Wetland Conservation Prioritization Model

The SHC approach challenges us to work strategically, to employ means to help us to place our limited resources in those places that give us the most conservation benefit. In an effort to embrace this paradigm shift, in some respects, the Panama City Field Office is looking to develop prioritization models for the major ecosystem that occur within their work area (wetlands, coastal, bays & estuaries, etc.). To this end, we decided to attempt to tackle wetlands first for several reasons: availability of data, importance of this resource within our work area, etc. Therefore, our wetland biologist, Ted Martin, convened a meeting of our Pinelands & Wetlands Ecosystem Team to pose them the question: "What makes a wetland important?" Their response(s) became the foundation from which we built our model. On the surface a fairly simple question, but the answer(s) can be a bit more complex. Structure, function, arrangement, context, etc., all come into play when attempting to answer the question. Nevertheless, in the end we got a long list of parameters the biologists felt made a wetland important or have greater value. Our first challenge was to decide what type of model (species based, resource based, ecological based, etc.) would best. In the end we decided on a general ecological based model, meaning we would not focus on or emphasize one aspect of the ecological picture (i.e. species or habitat), but rather account for many ecological factors (water quality, species, function, etc.). In further defining our modeling approach, we chose to take a two-tiered, hierarchical, spatially explicit modeling approach because it would afford us the ability to focus wetland conservation at the broad or landscape scale (large contiguous areas deemed of higher conservation importance at the landscape level) and then target high-valued wetlands at the local level. In this way, we attempted to narrow our focus on the perceived best of the best: the best wetlands within the best places on the landscape.

Therefore, our first order of business was use existing statewide conservation planning layers to define, or in this case refine, the boundary of our project from the entire PCFO work area to those large contiguous areas of high ecological value. Through a process of using density surface analysis, defining density thresholds and subsequent overlay analysis we focused our project area to a suite of areas making up almost 6.5 million acres (just over 2.5 million ha), we called the Wetland Conservation Area (WCA) (Figure 1).

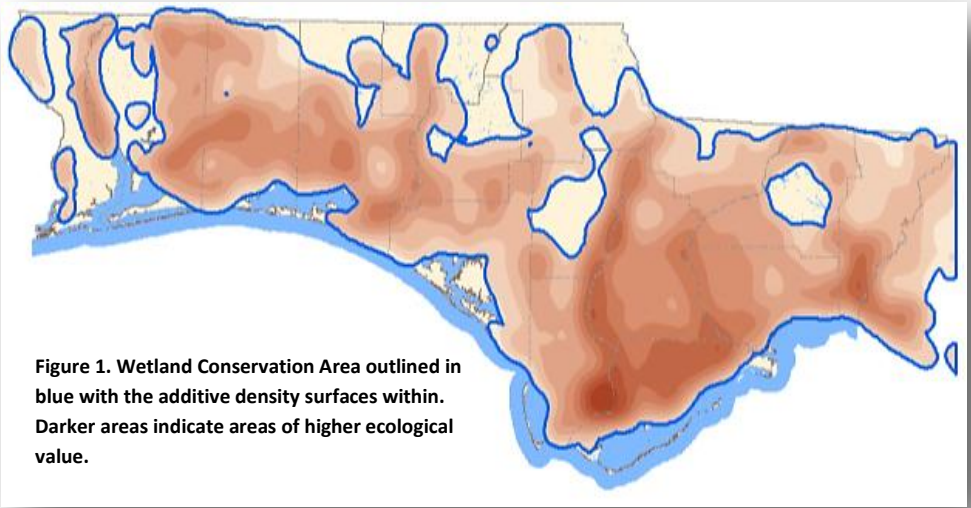

Figure 1. Wetland Conservation Area outlined in blue with the additive density surfaces within. Darker areas indicate areas of higher ecological value.

Once we established the WCA, we were set to tackle prioritizing the wetlands within the WCA. We based our analyses on the factors the biologists identified in their initial meeting. In all we used 16 factors to prioritize the wetlands. We grouped the factors, coined Prioritization Metrics, into six common ecological themes called Prioritization Criteria. Using a zero – 10 ranking class system (scale) (10 being high value and zero background or no value), we reclassified all of the Prioritization Metric layers. In order to make this model hierarchical we took each of the Prioritization Metric layers within their corresponding Prioritization Criteria and ran an additive overlay. This produced an overall Prioritization Criteria Metric Overlay (Criteria Overlay) for each of the six Prioritization Criteria (Figure 2).

What makes a hierarchical model more robust is that it affords the flexibility to use the Criteria Overlay individually or in combination with one another to generate a final prioritization layer for assigning priority values to wetlands. For instance, if you are only interested in listed species, you can take the Listed Species Criteria Overlay and use it by itself to assign priority values to the wetlands. Alternatively, if you are interested in prioritizing wetlands based on an overall ecological perspective, as we were, you can combine all of the Criteria Overlays to generate a final overall Wetland Prioritization Criteria Overlay for your analysis.

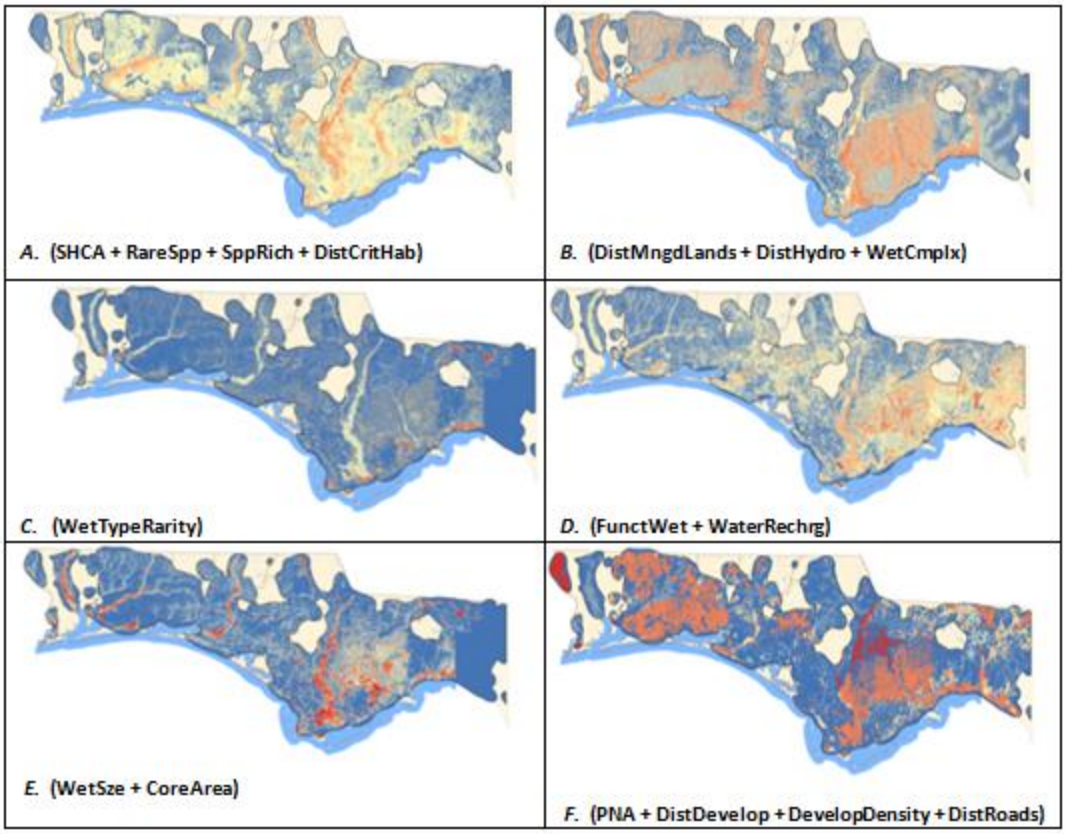

Figure 2. Prioritization Criteria Metric Overlays - A. Listed Species Priority; B. Connectivity Priority; C. Type/Rarity Priority; D. Wetland Functionality Priority; E. Wetland Characteristics Priority; F. Natural Habitat Priority.

The creation of the Criteria Overlay Model was the final step in the series of overlays to produce the output. We then ran a majority statistic between our wetland layer and the Criteria Overlay Model to assign a priority value to each of the wetlands within our WCA. In all, we prioritized 81,808 wetlands, making up 1,750,901 acres (684,672 ha). Their values ranged from a low of 20 to a high of 130 out of a potential maximum value of 160 (Figure 3).

We realize that we cannot protect all of the wetlands within our work area, but we believe that if we strategically target wetlands, the conservation actions we place on the ground (i.e., protection, restoration, easements) will collectively feed into the overall conservation of the landscape scale ecological services and integrity. This strategic approach affords us the opportunity to step back, look at the big picture and then focus our on-the-ground conservation efforts in the "right" places.

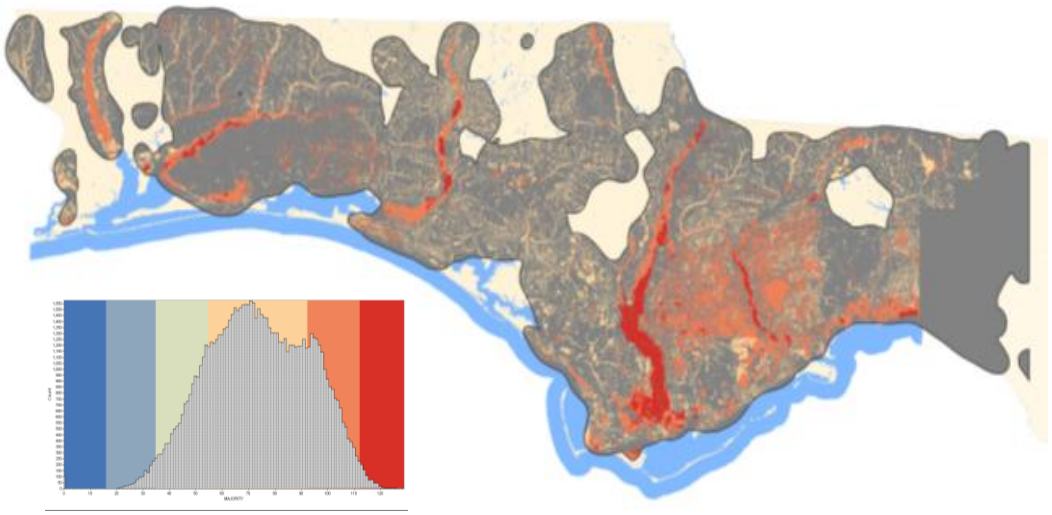

Figure 6. Wetland Prioritization Model with a histogram of the distribution of wetlands corresponding to the final priority classes shown in the map using a standard deviation classification scheme (warmer colors correspond to higher value)