2022 EPA GIT Funding Ideas

Table 1	
Goal Implementation Team (GIT)	Water Quality Goal Implementation Team (GIT 3)
Proposed GIT Technical Lead	Tentatively: Peter Claggett, U.S. Geological Survey, pclaggett@usgs.gov
Annual Weighting Factors to Consider	Project addresses an outcome that is lagging in attainability.
CBP Functional Areas	Yes - GIS Team
Preparers	Peter Claggett, U.S. Geological Survey, pclaggett@usgs.gov
Project Title	**Improving the mapping of pasture and hay**
Project Type	Modeling Support
Proposed Project Outcomes	Improving the spatial and thematic accuracy of agricultural land use and BMPs in Chesapeake Bay Program's suite of models.
Project Justification	Pasture and hay have different nutrient and sediment loading rates and are recipients of different BMPs. Pasture is also unique from hay as a potential source of stream pathogens. From a mapping perspective, it is very difficult to separate pasture from hay because they appear spectrally similar. Both are lumped together as a single land use class in the National Land Cover Database and in the CBP's high-resolution land use/land cover dataset. The USDA's National Agricultural Statistics Service has also stated that these classes are challenging to separate based purely on their spectral properties. In the CBP's high-resolution land use/land cover data, pasture and hay may both be confused with timber harvests and natural lands undergoing succession which are even more different in their respective pollutant loads. This confusion can only be partially resolved with the improved mapping of timber harvests and fallow lands. This proposal seeks to improve the accuracy and separation of the CBP's pasture and hay land use classes by using machine learning to leverage high-resolution and moderate-resolution spectral information coupled with data on animal operations. While this is a research initiative, it has a high potential for success given the data available in the Chesapeake Bay watershed. Improved mapping of pasture and hay will improve the spatial accuracy of land uses and BMPs in CAST and therefore improve the accuracy of CBP estimates of pollutant loads and progress.
Proposed Project Steps and Timeline	1. Consult with CBP's Agriculture Modeling Team on the land use/cover patterns of pasture, hay, and agricultural open space. 2. Use ancillary land use, animal operation, and other data to identify training sites for machine learning. 3. Within training sites, use multi-spectral aerial and satellite imagery to identify spectral patterns and seasonality of those patterns and use LiDAR imagery to identify slope and landforms. 4. Use deep-learning algorithms to predict the locations of pasture and hay land uses.

	5. Validate the model against local information on pasture land use available for select counties and states.
Estimated Costs	$100,000
Cross-Outcome Benefits	- 2025 Watershed Implementation Plan (WIP) Outcome (Primary) - Land Use Methods and Metrics Development Outcome (Secondary) - Water Quality Standards Attainment and Monitoring Outcome (Secondary)