

Problem 2.1 Nutrient Removal Wetland

Wetlands can be used to remove nutrients, such as Phosphorus or Nitrogen, from agricultural run-off. The largest such project is the Everglades Nutrient Removal Program. Consider a fixed basin size for the wetland and a fixed flow rate, such that T_R is pre-determined. Which circulation type would provide the greatest phosphorus removal? Plug-Flow or Stirred Reactor? Consider two cases.

1. Phosphorus is removed at constant rate, with all removal completed in time T_R .
2. Phosphorus is removed in a first-order reaction with removal rate, $k = 1/T_R$.