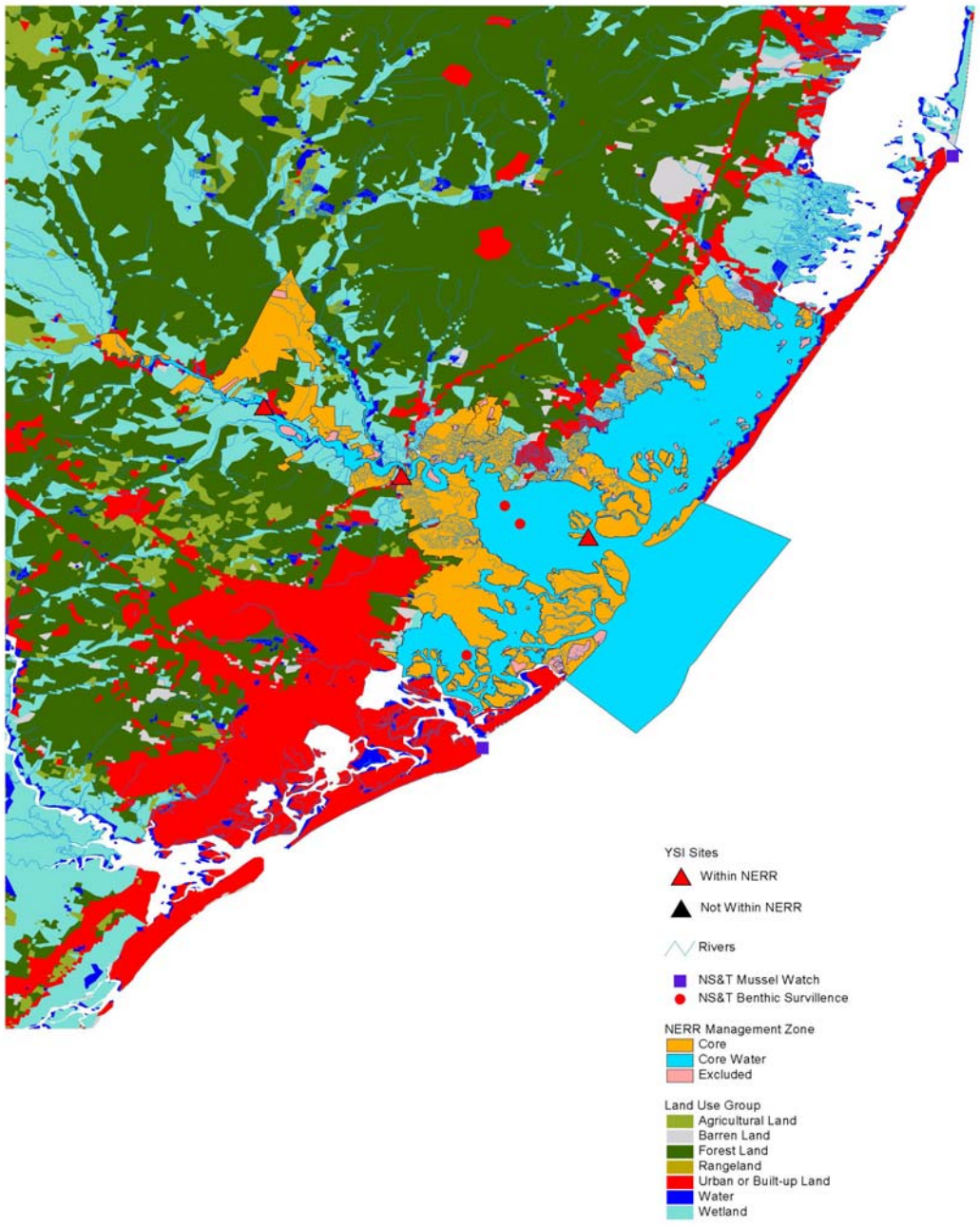
Jacques Cousteau at Mullica River



Mullica River, Buoy 126 in Great Bay (MULB6)

Characterization (Latitude = 39°30'29"N; Longitude = 74°20'18"W)
Great Bay is 7 km long (mainstream linear dimension), has an average depth of 3 m MHW, and an average width of 6.75 km. Tides at Buoy 126 are semidiurnal and range from 0.68 m to 1.55 m (average 1.07 m). The site is located on the eastern side of Great Bay and is approximately 100 m from the nearest land, a natural marsh island. At the sampling site, the depth is 4.23 m MHW and the width is 3.5 km. Creek bottom habitats are fine to coarse sand with no bottom vegetation but extensive blue mussel (*Mytilus edulis*) beds surrounding the site. All upland areas in the vicinity of this sampling site are natural marsh islands that are either state or federally owned and protected areas. The activities that potentially impact the site include recreational boating and fishing, and clamming.

Descriptive Statistics
Forty-eight deployments were made at this site between Aug 1996 and Nov 1998, with equal coverage during all seasons (Figure 111). Mean deployment duration was 15.4 days. Only five deployments (Oct 1996; Aug, Oct 1997; Jan, Nov 1998) were less than 10 days.

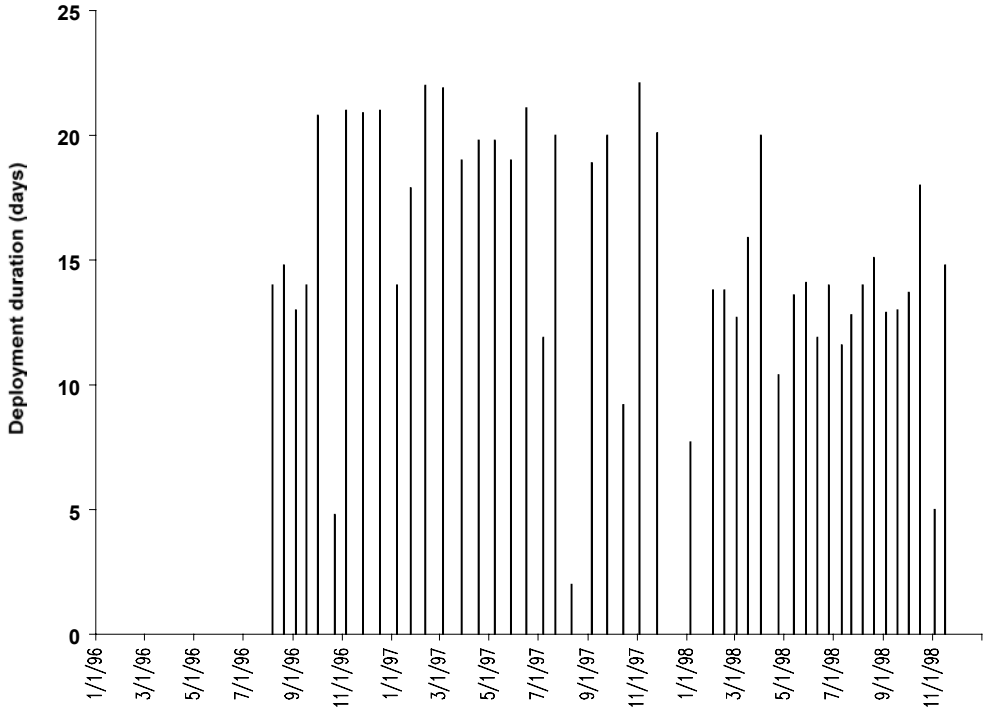


Figure 137. Mullica River, Buoy 126 deployments (1996-1998).

Sixty-six percent of annual depth data were included in analyses (38% in 1996, 81% in 1997, and 78% in 1998). Sensors were deployed at a mean depth of 2.8 m below the water surface and 0.3 m above the bottom sediment. Strong fluctuations (1.5-2 m) were evident from scatter plots, with consistent amplitude throughout the data set. Harmonic regression analysis attributed 86% of depth variance to 12.42 hour cycles and 7% of depth variance to both 24 hour cycles and interaction between 12.42 hour and 24 hour cycles.

Sixty-four percent of annual water temperature data were available for analyses (38% in 1996, 76% in 1997, and 78% in 1998). Water temperature followed a seasonal cycle, with mean water temperatures 4-6°C in winter and 22-24°C in summer (Figure 112). Minimum and maximum water temperatures between 1996-1998 were –1.4°C (Jan 1997) and 28°C (Aug 1998), respectively. Strong fluctuations (1-2°C) in daily water temperature and stronger fluctuations (3-10°C) in bi-weekly water temperature were evident from scatter plots throughout the data set. Fluctuations in water temperature were greatest in Jun-Jul and Oct-Nov in 1997-1998. Harmonic regression analysis attributed 60% of temperature variance to 12.42 hour cycles, 23% of temperature variance to 24 hour cycles, and 17% of temperature variance to interaction between 12.42 hour and 24 hour cycles.

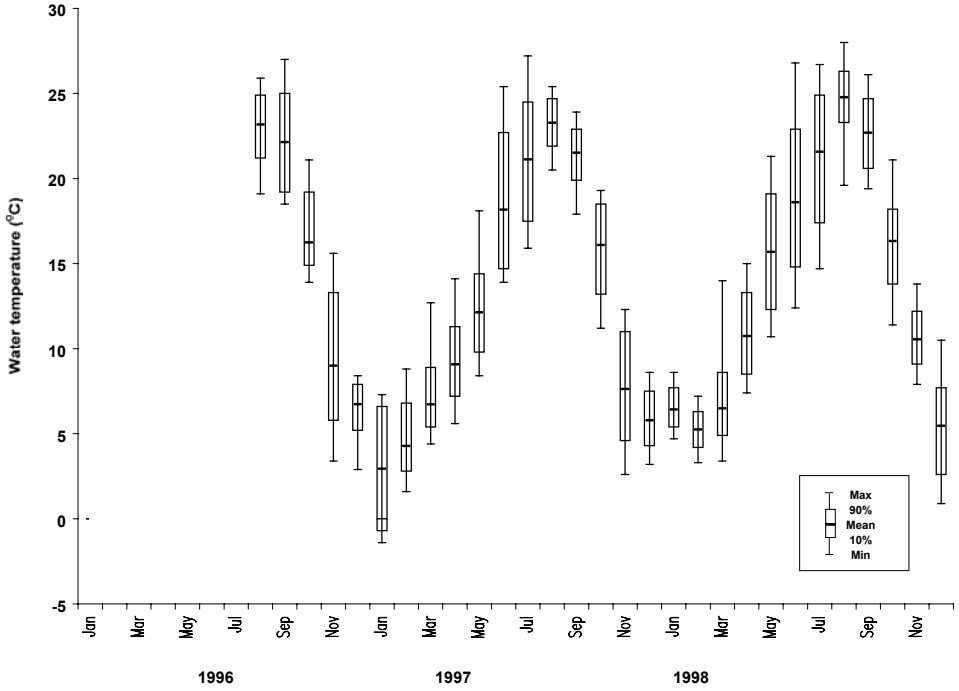


Figure 112. Water temperature statistics at Buoy 126, 1996-1998.

Sixty-three percent of annual salinity data were included in analyses (38% in 1996, 75% in 1997-1998). Mean salinity was 25-31 ppt throughout the data set; however, large variances were associated with mean salinity values (Figure 113). Minimum and maximum salinity between 1996-1998 was 13 ppt (May 1998) and 35.4 (Apr 1997), respectively. Strong fluctuations in daily and bi-weekly salinity equivalent to annual variation in mean salinity were evident from scatter plots. During episodic events in Aug & Dec 1996, Mar & May 1997, and Mar-May 1998, salinity fluctuations exceeded 10 ppt. Harmonic regression analysis attributed 82% of salinity variance to 12.42 hour cycles, 10% of variance to 24 hour cycles, and 8% of variance to interaction between 12.42 hour and 24 hour cycles.

Fifty-six percent of annual dissolved oxygen (% saturation) data were included in analyses (37% in 1996, 68% in 1997, and 64% in 1998). Mean DO was typically between 85-120% saturation throughout the data set. Mean DO below 50% saturation was never observed and mean DO above 100% saturation was regularly observed. Minimum and maximum DO between 1996-1998 was 7.8% saturation (Aug 1996) and 243% saturation (Jun 1998), respectively. Persistent hypoxia was never observed (Figure 114). Supersaturation was observed in summer and fall 1996-1998 and, when

present, supersaturation persisted for 20% of the first 48 hours post-deployment on average. Scatter plots suggest moderate fluctuations (20-40%) in percent saturation were observed for daily and bi-weekly cycles throughout most of the data set, with exceptionally strong (≥ 100%) fluctuations in percent saturation during episodic events in Aug 1996 and Oct 1997. Harmonic regression analysis attributed 41% of DO variance to interaction between 12.42 hour and 24 hour cycles, 34% of DO variance to 12.42 hour cycles, and 25% of DO variance to 24 hour cycles.

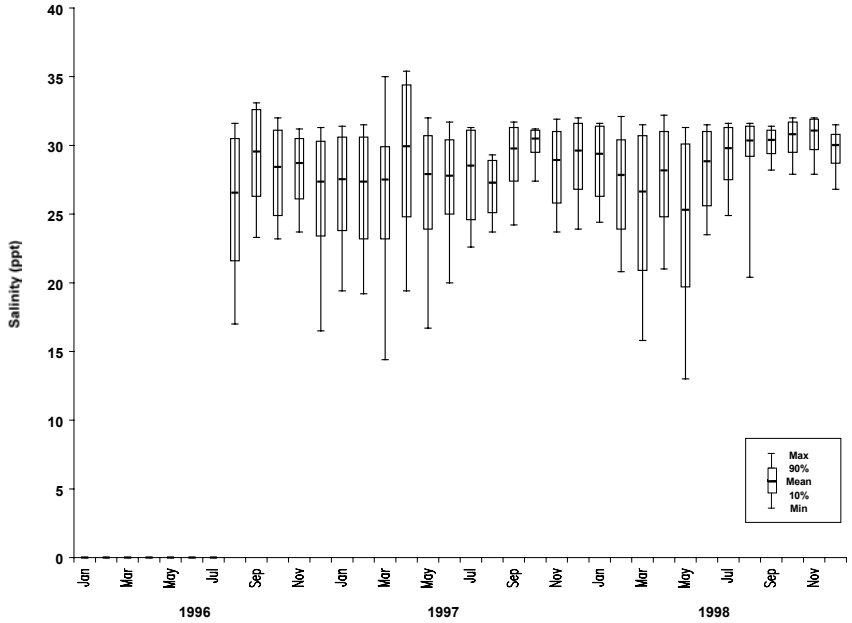


Figure 113. Salinity statistics for Buoy 126, 1996-1998.

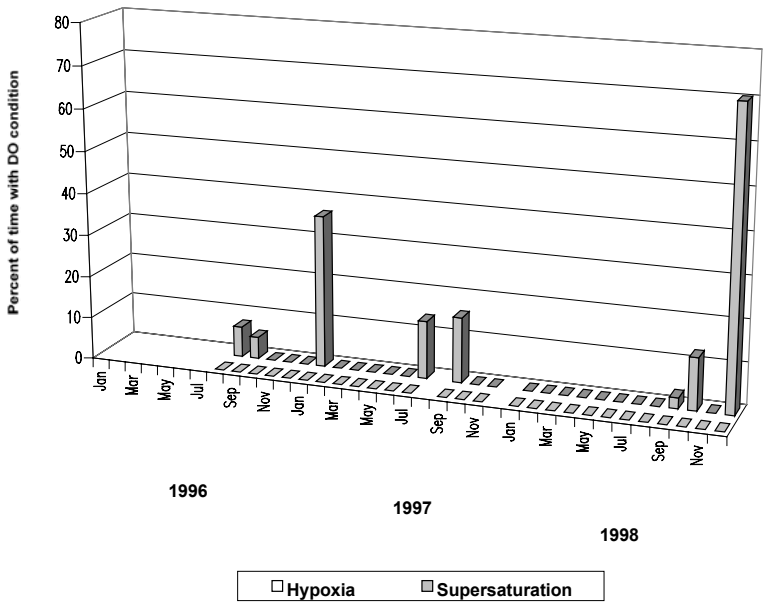


Figure 114. Dissolved oxygen extremes at Buoy 126, 1996-1998.

Mullica River, Lower Bank (MULBA)

Characterization (Latitude = 39°35'37"N; Longitude = 74°33'06"W)
The Mullica River is 34 km long (mainstream linear dimension), has an average depth of 12.8 m MHW, and an average width of 590 m. Tides at Lower Bank are semidiurnal and range from 0.46 m to 1.55 m (average 1.01 m). At the sampling site, the depth is 4.66 m MHW and the width is 290 m. Creek bottom habitats are predominantly fine sand, with no bottom vegetation. The dominant marsh vegetation near the sampling site is *Phragmites* sp. The dominant upland vegetation includes Pineland species such as Pitch pine and White oak. Upland land use near the sampling site includes a bridge and sparsely developed single family homes. Activities that potentially impact the site include recreational boating and agriculture of blueberries and cranberries.

Descriptive Statistics
Forty-one deployments were made at this site between Oct 1996 and Dec 1998, with equal coverage in all seasons (Figure 115). Mean deployment duration was 17.3 days. Only one deployment (Jul 1998) was less than 10 days.

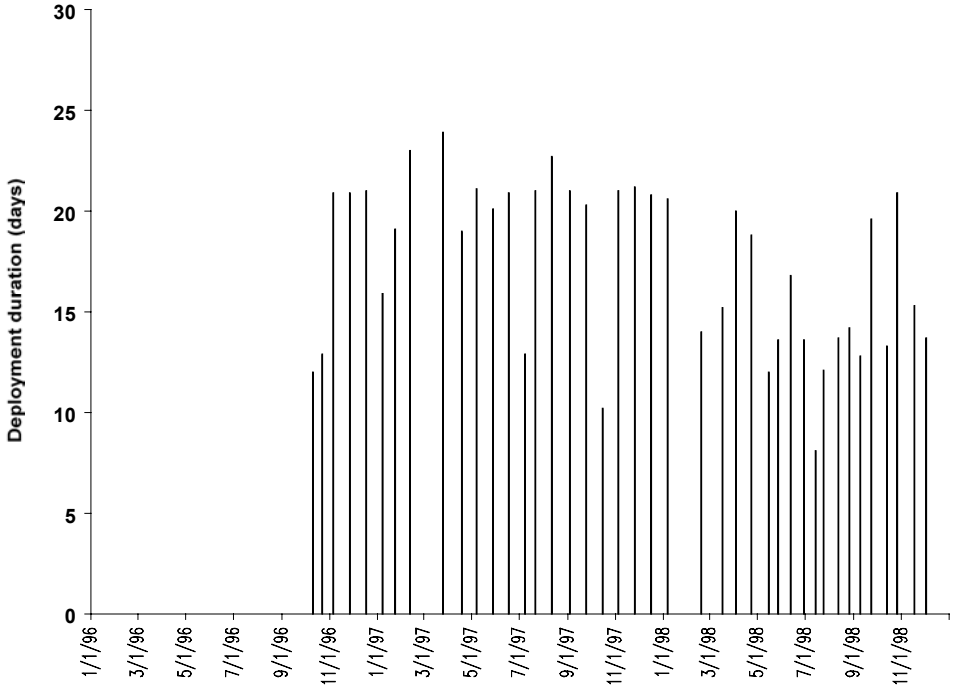


Figure 115. Mullica River, Lower Bank deployments (1996-1998).

Sixty-six percent of annual depth data were included in analyses (22% in 1996, 92% in 1997, and 85% in 1998). Sensors were deployed at a mean depth of 1.7 m below the water surface and 0.3 m above the bottom sediment. Strong fluctuations (1-1.5 m) in depth were evident from scatter plots, with consistent amplitude throughout the data set. Harmonic regression analysis attributed 85% of depth variance to 12.42 hour cycles, 6% of depth variance to 24 hour cycles, and 9% of depth variance to interaction between 12.42 hour and 24 hour cycles.

Sixty-five percent of annual water temperature data were included in analyses (22% in 1996, 89% in 1997, and 85% in 1998). Water temperature followed a seasonal cycle, with mean water temperature

2-5°C in winter and 24-26°C in summer (Figure 116). Minimum and maximum water temperatures between 1996-1998 were -0.2°C (Jan 1997) and 30.1°C (Jul 1997), respectively. Scatter plots suggest moderate fluctuations (1-2°C) in daily water temperature and strong fluctuation (3-10°C) in bi-weekly water temperatures throughout the year, particularly in winter and fall. Harmonic regression analysis attributed 60% of temperature variance to 12.42 hour cycles, 23% of temperature variance to 24 hour cycles, and 17% of temperature variance to interaction between 12.42 hour and 24 hour cycles.

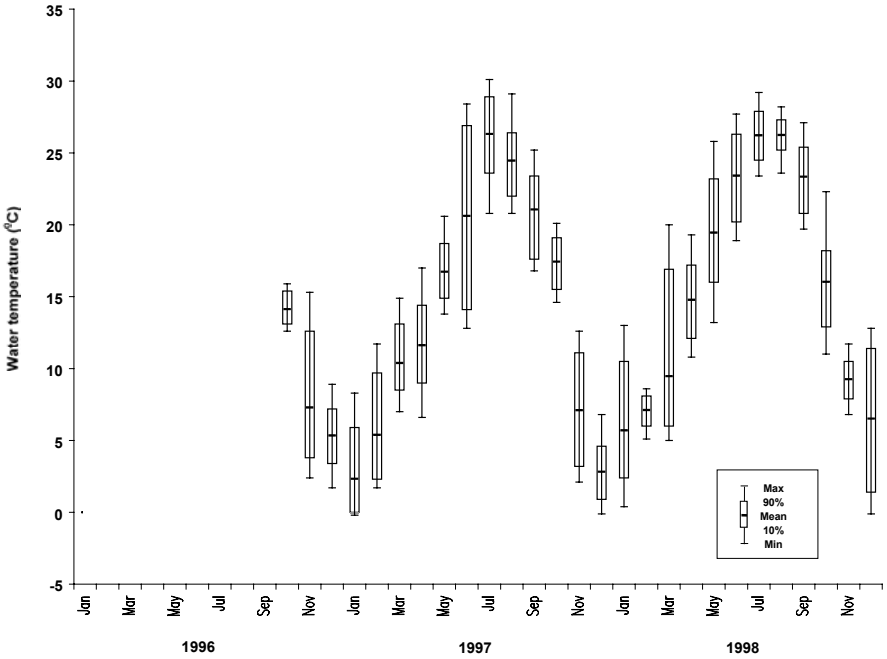


Figure 116. Water temperature statistics for Lower Bank, 1996-1998.

Sixty-five percent of annual salinity data were included in analyses (22% in 1996, 89% in 1997, and 85% in 1998). Mean salinity followed a seasonal cycle; however, large variances were associated with mean salinity values throughout the data set (Figure 117). Mean salinity was 2-8 ppt in summer and fall and 0-2 ppt in winter and spring 1997-1998. Minimum salinity between 1996-1998 was 0 ppt and was observed during almost every month when data were collected. Maximum salinity between 1996-1998 was 15.6 ppt (Nov 1998). Scatter plots suggest strong variation in salinity over daily and bi-weekly intervals equivalent to seasonal variation in mean salinity. Harmonic regression analysis attributed 77% of salinity variance to 12.42 hour cycles, 15% of salinity variance to interaction between 12.42 hour and 24 hour cycles, and 8% of salinity variance to 24 hour cycles.

Fifty-three percent of annual dissolved oxygen (% saturation) data were included in analyses (16% in 1996, 73% in 1997, and 70% in 1998). Mean DO followed a seasonal cycle; however, DO was typically 85-105% saturation throughout the year. Mean DO was greatest (105% saturation in 1997, 120-125% saturation in 1997) in winter and least (80-100% saturation) in summer. Minimum and maximum DO between Oct 1996-Dec 1998 was 4.9% saturation (Jul 1998) and 240.7% saturation (Sep 1998), respectively. Persistent hypoxia was never observed and supersaturation was only observed on four occasions in 1998 (Jan, Mar, Apr, Jul). When present, supersaturation lasted 29% of the first 48 hours post-deployment on average (Figure 118). Scatter plots suggest moderate fluctuations (20-40%) in percent saturation over daily and bi-weekly cycles throughout most of the

year, with occasional episodic fluctuations of 60-100% in Sep-Oct. Harmonic regression analysis attributed 38%, 34%, and 28% of variance to 24 hour cycles, 12.42 hour cycles, and interaction between these two cycles, respectively.

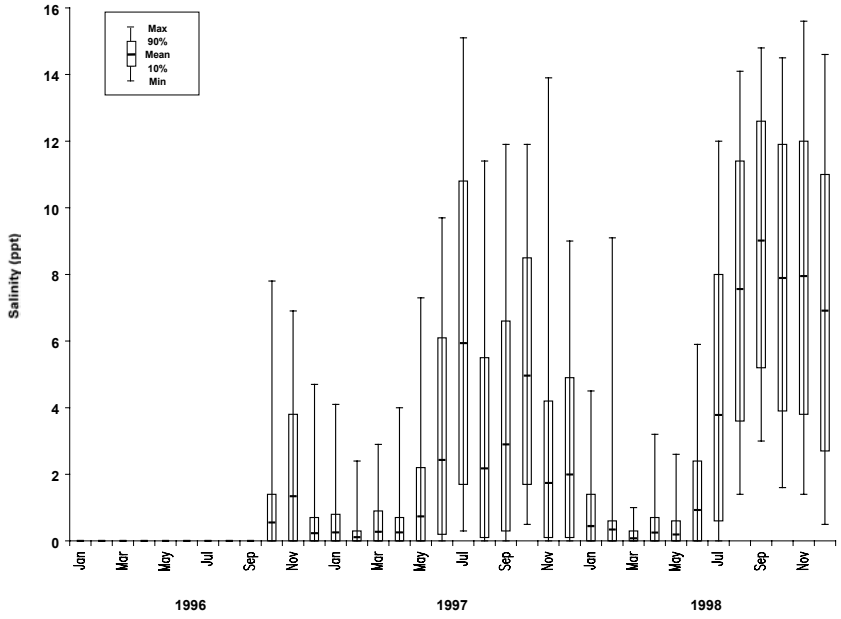


Figure 117. Salinity statistics for Lower Bank, 1996-1998.

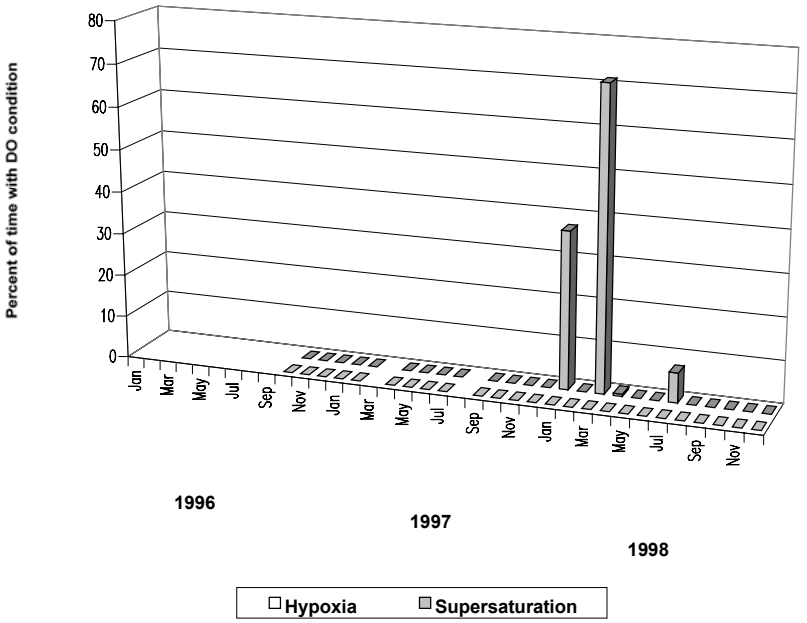


Figure 118. Dissolved oxygen extremes at Lower Bank, 1996-1998.