Delineating Conservation Focal Areas

The DFW enlisted internal and external stakeholders to inform the selection of GIS data and the method of analysis employed to delineate Conservation Focal Areas (CFAs). A wide variety of GIS data addressing biodiversity and habitat quality, connectivity, rarity and/or impairment within terrestrial, freshwater aquatic, and marine environs were found to be available at statewide and regional scales. To provide a regional context, the Department utilized a variety of conservation planning data compiled by the North Atlantic Landscape Conservation Cooperative (NALCC). Relevant regional data developed by NALCC partners included TNC's Geospatial Condition Analysis and UMass's Northeast Index of Ecological Integrity. These and other regional datasets served to complement the host of publicly available conservation-relevant state and local data in New Jersey. As applicable, a number of unpublished or derivative datasets were also utilized in developing CFAs.

The DFW decided to employ a weighted co-occurrence analysis that combines many independent datasets with different metrics to identify areas of high resource value. With some additional spatial optimization techniques, this approach allowed for the identification of specific geographic areas of agreement across a diverse set of geospatial data and metrics. These areas will be the focus of the DFW's assessment of threats and actions affecting New Jersey's wildlife habitats, and will identify locations where conservation actions can be carried out to benefit high priority fish and wildlife resources throughout the state.

General GIS Method – Phase 1

Once specific datasets were identified as having significant relevance to the CFA mapping objectives, data was acquired and necessary conversion and standardization processes were carried out in preparation for conducting a co-occurrence analysis. Where necessary, data were rescaled to New Jersey and reclassified into 30' grid cells. Inputs were then organized by three environments (terrestrial, freshwater aquatic, and marine) and into five categories (ecological condition, conservation infrastructure, fish and wildlife habitats, biodiversity and negative influences). For each input, metrics were reviewed by DFW biologists and converted into a standard weighting system which normalized all datasets to address the objectives of the CFA mapping process. Accordingly, weights were assigned following a standardized five tier scale ("5" being the highest value and "1" being the lowest) based upon factors which included (but were not limited to): the relevance of the data layer to our CFA mapping objectives, the degree to which the "regional" datasets addressed habitat values or conditions that were specific to New Jersey, and the original range of the source dataset values. The exception to the positive five tier scale included negative weights that ranged from -10 to -1 and a "restricted" category that excluded an area from being mapped as a CFA regardless of its intersection with one or more resource elements with positive values. Additionally, as the final mapping effort was based upon the "additive mapping" of valued habitats, the *proportion* to which any one dataset addressed a specific mapping objective needed to be factored in (i.e., if several datasets existed that were correlated with one specific issue, individual dataset weights were reduced to address confounding influences).

Phase 1 Process Summary:

- Compiled ~40 inputs spanning terrestrial, freshwater aquatic and marine environments from state and regional sources
- Performed conversion, re-scaling and reclassification so that each input was standardized into 30' cells
- Categorized data into five geodatabases: Ecological Condition, Conservation Infrastructure, Fish & Wildlife Habitats, Biodiversity and Negative Influences
- Assigned relative importance (weights) to each input

General GIS Method – Phase 2

Once inputs were reclassified according to assigned weights into 30' grid cells, a (weighted) co-occurrence analysis was performed that calculated the sum of all inputs. The resultant grid was then stratified by Landscape Region and rescaled by calculating percentile values for each cell relative to every other cell within the region. Cells were reclassified according to percentile ranks. For example, percentile values 0.90-1.00 were classified as the 90^{th} percentile, 0.80-0.89 were classified as the 80^{th} percentile and so forth.

Phase 2 Process Summary:

- Performed weighted co-occurrence analysis that combines inputs to identify areas where several different qualities are present ("resource-rich" areas).
- Stratified by Landscape Regions (calculated percentile ranks relative to each region) in order to have even distribution of areas between regions

General GIS Method – Phase 3

Areas that represented the top 70 percent of the data within each region were extracted and converted to vector data made up of contiguous polygons. Terrestrial areas smaller than 3.14 acres were removed from the result (there was no size threshold applied to aquatic areas). The remaining polygons served as core areas from which geoprocessing routines were applied to identify key connections (e.g., riparian corridors) and proximate areas within the 50^{th} percentile or above. Identified areas were combined/dissolved with the core areas and generalization routines were run to create protective buffers and smooth boundaries of resultant contiguous polygons. Regional Conservation Opportunity Areas (RCOA) or "Nature's Network" data on terrestrial, wetland and aquatic cores developed during the process of creating CFAs was used as a guide to incorporate some additional areas that were not captured in the initial CFA delineation. Lastly, urban areas were erased from the result and a minimum size threshold of 3.14 acres was applied to all contiguous areas.

Phase 3 Process Summary:

- Extracted percentile $\geq$ 70 in each Landscape Region
- Applied minimum size criteria to identify core areas •
- Applied connectivity rules to select key connections between high value areas
- Ran basic generalization/simplification processes to provide protective buffers and smooth boundaries of areas
- Utlized RCOA ("Nature's Network") data on terrestrial and aquatic cores as guide to add in areas not captured
- Erased all areas coded as "urban" in 2012 land-use/land-cover
- Applied minimum size criteria to all contiguous areas

A graphic that depicts the Conservation Focal Area development process is available at:
http://www.state.nj.us/dep/fgw/ensp/wap/pdf/cons_focal_areas.pdf

Terrestrial Datasets Selected

Generally, GIS datasets available for terrestrial landscapes spoke to issues of habitat types, or degrees or measures of habitat quality or impairment. Among the datasets that addressed “habitat types,” the most basic were layers produced by the State of New Jersey identifying core forest, grassland, wetland and shrub habitats (derived from 2012 land use/land cover data). While important indicators of space available to direct conservation actions and worthy of inclusion to the CFA mapping project, these were essentially considered a data “baseline,” identifying generic habitats remarkable merely due to their size or habitat type. The relative importance or significance of all other available datasets were weighted in comparison to this baseline.

Table 1. Summary of terrestrial datasets selected by DFW biologists.

Conservation Infrastructure				
No	**Dataset**	**Merit**	**Relevance**	**Weight**
1	Preserved Lands Composite	Indicator of preserved lands (highly actionable areas).	Medium. One of few layers addressing open space.	3
2	Natural Areas	Indicator of preserved lands (highly actionable areas).	Medium. One of few layers addressing open space.	3
Ecological Condition				
No	**Dataset**	**Merit**	**Relevance**	**Weight**
9	Permeability - Regional Flow	Indicator of habitat connectivity, if perhaps the “courser” of several applied.	Medium/High. Ranked based upon categories of flow.	3 4 5
13	Metric Landscape Complexity	Indicator of habitat elevation diversity and wetland density, as it relates to availability for species habitat adaptation.	Low. Ranked in accordance with degree of varied topography.	1 2 3 4
14	Metric Landscape Context Index	Indicator of habitat quality based upon degree of proximate impairment.	Low. Sliding scale based upon dataset, values typically on low end of scale.	1 2 3 4 5
15	Metric Local Connectedness	Indicator of habitat connectivity.	Medium/High	1 2 3
16	Northeast Index of Ecological Integrity	Very good indicator of habitat quality and sustainability.	High. Sliding scale based upon dataset.	1 2 3 4 5
Fish & Wildlife Habitats				
No	**Dataset**	**Merit**	**Relevance**	**Weight**
6	All habitats (core forest, grassland, wetland scrub/shrub, beach/dune, and water)	Indicator of generic, actionable habitat types/ Considered a “baseline” with which to base other terrestrial dataset weights.	Medium/Low.	2

(Table 1 continued)

Fish & Wildlife Habitats *(continued)*

No	Dataset	Merit	Relevance	Weight
7	Vernal Habitat	Indicator of habitat quality. Includes some species reference.	Medium/High. Two possible ranks, based upon vernal pool "certification" status.	4 2
11	LNDR (Landscape Project)	Indicator of biodiversity, habitat quality and use by E&T species.	Low.	2
12	Habitats of High Regional Responsibility for NJ	Indicated habitat for which NJ has high regional responsibility.	High. Ranked in accordance with degree of State responsibility.	5 4 3

Biodiversity

No	Dataset	Merit	Relevance	Weight
3	Natural Heritage Priority Sites	Very good indicator of quality and rarity, includes some species occurrence data.	High. Sliding scale based upon priority site significance.	5 4 3
8	Species Richness by Landscape Project Habitat Patches	Indicator of habitat size and quality per richness of "endangered," "threatened" or "special concern" species by LP 3.1 habitat patch.	Low. Sliding scale based upon richness indices.	5 4 3 2 1
10	Terrestrial Richness by road-bound block	Species richness data, indicator of habitat quality and diversity.	High, ranked on a sliding scale reflecting species richness.	5 4 3 2 1

Negative Influences

No	Dataset	Merit	Relevance	Weight
4	Human Influences: Developed Lands	Indicator of impairment and barriers to connectivity.	High "negative" relevance. Use as restricting layer.	Restricted -10 -5
5	Human Influences: Roads	Indicator of impairment and barriers to connectivity.	High "negative" relevance. Use as restricting layer.	Restricted -10 -5

Freshwater Aquatic Datasets

Datasets available for freshwater aquatic landscapes largely addressed measures of habitat quality or impairment, suitability for SCGN species, or general species diversity. By their nature, aquatic habitats are typically mapped and valued as narrow, linear features in the landscape. Aquatic habitat mapping within the State has historically been much less abundant or detailed than that available for terrestrial landscapes. For example, the mapping of aquatic habitats – to the extent that it might suggest "patches" – does not address the varied and immensely relevant benthic or substrate characteristics of a watercourse in the same manner as is available for the mapping of terrestrial habitat patches. However, available water quality and even species occurrence data can collectively speak to important parameters such as water temperature, clarity, chemistry and quality.

Table 2. Summary of the aquatic datasets selected by DFW staff.

No	Dataset	Merit	Relevance	Weight
Ecological Condition				
17	Category 1 waters (300' buffer)	Very good indicator of water quality, rare species use and focus on anti-degradation.	High. Good state-wide dataset.	5
19	Pinelands Streams (300' buffer)	Very good identification of water quality and unique water quality parameters.	High, if only for the Pinelands. Balances Trout Production Waters data layer.	5
25	Ambient Biomonitoring Network	Very good indicator of biodiversity and habitat quality	High.	3 2 1
26	Metric Riparian Landcover (90 meter buffer)	Indicator of impairment.	Low-Medium. Used to identify unimpaired aquatic habitats.	4 3 2 1
27	Metric Impervious Surfaces (90 meter buffer)	Indicator of impairment.	Low-Medium. Used to identify unimpaired aquatic habitats.	3 2 1
Biodiversity				
No	**Dataset**	**Merit**	**Relevance**	**Weight**
23	Aquatic Richness by HUC 14	Very good indicator of biodiversity and habitat quality.	High.	5 4 3 2 1
24	Streams and Waterbodies ranked by Aquatic Species	Indicator of biodiversity and SGCN species use of riparian corridors.	Medium-High.	5 4 3 2 1
Fish & Wildlife Habitats				
No	**Dataset**	**Merit**	**Relevance**	**Weight**
18	Trout Production water (300' buffer)	Excellent indicator of water quality and species biodiversity.	High, if primarily for the northern half of state. Balances with Pinelands Streams layer.	5
20	Freshwater Mussel Habitat (300' buffer)	Very good indicator of water quality, benthic habitat types and biodiversity.	High.	4
21	Odonate Streams (300' buffer)	Good indicator of biodiversity and habitat quality.	Medium-High.	4
22	Diadromous Fish Streams(300'buffer)	Good indicator of biodiversity and habitat quality.	High.	5

Marine Datasets

The intent of the DFW's mapping of "marine CFA's" within its SWAP is to identify *aquatic* marine habitats, including Barnegat Bay and relevant portions of the State's other major bays, such as the Delaware, Raritan and Great Bays. Coastal/intertidal wetlands or shorelines and freshwater/brackish estuarine systems, for example, are *not* mapped as "marine" CFA's, but rather by the "terrestrial" or "aquatic" CFA data layers, respectively. Some exceptions may be evident, such as the identification of seal haul-out sites, which are not literally "aquatic." But such habitats that are intrinsically linked to the aquatic species in the marine CFAs are most relevant in the marine CFA mapping. As was the case with available freshwater aquatic resource data layers, marine aquatic data availability is not quite as robust as that for terrestrial layers. It is worth noting that marine data layers generally did not include details of specific habitat types, benthic conditions or habitat diversity in the same manner as terrestrial habitat data. While there were data sets available for some key marine habitats (such as eelgrass [*Zostera marina[])* beds or artificial reef sites), much of the data that created the SWAP marine CFA mapping was specific to species occurrence data that served to highlight areas of high quality habitat or biodiversity.

Table 3. Summary of the marine datasets selected by DFW staff.

Conservation Infrastructure				
No.	**Dataset**	**Merit**	**Relevance**	**Weight**
35	The Marine Protected Areas Inventory	Indicates areas protected for a marine conservation purpose	Medium/High	3
Biodiversity				
No.	**Dataset**	**Merit**	**Relevance**	**Weight**
28	Submerged Aquatic Vegetation	Excellent indicator of habitat supporting biodiversity	High	5 4
29	Marine Species Richness by 1.3km grid	Very good indicator of general marine biodiversity.	Medium-High	5 4 3
31	Artificial Reef Sites	Good indicator of unique habitat and location of increased biodiversity.	Med-High. Dataset somewhat limited.	4
36	Back-bay and Estuarine Waterbody Spawning Access Areas	Designates specific areas utilized by anadromous fish to access back-bay and estuarine waterbodies (for spawning, etc.)	High	5
37	Shipwreck Dense Areas	Good indicator of unique benthic habitat and location of increased biodiversity.	Medium. Sliding scale based on dataset.	3 3 2
38	Sportfishing Areas	Indicates areas historically proven to represent productive and diverse fish habitats	Medium	2
39	Ocean Trawl Species Rich Areas	Indicates areas of high biological diversity as well as a "source population" for recovered habitats.	Medium/High	3
40	Seabird Annual Average Abundance Composite	Predictive indicator of seabird abundance throughout the entire "marine" CFA region.	Medium	5 4 3 2 1

(Table 3 continued)

Fish & Wildlife Habitats				
No.	**Dataset**	**Merit**	**Relevance**	**Weight**
30	Seal Haul-out Sites	Excellent indicator of unique habitat conditions critical to marine mammals.	Medium-High	4
32	Hard Clam Distribution in Barnegat Bay, 2012	Species-based indicator of habitat type.	Low	1
33	Mullica River/Great Bay/Delaware Bay Oysters	Species-based indicators of habitat type.	Low	1
Negative Influences				
No.	**Dataset**	**Merit**	**Relevance**	**Weight**
34	Mullica River/Great Bay Leases	Designates areas of anticipated anthropogenic activity/disturbance.	Medium “negative” relevance.	-5
41	Shipping Density (all vessels)	Indicator of marine environment stressors or impairment.	Low to Medium negative relevance.	-5 -10

As was noted in the body of the plan, these datasets represent the first draft of CFA maps, and maps may be further developed or refined in the future as new GIS data become available or as use and implementation of the maps reveals opportunities for refinement or improvements.