nesting period, female turtles migrate from ponds and wetlands in search of suitable nesting areas, becoming vulnerable to mortality along roadways.

In western New York in the spring of 2000, NYSDOT was informed of an area of highway with high turtle mortality. A local citizen expressed concern about the high vehicular mortality of primarily painted turtles (*Chrysemys picta*) and common snapping turtles (*Chelydra s. serpentine*), both common species in New York, along a stretch of NYS Route 21 in Woodville at the south end of Canandaigua Lake. Initially, the citizen requested permission to erect "Caution Turtle Crossing" signs in the area. When that option was ruled out, other solutions were sought.

A partnership was formed among two NYSDOT Regions, the New York State Department of Environmental Conservation (NYSDEC), and Finger Lakes Community College. Collectively, these partners determined that to best reduce turtle mortality, a two-component strategy was warranted. This included (1) construction of suitable turtle-nesting habitat on the eastern side of Route 21 from where the turtles were crossing and (2) construction of a physical barrier approximately 1,400 feet in length to funnel turtles, frogs, and salamanders to four existing culverts to cross under the road.

This innovative solution resulted from utilizing the specialties of each of the collaborators. NYSDEC provided expertise on turtle biology and site selection, NYSDOT Region 4 assisted with planning and provided maintenance forces and equipment for project construction, NYSDOT Region 6 was also involved in project planning and provided funds for materials, Finger Lakes Community College performed a pre-construction assessment, and a private landowner permitted the turtle-nesting habitat construction on private property.

To create suitable turtle-nesting habitat, NYSDOT maintenance forces cleared a portion of an overgrown vineyard. Loose, gravelly fill from a nearby, recently cleaned ditch was placed in a crescent-shaped area approximately 30 meters by 10 meters (approximately 100 feet by 33 feet). A wooden barrier was placed between the newly created nesting area and Route 21 to discourage travel across the road.

In addition to the constructed turtle nesting habitat, NYSDOT installed a 1,400 foot (approximately 427 meter) wooden barrier along the Canandaigua Lake/wetland side of Route 21 to funnel herptiles to four existing culverts. This physical barrier is up to 16 inches high (41 cm) constructed of 2 inch x 8 inch (5 cm x 20 cm) lumber staked with metal sign posts.

This project was undertaken specifically to address the turtle mortality concern; it was not added on to a capital project or due to regulatory requirements. This field-designed solution took less than a week to construct and cost approximately \$15,000 in materials. NYSDOT maintenance personnel and equipment were used during construction. Ongoing maintenance of the constructed turtle-nesting area consists of one late-season mowing each year to prevent overgrowth.

Facilitating Herptile Movement – Labrador Hollow Project

New York State is home to 18 species of salamanders and 14 species of frogs and toads. Of these, ten species of salamanders are affiliated with woodlands and temporary vernal pools. Each spring, these woodland salamanders migrate, oftentimes in large numbers, from upland forests to these salamanders' breeding ponds. Similarly, on warm spring and summer nights, frogs and toads emerge in great numbers to congregate in ponds. During migration, these herptiles become vulnerable to becoming roadkill as their journey takes them across roadways.

The Labrador Hollow project is another example of NYSDOT's efforts to address herptile roadkill in response to a citizen's concern. On April 1, 2002, a local birder posted a note on a birding listserv, indicating that he needed "to contact the right people to get a drift net and tunnel built for this area because the Herp Movement is phenomenal." The referenced area was along Route 91 in the Labrador Hollow area. The most prevalent species noted were spot-

ted salamander (*Ambystoma maculatum*) (430), wood frog (*Rana sylvatica*) (350+), and northern spring peeper (*Pseudacris c. crucifer*) (2000+).

An Environmental Specialist from NYSDOT's Environmental Analysis Bureau, an avid birder, noticed this note on the listserv the next day and contacted the person, a graduate student at the State University of New York, College of Environmental Sciences and Forestry (SUNY-ESF). Follow-up contacts were made with Dr. James Gibbs, a herpetologist at SUNY-ESF, and to the regional environmental/landscape staff in the Syracuse office. After all the right people were connected, the collaboration began.

Within eight days of the original posting, a NYSDOT landscape architect from the regional landscape/environmental unit met with the birder/herp enthusiast for site reconnaissance. The area of concern was a 3.5-mile (5.6-km) section of State Route 91 within the state Labrador Hollow Unique Area. Considering that the NYS Department of Environmental Conservation owned land on both sides of the highway, the NYSDOT landscape architect, via e-mail correspondence, recognized that "the opportunity for a partnership with both agencies as well as the College are (sic) excellent." NYSDOT contacted NYSDEC and facilitated a fruitful partnership between the resource agency, the transportation agency, and the research college.

The following spring, SUNY-ESF, in partnership with NYSDOT, established a study area and conducted field surveys to determine concentrated areas of mortality. Concurrently, the NYSDOT maintenance environmental coordinator was pursuing an option with the maintenance Resident Engineer to install a herp culvert/crossing using maintenance forces in the summer prior to a paving project.

The enthusiasm for the project was great. Regional environmental staff, sometimes accompanied by their spouses and children, conducted night surveys of herptile movement. E-mails included excerpts such as "great flow of ideas and interests!" and "Oh what fun we are having!" The camaraderie and enthusiasm was infectious.

During the summer of 2003, NYSDOT placed a 12-inch (30.5-cm) culvert across the road to serve as a "critter crossing" for amphibians and reptiles. The culvert consisted of two twenty-foot (6-meter) sections of 12-inch diameter corrugated metal pipe that were surplus in the maintenance yard. The culvert was placed prior to a planned paving job in the summer, thus signs of the installation were covered shortly after construction.

In the autumn of 2003, SUNY-ESF students, in cooperation with NYSDOT, installed drift fence in the woods to guide salamanders traveling down the forested slope to the crossing location. The drift fence consists of old, metal W-beam guide rail that was available for reuse in the scrap pile at one of the maintenance residencies. The drift fence was staked with cut rebar.

SUNY-ESF students conducted post-construction monitoring in the spring of 2004 to determine the number of mortalities along the road in the vicinity of the crossing. The study design was altered from the pre-construction study due to time constraints and limited volunteers. The findings of the spring 2004 study were inconclusive. Future monitoring studies are anticipated.

Similar to the Canandaigua Lake Project, the objective of this project was to address road mortality of herptiles specifically in response to a citizen concern rather than a capital project or regulatory need. This project, too, was conducted with maintenance forces and equipment, as well as volunteers. The resourcefulness of the maintenance staff to use scrap and surplus material is noteworthy. It took two days to install the pipe and another two-week period (not a fulltime effort) to install the drift fence. The collaborative efforts of NYSDOT, SUNY-ESF, and NYSDEC resulted in an inexpensive, field-designed, and quick solution.

Lessons Learned

There are several lessons learned from these projects. Firstly, the Department should establish a post-construction monitoring program prior to construction. NYSDOT has found that it is not feasible for agency forces to monitor the project after construction. Departments considering similar projects should explore partnering opportunities with other organizations (such as a local college or interested environmental group) to monitor the effectiveness of the project. Secondly, departments should anticipate the need for repairs and finishing touches, then plan accordingly. Though scheduled maintenance is working well, NYSDOT has found that each of the referenced projects needs repair or finishing on some sections.

Research

Though the quick, solution-oriented response to an identified herptile roadkill problem is commendable, NYSDOT recognizes the importance of research to guide and ensure well-informed decisions. To that end, NYSDOT developed and submitted a request for proposals in the fall of 2004 to initiate a research project exploring viable mitigation measures in the project process that address herptile crossings.

In the spring of 2005, SUNY-ESF was awarded a contract entitled "Effects of New York State Roadways on Amphibians and Reptiles: Research and Adaptive Mitigation Program." This research project is funded through the Federal Highway

Administration (FHWA) Statewide Planning and Research (SPR) program. The study duration is scheduled for four years; NYSDOT's share of the project cost is \$189,000.

There are unresolved questions to which answers would facilitate better decision making. Dr. James Gibbs, SUNY-ESF, has articulated several of these questions for NYSDOT, such as:

- Is herptile roadkill really a problem for local populations?
- What mitigation structures will these animals actually use?
- What habitat factors are associated with road-crossing sites?
- Can these road-crossing sites be accurately predicted through habitat modeling?
- Can such models be built into geographic information system (GIS)-based transportation planning systems?

SUNY-ESF proposes an integrated research and adaptive mitigation program that addresses three primary objectives:

1. Document the impacts of transportation infrastructure on herptile populations.
2. Determine the landscape, local habitat, and architectural attributes of effective herptile crossing structures.
3. Employ habitat analyses to identify "connectivity zones" where crossing structures would be most appropriately deployed along New York State roadways.

In support of these objectives, the research team will conduct five integrated studies defined in these tasks:

- i. Conduct literature review
- ii. Evaluate effects of roadways on amphibian and reptile populations
- iii. Assess the use and effectiveness of various crossing structures
- iv. Determine the optimal field placement of functional crossing structures for amphibians and reptiles
- v. Develop a GIS-based predictive model/expert system and planning toolbox

In the summer of 2005, SUNY-ESF graduate students initiated field studies. For Task ii, the investigators will perform field surveys of herptile populations at various distances from roadways to determine whether a "road effect" on populations occurs and, if it does, to estimate the width and breadth of the effect zone. To assess the use and effectiveness of the various crossing structures (Task iii), the investigators will create a behavioral choice "arena" that exposes many herptile test subjects to variations in crossing-structure type. The purpose is to identify those architectural attributes of crossing structures most associated with herptile usage and to develop a cost/benefit ratio (financial costs versus biological benefits) of various structure designs. Additionally, the investigators have commenced a literature review of road/herptile research.

Conclusion

NYSDOT prides itself as an agency committed to environmental stewardship and customer focus. The Department's actions outlined in this paper demonstrate these commitments. The Department's established environmental ethic and commitment to responding to public concerns are keys to success. Environmental staff working in the maintenance division provides on-the-ground forces to address environmental issues.

Additionally, maintenance forces that are willing to commit material, machines, and staff enable the Department to keep solutions cost-effective and simple. Forming partnerships with colleges, resource agencies, and environmental groups is essential to tapping into the necessary expertise and materials. Further research is needed to grasp the herptiles/road effect and develop solutions. Findings from the ongoing research undertaken by SUNY-ESF and funded by NYSDOT will facilitate the Department in making better-informed decisions to address concerns related to herptile road mortality.

Biographical Sketches: Debra Nelson joined the New York State Department of Transportation in 1992 and is the manager of the water/ecology section of the NYSDOT Environmental Analysis Bureau in Albany. Debra is a Certified Ecologist, a Professional Wetland Scientist, and a member of the Transportation Research Board's Task Force on Ecology and Transportation.

Mary Ellen Papin holds an M.S. degree in environmental science and a B.S. degree in biology. After working in the environmental-services field, Mary Ellen joined NYSDOT in 1994 as an environmental specialist. Since 2001, she has been the maintenance environmental coordinator for the Region 4 Transportation Maintenance Division.

Tim Baker has a B.S. in environmental science from Norwich University. Tim joined NYSDOT in 1998 after working for environmental services consultants. He is presently the maintenance environmental coordinator in NYSDOT's Region 3 office in Syracuse.