Subsurface tile drainage is an essential water management practice on many agricultural fields, enabling crop production in fields otherwise too wet to farm. Once considered negligible, phosphorus (P) levels in tile drain discharge in many U.S. regions are now recognized as potentially significant at field and watershed scales. Across the Lake Champlain Basin, the impacts of tile drainage on water quality have not been adequately assessed. We monitored 12 tile drains on silage corn and hay land on commercial dairy farms in the Jewett Brook watershed, St. Albans, Vermont for a full year. Tile drainage flow rates were measured continuously, and flow-paced composite samples were analyzed for total and dissolved P. Phosphorus concentrations varied across sites and seasons. Annual mean total P concentrations ranged from 45 to 1,166 µg/L across the 12 sites (median 185 µg/L). Lowest P concentrations tended to occur in December and highest concentrations in October. P loading rates among the 12 drains ranged from 0.12 – 1.12 kg/ha/yr and averaged 0.56 kg/ha/yr. The mean dissolved P loading rate was 0.27 kg/ha/yr, approximately 50% of the total P loading rate. Both total and dissolved P loading rates were significantly higher from row cropland compared to hayland. During the monitored year, approximately 26% of the total P load exported by Jewett Brook was contributed by tile drains. These results demonstrate that tile drains have the potential to contribute substantial quantities of P to surface waters in the Lake Champlain Basin.