Proposed New CBP Land Use Classification Scheme 03.19.2020

Purpose:
Several outcomes specified in the 2014 Chesapeake Bay Program Agreement and the proposed Chesapeake Bay Regional Hydrologic Model will benefit from the enhancement of the 2013 Chesapeake Bay Program land use dataset[1]. The current 2013 land use dataset was designed to inform the development of Phase III Watershed Implementation Plans as part of the 2017 Mid-Point Assessment. All unique classes, except for "wetlands", were required to exhibit proven unique nutrient and/or sediment loading rates. While this approach was very effective for informing water quality management decisions, it has limited utility for informing other Chesapeake Bay outcomes. Limitations of the current data include:

- Inaccuracies associated with class confusion, e.g., solar fields mapped as impervious surfaces, forest fragments mapped as "mixed open";
- Loss of land cover information (e.g., tree canopy, herbaceous, scrub-shrub) within wetlands and "fractional" classes (areas estimated to contain part cropland, pasture, turf grass, mixed open, and/or impervious surfaces);
- Over-estimation of agricultural land in counties with extensive mining and oil & gas development;
- Over-estimation of turf grass in counties lacking parcel data;
- Inability to estimate net changes in forests and urban tree canopy due to inherent data bias towards detecting loss and absence of successional classes;
- Inability to inform forecasts of future forests due to the absence of successional classes;
- Inability to accurately portray the spatial extent and shading of streams

To remedy these issues, a new land use classification scheme based on updated decision rules and additional ancillary data is proposed for translating land cover into land use. The proposed new classification was developed in the fall of 2019 through consultation with the Land Use Workgroup, Forestry Workgroup, Wetlands Workgroup, Climate Resiliency Workgroup, Agricultural Workgroup, Scientific Technical Assessment and Reporting team, and both the Habitat and Healthy Watersheds Goal Implementation Teams. It has been reviewed from a feasibility perspective by the Chesapeake Conservancy and the University of Vermont's Spatial Analysis Laboratory. The proposed classification is both feasible and within the scope of the USEPA's 2018 Cooperative Agreement with the Chesapeake Conservancy.

The proposed classification will not impact the WIPs, Milestones, or annual Progress runs. Land use changes based on the new classification will be directly cross-walked and aggregated into the existing Phase 6 thirteen mapped land use classes to compute change from 2013 to 2017 and from 2017 to 2021. These changes will then be applied to the original 2013 land use dataset to update it to 2017 and 2021 conditions. Nutrient and sediment loads will therefore only change as a result of actual changes in land use and management practices, not as a result of this new classification.

[1] https://chesapeakeconservancy.org/conservation-innovation-center-2/high-resolution-data/land-use-data-project/

Proposed New CBP Land Use Classification Scheme 03.19.2020

The following pages outline the proposed new classification scheme from two perspectives. The Phase 6 perspective illustrates how the proposed new classes nest under the existing thirteen Phase 6 land uses. The new classification disaggregates four Phase 6 classes into additional subclasses. Water is disaggregated into four new classes: estuary, lakes & ponds, streams, and ditches. This disaggregation will help the CBP partners distinguish different types of shoreline change and leverage recent investments in mapping streams and ditches from 1-meter resolution LiDAR imagery. Mapping all streams and distinguishing them from ditches will inform riparian buffer assessments, planting opportunities, and targeting efforts. It will also enable assessments of shaded vs daylighted stream miles. For impervious surfaces, solar fields and railroads will be identified. Railroads and solar fields may not exhibit the same hydrologic functions as other types of impervious cover which can be considered in the development of future hydrologic models. Moreover, solar fields are a rapidly growing feature on the rural landscape that contribute to climate resiliency. For the cropland class, orchards and vineyards will be explicitly mapped to reduce confusion with forest and mixed open classes, thereby improving the accuracy of mapped cropland and forest wildlife habitats.

Most efforts invested in the new classification will focus on disaggregating the “mixed open” class. For Phase 6, “mixed open” represents a catch-all class including timber harvests, active, abandoned and reclaimed mines, landfills, unconventional oil and gas development, beaches, waterbody margins, natural grasslands, and utility rights-of-ways. These areas compose a significant portion of the landscape in some counties. Insufficient ancillary data defining these different types of lands and over-reliance on local land use and zoning data led to an under-classification of mixed open in rural areas corresponding to an over-classification of agriculture. Understanding the composition of mixed open is vital for mapping wildlife habitats, projecting future changes in land use, and assessing alternative land management opportunities. “Natural Succession” represents unmanaged, non-forested lands that are slowly transitioning to forest. “Managed Succession” represents timber harvests that regenerate faster than unmanaged lands. “Suspended Succession” represents areas maintained as herbaceous or scrub-shrub such as transmission line, highway, and rail rights-of-ways. “Bare Construction” represent patches of bare land in urban and suburban landscapes. “Bare Shore” represents beaches, mudflats, and lake margins not included in wetland ancillary data. “Extractive” represents active and reclaimed (non-forested) surface mines, quarries, and gas pads. “Fragmented Forest” represents patches of trees less than 1-acre in size that are presumed to have an unmanaged understory such as narrow riparian forest buffers.

Because these new classes do not all logically nest under the thirteen Phase 6 land uses, the second outline, “General-Purpose Land Use Perspective”, rearranges the new classes into a more logical land use classification and includes their land cover components so that all mapped land use/cover information is represented in a single dataset. Thus, a single dataset with these 58 classes can be created and easily morph into the Phase 6 classification, a pure land cover map, or a pure land use map. The CBPO will develop various GIS-based layer files and legends to facilitate these translations.

Proposed New CBP Land Use Classification Scheme 03.19.2020

Phase 6 Land Use Perspective
(16 additional classes):

1. ***Water (WAT; from 1 to 7 classes)***
    - 1.1 Lotic
        - 1.1.1 Estuary
        - 1.1.2 Lakes & Ponds
    - 1.2 Lentic
        - 1.2.1 Streams
            - 1.2.1.1 Daylighted
            - 1.2.1.2 Shaded
            - 1.2.1.3 Buried
        - 1.2.2 Ditches
            - 1.2.2.1 Daylighted
            - 1.2.2.2 Shaded
2. ***Impervious, Roads (IR; no change)***
3. ***Impervious, Non-Roads (INR; 2 to 4 classes)***
    - 3.1. Structures
    - 3.2. Other Impervious
    - 3.3. Solar fields
    - 3.4. Railroads
4. ***Tree Canopy over Impervious (TCI; 1 to 2)***
    - 4.1. Tree Canopy over Structures
    - 4.2. Tree Canopy over Other Impervious
5. ***Turf Grass (TG; no change)***
6. ***Tree Canopy over Turf Grass (TCT; no change)***
7. ***Forest (FORE; change in name only)***
    - 7.1. Contiguous (> 1 acre)
8. ***Tidal Wetland (WLT; updated tidal zone overlay)***
9. ***Non-Tidal Floodplain Wetland (WLF; updated floodplain overlay to include headwaters)***
10. ***Non-Tidal Other Wetlands (WLO; no change)***
11. **Mixed Open (1 to 7 classes)**
    - 11.1. Natural Succession
    - 11.2. Timber Harvest
    - 11.3. Utility Rights-of-Ways
    - 11.4. Bare Construction
    - 11.5. Bare Shore
    - 11.6. Extractive
    - 11.7. Fragmented Forest (< 1 acre)
12. ***Cropland (CRP; 1 to 2 classes)***
    - 12.1. Cropland
    - 12.2. Orchard/vineyard
13. ***Pasture (PAS; no change)***

Proposed New CBP Land Use Classification Scheme 03.19.2020

General-Purpose Land Use Perspective:

1. ***Water (7)***
   - **1.1. Lotic**
     - 1.1.1. Estuary
     - 1.1.2. Lakes & Ponds
   - **1.2. Lentic**
     - 1.2.1. Streams
       - 1.2.1.1. Daylighted
       - 1.2.1.2. Shaded
       - 1.2.1.3. Buried
     - 1.2.2. Ditches
       - 1.2.2.1. Daylighted
       - 1.2.2.2. Shaded

2. ***Developed (13)***
   - **2.1. Infrastructure**
     - 2.1.1. Roads
     - 2.1.2. Railroads
     - 2.1.3. Tree Canopy over Roads
     - 2.1.4. Structures
     - 2.1.5. Tree Canopy over Structures
     - 2.1.6. Other Impervious
     - 2.1.7. Tree Canopy over Other Impervious
     - 2.1.8. Utility Rights-of-Ways
       - 2.1.8.1. Barren
       - 2.1.8.2. Herbaceous
       - 2.1.8.3. Scrub-shrub
   - **2.2. Bare Construction**
   - **2.3. Turf Grass**
   - **2.4. Tree Canopy over Turf Grass**

3. ***Forest (5)***
   - **3.1. Contiguous (> 1 acre)**
   - **3.2. Fragmented (< 1 acre)**
   - **3.3. Natural Succession (e.g., Fallow)**
     - 3.3.1. Barren
     - 3.3.2. Herbaceous
     - 3.3.3. Scrub-shrub

4. ***Production (14)***
   - **4.1. Agriculture**
     - **4.1.1. Cropland**
       - 4.1.1.1. Barren
       - 4.1.1.2. Herbaceous
     - **4.1.2. Orchard/vineyard**
       - 4.1.2.1. Barren
       - 4.1.2.2. Herbaceous
       - 4.1.2.3. Scrub-shrub
     - **4.1.3. Pasture**
       - 4.1.3.1. Barren
       - 4.1.3.2. Herbaceous
   - **4.2. Timber Harvest**
     - 4.2.1. Barren
     - 4.2.2. Herbaceous
     - 4.2.3. Scrub-shrub
   - **4.3. Extractive**
     - 4.3.1. Barren
     - 4.3.2. Herbaceous
     - 4.3.3. Scrub-shrub
   - **4.4. Solar fields**

5. ***Wetland (19)***
   - **5.1. Tidal**
     - 5.1.1. Open water
     - 5.1.2. Barren
     - 5.1.3. Herbaceous
     - 5.1.4. Scrub-shrub
     - 5.1.5. Contiguous Forest
     - 5.1.6. Fragmented Forest
   - **5.2. Non-Tidal**
     - 5.2.1. Floodplain/ Headwater
       - 5.2.1.1. Open water
       - 5.2.1.2. Barren
       - 5.2.1.3. Herbaceous
       - 5.2.1.4. Scrub-shrub
       - 5.2.1.5. Contiguous Forest
       - 5.2.1.6. Fragmented Forest
     - 5.2.2. Other
       - 5.2.2.1. Open water
       - 5.2.2.2. Barren
       - 5.2.2.3. Herbaceous
       - 5.2.2.4. Scrub-shrub
       - 5.2.2.5. Contiguous Forest
       - 5.2.2.6. Fragmented Forest
   - **5.3. Bare shore**