THE CHALLENGES AND CONSIDERATIONS IN DEVELOPING A WILDLIFE CROSSING AT TURNER RIVER: AN EFFORT TO PROTECT THE ENDANGERED FLORIDA PANTHER FROM HIGHWAYS AND VEHICLES IN BIG CYPRESS NATIONAL PRESERVE

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Date Submitted: November 15, 2010
Word Count: 6,230
Photos (1) Maps (1)
ABSTRACT

The breeding population of the endangered Florida panther (*Puma concolor coryi*) is currently confined to 4,860 square miles of suitable habitat in south Florida. Recovery efforts for the species, initiated over 30 years ago, emphasize its reintroduction into other areas of its historic range. To accomplish this goal, the females of the existing population need to survive, reproduce, and raise offspring to adulthood. The highest documented cause of female panther mortality for the past 30 years has been collisions with vehicles (46%). Between 1996 and 2006, 4 panthers, 3 of which were females, were killed in a specific area on U.S. Highway 41 at Turner River within Big Cypress National Preserve, highlighting the necessity to provide safe passage at this site, using a technique proven to save panther lives at other locations.

In 2006, Defenders of Wildlife, a non-profit wildlife advocacy organization, with sponsorship from the National Park Service and through an agreement with the U.S. Fish and Wildlife Service, applied for a Transportation Enhancement grant from the Florida Department of Transportation to fund construction of a wildlife crossing at this location. The project was awarded funding to develop a Project Development and Environmental Study to determine the feasibility and design of a wildlife crossing at this location. This paper details the challenges and considerations that guided project development, design selection justification, obstacles that ultimately cancelled the project, and lessons learned. Since 2006, 2 more female panthers have been killed at this particular site.
THE HISTORY OF ROADS IN BIG CYPRESS NATIONAL PRESERVE

Big Cypress National Preserve (Big Cypress), a unit of the National Park Service, is one of the largest roadless land areas in the eastern United States. Although a destination for approximately 1 million visitors annually, the Big Cypress is also traversed by motorists using the highways as a thoroughfare to cross the southern end of the state (Figure 2). They use the two major roads, Interstate 75 (State Road 84) and U.S. Highway 41 which connect the east and west coasts of south Florida. Within the Big Cypress 1,100 square-mile wetland ecosystem, there are only 30 miles of interstate highway (I-75), 40 miles of paved 2-lane highway (U.S. Highway 41), and 55 miles of secondary unpaved roads (County Roads 837, 839, 841, and SR 94). The paved road (SR 29) that borders Big Cypress, extends for 30 miles on its western edge (Figure 2). With so few roads, many wildlife species in Big Cypress have the advantage of living their lives without the danger of crossing a road. Animals such as Florida panthers, however, with home ranges of 80 square miles for females and 200 square miles for males, often face the risk of death from a vehicle (USFWS 2008). This animal and the efforts made to protect it from further losses when crossing a specific natural corridor (the Turner River area) on U.S. Highway 41 is the focus of this paper.

U.S. Highway 41 (US 41) or “Tamiami Trail”, so named because it connected Tampa and Miami, was completed through Big Cypress in 1928. As coast-to-coast travel demands surpassed the capability of this highway, a new road was planned 20 miles north of US 41 and completed in 1969. When these roads were built, the majority of this south Florida wetland ecosystem called Big Cypress Swamp was privately-owned, mostly by Barron G. Collier. These roads that now cut through the “swamp” literally paved the way for development as it expanded from the coastal cities.

In order to make this swamp land more inhabitable for humans and to promote development, plans were devised to dig a series of canals to channel the water and dry the wetlands. After many years of unsuccessful attempts to drain this land that was once viewed as “miserable” and “useless”, opinions finally began to shift toward an appreciation of this unique ecosystem and the goal became to protect rather than destroy it. However, the roads were already built and damage already done, as these roads acted as dams and impacted the natural sheet-flow of water so vital to the integrity of the Everglades and its estuaries (Robinson 1996). After much debate and negotiation, protection of these lands and its resources was finally secured through the establishment of Big Cypress National Preserve in 1974. With that, the mission of the National Park Service was to “ensure the preservation, conservation, and protection of the natural, scenic, hydrologic, floral, and faunal, and recreational values of the Big Cypress watershed…” [The Big Cypress National Preserve Establishment Act—16 U. S. C. 698f(a)].

Conservation of these values included the Florida panther and its largest remaining habitat.

THE FLORIDA PANTHER, HIGHWAY MORTALITY, AND MITIGATION EFFORTS

The Florida panther historically occupied eight southeastern states, from Texas to Florida. By the mid-twentieth century, habitat alteration, fragmentation by highways and development, prey base losses, and intentional persecution of this predator reduced its population to fewer than 30 individuals, most of which persisted in the Big Cypress Swamp in south Florida. As plans to upgrade SR 84 to an interstate (now known as I-75) in the early 1980s were made, an occasional panther was struck on this road. With the realization that the Florida panther wasn’t extinct, efforts focused on what steps were necessary to save the last of this species east of the Mississippi River. As a result, the design plans for the I-75 project were then refocused.

The design of I-75 shifted to include wildlife underpasses to allow this endangered species, along with other inhabitants of this ecosystem, such as white-tailed deer, black bears, and alligators, to safely cross under the road. In 1993, the 40-mile section of I-75 linking the east and west coasts of south Florida was completed. Wildlife were provided safe passage through a series of 36 underpasses, 13 of which also enabled the natural north-to-south flow of water to continue unimpeded. Underpass sites were selected based on natural habitat corridors and known crossing concentrations and averaged one mile

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Paper revised from original submittal.
Krista Sherwood

between each. Continuous 10-foot-high chain-link fencing on both sides of the interstate funnels wildlife to the underpasses. Since the completion of this $99 million project in 1993 (a cost which included the interstate upgrade and ecological mitigation improvements for wildlife movement and water flow), only 2 panthers have been killed within that segment, after accessing the road either through a hole illegally cut in the fencing or via the SR 29 intersection (Jansen et al 2010).

Concurrent efforts to save the Florida panther complemented the construction of the underpasses along the interstate. The few panthers that remained were breeding with each other, resulting in inbreeding depression, as evidenced by heart defects, low reproductive success, and overall poor vigor. The infusion into the population of additional genes, accomplished by introducing 8 female panthers from Texas in 1995, rescued the ailing panther population from extinction (McBride et al 2008). Coinciding with this effort was an analysis of the extent and quality of habitats required for the panther to persist in south Florida resulting in a determination of 4,860 square miles of suitable habitat (Kautz et al 2006) and an ongoing program to preserve those lands. Today, after a 30-year recovery effort, the population count is 100 to 120 individuals, occupying nearly 3,400 square miles, most of which are in public ownership (Kautz et al 2006, McBride et al 2008). As the panther population increases, so is the need for more suitable habitat. The U.S. Fish & Wildlife Service’s Panther Recovery Plan documents the strategy necessary for the endangered species recovery and includes expanding the panther’s population and its habitat in south Florida, expanding the population into south-central Florida, and to reintroduce panther populations outside of this area into its historic range (USFWS 2008). In order for this to be accomplished, it is necessary to preserve the existing population, especially the breeding females, as a source of individuals for reintroduction.

Although panthers have been protected from collisions with vehicles along the 40-mile stretch of I-75, they still die in unacceptable numbers on other south Florida roads. Vehicle-related mortality is the leading cause of known panther deaths, although, in the portion of the population sampled via radio-telemetry, it is the second known cause of death, preceded by intraspecific aggression, i.e., panthers killing panthers. Intraspecific aggression is often a result of an aggressive territorial behavior between panthers, primarily between males or males with females when raising kittens. With the panther’s large home range requirements, larger suitable habitat areas are necessary to decrease the likelihood of this type of encounter and source of mortality.

Whereas human intervention is not possible in averting intraspecific aggression, it is possible to alleviate panther deaths on roads. As documented by the Florida Fish and Wildlife Conservation Commission (FWC), from 1981 through 2009, 139 panthers have been killed and 8 panthers injured by vehicles on Florida’s roads. The deadliest year to date was 2009, during which 16 of 23 known panther deaths were on Florida roads. This annual loss of almost 20% of the population is a detriment to panther survival, population growth, and most importantly, decreases the likelihood of their expansion into other areas of their historic range (USFWS 2008).

Although panther deaths are now rare within the 40-mile fenced portion of I-75, they continue to occur on US 41 and SR 29. From 1981 through 2009, 33 panthers on SR 29 and 15 on US 41 have been killed. The majority of the land on either side of these two roads is suitable panther habitat in public ownership. In response to unacceptable levels of panther mortality along SR 29, six wildlife underpasses were built between 1995 and 2007. The placement locations of these crossings were determined by documented panther mortality and known movement corridors. Panther mortality, however, continues on this roadway because the fencing associated with these wildlife crossings is not continuous and the number of underpasses may be inadequate. Only 7 miles of fencing occurs in the 23-mile portion of this roadway that is in Big Cypress. By implementing a successful model such as the one used on I-75 of closely-spaced underpasses coupled with continuous fencing, panthers will also be able to safely traverse SR 29.
Of the 9 panthers killed on US 41 within Big Cypress boundaries, 6 were killed in one location near Turner River. Turner River, located near the small town of Ochopee on US 41, is surrounded by a cypress and hardwood strand that was fragmented by the construction of the road. Panthers monitored through radio telemetry by the National Park Service (NPS) revealed that this was a favored crossing location. Six panther deaths, 5 of which were female, and 3 panther injuries due to collisions with vehicles were documented near Turner River between 1984 and 2009. The need for a wildlife crossing in this area was first recommended in 2004 by the NPS (Jansen et al 2004). As female panther deaths continued at this site, the USFWS stated that the loss of this reproductively critical component of the population was “unacceptable” (Paul Souza, pers. comm., June 2009) and efforts began in order to resolve the problem.

The objective of this project, therefore, was to provide safe passage for panthers crossing US 41 at Turner River in Big Cypress National Preserve where panther crossings and vehicle-related mortality were concentrated.

THE TURNER RIVER PROJECT DEVELOPMENT

To address this objective, a collaborative effort among the National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS), and Defenders of Wildlife (Defenders), a non-profit national wildlife advocacy group, was initiated in 2006. Defenders was the formal applicant and USFWS the project sponsor for a Transportation Enhancement grant provided through the Federal Surface Transportation funding of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), administered by the Florida Department of Transportation (FDOT).

The application requested approximately $4 million for the construction of a wildlife crossing on US 41 at Turner River to provide for safe passage of the Florida panther, however, Defenders was awarded $675,000 for Fiscal Years 2007 and 2008; an amount that would fund the crucial Project Development and Environmental (PD&E) planning phase. Because the applicants realized that a vital element of this multi-disciplinary project was the assistance of professionals in transportation planning, the NPS applied for and received funding through the National Park Foundations’ Transportation Scholar Program for an on-site Transportation Planner with the educational background, skills and experience essential to represent them in this project. This paper’s author became the Transportation Planner assisting the National Park Service and Defenders in this project.

Transportation Planning Process

The purpose of the PD&E was to develop a project design in compliance with Federal and State laws and regulations. It would also provide for the standard of quality assurance for project development should the project progress toward construction. Within this phase, the necessary environmental analysis, project design, and public involvement process would be completed. As the project involved construction on a highway in the National Highway System and was funded with Federal monies, the Florida Department of Transportation would conduct the required PD&E process both in-house and through contracted services.

The on-site Transportation Planner collaborated with the involved parties to obtain and disseminate information specific to the area (i.e., land-use, recreation, environment, and wildlife characteristics, etc.), ensure plans integrated unique federal land regulations designated for the area, and incorporate environmental initiatives and transportation needs into the regional transportation planning process through the metropolitan planning organization. More specifically, to:

- Determine and evaluate the intrinsic environmental characteristics of the area’s habitat.
- Provide a wildlife species inventory of the area, with emphasis on state and federally listed species.
- Determine patterns of wildlife movement and mortality in relation to environmental parameters.
- Determine overall project-specific data needs; obtain and analyze available data.
- Survey existing infrastructure, property/site locations, land-use information, and recreation areas.
- Provide an assessment of impacts from highways and transportation corridors on wildlife and environmental needs, document existing mitigation efforts, and provide resources of successful mitigation efforts.
- Evaluate the characteristics of the surrounding transportation corridors and urban areas for consideration of current and potential future impacts on the area and resources.
- Include the project into the annually updated Collier County Metropolitan Planning Organization’s Transportation Improvement Program, a five-year transportation project funding priority plan submitted to the FDOT.
- Serve on the Technical Advisory Committee of the Collier County Metropolitan Planning Organization as an environmental representative.

**Design Specifications**

The project area encompassed 2.2 miles of US 41 from Turner River Road which is just east of Turner River and extends to Bass Lake Road, approximately 2 miles west of the river. The initial design under consideration was replacement of the existing 57-year-old bridge at Turner River with a higher and longer “profile bridge”. This design would provide for dry wildlife crossing on either side of the river, similar to the underpass design on I-75. Although the bridge was built in 1953, the most recent bridge inspection by FDOT indicated a rating that does not currently warrant a mandatory bridge replacement (FDOT pers. comm., 2008). Inspections assessing bridge conditions are required by the Federal Highway Administration to be completed no greater than bi-annually. Should the bridge be replaced prior to the end of its life cycle, the expense would be voluntary, meaning that funding is typically not allocated and would need to be pursued. As of 2009, the bridge replacement costs by type were:

- Standard (bridge at current height) = $5-6 million.
- New flat slab bridge with 8’ clearance = $15.4 million.
- Pier or profile bridge = $18 million.

Of the three bridge types listed above, the “profile” bridge would be the only option that would accommodate wildlife crossings under the bridge on either side of the river. However, the bridge replacement design was ultimately removed from further consideration because:

- A less costly option was available (a box culvert design).
- It would funnel wildlife to an area designated as a public access site to the river (the Turner River Canoe Launch visitor site at the bridge).
- It would not meet the sight distance requirements for turning off the highway into private driveways within the project area or the public access drive at Turner River. For the designated speed limit of the roadway, FDOT requires a 600 foot sight distance and the Federal Highway Administration’s suggested requirement is 900 feet; the stricter federal requirement was used in this determination.

The bridge replacement design would have been feasible with sufficient funding, private property acquisitions, and repositioning of the canoe launch site. However, timeliness was a deciding factor in choosing a design for the PD&E. Meaning, it was necessary to choose a design that would potentially meet the objective of providing safe passage for the Florida panther sooner.

An alternative design, termed “the two-crossing design” was developed. This design consisted of placing two prefabricated box culverts approximately 1,500 feet on either side of the river. One box
culvert would be 8 feet high by 24 feet long. The second culvert would be smaller, i.e., 7 feet high by 14 feet long. The smaller dimensions of the 2nd culvert would serve two purposes. One, it was necessary in order for the highway grade to meet the safe sight distance requirements for the driveways on the west side of the project area and two, although there have been anecdotal incidents of puma species using small passageways, a crossing of this size has not been tested. The smaller crossing design would, therefore, be experimental. Changes in the posted speed limit and private property purchases would be necessary in order to increase the culvert dimensions.

Both designs, the “profile bridge” and “the two-crossing design” would have included 10-foot high chain-link fencing, similar to that on SR 29 and I-75, extending 2.2 miles on both the north and south sides of the highway.

Much discussion ensued among Big Cypress, Defenders, USFWS, and FDOT on the overall design and design features. Due to extended project planning and time constraints for FDOT Fiscal Year (FY) funding allocations, this necessitated the allocated PD&E funds to be “rolled over” to the FY 2009/2010 program of projects to ensure the funds would not be lost. The following is a detailed list of the elements, categorized as advantages and disadvantages for each design, which were considered in determining the preferred wildlife crossing design for the conceptual plans and public meetings:

The Bridge Replacement Design – “Profile Bridge”

Advantages

- Placement of a wildlife crossing at the bridge is closer to documented panther highway crossing sites, based on radio-telemetry and vehicle-related mortality.
- Design would potentially meet the goal of the project, i.e., safe passage for the panther under US 41 at Turner River.
- Design would incorporate solutions for multiple Big Cypress land and resource management issues, including wildlife mortality mitigation, year-round accessibility to the river as a result of the greater height clearance under the bridge, and potential watershed mitigation through a greater flow-way under the highway.

Disadvantages

- More costly approach for the intended objective. It was estimated that construction would cost an additional $10 million than the alternative design option.

![Figure 1: The US 41 bridge at Turner River during a period of high water levels in which canoe access under the bridge is not possible. Photo by Bob Sobczak](image-url)
• Funding not available with the current awarded grant amount to complete the PD&E for this design (FDOT pers. comm., 2008).
• Would require modification of the present Turner River Canoe Launch site because the current entrance location would not meet safety sight distance requirements with the resulting grade change of this proposed design.
• Would require a higher land acquisition priority ranking within the NPS and a subsequent purchase of a private property (should the property owners be willing to sell and funding available). This property’s entrance would be affected by the design and not meet the safety distance requirements.
• Design would funnel panthers to a human recreation-use area (Turner River Canoe Launch site), recently designated by the NPS as a visitor access site. Panthers may exhibit avoidance of the area due to increased human use at or near the site.
• Panthers would need to parallel the fence for a longer distance before reaching the underpass.

The Two-Crossing Design (pre-fabricated box culverts east and west of Turner River)

Advantages
• Design would provide for more than one crossing location.
• Design would potentially meet the goal of the project, i.e., safe passage for the panther under US 41 at Turner River.
• Less distance required for a panther to parallel the fence until it reaches a safe crossing location (two crossings within the 2.2 miles of fencing).
• Use of prefabricated box culverts would provide for a more cost-efficient approach.
• Allotted funding from FDOT supports the PD&E planning phase for this design.
• Funding estimated for the construction phase may be more realistic and less timely to acquire (estimated at approximately $10 million less than the bridge replacement cost).
• Design would not directly impact the existing canoe launch site.
• Design would not require the purchase of private property ahead of the current NPS acquisition schedule.
• One box culvert size would be experimental since it is smaller than any installed in south Florida for panthers. If successfully used by the panther, it would provide a future option of an effective and potentially less expensive wildlife crossing.
• Design would be consistent with both FDOT and Federal Highway Administration Safety Standards.

Disadvantages
• Increased project/construction area; two separate construction sites rather than one in the bridge design.
• One box culvert size will be experimental since it is smaller than any installed in south Florida for panthers.
• Two highway grade changes within one mile of each other.

To summarize the costs, in 2009 the “profile bridge” was estimated to be approximately $18 million and “the two-crossing design” was estimated at $8 million. The costs for the fencing and the temporary diversion road would be comparable for either design. It is important to note that design safety measurements were based on current, not projected, traffic counts. The design safety was also measured using only the posted speed limit, not the actual traffic speed on this roadway which is typically much higher than the posted speed limit.
Design Selection, the Public Involvement Process, and the Outcome

Based on the above analysis of the two designs, the decision was made to move forward with the two-crossing design (consisting of the box culverts) as the preferred design. The next step for the PD&E was the public involvement process for FDOT to present the project, background information, and results of the necessary analyses, and the proposed preferred and alternative designs. Public meetings are a mandatory and important step in the project development process because it provides an opportunity for enhanced community involvement and public comment. Based on public input, project and design modifications may be necessary and desirable prior to completion of the feasibility study and final design.

In June 2009, the first official public meeting was held in a community near the proposed project site, hosted by FDOT and attended by citizens and representatives from the participating agencies and organizations. A total of 53 citizens signed the attendance sheet. The comments received at that meeting, or mailed in, were then reviewed by FDOT and summaries were provided to Big Cypress, Defenders, and USFWS. Comments included suggestions for alternative solutions at this site such as traffic calming devices that consisted of rumble strips or ‘round-a-bouts’, placement of more signs and flashing lights, and removing the roadway altogether. These suggestions were considered by FDOT as not feasible, given the functional classification of the highway, as well as its traffic volume.

Included in the intricacy of this project was not only an environmentally sensitive ecosystem and an endangered species, but also an area of cultural importance. Several Native American groups, the Seminole Tribe of Florida, the Miccosukee Tribe of Indians, and independent tribal members claim protected sacred and ceremonial sites within Big Cypress. The Tribes were invited to provide their input on the project early in the process. During discussions, comments received from the Tribes included concern that the fencing would deny access to sacred sites near the project area. They also stated that the project was an unnecessary expenditure of money during an economic downturn and that the project should not focus on a single species, the Florida panther. Comments from other respondents included loss of access for recreational use caused by the 2.2 miles of fencing, as well as comments on the aesthetics of the fencing itself. Project maps demonstrated that the area could be reached from other nearby entrance locations. Advocates of the project commented that the access inconvenience was a small price to pay for remedying the panther deaths in this area.

As explained by FDOT, the comments are assessed on their merit, not on the number supporting or opposing the project. However, based on the negative comments and the threat of legal action by the Tribes, Defenders and FDOT made the decision to abandon the PD&E study and pursue an alternative solution with the awarded funds. Subsequently, the next steps, i.e., completion of the PD&E study and planning process, project feasibility determination, project design, additional public participation opportunities, and pursuit of funding for the construction phase, were not taken.

A Proposed Alternative

In an early coordination meeting in 2008 with FDOT and the cooperating agencies, the need to find a temporary solution that would immediately protect the panthers was discussed, as the construction of a wildlife crossing might take years. FDOT agreed to provide speed feedback signs that would alert motorists to their current speed in comparison to the posted speed limit. This would serve not only to potentially slow vehicle speeds in the project area, but also to obtain a database of actual speeds, as motorists tend to drive well above the posted speed limit in this area. Two speed feedback signs were installed in November 2010 on either side of the project area on US 41.

With the termination of the wildlife underpass and fencing design option, discussion and planning began for implementation of a Roadside Animal Detection System (RADS), funded by the $675,000 Transportation Enhancement grant. RADS is an electronic motorist warning system that utilizes infrared sensors and flashing lights to alert drivers to wildlife that have been detected near the roadway. The ability to provide for an early detection of wildlife is an important factor in measuring the system’s
success. RADS has been implemented experimentally in dry, open landscapes, but not in dense
vegetation or a subtropical climate such as south Florida. Therefore, placement of RADS at Turner River
would be experimental (Marcel Huijser, pers. comm., 2010).

Defenders and the involved agencies discussed design preferences for the RADS based on the
characteristics of the project site and Florida panther behaviors in order to select the most effective setup
of the system. In October 2010, FDOT advertised the project in a Request for Proposals to obtain work
bids from qualified contractors who would implement and monitor RADS at the Turner River site. The
bidding period for proposals closed in November 2010. The selection results and the project
implementation schedule will be provided by FDOT.

**IMPORTANT CONSIDERATIONS AND LESSONS LEARNED**

Through the development of this project, several important elements were identified that significantly
impacted its outcome. Many of these considerations and lessons learned could be applied to other
transportation projects that involve natural and cultural resource protection initiatives (i.e., other wildlife
crossing projects). In project development, it is important to consider the following:

- **Inter-disciplinary Staff Involvement:** Involve experts in a combination of fields including
  engineers, planners, biologists, botanists, hydrologists, resource management specialists, law
  enforcement, and maintenance. This will ensure a multi-disciplinary approach for analyzing
  and incorporating all variables potentially involved in a project. This particular project was
  able to utilize the staff at Big Cypress as specialists from multiple disciplines to analyze
  project and area needs in depth and to better determine a suitable design solution.

- **Public and Tribal Support:** Involve the public, especially local residents and area
  recreationists, and tribal members early in the planning process. Although there may be
  conflicting agendas, it is crucial to ensure collaboration with all affected parties early on for a
  successful project result. It is also important to understand that public sentiment and special
  interest groups can often outweigh scientific evidence, especially for decision-makers. It is
  not always a level playing field.

- **Importance of Public Meetings:** Convey project information and scientific evidence at
  presentations, meetings, and workshops, through a facilitator whose role is crucial. The
  designated staff for this role should strive for educated awareness and consensus building.
  They should ensure a comprehensive involvement process and incorporation of all comments
  and suggestions throughout the project development process. Misconceptions of project
  information or feelings of lack of involvement in the decision-making process will never lead
  to desirable project results. Although multiple planning meetings were held with the
  involved agencies throughout the development process and information was always available
  to interested stakeholders and the public, this particular project potentially could have
  benefitted from additional public meetings, organized and facilitated by FDOT held early on
  in the process.

- **Environmental Feasibility:** Determine the benefits of the design and compare those with the
  project’s objective and goals for the land area and the resources affected. When more than
  one design is considered, document, address, and communicate the advantages and
  disadvantages of each design. The design must always assure accommodation and protection
  of significant natural and cultural attributes of the area, otherwise a project may not be
  successful or damage could be done to these resources.

- **Extensive Analysis:** Analyze design alternatives for potential effects on environmental,
  economic, and social elements, such as hydrology, topography, vegetation, habitat, and land-
  use variables. Design solutions should be based upon the elements unique to a particular
area, as well as analyzed on a larger spatial scale to ensure that it best fits the needs of the area.

- **Economic Feasibility:** Weigh the cost of the project with the benefits. Funding limitations are usually inevitable and may determine project outcome, unless there are alternative sources of funding identified. Always stress advocacy for the best design, not just the cheapest, and ensure that the overall design will meet the project goals and objectives. Remember that projects are often long-term investments; a design may be more expensive but it may provide more benefits and better results lasting into the future than the cheaper alternative.

- **Project Involvement:** Anticipate a challenge if an involved party, stakeholder, or the transportation professional enters a project in which discussions and decisions have already occurred. One may need to backtrack in order to make positive changes in the project approach and outcome which may subsequently cause a delay in the process. Early involvement by all necessary parties in project development is important.

- **Funding and Process Timelines:** Learn the timelines early on. Meet funding deadlines by providing decisions on design and other aspects of the project in a timely and consistent manner. Determine how decisions will be made and what processes are needed to move the project forward such as memos, letters, coordination meetings, or other effective means that will be unique to each project. Again, delays may occur if it is not determined how decisions will be made, especially when multiple partners with significant roles are involved.

- **Long-Range Results:** Provide for a comprehensive analysis and documentation of the projected future impacts and the short-term benefits of the area (i.e., current and anticipated traffic-use, current and anticipated resource benefits/impacts, etc.). To ensure design perpetuity, consider the status of the land adjacent to the crossing site and the likelihood and impacts of potential land-use changes.

- **Familiarity with Subject Literature:** Review and reference other wildlife crossing examples and subject matter literature as an external scientific and theoretical reference. Decisions should be based on sound data and reliable information.

- **Political Influences:** Realize that political implications may play a significant role in decision-making. Identify and invite all necessary political representatives to get involved.

- **Land Acquisition Issues:** Identify land acquisition needs, availability, and priorities for project development. Document and examine agency priorities and funding capabilities.

**RECOMMENDATIONS**

Many scientific papers and case studies have been published detailing the positive effects of wildlife crossing and fencing implementation in highway design on both human safety and wildlife protection (Forman et al. 2003, Smith 2003, Huijser et al. 2009). Studies specific to the Florida panther confirm that an effective long-term solution can be applied to the Turner River site (Foster and Humphrey 1995, Lotz et al. 1996, Jansen et al. 2010).

Until a wildlife crossing is built or a solution is developed that is as operationally effective as a crossing, motorist safety will continue to be compromised and panthers will continue to cross US 41 at Turner River with no protection from vehicles. Based upon what has been learned to date about this project, the recommendations include:

- Refocus the project solution to the initial design of replacing the bridge at Turner River. Mandatory bridge replacement will occur in the near future and a wildlife crossing should be a part of the project.
Krista Sherwood

- Relocate the Turner River Canoe Launch site to eliminate the access road and potential avoidance of the area by panthers.
- Purchase the available private property within the project area and incorporate this parcel into the boundary of Big Cypress National Preserve. This will mitigate the sight distance and highway safety requirements as inhibitors of project development. This will also ensure that the land on either side of the crossing is protected for the panthers.
- Identify cultural sites and consult with Tribal agencies on their access expectations.
- Identify reasonable access options for recreational use, such as self-closing gates.
- Plan all transportation projects within the historic range of the panther to provide/restore natural corridors for wide-ranging species.

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Paper revised from original submittal.
ACKNOWLEDGMENTS

The National Park Foundation, the non-profit charitable partner for America’s National Parks, manages the Transportation Scholar Program, which provided me the opportunity to benefit a critically endangered wildlife species, the Florida panther. The mission of the National Park Foundation is to “strengthen the connection between the American people and their National Parks by raising private funds, making strategic grants, creating innovative partnerships and increasing public awareness.” This program was made possible by the generous funding support of the Ford Motor Company.

I would like to genuinely thank Deborah Jansen, Big Cypress National Preserve Wildlife Biologist, for her knowledgeable support and guidance throughout this assignment and for her thoughtful review and helpful suggestions on this paper.

Sincere recognition is also due to Ron Clark and the entire Cultural and Resource Management team and to the staff at Big Cypress National Preserve for providing a welcome environment and valuable administrative and technical support to ensure a productive and inspiring experience within the Preserve.

REFERENCES


FIGURE 2 Big Cypress National Preserve boundary, major highways, and the proposed Turner River wildlife crossing location.