Proposed Practice Life and Credit Duration for Forestry BMPs in the Chesapeake Bay Model (June 2021)

This paper is the result of a Forestry Workgroup review of Practice Life and Credit Duration of forest and tree planting BMPs. After a GIS analysis, it was previously decided by the Forestry Workgroup and Watershed Technical Workgroup in May that all forestry and tree planting practices would be backed-out of the Chesapeake Assessment and Scenario Tool (CAST) 15 years after the latest high-resolution imagery is captured and incorporated into CAST.

Bottom line up front: With the rationale presented in this paper, the Forestry Workgroup is requesting that CBP approve a 15 year credit duration for all tree planting practices (see table). This is supported by the literature and is what was originally spelled out in its Verification Guidance.

Definitions

- **Practice Life--**The length of time a practice is expected to persist. This is primarily used to analyze annualized cost-benefit. The longer the practice life, the lower the cost of establishment/year.
- **Credit Duration--** The length of time a practice is credited in the National Environmental Information Exchange Network (NEIEN) before it needs to be re-verified.

Forest and Tree Establishment

Tree planting and maintenance are important practices for increasing the quality of tree cover while minimizing unwanted plant establishment. The Verification Guidance produced by the Forestry Workgroup (last revised in 2017) addresses planting, maintenance, and natural regeneration to ensure establishment. Planting is usually done by contract, which will often mandate that seedlings that don't survive be replaced. Riparian forest buffers, for instance, will receive multiple visits throughout the contract life with most of these happening in the first few years. A mix of state, federal, and non-profit partners are responsible to verify establishment depending on the location and the practice.

Once established, forests can grow indefinitely with little maintenance-- even in the event of a natural disaster (flooding, ice storms, etc.) -- as they are the natural land cover for this region. Some practices have a consistently higher standard of planning, implementation, maintenance, and regeneration (natural regeneration can be part of forest plantings per Verification protocol) which can lead to a higher quality end product.

Both forest and tree planting survival depend on site characteristics, quality of planting stock, species selected for planting, early maintenance, and weather. The primary reason that the practice life for trees/forests is not indefinite, is due to changes in site management. As good planting and maintenance and improved land use decisions are adopted, the practice life will increase in duration.

Most urban tree planting occurs on lawns and community space where site conditions are more favorable and where they are expected to grow better and live longer than trees when planted along streets. There are many, diverse programs for tree planting and 1 in 3 trees in urban areas are there because of natural regeneration (Nowak 2012).

Forestry BMPs (Pink= forest buffers Blue-=tree plantings)	**Practice Life Span** (time that a Practice is expected to persist; used primarily for cost-benefit calculations)		**Credit Duration** (time that a Practice is held in NEIEN before being needing reverification)	
	Current	Proposed	Current	Proposed
Ag Forest Buffer (w/o fencing- crop)	40 years	70 years	10 years	15 years
Ag Forest Buffer (w/ fencing- pasture)	30 years	*No change*	10 years	15 years
Urban Forest Buffer	40 years	*No change*	10 years	15 years
Ag Tree Planting	40 years	*No change*	10 years	15 years, then modeled as Land Use
Narrow forest buffers (w/o fencing)	40 years	*No change*	10 years	15 years, then modeled as Land Use
Narrow forest buffers (w/ fencing)	25 years	*No change*	10 years	15 years, then modeled as Land Use
Urban tree planting	40 years	*No change*	10 years	15 years, then modeled as Land Use
(Urban) Forest Planting	28 years	40 years	15 years	*No change*
Forest Harvesting BMPs	3 years (period BMPs are needed before land use reverts to undisturbed forest)	*No change*	3 years then reverts to Forest Land Use	*No change*

<u>Basis for Practice Life</u>

For Forest Plantings:

1. A forest established after 15 years is unlikely to be converted (compared to a grass buffer or single tree). One reason is because it is difficult to remove these trees. Also, multiple landowner surveys have shown that 80-88% of landowners intend to keep their new forest buffer indefinitely (English and Hyberg 2019, Cooper 2005, Fesco 1982).
2. Forests are naturally regenerative.
3. All Forest Plantings (buffers and urban forest planting BMPs) receive management and are often overseen by foresters (receive planting plan, pre-treatment, and maintenance).

For Tree Plantings (as opposed to buffers or other forest plantings):
There are no proposed changes to the Practice Life of tree plantings practices. Non-urban plantings may have a greater likelihood of survival. Urban and suburban plantings are often replaced or supplemented by natural regeneration.

Basis for Credit Duration

For Forest Buffers:

For buffers, a 15-year credit duration is further supported based on:

1) Contract length (The majority of CREP forest buffers have 15-year contract commitment which includes required maintenance and oversight by USDA. Contracts can be extended another 15 years, after the initial contract period.)
2) Landowner investment— the establishment of a forest takes considerable investment and the landowner is unlikely to convert after establishment (see Practice Life discussion above).
3) Consultation with forester—forest plantings have a higher bar for planning, implementation and establishment and are therefore more likely to persist.

After 15 years, new buffers will need to be verified to maintain the upslope efficiency in NEIEN. The FWG proposes that verified buffers can continue to receive upslope efficiencies, but not land use conversion credit, after 15 years.

On Whether A Buffer Should Receive Full Credit Upon Implementation: The Riparian Forest Buffer Expert Panel (Belt et al. 2014) debated whether to withhold full practice credit until the planting was grown (~10 years of age) but decided against it. The following was excerpted from their report: "Some forest buffer functions are realized quickly following planting and increase as forest soil and canopy functions are rebuilt… the recommended efficiencies for forest buffers are sufficiently conservative to address any lower efficiency experienced when buffers are new."

Furthermore, there is already little distinction in loading rates for the early stages of a buffer planting. E.g., For the first 2 years of a buffer planting, it functions as a grass buffer which receives 70% the efficiency of a forest buffer. The next 2-10 years of establishment, the forest planting looks and functions much like a mixed-open land use, which loads slightly more than forest in CAST (i.e., for nitrogen, forest loads around 1.5 #/acre/yr and Mixed Open loads around 1.8 - 2.0#/acre/yr).

Credit Duration for Tree Canopy and Forest Plantings:

To determine average survivorship of planted trees, scientists look at the population half-life rather than average or mean life expectancy. The population half-life is similar to the median: when 50% of the planted trees will remain living (i.e., survivorship = 50%). For planted urban trees (in street and lawn settings), the population half-life is typically 13-18 years. For "better than normal survivorship" the population half-life is 33-38 years (Hilbert et al 2019). For our purposes, we use the 15-year mark. As one Chesapeake forester put it, "there is no explicit data or reasoning that support maintaining the shorter (10 year) credit duration." The 15-year credit duration is conservative for the same reasons as provided in Practice Life above.

Regulation usually requires that tree planting practices used for MS4 compliance be regularly verified. Furthermore, landowners were shown to replace 25% of trees and local policies including contract provisions indicate a higher rate of replacement especially in the first years of planting (Ko et al 2015).

Tree Practices and Land Cover Data

Many tree plantings are reported to NEIEN as dispersed practices and are difficult or impossible to revisit. Fortunately, the extent of trees and continued tree survival can be monitored using high resolution land cover imagery. Land cover imagery shows tree mortality instantly and tree growth gradually so as landowners and contractors replace trees, and trees and forests replace themselves, it is the land cover data that provides the best indication of the extent of tree survival and occurrence on the landscape In most of the watershed as in the rest of the country, the impact of tree planting is considerably smaller than the loss of trees to development. The new high-resolution land cover change data is providing further proof of this. Therefore, the Land Use module of CAST gives a more accurate impression of the impact of tree practices on the landscape than NEIEN.

References

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