3 Results and Discussion

Net fine sediment accumulation rates ranged from 0.017 to 1.36 cm/year over the 147 stations where some fine sediment accumulation was detected (Figure 4 and Appendix A). Mean rates of net fine sediment accumulation for the 33 backwaters sampled ranged from 0 to 0.82 cm/year (Table 2). However, no individual backwaters were found to be significantly different from each other, probably due to low sample sizes and highly variable accumulation rates among locations within backwaters (Figure 4). Overall means for the different backwater strata were 0.29 cm/year for the small, high-connectivity backwaters, 0.43 cm/year for the small, low-connectivity backwaters, and 0.57 cm/year for the large backwaters. Accumulation rates of fine sediment in large backwaters were found to be significantly different (P > 05) than rates in small, high-connectivity backwaters.

The estimate of a low mean rate of net sedimentation obtained for the small, high-connectivity backwaters suggests that these areas are channel-like. The majority of the areas that were not sampled due to the presence of flow and sand substrate were in this backwater stratum (Table 1). In addition, the coring sites in this stratum had accumulated sediments with low moisture content (<50 percent) as compared with the other two strata, which suggests that small, high-connectivity sites that had accumulated sediment were channel-like. Therefore, if accumulation has occurred in these areas, it may likely be due to sand accumulation and not fine sediment accumulation as measured in this study.

Rates of net fine sediment accumulation for the three depth strata were 0.50 cm/year for the shallowest depth stratum, 0.55 cm/year for the medium depth stratum, and 0.68 cm/year for the deepest depth stratum. However, no significant differences were found among the depth strata as a whole using Tukey's multicomparison testing. Significant differences were detected between the deepest and shallowest depth classes for the small, low-connectivity backwaters and within a few backwaters. Accumulation rates were highly variable in the depth classes selected; therefore, few differences could be detected. Also, because present-day depths were used to look at correlations, accumulation of sediments in areas that were deeper in the past may have masked any relationship between depth and accumulation.

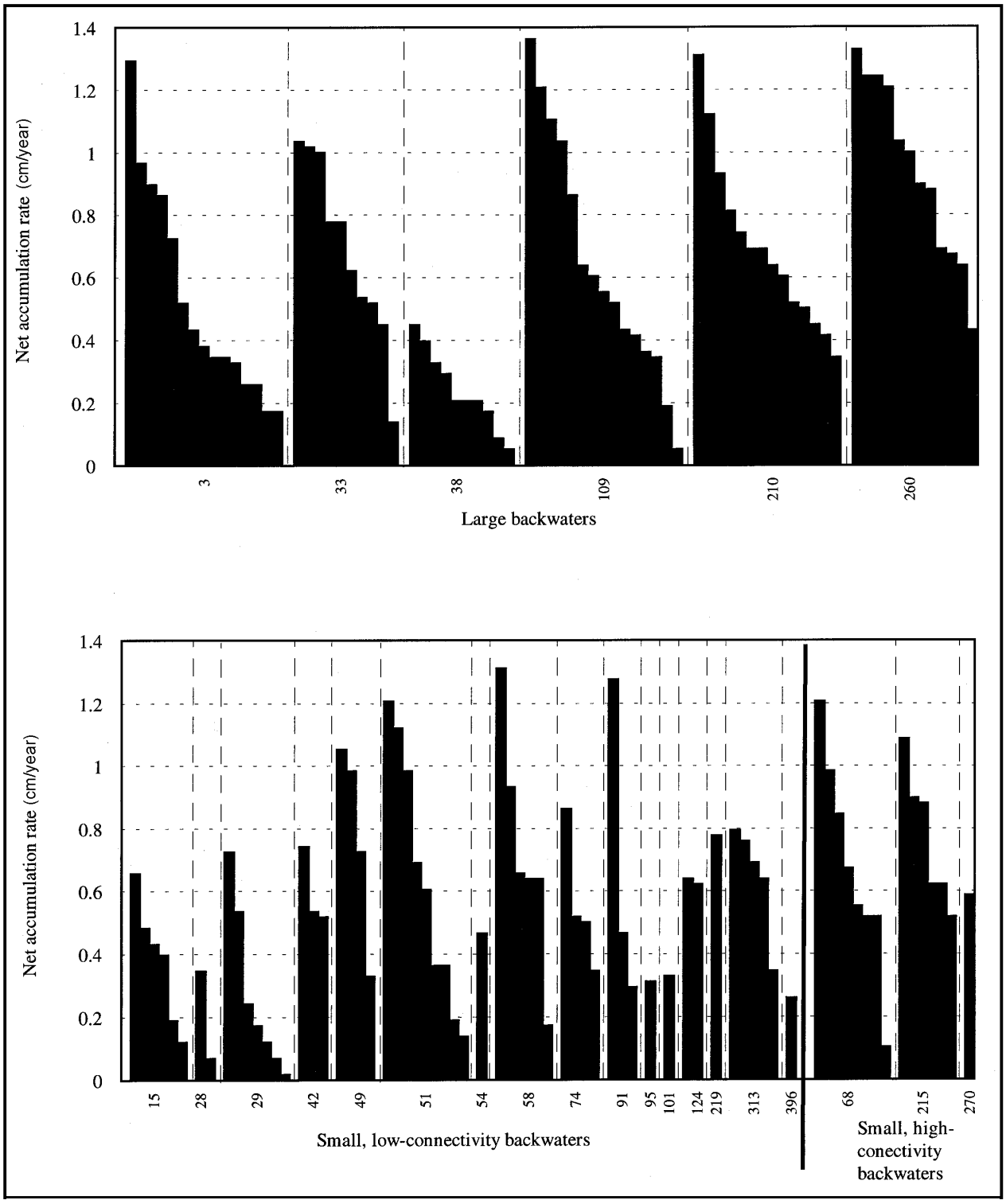

Figure 4. Net fine sediment accumulation rate as estimated by the depth to preimpoundment sediment for each sample site that fine sediment accumulation was found in Pool 8. (Sites grouped by backwater type and by individual backwater (separated by dashed lines))

Table 2
Mean Rate of Net Fine Sediment Accumulation For Each of the Sampled Backwaters, Sampled Backwater Types, And Sampled Overall Area of Pool 8

Backwater type	Backwater number	Accumulation rate (cm/year)	Backwater type accumulation rate (cm/year)	Pool 8 sampled area accumulation rate (cm/year)
Large backwaters	3	0.53	0.57	
	33	0.48		
	38	0.25		
	109	0.66		
	210	0.62		
	260	0.64		
Small, low-connectivity backwaters	15	0.39	0.43	0.46
	28	0.15		
	29	0.25		
	42	0.65		
	49	0.82		
	51	0.46		
	54	0.47		
	58	0.69		
	74	0.51		
	91	0.57		
	95	0.31		
	101	0.33		
	124	0.63		
	219	0.78		
	313	0.61		
	396	0.26		
Small, high-connectivity backwaters	68	0.58	0.29	
	102	0.00		
	132	0.00		
	179	0.00		
	193	0.00		
	215	0.76		
	270	0.20		
	279	0.00		
	386	0.00		
	393	0.00		
	406	0.00		

There were generally poor relationships between rates of net fine sediment accumulation at the 147 sample sites and variables describing backwater morphometry. For example, backwater size provided the strongest correlation with net accumulation rates, but the measure of the strength of correlation r^2 was less than 0.07. Similarly, measurements of various site-specific morphometry provided poor correlation with net accumulation rates, with site distance to a channel providing the strongest correlation with an r^2 of less than 0.05. These poor correlations suggest that extrapolation on the basis of these variables is not possible.

A wide range of surface (i.e., upper 10 cm) sediment characteristics (moisture content, sediment bulk density, and organic matter content) was observed over the 147 backwater station locations where cores were collected. Moisture content

ranged between 17 and 84 percent; sediment bulk density ranged between 0.14 and 1.62 g/mL; and organic matter content ranged between 0.43 and 19.53 percent. In addition, significant differences ($P < 0.05$) in moisture content, sediment bulk density, and organic matter content were found among the three backwater strata. The large backwaters had surface sediment with the highest moisture and organic matter content, and lowest sediment bulk density; the small, high-connectivity backwaters had sediment with the lowest moisture and organic matter content and highest sediment bulk density; the small, low-connectivity backwaters were intermediate in sediment characteristics. The small, high-connectivity backwaters likely have sediments with lower moisture content overall than determined in this study, as suggested by the large number of sites unsampled with the coring device due to the presence of sand.

Poor correlations were found between surface sediment characteristics and net fine sediment accumulation rates for the 147 stations (Figure 5). Poor correlations were also found between surface sediment characteristics and net accumulation rates determined by changes in bed elevation during the period 1989 to 1996 (Rogala and Boma 1996). However, large variations in moisture content were often observed with sediment depth (Figure 3b). Although many stations exhibited a pattern of silt/clays over sands (Figure 3a), other patterns were observed such as distributions of silt/clays throughout the core (Figure 3c), mixtures of sand and silt/clay over sand (Figure 3b), thin layers of sand over silt/clays, and thin layers of detrital material (Figure 3f). These observations, coupled with generally low correlations between net sedimentation rates and surface sediment characteristics, suggest that some layering may result from episodic loading. These findings suggest that fine sediment accumulation cannot be predicted by surficial sediment characteristics.

Correlations were poor between net fine sediment accumulation rates over the last 58 years measured by coring in this study and bed elevation change measured by Rogala and Boma (1996) between 1989 and 1996 (Figure 6). The poor correlation was not due to accumulation of coarser sediments because all sites sampled contained only fine sediment. The poor correlation observed may be due to changes in accumulation rates over a long time (e.g., loss of trapping efficiency) or to episodic changes in rates over shorter time periods (e.g., effects of floods). Therefore, caution must be used when estimating present-day patterns of fine sediment accumulation using the historical rates obtained by this or other methods relying on long-term averages.

The pool-wide mean (overall) net fine sediment accumulation rate for the contiguous backwaters of Pool 8, excluding the impounded area, was 0.46 cm/year. This mean rate is lower than previously documented fine sediment accumulation rates in the UMR obtained from isotopic dating (McHenry et al. 1984, Eckblad et al. 1977). This may be due in part to differences in site selection and study area selection for the studies. Previous studies have focused sampling in large impounded areas and large backwater lakes, whereas this study excluded sampling in the impounded area and included small backwater areas for sampling. In addition, some previous studies focused site selection in deep areas and areas of known fine sediment deposition, which may have provided overestimates of accumulation for backwaters as a whole. The positive correlation observed

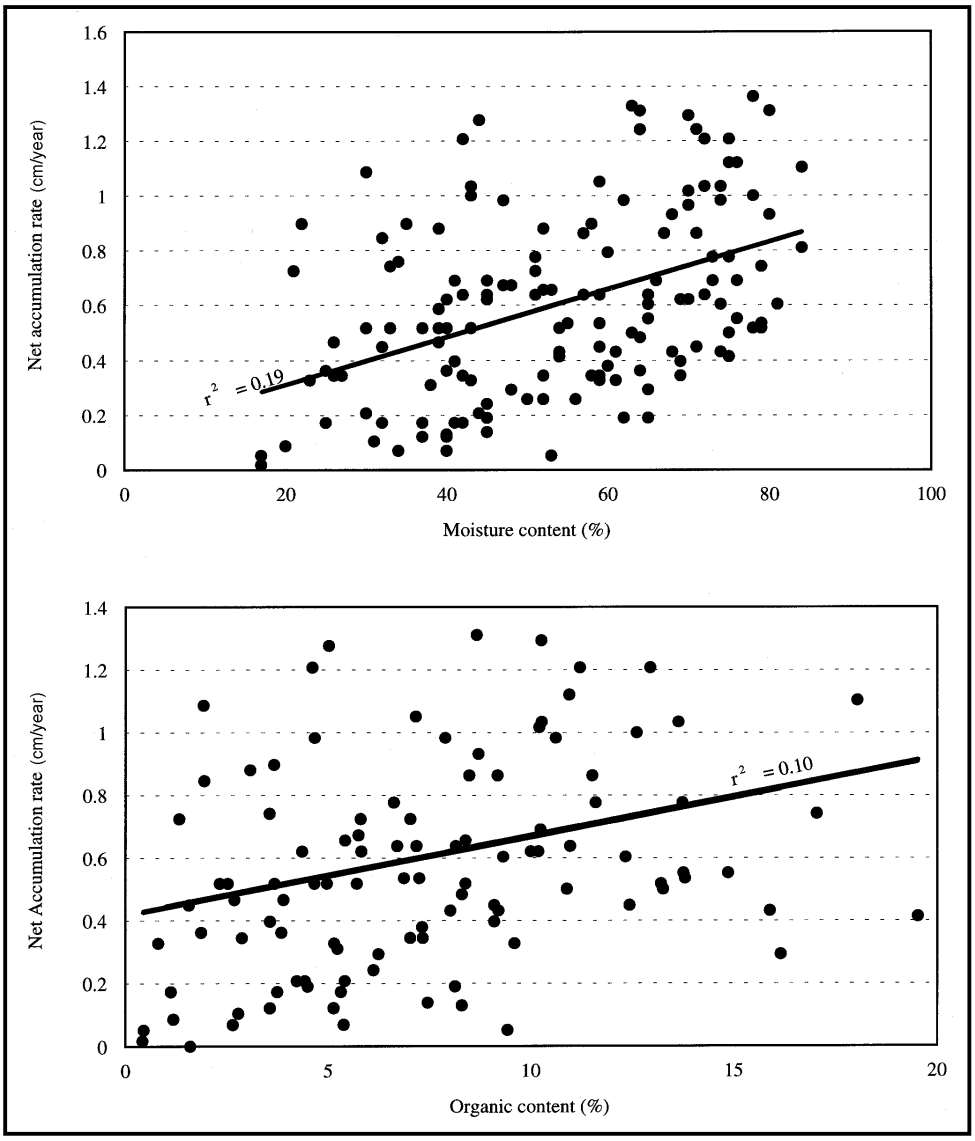

Figure 5. Correlation between surficial sediment characteristics (moisture content and organic content) and net accumulation rates for the 147 sites sampled in Pool 8

between depth strata and fine sediment accumulation rates in this study suggests higher rates would be obtained from sampling exclusively in deeper areas. In this study, locations were randomly selected across the selected backwater area of Pool 8, thus providing unbiased site selection and a better estimate of the overall mean rate of fine sediment accumulation for the study area.

The variability in accumulation rates of fine sediment in Pool 8 backwaters was, for the most part, uncorrelated to the factors investigated in this study. In general, backwater type and depth strata accounted for some variability in accumulation rates, but overall the predictive capability was poor. Backwater characteristics related to exchange of water in backwaters with channels provide very poor correlation with accumulation rates. A more holistic investigation of

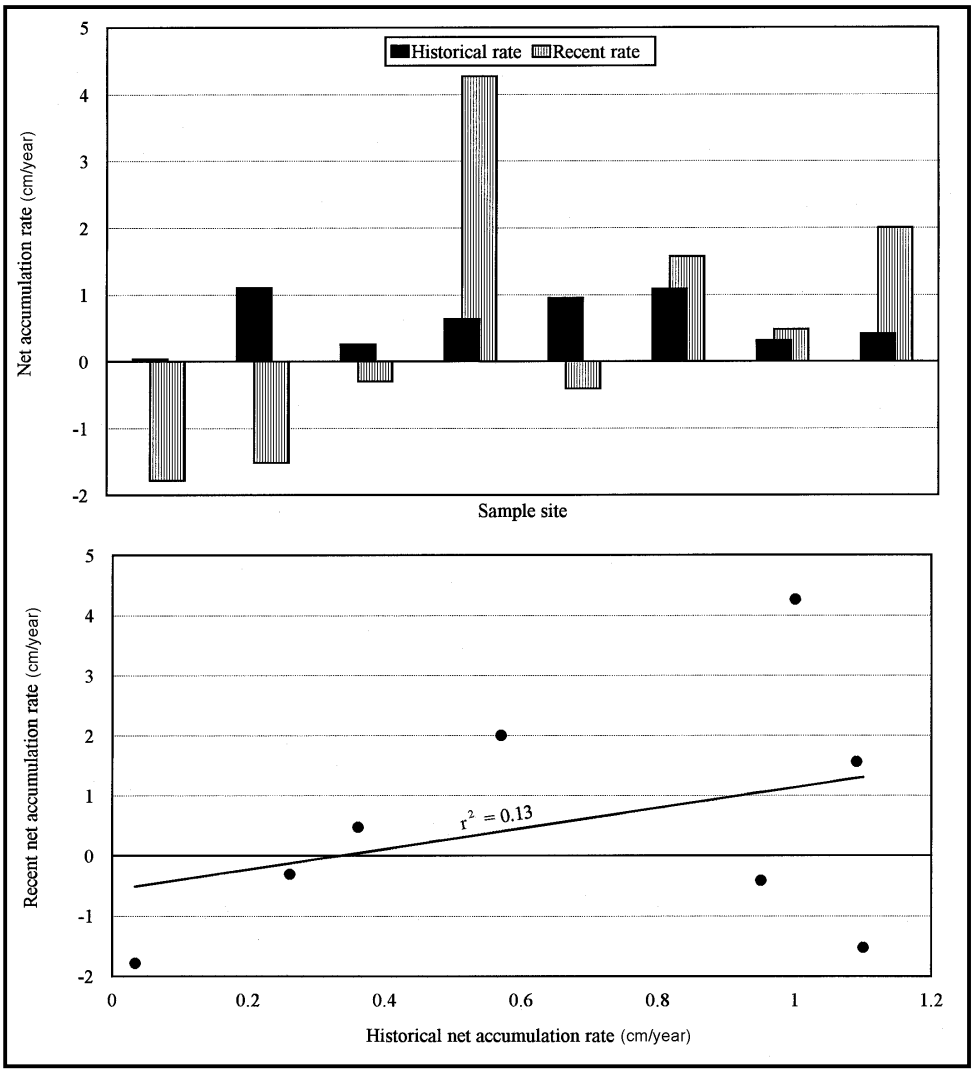

Figure 6. The comparison of historical and recent accumulation rates. (Upper graph illustrates the comparison of historical net accumulation rates as determined by the depth to impoundment sediment (historical rate) to more recent net sedimentation rates determined from sediment ranges surveyed between 1989 to 1996 (recent rates). Lower graph illustrates the regression line from the comparison of the rates for the two time periods)

sedimentation including accumulation of coarse sediments and erosion of sediments may provide for better predictive capabilities. However, this study effectively illustrates high variability in accumulation rates of fine sediments in backwaters that would suggest high variability in sedimentation rates also likely exist in these areas.