

DRAFT STAC RESPONSE TO NUTRIENT EQUIVALENCY MODEL to Diana Esher

Thank you for the opportunity to comment on the nutrient equivalency model proposed by the Modeling Subcommittee to trade phosphorus for nitrogen in nutrient reduction allocations. The Science and Technical Advisory Committee (STAC) was briefed at their December 2003 meeting by Lewis Linker. The Committee appreciates the willingness of the Modeling Subcommittee to actively engage interested parties in this activity and offers its assessment in the same spirit of engagement.

After deliberations over the past few months, it is the collective opinion of the STAC that the nutrient equivalent trading of phosphorus for nitrogen is not a valid means to reduce the low dissolved oxygen conditions in the Chesapeake Bay.

The Committee is especially concerned that the equivalency model as proposed runs counter to basic biochemical and biogeochemical scientific principles. In particular, it does not take into account the contrasting biochemical requirements for nitrogen and phosphorus that underlie the growth of microorganisms. Nor does it provide the underlying scientific mechanism for model's decrease in dissolved oxygen when phosphorus is reduced.

It is well established that the nitrogen requirement for phytoplankton that form the basis of the marine foodchain is 16 times higher than phosphorus.¹ Furthermore the chemistry and fate in of nitrogen and phosphorus in aquatic systems are quite different. Nitrogen comes in multiple chemical forms, or species, that are very dynamic and difficult to predict in a complex environmental system like the Chesapeake Bay. It is not possible to equate nitrogen with phosphorus without considering the different species. Phosphorus chemistry is also simpler than nitrogen but has an important twist that is not considered by the equivalency model. In low dissolved oxygen (reducing) environments phosphorus becomes more bioavailable to organism because it is released from a mineral form. If sufficient nitrogen is present, the release of phosphorus can create a positive feedback loop by providing nutrients to fuel more phytoplankton growth which in turn increases seasonal low dissolved oxygen levels. Therefore, reduction of phosphorus from land-based sources needs to be balanced with the internal sources of phosphorus in Bay's sediment under reducing conditions.

Until these scientific discrepancies are validated and reviewed by experts, the STAC recommends that the Bay Program continue its plan to reduce both nitrogen and phosphorus inputs into the Chesapeake Bay.

STAC has asked Cliff Randall to be engaged in the nutrient equivalent model and will keep the Committee engaged in discussions. STAC looks forward to future interactions.

Best Regards,

Carl Hershner Chair, STAC

Cc: Lewis Linker, Jim Collier, Ann Swanson

¹ The Redfield Ratio used by aquatic scientist to determine the limiting nutrient for phytoplankton growth is 106:16:1 for Total Carbon: Total Nitrogen: Total Phosphorus.