

i. Catch Basin Outlets

Volume measurements from the REI will be used to calculate the phosphorus loading rate of erosion at the catch basin outlet (Equation 1). The method assumes the outlet erosion for the current condition to be equivalent to the future phosphorus loading rate for each outlet assessed. It also assumes all the material eroded will directly impact the Lake Champlain Basin. The following calculations for phosphorus loading rates are dependent on the volume and age of erosion (Equation 2). This may also be referred to as the “volumetric approach.”

(USDA , 2002). Variables further explained in Appendix A.

Equation 1: Rate of Erosion	$E = (VS) / T$
Equation 2: Phosphorus Loading Rate	$P_i = E (Sc)$
Equation 3: Phosphorus Reduction	$P_i - P_{ii} = P_f$

Variable	Description	Brief Directions	Units
V	Total volume of erosion measured from outlet	Length x Avg. Width x Avg. Depth	Cubic feet
S	Sediment Bulk Density (USDA NRCS)	43.38	kg / ft ³
T	Age of erosion observed	30 years or known age of erosion*	Years
E	Erosion rate of sediment over time	Calculate with Equation 1.	kg sediment (TSS) / year
Sc	Sediment to Phosphorous weight conversion	0.000396	kg (P)/ kg sediment (TSS)
P _i	Displaced phosphorous over time, or phosphorus loading rate, pre-mitigation	Calculate with Equation 2 to convert to sediment to phosphorus	kg (P) / year
P _{ii}	Displaced phosphorous over time, or phosphorus loading rate, post mitigation	---	kg (P) / year
P _f	Displaced phosphorous over time, or phosphorus loading rate, final difference used for crediting	Only to be calculated when the outlet has erosion post mitigation	kg (P) / year

* The DEC is accepting a hybrid approach for municipalities to determine the age of observed erosion. The hybrid approach provides two options to choose from:

- (1) A normalized control of 30 years for the initial age of erosion was adopted from the [Maryland Department of Transportation Alternative Headwater Channel and Outfall crediting Protocol MDOT method](#). The literature suggests erosion occurs between 10 and 51 years, with potential stabilization occurring between 50 and 100 years (MDOT, 2018).
- (2) Alternatively, municipalities may use known dates or ages for the erosion or outlet structure.