In preparation for *Leveraging Deep Learning and Data Science for the Conservation and Restoration Movement* presented by Joel Dunn (Chesapeake Conservancy) during the STAC March 2024 Quarterly Meeting, please review the following articles:

High-resolution land cover land use data: Chesapeake Conservancy, U.S. Geological Survey (USGS) and University of Vermont Spatial Analysis Lab (UVM SAL) are collaborating, with funding from the Chesapeake Bay Program (CBP), to produce 1-meter resolution land cover and land use/land cover datasets for the Chesapeake Bay watershed regional area (206 counties, over 250,000 km2). These data are foundational, authoritative, and transformative looks at the landscape and its management throughout the region. We have developed a new AI model that will help us produce this data faster and more regularly with satellite data. https://www.chesapeakeconservancy.org/conservation-innovation-center/high-resolution-data/lulc-data-project-2022/

Hyper-resolution hydrography data: Working in partnership with UMBC, our approach generates a 2-dimensional representation of stream channels, valleys, and a wealth of other geomorphic information including continuous estimates of channel and valley width, bank height, aspect, and more. In conjunction with high-resolution land cover, land use, and topographic data, the comprehensive and accurate hydrography produced using this method will play a crucial role in informing modeling and management decisions relating to nutrient, sediment, and hydrologic connectivity to the Chesapeake Bay over the next 5 to 10 years. This data will be available in the summer of 2024. https://www.youtube.com/watch?v=llKNl-HtYSo

Deep learning model for wetlands mapping: The current data that we rely on to minimize impacts to wetlands is distressingly outdated. Chesapeake Conservancy's data science team developed a computer vision algorithm for mapping wetlands with 94% accuracy. The product of the model is a map of wetland probability as well as high resolution delineation of wetlands, allowing us to detect even tiny wetlands that routinely are missed in regional inventories. This probability data may be used to map the most likely wetland extent, but if users prefer, they can map wetland extent with a lower probability threshold. This manuscript was recently published in the journal Science of The Total Environment https://www.sciencedirect.com/science/article/pii/S0048969722077257?via%3Dihub.

Biodiversity mapping of current and future habitat: We are mapping the current actual habitat of priorities species in the Chesapeake watershed (and, beyond) and generating predicted habitat under multiple climate change scenarios. The machine learning model integrates climatic, environmental, landcover and other type of information, yielding an output that is useful for helping conservation even at parcel level. We plan to model endangered species, species with high ecological and social significance (e.g., keystone, indicator, charismatic species), and common species representing various taxonomic groups. For an example (though not in the Chesapeake, this research was done by our

Data Scientist), see https://www.nature.com/articles/s41598-023-39481-z

Solar array mapping and siting prediction: We have produced the first maps of ground-mounted solar arrays within the Chesapeake Bay watershed for each year from 2017 to 2022, using an AI model previously developed by Mike Evans and adapted for the Chesapeake watershed with additional training data. Using these data, we analyzed trends and patterns in the land cover classes affected by development of solar arrays within the watershed. This is crucial information to understand current development patterns and the potential future buildout and related impacts, especially to forests and farmland in the watershed. This research has been published to Biological Conservation https://www.sciencedirect.com/science/article/pii/S0006320723001751