In Reply Refer To:

United States Department of the Interior

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Mr. Carlos Swonke
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Environmental Affairs Division
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Austin, Texas 78701-2483

Consultation No. 02ETCC00-2015-F-0022

Dear Mr. Swonke:

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO), based on our review of the Texas Department of Transportation's (TxDOT) proposed wildlife conservation improvements to State Highway (SH) 100, from four miles east of Farm-to-Market (FM) 1847 to 1.75 miles west of FM 510, in Cameron County, Texas. In this document we evaluate the effects of the proposed action on the endangered ocelot (*Leopardus pardalis*) and Gulf Coast jaguarundi (*Herpailurus yagouaroundi cocamitli)* in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). TxDOT's final Biological Assessment (BA) and request for formal consultation was received on May 27, 2015.

Section 7 of the Act requires that all Federal agencies consult with the Service to ensure that the actions authorized, funded, or carried out by such agencies do not jeopardize the continued existence of any threatened or endangered species or adversely modify or destroy designated critical habitat (CH) of such species. The Federal Highway Administration (FHWA) assigned responsibility for compliance with the National Environmental Policy Act (NEPA) and all federal resource agency consultations, including section 7 formal consultations, to TxDOT in a Memorandum of Understanding (MOU) dated December 16, 2014 (23 U.S.C. 327). Therefore, TxDOT is the Federal agency associated with this proposed project.

This BO is based on information provided in TxDOT's formal consultation request and BA, construction plans, biological field investigation reports, interagency meetings and discussions, Service files and other sources of information. A complete administrative record of this consultation is on file with the Service's Texas Transportation Liaison, in the Austin Ecological Services Field Office (AUESFO).

Consultation History

Please see Appendix A for a detailed consultation history of the project.

BIOLOGICAL OPINION

Description of the Proposed Action

The proposed project includes the implementation of conservation actions targeted at protecting the ocelot and jaguarundi along 7.1 miles of SH 100, beginning about 4.0 miles east of FM 1847 in Los Fresnos and ending about 1.75 miles west of FM 510 in Laguna Vista. TxDOT proposes to construct four new wildlife crossings and rehabilitate an existing wildlife crossing at locations depicted in **Figure 1**. TxDOT proposes to install 6-foot tall fencing, with a concrete footer at the gates at Crossings 1 and 2 and a geomesh polypropylene within all other areas, along the 7.1 miles of SH 100, within the area where CTB is located in the center median of the road, to reduce the chances of an ocelot entering SH 100. TxDOT would leave the existing CTB on SH 100 in place. TxDOT would also install cattle guards at existing driveways (Figure 1) and 30-foot wing fences at road intersections. No new right-of-way (ROW) would be required for this project.

Figure 1. SH 100 ocelot improvement project, including locations of wildlife crossings and cattle guards.

The existing configuration of SH 100 within the project area consists of two 12-foot travel lanes in each direction, with 8-foot outside paved shoulders. A paved 8-foot wide center median is located between the traffic lanes and was originally intended to be a left turn lane. The CTB was installed in the center median in 2005 after several fatal head-on collisions. The ROW is typically 152 feet wide and is bordered by both public and private lands.

The primary goal of the proposed modifications along SH 100 is to mitigate the adverse effects of CTB on ocelot movements, restore habitat connectivity, and reduce further ocelot mortality on this section of the highway. Due to human safety concerns, the CTB would be retained along SH 100, even though it may continue to adversely affect the ocelot. Although no series of actions would completely eliminate the potential for ocelot road mortality on SH 100, the installation of the proposed wildlife crossings and associated fencing are scientifically based and should significantly reduce the potential for ocelot road mortality, while enabling ocelot movement and maintaining driver safety. In Florida, fencing the ROW along portions of Interstate 75 and the installation of wildlife crossings has been effective in reducing Florida panther road mortality (Foster and Humphrey 1995, Land and Lotz 1996).

While comprehensive guidelines for designing and monitoring wildlife crossings are available (Huijser et al. 2007, Bissonette and Cramer 2008) technical guidelines and best management practices have been developed for only a few wildlife species (Clevenger and Huijser 2011). TxDOT has created several ocelot crossings in recent years, but few have been monitored long-term, resulting in no standard guidelines for ocelot crossings in Texas that have been developed or validated.

Tewes and Hughes (2001) suggested that five factors could be used to determine locations for ocelot road crossings; 1) proximity to known populations, 2) telemetry data, 3) roadkills, 4) landscape features used by the ocelot and 5) habitat tracts next to roads. Wildlife/vehicle collision data can help identify conflict zones (Bissonette and Cramer 2008), but is not always useful for identifying crossing zones (Barnum 2003). Habitat connectivity and animal movement patterns are factors in determining where to place crossing structures (Anderson and Gutzwiller 1996, Cramer and Bissonette 2006[). Installing crossing structures at locations where animals choose to cross a roadway increases the likelihood of their use (Foster and Humphrey 1995). Therefore, planning the placement of wildlife crossings requires consideration of current and future land use in the project area (Clevenger and Huijser 2011).

There is no simple formula to determine the recommended distance between gaps or crossing structures (Clevenger and Huijser 2011). Recommendations for spacing are dependent on an animal's size and species-specific behavior. Recommended distances between structures range from 30 feet for amphibians (Eriksson et al. 2000) to more than one mile for medium and large mammals like mountain lion and deer (Dodd et al. 2007, Clevenger et al. 2002, Foster and Humphrey 1995, Wagner 2005, McKinney and Smith 2007, Mata et al. 2005). The development of allometric equations enable the spacing of crossing structures to be determined based on species-specific movement patterns rather than the assumption that one size fits all (Bissonette and Adair 2007). TxDOT calculated the linear dimension of home range (LDHR) for ocelot and determined an appropriate crossing spacing to be between 1.17 and 1.63 miles. While LDHR can help suggest a distance between wildlife crossings, it should be coupled with habitat and movement data to provide a sound approach for placing wildlife crossings (Bissonette and Cramer 2008).

TxDOT used the LDHR (Bissonett and Cramer 2008) for the ocelot, reviewed available ocelot telemetry and mortality data, analyzed woody vegetation from the Ecological Mapping System

of Texas (EMST), and investigated wildlife crossing locations recommended by the Service. Wetland delineations were conducted on several sites to help identify, avoid and minimize any potential wetland impacts. Based on the LDHR, field conditions and Service recommendations, the following actions would be implemented along SH 100 to reduce road mortality for the ocelot:

- Two new wildlife crossing structures would be installed;
- Two existing drainage culverts and one existing wildlife crossing would be modified to increase functionality,
- Exclusionary fencing would be placed on both sides of SH 100 for the entire 7.1 miles where CTB is present; and
- Cattle guards would be placed at driveway entrances, 30 foot long wing fences would be installed at each of the three intersecting roads, and gates would be installed at the two drainage ditch locations to deter ocelots from circumventing the exclusionary fencing.

Traffic would remain on SH 100 during construction. The project construction is anticipated to be phased. Fencing and modification of the existing wildlife crossing 3B would be the first phase. It is anticipated that modifications to the two drainage culverts, Crossings 1 and 2, would be constructed simultaneously and construction of Crossings 3 and 4 would follow. Traffic would be routed to the opposite side of the roadway as the wildlife crossings are constructed, with only one lane of traffic in each direction during the construction period. TXDOT anticipates letting the project the fall of 2015, with construction starting around October or November 2015. The entire project would take about 12 to 16 months to complete.

ROW Fencing

TxDOT would install a 6-foot tall fused PVC chain link fence, two to three feet inside the edge of the existing ROW on both sides of SH 100 for the 7.1 miles where the CTB exists and existing fencing does not. The fence would actually be 8-feet tall, with the bottom two feet of mesh buried below the ground surface. Existing fencing and gates on adjacent private lands would not be replaced or removed. The ROW fencing would be interrupted at 18 driveways, three public roads, and maintenance roads adjacent to the two drainage canals at Crossings 1 and 2.

In order to provide landowners access to their properties/businesses and deter ocelots from accessing SH 100 at driveway entrances, TxDOT would install cattle guards at all 18 existing driveways in the project area. The cattle guards would be 15.3 feet wide by 19.5 feet long, with an excavated area underneath (Allen et al. 2013). The last section of ROW fencing would be offset to terminate in the center of the cattle guard. A short wing wall (7.5 feet) would be installed paralleling the edge of the cattle guard forming an L-configuration with the ROW fence to prevent animals trying to enter the ROW from adjacent property from simply stepping around the end of the fence. TxDOT would maintain the fencing and cattle guards on an annual basis and on an emergency basis (e.g. car runs through fencing) as needed.

Transportation and land management agencies commonly install cattle guards where fences intersect roads (FHWA 2014). These lateral access control measures allow humans to leave and

enter the fenced road corridor at selected locations while helping to maintain the barrier effect of the wildlife fencing, although they do not address fence end runs (Huijser et al 2015). Wildlife guards (a modified cattle guard) were placed in fenced sections of US 93 in Montana and were shown to deter deer, black bear, and coyote from accessing the road (Allen et al. 2013). The US 93 wildlife guards were constructed of steel grating (Allen et al. 2013) which may have limited their effectiveness. TxDOT proposed to use round pipe cattle guards thinking they should prove more effective in deterring wildlife crossings than grating. The Service suggested using grating , otherwise known as bridge decking, with the idea that the roughness of the surface would be repellant to felids. To test both ideas, TxDOT will coordinate with the Service in selecting about 9 locations for pipe cattle guards and about 9 locations for grating cattle guards. While the effectiveness of cattle guards has not been addressed for felids, FHWA's Best Management Practices for Wildlife Vehicle Collision Reduction (cite) includes wildlife guards as a recommended measure for reducing vehicle collisions where roads meet fences.

Fencing at San Roman Road, Old Port Isabel Road, and Buena Vista Road would be installed one to three feet within the ROW, parallel to SH 100, and would turn 90 degrees at each of the three intersecting roads. The fence would extend for 30 feet at the intersecting roads, paralleling each side of the road, as a deterrent to ocelots from entering the SH 100. While it may be possible that an ocelot could circumvent the fencing at these road crossings, the likelihood is greatly reduced due to the lack of suitable habitat adjacent to these road intersections, traffic volume, and the ocelot's reticence to be near high volume roadways (M. Tewes pers. comm.). In addition, there are overhead street lights at the San Roman and Buena Vista Road intersections that may further deter ocelots from attempting to cross at these locations.

It is impossible to present a solution that completely eliminates the potential for an ocelot to access SH 100 or to anticipate the myriad of scenarios where an ocelot may be forced into crossing at these points. However, strategically fencing the areas around these three intersections can assist by making it improbable that an ocelot would attempt to cross the highway at these intersections. Fencing is a reasonable action to take to reduce the potential for an ocelot to attempt to cross the highway at these intersections.

At the proposed at wildlife Crossing 1 and 2 locations, TxDOT must allow Cameron County Drainage District #1 (Drainage District) and local landowner access. TxDOT would install swing (side pivot) gates across the maintenance road entrances on each side of SH 100. At Crossing 1, on the northeast side of the drainage ditch, two 18 foot swing gates would be installed to accommodate access for farm equipment. At the northwest access point at Crossing 1, and two more on the south side of SH 100, TxDOT would install two 10-foot wide swing gates. At Crossing 2, the two access points on the north and two on the south side of SH 100 would each have two 10-foot wide swing gates installed. There would be a concrete foundation poured at the base of the swing gates, with a 1-inch clearance between the concrete and bottom of the gate. All gates would be posted with signs that read "Keep gates closed at all times".

Wildlife Crossing Structures

Wildlife Crossing 1 would be located about 3.5 miles east of Los Fresnos in a drainage ditch controlled by the Drainage District. The top of the bank at this location is 10 feet high, with a

normal flow line at 2.29 feet above mean sea level. TxDOT's initial design called for installation of two 8x5x100 foot box culverts, one on each side of the existing 7x6x200 foot culvert, which handles the main drainage for the ditch, with the bottom elevated 3 to 3.5 feet above the drainage ditch flow line. The Service conceptually agreed to this design in January 2015. During final planning stages buried utility lines were discovered within the ROW and the design had to be modified. In order to accommodate the utilities and the Drainage District's need to access the culvert for maintenance, a long single box culvert is now proposed to serve as both a drainage conveyance and wildlife crossing.

TxDOT would remove the existing 7x6x200 foot concrete drainage culvert and replace it with a single 10x7x160 foot box culvert with a 1.5-foot wide concrete catwalk on each side of the culvert. The cat walk would be elevated two or more feet above the flow line of the drainage ditch. The drainage ditch would be reshaped to accommodate the shorter culvert and a geo-mesh mat would be installed to prevent soil erosion. In order to stabilize the side slopes of the drainage ditch, one-gallon containers of big sacaton (*Sporobulus wrightii*) will be planted along the one side of the drainage ditch for a distance of about 50 feet and extend about 12 feet down the slope. TxDOT will plant the other side with thornscrub vegetation, as is done on Laguna Atascosa National Wildlife Refuge (LANWR), if allowed by the drainage district at crossings 1 and 2 to provide some cover for the ocelot leading to the entrance of the crossing.

The existing reinforced concrete pipe (RCP) which collects and drains runoff from the road and its associated safety end treatment (SET) on both sides of the drainage ditch would be removed and replaced by a 24-inch RCP and associated SET. Changes to the RCP would be done on both sides of SH 100. The back-to-back MBGF currently in place at this location would remain until it needs to be replaced.

Wildlife Crossing 2 would be located about 1.1 miles east of wildlife Crossing 1 (4.5 miles east of Los Fresnos) and is also located in a drainage ditch controlled by the Drainage District. The top of the drainage ditch bank at this location is 15 feet high, with a flow line of 1.09 feet. TxDOT's initial proposed design called for installing a 9x5x100 foot box culvert on each side of the existing 8x5x196 foot drainage culvert. The new culverts would be installed about five feet higher than the ditch flow line and about six feet lower than the top of the bank. Again, in order to accommodate utility lines in the ROW, the Drainage District required TxDOT to redesign the crossing structure as a single culvert.

TxDOT proposes to remove the existing 8x5x196 foot concrete box culvert and replace it with a 10x7x180 foot box culvert with a proposed 1.5-foot wide concrete catwalk installed on both sides of the culvert and placed a minimum of two feet above the current flow line. The new culvert would extend about 12 feet beyond the right of way on either side of the road. The back-to-back MBGF would remain in place until it needs to be replaced. The existing 18-inch RCP would be shortened, the drainage ditch reshaped, and the wing wall and existing riprap would be removed and replaced with a geo-mesh mat to control erosion.

In order to stabilize the side slopes at wildlife Crossing 2, one-gallon containers of big sacaton will be planted along one side of the drainage ditch for a distance of about 50 feet and extend

about 12 feet down the slope. The other side will be planted in native thornscrub as discussed for Wildlife Crossing 1.

Wildlife Crossing 3A would be a newly built bridge structure, located adjacent to the Bahia Grande Unit of LANWR and is about 1.3 miles east of Crossing 2. The bridge would be 50 feet long and 74 feet wide and would be supported by eight pilings. This design would provide a 20x6.5x74 foot open space for ocelots and other wildlife to cross underneath the bridge.

The proposed bridge option is a better design for ocelots than the previously proposed culvert design, but requires installation partially below the existing road grade. The Crossing 3A would be constructed by excavating an area 3.5 feet beneath the current road bed and raising the road surface by three feet. On both sides of the bridge the surrounding ground would be graded in a semicircular area to a 4:1 or 8:1 grade to mimic a slight depression in the landscape and reduce the potential for water flowing under the bridge. The combination of soil excavation, raising the height of the roadway and sculpting the approach to the crossing would meet the Service's requirement that the bottom of the bridge structure be at least three feet higher than the elevation at the edge of the ROW, allowing the ocelot an unobstructed sight distance to vegetation on the opposite ROW. Adjacent ROW fencing would be angled into the crossing to prevent hard corners and to provide a wider opening leading into the crossing. Fencing would also be extended up the wing walls and across the top of the bridge structure.

Regarding the Service's concern for ponding at Crossing 3A, TxDOT reviewed the proposed bridge design and estimated the area that may potentially contribute runoff. It was calculated that the area receiving rain on both sides of the bridge would total 0.06 acres. For a 50 percent annual exceedance probability (AEP) rainfall, also known as a 2-year rainfall, the estimated runoff would cause about 0.25 cubic feet per second (cfs) runoff which, if the area under the bridge is perfectly flat, would cause no more than 1.25 inches of ponding. If the under bridge area contains a low spot, the water would be deeper in the low spot but would leave dry ground around it. A 10 percent AEP (10-year) rainfall under the same conditions would cause maximum 1.6 inches of water to pond under the bridge. The rainfall intensities used to calculate the AEP was 8.27 inches per hour for the 2-year event and 11.50 inches per hour for a 10 year event; these rates are based on long term rainfall measurements for Cameron County. Based on the hydrologic calculations it is unlikely that a severe rainfall event would cause water to pond deep enough to prevent wildlife from using the below grade bridge crossing for an extended period of time. However to address unforeseeable events (e.g. hurricanes), TxDOT would create a cat walkway two feet up the side slopes on both sides of the crossing to provide an alternative pathway should the bottom of the crossing flood temporarily following a significant rain event.

Following construction of the bridge structure, the right-of-way leading up to the below grade crossing on both sides of the roadway would be planted with native thornscrub seedlings. This area is estimated at 0.11 acre and would be planted at a density of 1,200 seedlings per acre, which is about 138 seedlings.

At Crossing 3A, a series of 55-gallon plastic drums would be placed on the north and south side of the road so vegetation on either end of the bridge structure can be watered. The drums would

be strapped to a T-post with six drums placed on both the east and west sides of the structure. A 1-inch gravity fed drip irrigation line would run down the wing walls and should water a 1,575 square foot area. To control watering, a 1-inch remote control valve with field transmitter would be installed.

Modifications at Crossing 3B would include the rehabilitation of the existing wildlife crossing installed in the mid 1990's, consisting of a 6x4 foot box culvert and a four foot high fence, located adjacent to LANWR property near the resaca and about 0.32 miles east of Crossing 3A. Based on the recommendation made by Sandra Jacobson, TxDOT proposes to modify the structure to improve its potential for use by ocelots. The existing 4-foot tall fence would be removed and replaced with the same 6-foot high chain link fence that is being used on the remainder of the project. The fencing would be extended across the top of the headwall of the culvert to deter animals from attempting to cross the road. Any shrubs that currently hang over or are near the fence would be cut back to prevent an ocelot from using them to circumvent the fence, but all other native vegetation would remain.

Wildlife Crossing 4 would be a new structure, with private property on either side of the crossing and is located about one mile east of the CTB opening for Buena Vista Road and about 1.1 miles west of end of the CTB. In early December 2014, TxDOT assessed the water table depth at three locations to determine if there was an area suitable for a crossing structure. TxDOT identified an area west of Buena Vista Road with a suitable water table depth for a below-grade bridge structure, but the Service recommended Crossing 4 be located East of Buena Vista Road due to the future expansion of Buena Vista as part of the proposed South Padre Second Access Causeway. Based on the Service's requested location for the crossing, a below-grade bridge was not an option and a 10x5x80 foot box culvert is proposed to be installed. The SH 100 road surface must be elevated by seven feet to accommodate the box culvert. Because this is an elevated structure, a MBGF would be installed at the pavement edge to prevent vehicles from potentially driving off the edge of the road. Wing walls would be constructed on both the north and the south ends of the culvert. Fencing would extend along the natural ground adjacent to the wing walls to prevent animals from circumventing the fencing. Following construction the ROW leading up to the crossing on both sides of the roadway would be planted with native thornscrub seedlings. This area is estimated at 0.12 acre in size and would be planted at a density of 1,100 seedlings per acre.

Operations and Maintenance

TxDOT would monitor and maintain the fencing, cattle guards, cameras, and wildlife crossings on a monthly basis and on an emergency basis (e.g. car runs through fencing) as needed for the life of the project. The Service will perform maintenance 6 to 8 inches inside its fence in the area of the crossings based on notification from TxDOT. Bi-annual reports (January and June) on monitoring and maintenance actions would be provided to the Service, beginning six months after construction ends and continuing for five years. During the first five years after construction, the monthly monitoring of cameras would be used to determine if the wildlife crossings are operating properly and not filling with sedimentation. At the end of five years TxDOT would evaluate the frequency, size, and duration of repairs and maintenance actions, and

work with the Service to develop a long-term maintenance program to maintain the functionality of the structures and ensure continued protection for the ocelot and jaguarundi.

Conservation Measures

During construction of the wildlife crossings and associated fencing, TxDOT proposes to implement the following voluntary conservation measures:

1. TxDOT would include notes and educational materials in the Environmental Permits, Issues, and Commitments (EPIC) sheets for the contractor explaining about the potential presence of ocelot and/or jaguarundi and the appearance of each. Information would also be included on what to do should an ocelot/jaguarundi be sighted or found dead in the project area. If a live ocelot/jaguarundi is spotted in the area construction activity would be halted and TxDOT Construction Project Manager and District ENV staff would be notified. They would in turn notify TxDOT ENV staff in Austin and the Service. Construction activity would be halted until the animal has left the construction area.
2. TxDOT's Contractor would be responsible for maintaining mufflers on equipment and taking reasonable measures to minimize construction noise.
3. Areas in the ROW leading up to wildlife crossings 3A and 4 would be planted with native thornscrub as construction is completed. Planting would be in accordance with *Executive Order 13112, Invasive Species and the Executive Memorandum on Beneficial Landscaping* and utilize species listed in Table 1 of the BA.
4. Construction and maintenance activities would be scheduled to occur only during daylight hours.
5. No clearing of wooded areas (other than trimming of overhanging branches for safety reasons or to prevent ocelot from circumventing fencing) would occur.

Monitoring

To monitor the use and efficacy of the proposed wildlife crossings and cattle guards, TxDOT proposes to install a series of motion activated cameras. While camera traps do not reliably detect small mammals, they are ideally suited to sample medium to large sized mammals (Ancrenaz et al. 2012). Cameras were selected over other non-invasive techniques such as genetic monitoring based on the environment, species of interest (i.e. ocelot), ease of operation, available resources, and study goals. Any cameras that are visible to the public would be placed in protective boxes welded to poles to prevent theft. In addition to these measures, the fact that the majority of the cameras would be located behind fencing will aid in theft prevention. The monitoring is designed to:

- Determine the species, numbers, and timing (seasonal, day, night) of wildlife use of the crossing structures.
- Compare wildlife usage of different types wildlife crossing structures (bridge vs culvert).
- Evaluate effectiveness of the different crossing structures in facilitating wildlife movement under SH 100.
- Evaluate the effectiveness of cattle guards, swing gates, and wing fences at preventing wildlife from attempting to enter the SH 100 ROW.

Single cameras would be placed at up to five cattle guard locations to document their effectiveness in deterring wildlife crossing. Cameras would be placed upon completion of construction at each crossing structure. Cameras would be downloaded on a monthly basis and analyzed to determine wildlife usage. Four cameras would be installed and maintained at each of the five wildlife crossings; two Reconyx style cameras would be placed 30 feet from the entrance to the crossing structure on either side of the highway and facing toward the crossing at about a 40 degree angle (P. Cramer pers. comm.). Two Cuddeback cameras would be placed at the same locations, but facing away from the crossing structures to capture animals that may approach the crossing but not attempt to cross (P. Cramer pers. comm. April 7, 2015). Although multiple cameras would be used at single locations, all cameras at each location would be considered one sampling unit (Ancrenaz et al. 2012). Monitoring would occur for five years after construction is completed. TxDOT would prepare and submit an annual report of monitoring activities to the Service beginning one year after the completion of construction. If a non-working camera is found (i.e. storage space exceeded, battery died) the approximate date that it stopped functioning will be determined by the day the last picture was taken (Ancrenaz et al. 2012).

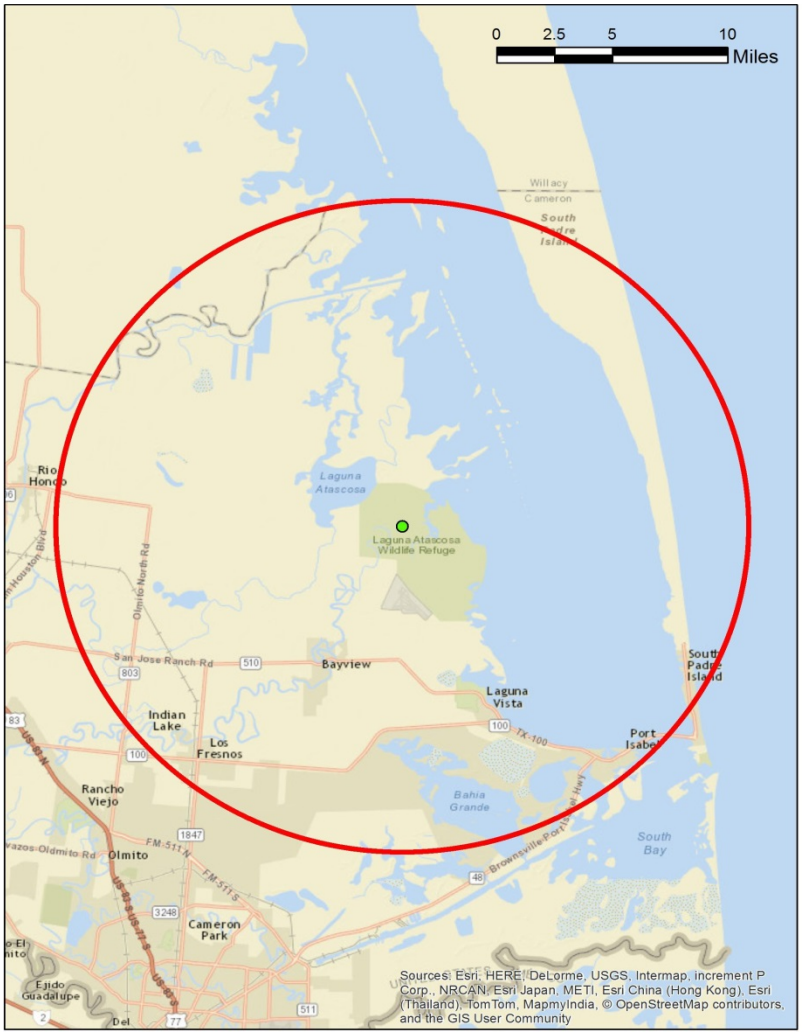
Failure to detect ocelot use at one or more of crossings does not indicate a failure of the crossing structure. The ability to detect rare species that occur at low numbers on the landscape may be due to sampling, habitat features, or species ecology and conclusions about species absence or lack of use of a crossing should be avoided (Ancrenaz et al. 2012). Functional wildlife crossing structures are those that promote interchange within the target species population, allow access to resources, and ultimately enhance the viability of populations (Clevenger and Huijser 2011). TxDOT believes that wildlife crossings on SH 100 will promote movement of ocelot and other wildlife across SH 100, allow ocelot access to land south of the SH 100, and assist with increased viability of the ocelot population in the area of SH 100.

Action Area

TxDOT proposes the project action area encompass the entire TxDOT ROW along 7.1 miles of SH 100, beginning about 0.4 mile east of FM 1847 in Los Fresnos and ending about 0.75 mile west of FM 510 in Laguna Vista. The action area is equivalent to 130.11 acres and includes the existing SH 100 roadway (66.91 acres) and the cleared ROW (59.54 acres).

The Service considers the action area to be the area directly and indirectly affected by the proposed project activities, including but not limited to, the proposed project site. Therefore, the action area for this consultation is considered to be the activity area (breeding, feeding, sheltering, and dispersal habitat) for the ocelot population centered in and around LANWR, encompassing a radius of about 15 miles (**Figure 2**), for reasons that are discussed in the "Effects of the Proposed Action" section of this consultation.

Figure 2. Project action area encompassing a 15-mile buffer around the ocelot population, centered on LANWR.



Status of the Species

Ocelot

The ocelot was designated as an endangered species under the Act in 1982, a status that extended U.S. protections to the species throughout its range in 22 countries, including the U.S. (Texas), Mexico, and Central and South America. Critical habitat has not been designated for the ocelot. Ocelot populations gained greater protections in 1989, when the species was upgraded to Appendix I of the Convention on International Trade in Endangered Species of Flora and Fauna (CITES); a protection that prohibits CITES signatories from permitting any trade in the species or its parts. Two subspecies occur in the United States: the Texas ocelot (*Leopardus pardalis albescens*) and the Sonoran ocelot (*Leopardus pardalis sonoriensis*). The Texas ocelot is isolated from the Sonoran ocelot by the Sierra Madre highlands in Mexico (Tewes and Schmidly 1987, Service 1990).

Description

The ocelot is a medium-sized cat, measuring up to three feet in body length and weighing twice as much as a large domestic cat. The ocelot is slender and its coat is covered with attractive, irregular-shaped rosettes and spots that run the length of their body. The ocelot's background coloration can range from light yellow, to reddish gray, to gold, to a grayish gold color. They have a white underside. The head has spots, two black stripes on the cheeks, four to five longitudinal black stripes on the neck and their black. Their ears have large white spots on the back. The tail has dark bars or incomplete rings. Although it resembles the margay (*Leopardus wiedii*), the ocelot is approximately twice the size of a margay with a slightly shorter tail (Murray and Gardner 1997, de Oliveira 1998).

Habitat

Tamaulipan brushland is a unique ecosystem, found only in South Texas and northeastern Mexico. Characteristic vegetation of Tamaulipan brushland is dense and thorny, therefore, it is often referred to as thornscrub. It is estimated approximately 95 percent has been has been cleared for agriculture, urban development, road developments and expansions, and recreation (Service 1990, Jahrsdoerfer and Leslie 1988). Tewes and Everett (1986) found less than one percent of South Texas supported the extremely dense thornscrub used by ocelots. Tewes and Everett (1986) classified ocelot habitat in Texas according to the amount of foliar canopy. Class A, or optimal habitat, has 95 percent canopy cover, Class B, or suboptimal habitat, has between 75 to 95 percent canopy cover; and, Class C, considered inadequate habitat, has less than 75 percent canopy cover. The most crucial habitat component is probably dense cover near the ground, less than three feet in height. Tewes and Everett (1986) found that core areas of ocelot home ranges on LANWR contained more thornscrub than peripheral areas of their home ranges. Jackson et al. (2005) suggest that the ocelot in Texas prefers closed canopy over other land cover types, but that areas used by this species tend to consist of more patches with greater edge. The ocelot is reported to occur along watercourses and will readily enter the water (Goodwyn 1970, as cited by Service 1990), but it is unclear if this proximity to water is a habitat requisite or simply an indication of where dense cover is most likely to occur.

Species composition of shrubs used by ocelots was quantified in three plant communities, two in Texas and one in Mexico (Shindle and Tewes 1998, Caso 1994). At the Texas sites, 45 woody species were found at the LANWR in Cameron County and 28 woody species on a private ranch in Willacy County (Shindle and Tewes 1998). The dominant species were granjeno (*Celtis pallida*), crucita (*Eupatorium odoratum*), Berlandier fiddlewood (*Citharexylum berlandieri*), honey mesquite (*Prosopis glandulosa*), and desert olive (*Forestiera angustifolia*) at LANWR, and honey mesquite and snake-eyes (*Phaulothamnus spinescens*) in Willacy County.

In Mexico, ocelot habitat use was 97.6 percent mature forest (heavy rain forest to sparse tropical deciduous forest) and 2.4 percent pasture-grassland (Caso 1994). In Veracruz, Hall and Dalquest (1963) stated ocelots utilized the forests and jungles. Ocelots are known from the tropical forest of Belize, the lowland rain forest of Peru, and semideciduous forests and seasonally flooded marshes of Brazil (Ludlow and Sunquist 1987).

Life History

The ocelot is primarily nocturnal, although some diurnal activity has been recorded (Navarro-Lopez 1985, Tewes 1986, Tewes and Schmidly 1987, Laack 1991, Caso 1994). Navarro-Lopez (1985) found ocelots in Texas to have two peaks of activity, one at about midnight and the other at daybreak. Ocelots are solitary hunters and eat a wide variety of prey, but mammals, especially rodents, make up the bulk of their diet (Bisbal 1986, Emmons 1987, Service 1990). Other items of prey include birds, armadillos, marsupials, monkeys, rabbits, bats, feral hogs, reptiles, fish and crabs (Emmons 1987, Ludlow and Sunquist 1987, Service 1990, Booth-Bicznik et al. 2013).

The reproductive season is year round, with spring or autumn breeding peaks noted in Texas and Mexico. The mating season varies from region to region. In the Yucatan, mating occurs in October and October-January peaks are also reported from Paraguay and northeastern Argentina. Laack (1991) observed first reproduction in wild females between 30 and 45 months-of-age, but Eaton (1977) and Tewes and Schmidly (1987) estimated they may produce young at 18-30 months of age. Ocelots can produce young year round and have a gestation period of 70-80 days (Eaton 1977, Laack 1991). Litters contain one, two, and very rarely three kittens (Eaton 1977, Laack 1991). Laack et al. (2005) reported an average of 1.2 kittens per litter for 16 litters born to 12 female ocelots in Texas. Den sites are usually well hidden and include dense, thorny scrub, caves, hollows in trees or logs, and grass tussocks (Laack 1991, Tewes and Schmidly 1987). The mother provides extended parental care to the young because of the time it takes for them to become proficient at capturing prey. Males are believed to contribute little to direct parental care (Tewes 1986, Laack 1991).

Adults of both sexes tend to have home ranges exclusive of other adult individuals of the same sex, but there is considerable home range overlap between the sexes (Emmons 1988, Laack 1991). Adult males have larger home ranges than adult females. The home ranges of subadult males and females tend to be similar in size to the home ranges of adult females until dispersal (Laack 1991). A number of studies have looked at the home range size of ocelots in Texas and Mexico, as determined from monitoring radio-collared individuals. Home range size generally varies from 0.77 to 6.9 square miles (Caso 1994, Ludlow and Sunquist 1987, Konecny 1989, and Dillon 2005). The established adult home ranges of ocelots in Laack's (1991) study of dispersing ocelots did not include semi-isolated patches and transient home ranges were at times farther from the natal range than the animal's eventual home range.

In the lowland rainforest of Manu National Park in Peru, Emmons (1988) reported ocelot home ranges of approximately 2.3 and 3.1 square miles for males and approximately 0.6 and 1 square mile for females. In Cockscomb Basin Wildlife Sanctuary in Belize, home range was reported as 12 square miles for a male ocelot and 5.5 square miles for a female (Konecny 1989). In seasonally flooded savanna woodland, Ludlow and Sunquist (1987) reported a home range of 3.6 and 4.3 square miles for two males and mean home range of 1.3 square miles for six adult females in the Venezuelan llanos. In the Brazilian Pantanal, the home range for two adult females over six months was reported to be 0.3 and 0.6 square miles (Crawshaw and Quigley 1989).

Ocelots live solitary lives except when a female is with kittens or when pairs come together briefly to breed. They disperse from the natal range at approximately two years of age. Young males always disperse from their natal areas, while young females may or may not leave their natal area. Laack (1991) reported on the dispersal of five male and four female subadult ocelots at LANWR. One ocelot dispersed at 14 months-of-age, another at 20 months-of-age, and five at 30-35 months-of-age, but only four lived to establish home ranges. Seven to 9.5 months elapsed between the leaving the natal range and establishing an independent home range. One female moved 1.6 miles (distance between home range centers) and the males moved 4.3 to 5.6 miles. During dispersal the ocelots used narrow corridors of brush, between 16.4 and 328 feet wide, along resacas, drainage ditches, and small scrub patches within agricultural or pasture land. The ocelots tended to avoid areas occupied by other adults. According to Laack (1991), none of the dispersing ocelots successfully joined a population outside of LANWR.

Several studies have resulted in the estimation of various survival rates. Tewes (1986) reported a survival rate of 71 percent, based on four mortalities while monitoring 12 radio-tagged ocelots. Haines et al. (2005a) estimated an annual survival rate at 87 percent for resident adults and 57 percent for transient ocelots. For newborn ocelots, Laack et al. (2005) estimated a 68 percent annual survival rate.

Population Dynamics

Tewes and Miller (1987) suggested that several factors may indicate the possibility of inbreeding, including: habitat islands saturated with resident ocelots, frustrated dispersal, and offspring that fail to leave parental home ranges. Habitat fragmentation reduces the ability of ocelots to interact freely, which may reduce the genetic viability of the species over time, and because ocelots have to cross areas of little or no habitat to interact, may also increase the risk of harm to individual ocelots. Genetic studies to determine genetic differentiation have been done on three ocelot populations: LANWR; Willacy County; and Tamaulipas and Vera Cruz, in northern Mexico. Low variability was expected within the Texas populations because of range reduction and fragmentation. Inbreeding was detected in the three populations (Korn and Tewes 2013). The study showed the Willacy and Mexico populations were more closely related genetically than the LANWR population was to either. Walker (1997) suggested that the LANWR and Willacy populations have lost genetic variation when they became isolated from each other and from ocelots in Mexico. While some habitat in south Texas is managed for the ocelot, the quality and quantity of optimal habitat in Texas is on a downward trend and most likely supports a smaller ocelot population than that of the 1980's. The continued existence of the ocelot in its northern habitat is critical in stabilizing and reversing ocelot decline in Texas. However, much of the area that could be restored to suitable habitat occurs on private lands. The Lower Rio Grande Valley is rapidly growing and agricultural lands are rapidly being developed (Wilkins et al. 2000). Opportunities for landowners to participate in economic incentive programs and Safe Harbor Agreements may enable the proactive conservation of the ocelot.

Status and Distribution

Historically, the ocelot occurred in Arkansas, Arizona, southern California, Texas, Mexico and southward through Central and South America to Peru, Uruguay, and northern Argentina (Navarro-Lopez 1985). Today the species ranges from extreme southern Texas and northern Sonora, Mexico to Central America, Ecuador and northern Argentina, but in reduced numbers (Tewes and Everett 1986, Emmons 1990, Murray and Gardner 1997).

Two U.S. breeding populations of ocelot occur in southern Texas (Tewes and Everett 1986). One population occurs in Willacy and Kenedy Counties, primarily on private property (Navarro-Lopez 1985), and the other in Cameron County, primarily on the LANWR (Laack 1991).

Since 1980, individual ocelots have only been documented in Cameron, Hidalgo, Willacy, Kenedy and Jim Wells Counties in Texas (Tewes and Hughes 2001). Laack and Rappole (1986) documented ocelot sightings in Cameron County. Shinn (2002) used camera traps and hair snares on 25 widely scattered tracts managed by the Service's South Texas Refuges Complex, and did not find evidence of ocelots west of Brownsville on the Rio Grande River. Shinn's study did confirm the presence of the species in extreme southern Cameron County and in extreme western Willacy County.

In Hidalgo County, at the Santa Ana National Wildlife Refuge, at least one ocelot was radio-tracked from the 1990's (J. Mays pers. comm.). Fischer (1998) trapped, radio-tracked and tagged an adult female from 1992 through 1996 along the Rio Grande River in southeastern Hidalgo County. Out of 8,304 trap-nights he caught 21 bobcats, 300 non-target animals, and no other ocelots.

In 1982, Tewes (1986) trapped two ocelots on a private ranch in Willacy County. Five ocelots (three females, one male and one of unknown sex) were identified in Willacy County near Raymondville, Texas in December 2002. Based on two photographs on October 11, 2003, one of the females was pregnant; therefore, a sixth resident ocelot may have been born (Sternberg and Chapa 2004). Between October and December 2003, camera traps photographed three ocelots on another private ranch in Willacy County.

"Occupied habitat" occurring in Jim Wells, Nueces, Live Oak, and Kleberg counties, 50 miles north of the Willacy-Kenedy population is shown in Figure 9 of the recovery plan (Service 1990). In 1997 and 1998, Tuovila (1999) did a trapping study in the southern half of Live Oak County and northernmost Jim Wells. He trapped 17 bobcats and 238 non-target animals, but no ocelots. No ocelots were documented at Choke Canyon Reservoir in Live Oak and McMullen counties, Texas during trapping efforts despite a 10-year increase in optimal ocelot cover (Grassman et al. 2006).

Tewes and Everett (1986) based a "crude estimate" of the total ocelot population size in South Texas from 80 to 120 individuals upon an aerial survey of brush habitat and knowledge gained from following the movements of radio-collared ocelots trapped in or near LANWR. Haines et al. (2005b) estimated the number of breeding individuals in the LANWR population was 19

ocelots, with a total population of 38 ocelots in Cameron County. He estimated the population by averaging ocelot home range sizes reported by Navarro-Lopez (1985), Tewes (1986), and Laack (1991) and extrapolating this estimate to the amount of available dense thornscrub habitat and assumed adults equaled half of the total population. Today, fewer than 80 individuals may remain in South Texas and the U.S. The current ocelot population in Cameron County is estimated at less than 20 individuals (H. Swarts pers. comm.) with the Willacy County population estimated at between 25 and 45 individuals (M. Tewes pers. comm.). A much larger population of the Texas ocelot occurs in Tamaulipas, Mexico near San Fernando, approximately 100 miles south of the U.S.-Mexico border (Caso 1994). In forested South America alone, Emmons (1988) noted that even at the lowest density estimates (one animal per 1.9 square miles) there would be approximately 800,000 ocelots and suggested that true numbers are probably 1.5 to 3 million across a number of ocelot subspecies.

Reason for Listing

Habitat loss and fragmentation and loss of connectivity are the primary reasons for ocelot decline in Texas. Ocelots rely upon thick vegetation along the Lower Rio Grande and the South Texas Tamaulipan brush community for foraging, resting, and establishing dens. They require corridors, such as riparian habitat along rivers, shorelines, and natural drainages to travel between optimal habitat areas. Destruction and fragmentation of habitat and travel corridors increases threats to the ocelot, as does incidental trapping, competition from feral dogs and cats, and primarily, mortality from vehicles. In Mexico, particularly in the northeast, ocelots suffer from habitat loss due to charcoal production, agriculture and livestock ranching. Human population increases and associated urban expansion and industrialization in the ower Rio Grande Valley has resulted in brush clearing and increased pollution and water quality degradation (Service 1986). Thornscrub habitats have also been converted to rangeland using herbicides (Bontrager et al. 1979), root plowing, and fire (Hanselka 1980).

Pesticides can be incorporated into the food chain and are potentially harmful or fatal to terrestrial and aquatic organisms. Agriculture pesticides are used year-round in the Lower Rio Grande Valley (LRGV) and drift or overspray from aerial applications occurs periodically. In the LRGV, runoff from cultivated fields may concentrate pesticides and herbicides in permanent bodies of water. The types of pesticide chemical compounds and application rates have been extensive and heavy throughout the LRGV. As a result, pesticide accumulation in the biota remains a major concern in management of thornscrub. Dichlorodiphenyldichloroethylene (DDE), polychlorinated biphenyls (PCBs), and mercury have been detected in ocelot blood and hair samples at low concentrations, but are not believed to be a significant problem (Mora et al. 2000).

Although habitat loss in South Texas is mainly attributable to agricultural and urban expansion, other contributing factors include human modifications of the Rio Grande with dams and reservoirs for flood control and hydroelectric power; floodway systems that remove water from the stream channel during peak flows; water diversions for irrigation, municipal, and industrial usage; and channel restriction and canalization (Coastal Impact Monitoring Program 1995).

As a result of increasing economic integration between the U.S. and Mexico, there is increasing pressure for new or improved highways and bridge infrastructure, as well as recently increasing national security concerns and the installation of border fence~~s~~ and lighting in the Texas/Mexico border region. There are 11 existing and one proposed international bridge along the Rio Grande between Falcon International Reservoir and the Gulf of Mexico**.** Local population growth and rapid industrialization on the Mexican side of the border have raised concerns regarding the placement of road and bridge infrastructure in the LRGV. Increased construction of these facilities may impact the Rio Grande floodplain and its riparian wildlife habitat, disrupting the continuity of the "wildlife corridor."

Importing and exporting skins of many spotted cats became illegal in the U.S. between 1967 and 1973 and the ocelot was added to CITES in 1989. Recommendations have been made by Tewes and Everett (1986) for selective methods of predator control and hunter education to avoid the accidental shooting of ocelots. In 1997, the Service entered into a section 7 consultation with the U.S. Department of Agriculture's Animal Damage Control for the use of leg-hold traps, snares, and M-44s explosive predator baits in South Texas and provided provisions for the protection of ocelots during their control practices.

Data is limited regarding disease in the ocelot, but several diseases and parasites have been documented. They include: Notoedric mange (*Notoedres cati*) (Pence et al. 1995); Hepatozoon in the blood; Cytauxzoon in their red blood cells; fleas (*Pulex sp.)*; dog ticks (*Dermacentor variabilis*); and Amblyomma ticks (Mercer et al. 1988). The tapeworm (*Taenia taeniaeformis*) (Service 1990) and helminthes (Pence et al. 1995) have also been reported in ocelots.

Ocelot mortality has also been attributed to aggression and predation by other animals. Ocelots can be prey of domestic dogs, coyotes, snakes, alligators and bobcats (Service 1990). In the last 30 years or so, vehicular collisions are the greatest known cause of ocelot mortality in South Texas, accounting for 45 percent of deaths of 80 radio-tagged ocelots monitored by Haines et al. (2005a) between 1983 and 2002. Calculation of known ocelot mortality in the LANWR population since the mid-1990s indicates road mortality may be increasing. Of the 33 known ocelot deaths since 1994, 14 (42 percent) were the result of road mortality. Road mortality numbers may be even higher because ocelot carcasses may be depredated or removed from roadways by members of the public before officials can arrive to examine the remains (M. Sternberg pers. comm.). In addition, if an ocelot's carcass is found after decomposition has started, it is often difficult to determine the animal's cause of death. Since 2007, six of the 10 known ocelot deaths (60%) have been the result of road mortality (H. Swarts pers. comm.).

Several wildlife underpasses and culverts have been installed by TxDOT for ocelot use as travel corridors in critical areas, but they have not been monitored for a sufficient length of time to determine if they were used by ocelots. The construction or improvements to several roads have undergone section 7 consultation, resulting in the placement of additional wildlife crossings. These wildlife crossings may allow ocelots to disperse between patches of suitable habitat and reduce genetic isolation of the populations.

The construction of approximately 70 miles of border fence in the LRGV, covering three counties (Cameron, Hidalgo, and Starr) has increased habitat fragmentation and reduced or eliminated habitat connectivity. In Hidalgo County, 22 miles of flood control wall/fence acts as a barrier to terrestrial wildlife, as does the 6.9 miles of CTB installed as a safety measure on SH 100 in Cameron County. The fence proposal (14 miles) in Starr County would be constructed within the flood plain close to the Rio Grande River, the major water source for wildlife, and isolate wildlife from the river. The "wildlife corridor" for the ocelot and jaguarundi along the river riparian are that the Service has been developing since 1979, is severely impacted by the border fence.

Range-wide Trend

The current population estimate for the ocelot is fewer than 80 individuals in south Texas. The population has been in decline in recent years. Tewes and Everett (1986) estimated the ocelot population in south Texas to be around 120 individuals, with the majority distributed in Cameron and Willacy Counties. The Cameron County population located in and around LANWR was estimated to be about 30 individuals in 1991 (Laack 1991, Sternberg and Mays 2011). Habitat loss, fragmentation and road mortality continue to be the major causes of the ocelot population decline in Texas.

Critical Habitat

Critical habitat has not been designated for this species.

Gulf Coast jaguarundi

The jaguarundi was listed as endangered on June 14, 1976 (41FR24064). The jaguarundi is also listed in the CITES Appendix I, which bans international commerce. CITES offers some protection over much of its range. Hunting is prohibited in Argentina, Belize, Bolivia, Columbia, Costa Rica, French Guiana, Guatemala, Honduras, Mexico, Panama, Paraguay, Surinam, Uruguay, United States, and Venezuela. Hunting is regulated in Peru, while no legal protection is offered in Brazil, Nicaragua, Ecuador, El Salvador, and Guyana. No critical habitat is designated for this species.

Description

The jaguarundi has a long slender body, short legs, and sleek un-patterned fur, and looks more like a large weasel or otter than a cat. They are roughly twice the size of a domestic cat, weighing about 7 to 22 pounds, standing 10 to 14 inches at the shoulder, and can be up to 4 feet long from nose to tail tip, with the tail taking up about a third the length. It has a long and flat head instead of a round one. The ears are short and rounded, and this is one of the few cat species that does not have a contrasting color on the backs of the ears. Their eyes are small and set closely together.

Jaguarundis have three distinct color phases, black, reddish-brown, and brownish-gray, although the latter phase has also been called blue. The phases are so distinct that at one time they were thought to be separate species, the red one being called *Felis eyra*. The black color phase does not occur in Texas (Goodwyn 1970). These cats are not known to be closely related to the other small South American cats. Instead of having 36 chromosomes, like the South American cats, the jaguarundi has 38, like the cougar (*Puma concolor*) (Tewes and Schmidly 1987).

Habitat

Habitat requirements in Texas are thought to be similar to those for the ocelot: thick, dense thorny brushlands or chaparral. Approximately 1.6 percent of the land area in South Texas is this type of habitat (Tewes and Everett 1986). The thickets do not have to be continuous, but may be interspersed with cleared areas. Jaguarundis possibly show a preference for habitat near streams (Goodwyn 1970, Davis and Schmidly 1994) and may be more tolerant of open areas than the ocelot. The jaguarundi uses mature forest (i.e., brush) and pasture-grassland (Caso 1994). Jaguarundi habitat use was 53 percent mature forest and 47 percent pasture-grassland. Jaguarundi use open areas for hunting and sometimes resting, but if threatened with a potential danger they will seek cover in brush areas.

In South America, habitat includes high mountain forests, tropical forests, swamp forests, savannahs, overgrown pastures, and thickets (NFWL 1980, Tewes and Schmidly 1987). In Venezuela, the jaguarundi has been most frequently found to occur in tropical dry forest relative to other habitat types. They are rare and thinly distributed in moist forest types, especially deep rain forest. They have been reported to prefer forest edges and secondary brush communities, but this may only be where they are most frequently seen. In Belize's Cockscomb Basin Wildlife Sanctuary, jaguarundi are most frequently associated with water and old-field habitats. It appears to be the most flexible cat in its ability to occupy different habitats and having access to dense ground vegetation appears to determine habitat suitability (Nowell and Jackson 1996).

The most common plants occurring in habitats in the LRGV where the jaguarundi has been known to occur are huisache (*Acacia farnesiana*), blackbrush acacia (*Acacia rigidula*), prairie baccharis (*Baccharis texana*), chilipiquin (*Capsicum annuum*), lotebush, allthorn goatbush (*Castela texana*), Texas persimmon (*Diospyros texana*), coyotillo (*Karwinskia humboldtiana*), common lantana (*Lantana horrida*), berlandier wolfberry (*Lycium berlandier*), javelinabrush (*Microrhammus ericoides*), Texas pricklypear (*Opuntia lindheimeri*), retama (*Parkinsonia aculeata*), honey mesquite, cedar elm (*Ulmus crassifolia*), and lime pricklyash (*Zanthoxylum fagara*) (Goodwyn 1970).

Life History

Most information gathered on the jaguarundi comes from historical writings and information gained from studying the jaguarundi in South Texas and in Mexico.

In Belize, jaguarundi are seen quite often. Konecny (1989) found that two males had home ranges of 38.6 and 34 square miles, and one female had a home range of 7.7 square mile. Caso

(1994) captured and radio-collared jaguarundi in Tamaulipas, Mexico from 1991 to 2005. He found home range sizes averaged 3.8 and 3.22 square miles for males and females, respectively. Both studies captured jaguarundi in undisturbed brush and grasslands with scattered second growth woodlands (Caso 1994). Historical accounts from Mexico suggest that jaguarundi are good swimmers and enter the water freely.

Little is known of jaguarundi reproduction in the wild. Den sites include dense thickets, hollow trees, spaces under fallen logs overgrown with vegetation, and ditches overgrown with shrubs (Tewes and Schmidly 1987, Davis and Schmidly 1994). In Mexico, they are observed as being solitary, except during November and December when they mate. Young have been born in March and August, with possibly two litters per year. Usually two to four young comprise a litter, with litters being either all of one color phase or containing both the red and gray phases. Jaguarundi kittens are spotted at birth, and lose their markings as they mature. Gestation (based on captive jaguarundi) varies from 63 to 75 days (Goodwyn 1970, Tewes and Schmidly 1987, Davis and Schmidly 1994). Jaguarundis communicate by calls, of which 13 have been identified in captive animals. The largest repertoire occurs during the mating season (Hulley 1976).

The jaguarundi is primarily active during the day, although some nocturnal activity has been recorded (Konecny 1989, Caso 1994). However, they appear to be far less nocturnal than the ocelot. They are excellent climbers although they spend most of the time on the ground. They hunt primarily in the morning and evenings. Prey is largely birds, but bird eggs, rats, mice, rabbits, reptiles and fish are also taken (Goodwyn 1970, Tewes and Schmidly 1987, Davis and Schmidly 1994). In Venezuela, Bisbal (1986) found the diet of jaguarundi to be 46 percent mammals, 26 percent birds, and 29 percent reptiles. In Mexico and South America, jaguarundi are often believed to prey on domestic poultry and may be killed on-sight as a pre-emptive measure.

Population Dynamics

Habitat loss and alteration due to brush-clearing activities, human encroachment, and human persecution are the main cause for the decline in jaguarundi populations (Service 1995). Tracts of at least 75 to 100 acres of isolated dense brush, brush interconnected with other habitat tracts by brush corridors, or smaller tracts adjacent to larger areas of habitat may be used by jaguarundi. Roads, narrow water bodies, and rights-of-way are not considered barriers to movements. Brush strips connecting areas of habitat, such as brushy fence lines and water courses, are very important in providing escape and protective cover.

The jaguarundi is generally not exploited for commercial trade and does not experience the harvest pressure that is experienced by the ocelot (Sunquist and Sunquist 2002). In Central and South America, Texas, and Northeastern Mexico, the coat of the jaguarundi is not highly sought after by the skin trade because of its poor quality and lack of spotting. They are difficult to trap, but may be caught in traps set for commercially valuable species, and may be subject to low intensity hunting pressure around settled areas.

Status and distribution

The Gulf Coast jaguarundi's historical range is from the Lower Rio Grande Valley in southern Texas into the eastern portion of Mexico, in the States of Coahuila, Nuevo Leon, Tamaulipas, San Luis Potosi, and Veracruz (Nowak 1991, Olivera 1998, Arroyo Rageb 2007, Caso et al 2008, SEMARNAT 2010, Natureserve 2011, TPWD 2012). In Texas, jaguarundis were limited to the southern portion of the state, including Cameron, Hidalgo, Willacy, and Starr counties (Bailey 1905, Davis 1974). Today the jaguarundi has a similar distribution, but in reduced numbers, although it probably no longer occurs in Arizona (Tewes and Schmidly 1987) and there has not been a confirmed sighting in south Texas in over 10 years. They may also be extinct in Uruguay. They are reported to occur at Masaya National Park in Nicaragua, Soberania National Park in Panama and El Imposible National Park in El Salvador (Nowell and Jackson 1996). The presence of jaguarundi in Florida is likely the result of human introduction (Nowak and Paradiso 1983).

In Texas, jaguarundi have been known to occur in Cameron and Willacy counties. Tewes and Everett (1986) analyzed the records of a clearinghouse established in 1981 to coordinate reception and filing of reports of jaguarundi (and ocelots) in Texas. Many of the reports were solicited by sending out questionnaires to trappers. Jaguarundis were reported from central Texas and the upper Gulf Coast, as well as from South Texas. However, due to lack of any tangible evidence, such as road kills, most of the sightings are believed to have been of black feral house cats. Tewes and Everett (1986) could not estimate the jaguarundi population in South Texas because confirmed sightings are rare. Goodwyn (1970) reported from interviews he conducted in 1969, that jaguarundi were thought to occur in seven specific areas: Santa Ana National Wildlife Refuge; LANWR; "Paso Real", an area along the lower Arroyo Colorado on the border between Cameron and Willacy counties; the southern part of the El Sauz Ranch in northeast Willacy County; a small area west of Olmito in southern Cameron County; an area east of Villa Nueva; and an area near the Port Isabel airport in Cameron County.

Several other credible reports of jaguarundi have been documented in Cameron, Willacy and Webb Counties (Tewes 1987, Tewes and Everett 1986). One was a road-killed male jaguarundi found near the junction of SH 4 and FM 511 in Cameron County on April 21, 1986 (Tewes 1987, Laack and Rappole 1987). Unconfirmed jaguarundi sightings in Hidalgo County include: Bentsen Rio Grande State Park, Santa Ana National Wildlife Refuge, Santa Ana National Wildlife Refuge, LANWR, Cimarron Country Club, Wimberley Ranch, and the Anacua Unit of the Texas Parks and Wildlife Department's Las Palomas Wildlife Management Area, and other areas (Prieto 1990, Benn 1997). Unconfirmed sightings of a jaguarundi occurred at the Sabal Palm Grove Sanctuary in Cameron County in 1988 (Anonymous 1989) and at the Santa Ana National Wildlife Refuge in March 1998 (Santa Ana National Wildlife Refuge data). Based upon sighting reports, personnel of the Santa Ana National Wildlife Refuge suspect the presence of jaguarundi on the refuge (Benn 1997). The most recent reported sighting was by an Ecological Services biologist at LANWR on November 22, 2004, when two jaguarundi were sighted approximately 0.75 mile north of FM 106 and Buena Vista Road, which is the entrance road to the Refuge (Reyes 2008). However, Sunquist and Sunquist (2002) reported the species has likely been extirpated in Texas.

Reason for Listing

Loss of habitat is one of the main threats to the jaguarundi. Historically, dense mixed brush occurred along dry washes, arroyos, resacas, and the flood plains of the Rio Grande. A majority of shrub land has been converted to agriculture and urban development. Unfortunately for the jaguarundi, the best soil types used for agricultural crops also grow the thickest brush and thus produce the best habitat for the jaguarundi. Less than five percent of the original vegetation remains in the Rio Grande Valley.

Range-wide Trend

As mentioned previously, the number of jaguarundi in South Texas is unknown. For Cameron County, there have been no surveys or confirmed sightings in recent years. Since 1986, live trapping and camera monitoring efforts at LANWR and in Willacy County have not documented the presence of a jaguarundi.

Critical Habitat

Critical habitat has not been designated for this species.

Analysis of the species/critical habitat likely to be affected

The proposed construction of ROW fencing, along with the installation of cattle guards at each driveway, gates at utility access points, and five new or rehabilitated wildlife crossings within ocelot habitat and travel corridors may result in adverse effects to the species within the action area. Potential effects include restoring limited habitat connectivity and altering the movement of individuals due to noise, construction, and operational activities. Further loss of ocelots on SH 100 would also continue the loss of genetic diversity in the LANWR ocelot population, which could lead to the extirpation of that population if left unchecked. The proposed actions would also be beneficial to the ocelot and jaguarundi by preventing cats from easily entering SH 100 in the area where the CTB acts as a barrier to movement across the road. The effects of the proposed action on ocelots and jaguarundis are considered further in the remaining sections of this BO.

Critical habitat has not been designated for the ocelot or jaguarundi; therefore, there would be no effect and CH is not considered further in this document.

Environmental Baseline

Under section 7(a)(2) of the Act, when considering the effects of an action on Federally-listed species, the Service is required to take into consideration the environmental baseline. The environmental baseline includes past and ongoing natural factors and the past and present impacts of all Federal, State, or private actions and other human activities in the action area, including Federal projects in the action area that have already undergone section 7 consultation

and the impacts of State or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

TxDOT has described the action area to be equivalent to the entire ROW for the 7.1 mile length of the project, totaling about 130.11 acres. For the SH 100 project, the Service considers the action area to be any area where direct or indirect effects associated with the proposed project could occur to the ocelot or jaguarundi. The SH 100 project could result in adverse effects to the ocelot and jaguarundi from harm and harassment due to noise, loss of habitat connectivity, as well as direct injury or death if an ocelot is killed or injured by a vehicle on SH 100. Indirect effects extend the potential for effects beyond the confines of the project ROW and include the loss of genetic viability and demographic robustness of the ocelot population located in and around LANWR that could occur if any additional road mortality were to occur on SH 100. Therefore, the Service considers the action area to be all areas within Cameron County that are within the normal activity range of the ocelot population centered in and around LANWR. These effects are most likely to occur within a 15 mile radius from the LANWR headquarters and visitor center (H. Swarts, pers. comm.), equivalent to about 452,160 acres, which is the action area that is used in this BO analysis. A majority of the ocelot road mortality that has occurred in Cameron County during the last 20-30 years has occurred within this action area.

Status of the species within the action area

The ocelot and jaguarundi are treated together here, as in many publications (e.g., Service 1987, Service 1990), because little is known about the jaguarundi in Texas and the two species are thought to exhibit similar habitat preferences in south Texas. They both suffer from similar causes of population decline and benefit from similar recovery efforts. The three greatest threats to the continued existence of ocelots or jaguarundis in the action area are habitat loss, loss of genetic diversity, and road mortalities. It is currently estimated that there are about 80 ocelots in Texas, with the population in the action area around LANWR currently estimated at less than 20 individuals (H. Swarts pers. comm.). Due to their elusive nature, the number of jaguarundi is unknown, but the population is certainly less than the ocelot.

Habitat within the Action Area

All of the land within the SH 100 ROW, in the area that would be directly affected by the project, is owned by TxDOT, except for the Drainage District easements at Crossings 1 and 2. The land adjacent to, but outside of, the SH 100 ROW, including a majority of the action area, is either under private or federal ownership. LANWR owns property on both sides of SH 100 in the area of crossings 3A and 3B. Most of the privately owned land in the vicinity is agricultural or ranchland, with a few businesses and residences. The ranchland and federal land contain rangeland grasses and native woody vegetation.

The project area climate is semiarid-subtropical/subhumid within the Modified Marine climatic type, e.g., summers are long and hot and winters are short, dry, and mild (Bailey 1995). The marine climate results from the predominant onshore flow of tropical maritime air from the Gulf of Mexico. Onshore air flow is modified by a decrease in moisture content from east to west and

by intermittent seasonal intrusions of continental air.

Several dominant habitat types occur within the action area: Tamaulipan thornshrub communities, riparian, grasslands, and coastal prairies. Tamaulipan thornshrub communities consist of dense thickets of such species as Texas ebony (*Ebenopsis ebano*), mesquite, brasil (*Condalia hookeri*), granjeno (*Celtis pallida*), lotebush (*Ziziphus obtusifolia*), allthorn goatbush, *Acacia* sp., and Spanish dagger (*Yucca treculeana*). The coastal prairies occur on lower elevations with more saline soils and are dominated by such species as bushy sea-oxeye (*Borrichia frutescens*), gulf cordgrass (*Spartina spartinae*), glasswort (*Salicornia sp.*), and numerous grass species. The grasslands are distinguished by the presence of swollen fingergrass (*Chloris barbata),* Rooseveltweed *(Baccharis neglecta),* and Johnsongrass *(Sorghum halepense).* Remnant habitat that occurs along resacas and fence lines adjacent to road and utility ROWs represent riparian habitat.

Ocelots prefer thornscrub communities with greater than 95 percent canopy cover (Horne 1998). They are believed to use a fairly narrow range of microhabitats (Emmons 1988, Horne 1998). Microhabitat features that are important for ocelot use appear to be; a canopy height of greater than 7.9 feet, and vertical cover with about 90 percent visual obscurity at 3-6 feet (Horne 1998). Resacas, rivers, irrigation canals, irrigation drains, natural drainages, shorelines fence lines and road verges all provide suitable travel corridors for ocelots, especially as density and percent cover of thornscrub vegetation increase (Tewes et al. 1995). Even brush tracts as small as five acres, when adjacent to larger areas of habitat, may be used by ocelots. Historically, potential ocelot habitat occurred throughout south Texas, but in the 20th century it was reduced to less than one percent by conversion into agricultural and suburban land use (Tewes and Everett 1986).

Many of the past and present land uses in the action area have had the net result of vegetation removal or alteration. Overgrazing, the suppression of prairie fires, and other changes in land use patterns have also been associated with the transformation of native habitats (ICE 2010). Collins (1984) remarked that brush clearing was a threat to endangered cats and the implementation of protective measures for brushy areas was an immediate concern. The native thornscrub serves to support a variety of wildlife species and is used as habitat or travel corridors by ocelots and jaguarundi. Since the 1920's, more than 95 percent of the original native thornscrub and about 90 percent of the riparian vegetation has been converted to agriculture or urban use (Service 1988).

Species Presence in the Action Area

Ocelots, and possibly jaguarundis, occur in the Tamaulipan thornshrub communities found within the action area. The ocelot population in and around LANWR has been radio-monitored since 1983 (Tewes 1986; Laack 1991). The current estimated population of ocelots that occur in the action area is believed to be less than 20 individuals (H. Swarts, pers. comm.).

GPS-collared ocelot movements have been monitored in and around LANWR since 2011. GPS tracking points indicate that ocelots can move significant distances in a relatively short period of

time. Ocelots have been monitored traveling across extensive areas of open flats as they move in and around LANWR. Over a recording period of several months in the summer of 2013, a young male ocelot was recorded moving within a 9-11 mile radius of LANWR, including locations near Laguna Vista, Los Fresnos, and Rio Hondo. TxDOT was notified in August 2013 that this individual was coming dangerously close to several roads, including SH 100. The ocelot was ultimately found dead on SH 100 due to road mortality in November 2013.

Buena Vista Road, FM 106, and FM 510 extend through the core ocelot population area close to LANWR. Other major roads in the action area include SH 100, FM 2480, San Roman Road, FM 539, FM 1847, FM 1561, FM 1575, FM 803, US 345, FM 1420, FM 2925, FM 3069, and Old Port Isabel Road. Almost every ocelot in the LANWR population crosses FM 106 or Buena Vista Road at some point in their life, either as a young dispersing individual or as a resident adult (L. Laack, pers. comm.). Ocelots have been found near these roads on a regular basis; one adjacent to FM 106 near LANWR Unit 1, and the other in the vicinity of the INS detention facility, near Buena Vista Road.

Road mortality locations are another indication of the ocelot's range. There have been numerous ocelot road mortalities in the action area. Ocelot road kills have been documented on FM 106 in 1984, 1988, and 1997, and on Buena Vista Road in 1987 and 2000. Six other road kills have occurred in the immediate vicinity of FM 510, between Laguna Vista and Bayview. There have even been two ocelot road mortalities on the Bayside Tour Road within LANWR, resulting in the closure of the road for public use in 2014. Since 2010, there have been three ocelot road kills on SH 100 in the area where the CTB was installed, including one on the south side of the highway, indicating that the ocelot had successfully crossed SH 100 from north to south at some unknown location before it was killed trying to cross back to the north side of the road. An ocelot was also killed on SH 100 in 1994.

A road-killed jaguarundi collected in 1986 on SH 4 east of Brownsville, TX represents the last documented jaguarundi in the United States. However, numerous sightings of jaguarundi are reported in South Texas each year, including within the action area. The status of the jaguarundi within the action area is unknown, but they may occur in very low numbers within the action area. The most recent reported sighting was by an Ecological Services biologist on November 22, 2004, at Laguna Atascosa NWR, in Cameron County, when two jaguarundi were sighted approximately 0.75 mile north of FM 106 and Buena Vista Road, which is the entrance road to LANWR (E. Reyes pers. comm.). A cat resembling a jaguarundi was photographed at the Audubon's Sabal Palm Sanctuary near Brownsville. The Sanctuary is located approximately 11 miles southwest of the recorded 1986 jaguarundi road kill. A known population of jaguarundi exists in the coastal state of Tamaulipas, Mexico, lending importance of maintaining a north/south travel corridor between the Mexico and Texas jaguarundi populations. The TPWD considers the jaguarundi to be extirpated from Texas (J. Evans, TPWD Mammologist, pers. comm.).

Factors Affecting Species Environment in the Action Area

Land ownership

The majority of the land in the action area is in private ownership and is primarily agricultural or ranch land. There are multiple private owners. Several state and federal agencies own and manage land within the action area. The Service manages the LANWR, north of Buena Vista Road, three tracts of land east of Buena Vista Road, one tract of land adjacent to FM 510, and one tract of land that occurs on both sides of SH 100. TxDOT owns and maintains their ROWs within the action area. Changes to the current land use in the action area would be driven by the goals, objectives and mandates of the landowners and may have a direct relationship on the effectiveness of any structural conservation measures.

Habitat Acquisition and Management

The South Texas Refuges Complex (STRC) is situated in southernmost Texas, and is made up of three NWR's: Santa Ana NWR, LANWR, and Lower Rio Grande Valley (LRGV) NWR. Laguna Atascosa NWR owns or manages about 97,000 acres of land. LANWR is home to one of the two known population of ocelots in the U.S. Located to the north of LANWR is the Texas ranch country, which includes huge blocks of important wildlife habitat, including the other U.S. ocelot population, located in Willacy County.

The LANWR Master Plan was completed in 1989, establishing a variety of objectives relative to the protection of endangered species, migratory waterfowl, cultural resource protection, research, investigation, and the provisions of public use and recreation opportunities. LANWR completed a proposed refuge expansion plan (Environmental Assessment and Conceptual Management Plan) in September of 1999. One of the reasons for the expanded management plan was the need to provide additional riparian and thicket habitats for the endangered ocelot and jaguarundi.

The Service continues to acquire land from willing sellers and establish conservation easements with willing landowners in order to establish wildlife corridors between LANWR and the Willacy County population to the north, and between LANWR and the Rio Grande, from Boca Chica to Falcon Dam, to the south. A conservation easement with the Brownsville Navigation District (Puerta de Trancas Loma), located between SH 48 and the Brownsville Ship Channel, and the wildlife crossing on SH 48 both play a key role in the ability of ocelots and jaguarundis to move safely between LANWR and the Mexico border. Directly to the south, across the border in Mexico, are ecologically valuable areas, such as the Laguna Madre of Tamaulipas and the Sierra de los Picachos in Nuevo Leon. These areas are receiving focused conservation attention from the Mexican Government and a number of interested U.S. and Mexican conservation organizations. The Service is working with Mexico to establish a wildlife coastal corridor along the Rio Grande, south of the action area, and in Tamaulipas in order to connect these ecologically important areas.

Wildlife Corridors

Brush clearing and conversion of native thornscrub to other habitat types continues to be a major limiting factor for the feline populations in the action area (Collins 1984, Rappole 1986). The ocelot and jaguarundi depend on densely vegetated travel corridors along resacas, ramaderos, and between brush tracts (Rappole 1988). These corridors facilitate dispersal through the otherwise cleared or fragmented landscape. Vegetation removal associated with "clean farming", as well as water storage, delivery and drainage, has negatively affected felid populations by altering or removing travel corridors between remnant thornscrub and brush patches.

A wildlife corridor is a linear habitat, embedded in a dissimilar matrix proposed for conservation on the grounds that it will enhance or maintain the viability of specific wildlife populations in the habitat blocks (Beier and Noss 1998). The original landscape in many reserve areas was a series of interconnected natural habitats. Thus, corridors are an attempt to maintain or restore natural landscape connectivity. Increased connectivity, along with adding effective habitat areas, can counteract habitat fragmentation (Noss 1987). Corridors also facilitate gene flow and dispersal of individual animals (Soule and Simberloff 1986). Life history studies of wide ranging animals suggest that maintenance or restoration of landscape connectivity is a good management strategy (Noss 1987). Corridors alleviate threats from inbreeding depression and a network of habitat patches or refugia linked by corridors may allow greater persistence for a species than can be provided by protecting individual isolated refuge areas.

Enlarging the width of a corridor can alleviate potential disadvantages caused by human and associated disturbances (Noss 1987). In general, the best corridors are as wide as possible. The ideal corridor width should be wide enough for an ocelot or jaguarundi to access sufficient food, water, and cover for their life requisites. In this way, genetic exchange can occur along the corridor and populations could be maintained even though the population density in any particular location might be low. Available corridor width depends on the target species, the habitat structure and quality within the corridor, the surrounding habitat, and human use of the area (Noss 1987).

Riparian and scrub forests associated with the Rio Grande consist of several intergrading habitat types that produce taller vegetation than surrounding areas. This vegetation is important to wildlife as corridors throughout LRGV, as are "resacas", which are former streambeds now subject to repeated drying and inundation and often forming a long quiet pond or oxbow (Service 1984). The Resaca de la Gringa is located on both sides of the Buena Vista Road and serves as a wildlife corridor connecting tracts of land from LANWR with land east and west of Buena Vista Road. Resaca de los Cuates connects tracts north and south of FM 510. These resacas feature dense vegetation that provides cover for transient ocelots and jaguarundi.

The Service (1990) believes it is highly likely that the continued existence of the isolated ocelot and jaguarundi populations along the Rio Grande are dependent upon protecting a movement corridor along the river. The habitat corridor paralleling the Rio Grande serves an important role in connecting the main coastal population of ocelots to the interior subpopulations. The lack of

suitable unoccupied habitat causes individual ocelot or jaguarundi to keep moving, sometimes retracing their previous movements, thus exposing them to an increased risk of mortality from vehicle strikes. Having to use fragmented habitat patches also reduces genetic viability and minimizes the likelihood of their survival and recovery in the wild. Ideker (1984) concluded that the only hope for the continued survival for both of these felid species in Texas was to preserve and restore the rapidly vanishing brush and thornscrub habitat of the area.

Other Federal Actions

Several other federal actions have resulted in formal section 7 consultations with the Service and the issuance of incidental take for the ocelot and jaguarundi within the action area.

A formal section consultation was completed for FHWA on improvements to FM 106 and Buena Vista Road in January 2005, and revised in June 2013. This action included improving the existing two-lane roadway to meet State highway standards by resurfacing the existing lanes and adding shoulders and graded ditches for approximately 12 miles between FM 1847 and FM 510. The proposed improvements would provide a 44-foot wide rural roadway consisting of two 12-foot wide travel lanes with 10-foot wide shoulders. These improvements would require approximately 10 feet of additional ROW on either side of the road. FM 106 bisects portions of the LANWR and serves as the access road leading into the refuge headquarters. TxDOT proposed to install eight wildlife crossings on FM 106 and Buena Vista Road to avoid and minimize effects to the ocelot and jaguarundi and loss of travel corridor habitat. ROW fencing would also be installed. Incidental take was provided for an aggregate of four endangered cats over any five year period related to the construction and use of FM 106. Construction of this project was started in November 2015.

A formal section 7 consultation was conducted with FHWA for SH 48 in 2004. The action included widening and improving approximately 9.7 miles of SH 48. The limits of the proposed construction are from SH 100 in Port Isabel to the Shrimp Basin near Brownsville. The highway was a two lane undivided road, with 12-foot wide main lanes, 8-foot-wide shoulders, and a 4-foot-wide flush median. The project expanded the roadway to a four-lane divided highway, with four 12-foot wide main lanes, two 10-foot wide outside shoulders, and two 4-foot wide inside shoulders with a concrete traffic barrier in the center. To avoid and minimize impacts to the endangered ocelot and jaguarundi TxDOT implemented a number of measures that included a bridge design wildlife crossing and associated diversion fencing on both sides of the highway. The Brownsville Navigation District granted the Service a 19-year conservation easement, 1,000-foot wide from the highway to the ship channel. Incidental take was provided for one ocelot and one jaguarundi. This project has been completed, and there has been no reported take of an ocelot or jaguarundi to date. Monitoring of the wildlife crossing, using camera traps, has not indicated any attempts to use the crossing by either an ocelot or a jaguarundi, although bobcats have used this crossing regularly.

In 2010, the Service conducted a formal section 7 consultation with the Department of Homeland Security for the installation of a waterline for the Port Isabel Detention Center. The new 12-inch water line connected to an existing line at the corner of FM 2480 and FM 510. The new line

followed FM 510 east to the intersection with FM 106, then turned north along FM 106 until it reached the detention facility. Incidental take was provided for the harassment of one ocelot and one jaguarundi during construction. Lethal take was not provided. This project has been completed, and there has been no reported take of an ocelot or jaguarundi to date.

Two other notable formal consultations have been conducted for the ocelot and jaguarundi outside of the action area, but the incidental take associated with these consultations could affect the LANWR ocelot population. They are:

- A 2013 formal consultation with the Federal Aviation Administration (FAA) for SpaceX. The FAA proposes to issue launch licenses and/or experimental permits to authorize Space X to launch Falcon 9 and Falcon Heavy orbital or suborbital vehicles from the launch site. SpaceX proposes to construct facilities, structures, and utility connections to support and operate a vertical launch site and control center on about 56.5 acres of land in Cameron County. The FAA was authorized incidental take of two endangered cats over the life of the project. SpaceX has not begun construction.
- In 2012, the Service completed a formal section 7 consultation with FHWA for improvements to US 77, between IH 37 in Nueces County and US 83 in Cameron County. The consultation covers construction, improvements, operation and maintenance of US 77 for the life of the project. Incidental take was authorized for two endangered cats during any five year period.

If all of the incidental take of ocelots that has been authorized since 2000 in Cameron County were to occur, the LANWR population would be extirpated.

Effects of the Action

Under section 7(a)(2) "effects of the action" refers to the direct and indirect effects of an action on a species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action. The effects of the proposed action are added to the environmental baseline to determine the future baseline that serves as the basis for the determination in this biological opinion. The impacts discussed below are the Service's evaluation of the direct and indirect effects of the proposed action. Indirect effects are those caused by the proposed action that occur later in time, but are still reasonably certain to occur (50 CFR 402.02). The Service has determined that there are no interrelated or interdependent actions apart from the action under consideration.

<u>Factors to be considered</u>

Proximity of the action

The proposed SH 100 project is located less than 10 miles from the core of the LANWR ocelot population. All of the prior ocelot deaths that have occurred on SH 100 within the project corridor have been young male ocelots. These individuals were likely searching for unoccupied habitat to establish new territories and/or looking for breeding opportunities when they tried crossing the roadway and were blocked by the CTB.

Distribution

The proposed improvements to SH 100 would occur within a single, long, linear area. The project length is about 7.1 miles and average width of the ROW is 152 feet, totaling about 130.11 acres. The construction footprint and direct effects would be localized to occur within the existing ROW. A majority of the ROW has previously been altered, containing the existing paved road and the managed/maintained ROW clear zone.

Timing

The projects disturbance would occur over a 12 to 16 month period during construction, although exposure would be limited to areas under construction at any given time. Since the project would take more than a single year to complete, it would span all climatological seasons. Effects could occur at any time of year, but are the most likely when young male ocelots leave the core population group in search of mates or new territories. Indirect effects would occur beyond the construction timeframe and would last throughout the life of the project.

Nature of the effect

The effects associated with the SH 100 project would be to the LANWR ocelot population's size, distribution, and/or variability. While the ROW fence would help keep cats off of the road, reduce traffic related mortality risks, and funnel ocelots and other wildlife toward the wildlife crossing structures, it would also act as a barrier for ocelot movement and exploration of the reconnected habitat north and south of SH 100. This effect would persist until the ocelot and jaguarundi become familiar with the wildlife crossing structures and feel comfortable using them to cross the roadway. These effects would be greater for dispersing animals, than resident animals.

Duration

Construction is proposed to begin on the project in the fall of 2015 and would take between 12 and 16 months to complete. The effects to the listed cats during construction would be short-term and only occur during project construction. Long-term effects would begin during project construction and persist as long as the road remains in the proposed configuration post-construction. These effects include the alteration of the species ability to carry out their normal life cycle, including emigration/immigration across the SH 100 corridor.

Disturbance frequency, intensity, severity

The proposed project would consist of a series of separate, but related, events. First, the fencing, cattle guards, and gates would be constructed along both sides of the road for the entire project length. Next, the new wildlife crossings would be installed and the road modified to accommodate the drainage and crossing modifications. Finally, vegetation would be planted and disturbed areas restored to pre-project conditions. TxDOT anticipates the project would start in

the Fall of 2015 and take about 12 to 16 months to complete. The disturbance would be a one-time event, except for when vehicles run off the roadway and damage portions of the ROW fence, requiring subsequent repairs. The direct disturbance to these species would only last during the construction portion of the project. The disturbance to movement due to the ROW fence would last until the species becomes accustomed to the wildlife crossings and readily uses them. The overall disturbance to these species related to the CTB creating a physical barrier in the center of SH 100 would last as long as the CTB remains in place.

The intensity and severity of the disturbance to the ocelot and jaguarundi would be significant and diminish over time. The population numbers for both species in the action area are extremely low. There is currently no genetic exchange between the LANWR ocelot population and the Willacy County or Mexico populations. Road mortality on SH 100 due to the CTB has reduced the genetic viability of the LANWR population. Further loss could result in extirpation of this population and further isolate the Willacy County population from the population in Mexico. While the proposed fencing and wildlife crossings may reduce potential ocelot road mortality, it would not be eliminated, since TxDOT is not removing the CTB or replacing it with a more wildlife permeable alternative, such as MBGF, due to safety concerns and state highway construction guidelines. The SH 100 project would continue to affect the LANWR ocelot population as long as the fencing and wildlife crossings are necessary to minimize the devastating effects of the CTB. Currently dispersing male ocelots cross in this area and may not become accustomed to using the passage. When ocelots re-establish home territories south of the highway, they will then have a chance to become accustomed to using the passage.

Analysis for Effects of the Action

The proposed project involves the installation of fencing along both sides of SH 100 for 7.1 miles, between Los Fresnos and Laguna Vista. Cattle guards would be installed at 18 driveway entrances and fence gates would be installed at two drainage canal access points. Five wildlife crossings would be installed or rehabilitated to provide the ocelot and jaguarundi a safe method to cross SH 100. However, the CTB that TxDOT installed in the center median of the road would remain in place to prevent head-on collisions on this section of SH 100, even though there are other public safety options available, such as MBGF, which are more wildlife friendly. TxDOT notes that the CBT would require less maintenance after a vehicle collision, making them safer for TxDOT workers than MBGF, which requires repair after impacts to maintain the required level of public safety.

Interrelated and interdependent actions are analyzed together with the direct and indirect effects of the action. Interrelated and interdependent actions that could occur in association with the project include, but are not limited to relocation of utilities in the ROW, if necessary, and the placement of project specific locations (PSLs), such as construction storage areas, vehicle and equipment parking areas, fueling areas, etc. TxDOT did not request incidental take coverage for any interrelated and interdependent actions in their project proposal, therefore effects associated them must be avoided by TxDOT and its contractor. If TxDOT, or its contractor, determines that an interrelated and interdependent action would affect an ocelot, jaguarundi, or their habitat, reinitiation of this BO would be required.

Beneficial Effects

The main purpose of the project is to mitigate for the adverse effects that have resulted from TxDOT's installation of the CTB on SH 100. The proposed ROW fencing is meant to act as a first line barrier to prevent cats from easily entering the roadway. The fencing would also act as a funnel, directing cats toward the wildlife crossing structures. The cattle guards and wing fencing are supplements to the ROW fencing in helping to deter cats from entering the roadway. The wildlife crossing structures would connect habitat on both sides of SH 100, while minimizing the ocelot and jaguarundi's exposure to road mortality.

The ROW fencing is meant to deter cats from accessing the roadway and guide them to a wildlife crossing. While it is possible that an ocelot could get inside the ROW fence and become trapped between the CTB and the fence, the fencing has been designed to reduce this risk to the greatest extent practicable. Specific fence design elements that reduce the risk of an ocelot crossing into the ROW or road include; concrete footers, cattle guards at driveways, and 6-foot tall fencing.

Direct Effects

Direct effects to the ocelot and jaguarundi are divided into short-term and long-term effects. Short-term effects include noise and human disturbance and would only occur during project construction, such as during the installation of the ROW fencing, cattle guards, and wildlife crossing structures. The long-term effects are related to habitat fragmentation and partial re connection.

Based on GPS and radio-telemetry information and road mortality data, ocelots do not appear to consistently inhabit the area adjacent to SH 100. And because construction would only take place during daylight hours, ocelots would not be subjected to artificial construction lighting effects during their nocturnal activities.

Direct effects to the ocelot or jaguarundi would be in the form or harm or harassment due to modifications of normal feeding, breeding, or sheltering activities that result in reduced fitness or other injury to individuals of the population. Direct injury or death of individuals is also possible, since the potential for them to enter SH 100 and be killed or injured by passing vehicles has not been completely eliminated.

<u>Human disturbance</u>

Although not documented for the ocelot and jaguarundi, several responses to human disturbance can be expected in felines. For example, Florida panthers shifted their habitat use area in response to hunters although no changes related to energy intakes (activity rates, movement rates or predation success) were noted (Janis and Clark 2002). In another study, lynx were found to have a median tolerance limit to approaching humans of 164 feet and they tolerated a closer approach by humans when in denser habitats, than in more open areas (Sunde et al 1998, as cited

by Tempel et al 2006). In general, typical wildlife responses to human disturbance may be fleeing, increased vigilance, and changes in habitat selection (Frid and Dill 2002). These responses can be expected in ocelots or jaguarundis as human disturbance occurs during any phase of this project, including construction, revegetation, and maintenance.

Noise

Noise can cause stress in animals and the autonomic responses to noise are varied. MacArthur et al. (1979) believed that there was an energetic cost to animals being disturbed by noise. Other researchers have used heart rate as physiological index of energy expenditure, monitored with telemetry, in wild animals exposed to noise. While some have used heart rate changes to indicate alarm or excitement of animals exposed to noise (Larkin 1996). For the proposed project, the most severe noise likely to be encountered by the cats is that from operation of construction equipment. Noises vary according to the direction from where they are measured. (Larkin 1996). Responses of wildlife to noise have included a range of responses from no reaction, to alerting, to disruption of feeding, to running away (Larkin 1996). There are no known studies that specifically address the effects of noise on ocelot or jaguarundi, in fact, information about the effect of noise on species of felines is lacking. It is reasonable to assume that the cats could display the range of responses to noise, they could have no reaction, become alert, halt whatever action they are undertaking, or display a fight or flight response.

Noise created during construction and maintenance would have the potential to affect individual ocelot and jaguarundi that occur within the project area. All project-related noise would be temporary and limited to within the immediate area under construction. Since the proposed road modifications to SH 100 would not increase the vehicle capacity of the road, noise associated with traffic on SH 100 would not exceed existing levels.

The impacts of noise would include subtle, localized impacts from the overall elevation of ambient noise levels during construction. Noise levels after construction are anticipated to return to close to current ambient levels. Elevated noise levels during construction could result in reduced communication ranges, interference with predator/prey detection, or habitat avoidance in the action area. More intense impacts would include behavioral changes, disorientation, or hearing loss. Predictors of wildlife response to noise include: noise type (i.e., continuous or intermittent), prior experience with noise, proximity to a noise source, stage in the breeding cycle, activity, and age. Prior experience with noise is the most important factor in the response of wildlife to noise, because wildlife can become accustomed to the noise. They may also permanently avoid an area due to the noise, if it lasts for a significant period of time. The proposed action runs along areas that are mostly undeveloped, but it is likely that any ocelot or jaguarundi that inhabits the action area has prior experience with the existing noise levels in the action area. The rate of habituation to short-term construction is not known, but it is anticipated that most ocelots and jaguarundis would only be temporarily displaced from areas adjacent to the project, during construction periods.

Fragmentation and Connectivity

Along with habitat loss and degradation, most biologists agree that habitat fragmentation is a major cause of reduced biodiversity (Noss et al 2001). Habitat fragmentation is the separation of a landscape into various land uses (development, agriculture, etc.) resulting in numerous small disjointed habitat patches left for use by wildlife. Fragmentation eliminates areas needed for breeding, feeding, and sheltering for species like the ocelot and jaguarundi that require large, unbroken blocks of habitat. Fragmentation can also isolate cats from travel corridors and reduce dispersal for breeding. In a small population, such as the ocelot and jaguarundi in south Texas, inbreeding can reduce fitness of individuals and loss of genetic variability can reduce the ability of an animal to adapt to a changing environment (Lande 1988) and increase population-level disease susceptibility as immunity profiles homogenize.

Additionally, the small habitat patches resulting from fragmentation may not provide the food and cover resources necessary for the species; therefore, they may not use the habitat patch. This can result in an increased risk of death by predation if the animal has to venture beyond the cover of the patch to find new resources. The proposed ROW fencing would act as a barrier to ocelot movements, resulting in fragmented habitat on both sides of the road. However, the CTB already acts as a movement barrier to ocelots and jaguarundis on SH 100. Leaving the CTB in place protects the traveling public from head-on collisions, but causes fragmentation and presents a geographical barrier to ocelot and jaguarundi movement. The wildlife crossings should partially mitigate the barrier effect caused by the CTB, which currently presents an obstacle to ocelot and other wildlife from accessing available habitat south of the road.

Habitat connectivity within the portions of the wildlife corridor would be reduced. This would likely impact ocelot and jaguarundi movement, access to traditional water sources, and potential for gene flow. Impacts on these species relative to habitat connectivity are anticipated to be both short-and long-term, and range from minor to major depending upon project. The connectivity for cats through the project site would be reduced during construction and maintenance due to human activity.

Indirect Effects

Indirect effects are those effects that are caused by or would result from the proposed action, occur later in time, but are reasonably certain to occur. Indirect effects may occur outside the area directly affected by the proposed action. Indirect effects associated with this project relate to harm and harassment from habitat fragmentation and the potential for further degradation of the genetic viability of the LANWR population if additional cats are lost on SH 100.

Due to the isolation of the LANWR ocelot population from any other ocelot populations and its extremely small size (estimated to be less than 20 individuals), genetic bottle-necking caused by inbreeding is highly likely. When population numbers reach this low a level, the loss of singleanimals may negatively impact the population. Genetic drift and inbreeding in small, isolated, populations act to erode genetic diversity through the loss of alleles and the increase in homozygosity (Lacy 1987). A combination of genetic drift and inbreeding in small populations

decreases population viability and increases the probability of extinction (Newman and Pilson 1997; Westermeier et al. 1998, Brook et al. 2002).

Walker (1997) reported a reduction in mean heterozygosity in populations of ocelots from Texas compared to those in Mexico, with heterozygosity of the isolated population at LANWR being approximately half that seen in Mexico. More recently, Janecka et al. (2008) estimated and compared the genetic diversity of the Cameron and Willacy County ocelot populations from ocelot blood samples taken between 1986 and 2005. The Cameron County population had low levels of heterozygosity, consistent with previous studies (Walker 1997) and showed a 23 percent decrease in heterozygosity from 0.43 in 1986-1989 to 0.33 in 2001-2005 (Janecka et al. 2008). The Willacy population had higher levels of genetic diversity but also showed a 10 percent reduction in heterozygosity from 0.48 in 1996-1998 to 0.43 in 2001-2005 (Janecka et al. 2008).

Genetic analyses comparing the U.S. ocelot populations with those in northeastern Mexico revealed that both U.S. populations are significantly divergent from populations in northeastern Mexico and suggest no genetic exchange has occurred between the Texas to Mexico populations in recent decades (Janecka et al. 2011, Janecka et al. 2014). The Service is working with a number of conservation partners, including Mexico, to develop an ocelot coastal corridor to facilitate ocelot or jaguarundi movement between the Texas populations and Mexico, which ultimately may allow for a reversal of the genetic degradation in the Texas ocelot populations. The ocelot coastal corridor will connect LANWR to Bahia Grande (crossing SH 100), the Loma Preserve at the Port of Brownsville (crossing SH 48 at the ocelot wildlife crossing), Boca Chica (crossing SH 4), and into Mexico (Laguna Madre and Delta del Rio Bravo Flora and Fauna Protected Area). The ocelot coastal corridor will act as a long-term wildlife corridor for ocelot dispersal and habitat connectivity. Translocation of ocelots from more diverse source populations (e.g. Mexico or Belize) to Texas and translocation of ocelots between the LANWR and Willacy County populations are short-term management strategies that are practical for improving genetic diversity (Janecka et al. 2014).

Species' Response to the Proposed Action

It is extremely difficult, if not impossible, to determine the response of the ocelot or jaguarundi to the proposed action. The ROW fencing and cattle guards would help prevent some cats from entering the SH 100 roadway, but are not likely to be 100 percent effective. The project would likely result in the reduction of fitness and genetic diversity of individuals in the LANWR population as a result of some continued habitat isolation. In addition, the fencing would likely cause the "bounceback effect", causing cats that encounter the fence to turn away and seek whatever resources they were looking for in a different location. This leads them to expend unnecessary energy in search of food, mates, or new territories, thereby requiring additional energy expenditure and reducing the fitness of the individual, as well as increasing the likelihood of causing them to encounter other threats, including roads.

The ROW fencing would help funnel cats to the new and modified wildlife crossings. It may take months or even years before the cats successfully use the crossings to access available

habitat on the south side of SH 100. Crossings 1 and 2 may never effectively function reliably as wildlife crossings. The ROW fencing would extend over the top of the crossings and is not designed to funnel wildlife directly into the crossing structures although the Drainage District may allow some thornscrub vegetation be installed on one side of the drainage ROW; providing some potential cover for the cats within or along the drainage ditches. With less habitat to lead them into the crossings, utilizing them will be less appealing to the cats. And lastly, the primary purpose of Crossings 1 and 2 is water conveyance for the Drainage District. There would be standing water in the crossings most of the time, reducing the openness ratio of the crossings. The Service is concerned that even with the installation of cat walkways within the culverts, the ocelot and jaguarundi are less likely to use these crossings than they would the same sized culverts placed at grade, above the water table, with fencing and dense woody vegetation leading directly into the crossing opening.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Past and present federal actions in the vicinity of the proposed action are discussed under the Environmental Baseline section.

The Service is not aware of any Cumulative Effects within the action area.

Conclusion

After reviewing the current status of the ocelot and jaguarundi, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that TxDOT's proposed SH 100 rehabilitation actions, as proposed is not likely to jeopardize the continued existence of the ocelot or jaguarundi, and is not likely to destroy or adversely modify designated critical habitat. No critical habitat has been designated for these species; therefore, none would be affected.

Ocelots are known to occur in areas of suitable habitat in Cameron County, Texas, and although there have been no confirmed sightings of jaguarundi in south Texas in over 20 years, sightings are occasionally reported and provide sufficient information to include them in this analysis. Four ocelots have been killed on SH 100 since it was widened in 1994, including three in the last four years, after the CTB was installed. The proposed reconfiguration of SH 100 is expected to significantly reduce the likelihood of future ocelot deaths. , Continued inaction by TxDOT would likely result in further ocelots deaths on SH 100. The LANWR population is currently estimated at less than 20 individuals, and has been genetically isolated from other ocelot populations for a number of years. Continued loss of individuals from the LANWR population would further dilute the genetic viability of the population leading to its certain extirpation.

Although TxDOT cannot eliminate the possibility of further ocelot or jaguarundi mortality on SH 100, they have minimized the effects to the maximum extent possible for this project, while

maintaining public safety on the roadway. Therefore, after reviewing the current status of the ocelot and jaguarundi, the environmental baseline for the action area, the effects of the proposed SH 100 improvements, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the ocelot or jaguarundi. There is no critical habitat listed in the state of Texas for these species of cats, therefore none will be affected.

Our non-jeopardy determination is based on the following reasons:

- The listed ocelot population extends across most of Central and South America and population estimates range from around 800,000 up to three million in South America alone (Emmons 1988). The jaguarundi is also more abundant outside of the U.S. The loss of all or a portion of the ocelot or jaguarundi populations in Texas would not diminish the overall numbers of these two species in the wild. Even if the reproduction and distribution of the LANWR population is adversely affected and the population ceases to be genetically viable, range wide recovery would not be diminished.
- The proposed project actions would be beneficial in reducing the chances for road mortality on SH 100 where the CTB exists. The wildlife crossings would also provide safe habitat connectivity to areas currently isolated by the CTBs on SH 100.
- There is no way to completely eliminate the potential for ocelot and jaguarundi road mortality in the action area. The implementation of the proposed action and its associated conservation measures, such as fencing and wildlife crossings, on roads within the action area would provide the best opportunity to maintain the ocelot population at LANWR.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the TxDOT so that they become binding conditions of the project in order for the exemption in section 7(o)(2)

to apply. TxDOT has a continuing duty to regulate the activities covered by this incidental take statement. If TxDOT fails to assume and implement the terms and conditions, or (2) fails to require any agent acting on behalf of TxDOT to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to any contracting document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, TxDOT must report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement (50 CFR 402.14(i)(3)).

Amount or Extent of Take Anticipated

The Service anticipates incidental take of the ocelot and jaguarundi in the form of harm and harassment during implementation of the proposed action by TxDOT. The take would occur during construction of the ROW fencing and wildlife crossing structures, and would last as long as these features remain in place and in effective working condition. The amount of take that would occur due to harm and harassment, would be difficult to detect because these species are wide-ranging, elusive, nocturnal, and finding injured individuals or pinpointing that an injury was caused by the project components and resulted in the impairment of essential feeding, breeding, and/or sheltering behavior is unlikely. The take of ocelot or jaguarundi, however, can be reasonably anticipated due to the continued risk of road mortality and disturbance to normal dispersal of the cats into otherwise suitable habitat.

Implementation of the proposed action by the TxDOT would reduce the likelihood that unauthorized take would occur on SH 100. However, TxDOT is not removing the CTB from the SH 100 center median, maintaining the likelihood that any ocelot or jaguarundi that circumvents the ROW fencing and wildlife crossings and enters the roadway would be directly taken, via injury or death. In addition, because the project construction is expected to last between 12 and 16 months, the Service anticipates that the construction and maintenance may result in harm and harassment of these species. Based on the information in this BO, the Service has determined the amount of anticipated take is limited to:

> Non-lethal take of all ocelot and jaguarundi that are harmed or harassed due to the construction and long-term presence of the ROW fence, cattle guards, wildlife crossings, and gates at the Drainage District ROWs. The harm and harassment associated with these features would be expected to result in an adverse effect to the typical feeding, breeding, or sheltering behavior of the ocelot or jaguarundi. This take would be for the life of the project, provided all features are inspected on a regular basis and repairs are made within 30 days of discovering damage that inhibits the feature from providing its full conservation value. This includes, but is not limited to: repair of ROW fencing knocked down by humans, vehicles, and non-tropical storm winds or rain; removal of built up sediment in the wildlife culverts that exceeds 12-inches in depth; removal of accumulated sediment or debris from the cattle guards if more than 25 percent of the empty space beneath is filled; control of vegetation adjacent to the ROW fence on TxDOT's easement to prevent cats from easily circumventing the fence; and, repair of the gates located at the Drainage District ROWs if they are damaged or left open on more than one occasion within any 7 day period.

Lethal take of one ocelot or jaguarundi that is injured or killed on SH 100 within the 7.1 mile project corridor at any point in the future after the issuance of this BO.

Effect of Take

In the accompanying BO, the Service determined that this level of anticipated take is not likely to result in jeopardy to the ocelot or jaguarundi in the wild across their listed range. However, further loss of individuals from the LANWR ocelot population due to road mortality could push this population towards extirpation.

REASONABLE AND PRUDENT MEASURES

The Service believes the following Reasonable and Prudent Measures are necessary and appropriate to minimize the impacts of incidental take of the ocelot and/or jaguarundi.

1. TxDOT must fully implement the Voluntary Conservation Measures proposed in their BA for this project.

2. TxDOT must notify the Service of any take of an ocelot or jaguarundi or if any cat is found dead or injured during project implementation.

3. TxDOT must provide information and training to all employees and contractors working on the project about ocelot habitat requirements and the measures proposed by TxDOT or required in the BO to avoid impacts to the ocelot and jaguarundi.

4. TxDOT must monitor take of the ocelot and jaguarundi and provide periodic monitoring reports to the Service.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, TxDOT must comply with the following Terms and Conditions, which implement the Reasonable and Prudent Measures described above and outline required reporting/monitoring requirements. These Terms and Conditions are non-discretionary.

1. TxDOT has proposed a number of voluntary conservation measures, listed in the BA and the “Description of the Proposed Action” section of this document. TxDOT’s proposed Conservation Measures are incorporated as reasonable and prudent measures by reference and must be implemented, as proposed, in conjunction with this project.

2. If a cat is found injured or dead at the project site (including the roadway, ROW, and any other location linked to the project site or its scope of work), all work must stop and TxDOT must immediately notify the species lead biologist Hilary Swarts (956-245-9445), at LANWR, and the Service’s Texas Transportation Liaison, Darren LeBlanc (512-608-7591). The dead or injured cat should not be disturbed in any manner without authorization from the Service.

3. TxDOT must hold a pre-construction meeting with its employees and any contractors working on this project to provide specific instruction on the implementation of TxDOT's proposed Conservation Measures and the Service's Reasonable and Prudent Measures, included in this Incidental Take Statement. Instructions specific to the contractor(s) related to implementation of the Conservation Measures and Reasonable and Prudent Measures must be documented in writing. TxDOT is ultimately responsible for informing anyone working on this project of these requirements.

4.a. TxDOT will monitor and report incidental take that occurs from this project to the Service. This must be done through sufficient on-site inspections to determine if construction related impacts have occurred as described in this BO. Construction monitoring reports must include a summary of construction actions implemented during the previous six month period, any unanticipated actions or delays in project completion, and any known incidental take that has occurred along with reasons for that take. Construction monitoring reports must be submitted in accordance with the timelines proposed in TxDOT's project monitoring and reporting Conservation Measure.

4.b. TxDOT will monitor and maintain the fencing, cattle guards, and wildlife crossings on a monthly basis and on an emergency basis (e.g. car runs through fencing), as needed, for as long as SH 100 is in use.

4.c. In order to determine if the wildlife crossing structures are being used, post-construction monitoring of the crossing structures and cattle guards with wildlife cameras would begin after the completion of construction. TxDOT will monitor and maintain cameras at wildlife crossings and cattle guards for five years after construction. For the first year, camera data will be collected monthly or more or less frequently depending on the rate that camera data cards are filling up. A report will be submitted to the Service in January and June of each year following construction, including camera location, species, numbers and date/time of wildlife use, and a summary of crossing events (successful or not). After the first year, TxDOT will coordinate with the Service on adaptive monitoring and make adjustments for effectiveness and efficiency. All raw data, including photos, from the wildlife monitoring cameras will be turned over to the Service's ocelot biologist at LANWR along with the monitoring reports. Any cameras that are broken or stolen must be replaced within 30 days in order for sampling results to be consistent and uninterrupted. At the end of five years and in coordination with the Service, TxDOT would evaluate the frequency, size, and duration of repairs and maintenance actions and include them in a report to the Service. Using the project and species monitoring information, TxDOT, in coordination with the Service, will develop a long-term maintenance program to maintain the functionality of the fencing and structures in order to ensure continued long-term protection for the ocelot and jaguarundi.

The Reasonable and Prudent Measures, with their implementing Terms and Conditions, are to minimize the impact of incidental take that might otherwise result from the proposed action. If the incidental take is exceeded, this represents new information requiring reinitiation of formal Act section 7 consultation and review of the Reasonable and Prudent measures provided. Should this occur, TxDOT must immediately provide an explanation of the cause of the taking and review with the Service the need for reinitiating consultation on the project.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal action agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or develop information.

For the benefit of the ocelot and jaguarundi, the Service recommends the following:

- Implement ROW maintenance that promotes or maintains thornscrub or brush habitat along the edge of TxDOT's road ROWs.

- Conduct research on local ocelot and jaguarundi use of wildlife crossings and the effectiveness of fencing and cattle guards as a deterrent for cats entering roadways.

- Coordinate with the Service on non-federal projects to assist in the creation or preservation of ocelot corridors to connect ocelot populations in Willacy and Cameron counties, Texas and in Mexico.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

Reinitiation Notice

This concludes the Service's formal consultation on the action described in TxDOT's formal consultation request. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) the project is not completed within three years of the date of this BO; (3) new information reveals the agency action that may affect listed species or critical habitat in a manner, or to an extent, not considered in this opinion; (4) the agency action is subsequently modified in a manner that causes an effect to the listed species or CH not considered in this opinion; or (5) a new species is listed or CH is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease immediately pending reinitiation.

Sincerely,

Tanya Sommer
Acting Field Supervisor

cc: Robin Gelston, TxDOT Pharr District, San Antonio, TX (electronic)
John Young, TxDOT ENV, Austin, TX (electronic)
Meghan Pawlowski, TxDOT ENV, Austin, TX (electronic)
Hilary Swarts, Laguna Atascosa NWR (electronic)

LITERATURE CITED

Allen, T.D.H., M.P. Huijser, and D W. Willey. 2013. Effectiveness of wildlife guards at access roads. Wildlife Society Bulletin 37:402-408.

Ancrenaz, M.A.J. Hearn, J. Ross, R. Sollmann, and A. Wilting. 2012. Handbook for wildlife monitoring using camera traps. BBEC II Secretariat.

Anderson, S.H., and K.J. Gatzwiller. 1996. Habitat evaluation methods. Pages 592-606 *in* T.A. Bookhout, ed. Research and management techniques for wildlife and habitats. Fifth Edition. The Wildlife Society, Bethesda, Maryland.

Anonymous. 1989. Update on jaguarundi sightings. Horizons 14(1):8.

Bailey, R.G. 1995. U.S. Forest Service: Description of the Ecoregions of the United States. http://www.fs.feds.us/land/ecosysmgmt/index.html.

Barnum, S.A. 2003. Identifying the best locations along highways to provide safe crossing opportunities for wildlife: A handbook for highway planners and designers. Final report CDOT-DTD-UCD-2003-9. Colorado Department of Transportation Research, Denver, Colarado.

Beier, P. and R.F. Noss. 1998. Do habitat corridors really provide connectivity? Conservation Biology 12:1241-1252.

Benn, S. 1997. Endangered feline population and habitat enhancement. Final Report, Federal Aid Grant No. 12. Texas Parks and Wildlife Department, Austin, Texas.

Bisbal, F.J. 1986. Food habits of some Neotropical carnivores in Venezuela. Mammalia 50:329-339.

Bissonette, J.A., and W. Adair. 2007. Restoring habitat permeability to roaded landscapes with isometrically-scaled wildlife crossings. Biological Conservation 141:482-488.

Bissonette, J.A., and P.C. Cramer. 2008. Evaluation of the use and effectiveness of wildlife crossings. NCHRP report 615. Transportation Research Board of the National Academies, Washington, D.C.

Bontrager, O.E., C.J. Scifres, and D.L. Drawe. 1979. Huisache control by power grubbing. Journal of Range Management 32:185-188.

Booth-Binczik, S.D., R.D. Bradley, C.W. Thompson, L.C. Bender, J.W. Huntley, J.A. Harvey, L.L. Laack, and J.L. Mays. 2013. Food habits of ocelots and potential for competition with bobcats in southern Texas. The Southwestern Naturalist 58(4):403-410.

Brook, B.W., D.W. Tonkyn, J.J. O'Grady, and R. Frankham. 2002. Contribution of inbreeding to extinction risk in threatened species. Conservation Ecology 6:1-16.

Caso, A. 1994. Home range and habitat use of three neotropical carnivores in northeast Mexico. Unpublished M.S. Thesis, Texas A&M University, Kingsville, Texas.

Clevenger, A.P., and M.P. Huijser. 2011. Wildlife crossing structure handbook: Design and evaluation in North America. Publication # FHWA-CFL/TD-11-003.

Clevenger, A.P., B. Chruszcz, K. Gunson, and J. Weirzchowski. 2002. Roads and wildlife in the Canadian Rocky Mountain Parks-movements, mortality, and mitigation. Final Report. Parks Canada, Banff, Alta, Canada.

Coastal Impact Monitoring Program. 1995. Report of Literature Review on Discharges from the Rio Grande and Arroyo Colorado and their Impacts. Texas General Land Office, Austin, Texas.

Collins, K. 1984. Status and management of native south Texas brushland. U.S. Fish and Wildlife Service, Ecological Services, Corpus Christi, Texas.

Cramer, P.C., and J.A. Bissonette. 2006. Wildlife crossings in North America: The state of the science and practice. Proceedings of the 2006 International Conference on Ecology and Transportation, San Diego, California.

Crawshaw, Jr., P.G., and H.B. Quigley. 1989. Notes on ocelot movement and activity in the Pantanal Region, Brazil. Biotropica 21:377-379.

Davis, W.B. and D.J. Schmidly. 1994. *The Mammals of Texas*. Texas Parks and Wildlife Press. Austin, Texas.

de Oliveria, T.G. 1998. *Leopardus wiedii*. Mammalian Species 579:1-6.

Dillon, A. 2005. Ocelot home range and density in Belize, Central America: Camera trapping and radio telemetry. M.S. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Dodd, N.L., J.W. Gagnon, S. Boe, A. Manzo, and R.E. Schweinsburg. 2007. Evaluation of measures to minimize wildlife-vehicle collisions and maintain permeability across highways: State Route 260, Arizona. Final Project Reports JPA 01-152 and JPA 04-024T. Arizona Department of Transportation, Arizona Transportation Research Center, and the Federal Highway Administration.

Eaton, R. 1977. Breeding biology and propagation of the ocelot (*Leopardus* [*Felis*] *pardalis*). Zool. Garten Jena 47:9-23.

Emmons, L.H. 1987. Comparative feeding ecology of felids in a neotropical forest. Behavioral Ecology and Sociobiology 20:271-283.

Emmons, L.H. 1988. A field study of ocelots (*Felis pardalis*) in Peru. Review of Ecology (*Terre Vie*) 43:133-157.

Eriksson, O., A. Sjolund, and C. Andren. 2000. Amphibians and Roads. Vagverket, Swedish National Road Administration, Publication 7.

Federal Highway Administration. 2014. Environmental toolkit: Wildlife vehicle collision reduction training. https://www.environment.fhwa.dot.gov/wvctraining/mod4/module_4_14.asp

Fischer, C.V. 1998. Habitat use by free-ranging felids in an agroecosystem. M.S. Thesis, Texas A & M University, Kingsville, Texas.

Foster, M.L., and S.R. Humphrey. 1995. Use of highway underpasses by Florida panthers and other wildlife. Wildlife Society Bulletin 23:95-100.

Frid, A. and L.M. Dill. 2002. Human-caused disturbance stimulias a form of predation risk. Conservation Ecology. 6(1):11-26.

Goodwyn, F. 1970. Behavior, life history and present status of the jaguarundi, Felis yagouaroundi (Lacepede), in South Texas. M.S. Thesis, Texas A&I University, Kingsville, Texas.

Grassman, L.I., M.E. Tewes, and A. Haines. 2006. Ocelot and jaguarundi survey on perimeter lands of Choke Canyon Reservoir. Final report (Cooperative agreement # 201814J852) to the U.S. Fish and Wildlife Service. Texas A&M University, Kingsville, Texas.

Haines, A.M., M.E. Tewes, and L.L. Laack. 2005a. Survival and sources of mortality in ocelots. Journal of Wildlife Management 69:255-263.

Haines, A.M., M.E. Tewes, L.L. Laack, W.E. Grant and J. Young. 2005b. Evaluating recovery strategies for an ocelot population in southern Texas. Biological Conservation 126:512-522.

Hall, E.R. and W.W. Dalquest. 1963. The mammals of Veracruz. Museum of Natural History, University of Kansas, Lawrence, Kansas.

Hanselka, C.W. 1980. The historical role of fire on South Texas rangelands. Pages 2-18 *in* C.W. Hanselka, ed. Prescribed range burning in the Coastal Prairie and eastern Rio Grande Plains of Texas. Texas Agricultural Experiment Station, Control # TA 16277.

Horne, J.S. 1998. Habitat partitioning of sympatric ocelot and bobcat in southern Texas. M.S. Thesis. Texas A&M University-Kingsville, Kingsville, Texas.

Huijser, M.P., A. Kociolek, P. McGowen, A. Hardy, A.P. Clevenger, and R. Arment. 2007. Wildlife vehicle collision and crossing mitigation measures: A toolbox for the Montana Department of Transportation. Western Transportation Institute. Montana State University, Bozeman, Montana.

Hulley, J.T. 1976. Maintenance and breeding of captive jaguarundi (*Felis yagouaroundi*) at Chester Zoo and Toronto. International Zoo Yearbook 16:120-122.

Immigration and Customs Enforcement. 2010. Biological Assessment for the Proposed Construction and Maintenance of a Water Transmission Line on County Road 794, FM 510, and Buena Vista Road, Cameron County, Texas.

Ideker, J. 1984. Documentation of the status of neotropical felids along the Lower Rio Grande Valley wildlife corridor in South Texas: October 10, 1984-Spetember 30, 1985. Santa Ana/Rio Grande Valley National Wildlife Refuge Complex, Alamo, Texas.

Jackson, V.L., L.L. Laack, and E.G. Zimmerman. 2005. Landscape metrics associated with habitat use by ocelots in South Texas. Journal of Wildlife Management 69:733-738.

Jahrsdoerfer, S.E. and D.M. Leslie, Jr. 1988. Tamaulipan brushland of the lower Rio Grande Valley of South Texas: Description, human impacts, and management options. U.S. Fish and Wildlife Service, Oklahoma Cooperative Fish and Wildlife Research Unit, Stillwater, Oklahoma.

Janecka, J.E., M.E. Tewes, L.L. Laack, L.I. Grassman, A.M. Hines, and R.L. Honeycutt. 2008. Small effective population sizes of two remnant ocelot populations in the United States. Conservation Genetics 9:869-878.

Janecka, J.E., M.E. Tewes, L L. Laack, L.I. Grassman, A.M. Hines, D.B. Shindle, B.W. Davis, W.J. Murphy, and R.L. Honeycutt. 2011. Reduced genetic diversity and isolation of remnant ocelot populations occupying a severely fragmented landscape in southern Texas. Animal Conservation 14:608-619.

Janecka, J.E., M.E. Tewes, L.L. Laack, A. Caso, L.I. Grassman, and R.L. Honeycutt. 2014. Loss of genetic diversity among ocelots in the United States during the 20th century linked to human induced population reductions. PLoS One 9(2):e89384.

Janis, M.W. and J.D. Clark. 2002. Responses of Florida panthers to recreational deer and hog hunting. The Journal of Wildlife Management 66(3): 839-848.

Konecny, M.J. 1989. Movement patterns and food habits of four sympatric carnivore species in Belize, Central America. Pages 243-264 *in* K.H. Redford and J.F. Eisenberg, editors. Advances in neotropical mammalogy. Sandhill Crane Press, Gainesville, Florida.

Korn, J.M., and M.E. Tewes. 2013. Genetic pedigree and prey dynamics of ocelot and fine-scale movement patterns of bobcat in south Texas. Ph.D. Dissertation, Texas A&M University- Kingsville, Kingsville, Texas.

Laack, L.L. 1991. Ecology of the ocelot (*Felis pardalis*) in South Texas. M.S. Thesis, Texas A&I University, Kingsville, Texas.

Laack, L.L., M.E. Tewes, A.H. Haines, J.H. Rappole. 2005. Reproductive ecology of ocelot (*Leopardus pardalis*) in southern Texas. Acta Theriologica 50:505-514.

Laack, L.L. and J.H. Rappole. 1986. Investigation into the basic ecology of the ocelot in South Texas. Final Report (October1, 1985-September 30, 1986), contract #14-16-0002-81-229. Caesar Kleburg Wildlife Research Institute, Texas A&I University, Kingsville, Texas.

Laack, L.L., and J.H. Rappole. 1987. Investigation into the basic ecology of the ocelot in South Texas. Final Report (October1, 1986-September 30, 1987), contract #14-16-0002-81-229. Caesar Kleburg Wildlife Research Institute, Texas A&I University, Kingsville, Texas.

Lacy, R.C. 1987. Loss of genetic diversity from managed populations: Interacting effects of drift, mutation, immigration, selection, and population subdivision. Conservation Biology 1:143-158.

Land, D., and M. Lotz. 1996. Wildlife crossing designs and use by Florida panthers and other wildlife in southwest Florida. Pages 323-328 *in* G. Evink, D. Ziegler, P. Garrett and J. Berry, editors. Highways and movement of wildlife: Improving habitat connections and wildlife passageways across highway corridors. Florida Department of Transportation, Tallahassee, Florida.

Lande, R. 1988. Genetic and demography in biologica; conservation. Science 241(4872):1455-1460.

Larkin, R.P. 1996. Effects of military noise on wildlife: A literature review. Center for Wildlife Ecology, Illinois Natural History Survey.

Ludlow, M.E., and M.E. Sunquist. 1987. Ecology and behavior of ocelots in Venezuela. National Geographic Research and Exploration 3:447-461.

MacArthur, R.A., R.H. Johnston, and V. Geist. 1979. Factors influencing heart rate in free-ranging bighorn sheep: A physiological approach to the study of wildlife harassment. Canadian Journal of Zoology 57(10):2010-2021.

Mata, C., I. Hervas, J. Herranz, F. Suarez, and J.E. Malo. 2005. Complementary use by vertebrates of crossing structures along a fenced Spanish motorway. Biological Conservation 124:397-405.

McKinney, T., and T. Smith. 2007. US 93 bighorn sheep study: Distribution and trans-highway movements of desert bighorn sheep in northwestern Arizona. Report FHWA-AZ-07-576. Arizona Department of Transportation, Phoenix, Arizona.

Mercer, S.H., L.P. Jones, J.H. Rappole, D. Twedt, L.L. Laack, and T.M. Craig. 1988. Hepatozoon sp. in wild carnivores in Texas. Journal of Wildlife Diseases 24:574-576.

Mora, M.A., L.L. Laack, M.C. Lee, J. Sericano, R. Presley, P.R. Gardinali, L. R. Gamble, S. Robertson, and D. Frank. 2000. Environmental contaminants in blood, hair, and tissues of ocelots from the Lower Rio Grande Valley, Texas, 1986-1997. Environmental Monitoring and Assessment 64:447-492.

Murray, J.L. and G.L. Gardner. 1997. *Leopardus pardalis*. Mammalian Species No. 548:1-10.

Navarro-Lopez, D. 1985. Status and distribution of the ocelot in South Texas. M.S. Thesis. Texas A&M University, Kingsville, Texas.

National Fish and Wildlife Laboratory. 1980. Selected vertebrate endangered species of the seacoast of the United States-the jaguarundi. U.S. Fish and Wildlife Service, Biological Services Program, Washington, D.C.

Newman, D. and D. Pilson. 1997. Increased probability of extinction due to decreased genetic effective population size, experimental populations of *Clarkia pulchella*. Evolution 51:354-362.

Noss, R.F. 1987. Corridors in real landscapes: A reply to Simberloff and Cox. Conservation Biology 1:159-164.

Noss, R.F., E.T. LaRoe, J.M. Scott. 2001. Endangered ecosystems of the United States: A preliminary assessment of loss and degradation. National Biology Service Report.

Nowak, R. and J.L. Paradiso. 1983. Walker's mammals of the world. Volume 2. John Hopkins University Press, Baltimore, Maryland.

Nowell, K., and P. Jackson. 1996. Wild cats, status survey and conservation action plan. IUCN/SSC cat Specialist Group.

Pence, D.B., M.E. Tewes, D.B. Shindle, and D.M. Dunn. 1995. Notoedric mange in an ocelot (*Felis pardalis*) from southern Texas. Journal of Wildlife Diseases 31(4): 558-561.

Prieto, F.G. 1990. Endangered feline population and habitat enhancement. Performance Report, Federal Aid Project No. W-125-R-1 and ESEC 6-1, Job No. 12. Texas Parks and Wildlife Department, Austin, TX.

Rappole, J.H. 1986. An intensive study for ocelots and jaguarundi on the Tres Corrales Ranch, Hidalgo County, Texas. Final report. Caesar Kleburg Wildlife Research Institute, Kingsville, Texas.

Rappole, J.H. 1988. "Ocelots' last stand." Defenders Magazine 63(1):30-35.

Reyes, E. 2008. Email from Alamo Sub Office to Corpus Christi Ecological Services Field Office, U.S. Fish and Wildlife Service.

Shindle, D.B., and M.E. Tewes. 1998. Woody species composition of habitats used by ocelots (*Leopardus pardalis*) in the Tamaulipan Biotic Province. The Southwestern Naturalist 43:273-279.

Shinn, K.J. 2002. Ocelot distribution in the Lower Rio Grande Valley National Wildlife Refuge. M.S. Thesis, University of Texas-Pan American.

Soule, M.E., and D. Simberloff. 1986. What do genetics and ecology tell us about the design of nature reserves? School of Natural Resources, University of Michigan. Biological Conservation 35(1):19-40.

Sternberg, M. and A.G. Chapa. 2004. Monitoring ocelots at El Jardin and San Perlita conservation easements on the San Francisco Ranch, Texas.

Sternberg, M. and J.L. Mays. 2011. Ocelot survey in and around Laguna Atascosa National Wildlife Refuge. U.S. Fish and Wildlife Service, South Texas Refuge Complex, Alamo, Texas.

Sunquist, M., and F. Sunquist. 2002. Wild cats of the world. University of Chicago Press, Chicago, Illinois.

Tempel, D., V. Wright, J. Neilson and T. Mildenstein. 2006. Volume 5- Backcountry recreation impacts to terrestrial wildlife. *in* V. Wright (ed.). Linking Wilderness Research and Management. Aldo Leopold Wilderness Research Institute, Missoula, Montana.

Tewes, M.E. 1986. Ecological and behavioral correlates of ocelot spatial patterns. Unpublished Ph.D. Dissertation, University of Idaho, Moscow, Idaho.

Tewes, M.E. 1987. Potential effects of the Playa del Rio Project on the endangered ocelot and

jaguarundi. Report to U.S. Army Corps of Engineers, Galveston, Texas.

Tewes, M.E., and D.D. Everett. 1986. Status and distribution of the endangered ocelot and jaguarundi in Texas. Pages 147-158 *in* S.D. Miller and D.D. Everett, editors. Cats of the world: Biology, conservation, and management. National Wildlife Federation, Washington, D.C.

Tewes, M.E., and D.J. Schmidly. 1987. The neotropical felids: Jaguar, ocelot, margay, and jaguarundi. Pages 697-711 *in* M. Novak, J.A. Baker, M.E. Obbard, and B. Malloch, editors. Wild furbearer management and conservation in North America. Ministry of Natural Resources, Ontario, Canada.

Tewes, M.E., and S.D. Miller. 1987. Future research for the endangered ocelot population of the United States. Pages 164-166 *in* R.R. Odom, K.A. Riddleberger, and J.C. Ozier, editors. Proceedings of the Third Southeastern Nongame and Endangered Wildlife Symposium. Georgia Department of Natural Resources, Athens, Georgia.

Tewes, M.E., and R.W. Hughes. 2001. Ocelot management and conservation along transportation corridors in southern Texas. Pages 559-564 *in* Proceedings of the International Conference on Ecology and Transportation, Keystone, Colorado.

Tewes, M.E., L.L. Laack, and A. Caso. 1995. Corridor management for ocelots in the southern United States and northern Mexico. Proceeding of the International Wildlife Management Congress 1:444-446.

Tuovila, V.R. 1999. Bobcat movements and survival near U.S. Highway 281 in southern Texas. Unpublished M.S. Thesis, Texas A&M University, Kingsville, Texas.

U.S. Fish and Wildlife Service. 1984. Final rule to determine *Dyssodia tephroleuca* (ashy dogweed) to be an endangered species. Federal Register, Vol. 49, pp. 29232-29234.

U.S. Fish and Wildlife Service. 1986. Preliminary survey of contaminant issues of concern on National Wildlife Refuges. Division of Refuge Management, Washington, D.C.

U.S. Fish and Wildlife Service. 1987. Ashy dogweed Recovery Plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

U.S. Fish and Wildlife Service. 1988. Johnston's Frankenia (*Frankenia johnstonii*) Recovery Plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

U.S. Fish and Wildlife Service. 1990. Listed cats of Texas and Arizona recovery plan (with emphasis on the ocelot). U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

U.S. Fish Wildlife Service. 1995. Threatened and endangered species of Texas. Austin, Texas.

Wagner, P. 2005. Improving mobility for wildlife and people: Transportation planning for habitat connectivity in Washington State. Proceedings of the 2005 International Conference on Ecology and Transportation. Raleigh, North Carolina.

Walker, C.W. 1997. Patterns of genetic variation in ocelot (*Leopardus pardalis*) populations for South Texas and northern Mexico. Ph.D. Dissertation, Texas A&M University-Kingsville, Kingsville, Texas.

Westermeier , R.L., J.D. Brown, S.A. Simpson, T.L. Esker, R.W. Jansen, J.W. Walk, E.L. Kershner, J.L. Bouzat, and K.N. Paige. 1998. Tracking the long-term decline and recovery of an isolated population. Science 282:1695-1698.

Wilkins, R.N., R.D. Brown, R.J. Conner, J. Engle, C. Gilliland, A. Hays, R.D. Slack, and D.W. Steinbach. 2000. Fragmented lands: Changing land ownership in Texas. The Agriculture Program, Texas A&M University, College Station, Texas.

Appendix A. Consultation History

October 22, 1993:	Letter from TxDOT Pharr District to the Service notifying their intent to provide 16.66 acres of wetland mitigation for impacts associated with improvements (widening from two to four lanes, with a center left turn lane) to SH 100. TxDOT also proposes to include wildlife crossings for the ocelot in its project design.
December 1, 1993:	The Service responds to TxDOT's October 22 letter, stating that a tentative agreement was reached during a September 23, 1993 site visit that two 5x3 foot culverts would be installed under SH 100 for use by ocelots and jaguarundi. One culvert would be located at station 605.00 in a dry ditch and the second would be located at station 669+80.
January 5, 1994:	Site visit attended by TxDOT Pharr District and the Service to discuss the SH 100 improvement project.
February 1, 1994:	Letter from TxDOT Pharr District to the Service restating discussions that took place during the January 5 site visit. TxDOT proposed to install a 48-inch pipe culvert for use by felids, adjacent to an 8x5 foot box culvert at station 610.00. The pipe culvert would be above the "usual plane of high water" and would not be used for drainage purposes. A one foot wide concrete cat ramp would lead from the entrance of the pipe to the edge of the ditch below the level of the berm. Concrete riprap would be installed at the base of the box culvert and brush would be allowed to revegetate adjacent to the riprap. TxDOT also proposed installing a 5x3 foot culvert at station 699+80 to serve as an equalization of water drainage across the road. The culvert would be dry except during storm events, so no cat walk was proposed.
March 24, 1994:	Letter from the Service to TxDOT Pharr District concurring that if the actions proposed in TxDOT's February 1 letter were implemented as planned, the action would be unlikely to adversely affect the ocelot or jaguarundi.
October 17, 1994:	An ocelot was killed on SH 100 during construction of the proposed improvements in close proximity to where one of the two proposed wildlife crossing structures was to be installed.
February 24, 2005:	Letter from TxDOT Pharr District to the Service proposing the installation of 42-inch high concrete traffic barriers (CTB) along 11 miles of SH 100. The CTB would have a 1,400 foot opening at the intersections of FM 3069, San Roman Road, and FM 106 road extension (Buena Vista Rd). TxDOT did not provide any reason why they deemed the installation of the CTB necessary in this correspondence.

July 12, 2006:	Site visit made by TxDOT and Service biologists to discuss the installation of the CTB and examine SH 48 where CTB with 1x5 foot scuppers (cutouts) had been previously installed. The Service recommended at least four locations where gaps between the CTB were recommended to facilitate wildlife crossing SH 100.
July 27, 2006:	Email from TxDOT Pharr District to the Service proposing the installation of 1x5 foot scuppers in the CTB at three locations, where the Service had recommended gaps in the CTB, for a length of 150 feet. TxDOT stated that larger cutouts or gaps in the CTB could not be implemented due to funding constraints and because they could compromise the structural integrity of the CTB.
August 2, 2006:	Email response from the Service to TxDOT Pharr District summarizing the Service's notes from the site visit. The Service restated our recommendation for gaps between the CTB at four locations. The Service also stated the 1x5 foot cutouts would allow for passage of small mammals, but not ocelot.
August 31, 2006:	Letter from the Service to TxDOT Pharr District detailing our concern with TxDOT's proposal to install the CTBs on SH 100. We restated our opinion that the 1x5 foot cutouts were not adequate to allow use by ocelots and again recommended gaps in the CTB. The Service states the installation of the CTB on SH 100 would impede the movement of ocelots and jaguarundi across SH 100 and between LANWR tracts of land located on either side of the road. The Service recommended TxDOT seek additional FHWA funds to install wildlife crossings and fencing on SH 100.
September 2, 2006:	Email from the Service to TxDOT summarizing a site visit from the previous week. The Service recommended four small gaps (5 to 10 feet) be left open at several locations to allow for movement of ocelots and other wildlife. The recommended gap locations were 1.8, 2.1, 3.5, and 5.3 miles east of San Roman Road. TxDOT indicated that the installation of gaps in the CTB would not be possible and suggested 1x5 cutouts along the bottom of the CTB in certain locations.
September 8, 2006:	Internal TxDOT email which summarizes TxDOT's discussions with the Service regarding the CTB acting as a barrier to wildlife crossing the road and affecting the genetic variability of species in the area. TxDOT notes that without Service concurrence on the project, a single take of endangered species would result in a violation of the Act.
September 27, 2006:	Email from Service to TxDOT Pharr District stating our understanding

that TxDOT would install the CTB with 1x5 foot cutouts at three locations. The email also discusses the proposed safety lighting at the intersections at San Roman Road and Buena Vista Road. The Service recommends limiting the lighting adjacent to the box culvert near the San Roman Road intersection which ocelots or other wildlife could use as a wildlife crossing.

May 3, 2010: An ocelot was killed by a vehicle on the north side of SH 100 in the area where the CTB had been installed.

June 17, 2010: Meeting between the Service and TxDOT Pharr District to discuss the recent ocelot road mortality on SH 100 in the area where the CTB blocks passage across the road. The Service discussed measures that could be implemented to reduce the likelihood of future road mortalities in the area. The Service and TxDOT created a number of action items to be addressed. They included:

- The Service would provide TxDOT with a list of the locations where gaps were needed in the CTB.
- TxDOT would provide the Service with FM 106 plan sheets for Service review and comment.
- The Service would provide TxDOT with two or three recommended wildlife crossing designs and locations along SH 100, so TxDOT could develop plans for the crossings to be implemented when funding became available.
- TxDOT would provide the Service with a complete an inventory of all wildlife crossings they installed since the 1990's.
- TxDOT requested the Service provide a wildlife corridor map, so their engineers could plan for needed crossings on future construction projects.
- The Service recommended TxDOT examine the SH 48 wildlife crossing to address flooding issues, vegetation concerns, and camera installation.
- TxDOT requested Service comments on fencing options.

August 10, 2010: TxDOT provided the Service with a wildlife crossing inventory map for the Pharr District.

October 26, 2010: Letter from Service to TxDOT Pharr District discussing the June 17, 2010, meeting and the unauthorized take of an ocelot on SH 100 due to the CTB being installed contrary to the recommendations of the Service. The letter restates the Service's position that the CTBs present a significant hazard to ocelot, jaguarundi, and other wildlife trying to cross the road. The Service further stated that the CTBs were likely to result in unauthorized take of additional ocelots on SH 100. The Service provided a summary of

recommendations for improvements on SH 100 to allow for safer crossing for ocelots and other wildlife.

October 26, 2010: The Service provided TxDOT with a White Paper "Assessment of Wildlife Crossing Needs for SH 100 between Los Fresnos and Laguna Vista, TX". The White Paper provided specific recommendations for a series of three wildlife crossings on SH 100, and included recommendations on the sizing of crossing structures, placement of crossings at or above grade, the appropriate use of fencing in association with crossings, the use of signage to warn motorists of the presence of federally protected species in the area, long-term monitoring of any crossing structures that are built, and recommended the replacement of 0.85 mile of CTB with wildlife-friendly safety barriers. The Service also discussed possible funding opportunities to assist with construction of wildlife crossings and requested that the Service and TxDOT work collaboratively to find money for wildlife crossings.

November 3, 2010: Email from TxDOT Pharr District to the Service acknowledging the receipt of the letter and white paper and noting that TxDOT would respond once they had a chance to evaluate the request.

Spring 2011: Several emails between TxDOT Pharr District and the Service regarding TxDOT's application for a Public Lands Highways Discretionary (PLHD) Grant, which was ultimately not approved.

May 27, 2011: Meeting between TxDOT Pharr District and the Service in which TxDOT presented the results of preliminary engineering for crossing structures on SH 100 and to discuss discretionary funding that may be available. Multiple options were presented for crossing locations and cost/benefits were discussed. TxDOT committed to acquire and install four wildlife crossing signs on SH 100. TxDOT would also evaluate the cost and other feasibility issues with elevated (at or above grade) crossings. The Service committed to review the various options presented and provide TxDOT with comments.

September 15, 2011: Email from TxDOT to the Service indicating that TxDOT had received internal approval to install wildlife crossing signs at four locations, recommended by the Service, on SH 100.

September 16, 2011: Email response from the Service to TxDOT acknowledging the placement of wildlife crossing signs on SH 100.

December 6, 2012: Meeting between the Service and FHWA to discuss ocelot road mortality issues in TxDOT's Pharr District. The discussion included; the end of the PLHD grant program with the passing of the new Transportation Bill, as

well as wildlife crossing recommendations, specific to ocelot and medium-sized felids. Also mentioned was a CA study on the safety effectiveness of CTB compared with other collision protective measures.

January 29, 2013: Meeting between the Service and TxDOT ENV to discuss the history of SH 100 and determine why TxDOT had not responded to the Service's October 26, 2010 letter and White Paper.

May 15, 2013: Meeting between TxDOT and the Service to discuss the history of SH 100. TxDOT provided a list detailing the history of communications between the two agencies related to the installation of the CTB on SH 100. The Service inquired whether TxDOT had ever officially responded to our recommendation from the June 17, 2010 meeting related to the ocelot mortality on SH 100 and the White Paper which followed, dated October 26, 2010.

May 2013: Letter from TxDOT Pharr District to the Service officially responding to the Service's October 26, 2010, letter. The response included a summary of recent communications between TxDOT and the Service and an update on crossing options that had been evaluated to date.

August 21, 2013: Meeting and teleconference between the Service and TxDOT. One of the issues addressed was the lack of action taken by TxDOT to address the CTB issue on SH 100. The Service provided radio-collar tracking information, from August 5-12, 2013, on an ocelot that was coming dangerously close to SH 100 and relaying our concern that if something wasn't done immediately, that ocelot was in imminent danger.

November 8, 2013: An adult male ocelot is found dead on SH 100 adjacent to the concrete barrier. This was the same cat the Service had warned TxDOT was coming in close proximity to SH 100 in August. TxDOT was notified immediately.

November 13, 2013: Meeting between the Service and TxDOT to discuss the SH 100 road mortality. The Service provided short- and long-term recommendations to prevent further ocelot mortality on SH 100. Short-term recommendations included creating openings in the CTB at strategic locations, while long-term solutions included the installation of wildlife crossings and fencing. Section 7 consultations were temporarily suspended for TxDOT Pharr District projects until significant action was taken to prevent future ocelot mortalities on the section of SH 100.

November 18, 2013: Email from TxDOT to the Service providing a proposed Strategic Plan for SH 100.

November 19, 2013: Conference call between the Service and TxDOT ENV and Pharr District discussing their response to the recent ocelot road mortality and actions TxDOT proposed to prevent further loss of ocelots on the road. TxDOT proposed to replace the CTB (210 feet at location 1; 240 feet at location 2; and 700 feet at location 3) with metal beam guard fence (MBGF) at three locations, 3.5 miles, 4.5 miles, and 7 miles east of Los Fresnos respectively, and install signage at those locations and at the resaca.

November 26, 2013: The Service provided TxDOT with an assessment of their proposal to replace segments of the CTB on SH 100 with MBGF.

December 4, 2013: Email from TxDOT Pharr District to the Service revising the CTB replacement distances to 300 feet at location 1, 300 feet at location 2, and 600 feet at location 3. TxDOT would also install fencing at locations 1 and 3.

December 5, 2013: Email from Service ES to Service Law Enforcement (LE) describing the recent ocelot road mortality and requesting LE assistance in reaching a resolution to the SH 100 CTB issue.

December 13, 2013: The Service provided TxDOT with a revised assessment of their proposal to replace segments of the CTB on SH 100 with MBGF.

March 7, 2014: Letter from TxDOT Pharr District to the Service officially responding to the Service's October 26, 2010, white paper. The letter also included plans to address the November 2013 SH 100 road mortality. TxDOT agreed to the following mitigation actions:

- Replace 300 feet of CTB with MBGF at the drainage ditch located 3.5 miles east of Los Fresnos and install 1,620 feet of ROW fencing;
- Remove 450 feet of CTB at the drainage ditch located 4.5 miles east of Los Fresnos;
- Replace 1,200 feet of CTB with MBGF at the Resaca and install 5,820 feet of ROW fence; and
- Install four wildlife crossing signs, two at each of the two drainage ditches in Segments 1 and 2.

May 9, 2014: Email from TxDOT to the Service providing an update on the progress of replacement of several sections of the CTB with MBGF and the installation of section of ROW fencing at these locations.

June 11, 2014: Email from TxDOT Pharr District to the Service that work proposed in TxDOT's March 7, 2014 letter had been completed on the proposed SH 100 CTB replacement and fencing.

July 9, 2014: An adult male ocelot is found dead on SH 100 due to being hit by a vehicle in the area where CTB remains in place. This location was about five miles east of the recently completed MBGF replacement. The ocelot, which was known from the LANWR population, was found on the south side of SH 100 indicating that it had successfully navigated from the LANWR area to habitat on the south side of SH 100. It is unknown whether the ocelot crossed SH 100 in an area where the CTB is not installed, or where it has been replaced by MBGF, or if it crossed roads other than SH 100 to reach the south side of SH 100.

July 11, 2014: Emergency meeting between the Service and TxDOT to address the latest ocelot road mortality on SH 100. The Service noted the significant impact road mortality deaths, particularly on SH 100, where the CTB exists, are having on the ocelot population in and around LANWR. The Service recommended TxDOT evaluate all possible solutions, talk to wildlife crossing researchers, and innovate to remedy the SH 100 situation. The Service also noted that failure to act on this issue could result in LE action and suspension of section 7 consultations.

August 26, 2014: Meeting at LANWR attended by TxDOT ENV and Pharr District, Service biologists and LE. TxDOT presented their proposed response to the latest road mortality on SH 100, including pros and cons of various response scenarios. Short term actions included fencing both sides of SH 100 for the entire 6.9 miles of CTB and public education actions. For long-term actions, TxDOT proposed the installation of wildlife crossings at four locations along SH 100, including: two 8x5 foot culverts at Crossing 1 (a drainage ditch controlled by the Cameron County Drainage District #1), two 9x5 foot culverts at Crossing 2 (a drainage ditch controlled by the Cameron County Drainage District #1), a single 10x5 foot box culvert at Crossing 3 (located within LAWNR property), and a single 10x5 foot box culvert at Crossing 4 (located within LAWNR property). The long term actions would be implemented when funding becomes available. The Service recommended complete removal of the CTB and replacement with a wildlife permeable option.

September 19, 2014: Email from TxDOT to the Service providing a draft proposal to address ocelot mortality issues on SH 100. The proposal included a literature review of wildlife passage options and solutions, public safety options to address head-on collisions, TxDOT's proposed actions for SH 100 and the justification for the proposed actions, notice of TxDOT approval to spend five million dollars to complete the long-term actions, notification of the intent to conduct section 7 consultation on the response actions, and a mention of the interest in pursuing a programmatic consultation for future projects in the Pharr District to more effectively avoid, minimize, and mitigate project effects to the ocelot.

October 3, 2014: Letter from the Service to TxDOT in response to their September 19 proposal. The Service response provided recommended modifications to TxDOT's proposed actions, including: fencing the entire ROW, rather than only ROW adjacent to LANWR property; determine the size of the crossing structures based on the literature for medium-sized mammals and noted a Service requirement in California for gaps in CTB every 150 feet in areas where the endangered kit fox are located; placing the crossing structures at or above grade, especially the ones proposed to be installed at drainage ditch locations, installing gaps in the CTB at any location where fencing of the ROW is not possible; and noted the timeline for completing the project may result in additional road mortality of ocelots on SH 100.

October 8, 2014: Meeting between TxDOT and the Service to discuss the Service's October 3, 2014, response to TxDOT's September 19, 2014, proposal. TxDOT emailed design drawings, crossing dimensions, and driveway entrances to the Service prior to the meeting.

October 2014: TxDOT and the Service exchanged numerous emails and telephone calls between October 10 and 21 to identify and respond to questions on the SH 100 proposal.

October 24, 2014: Email from TxDOT to the Service providing dimensions and elevation of their proposed SH 100 wildlife crossing structures.

October 29, 2014: Telephone conversation between TxDOT and the Service in which the Service accepted that the proposed wildlife crossing dimensions and elevations were acceptable, although not ideal. The Service also noted that the use of riprap on the side slopes of Crossings 1 and 2 was not acceptable and provided several possible alternatives.

November 18, 2014: Meeting between TxDOT and Service biologists and Sandra Jacobson, a transportation ecologist with the US Forest Service, and expert in wildlife/road interactions and solutions. Sandra provided her input on the SH 100 situation after conducting a visit to the site. She noted that four new wildlife crossing and one modified crossing could be sufficient for SH 100 if the crossings were sized and located appropriately. She recommended fencing the entire ROW where the CTB exists and the installation of up to five wildlife crossings. She provided recommendations for fence height, including the use of outriggers, how to address driveways and other access gaps, and monitoring of crossing structures as vital in determining the effectiveness of the structures and informing future crossing structure design for the target species. She also noted that Crossings 1 and 2 may not be effective for ocelots due to a lack of habitat connectivity and no direct sight line through the structures. She

noted that the elevation of the crossings must be high enough for the animals to see the habitat on the opposite side of the road. She recommended moving the location of proposed Crossing 3 and rehabilitating an old crossing installed for the SH 100 improvement project in the late 90s. Sandra also recommended fencing across the top of crossing structures to help funnel the ocelots into the crossings. She also recommended rolling bars on the cattle guards and outriggers on the top of the ROW fences.

December 2, 2014: Meeting between TxDOT and the Service at which TxDOT provided an updated proposal for SH 100 and a response to the Service October 3, 2014, comment letter. The proposed modifications included rehabilitating Crossing 3B, the existing 6x4 foot box culvert, by modifying the fencing around the crossing to help funnel wildlife into the crossing better and managing woody vegetation near the fence to prevent ocelots from circumnavigating the fence. At Crossings 3 and 4 TxDOT proposed installing 50x6x84 foot bridge structures. TxDOT modified the ROW fencing proposal to encompass the entire 6.9 mile project area, with gaps at driveways, public roads, and utility access roads. TxDOT would not create any additional openings in the CTB and would replace the MBGF near Crossing 3 with CTB. TxDOT also included a brief monitoring and scheduling proposal.

December 2014: Several emails from TxDOT Pharr District to the Service related to water table depths at l potential locations for Crossings 3 and 4. TxDOT noted that, based on the water table depths, only two locations were suitable for below-grade bridges. Based on comments from the Service and recommendations made by Sandra Jacobson, TxDOT modified the elevation of the below grade bridge crossing and shared the revised drawings with the Service.

December 19, 2014: Email from the Service to TxDOT indicating that Service biologists were discussing the pros and cons of below-grade bridges or wildlife culverts for ocelot crossings.

December 2014: TxDOT mailed letters to affected landowners along SH 100 regarding a meeting to discuss ROW fencing and gating or installation of cattle guards on driveways to reduce the likelihood of ocelots entering SH 100. TxDOT requested the Service's assistance with the landowner discussions. Boyd Bilhovde, LANWR Refuge Manager, joined Robin Gelston, with TxDOT Pharr District, in meeting with affected landowners.

January 7, 2015: Several emails between TxDOT and the Service related to the locations of Crossings 3 and 4 and whether the crossing design would be bridges or box culverts. TxDOT preferred below grade bridges at both crossing

locations. The Service preferred the structures to be at grade. January 20, 2015: Email exchange between TxDOT and the Service regarding the location and design of Crossings 3 and 4, as well as drainage (standing water) concerns under bridges, if approved. TxDOT provided their reasoning for bridges at both crossing locations and their preferred locations based on water table depth and private property concerns. The Service responded to the proposed locations of the two crossings and agreed with a bridge design at Crossing 3 as long as the bottom of the bridge was three feet above the grade at the edge of the ROW, and a 10x5 foot box culvert at Crossing 4 with the same elevation requirement.

January 2015: Several calls and emails between TxDOT and the Service about the final location of Crossing 4. Landowner access, wetland issues, and likely ocelot corridors were discussed.

February 2, 2015: Email from TxDOT to the Service providing a revised proposal for SH 100 based on recent discussions between TxDOT and the Service related to location and design of the crossings.

February 19, 2015: Email from the Service to TxDOT with comments on the February 2 proposal indicating that monitoring of the wildlife crossings must be extended from two years to five years; requesting revised schematics of Crossings 1 and 2 which TxDOT indicated could not be installed as previously proposed and agreed to, due to site characteristics and engineering constraints; requesting that native vegetation be used for slope stabilization where needed; stating that maintenance activities for the fencing , cattle guards, and crossing structures must be conducted for the life of the project; and, stating that TxDOT would remain liable for any take of ocelots on SH 100 where the CTB remains in place, acting as an impenetrable barrier to wildlife movement across the road.

March 2015: TxDOT notified the Service that the landowner located adjacent to the Service's preferred location for Crossing 4 was concerned about the legal responsibilities and restrictions the crossing could have on his use of the property. The landowner indicated that they would not support a crossing at the proposed location and requested TxDOT and the Service reconsider the location of this crossing. TxDOT requested the Service write a letter to the landowner explaining the reasons for a placing a crossing at this location, but later rescinded this request.

April 6, 2015: Email from TxDOT to the Service describing problems encountered during TxDOT's final design of the wildlife crossings, including: wetland impacts from the ROW fence; resistance to the location of Crossing 4 from the adjacent landowner; and, engineering constraints for the final design of Crossings 1 and 2. At Crossings 1 and 2, TxDOT discovered utilities in the ROW that prevented them from constructing the crossings

as previously proposed. Crossing 1 would now be a single 10x7x160 foot box culvert that would serve as both a drainage culvert and a wildlife crossing. The openness ratio calculated by TxDOT would be about 0.31. Crossing 2 would also be changed to a single box culvert, with the dimensions of 10x7x180 foot and an openness ration of about 0.28. Both culverts would have a 1.5 foot wide concrete cat walk on each side of the culvert, elevated at least 1 foot above the average flow line. There was also a potential issue with the private landowner whose property would be adjacent to Crossing 4.

April 6, 2015:	The Service provided several recommendations to TxDOT, via telephone conversation, on how to address the latest proposal by TxDOT.
June 1, 2015:	TxDOT provided a BA and request for formal consultation on their proposal to address ocelot mortality on SH 100.
June 5, 2015:	TxDOT provided the Service with a revised BA.
June 2015:	Several emails and phone calls between the Service and TxDOT regarding questions and clarifications on the revised BA.
June 18, 2015:	Letter from the Service to TxDOT with comments and recommended changes to the BA. Biologists from the Service and TxDOT met to discuss the Service's comments on the BA.
June 24, 2015:	Letter from the Service to TxDOT acknowledging the initiation of formal section 7 consultation under the Act.
July 22, 2015:	TxDOT provided the Service with a second revised BA and response to our comment latter of June 18, 2015.
August 12, 2015:	The Service provided a draft BO to TxDOT for review.
September 28, 2015:	TxDOT provided comments on the draft BO.
December 4, 2015:	The Service provided TxDOT with a final BO.