

## **Cumulative Effects**

### **Motor Vehicle Mortality Associated with Cumulative Effects**

Within the Action Area our cumulative effects analysis analyzes the impact of increases in traffic volume from future, non-Federal, non-HCP sources we believe are reasonably certain to occur on the same roadways. Based on our review of past developments in the region we estimate approximately 25.3 percent of future, possible developments are pursued without review by the Service. Thus, we assume that 25.3 percent of traffic volume identified in the DIRPM would likewise originate from developments the Service would not have opportunity to review.

Because the requested duration of the ITPs is 50 years during which we anticipate full build-out, we used estimates of future traffic volumes in the year 2070. Specifically, we analyzed cumulative effects by:

#### **1. Current Road Segment Mortality:**

Our analysis of panther/vehicle collisions and traffic volume generated from past projects in the Action Area found increasing traffic volume increases impacts to the panther. However, our analysis and literature review also indicate many additional factors aside from traffic volume also influence the probability of panther/vehicle collisions. These include, but are not limited to, the abundance of panthers in proximity to roadways, the availability of suitable panther habitat near roadways, the presence of wildlife crossings, traffic speed, and road width (Schwab and Zandbergen, 2011). We believe the recent history of panther mortalities on a particular road segment is the best available means of integrating the combined influence of all such factors operating along a given roadway. Thus, we predict future annual mortality rates for each road segment in the Action Area will increase as a linear function of traffic volume consistent to that observed by Charry and Jones (2009) and subsequently confirmed by our own analysis of the record of panther vehicle mortality increases in response to increased traffic from a development in the Action Area that is similar to those described in the HCP (Ave Maria).

Vehicle collisions killed 110 panthers on 91 road segments in the Action Area between 2014 and 2018, with 40 percent of all mortalities being females. The 5-year mortality rate on individual road segments varied between 0 and 5 individuals/5 years, with at least one mortality occurring on the segment during the baseline period. Annual mortality for individual road segments is provided in Appendix A.

#### **2. Current Road Segment AADT in Action Area:**

The current road segment AADTs in the Action Area are an average of AADTs on each road segment from 2014 through 2018, and can be found in Appendix A. The current AADTs for segments within FDOT's District 1 road network vary from 0 to 133,700. Only those segments in the Action Area with a history of panther mortality were used for calculating future mortality. These segments are identified in the appendix by their Road Segment Identifier. The reason for only including these segments is that the equation for calculating future mortality includes a measure of current mortality.

### 3. 2040 Road Segment Non-HCP AADT in Action Area:

The 2040 Road Segment non-HCP AADTs in the Action Area as calculated using the Adjusted DIRPM Model can be found in Appendix A. These segments are identified in the appendix by the road segment identifier, which is the concatenated key used in the FDOT traffic model that serves as the bi-directional road segment identifier. The AADT for these segments is the increase in AADT above the current AADT. Only those segments with a history of panther mortality were used for calculating future mortality because the equation for calculating future mortality includes a measure of current mortality. We assumed road segments with existing mortality contained all of the features that would contribute to future mortality, such as the presence of habitat and panthers adjacent to areas of current panther-vehicle collision.

### 4. 2070 Road Segment Non-HCP AADT in Action Area

The 2070 Road Segment AADTs were estimated because the duration of the ITP, if issued, is 50 years. We estimated the non-HCP generated 2070 AADT per segment (non-HCP sourced traffic volume increase at the time of ITP expiration) by first determining the expected annual rate of traffic increase between current and 2040 per road segment using the following equation:

Expected annual rate of traffic increase per road segment = (2040 Non-HCP AADT per segment – Current AADT per segment) / 22 years.

We then used this rate to estimate the 2070 traffic volumes per road segment due to non-HCP generated traffic by multiplying the rate calculated above by 52 years (the number of years between 2018 and 2070).

### 5. 2070 Road Segment non-HCP Mortality in the Action Area

We estimate the predicted proportion of future panther mortality due to non-HCP generated traffic on each road segment with a history of panther mortality in the Action Area using the following formula:

2070 Road Segment non-HCP Mortality in Action Area = (Current Road Segment Mortality / Current Road Segment AADT in Action Area) x 2070 Road Segment Non-HCP AADT in Action Area.

2070 Road Segment non-HCP Mortality in the Action Area ranges from .04 to 8, and can be found in Appendix A. These segments are identified in the appendix by “AB Segment”; or simply “AB” in the adjusted DIRPM geospatial data set.

### 6. 2070 Non-HCP Mortality in the Action Area

To get the total Non-HCP predicted mortality in 2070 we totaled the 2070 mortality per road segment from step 5.