Natural Features Model
Project Overview

Town staff developed the Natural Features Model to examine some of the environmental tradeoffs of growth in Chapel Hill. Staff are using the Model as a tool to aid our review of proposed development and redevelopment projects. This is not a regulatory tool and does not determine whether land is suitable for development. Instead, the model helps to identify when and where further analysis and discussion of environmental tradeoffs is needed.

Clicking this link will bring you to the Natural Features Model[1].

The model uses habitat, hydrology, and land use data to identify potential environmental constraints and assets that require further discussion and analysis. The Natural Features Model helps staff to:

- Identify opportunities to protect or enhance ecologically valuable natural areas through Town-led initiatives.
- Work with developers to design projects that balance growth with conservation.

How it works

The Natural Features Model is a composite of three sub-models that focus on habitat, hydrology, and land use data. Each sub-model is based on input data from multiple sources while the composite model aggregates the three sub-models. We anticipate the model will evolve and change over time as datasets are continuously updated.

The composite model and sub-models all use a statistical technique known as "weighted overlay analysis[2]" that allows staff to finetune the relative importance of each of the input data sources. For example, the composite model significantly prioritizes the habitat sub-model over the other two sub-models as can be seen in the table below. Meanwhile, within the habitat sub-model, habitat corridors are prioritized over disconnected habitat fragments.

Sub-models	Weighted Influence
Habitat	50%
Hydrology	30%
Land Use	20%

How to use it

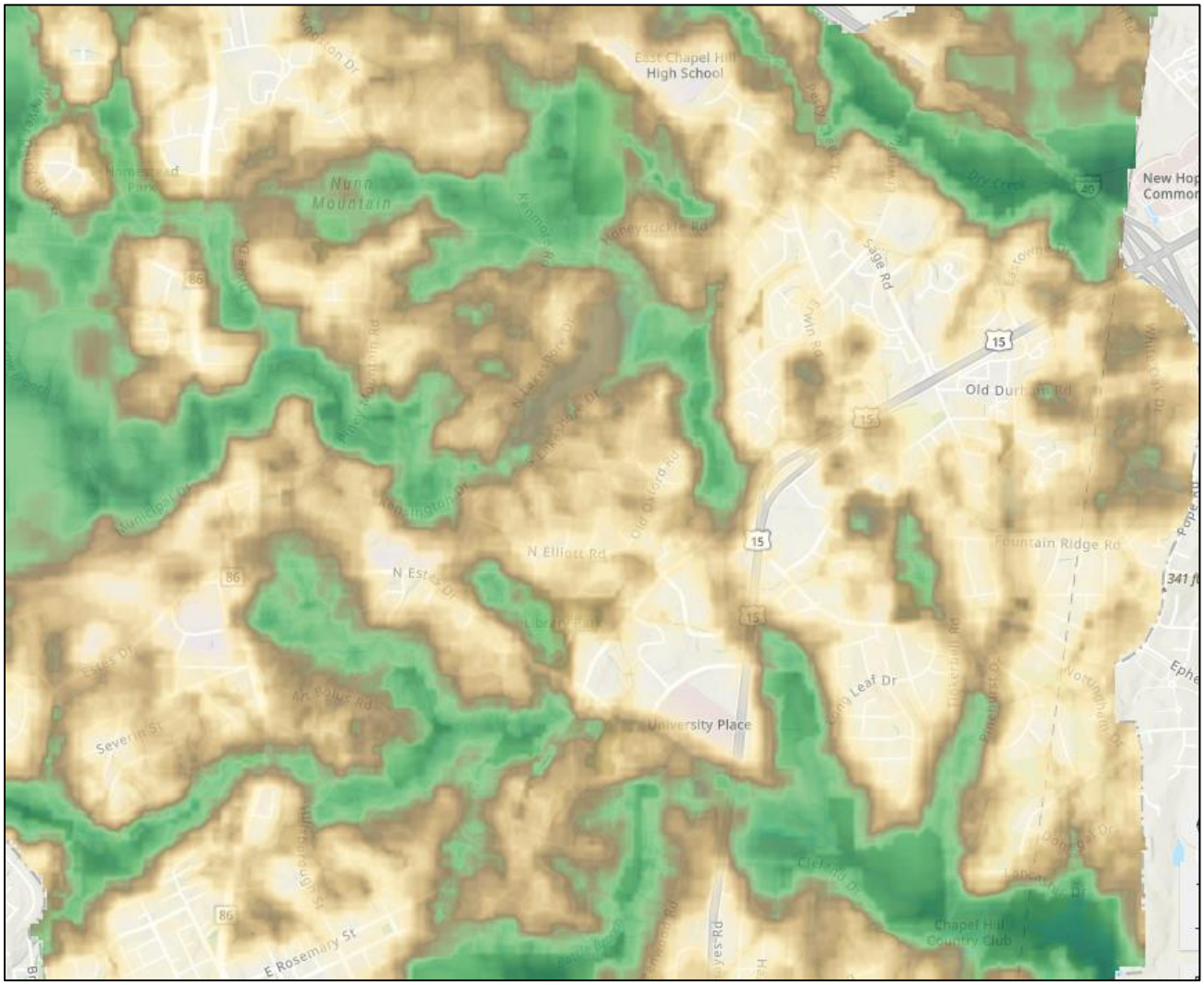
The Natural Features Model is valuable to staff because it helps clearly indicate where natural features may be present. Staff can then use the sub-models to further explore how habitat, hydrology, or land use influence a particular area. Each sub-model is composed of data sets which can be explored further.

[1] https://experience.arcgis.com/experience/e07f9756efb84b708abca06e1ad19008
[2] To learn more about weighted overlay models, visit https://pro.arcgis.com/en/pro-app/latest/tool-reference/spatial-analyst/how-weighted-overlay-works.htm

Example Images from the Natural Features Model
The following images are screenshots of the Natural Features Model to demonstrate how it may look to a user. For more detailed information on the inputs, sources, and weights, refer to the individual sub-model pages in the Natural Features Model tool.

Natural Features Model
This image of the Natural Features Model shows the location of significant, moderate, and minimal natural features. Because this composite model is based on the other sub-models, a "natural feature" could be any number of things like a stream, a habitat corridor, protected open space, or some combination of those things. The image should be interpreted with the guidance below.

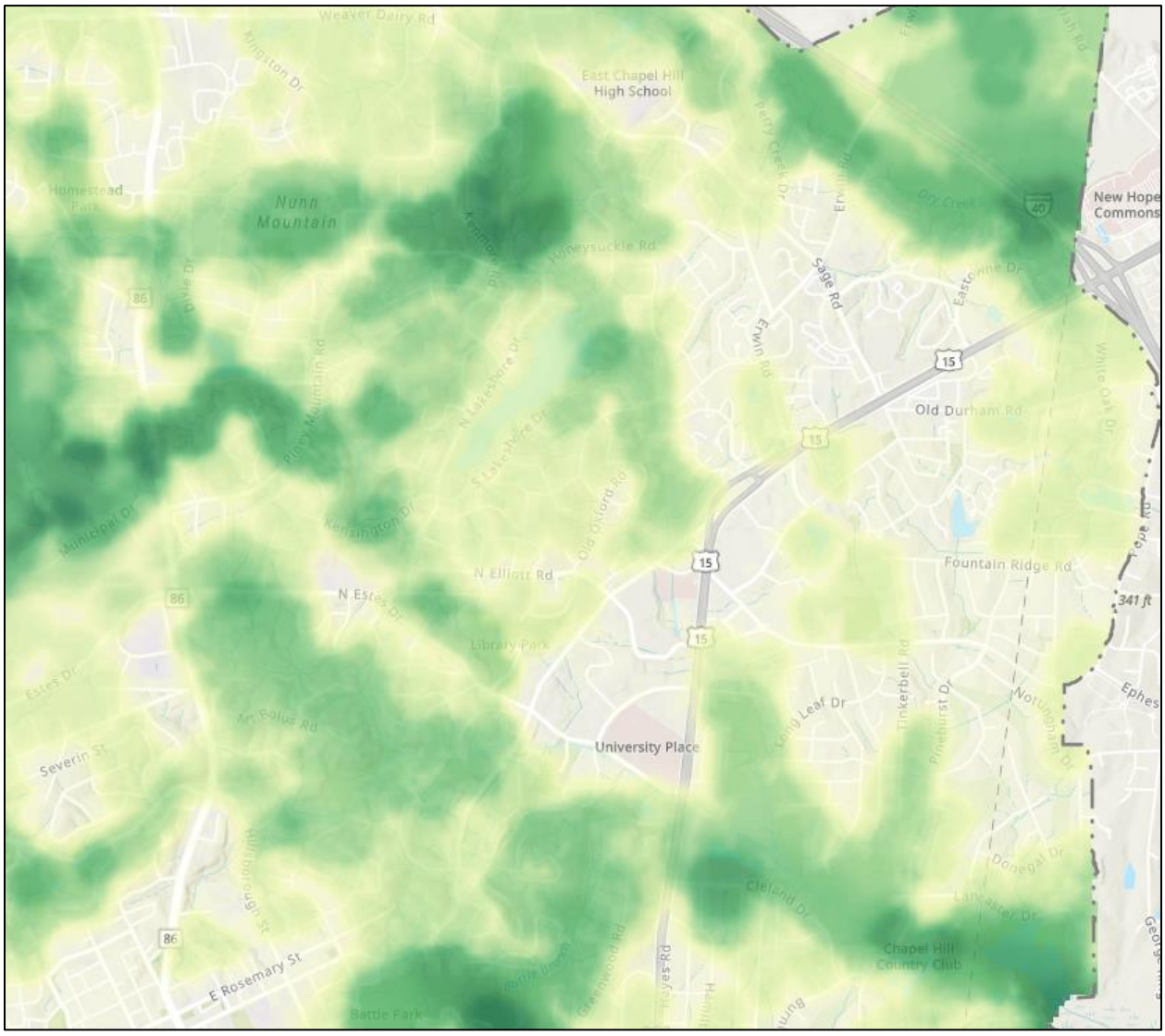
- Light to dark green indicates areas with increasing *significant* natural features.
- Light to dark brown indicates areas with increasing *moderate* natural features.
- Areas with no shading indicates *minimal* natural features.



Habitat Sub-Model

This image of the Habitat Sub-Model shows the proximity of habitat areas. These can include both habitat corridors and habitat patches/fragments. The image should be interpreted with the guidance below.

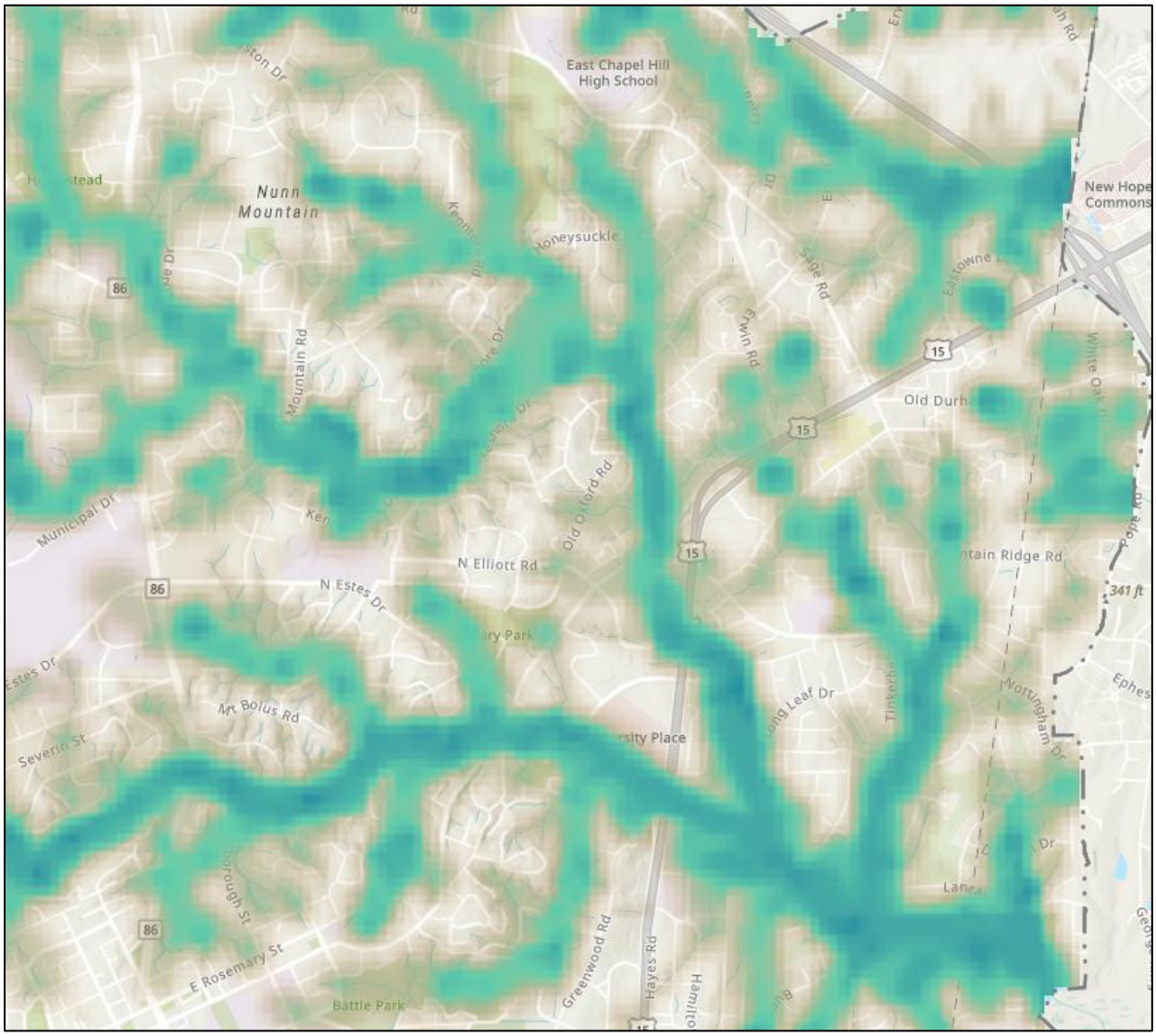
- Darker green indicates areas that are *closer to* habitat areas.
- Yellow or no shading indicates areas *farther from* habitat areas.



Hydrology Sub-Model

This image of the Hydrology Sub-Model shows the proximity distance of water features. The image should be interpreted with the guidance below.

- A darker blue indicates areas *within* a water feature corridor.
- Brown shading or no shading indicates a *greater* distance to a water feature corridor.



Land Use Sub-Model

This image of the Land Use Sub-Model shows the degree to which land uses are supportive of natural open space based on their current designation. Publicly owned land and land protected by conservation easements, or other similar mechanisms, ranks the highest. The image should be interpreted with the guidance below.

- Darker green indicates uses *supporting* natural open space.
- Areas in white indicate uses that *moderately support* natural open space.
- Darker purple indicates areas that are *not supportive* of natural open space.

Going Deeper: *Exploring Sub-Model Inputs*

All three of the Sub-Models allow users to examine the detailed map layers that they draw from. Going deeper into these detailed layers can help users better understand the unique circumstances that influence the scores (i.e., the colors) shown in the sub-models.

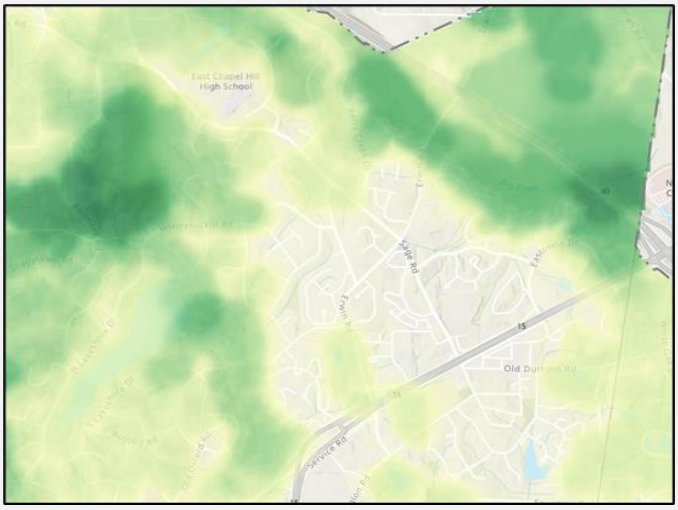
In many cases, these detailed map layers also extend beyond Chapel Hill's boundaries and help to provide more context for how environmental features in Chapel Hill fit into the bigger picture of the region. The examples below illustrate how these detailed layers can be used.

Default View:

The traditional view of the Habitat Sub-Model (right) shows an area of Chapel Hill with overall habitat scores based on various inputs.

- Yellow or no shading indicates areas *farther from* habitat features.
- Darker green indicates areas that are *closer to* habitat areas.

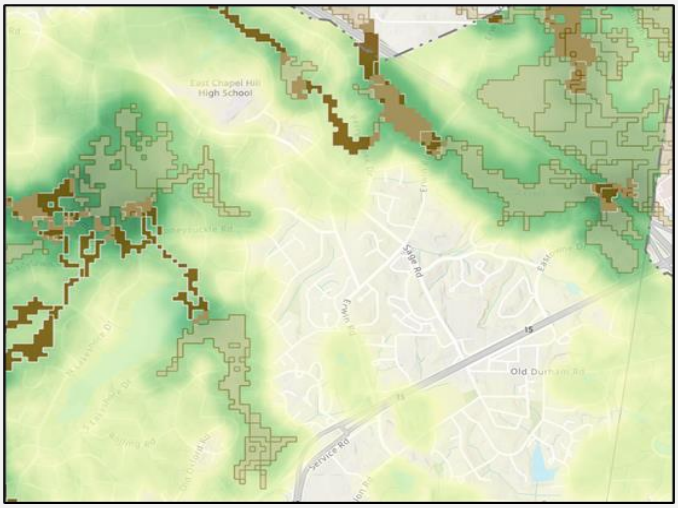
Using the icon in the Model viewer allows users to see the list of detailed map layers that feed into the sub-model. Each layer can be toggled on or off to learn more.



Detailed Layers:

The same area of Chapel Hill is shown with detailed map layers for "Habitat Patches" and "Habitat Corridors" turned on (right). This view sheds light on what specific assets contribute to the overall classifications shown above.

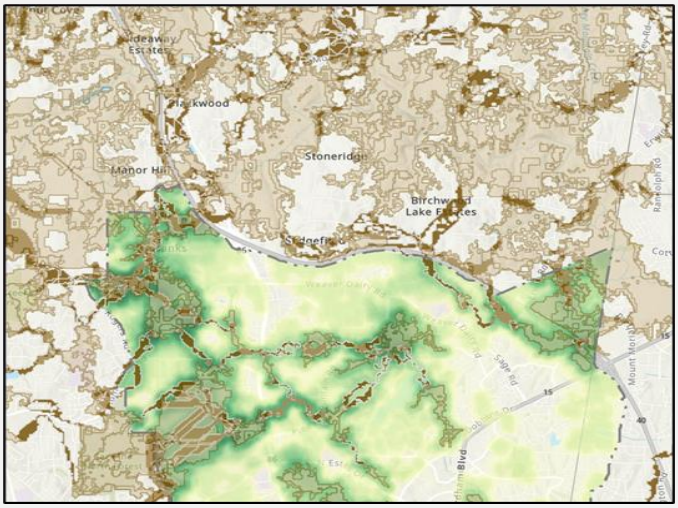
- Darker brown to lighter brown indicates area that are habitat corridors and habitat patches.



Zooming Out:

Because the detailed map layers extend beyond Chapel Hill's boundaries, they can provide meaningful context.

Zooming out from the same area of Chapel Hill shown in the examples above shows how habitat corridors and habitat patches differ between land in Chapel Hill and land north of Chapel Hill.



Background

The Natural Features Model is an iteration of the "Suitability Analysis – Natural Area Model[3]" we shared in December 2023. The model evolved from the "Suitability Analysis – Natural Areas Map" adopted as a part of the Town's Complete Community Strategy, a Comprehensive Plan component.[4]

The Strategy acknowledges that growth will come to Chapel Hill and defines how growth should be both accommodated and managed as we work towards an inclusive, sustainable and economically competitive future. Goal Two of the Strategy emphasizes the use and benefit of a Natural Areas Map: "The Natural Areas Maps depicts where stream corridors and watersheds can be utilized and improved to further this objective as greenways for transportation."

[3] https://chapelhill.legistar.com/LegislationDetail.aspx?ID=6451422&GUID=7992236E-EB09-44B3-A6B1-E0A751B979CC
[4] https://www.townofchapelhill.org/home/showpublisheddocument/53972/638222644055270000