Handout 2-3 Land Use and Over Development

Habitat Loss in Virginia is one of the greatest threats to the water resources on the Virginia Peninsula and can be considered a "Driver" of other threats like loss of natural waters and water quality, non-point pollution of natural waters and loss of natural habitats. [Landscope Virginia](#) and [The Virginia Department of Conservation and Recreation Land Conservation Division](#) are the primary source for this handout

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"The greatest threat to Virginia's biodiversity comes from the loss and degradation of suitable habitat. Across the state, land is being converted to more intensive uses. In particular woodlands and pastures are being converted to subdivisions and shopping centers, and new roads and utility corridors are being constructed to service them. Current estimates indicate that over 93,000 acres of Virginia's open space lands are converted to non-renewable uses each year.

The Virginia Natural Heritage Program contributes in a number of ways to help protect sensitive habitats from these threats. The most direct method is through land acquisition for the Natural Area Preserve System. This is especially effective for rare species and communities – such as limestone barrens – that can persist in small isolated pockets and that are not greatly affected by activities beyond the boundaries of the preserve. Land acquisition is less effective for many aquatic and cave habitats because they are often affected by events throughout large watersheds.

DCR's project review process plays an important role in protecting these and other sensitive habitats. By reviewing development proposals the Natural Heritage Program offers guidance on the location and design of projects to help avoid or minimize impacts to natural heritage resources. The program's karst protection staff help reduce impacts to cave systems by educating the public on the sensitive nature of these resources and by providing guidance to localities on matters such as storm water drainage systems.

Habitat Fragmentation

Development and the accompanying infrastructure, such as roads and power line rights-of-way, may threaten biodiversity through habitat fragmentation. Although suitable habitat may remain intact, the populations of some species such as forest nesting neotropical migrant birds will decline due to several factors. First, some species instinctively seek large undisturbed tracts for breeding – without large enough habitat, they simply will not breed. Second, when some plant and animal populations become isolated, they may suffer from problems associated with in-breeding. Third, the species that remain in small patches of habitat are often vulnerable to predation or invasion from "edge species." For example, opossums and raccoons that thrive at the edge of a forest may prey heavily on the eggs and nestlings of forest birds whose habitat has been reduced to small patches. And fourth, habitat fragmentation opens up new avenues and opportunities for the introduction of invasive species.

The Virginia Natural Heritage Program plays a vital role in reducing the effects of habitat fragmentation. With its extensive database on the locations of critical habitats, its GIS capabilities, and the expertise of its staff, the Natural Heritage Program can help guide development and land protection efforts, in order to preserve the biological integrity of large areas. One recent example is the Natural Heritage Program's contribution to the Southern Watershed Area Management Program (SWAMP), which identified significant conservation corridors for the cities of Virginia Beach and Chesapeake."

Abstract – [Vulnerability Model](https://www.dcr.virginia.gov/natural-heritage/vaconvisvulnerable) (https://www.dcr.virginia.gov/natural-heritage/vaconvisvulnerable)

The purpose of the *VirginiaConservation Vision Development Vulnerability Model* is to quantify the risk of conversion from greenspace (natural, rural, or other open space lands) to urbanized or other built-up land uses. The model output is a raster dataset in which the relative vulnerability of lands ranges from 0 (least vulnerable) to 100 (most vulnerable). Vulnerability values are not probabilities, but should be interpreted as a relative measure of development potential. Conservation lands on which biodiversity preservation is believed to be the primary goal are considered undevelopable and are coded with the value -1, while areas in which development has already occurred are coded 101.

The basis of the model is a Random Forest machine-learning model, used to relate a suite of predictor variables representing conditions at an initial time to outcomes (developed or not) a decade later. The predictor variables can be grouped into three categories based on their spatial focus: (1) local site characteristics, (2) neighborhood characteristics, and (3) travel time or distance to development "attractors". The sampling frame was limited to areas that were undeveloped at the initial time but that could potentially be developed in the future.

To train and test the model, predictor variables representing conditions in the year 2006 were connected to outcomes in 2016, with the data split into independent subsets used for training and testing. Once the prediction model was finalized, variables representing conditions in 2019 were used to predict the relative potential for development by the year 2029. To produce the final vulnerability map, raw prediction values were adjusted to reflect the status of lands that are currently protected or already developed.

This model is one of several in a suite of conservation planning and prioritization models developed by the Virginia Natural Heritage Program and partners, known collectively as Virginia ConservationVision. It is intended for use in conjunction with other data to help target lands for protection. The model can also serve as an input for simulating future land cover change and its consequences under different planning scenarios.

Details

For an overview of how this model was produced, **see this slide show** (PDF).

For details, refer to the **technical report** (PDF) which includes:

- A list of all input datasets used to develop the model
- Detailed description of the methodology used to produce the model
- A series of maps providing visual representation of the relative vulnerability of lands across the state, as well as across each planning district
- Guidance on interpretation and appropriate uses for the model
- Comparison of the model with similar models

For posterity, the technical report for the previous model version is available **here.** (PDF)

Online Mapping

The model can be viewed in an interactive web map on **ArcGIS Online**, as well as the **Virginia Natural Heritage Data Explorer** in the "Conservation Planning" section.