

APPENDIX B

Water Quality Monitoring Program

MEMO

June 5, 2003

TO: Sue Jacobson, Environmental Analyst, Office of Long Island Sound Programs

FROM: Christine Olsen, Environmental Analyst 3, Bureau of Water Management (x2350)

Re: Islander East Pipeline/Thimble Islands

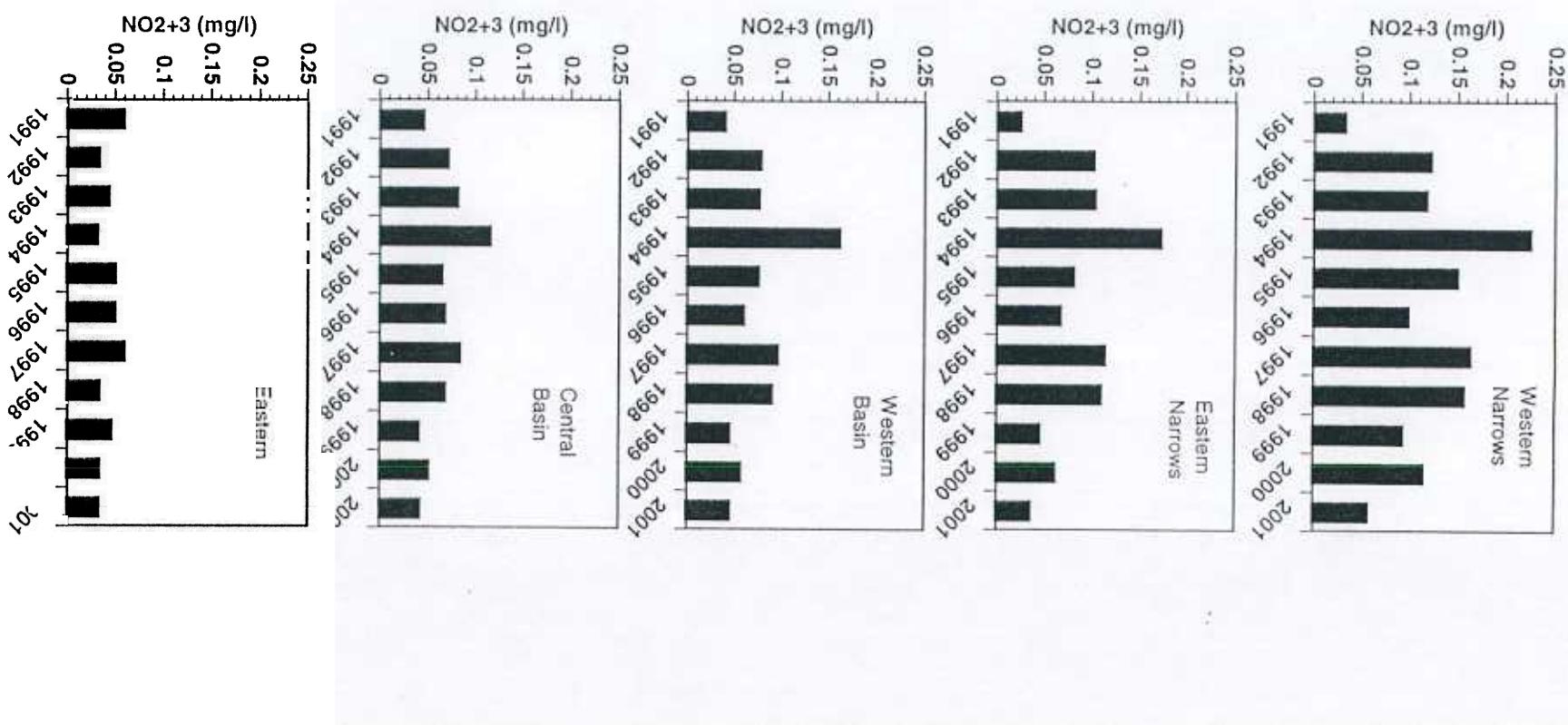
The Long Island Sound program of the Bureau of Water Management is submitting the following in support of the effort to collect and compile information relevant to the Thimble Islands/Branford area of Long Island Sound. The Bureau's Long Island Sound Ambient Water Quality Monitoring Program does not focus on nearshore sampling, and so does not make observations in the immediate vicinity of the Thimble Islands. Please contact me with any questions or additional requests.

- 1) Maps of the area of hypoxia from 59 summertime surveys over 12 years (July through September surveys, 1991-2002). These maps show that only rarely are the waters of the Sound off of the Thimble Islands area subjected to marginal or moderate impacts of the low dissolved oxygen conditions that develop each summer. In general this area meets the LISS interim management goal for bottom water dissolved oxygen, usually with dissolved oxygen concentrations that are excellent and fully supportive of marine life. Only a single observation was made over this period, in August of 1994 (WQAUG94), where hypoxia (dissolved oxygen less than 3.0 mg/L) extended as far east as the Thimble Islands area. Of the twelve year record available, 1994 had the most severe hypoxic event, with the largest area effected during that early August cruise.
- 2) A copy of the Bureau's Long Island Sound Ambient Water Quality Monitoring Program: Summer Hypoxia Monitoring Survey 1991-1998 Data Review. Some points of interest: Figure 1, page 4, basins of the Sound – the Thimble Islands are located in the Central Basin; Figure 9, page 18, impacts of low dissolved oxygen by basin; and Figure 10, page 19 shows all of the stations that have been observed with dissolved oxygen concentrations less than 3.0 mg/L. If data through 2002 were included, Figure 10 would not change.
- 3) Long-term (12-year) mean nutrient concentrations from monthly water quality monitoring survey, averaged by basin. Included is a table and two figures, one figure showing dissolved inorganic nitrogen, the other showing dissolved inorganic phosphorus. These data show that the Central Basin (includes the Branford area) has dissolved nutrient concentrations less than those observed in the Narrows and Western Basin. These lower ambient nutrient concentrations are at least in part due to lower anthropogenic inputs of nutrients such as from sewage treatment plants.
- 4) A page from the 5/20/2003 report: Total Nitrogen Balance Sheet – Monthly Averages by Plant, 2003. The Branford sewage treatment plant (Zone 3) was recently upgraded to remove nitrogen. Effluent monitoring from early in 2003 shows that the nitrogen being discharged is well below (less than one-quarter of) the 2003 limit assigned based on the TMDL/nitrogen trading program. (contact Gary Johnson for additional information/details.)

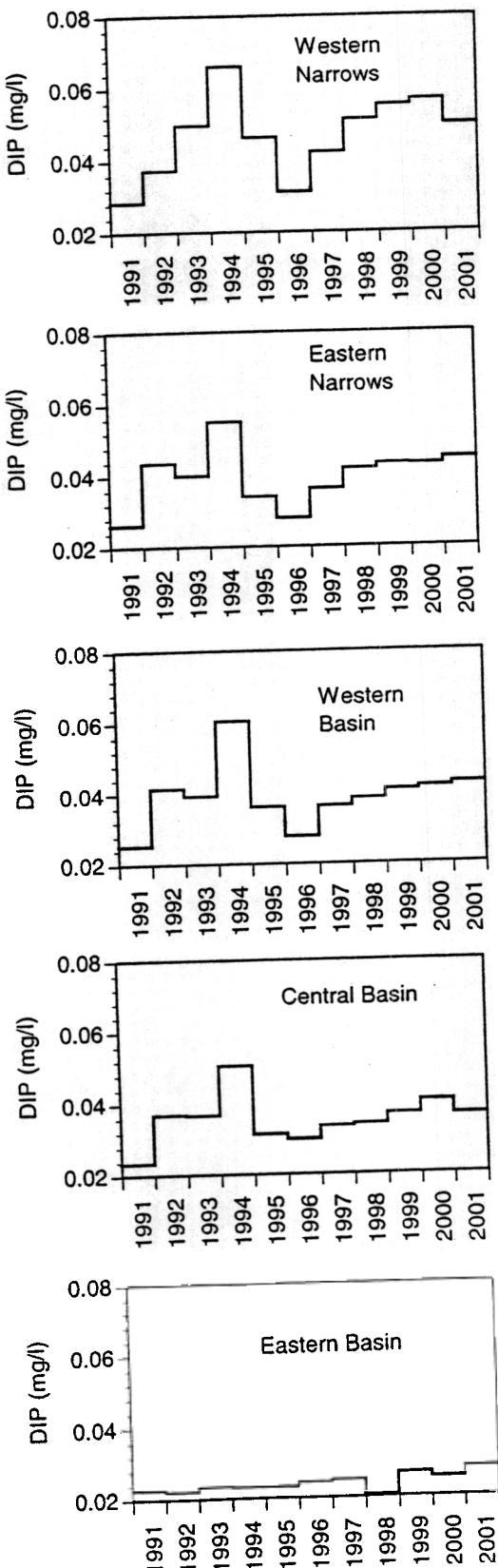
Long term (1991 to 2002) mean and standard deviation of some of the nutrient parameters for the four basins. (Data include surface and bottom duplicate results, include all the cruises, WQ, CH and SS).

Parameters	Narrow (A4, B3, C1, C2 & D3)	Western Basin (9, E1, 15, F2 & F3)	Central Basin (H2, H4, H6 & I2)	Eastern Basin (J2, K2 & M3)
Surface NOx (mg N /L)	0.094 ± 0.109	0.070 ± 0.082	0.063 ± 0.073	0.054 ± 0.045
Surface NH4 (mg N /L)	0.032 ± 0.058	0.010 ± 0.016	0.009 ± 0.013	0.014 ± 0.013
Surface TDN (mg N /L)	0.290 ± 0.160	0.227 ± 0.103	0.224 ± 0.216	0.192 ± 0.104
Surface DIP (mg P /L)	0.044 ± 0.030	0.039 ± 0.024	0.036 ± 0.023	0.026 ± 0.012
Surface SiO2 (mg Si/L)	1.200 ± 1.027	1.194 ± 0.965	1.087 ± 0.852	0.706 ± 0.429
Surface chl a (µg /L)	6.078 ± 5.951	3.585 ± 3.179	3.076 ± 2.912	2.028 ± 1.520
Bottom NOx (mg N /L)	0.096 ± 0.093	0.079 ± 0.074	0.073 ± 0.068	0.049 ± 0.043
Bottom NH4 (mg N /L)	0.038 ± 0.041	0.020 ± 0.023	0.017 ± 0.020	0.015 ± 0.012
Bottom TDN (mg N /L)	0.281 ± 0.128	0.236 ± 0.101	0.225 ± 0.100	0.181 ± 0.074
Bottom DIP (mg P /L)	0.051 ± 0.026	0.045 ± 0.020	0.041 ± 0.020	0.026 ± 0.011
Bottom SiO2 (mg Si/L)	1.512 ± 1.013	1.444 ± 0.889	1.258 ± 0.781	0.630 ± 0.364
Bottom chl a (µg /L)	3.402 ± 4.595	2.363 ± 3.005	2.277 ± 3.000	1.868 ± 1.535

Long term annual mean inorganic nitrogen (nitrate plus nitrite) in
the 5 basins of Long Island Sound



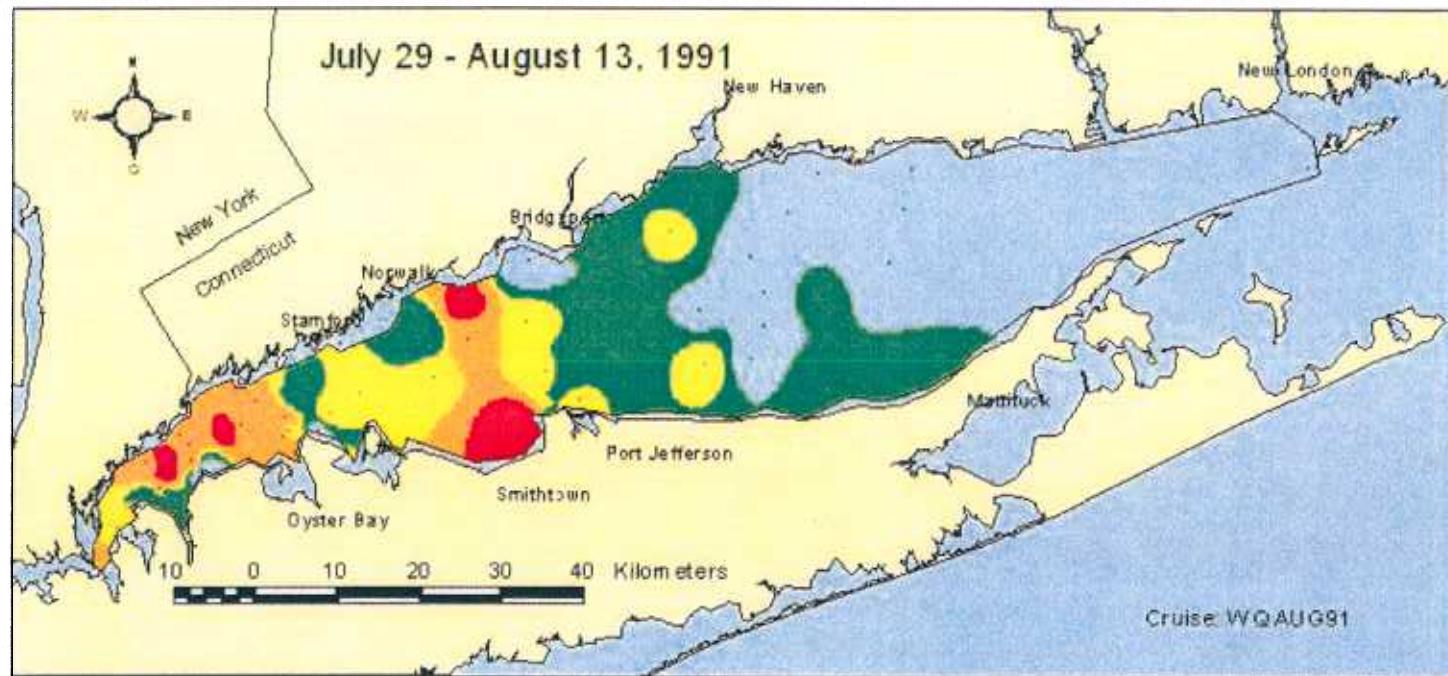
Long term annual mean surface dissolved inorganic phosphate in the 5 basins of Long Island Sound



Nitrogen Balance Sheet - Montly Averages by Plant, 2003

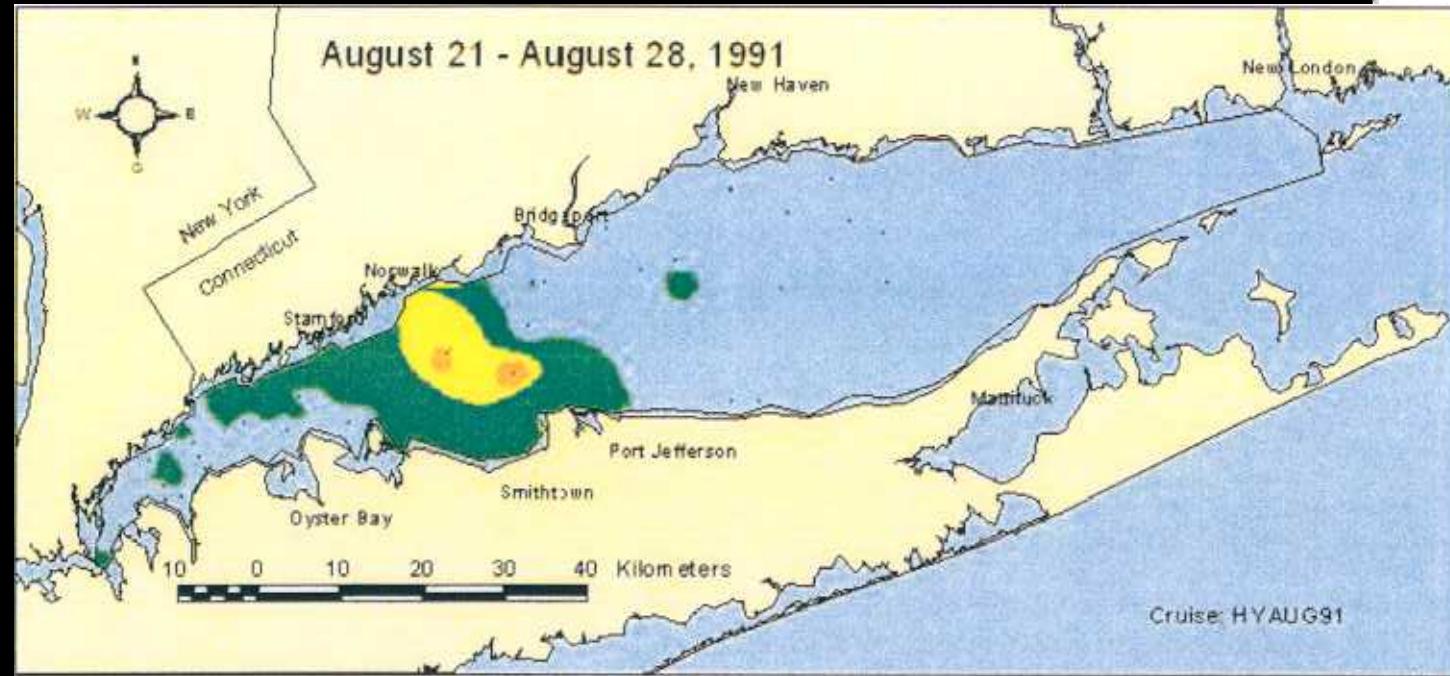
	<u>LIMIT '03</u>	<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>	<u>JUL</u>	<u>AUG</u>	<u>SEP</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>
PLAINVILLE WPCF	188	343	305	327									
PLYMOUTH WPCF	77	72	59	70									
PORTLAND WPCF	58	34	29	37	39								
ROCKY HILL WPCF	535	825	675	1133	882								
SIMSBURY WPCF	199	381	382	351	307								
SOUTH WINDSOR WPCF	196	317	279	336									
SUFFIELD WPCF	83	46	47	62									
VERNON WPCF	342	528	583	770									
WINDSOR LOCKS WPCF	122	177	173	219	129								
WINDSOR POQUONOCK WPCF	182	429	498	417	349								
WINSTED WPCF	119	216	153	179	162								
ZONE: 3													
BRANFORD WPCF	357	85	59	85									
CHESTER WPCF	190	636	518	681	521								
MERIDEN WPCF	834	936	755	1032	1180								
NEW HAVEN EAST WPCF	2911	1669	1349	1801	1421								
NORTH HAVEN WPCF	294	659	561	586	420								
SOUTHBURY WPCF	378	786	889	836	804								
WALLINGFORD WPCF	500	488	532	677	711								
WEST HAVEN WPCF	655	756	593	700	624								
ZONE: 4													
ANSONIA WPCF	213	353	395	332	333								
BEACON FALLS WPCF	22	52	51	47	41								
DANBURY WPCF	821	1718	1316	1869	1913								
DERBY WPCF	132	52	48	51									
LITCHFIELD WPCF	43	52	46	61									
MILFORD BEAVER BROOK WP	175	202	179	279	192								
MILFORD HOUSATONIC WPCF	572	509	362	484	657								
NAUGATUCK TREATMENT Co	458	525	526	741	770								
NEW MILFORD WPCF	52	56	85	87	39								
NEWTOWN WPCF	31	48	37	58									
NORFOLK WPCF	20	12	8	16	14								
NORTH CANAAN WPCF	24	29	35	28	24								

Dissolved Oxygen in Long Island Sound Bottom Waters



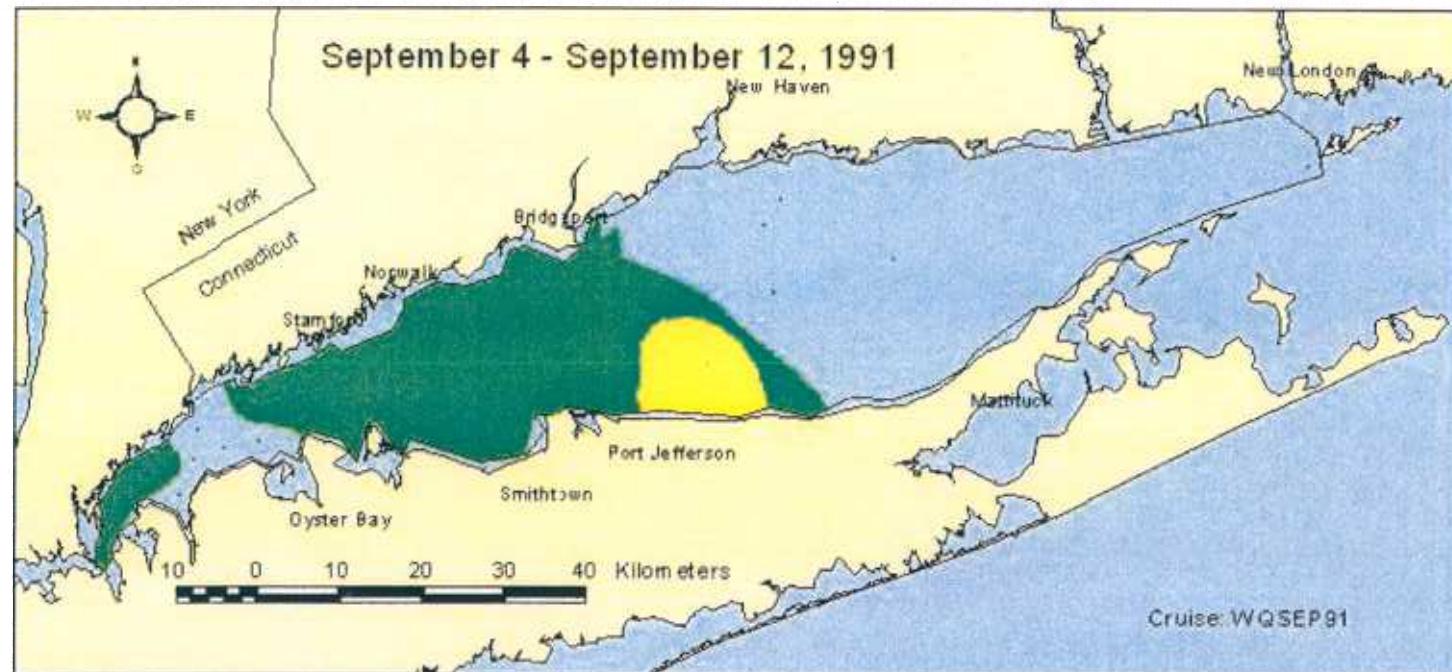
Dissolved Oxygen	Severity of Impact
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1.0 - 1.99 mg/L	Moderately severe
2.0 - 2.99 mg/L	Moderate
3.0 - 3.49 mg/L	Marginal
3.5 - 4.79 mg/L	Interim management goal
4.8 + mg/L	Excellent - Supportive of marine life

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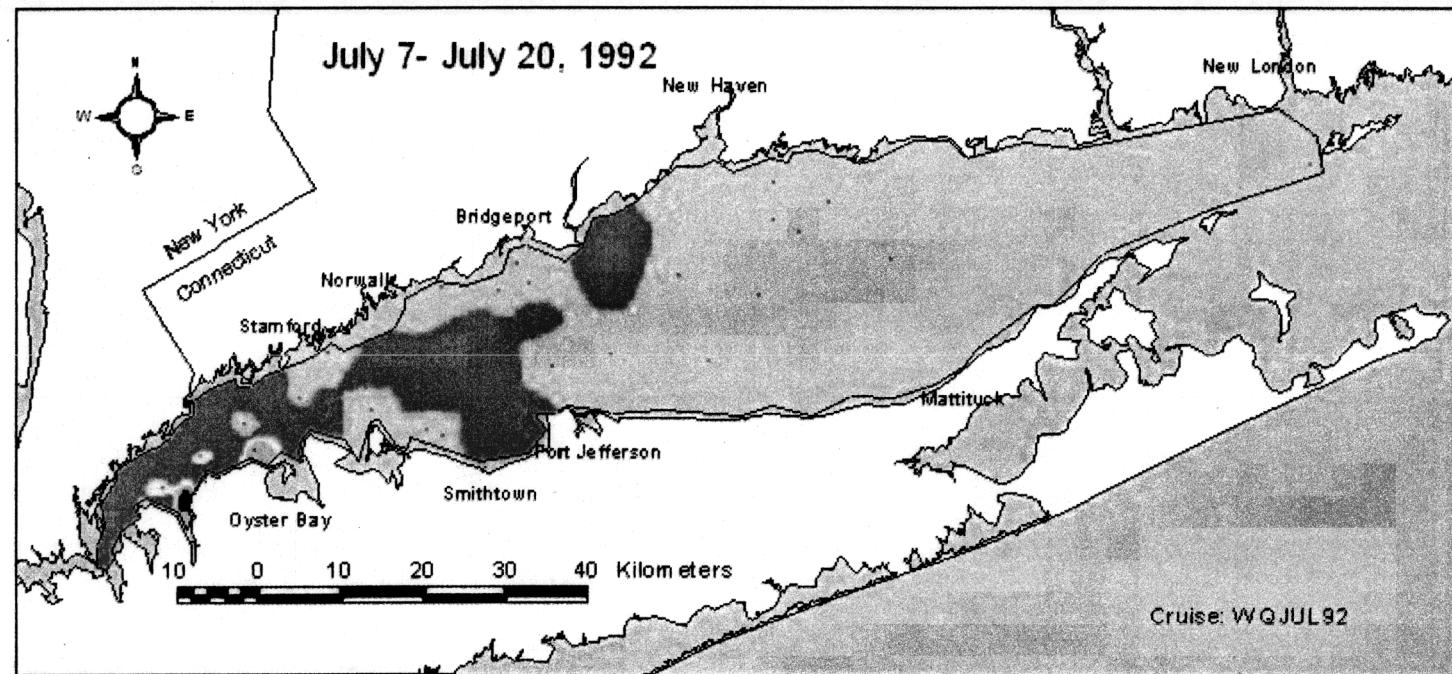
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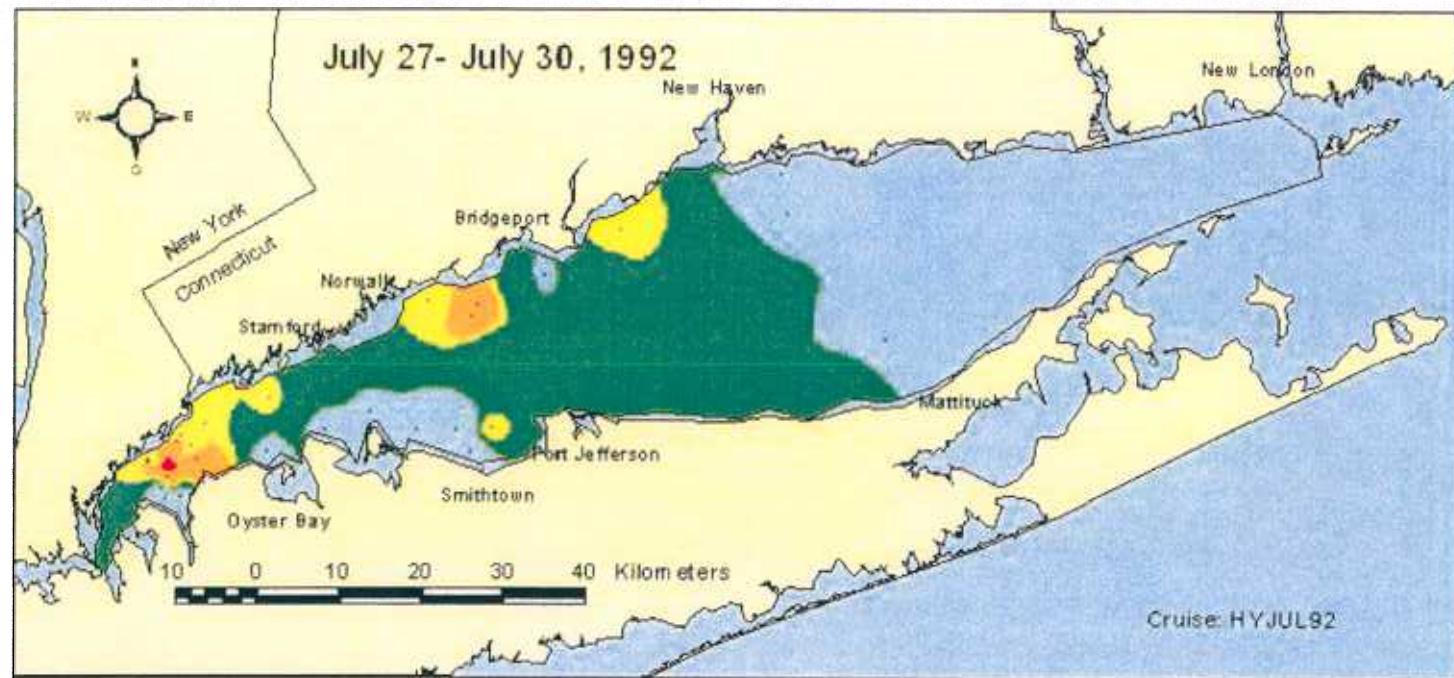
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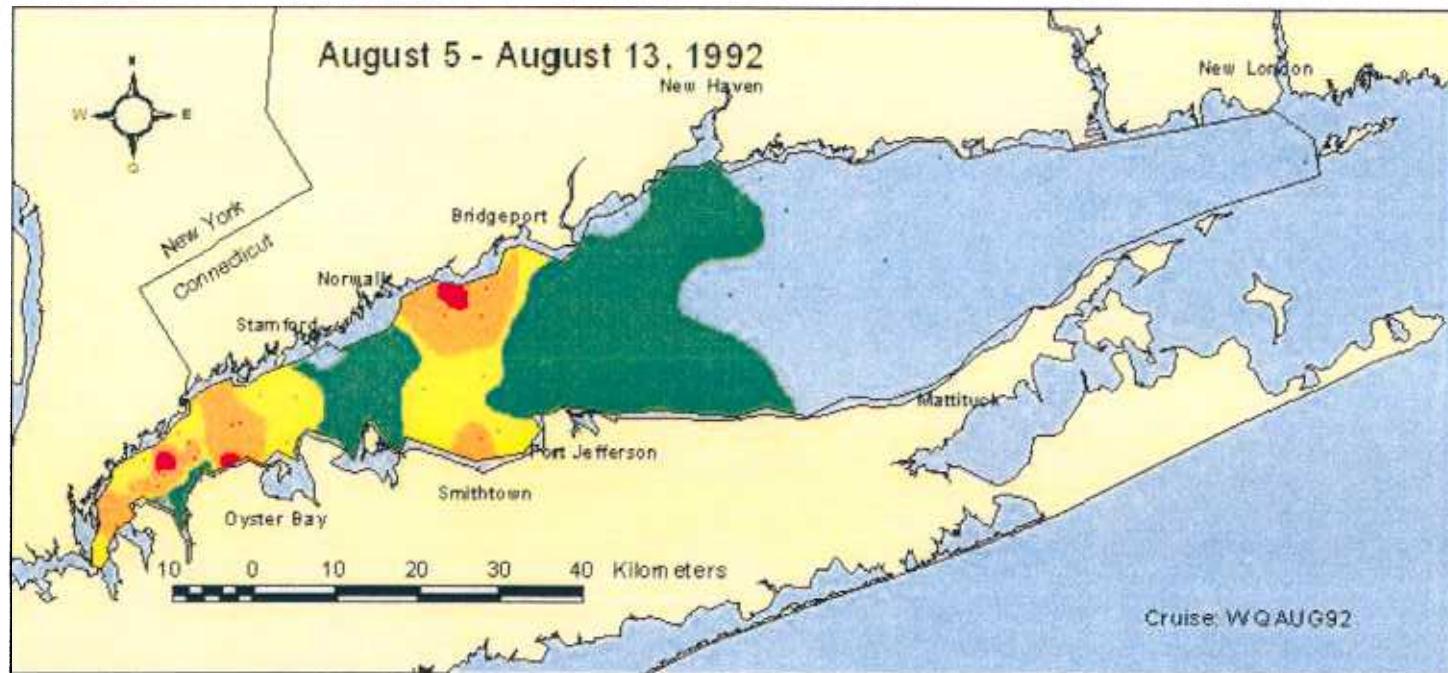
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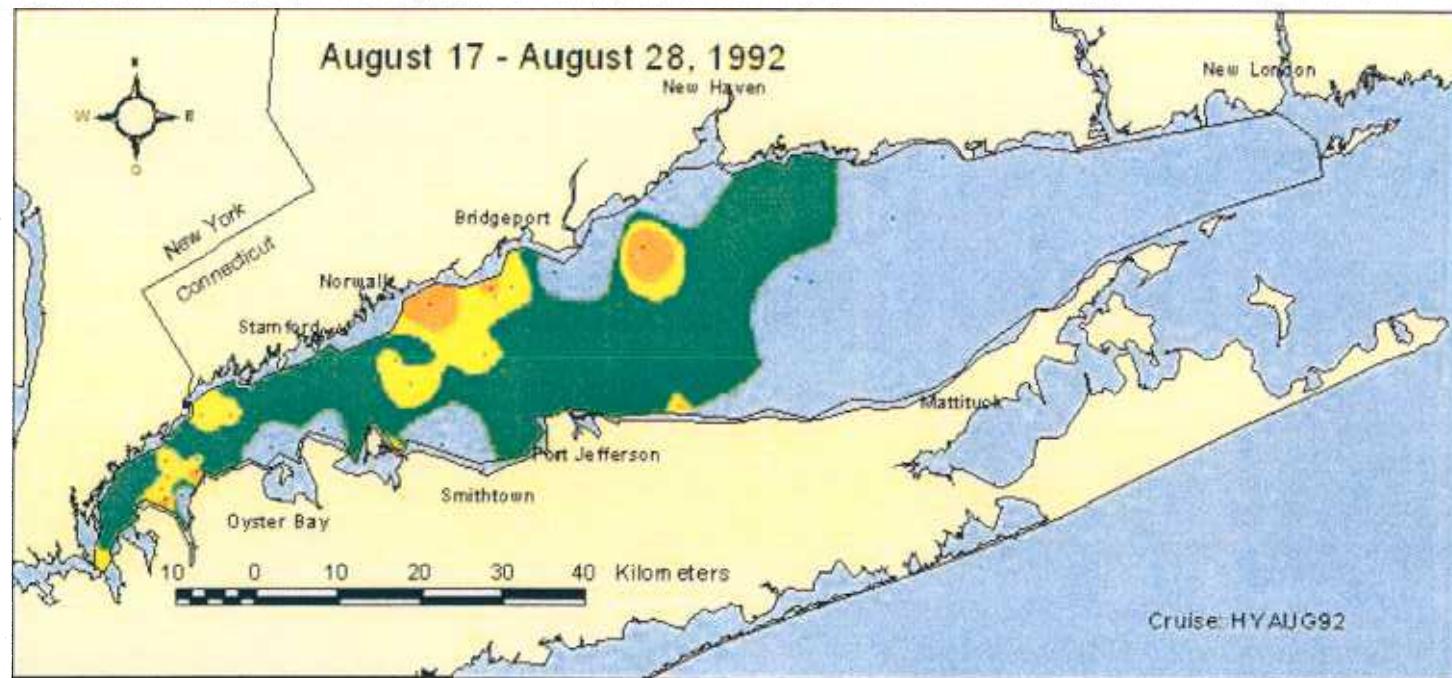
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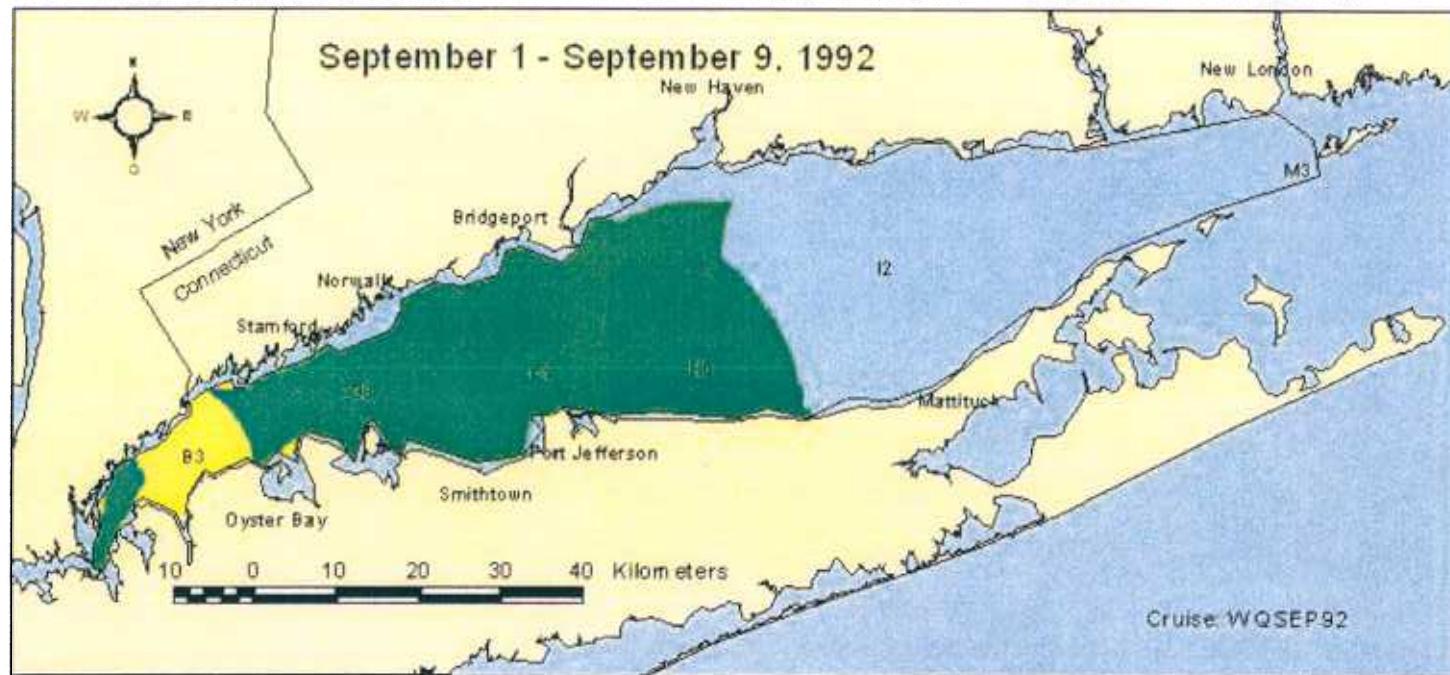
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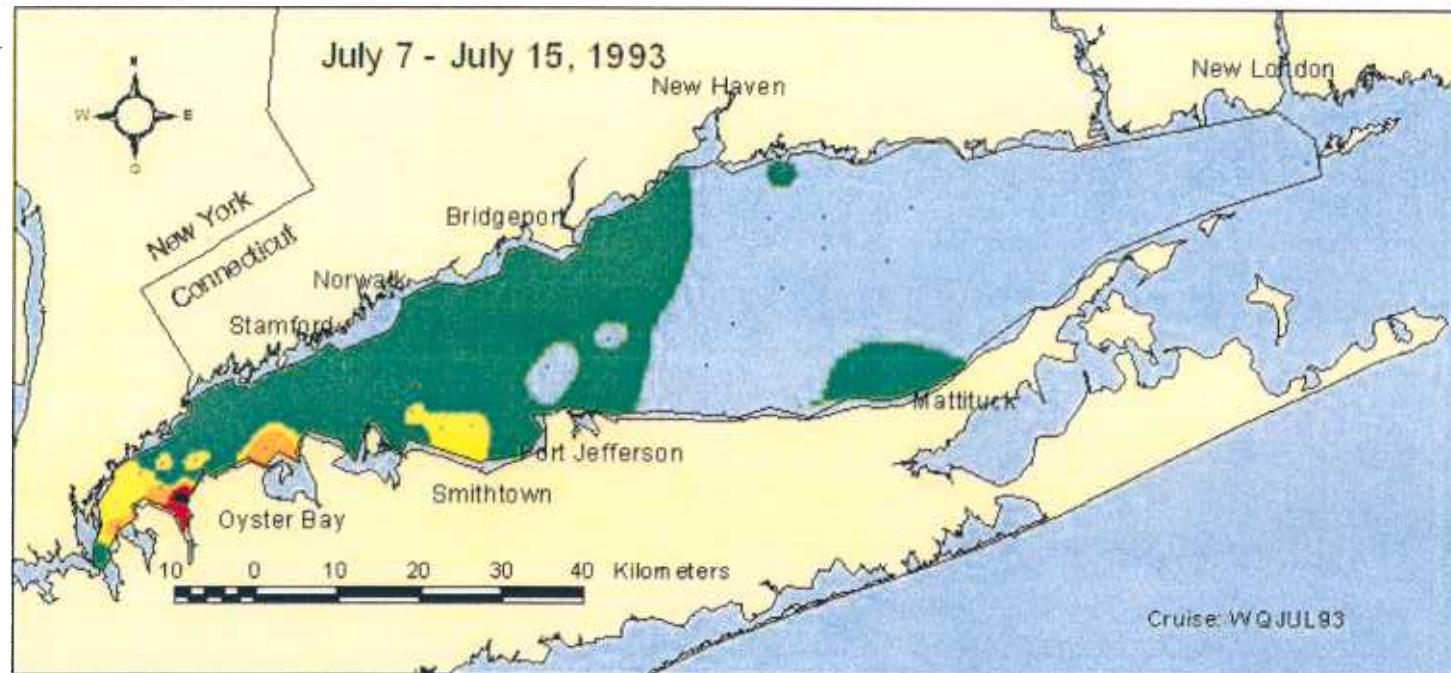
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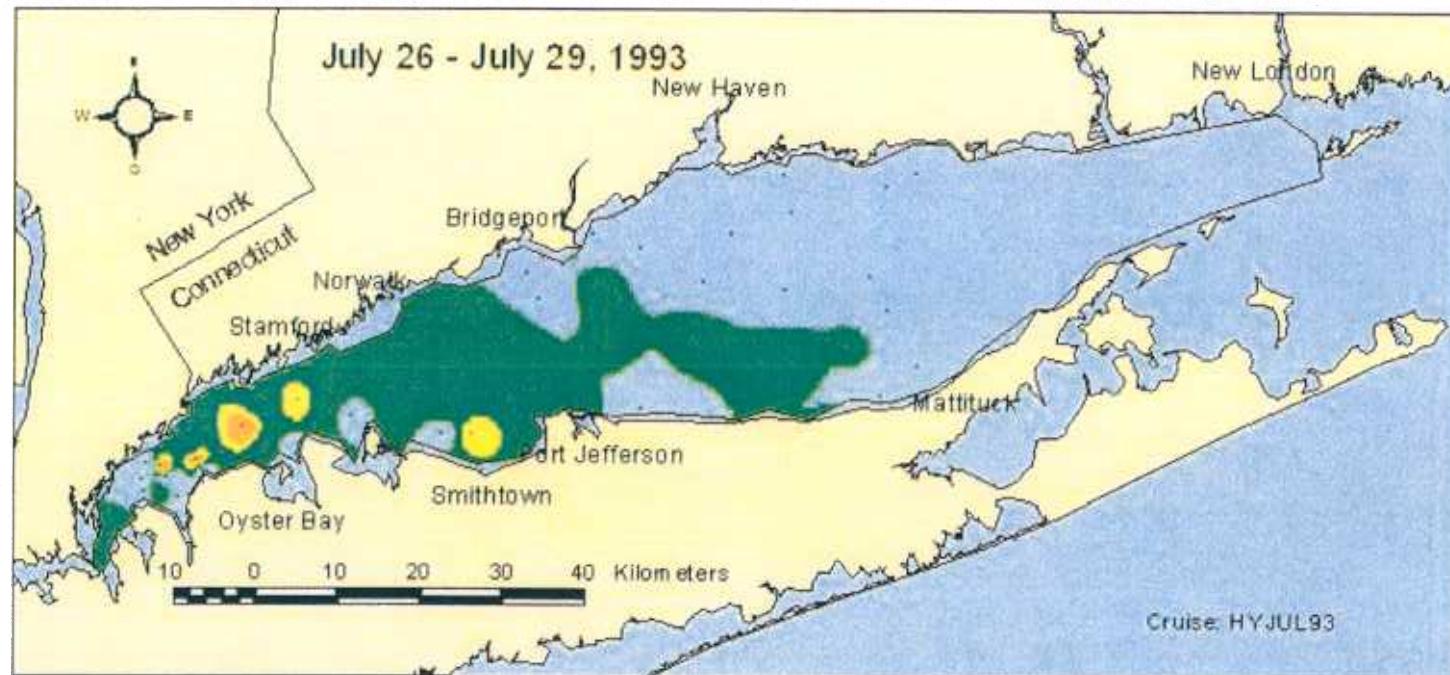
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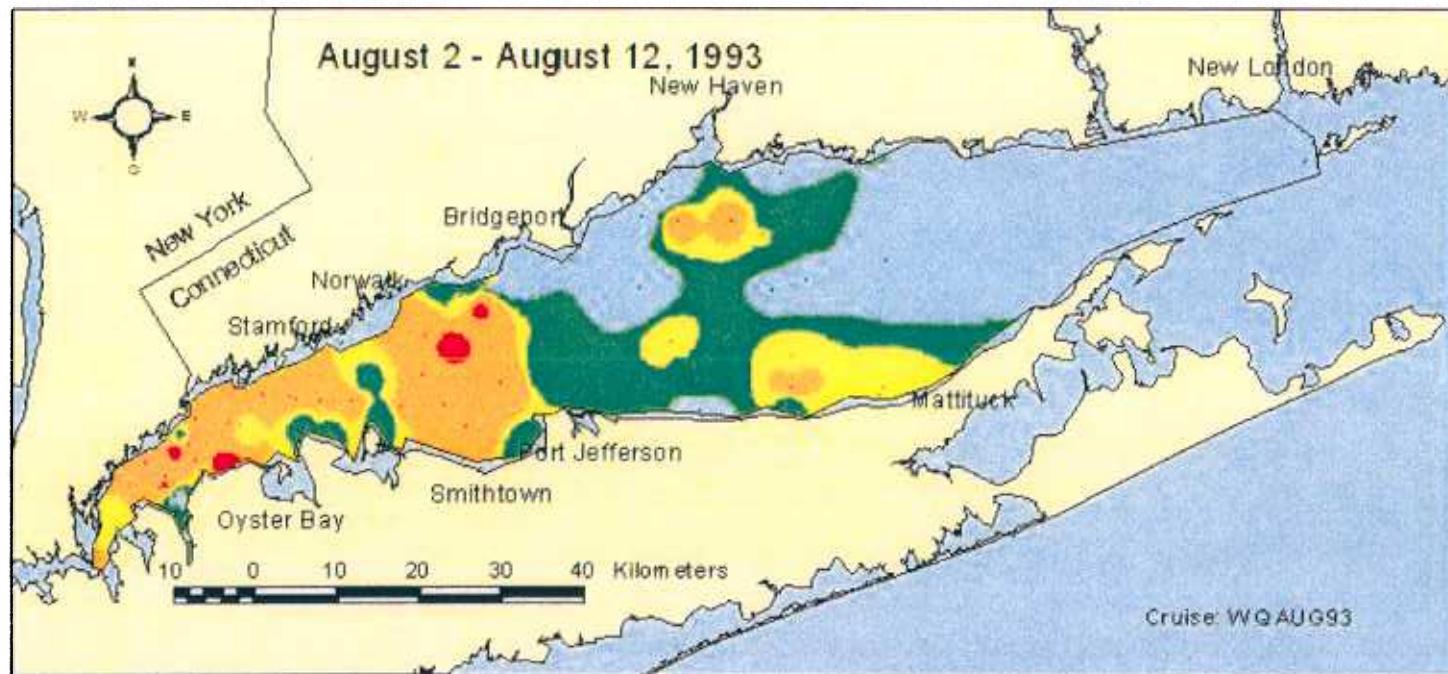
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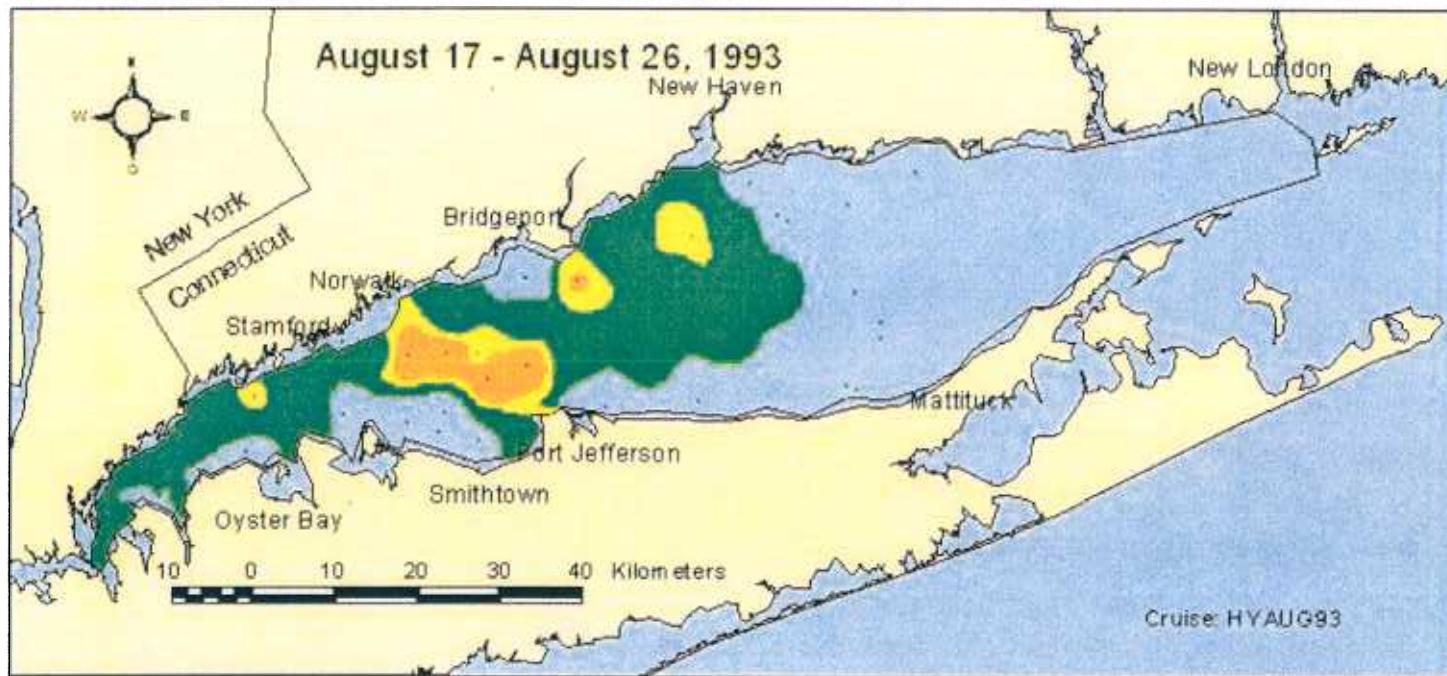
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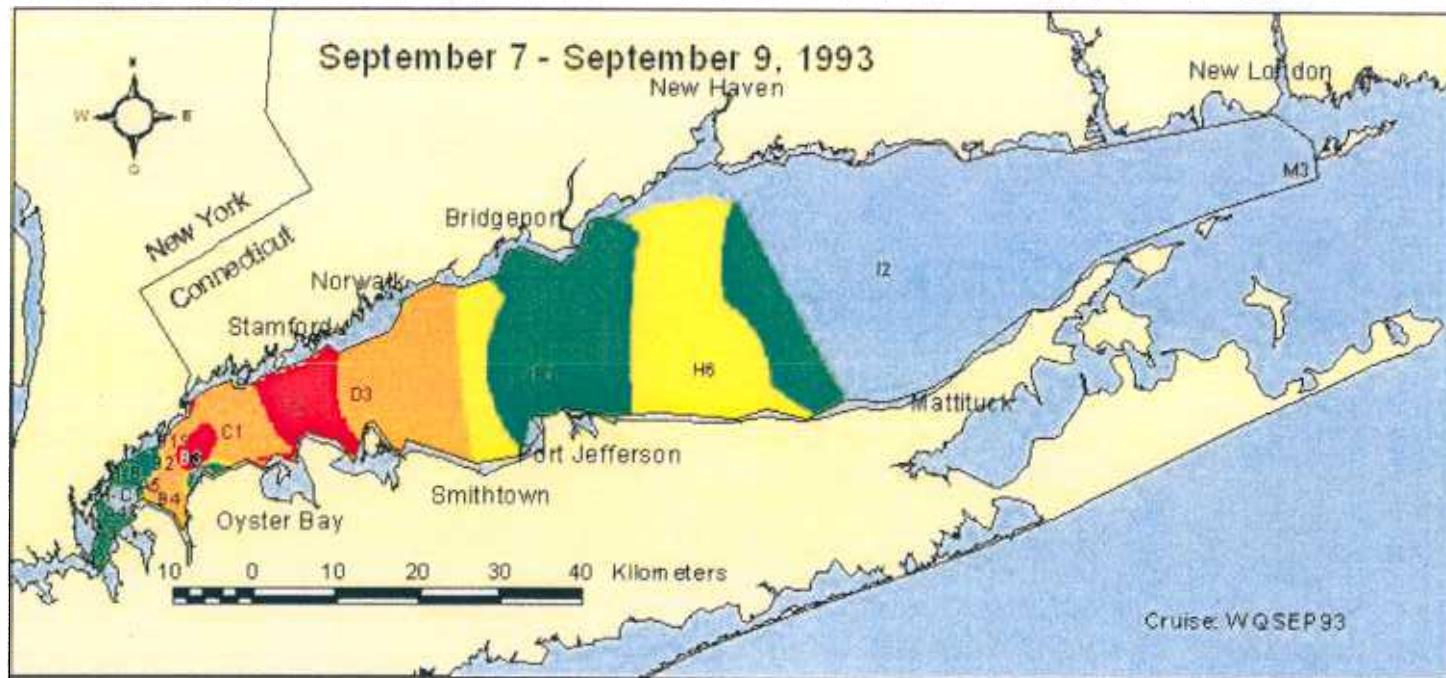
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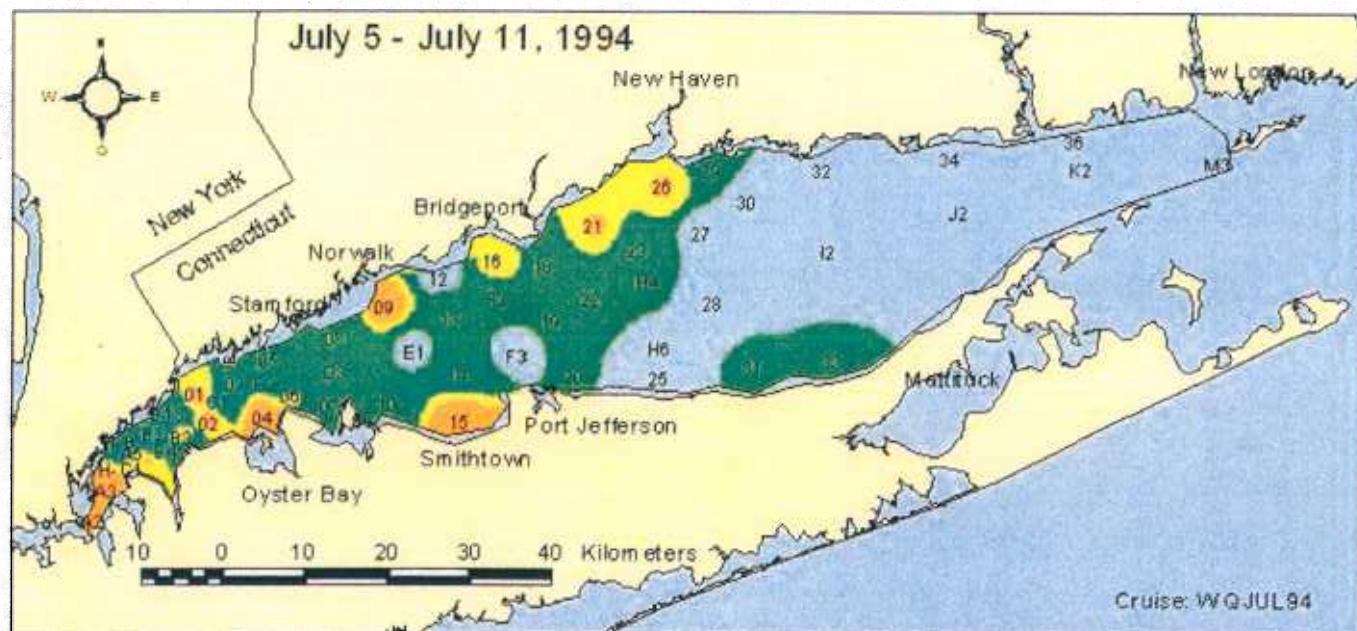
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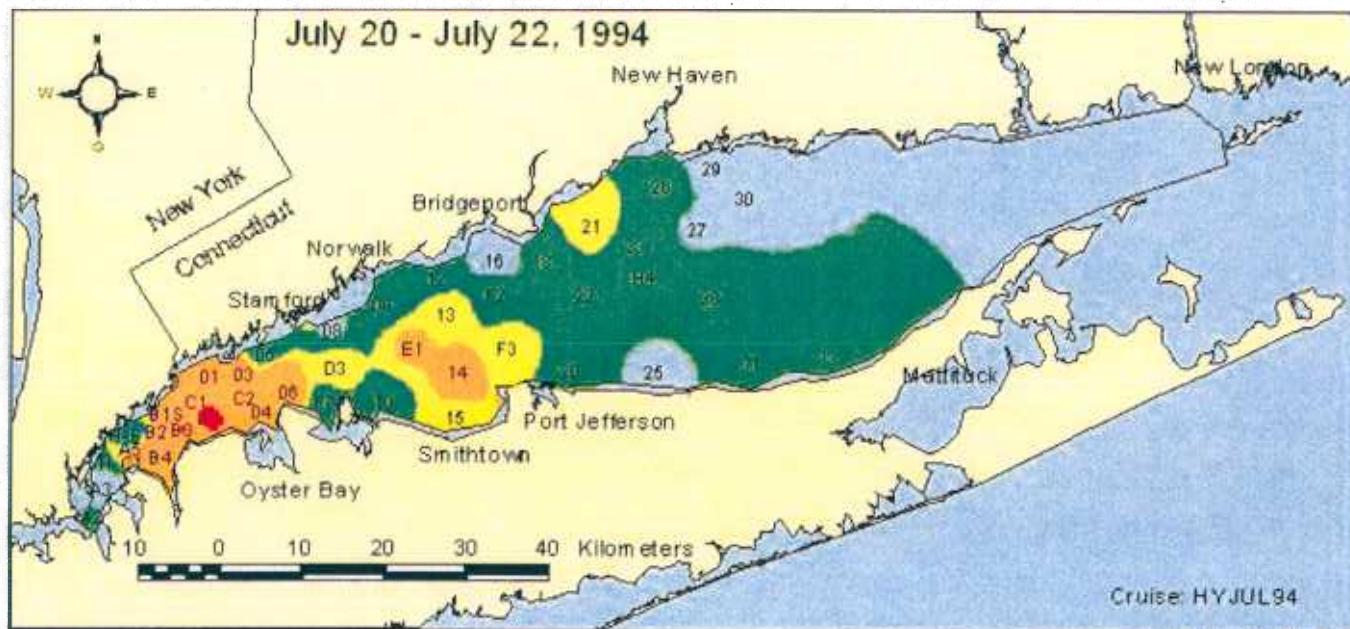
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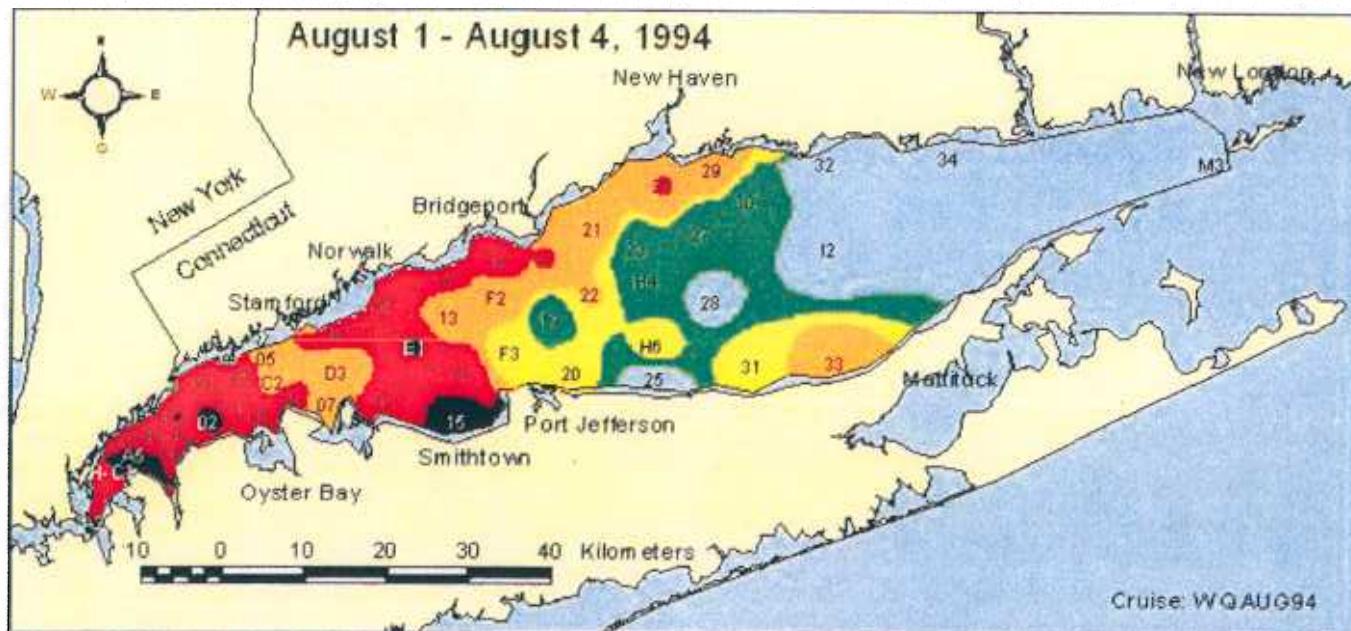
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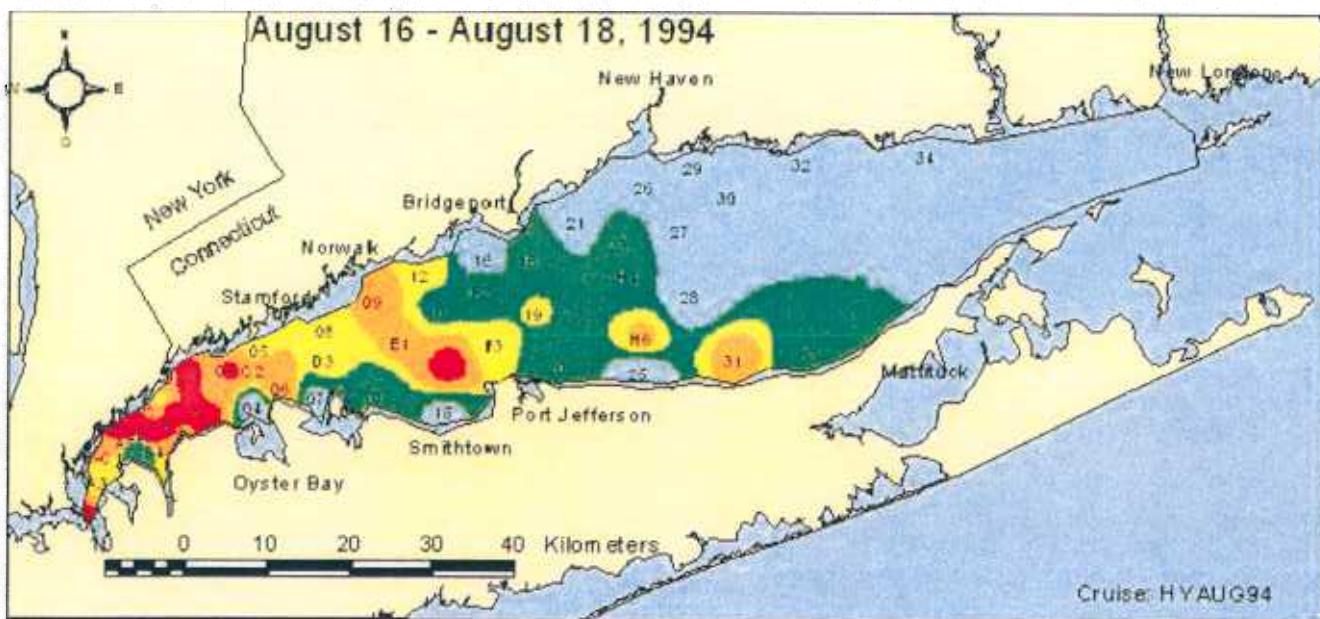
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