

RESERVOIR PARTITIONING AND INTAKE ISOLATION FOR RAW WATER QUALITY

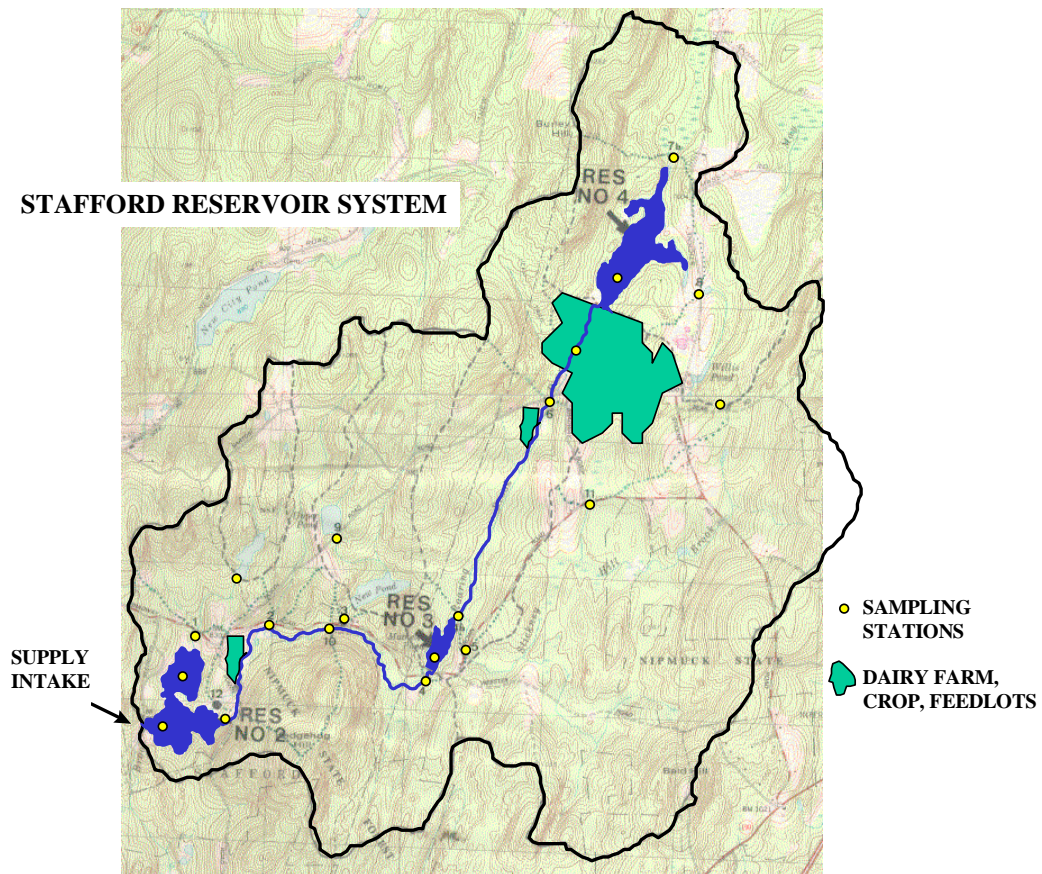
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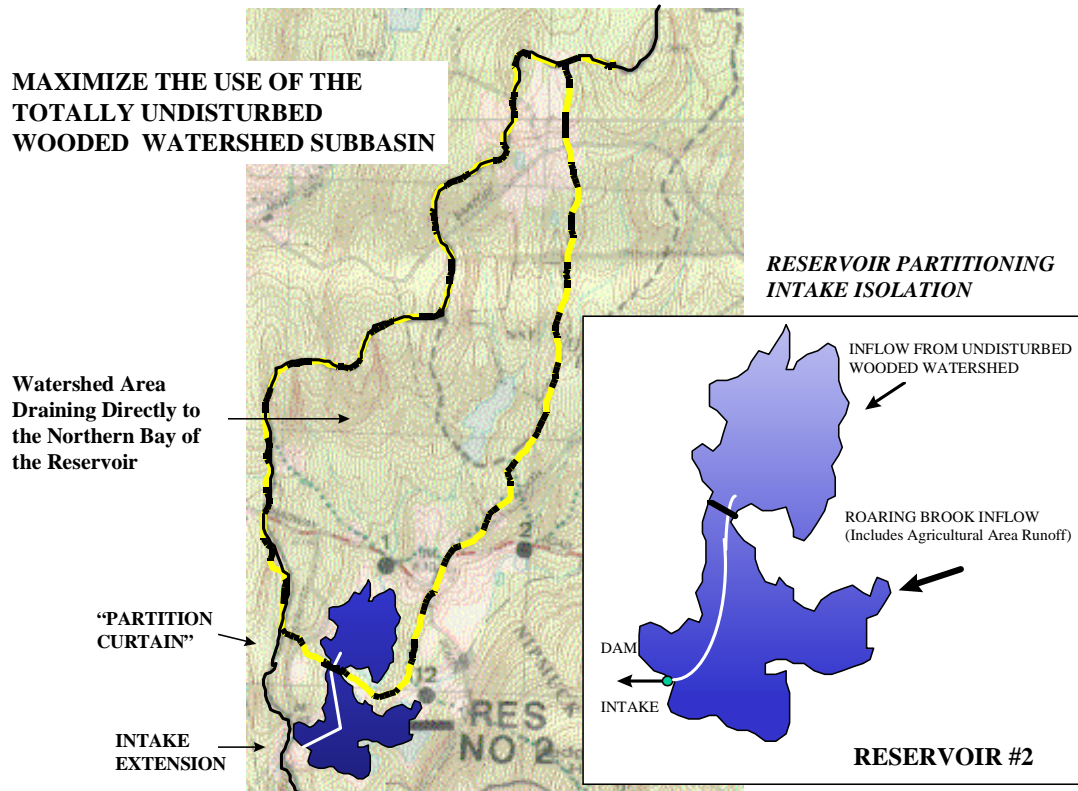
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The Stafford Source Water System supplies approximately 1 MGD of water to rural northeastern Connecticut. The source consists of a large, mostly wooded, watershed basin and three small shallow reservoirs in the flowline of Roaring Brook. Reservoir No. 4 is a small shallow impoundment located high in the watershed. Immediately below Reservoir No.4 is a large, expanding, dairy farm operation. Water quality downstream of the dairy farm is consistently poor, especially during storm runoff



episodes. Reservoir No.3 lies approximately two miles downstream of the farm. Reservoir No.2 is further downstream, and is the direct source of raw supply water. Significant water quality impacts have been identified, including nutrient and organic loads, high coliform counts, color, metals, turbidity, and bluegreen algae blooms. Water treatment difficulties have included controlling taste and odor, meeting chlorine demands (especially during storm runoff peaks), and the formation of disinfection byproducts. Efforts to identify and implement agricultural best management practices (BMPs) to control runoff quality have progressed slowly due to private land ownership and implementation costs.

Small, deep water layer aerators (with biological substrates to enhance ammonia removal by nitrification) were installed in Reservoirs No. 3 and No. 2. The "indirect impacts" (iron and manganese, ammonia, and sediment P release) related to high organic loads were significantly controlled. However, water quality, especially during peak runoff episodes, remained difficult to treat.



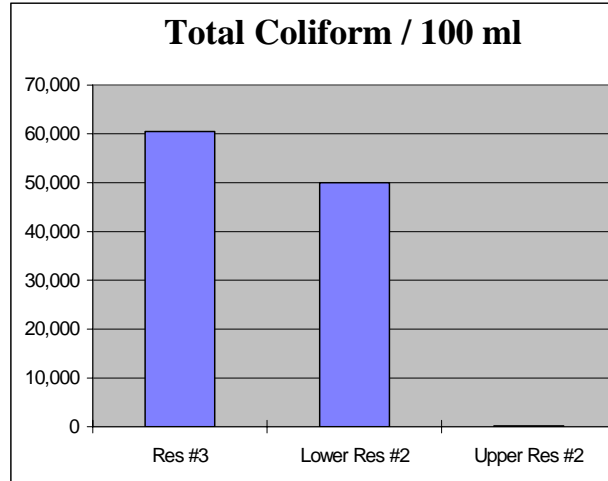
Reservoir No. 2 (the direct to source of raw water) is a shallow reservoir consisting of two "bays". Roaring Brook (which carries dairy

farm runoff) enters the lower bay, flows through Reservoir No. 2, and leaves either over the dam or through the supply intake. Approximately half of the reservoir volume and area lie in the upper bay. A narrow constriction connected the upper and lower bays of Reservoir No. 2. The watershed drainage basin which drains directly to the upper bay was entirely undisturbed woodland. In order to minimize supply water quality impacts of agricultural runoff carried by Roaring Brook the intake was extended to the upper bay of Reservoir No. 2, and a scrim-reinforced curtain was used to separate the upper and lower bays of the reservoir at the narrow constriction. The intent of this reservoir partitioning was to isolate the water supply intake as much as possible from the impacts of water quality in Roaring Brook, especially during storm episodes.

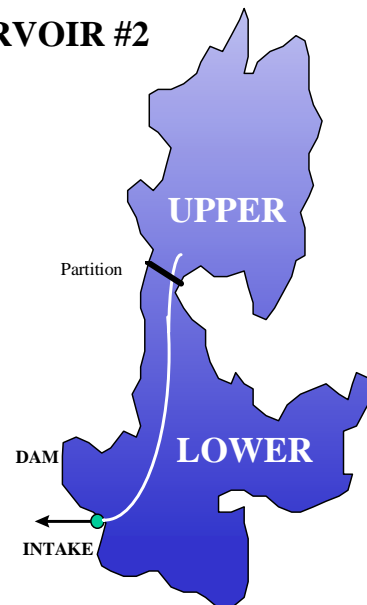
A comparison of water quality in Reservoir No. 4 (above the farm), Reservoir No. 3 (below the farm), lower Reservoir No. 2, and upper Reservoir No. 2, identifies the benefits of reservoir partitioning and intake

1998 Stafford Reservoir #2 and #3

	Total Coliform/100 ml	7/1/98
Res #3	60,500	
Lower Res #2	50,000	
Upper Res #2	200	

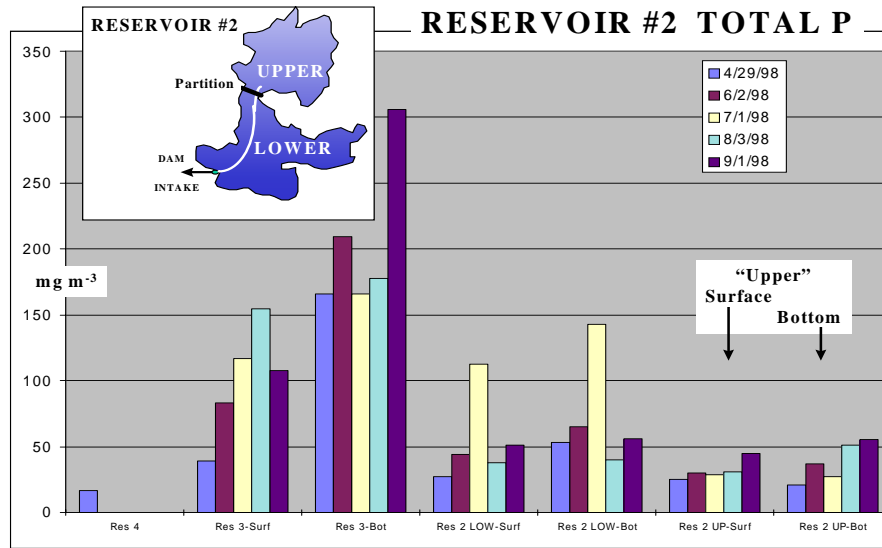


RESERVOIR #2

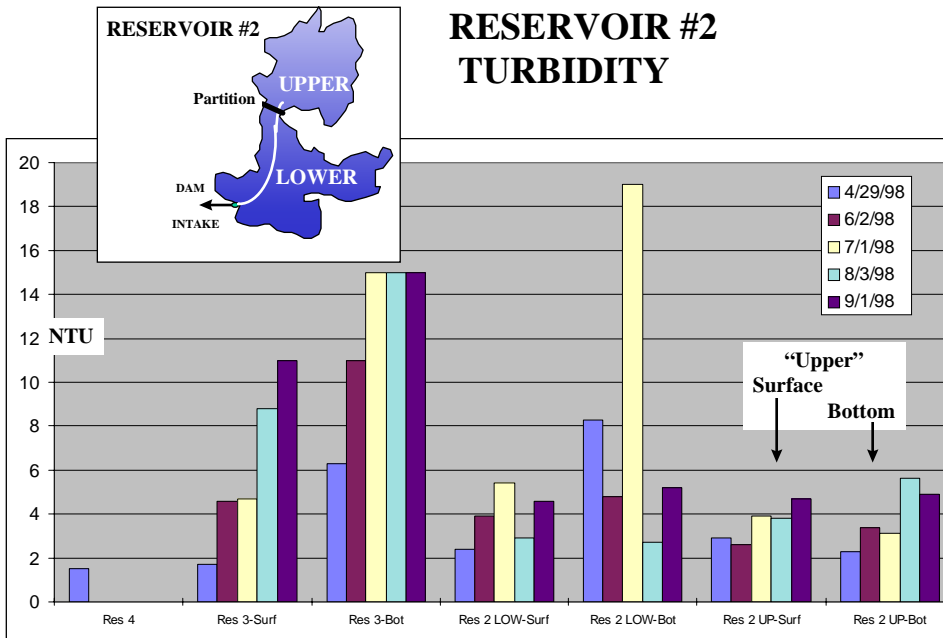


isolation. Total coliform counts were very high at Reservoir No. 3 and lower Reservoir No. 2 following storms, yet remained low within upper Reservoir No. 2.

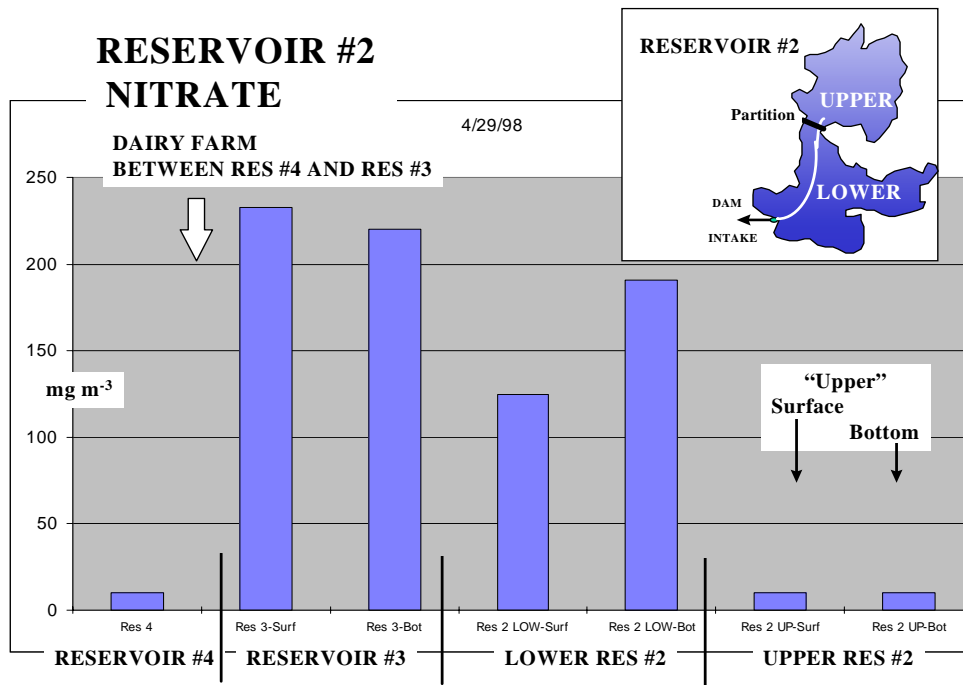
Total phosphorous concentration in surface and over-bottom waters remained lower in the isolated upper bay, compared to the lower bay which is exposed to Roaring Brook peak flows. Although total phosphorous increased as the summer progressed, concentrations were lowest in the upper bay.



Turbidity also remained low in surface and over-bottom waters in the isolated upper bay, especially during storm events.



Row crops (e.g. feed corn) are a significant source of nitrate loads. Reservoir No. 3 and the lower basin of Reservoir No. 2 exhibited significant nitrate concentrations, while the upper basin of Reservoir No. 2 remained near the lower detection limit and nearly identical to Reservoir No. 4 (above the dairy farm).



Storm episode sampling during October 1998 demonstrated that the isolated upper basin of Reservoir No. 2 exhibited the lowest total phosphorous, ammonia, color, and total coliform observations. Withdrawal of water from the isolated upper basin has avoided many of the impacts originating from agricultural runoff, and has improved the ability to treat raw source water in the system.

