Comparing Nutrient Losses Via Runoff from a New Golf Course and the Golf Course Site's Previous Native Condition

Investigator: Dr. Steve Starrett, Civil Eng. Dept, Kansas State University

Executive Summary

The main objective of this research is to compare the nutrient loading, by way of surface water runoff from a new golf course, and the site's previous native prairie condition. The nutrient loading from the golf course site into the main surface water stream will be determined during construction and during operation. Surface water samples will be collected during runoff events from at least 2 locations on Little Kitten Creek (major stream). Water samples will be tested for nutrients, and sediment concentrations. Surface water runoff amounts will be determined so that mass amounts of nutrients contained in the runoff can be calculated.

Much progress on our project has been made over the last year. It was a very wet spring and early summer which produced numerous runoff events. We have collected about 750 water samples to date, 276 during 1999. Rainfall and streamflow data continues to be measured. The following table summarizes the average total nitrogen and phosphorus concentrations in runoff at various locations.

Table 1. Comparison of nutrient concentrations between pre-construction and during construction conditions, and between locations.

Year	Major Inflow	Major Outflow	GC Site Subwat.	Ponds
NITROGEN (PPM)				
<1998	1.43	1.18	0.42	1.15
1998	1.40	4.52	1.33	1.81
1999	1.18	3.19	3.96	2.16
PHOSPHORUS (PPM)				
<1998	0.51	0.55	0.03	0.07
1998	0.41	0.77	0.16	0.13
1999	0.21	1.17	1.33	0.28

Our immediate plans are to continue to collect water samples, determine stream depth vs. flowrate relationships, and determine nutrient loading on a mass per area basis for the prior to construction and during construction conditions. We continue to write proposals to expand this work that USGA has greatly helped us start. Three proposals will likely be submitted over the next year to USDA NRI Program, EPA Water and Watersheds Program and NSF Urban Research Initiative Program.

Comparing Nutrient Losses Via Runoff from a New Golf Course and the Golf Course Site's Previous Native Condition

Investigator: Dr. Steve Starrett, Civil Eng. Dept, Kansas State University

The main objective of this research is to compare the nutrient loading, by way of surface water runoff from a new golf course, and the site's previous native prairie condition. The nutrient loading from the golf course site into the main surface water stream will be determined during construction and during operation. Surface water samples will be collected during runoff events from at least 2 locations on Little Kitten Creek (major stream). Water samples will be tested for nutrients, and sediment concentrations. Surface water runoff amounts will be determined so that mass amounts of nutrients contained in the runoff can be calculated.

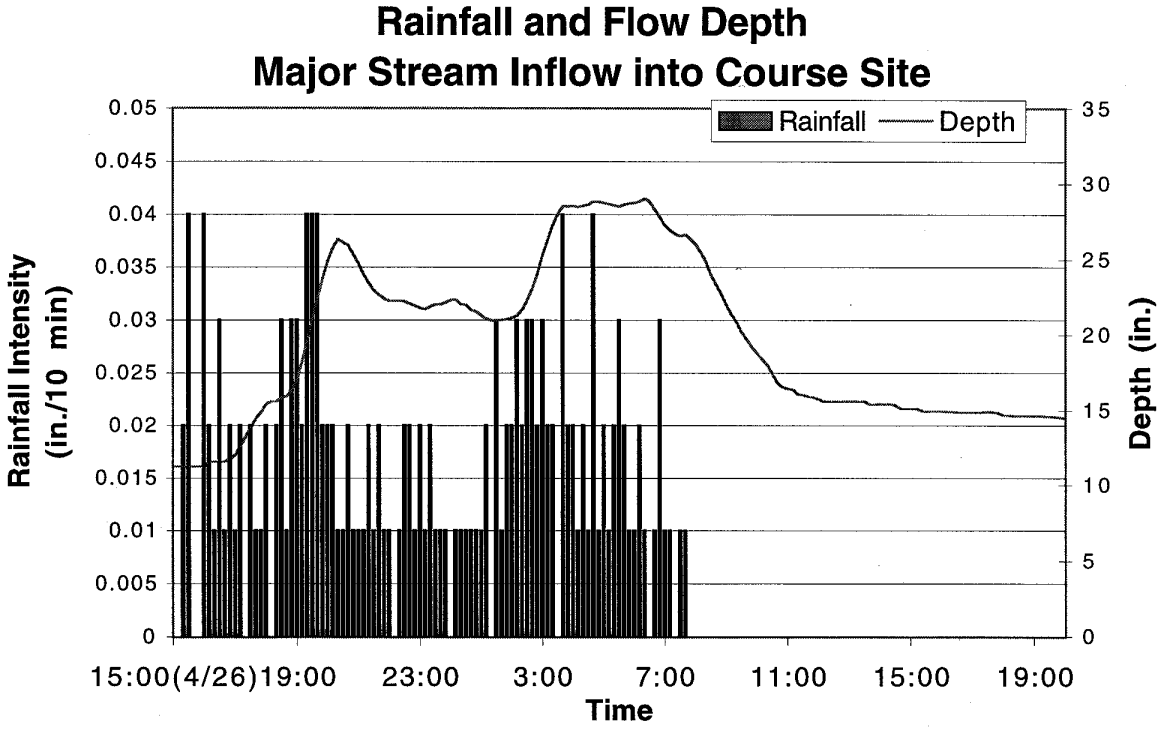
Much progress on our project has been made over the last year. It was a very wet spring and early summer which produced numerous runoff events. We have greatly expanded our hydrology and water quality related databases. Figure 1 shows the rainfall data and stream depth at 2 different locations for a certain 1999 storm. The streamflow depth will be used to estimate flowrates so that mass of nutrient per watershed area can be determined.

We have collected about 750 water samples to date, 276 during 1999. The following table summarizes the average total nitrogen and phosphorus concentrations in runoff at various locations (Table 1).

Table 1. Comparison of nutrient concentrations between pre-construction and during construction, and between locations.

Year	Major Inflow	Major Outflow	GC Site Subwat.	Ponds
NITROGEN (PPM)				
<1998	1.43	1.18	0.42	1.15
1998	1.40	4.52	1.33	1.81
1999	1.18	3.19	3.96	2.16
PHOSPHORUS (PPM)				
<1998	0.51	0.55	0.03	0.07
1998	0.41	0.77	0.16	0.13
1999	0.21	1.17	1.33	0.28

Figures 2 and 3 show representative storm events and associated nutrient concentration levels.



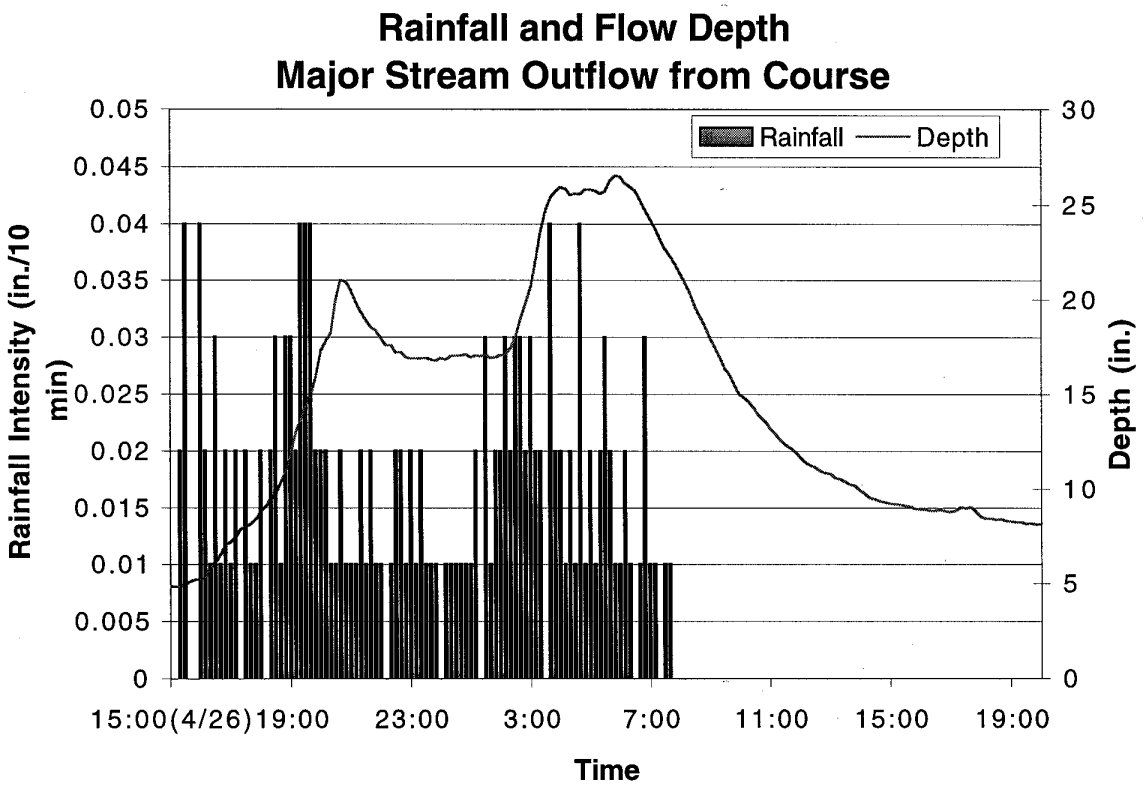
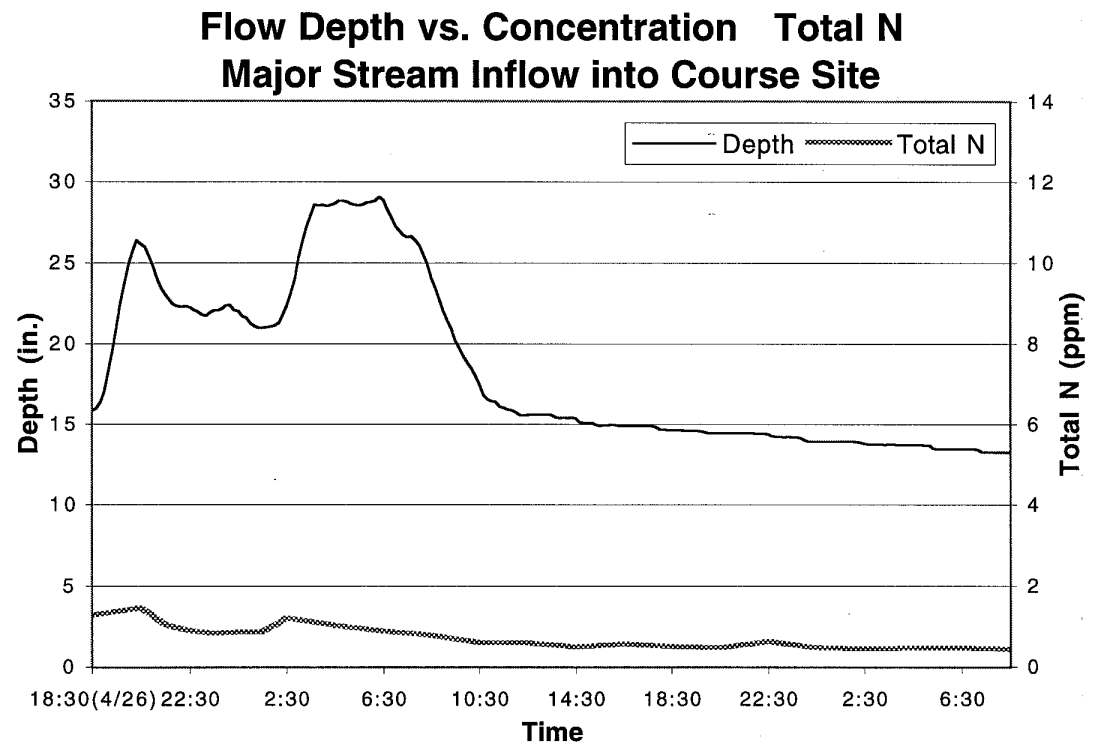


Figure 1. Rainfall and streamflow depth at two locations.



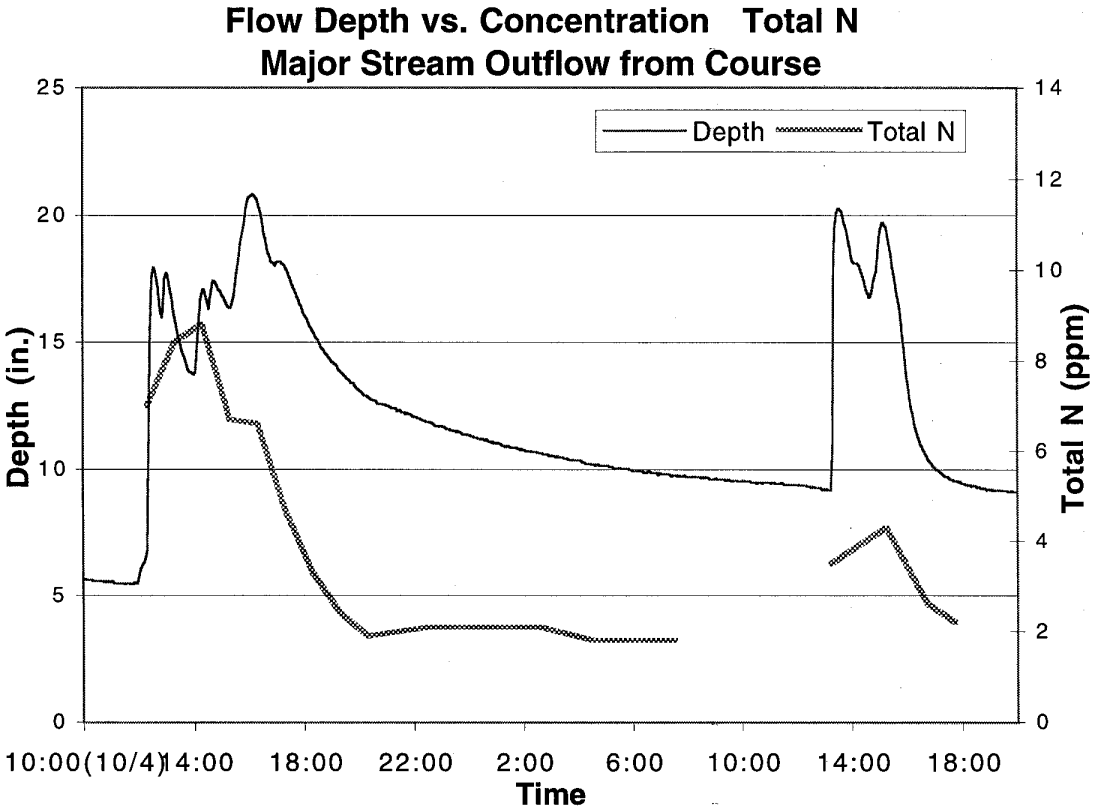
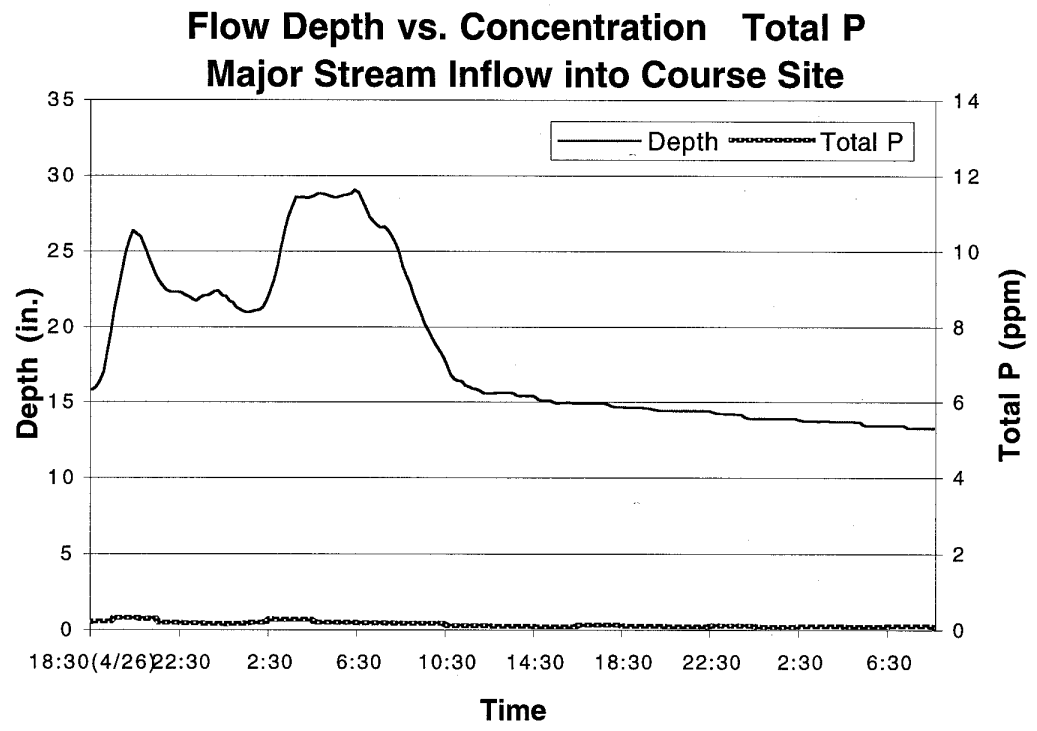


Figure 2. Nitrogen concentrations in runoff at two locations.



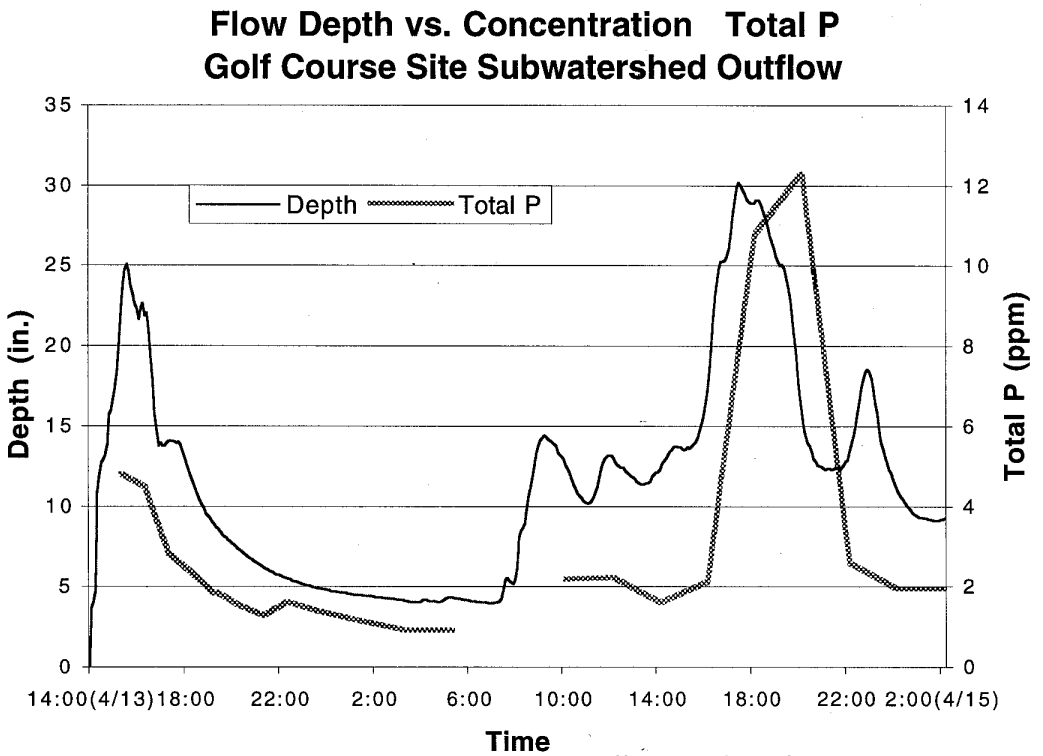


Figure 3. Phosphorus concentrations in runoff at two locations.

Our immediate plans are to continue to collect water samples, determine stream depth vs. flowrate relationships, and determine nutrient loading on a mass per area basis for the prior to construction and during construction conditions. We continue to write proposals to expand this work that USGA has greatly helped us start. Three proposals will likely be submitted over the next year to USDA NRI Program, EPA Water and Watersheds Program and NSF Urban Research Initiative Program.