Bryan Speegle, Director

COUNTY OF ORANGE

RESOURCES & DEVELOPMENT MANAGEMENT DEPARTMENT

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September 1, 2006

Ms. Joanne Schneider
Santa Ana Regional Water Quality Control Board
3737 Main Street, Suite 500
Riverside, CA 92501-3339

SUBJECT: Newport Bay Fecal Coliform TMDL Annual Data Report

Dear Ms. Schneider:

The Orange County Resources and Development Management Department (RDMD) is pleased to submit the 2006 Newport Bay Fecal Coliform TMDL Annual Data Report.

The attached information addresses the requirements of the fecal coliform TMDL and the January 7, 2000, Water Code Section 13267 letter from the Santa Ana Regional Water Quality Control Board. The Report represents the collective response of the County of Orange and the Cities of Costa Mesa, Irvine, Lake Forest, Laguna Hills, Laguna Woods, Newport Beach, Orange, Santa Ana and Tustin. The data analyzed in the report was provided by the Orange County Health Care Agency.

Included in this report is a *Preliminary Statistical Analysis of Fecal Coliform in Newport Bay*. The analysis was completed by Neptune and Company, Inc. and explores trends in fecal coliform concentrations over the span of five years of monitoring (2001-2006) in Newport Bay. The analyses are preliminary in the sense that the models are data-based, incorporating little information outside of the data itself. Further analysis, utilizing more sophisticated models could be applied and several suggestions are made regarding tools for future efforts.

The County of Orange and the watershed cities are committed to responding to environmental concerns within the Newport Bay watershed, many of which relate to the TMDL process. If you have any questions or comments regarding this report, please call Amanda Carr at (714) 567-6367.

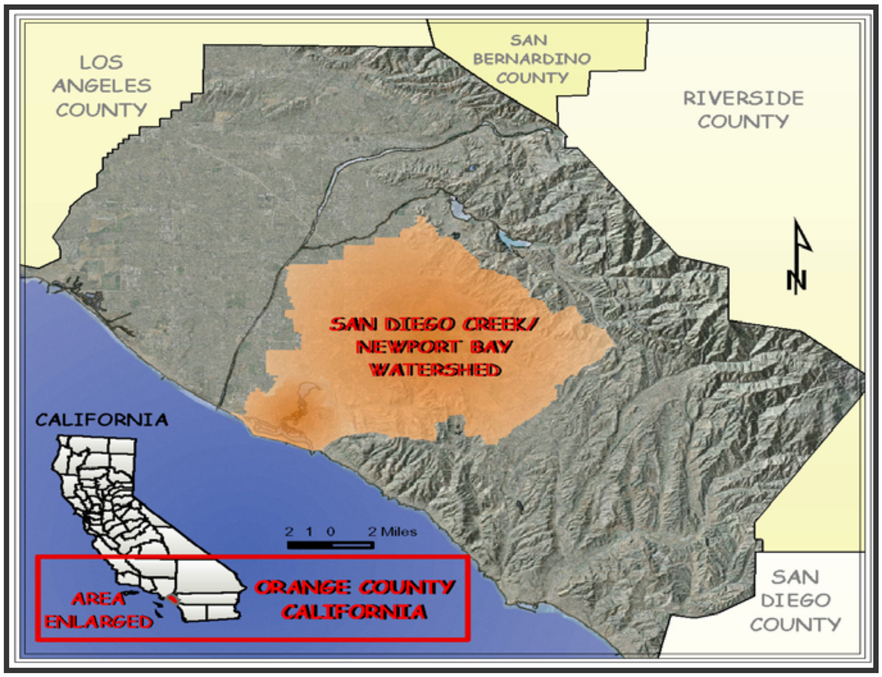
Very truly yours,

Chris Crompton, Manager
Environmental Resources

Attachment: Newport Bay Fecal Coliform Annual Data Report

cc: Patrick Bauer, City of Costa Mesa
Mike Loving, City of Irvine
Ken Rosenfield, City of Laguna Hills
Lauren Barr, City of Laguna Woods
Bob Woodings, City of Lake Forest
Dave Kiff, City of Newport Beach
Gene Estrada, City of Orange
Souri Amirani, City of Santa Ana
Tim Serlet, City of Tustin
Sat Tamaribuchi, The Irvine Company
Norris Brandt, Irvine Ranch Water District
Grace Piña-Garrett, Caltrans
David Placek, Tustin Legacy Community Partners
Glen Worthington, The Great Park Corporation
Jim Werkmeister, Lennar Corporation

NEWPORT BAY FECAL COLIFORM TMDL
ANNUAL DATA REPORT



September 2006

Prepared and submitted on behalf of:

The County of Orange
and
The Cities of Costa Mesa, Irvine, Lake Forest,
Laguna Hills, Laguna Woods, Newport Beach, Orange, Santa Ana, and Tustin

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1.0 INTRODUCTION

The fecal coliform Total Maximum Daily Load (TMDL) for the Newport Bay was established by the Santa Ana Regional Water Quality Control Board (RWQCB) on April 9, 1999. The TMDL and the January 7, 2000 Water Code Section 13267 letter from the RWQCB (**Appendix A**) require the County of Orange and the Cities of Costa Mesa, Irvine, Lake Forest, Newport Beach, Orange, Santa Ana and Tustin (watershed cities) to develop a routine monitoring program for Newport Bay and to submit an annual data report by September 1st of each year. The report is required to summarize the bacteriological data collected in Newport Bay from April 1st through March 31st and evaluate compliance with the recreational use (REC-1) bacterial water quality objectives established in the Water Quality Control Plan for the Santa Ana River Basin (Basin Plan). This report responds to these requirements and includes data from April 1, 2005 through March 31, 2006.

In an effort to evaluate the routine monitoring program data over a longer time scale, a statistical analysis of fecal coliform concentrations collected for Newport Bay over the years 2001-2006 was conducted. The analyses were primarily exploratory in nature, looking for simple patterns that might be useful in providing insight into the system in Newport Bay. The primary goal of the analysis was to model the changes in fecal coliform concentrations over time. A secondary goal was to see if there are clusters of stations (locations within the bay) that behave similarly, to guide future data collection. A discussion of the analysis and results is included in **Appendix B**.

2.0 ROUTINE MONITORING PROGRAM (TMDL Section 3.a.ii.a)

2.1 Data Collection

Section 3.a.ii.a of the TMDL requires the County, watershed cities and agricultural operators to implement a routine monitoring program to determine compliance with bacterial water quality objectives in the Bay. At a minimum, routine monitoring includes the collection of five samples per 30-day period at a total of 35 stations, as identified in **Figure 1**, and analysis of the samples for total coliform, fecal coliform, and enterococcus indicator bacteria. The County and watershed cities have identified the current monitoring program implemented by the County of Orange Health Care Agency (HCA) as the basis for satisfying the requirements of the routine monitoring program.

The Basin Plan established fecal coliform water quality objectives for REC-1 use of Bays and Estuaries as follows:

> *Fecal coliform concentration: log mean less than 200 MPN/100 mL, based on five or more samples/30 day period, and not more than 10% of the samples exceed 400 organisms/100 mL for any 30-day period.*

2.2 Data Analysis

Table 1 presents the data from HCA's bacteriological monitoring program. Concentrations of total coliform, fecal coliform and enterococcus indicator bacteria are listed for each Bay and tributary station with the corresponding sampling date.

Table 2 presents an evaluation of the data in Table 1 with respect to the REC-1 fecal coliform objective in the Basin Plan (see definition above under 2.1 Data Collection). In determining if a single date met the objectives for a 30-day period, three conditions resulted in a “no” determination. Those three conditions are:

- The single day sample exceeded 400 MPN/100 ml; or
- The log mean was greater than 200 MPN/100 ml; or
- There was a single day exceedance of 400 MPN/100 ml within the thirty day period[1].

2.2.1 2005-2006 Data

Calculation of the geomean for the first four sampling events in April required the use of some March 2005 data from the previous sampling year (see the September 2005 Report). Failure of the objective on these dates may be due to an exceedance of the acute 400 organisms/100 mL standard in the preceding data. It should also be noted that the Santa Ana Delhi Channel, Back Bay Drive Drain, and Big Canyon Wash tributary stations are not assigned REC-1 beneficial uses. The data from these tributaries have been provided as recognition of their potential impact on water quality in Newport Bay. As a result, the data for Santa Ana Delhi Channel, Back Bay Drive Drain, and Big Canyon Wash have not been evaluated with respect to the REC-1 fecal coliform objectives.

Figures 2 and **3** show the percentage of time that fecal coliform sampling at each station met REC-1 fecal coliform objectives for the dry and wet seasons respectively.

Three stations were frequently not amenable to sampling due to either: 1) Low tide conditions (Vaughn’s Launch and Ski Zone), 2) Lack of access to site due to inaccessible roads (Vaughn’s Launch and Ski Zone), or 3) No water present due to diversion practices (Back Bay Drive Drain). The inability to sample at these locations on a regular basis is the primary reason for missing geomean values as depicted in **Table 2**. In particular, geomean values for the Upper Bay station of Vaughn’s Launch could only be calculated eleven times for the entire sampling period of April 1, 2005 – March 31, 2006. No geomean values could be calculated for the Upper Bay station of Ski Zone. Consequently, there is insufficient data to determine if the stations were in compliance with the fecal coliform objectives.

During the dry season (April 15 – October 15), as depicted in **Figure 2**, eighteen of thirty-one stations met the REC-1 objective at least 75% of the time. The following three stations met the objective 100% of the time:

- N Street Beach
- Abalone Avenue Beach
- Rocky Point Beach

The following station met the objective less than 45% of the time:

- 33rd Street Channel

[1] Due to the weekly sampling schedule, a single day exceedence of 400 MPN/100 mL results in a greater than 10% exceedence within the thirty-day period.

During the wet season (October 16 – April 14), as depicted in **Figure 3** the Rocky Point Beach station met the REC-1 objective 100% of the time. The following twelve of thirty-one stations met the objective at least 75% of the time:

- Via Genoa Beach
- Rhine Channel
- 19th Street Beach
- 15th Street Beach
- N Street Beach
- Sapphire Avenue Beach
- Grand Canal
- Abalone Avenue Beach
- Park Avenue Beach
- Promontory Point Channel
- Harbor Patrol Beach
- Bayshore Beach

The following three stations met the objective less than 45% of the time:

- Newport Blvd. Bridge
- Newport Dunes North
- San Diego Creek @ Campus Dr.[2]

2.2.2 2001-2006 Data

Figures 4 and **5** show the percentage of time that fecal coliform sampling at each station met REC-1 fecal coliform objectives for the dry and wet seasons based on the cumulative annual report data from April 2001-March 2006.

Based on data from the 2001, 2002, 2003, 2004 and 2005 dry seasons (April 15 – October 15), as depicted in **Figure 4**, twenty-one of thirty-one stations met the REC-1 objective at least 75% of the time. The following three stations met the objective less than 45% of the time:

- 43rd Street Beach
- 33rd Street Channel
- Newport Blvd. Bridge

Based on data from the 2001-02, 2002-03, 2003-04, 2004-05 and 2005-06 wet seasons (October 16 – April 14), as depicted in **Figure 5**, the Rocky Point Beach station met the REC-1 objective at least 75% of the time. The following fourteen stations met the objective less than 45% of the time:

- Onyx Avenue Beach
- 43rd Street Beach
- 38th Street Beach
- 33rd Street Channel
- 19th Street Beach
- Newport Dunes Middle
- Newport Dunes West
- Newport Dunes North
- North Star Beach
- 10th Street Beach

[2] While San Diego Creek is not included within the TMDL, data has been collected and evaluated as it is tributary to Newport Bay.

- Newport Dunes East
- De Anza Launch
- Newport Blvd. Bridge
- San Diego Creek @ Campus Dr.[3]

Tables 3 and **4** compare the individual years' dry and wet season data respectively and highlight the stations meeting the bacteria water quality standard greater than or equal to 75% of the time and stations meeting standards less than 45% of the time.

[3] While San Diego Creek is not included within the TMDL, data has been collected and evaluated as it is tributary to Newport Bay.

FIGURES

TABLES

APPENDIX A

Letter from the Santa Ana Regional Water Quality Control Board dated January 7, 2000 Including Attachment to Resolution No. 99-10 (Basin Plan TMDL for Fecal Coliform)

APPENDIX B

Preliminary Statistical Analysis of Fecal Coliform in Newport Bay

FIGURE 1

BACTERIOLOGICAL WATER SAMPLING STATIONS IN NEWPORT BAY

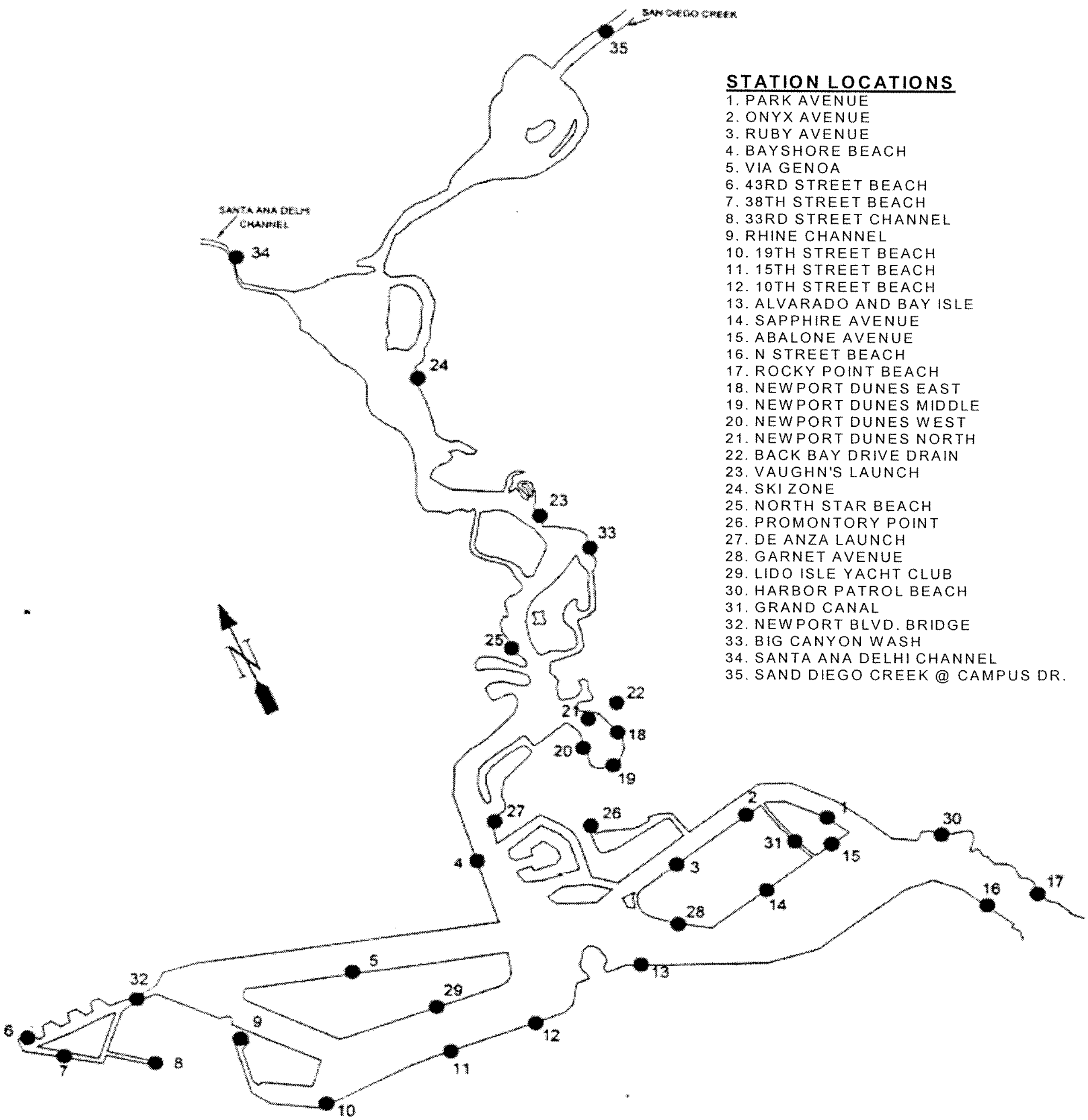
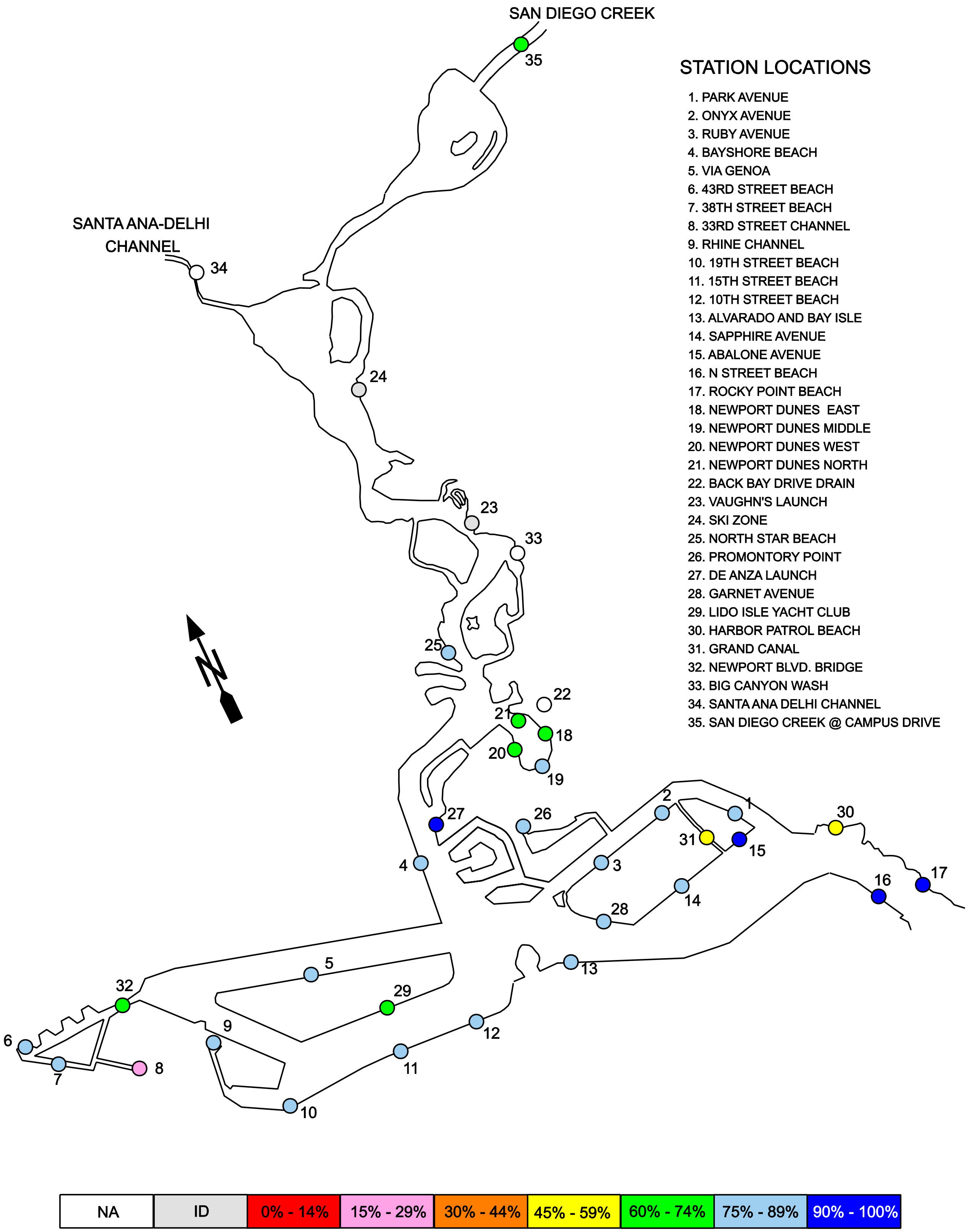


FIGURE 2

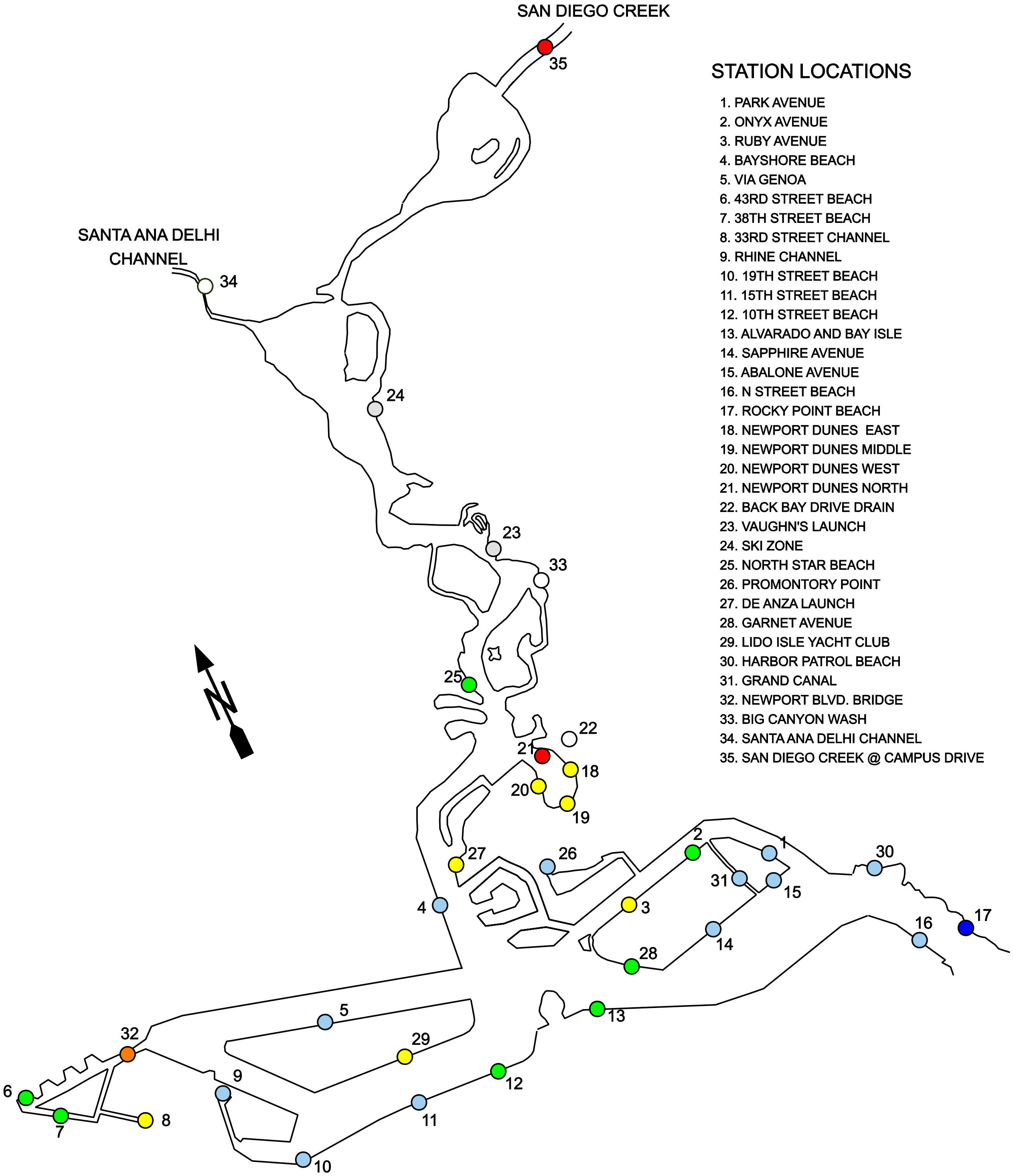
Percentage of Time REC-1 Fecal Coliform Objective Met
(200 MPN/100mL Geomean and non-exceedance of 400CFU/100mL)
for 2005 Dry Season (April 15 - October 15)



NA = Not evaluated. Not assigned REC-1 standards.
ID = Insufficient data to calculate a representative percentage value for site.

FIGURE 3

Percentage of Time REC-1 Fecal Coliform Objective Met
(200 MPN/100mL Geomean and non-exceedance of 400CFU/100mL)
for 2005-2006 Wet Season (October 16 - April 14)



STATION LOCATIONS

1. PARK AVENUE
2. ONYX AVENUE
3. RUBY AVENUE
4. BAYSHORE BEACH
5. VIA GENOA
6. 43RD STREET BEACH
7. 38TH STREET BEACH
8. 33RD STREET CHANNEL
9. RHINE CHANNEL
10. 19TH STREET BEACH
11. 15TH STREET BEACH
12. 10TH STREET BEACH
13. ALVARADO AND BAY ISLE
14. SAPPHIRE AVENUE
15. ABALONE AVENUE
16. N STREET BEACH
17. ROCKY POINT BEACH
18. NEWPORT DUNES EAST
19. NEWPORT DUNES MIDDLE
20. NEWPORT DUNES WEST
21. NEWPORT DUNES NORTH
22. BACK BAY DRIVE DRAIN
23. VAUGHN'S LAUNCH
24. SKI ZONE
25. NORTH STAR BEACH
26. PROMONTORY POINT
27. DE ANZA LAUNCH
28. GARNET AVENUE
29. LIDO ISLE YACHT CLUB
30. HARBOR PATROL BEACH
31. GRAND CANAL
32. NEWPORT BLVD. BRIDGE
33. BIG CANYON WASH
34. SANTA ANA DELHI CHANNEL
35. SAN DIEGO CREEK @ CAMPUS DRIVE

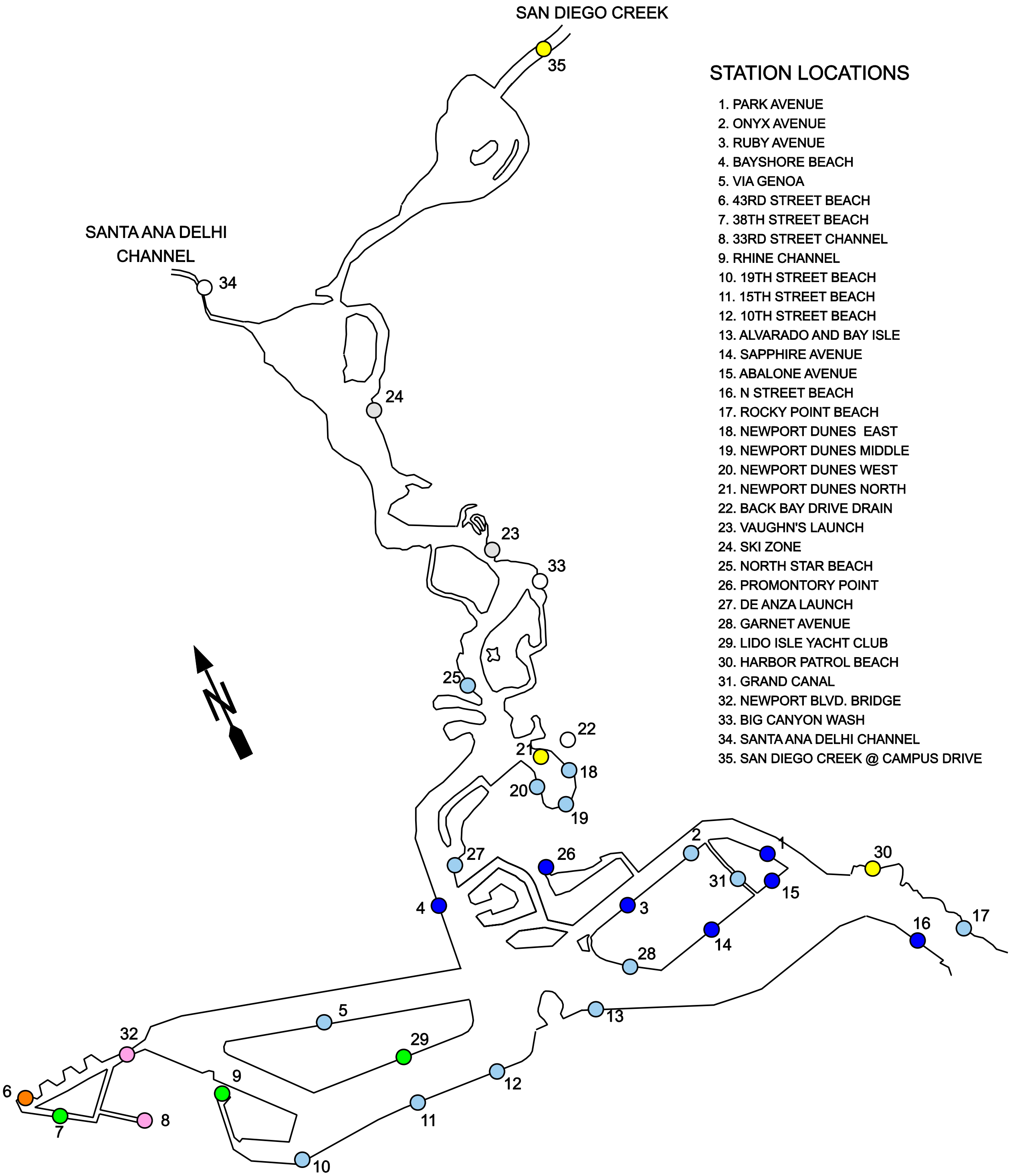
NA	ID	0% - 14%	15% - 29%	30% - 44%	45% - 59%	60% - 74%	75% - 89%	90% - 100%

NA = Not evaluated. Not assigned REC-1 standards.

ID = Insufficient data to calculate a representative percentage value for site

FIGURE 4

Percentage of Time REC-1 Fecal Coliform Objective Met
(200 MPN/100mL Geomean and non-exceedance of 400CFU/100mL)
for 2001-2005 Dry Seasons (April 15 - October 15)

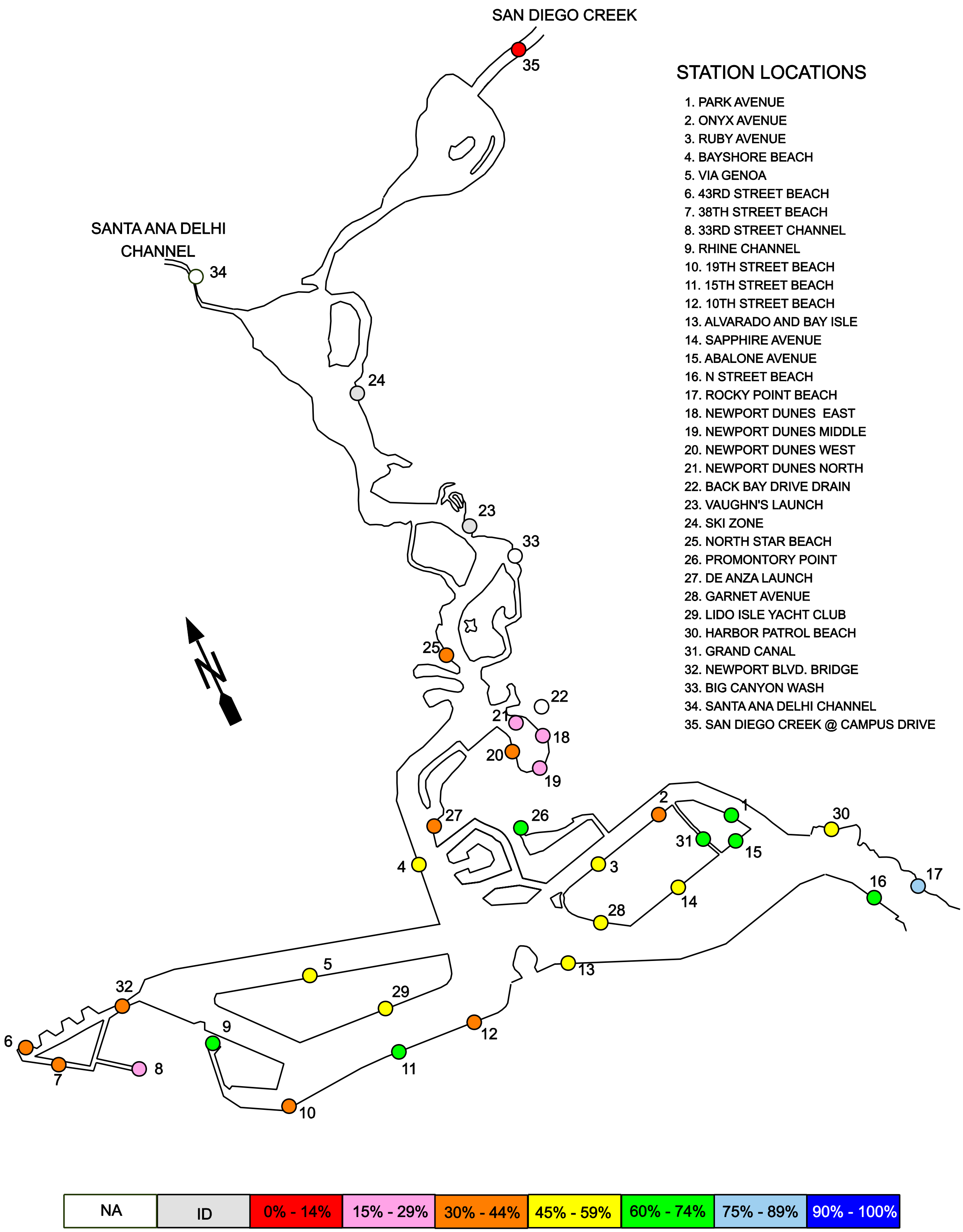


NA	ID	0% - 14%	15% - 29%	30% - 44%	45% - 59%	60% - 74%	75% - 89%	90% - 100%

NA = Not evaluated. Not assigned REC-1 standards.
ID = Insufficient data to calculate a representative percentage value for site.

FIGURE 5

Percentage of Time REC-1 Fecal Coliform Objective Met
(200 MPN/100mL Geomean and non-exceedance of 400CFU/100mL)
for 2001-2006 Wet Seasons (October 16 - April 14)



NA = Not evaluated. Not assigned REC-1 standards.

ID = Insufficient data to calculate a representative percentage value for site

TABLE 1

BACTERIOLOGICAL SAMPLING RESULTS FOR NEWPORT BAY
April 2005 - March 2006
LOWER BAY STATIONS
(Concentrations in CFU/100 mL)

	43rd Street Beach			38th Street Beach			33rd Street Channel		
	TC	**FC**	**ENT**	**TC**	**FC**	**ENT**	**TC**	**FC**	**ENT**
4/4/05	80	20	<2	1460	<10	32	5800	150	110
4/11/05	60	<10	<2	<10	<10	<2	10	<10	<2
4/18/05	60	<10	2	100	<10	<2	150	<10	<2
4/25/05	Cw/C	7200	2	Cw/C	8800	4	5400	60	<2
5/2/05	400	<10	10	80	<10	4	11000	80	265
5/9/05	140	<10	22	80	<10	6	60	10	<2
5/16/05	>210	50	20	10	<10	6	3000	>740	26
5/23/05	240	<10	10	150	<10	4	50	<10	10
5/31/05	30	<10	<2	>60	40	20	10	<10	6
6/6/05	>460	10	<2	40	<10	<2	50	<10	<2
6/15/05	130	20	8	4600	130	6	11000	660	360
6/20/05	50	<10	<2	190	30	96	40	<10	<2
6/27/05	110	<10	<2	30	30	2	20	<10	<2
7/5/05	6200	80	48	2000	70	44	600	70	30
7/11/05	30	<10	<2	70	<10	<2	520	10	2
7/18/05	100	<10	4	2000	80	10	600	<10	72
7/25/05	270	50	<2	Cw/C	380	242	Cw/C	4400	200
8/2/05	7400	350	10	200	<10	2	<10	10	20
8/8/05	160	<10	<2	600	10	4	TNTC	2000	204
8/15/05	160	20	4	410	<10	6	100	<10	8
8/22/05	120	<10	8	380	10	10	480	10	52
8/29/05	40	<10	2	<10	<10	<2	800	30	20
9/6/05	30	<10	4	<10	<10	2	14000	100	200
9/14/05	30	<10	<2	40	<10	4	40	<10	4
9/19/05	70	<10	2	40	<10	4	30	<10	<2
9/28/05	>570	10	2	30	<10	2	100	20	10
10/3/05	80	10	<2	30	<10	<2	230	<10	2
10/11/05	3400	340	20	140	<10	2	210	<10	30
10/17/05	35000	5000	840	20000	Cw/C	980	13000	Cw/C	2000
10/24/05	100	10	6	220	<10	44	100	10	10
10/31/05	60	<10	2	280	80	120	1000	10	319
11/7/05	5000	80	32	40	<10	<2	20	<10	8
11/14/05	130	10	8	110	<10	34	190	<10	48
11/21/05	20	<10	2	<10	<10	4	10	<10	<2
11/30/05	480	180	309	350	<10	10	230	<10	6
12/5/05	70	20	<2	30	<10	6	40	<10	<2
12/12/05	260	<10	30	20	<10	4	>970	60	24
12/19/05	20	<10	6	40	<10	6	80	<10	8
12/27/05	70	<10	4	210	<10	32	34200	430	84
1/3/06	79000	4000	650	105000	3000	1440	96000	6000	1250
1/9/06	1640	<10	20	140	30	10	2400	50	150
1/17/06	20	<10	4	10	<10	2	10	<10	2
1/23/06	>480	50	2	30	<10	22	210	10	34
1/30/06	<10	<10	6	<10	<10	4	10	<10	<2
2/6/06	<10	<10	<2	40	<10	8	110	60	24
2/14/06	10	<10	<2	<10	<10	<2	60	<10	6
2/21/06	1400	280	333	230	<10	30	20	<10	8
2/27/06	95	<10	4	70	<10	2	>1520	180	38
3/6/06	1620	20	10	20	<10	<2	150	10	40
3/15/06	40	<10	8	<10	<10	<2	20	<10	<2
3/20/06	50	<10	26	<10	<10	<2	60	10	8
3/27/06	250	10	8	10	10	<2	11000	170	110

Sampling results possibly influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

Data provided by County of Orange Health Care Agency

TC = Total Coliforms **ENT** = Enterococci **Cw/C** = Confluent Growth with Coliforms

FC = Fecal Coliforms **NS** = Not Sampled **TNTC** = Too Numerous To Count

TABLE 1

BACTERIOLOGICAL SAMPLING RESULTS FOR NEWPORT BAY
April 2005 - March 2006
LOWER BAY STATIONS

(Concentrations in CFU/100 mL)

	Lido Yacht Club Beach			Via Genoa Beach			Newport Blvd. Bridge		
	TC	**FC**	**ENT**	**TC**	**FC**	**ENT**	**TC**	**FC**	**ENT**
4/4/05	150	40	2	20	20	<2	Cw/C	880	386
4/11/05	100	60	<2	<10	<10	<2	1070	70	4
4/18/05	300	420	2	60	<10	<2	35000	180	8
4/25/05	Cw/C	16000	<2	Cw/C	7000	<2	Cw/C	9600	4
5/2/05	600	450	1000	100	<10	2	14000	1040	110
5/9/05	1500	930	20	210	20	2	21200	16000	2
5/16/05	1210	1610	20	80	30	10	Cw/C	4600	398
5/23/05	3400	3000	160	30	10	6	>980	40	10
5/31/05	100	60	2	10	10	2	TNTC	80	46
6/6/05	30	<10	42	<10	10	2	<10	<10	<2
6/15/05	50	50	<2	10	<10	<2	Cw/C	150	10
6/20/05	140	80	10	30	<10	2	20	<10	<2
6/27/05	120	80	26	10	<10	4	650	10	8
7/5/05	430	180	30	30	10	2	4000	130	140
7/11/05	10	10	<2	10	<10	<2	4600	60	2
7/18/05	230	50	34	<10	10	2	40	10	<2
7/25/05	740	400	30	20	<10	2	280	20	10
8/2/05	80	10	6	70	20	6	400	100	20
8/8/05	30	10	6	50	<10	6	10	<10	2
8/15/05	70	80	34	10	<10	4	50	<10	4
8/22/05	60	<10	6	10	<10	2	80	<10	2
8/29/05	30	50	44	<10	20	<2	40	10	4
9/6/05	<10	<10	<2	<10	10	2	100	10	<2
9/14/05	20	10	8	40	10	2	60	<10	2
9/19/05	40	<10	4	10	<10	2	80	<10	<2
9/28/05	30	30	10	10	10	<2	630	<10	6
10/3/05	>180	30	120	<10	<10	<2	210	<10	2
10/11/05	10	10	2	10	10	2	170	50	<2
10/17/05	200	40	10	610	80	99	Cw/C	54000	15000
10/24/05	12000	13000	46	50	<10	4	590	260	2
10/31/05	120	<10	2	10	<10	<2	5800	100	250
11/7/05	10	10	<2	<10	<10	<2	480	10	4
11/14/05	<10	10	4	20	10	24	19000	210	1000
11/21/05	<10	10	2	<10	<10	2	110	10	4
11/30/05	30	30	10	230	100	58	150	<10	6
12/5/05	20	<10	<2	<10	<10	66	10	<10	<2
12/12/05	10	<10	<2	60	<10	98	19000	230	224
12/19/05	70	<10	2	140	<10	30	1240	190	2
12/27/05	<10	<10	4	300	300	150	11000	240	277
1/3/06	Cw/C	12000	6000	138000	7000	10000	93000	4000	5000
1/9/06	60	30	10	130	<10	20	Cw/C	16000	400
1/17/06	60	<10	10	30	<10	2	770	<10	20
1/23/06	40	10	10	10	<10	10	3400	150	140
1/30/06	10	<10	<2	30	<10	2	110	<10	4
2/6/06	<10	10	10	30	50	48	33200	280	130
2/14/06	<10	<10	8	<10	10	6	70	10	<2
2/21/06	1480	10	4	30	<10	<2	29600	240	335
2/27/06	60	50	2	60	40	110	16000	3400	1000
3/6/06	50	10	<2	60	20	4	50	<10	<2
3/15/06	200	190	44	<10	<10	<2	<10	<10	<2
3/20/06	10000	60	<2	5800	<10	4	4000	<10	<2
3/27/06	170	70	<2	10	10	6	770	100	400

(shaded) Sampling results possibly influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

Data provided by County of Orange Health Care Agency

TC = Total Coliforms **ENT** = Enterococci **Cw/C** = Confluent Growth with Coliforms

FC = Fecal Coliforms **NS** = Not Sampled **TNTC** = Too Numerous To Count

TABLE 1

BACTERIOLOGICAL SAMPLING RESULTS FOR NEWPORT BAY
April 2005 - March 2006
LOWER BAY STATIONS
(Concentrations in CFU/100 mL)

	Rhine Channel			19th Street Beach			15th Street Beach		
	TC	FC	ENT	TC	FC	ENT	TC	FC	ENT
4/4/05	10	<10	<2	40	40	<2	30	<10	<2
4/11/05	10	<10	<2	80	<10	<2	10	<10	<2
4/18/05	100	10	<2	30	<10	<2	37800	20	68
4/25/05	Cw/C	20400	4	Cw/C	TNTC	52	Cw/C	14000	20
5/2/05	150	<10	6	<10	10	2	100	<10	6
5/9/05	650	<10	2	460	10	2	920	<10	24
5/16/05	130	30	50	90	10	<2	20	<10	2
5/23/05	120	<10	8	<10	<10	<2	50	50	8
5/31/05	70	<10	<2	10	<10	<2	<10	20	2
6/6/05	130	30	2	<10	<10	<2	80	50	2
6/15/05	20	<10	<2	20	<10	<2	50	<10	<2
6/20/05	20	10	<2	<10	<10	<2	20	10	<2
6/27/05	30	20	<2	<10	<10	4	<10	<10	<2
7/5/05	80	<10	<2	480	<10	<2	750	20	<2
7/11/05	140	70	28	<10	<10	<2	20	<10	2
7/18/05	20	<10	8	80	40	<2	20	<10	48
7/25/05	30	<10	8	10	<10	<2	10	<10	<2
8/2/05	100	20	6	40	<10	46	50	10	4
8/8/05	150	<10	6	30	<10	4	10	<10	<2
8/15/05	300	<10	<2	210	<10	4	250	<10	<2
8/22/05	320	30	4	20	10	<2	10	<10	2
8/29/05	50	<10	2	40	<10	10	60	<10	<2
9/6/05	10	<10	<2	<10	<10	<2	10	<10	<2
9/14/05	60	20	<2	10	10	<2	140	10	<2
9/19/05	270	<10	2	10	<10	<2	10	<10	<2
9/28/05	220	80	4	120	40	2	290	10	<2
10/3/05	70	10	4	<10	<10	<2	10	10	<2
10/11/05	100	<10	<2	10	<10	<2	100	<10	4
10/17/05	5000	390	770	800	99	240	1000	110	160
10/24/05	170	50	6	30	20	4	30	10	<2
10/31/05	80	<10	2	20	10	<2	20	<10	<2
11/7/05	10	<10	2	120	110	216	<10	<10	<2
11/14/05	60	10	2	<10	<10	2	190	10	20
11/21/05	10	<10	<2	10	10	8	10	<10	<2
11/30/05	50	20	2	10	<10	2	10	<10	<2
12/5/05	70	30	<2	230	20	30	<10	<10	2
12/12/05	60	10	26	110	24	34	80	10	2
12/19/05	460	80	<2	100	20	180	40	<10	2
12/27/05	100	10	2	130	40	22	70	<10	4
1/3/06	120000	3000	1940	168000	6000	7000	TNTC	12000	11000
1/9/06	170	<10	28	70	<10	8	290	<10	10
1/17/06	100	<10	4	600	380	30	30	<10	4
1/23/06	80	<10	4	80	40	40	<10	<10	<2
1/30/06	40	<10	<2	<10	<10	10	30	<10	2
2/6/06	10	<10	<2	<10	<10	<2	10	<10	<2
2/14/06	<10	<10	<2	10	10	<2	20	<10	<2
2/21/06	40	<10	2	2800	10	2	130	<10	<2
2/27/06	110	40	<2	80	<10	2	<10	<10	<2
3/6/06	30	10	<2	150	<10	<2	110	10	<2
3/15/06	10	<10	<2	10	<10	<2	10	<10	<2
3/20/06	19000	10	70	25200	50	2	17000	10	4
3/27/06	190	<10	358	<10	10	2	<10	<10	<2

Sampling results possibly influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

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TABLE 1

BACTERIOLOGICAL SAMPLING RESULTS FOR NEWPORT BAY
April 2005 - March 2006
LOWER BAY STATIONS
(Concentrations in CFU/100 mL)

	10th Street Beach			Alvarado/ Bay Isle Beach			N Street Beach		
	TC	**FC**	**ENT**	**TC**	**FC**	**ENT**	**TC**	**FC**	**ENT**
4/4/05	280	270	10	30	10	2	10	<10	4
4/11/05	10	<10	<2	50	<10	<2	10	<10	<2
4/18/05	10	<10	<2	110	<10	<2	80	<10	<2
4/25/05	Cw/C	6200	4	Cw/C	5600	2	4000	50	<2
5/2/05	80	<10	2	170	20	130	130	<10	4
5/9/05	230	20	<2	210	10	20	<10	10	<2
5/16/05	20	<10	<2	10	<10	<2	10	<10	<2
5/23/05	30	<10	50	50	10	20	30	<10	<2
5/31/05	50	<10	50	100	30	22	<10	<10	<2
6/6/05	<10	<10	<2	30	10	<2	<10	<10	<2
6/15/05	10	<10	<2	30	10	<2	80	10	<2
6/20/05	<10	<10	<2	50	<10	4	<10	<10	<2
6/27/05	10	<10	<2	20	<10	<2	60	<10	6
7/5/05	30	<10	<2	80	<10	4	70	<10	2
7/11/05	<10	<10	<2	10	<10	2	20	<10	<2
7/18/05	30	<10	4	20	20	4	<10	<10	<2
7/25/05	30	<10	<2	70	20	10	40	<10	2
8/2/05	<10	10	2	40	<10	8	20	20	4
8/8/05	10	<10	<2	30	10	<2	20	<10	<2
8/15/05	20	<10	<2	<10	<10	2	40	10	<2
8/22/05	10	<10	6	20	<10	2	<10	<10	<2
8/29/05	20	<10	<2	10	20	2	30	<10	<2
9/6/05	40	<10	<2	30	10	<2	<10	10	<2
9/14/05	20	10	20	10	10	4	<10	<10	2
9/19/05	10	<10	<2	20	20	<2	<10	<10	2
9/28/05	10	30	10	<10	10	4	10	<10	<2
10/3/05	30	<10	<2	30	10	<2	30	10	<2
10/11/05	70	30	8	10	10	2	<10	<10	<2
10/17/05	170	10	40	180	10	90	99	20	10
10/24/05	180	150	310	30	10	4	<10	6	<2
10/31/05	20	30	34	10	<10	10	10	<10	4
11/7/05	60	70	4	10	10	<2	<10	20	<2
11/14/05	60	<10	<2	30	<10	10	10	<10	<2
11/21/05	<10	<10	<2	10	20	<2	<10	10	2
11/30/05	650	<10	2	20	50	8	10	<10	<2
12/5/05	10	10	4	10	<10	4	<10	<10	<2
12/12/05	280	160	150	40	30	400	10	10	2
12/19/05	20	<10	2	10	10	86	<10	<10	<2
12/27/05	380	240	44	50	60	20	40	<10	2
1/3/06	Cw/C	11000	12000	Cw/C	10000	11000	22000	520	490
1/9/06	170	80	10	70	<10	8	40	<10	70
1/17/06	3800	4400	20	<10	<10	4	<10	<10	<2
1/23/06	10	10	100	6200	5800	38	10	<10	8
1/30/06	50	<10	<2	10	<10	4	<10	<10	<2
2/6/06	10	<10	4	<10	<10	2	<10	<10	<2
2/14/06	20	<10	<2	<10	<10	<2	<10	<10	<2
2/21/06	100	<10	<2	1760	60	62	70	10	<2
2/27/06	80	20	40	10	<10	8	10	10	2
3/6/06	280	30	<2	60	20	2	20	10	4
3/15/06	<10	<10	2	<10	<10	<2	10	<10	<2
3/20/06	880	20	6	2400	<10	<2	80	<10	<2
3/27/06	10	20	<2	220	70	8	<10	<10	<2

(shaded) Sampling results possibly influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

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TABLE 1

BACTERIOLOGICAL SAMPLING RESULTS FOR NEWPORT BAY
April 2005 - March 2006
LOWER BAY STATIONS
(Concentrations in CFU/100 mL)

	Garnet Avenue Beach			Ruby Avenue Beach			Sapphire Avenue Beach		
	TC	**FC**	**ENT**	**TC**	**FC**	**ENT**	**TC**	**FC**	**ENT**
4/4/05	<10	<10	<2	10	<10	8	10	10	6
4/11/05	60	30	<2	10	<10	<2	30	10	<2
4/18/05	<10	<10	<2	20	<10	<2	<10	<10	<2
4/25/05	Cw/C	7800	10	Cw/C	7000	10	Cw/C	4200	10
5/2/05	>510	20	66	110	10	4	180	30	10
5/9/05	>80	10	20	100	20	10	100	10	10
5/16/05	30	<10	32	10	<10	<2	10	<10	<2
5/23/05	40	<10	2	30	10	10	40	10	22
5/31/05	30	10	22	40	10	4	10	<10	2
6/6/05	10	30	<2	30	10	4	110	60	6
6/15/05	20	<10	<2	50	60	<2	30	20	2
6/20/05	<10	<10	4	30	20	8	30	<10	6
6/27/05	30	<10	<2	10	<10	<2	30	<10	20
7/5/05	70	10	2	20	<10	4	10	<10	2
7/11/05	20	<10	6	<10	10	<2	20	<10	<2
7/18/05	40	<10	10	10	<10	<2	20	<10	10
7/25/05	60	<10	6	10	10	<2	60	10	10
8/2/05	30	<10	<2	10	10	<2	50	<10	6
8/8/05	10	10	8	20	<10	<2	10	20	56
8/15/05	<10	<10	2	50	<10	<2	20	<10	4
8/22/05	30	<10	22	20	<10	<2	20	<10	10
8/29/05	<10	10	<2	20	<10	4	10	<10	2
9/6/05	10	<10	2	80	<10	44	30	<10	2
9/14/05	30	50	2	20	<10	2	30	<10	2
9/19/05	>20	<10	2	580	40	6	20	10	2
9/28/05	40	10	2	70	10	<2	40	<10	2
10/3/05	70	10	2	20	30	2	>20	20	40
10/11/05	10	20	<10	20	<10	2	<10	<10	<2
10/17/05	180	40	40	280	30	40	180	120	20
10/24/05	20	<10	2	20	<10	2	40	<10	2
10/31/05	<10	10	2	<10	<10	<2	280	10	2
11/7/05	10	10	<2	40	<10	<2	110	40	54
11/14/05	<10	<10	6	<10	<10	4	<10	10	4
11/21/05	<10	<10	<2	<10	<10	4	<10	<10	<2
11/30/05	20	<10	2	50	10	<2	<10	<10	8
12/5/05	190	520	<2	20	<10	2	100	<10	<2
12/12/05	40	<10	<2	20	<10	8	<10	<10	10
12/19/05	10	<10	<2	20000	18000	<2	10	20	4
12/27/05	10	<10	<2	170	120	<2	<10	<10	<2
1/3/06	>127000	5000	7000	70000	2000	5000	86000	4000	5000
1/9/06	340	20	36	20	10	8	20	10	2
1/17/06	20	<10	2	1120	40	72	10	<10	6
1/23/06	40	<10	6	<10	<10	4	<10	<10	<2
1/30/06	10	<10	<2	620	640	62	30	10	<2
2/6/06	40	<10	<2	10	<10	<2	<10	<10	<2
2/14/06	10	<10	<2	20	<10	<2	10	<10	<2
2/21/06	1660	10	<2	50	<10	<2	50	<10	<2
2/27/06	<10	<10	8	<10	<10	6	10	<10	<2
3/6/06	40	10	8	30	<10	4	20	<10	<2
3/15/06	10	<10	<2	<10	<10	2	<10	<10	<2
3/20/06	760	<10	10	10	<10	<2	5400	10	20
3/27/06	350	10	72	10	<10	4	<10	<10	<2

Sampling results possibly influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

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TABLE 1

BACTERIOLOGICAL SAMPLING RESULTS FOR NEWPORT BAY
April 2005 - March 2006
LOWER BAY STATIONS
(Concentrations in CFU/100 mL)

	Grand Canal			Abalone Avenue Beach			Park Avenue Beach		
	TC	**FC**	**ENT**	**TC**	**FC**	**ENT**	**TC**	**FC**	**ENT**
4/4/05	10	<10	10	10	20	6	10	<10	<2
4/11/05	40	<10	<2	20	<10	<2	30	<10	<2
4/18/05	30	30	6	20	10	<2	10	<10	<2
4/25/05	Cw/C	730	8	21800	210	4	Cw/C	4800	10
5/2/05	>1000	40	86	170	<10	4	130	10	8
5/9/05	140	30	20	20	<10	<2	150	<10	4
5/16/05	50	10	40	30	<10	2	30	<10	<2
5/23/05	100	20	2	30	<10	6	80	10	6
5/31/05	<10	20	2	30	10	4	40	<10	4
6/6/05	10	<10	4	20	20	<2	100	20	<2
6/15/05	60	<10	<2	10	<10	2	10	10	<2
6/20/05	<10	10	2	<10	10	<2	10	<10	2
6/27/05	<10	20	4	10	<10	2	20	<10	8
7/5/05	<10	<10	<2	10	<10	6	20	20	2
7/11/05	500	470	10	10	<10	<2	70	10	<2
7/18/05	40	10	2	<10	<10	44	200	10	8
7/25/05	50	70	2	60	<10	<2	60	<10	<2
8/2/05	10	30	6	>280	110	2	150	20	10
8/8/05	30	<10	6	220	120	800	20	<10	<2
8/15/05	40	10	6	20	60	22	30	<10	2
8/22/05	50	10	2	10	<10	<2	10	<10	4
8/29/05	80	60	26	20	10	4	180	50	8
9/6/05	40	40	10	<10	<10	<2	80	<10	6
9/14/05	10	<10	2	10	<10	2	50	<10	6
9/19/05	<10	<10	<2	<10	<10	2	30	<10	2
9/28/05	80	30	<2	30	10	<2	40	<10	<2
10/3/05	30	20	4	10	<10	<2	>20	10	54
10/11/05	20	20	20	<10	10	<2	30	10	22
10/17/05	50	20	20	70	<10	10	470	60	30
10/24/05	100	70	8	20	<10	<2	40	<10	2
10/31/05	10	10	<2	>20	<10	6	60	20	2
11/7/05	<10	10	<2	30	<10	4	150	20	4
11/14/05	110	70	4	60	40	4	40	10	2
11/21/05	30	10	4	10	<10	<2	170	<10	<2
11/30/05	10	20	4	<10	<10	22	20	<10	2
12/5/05	10	<10	20	<10	<10	<2	<10	<10	<2
12/12/05	20	<10	2	10	10	20	20	<10	<2
12/19/05	<10	<10	<2	10	10	<2	<10	<10	2
12/27/05	20	30	<2	20	<10	8	20	<10	4
1/3/06	54000	1000	1400	65000	2000	1740	67000	4000	1730
1/9/06	70	20	10	20	<10	8	20	10	2
1/17/06	<10	<10	<2	270	<10	54	50	<10	<2
1/23/06	20	10	<2	<10	<10	<2	780	10	4
1/30/06	10	10	10	<10	<10	<2	10	<10	<2
2/6/06	40	30	<2	<10	<10	2	<10	<10	2
2/14/06	<10	10	2	230	170	6	<10	<10	2
2/21/06	70	<10	6	180	<10	10	120	<10	<2
2/27/06	20	<10	<2	20	<10	<2	<10	10	4
3/6/06	NS	NS	NS	20	20	<2	70	10	<2
3/15/06	<10	<10	<2	<10	<10	<2	<10	<10	<2
3/20/06	1910	<10	6	4800	<10	<2	2600	<10	<2
3/27/06	10	10	2	10	<10	<2	10	<10	2

(Shaded) Sampling results possibly influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

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TABLE 1

BACTERIOLOGICAL SAMPLING RESULTS FOR NEWPORT BAY
April 2005 - March 2006
LOWER BAY STATIONS
(Concentrations in CFU/100 mL)

	Onyx Avenue Beach			Promontory Point Channel			Harbor Patrol Beach		
	TC	**FC**	**ENT**	**TC**	**FC**	**ENT**	**TC**	**FC**	**ENT**
4/4/05	70	60	2	50	10	<2	>40	10	2
4/11/05	30	<10	10	20	<10	<2	510	430	30
4/18/05	30	10	4	20	<10	<2	150	80	<2
4/25/05	Cw/C	7400	20	Cw/C	4600	6	Cw/C	>820	6
5/2/05	270	120	160	<10	<10	<2	230	10	54
5/9/05	240	20	6	200	<10	6	3000	810	273
5/16/05	20	<10	4	<10	<10	<2	>200	110	30
5/23/05	20	10	8	10	<10	<2	>400	400	120
5/31/05	60	<10	24	<10	<10	<2	730	650	10
6/6/05	40	<10	6	<10	<10	<2	>140	50	160
6/15/05	40	10	4	<10	<10	<2	>130	80	<2
6/20/05	10	<10	2	<10	<10	<2	50	<10	<2
6/27/05	30	30	8	<10	<10	<2	1130	80	20
7/5/05	40	<10	6	10	<10	<2	20	30	22
7/11/05	10	10	<2	10	<10	<2	60	30	2
7/18/05	80	10	2	<10	<10	<2	30	10	6
7/25/05	<10	10	4	10	<10	2	40	<10	4
8/2/05	60	20	6	<10	<10	<2	>300	100	72
8/8/05	30	10	2	30	<10	2	500	60	40
8/15/05	<10	10	<2	<10	<10	<2	60	50	10
8/22/05	<10	10	<2	180	<10	<2	80	10	10
8/29/05	20	10	2	<10	<10	2	30	<10	<2
9/6/05	10	10	82	<10	<10	<2	10	<10	2
9/14/05	60	20	4	<10	<10	<2	20	<10	<2
9/19/05	400	10	4	10	<10	<2	30	<10	2
9/28/05	40	<10	2	<10	<10	<2	<10	<10	4
10/3/05	60	10	<2	<10	<10	<2	10	20	6
10/11/05	30	<10	<2	20	<10	4	<10	<10	2
10/17/05	1070	540	5000	90	<10	40	250	10	70
10/24/05	10	<10	2	<10	<10	<2	110	70	20
10/31/05	30	<10	<2	<10	<10	2	20	10	10
11/7/05	<10	10	<2	<10	<10	<2	40	10	4
11/14/05	70	60	130	<10	<10	2	10	30	6
11/21/05	20	<10	8	20	<10	<2	10	<10	<2
11/30/05	100	<10	800	<10	<10	2	80	20	10
12/5/05	20	<10	<2	10	<10	<2	10	<10	<2
12/12/05	<10	10	2	<10	<10	2	10	<10	6
12/19/05	<10	<10	<2	<10	<10	<2	10	<10	2
12/27/05	30	<10	8	<10	<10	<2	40	10	<2
1/3/06	63000	2000	1340	37000	1080	1560	35000	820	1010
1/9/06	30	<10	6	10	<10	<2	>800	50	94
1/17/06	20	<10	2	<10	<10	<2	50	<10	20
1/23/06	10	20	8	<10	<10	2	10	<10	<2
1/30/06	60	20	20	<10	<10	<2	>10	<10	36
2/6/06	10	<10	2	<10	<10	2	20	40	10
2/14/06	20	<10	10	<10	<10	<2	50	<10	10
2/21/06	10	<10	<2	20	20	8	110	10	<2
2/27/06	120	70	36	<10	<10	<2	70	80	8
3/6/06	10	<10	<2	70	<10	2	70	20	4
3/15/06	<10	<10	2	<10	<10	<2	80	40	30
3/20/06	<10	<10	2	<10	<10	<2	1880	50	20
3/27/06	80	40	4	<10	<10	<2	>60	30	26

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TABLE 1

BACTERIOLOGICAL SAMPLING RESULTS FOR NEWPORT BAY
April 2005 - March 2006
LOWER BAY STATIONS

(Concentrations in CFU/100 mL)

	Rocky Point Beach		
	TC	**FC**	**ENT**
4/4/05	10	<10	<2
4/11/05	10	<10	<2
4/18/05	30	10	<2
4/25/05	1390	30	28
5/2/05	80	<10	<2
5/9/05	10	<10	2
5/16/05	60	40	6
5/23/05	300	20	8
5/31/05	50	10	<2
6/6/05	>50	<10	8
6/15/05	20	<10	<2
6/20/05	30	<10	<2
6/27/05	30	<10	<2
7/5/05	50	<10	<2
7/11/05	<10	10	<2
7/18/05	<10	<10	2
7/25/05	60	<10	<2
8/2/05	30	20	60
8/8/05	20	<10	<2
8/15/05	>230	20	4
8/22/05	180	10	<2
8/29/05	340	80	10
9/6/05	<10	<10	<2
9/14/05	20	<10	2
9/19/05	100	<10	4
9/28/05	20	<10	<2
10/3/05	10	<10	<2
10/11/05	10	<10	<2
10/17/05	>30	<10	<10
10/24/05	20	<10	4
10/31/05	80	<10	8
11/7/05	10	<10	<2
11/14/05	<10	10	2
11/21/05	<10	<10	<2
11/30/05	10	<10	<2
12/5/05	20	<10	80
12/12/05	<10	<10	<2
12/19/05	<10	<10	<2
12/27/05	<10	10	4
1/3/06	590	10	40
1/9/06	50	10	2
1/17/06	<10	<10	<2
1/23/06	<10	<10	<2
1/30/06	10	<10	10
2/6/06	<10	10	<2
2/14/06	<10	<10	<2
2/21/06	60	<10	2
2/27/06	<10	10	<2
3/6/06	50	10	2
3/15/06	<10	<10	<2
3/20/06	110	<10	4
3/27/06	<10	<10	<2

Sampling results possibly influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

Data provided by County of Orange Health Care Agency

TC = Total Coliforms **ENT** = Enterococci **Cw/C** = Confluent Growth with Coliforms

FC = Fecal Coliforms **NS** = Not Sampled **TNTC** = Too Numerous To Count

TABLE 1

BACTERIOLOGICAL SAMPLING RESULTS FOR NEWPORT BAY
April 2005 - March 2006
UPPER BAY STATIONS
(Concentrations in CFU/100 mL)

	Newport Dunes - Middle			Newport Dunes - West			Newport Dunes - East		
	TC	FC	ENT	TC	FC	ENT	TC	FC	ENT
4/4/05	70	50	10	70	20	2	330	170	56
4/11/05	60	10	10	10	20	<2	130	60	6
4/18/05	10	<10	<2	660	460	160	320	<10	<2
4/25/05	Cw/C	11000	6	Cw/C	9400	20	Cw/C	19000	20
5/2/05	690	50	36	600	20	10	>1150	260	60
5/9/05	1250	30	4	680	60	2	1720	110	6
5/16/05	10	20	30	<10	<10	6	<10	<10	6
5/23/05	20	10	2	<10	<10	6	10	20	2
5/31/05	>40	10	20	>350	10	2	>10	<10	<2
6/6/05	10	<10	<2	<10	<10	2	<10	<10	<2
6/15/05	20	20	10	110	40	10	60	<10	34
6/20/05	50	20	2	10	<10	2	60	10	2
6/27/05	<10	10	4	<10	<10	24	<10	<10	<2
7/5/05	40	10	6	10	<10	<2	30	<10	10
7/11/05	10	10	<2	<10	<10	<2	30	<10	<2
7/18/05	40	10	20	10	<10	<2	140	20	10
7/25/05	10	<10	<2	50	<10	<2	70	<10	<2
8/2/05	400	<10	2	150	80	20	1320	30	6
8/8/05	40	<10	6	30	<10	4	120	60	6
8/15/05	10	10	8	<10	10	2	10	10	<2
8/22/05	<10	<10	2	<10	<10	<2	40	10	4
8/29/05	20	<10	<2	10	10	2	20	<10	<2
9/6/05	<10	<10	<2	10	<10	<2	40	<10	<2
9/14/05	2800	<10	20	2400	20	20	260	<10	4
9/19/05	40	10	<2	10	<10	<2	30	<10	4
9/28/05	40	<10	2	60	<10	<2	40	<10	<2
10/3/05	30	<10	10	2000	50	100	50	30	10
10/11/05	>400	<10	32	80	<10	20	30	<10	4
10/17/05	10000	390	470	15000	410	650	4000	310	480
10/24/05	60	30	2	130	<10	8	100	20	6
10/31/05	20	<10	<2	20	20	<2	390	130	<2
11/7/05	60	<10	2	40	10	4	50	10	<2
11/14/05	170	100	22	110	40	8	210	110	30
11/21/05	<10	<10	<2	10	<10	<2	30	30	2
11/30/05	130	60	8	80	70	8	200	80	34
12/5/05	10	20	4	20	20	4	10	<10	4
12/12/05	70	<10	8	40	20	2	70	100	6
12/19/05	110	20	600	20	<10	120	110	110	68
12/27/05	50	50	2	60	20	2	330	160	26
1/3/06	Cw/C	Cw/C	27000	Cw/C	14000	30000	Cw/C	Cw/C	28400
1/9/06	1010	450	58	2000	570	150	1000	840	70
1/17/06	30	50	4	10	<10	2	10	<10	2
1/23/06	1140	670	600	480	350	1000	380	270	58
1/30/06	<10	20	2	10	10	<2	50	10	10
2/6/06	420	420	84	210	230	66	4800	5600	600
2/14/06	80	80	4	60	30	8	80	40	4
2/21/06	8400	80	2	6600	50	2	5600	100	<2
2/27/06	80	20	6	50	20	6	50	70	10
3/6/06	310	60	<2	390	390	10	580	380	10
3/15/06	50	<10	2	60	10	4	40	20	6
3/20/06	Cw/C	440	200	Cw/C	540	210	Cw/C	350	230
3/27/06	100	60	26	80	30	10	410	280	100

(Shaded) Sampling results possibly influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

TC = Total Coliforms **ENT** = Enterococci **Cw/C** = Confluent Growth with Coliforms
FC = Fecal Coliforms **NS** = Not Sampled **TNTC** = Too Numerous To Count

TABLE 1

BACTERIOLOGICAL SAMPLING RESULTS FOR NEWPORT BAY
April 2005 - March 2006
UPPER BAY STATIONS
(Concentrations in CFU/100 mL)

	Newport Dunes - North			Vaughn's Launch			Ski Zone		
	TC	**FC**	**ENT**	**TC**	**FC**	**ENT**	**TC**	**FC**	**ENT**
4/4/05	7200	6200	200	420	20	68	100	<10	6
4/11/05	80	70	4	NS	NS	NS	NS	NS	NS
4/18/05	70	30	<2	NS	NS	NS	NS	NS	NS
4/25/05	Cw/C	TNTC	24	NS	NS	NS	NS	NS	NS
5/2/05	>960	220	58	5800	680	291	NS	NS	NS
5/9/05	550	40	10	NS	NS	NS	NS	NS	NS
5/16/05	<10	10	52	NS	NS	NS	NS	NS	NS
5/23/05	20	40	10	NS	NS	NS	NS	NS	NS
5/31/05	>10	<10	<2	>20	10	10	NS	NS	NS
6/6/05	10	<10	8	NS	NS	NS	NS	NS	NS
6/15/05	20	<10	46	NS	NS	NS	NS	NS	NS
6/20/05	70	20	4	>50	30	6	NS	NS	NS
6/27/05	10	<10	<2	NS	NS	NS	NS	NS	NS
7/5/05	30	<10	2	Cw/C	<10	20	NS	NS	NS
7/11/05	50	10	24	NS	NS	NS	NS	NS	NS
7/18/05	120	100	4	NS	NS	NS	NS	NS	NS
7/25/05	4600	10	20	NS	NS	NS	NS	NS	NS
8/2/05	60	<10	10	>10	<10	92	NS	NS	NS
8/8/05	480	340	74	NS	NS	NS	NS	NS	NS
8/15/05	120	100	28	50	<10	30	NS	NS	NS
8/22/05	>10	10	46	<10	<10	8	<10	<10	4
8/29/05	140	50	8	<10	10	2	NS	NS	NS
9/6/05	120	10	4	20	<10	6	100	<10	10
9/14/05	60	<10	8	>10	<10	10	NS	NS	NS
9/19/05	10	<10	<2	>80	30	110	NS	NS	NS
9/28/05	10	10	4	>200	100	246	NS	NS	NS
10/3/05	20	10	6	10	10	8	>10	10	24
10/11/05	20	<10	4	>30	10	26	NS	NS	NS
10/17/05	11000	170	360	800	130	160	13000	490	450
10/24/05	430	40	90	>210	70	38	NS	NS	NS
10/31/05	60	30	<2	>80	50	100	NS	NS	NS
11/7/05	40	10	<2	80	10	200	<10	<10	10
11/14/05	50	40	4	70	40	120	80	70	130
11/21/05	10	<10	<2	50	40	10	NS	NS	NS
11/30/05	60	20	10	30	<10	70	220	190	10
12/5/05	40	<10	6	10	<10	38	100	10	4
12/12/05	100	70	10	40	10	6	130	10	110
12/19/05	50	20	6	NS	NS	NS	NS	NS	NS
12/27/05	110	100	10	150	60	68	20	10	12
1/3/06	Cw/C	17000	27000	Cw/C	28000	59000	Cw/C	56000	98000
1/9/06	370	150	34	570	110	56	NS	NS	NS
1/17/06	280	10	20	NS	NS	NS	NS	NS	NS
1/23/06	>420	10	26	NS	NS	NS	NS	NS	NS
1/30/06	60	10	2	40	10	94	NS	NS	NS
2/6/06	130	100	10	NS	NS	NS	NS	NS	NS
2/14/06	500	330	76	130	60	10	100	50	10
2/21/06	5000	380	48	NS	NS	NS	NS	NS	NS
2/27/06	320	100	24	110	80	24	30	20	8
3/6/06	450	140	76	NS	NS	NS	NS	NS	NS
3/15/06	60	20	10	210	20	58	320	10	2
3/20/06	Cw/C	340	180	NS	NS	NS	NS	NS	NS
3/27/06	80	20	10	50	<10	6	>30	<10	10

[shaded] Sampling results possibly influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

TC = Total Coliforms   **ENT** = Enterococci   **Cw/C** = Confluent Growth with Coliforms
FC = Fecal Coliforms   **NS** = Not Sampled   **TNTC** = Too Numerous To Count

TABLE 1

BACTERIOLOGICAL SAMPLING RESULTS FOR NEWPORT BAY
April 2005 - March 2006
UPPER BAY STATIONS
(Concentrations in CFU/100 mL)

	North Star Beach			De Anza Launch			Bayshore Beach		
	TC	FC	ENT	TC	FC	ENT	TC	FC	ENT
4/4/05	<10	<10	10	40	<10	2	40	30	4
4/11/05	80	10	2	10	<10	2	10	<10	<2
4/18/05	<10	<10	<2	40	<10	<2	20	<10	<2
4/25/05	Cw/C	Cw/C	140	Cw/C	TNTC	42	Cw/C	8000	40
5/2/05	>680	<10	24	NS	NS	NS	>710	10	34
5/9/05	3400	160	36	440	10	10	320	<10	<2
5/16/05	10	<10	2	70	10	2	50	20	2
5/23/05	50	<10	6	20	10	<2	>40	30	362
5/31/05	50	<10	4	<10	<10	<2	40	10	2
6/6/05	40	10	4	<10	<10	<2	30	<10	6
6/15/05	130	30	<2	40	10	<2	60	<10	2
6/20/05	10	10	2	20	<10	8	10	<10	<2
6/27/05	<10	<10	<2	10	<10	<2	10	<10	<2
7/5/05	250	220	64	10	<10	2	50	10	10
7/11/05	20	30	2	<10	<10	<2	30	10	<2
7/18/05	20	<10	36	60	<10	<2	60	<10	2
7/25/05	10	20	4	70	20	2	50	<10	4
8/2/05	30	<10	6	60	<10	2	20	10	2
8/8/05	20	<10	<2	20	<10	2	10	20	2
8/15/05	30	20	2	<10	<10	4	80	<10	10
8/22/05	10	<10	2	10	<10	4	100	40	24
8/29/05	30	10	2	10	<10	<2	70	10	6
9/6/05	<10	<10	<2	<10	<10	<2	20	<10	<2
9/14/05	<10	10	8	100	30	<2	4	<10	2
9/19/05	20	<10	<2	40	<10	2	40	10	<2
9/28/05	60	<10	2	20	<10	2	80	10	24
10/3/05	34200	<10	98	20	<10	<2	20	<10	4
10/11/05	60	<10	2	10	10	<2	70	20	4
10/17/05	830	99	80	310	30	99	200	20	40
10/24/05	100	30	10	80	10	4	40	<10	<2
10/31/05	70	30	8	30	<10	2	10	<10	2
11/7/05	120	<10	10	80	100	22	60	10	8
11/14/05	10	<10	8	10	<10	4	150	<10	24
11/21/05	50	<10	10	<10	<10	<2	<10	<10	<2
11/30/05	40	<10	8	13000	590	2000	10	10	2
12/5/05	10	<10	10	20	<10	10	10	<10	2
12/12/05	10	10	8	10	<10	2	10	20	<2
12/19/05	50	<10	4	60	<10	2	60	10	<2
12/27/05	20	20	2	50	10	8	130	10	210
1/3/06	Cw/C	21000	42000	Cw/C	17000	25000	92000	4000	6000
1/9/06	480	40	40	100	10	10	100	10	2
1/17/06	440	<10	92	10	<10	2	<10	<10	6
1/23/06	40	<10	20	40	30	10	10	<10	6
1/30/06	20	<10	6	210	10	210	<10	<10	<2
2/6/06	50	<10	4	10	<10	<2	150	10	2
2/14/06	100	70	2	760	310	10	<10	<10	20
2/21/06	Cw/C	350	4	8400	80	2	11000	100	10
2/27/06	<10	10	2	20	<10	<2	20	20	<2
3/6/06	>1080	210	22	420	50	2	370	60	2
3/15/06	100	<10	4	50	<10	<2	20	<10	2
3/20/06	Cw/C	1000	800	Cw/C	550	120	Cw/C	120	54
3/27/06	60	<10	10	30	<10	4	20	20	4

(Shaded) Sampling results possibly influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

TC = Total Coliforms **ENT** = Enterococci **Cw/C** = Confluent Growth with Coliforms
FC = Fecal Coliforms **NS** = Not Sampled **TNTC** = Too Numerous To Count

TABLE 1

BACTERIOLOGICAL SAMPLING RESULTS FOR NEWPORT BAY
April 2005 - March 2006
TRIBUTARY STATIONS

(Concentrations in CFU/100 mL)

	San Diego Creek - Campus Dr.			Santa Ana Delhi Channel			Big Canyon Wash		
	TC	FC	ENT	TC	FC	ENT	TC	FC	ENT
4/4/05	2200	210	110	7500	470	253	>260	70	64
4/11/05	>770	100	4	>6300	170	4200	NS	NS	NS
4/18/05	7200	1000	20	58000	13000	190	>180	70	24
4/25/05	Cw/C	Cw/C	TNTC	Cw/C	TNTC	110	12000	520	4
5/2/05	22000	1000	2600	>9900	760	1000	2000	20	22
5/9/05	>9100	560	800	>10000	650	285	NS	NS	NS
5/16/05	5900	430	204	>220	100	64	220	<10	2
5/23/05	>2300	100	48	>600	200	150	>520	40	22
5/31/05	>690	80	34	>1800	320	180	>420	80	96
6/6/05	>480	50	10	>420	140	100	NS	NS	NS
6/15/05	2300	10	10	>1220	190	160	NS	NS	NS
6/20/05	>1220	30	36	>250	140	56	>750	220	48
6/27/05	>130	70	24	>450	160	130	>450	60	60
7/5/05	>1300	100	20	>2500	420	6	3200	220	40
7/11/05	>380	<10	10	>800	710	100	>160	80	42
7/18/05	>800	30	10	>5600	280	190	15000	10	100
7/25/05	>5400	60	6	>5300	4600	364	NS	NS	NS
8/2/05	>900	30	28	68000	18000	6200	>2000	80	60
8/8/05	>2100	30	22	>112000	19000	1000	4800	80	92
8/15/05	>1900	100	10	>5500	570	360	2600	350	170
8/22/05	1200	10	<2	>6200	580	263	2400	360	180
8/29/05	>1100	<10	2	>3100	580	208	3000	320	72
9/6/05	>1100	10	10	3400	400	236	>720	190	72
9/14/05	>750	10	8	>5700	490	277	>310	10	28
9/19/05	>700	10	10	2900	1010	224	>420	100	52
9/28/05	7000	260	170	38000	TNTC	TNTC	4200	70	56
10/3/05	>3900	220	38	>7600	830	368	5800	200	160
10/11/05	4300	150	10	>6400	2600	224	2400	140	76
10/17/05	Cw/C	72000	69000	Cw/C	Cw/C	140000	48000	18000	23000
10/24/05	>6900	800	228	>9000	2600	342	3600	150	78
10/31/05	3200	130	26	23000	390	348	3400	160	130
11/7/05	2200	100	42	4300	1120	221	>420	200	120
11/14/05	58000	420	58	28000	930	2000	3000	100	120
11/21/05	8000	140	20	4200	560	218	2800	290	140
11/30/05	4500	240	60	>7300	1170	368	>610	170	228
12/5/05	61000	500	20	29000	1000	400	8600	210	140
12/12/05	>14000	130	62	20000	250	287	1000	250	94
12/19/05	2800	70	20	10300	280	120	NS	NS	NS
12/27/05	1900	60	42	Cw/C	3800	2000	4800	450	160
1/3/06	Cw/C	36000	178000	Cw/C	14000	31000	52000	1000	7000
1/9/06	>7200	320	200	27000	210	1000	>710	110	86
1/17/06	>3200	130	226	44000	200	170	NS	NS	NS
1/23/06	>790	80	120	2700	70	80	>560	130	210
1/30/06	1300	30	10	>5400	150	230	2600	110	88
2/6/06	>420	80	30	2800	180	44	>680	320	120
2/14/06	1600	30	38	4000	130	68	13000	250	100
2/21/06	41000	3000	44	132000	3600	180	NS	NS	NS
2/27/06	3600	50	10	10500	210	82	>1080	280	120
3/6/06	6900	220	150	5600	200	218	>420	120	140
3/15/06	29000	80	58	6200	350	180	4800	200	78
3/20/06	Cw/C	2200	6200	112000	440	267	2800	210	190
3/27/06	>3000	30	56	>10800	340	170	>430	30	98

[shaded] Sampling results possibly influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

TC = Total Coliforms **ENT** = Enterococci **Cw/C** = Confluent Growth with Coliforms
FC = Fecal Coliforms **NS** = Not Sampled **TNTC** = Too Numerous To Count

TABLE 1

BACTERIOLOGICAL SAMPLING RESULTS FOR NEWPORT BAY
April 2005 - March 2006
TRIBUTARY STATIONS

(Concentrations in CFU/100 mL)

	Back Bay Dr. Drain		
	TC	**FC**	**ENT**
4/4/05	>330	40	82
4/11/05	660	20	378
4/18/05	NS	NS	NS
4/25/05	NS	NS	NS
5/2/05	Cw/C	19000	4600
5/9/05	NS	NS	NS
5/16/05	NS	NS	NS
5/23/05	NS	NS	NS
5/31/05	NS	NS	NS
6/6/05	NS	NS	NS
6/15/05	NS	NS	NS
6/20/05	NS	NS	NS
6/27/05	NS	NS	NS
7/5/05	NS	NS	NS
7/11/05	NS	NS	NS
7/18/05	NS	NS	NS
7/25/05	NS	NS	NS
8/2/05	NS	NS	NS
8/8/05	NS	NS	NS
8/15/05	NS	NS	NS
8/22/05	NS	NS	NS
8/29/05	NS	NS	NS
9/6/05	NS	NS	NS
9/14/05	5200	860	400
9/19/05	8200	550	1000
9/28/05	5200	2600	200
10/3/05	6600	400	1000
10/11/05	3000	270	200
10/17/05	28000	1000	5000
10/24/05	4200	720	378
10/31/05	3400	200	309
11/7/05	4400	600	600
11/14/05	5600	200	238
11/21/05	560	130	800
11/30/05	390	70	130
12/5/05	>900	70	386
12/12/05	5400	140	1000
12/19/05	940	80	86
12/27/05	1230	60	325
1/3/06	12000	560	350
1/9/06	2600	260	50
1/17/06	3600	1000	204
1/23/06	280	40	120
1/30/06	4200	240	180
2/6/06	330	150	140
2/14/06	8000	100	250
2/21/06	10	<10	<2
2/27/06	>710	30	64
3/6/06	30	<10	<2
3/15/06	270	<10	74
3/20/06	1070	60	82
3/27/06	4600	2000	400

Sampling results possibly influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

TC = Total Coliforms
FC = Fecal Coliforms
ENT = Enterococci
NS = Not Sampled
Cw/C = Confluent Growth with Coliforms
TNTC = Too Numerous To Count

TABLE 2

RUNNING GEOMEAN OF FECAL COLIFORM CONCENTRATIONS IN NEWPORT BAY

April 2005-March 2006

LOWER BAY STATIONS

	43rd Street Beach			38th Street Beach			33rd Street Channel		
	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*
4/4/05	20	11	yes	<10	26	yes	150		ID
4/11/05	<10	11	yes	<10	16	yes	<10		ID
4/18/05	<10	11	yes	<10	16	yes	<10		ID
4/25/05	7200	43	no	8800	51	no	60		ID
5/2/05	<10	43	no	<10	39	no	80	37	yes
5/9/05	<10	37	no	<10	39	no	10	22	yes
5/16/05	50	51	no	<10	39	no	>740	51	no
5/23/05	<10	51	no	<10	39	no	<10	51	no
5/31/05	<10	14	yes	40	13	yes	<10	36	no
6/6/05	10	14	yes	<10	13	yes	<10	24	no
6/15/05	20		ID	130		ID	660		no
6/20/05	<10	11	yes	30	27	yes	<10	23	no
6/27/05	<10	11	yes	30	34	yes	<10	23	no
7/5/05	80	17	yes	70	38	yes	70	34	no
7/11/05	<10	17	yes	<10	38	yes	10	34	no
7/18/05	<10	15	yes	80	35	yes	<10	15	yes
7/25/05	50	21	yes	380	58	yes	4400	50	no
8/2/05	350	43	yes	<10	46	yes	10	50	no
8/8/05	<10	28	yes	10	31	yes	2000	97	no
8/15/05	20	32	yes	<10	31	yes	<10	97	no
8/22/05	<10	32	yes	10	21	yes	10	97	no
8/29/05	<10	23	yes	<10	10	yes	30	36	no
9/6/05	<10	11	yes	<10	10	yes	100	57	no
9/14/05	<10		ID	<10		ID	<10		ID
9/19/05	<10	10	yes	<10	10	yes	<10	20	yes
9/28/05	10		ID	<10		ID	20		ID
10/3/05	10	10	yes	<10	10	yes	<10	18	yes
10/11/05	340	20	yes	<10	10	yes	<10	11	yes
10/17/05	5000	70	no	Cw/C	53	no	Cw/C	60	no
10/24/05	10	70	no	<10	53	no	10	60	no
10/31/05	<10	70	no	80	80	no	10	53	no
11/7/05	80	106	no	<10	80	no	<10	53	no
11/14/05	10	53	no	<10	80	no	<10	53	no
11/21/05	<10	15	yes	<10	15	yes	<10	10	yes
11/30/05	180		ID	<10		ID	<10		ID
12/5/05	20	31	yes	<10	10	yes	<10	10	yes
12/12/05	<10	20	yes	<10	10	yes	60	14	yes
12/19/05	<10	20	yes	<10	10	yes	<10	14	yes
12/27/05	<10	20	yes	<10	10	yes	430	30	no
1/3/06	4000	38	no	3000	31	no	6000	109	no
1/9/06	<10	33	no	30	39	no	50	151	no
1/17/06	<10	33	no	<10	39	no	<10	105	no
1/23/06	50	46	no	<10	39	no	10	105	no
1/30/06	<10	46	no	<10	39	no	<10	50	no
2/6/06	<10	14	yes	<10	12	yes	60	20	yes
2/14/06	<10	14	yes	<10	10	yes	<10	14	yes
2/21/06	280	27	yes	<10	10	yes	<10	14	yes
2/27/06	<10	19	yes	<10	10	yes	180	26	yes
3/6/06	20	22	yes	<10	10	yes	10	26	yes
3/15/06	<10	22	yes	<10	10	yes	<10	18	yes
3/20/06	<10	22	yes	<10	10	yes	10	18	yes
3/27/06	10	11	yes	10	10	yes	170	31	yes

(Grey) Sampling results on these dates may have been influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

(Orange) Running 30-day geometric mean > 200 organisms/100 mL based on 5 or more samples per 30-day period or Fecal Coliform sample > 400 organisms/100mL

(Blue) Both criteria of the Fecal Coliform TMDL met

(Boxed) Geomean unable to be calculated since less than 5 samples taken from the preceding 30-day period

* Geometric means and 30-day objective are based on 5 samples from the preceding 30-day period

TNTC = Too Numerous to Count

ID = Insufficient Data to Compare to Objective

NS = Not Sampled

Cw/C = Confluent Growth with Coliforms

TABLE 2

RUNNING GEOMEAN OF FECAL COLIFORM CONCENTRATIONS IN NEWPORT BAY

April 2005-March 2006

LOWER BAY STATIONS

	Lido Yacht Club Beach			Via Genoa Beach			Newport Blvd. Bridge		
	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*
4/4/05	40	79	no	20	11	yes	880	124	no
4/11/05	60	51	yes	<10	11	yes	70	74	no
4/18/05	420	73	no	<10	11	yes	180	133	no
4/25/05	16000	200	no	7000	43	no	9600	254	no
5/2/05	450	373	no	<10	43	no	1040	644	no
5/9/05	930	701	no	20	43	no	16000	1150	no
5/16/05	1610	1353	no	30	53	no	4600	2656	no
5/23/05	3000	2004	no	10	53	no	40	1966	no
5/31/05	60	656	no	10	14	yes	80	755	no
6/6/05	<10	306	no	10	14	yes	<10	298	no
6/15/05	50		ID	<10		ID	150		ID
6/20/05	80	94	no	<10	10	yes	<10	34	yes
6/27/05	80	45	yes	<10	10	yes	10	26	yes
7/5/05	180	57	yes	10	10	yes	130	29	yes
7/11/05	10	57	yes	<10	10	yes	60	41	yes
7/18/05	50	57	yes	10	10	yes	10	24	yes
7/25/05	400	78	yes	<10	10	yes	20	27	yes
8/2/05	10	51	yes	20	11	yes	100	44	yes
8/8/05	10	29	yes	<10	11	yes	<10	26	yes
8/15/05	80	44	yes	<10	11	yes	<10	18	yes
8/22/05	<10	32	yes	<10	11	yes	<10	18	yes
8/29/05	50	21	yes	20	13	yes	10	16	yes
9/6/05	<10	21	yes	10	11	yes	10	10	yes
9/14/05	10		ID	10		ID	<10		ID
9/19/05	<10	14	yes	<10	11	yes	<10	10	yes
9/28/05	30		ID	10		ID	<10		ID
10/3/05	30	16	yes	<10	10	yes	<10	10	yes
10/11/05	10	16	yes	10	10	yes	50	14	yes
10/17/05	40	20	yes	80	15	yes	54000	77	no
10/24/05	13000	86	no	<10	15	yes	260	148	no
10/31/05	<10	69	no	<10	15	yes	100	234	no
11/7/05	10	55	no	<10	15	yes	10	234	no
11/14/05	10	55	no	10	15	yes	210	312	no
11/21/05	10	42	no	<10	10	yes	10	56	yes
11/30/05	30		ID	100		ID	<10		ID
12/5/05	<10	12	yes	<10	16	yes	<10	18	yes
12/12/05	<10	12	yes	<10	16	yes	230	34	yes
12/19/05	<10	12	yes	<10	16	yes	190	34	yes
12/27/05	<10	12	yes	300	31	yes	240	64	yes
1/3/06	12000	41	no	7000	73	no	4000	211	no
1/9/06	30	51	no	<10	73	no	16000	923	no
1/17/06	<10	51	no	<10	73	no	<10	493	no
1/23/06	10	51	no	<10	73	no	150	470	no
1/30/06	<10	51	no	<10	37	no	<10	249	no
2/6/06	10	12	yes	50	14	yes	280	146	no
2/14/06	<10	10	yes	10	14	yes	10	33	yes
2/21/06	10	10	yes	<10	14	yes	240	63	yes
2/27/06	50	14	yes	40	18	yes	3400	118	no
3/6/06	10	14	yes	20	21	yes	<10	118	no
3/15/06	190	25	yes	<10	15	yes	<10	61	no
3/20/06	60	36	yes	<10	15	yes	<10	61	no
3/27/06	70	53	yes	10	15	yes	100	51	no

Sampling results on these dates may have been influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

Running 30-day geometric mean > 200 organisms/100 mL based on 5 or more samples per 30-day period or Fecal Coliform sample > 400 organisms/100mL

Both criteria of the Fecal Coliform TMDL met

Geomean unable to be calculated since less than 5 samples taken from the preceding 30-day period

* Geometric means and 30-day objective are based on 5 samples from the preceding 30-day period

TNTC = Too Numerous to Count

ID = Insufficient Data to Compare to Objective

NS = Not Sampled

CwC = Confluent Growth with Coliforms

TABLE 2

RUNNING GEOMEAN OF FECAL COLIFORM CONCENTRATIONS IN NEWPORT BAY

April 2005-March 2006

LOWER BAY STATIONS

	Rhine Channel			19th Street Beach			15th Street Beach		
	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*
4/4/05	<10	18	yes	40	13	yes	<10	10	yes
4/11/05	<10	18	yes	<10	13	yes	<10	10	yes
4/18/05	10	18	yes	<10	13	yes	20	11	yes
4/25/05	20400	82	no	TNTC	69	no	14000	49	no
5/2/05	<10	46	no	10	69	no	<10	49	no
5/9/05	<10	46	no	10	53	no	<10	49	no
5/16/05	30	57	no	10	53	no	<10	49	no
5/23/05	<10	57	no	<10	53	no	50	59	no
5/31/05	<10	12	yes	<10	10	yes	20	16	yes
6/6/05	30	16	yes	<10	10	yes	50	22	yes
6/15/05	<10		ID	<10		ID	<10		ID
6/20/05	10	12	yes	<10	10	yes	10	22	yes
6/27/05	20	14	yes	<10	10	yes	<10	16	yes
7/5/05	<10	14	yes	<10	10	yes	20	16	yes
7/11/05	70	17	yes	<10	10	yes	<10	11	yes
7/18/05	<10	17	yes	40	13	yes	<10	11	yes
7/25/05	<10	17	yes	<10	13	yes	<10	11	yes
8/2/05	20	17	yes	<10	13	yes	10	11	yes
8/8/05	<10	17	yes	<10	13	yes	<10	10	yes
8/15/05	<10	11	yes	<10	13	yes	<10	10	yes
8/22/05	30	14	yes	10	10	yes	<10	10	yes
8/29/05	<10	14	yes	<10	10	yes	<10	10	yes
9/6/05	<10	12	yes	<10	10	yes	<10	10	yes
9/14/05	20		ID	10		ID	10		ID
9/19/05	<10	14	yes	<10	10	yes	<10	10	yes
9/28/05	80		ID	40		ID	10		ID
10/3/05	10	17	yes	<10	13	yes	10	10	yes
10/11/05	<10	17	yes	<10	13	yes	<10	10	yes
10/17/05	390	32	yes	99	21	yes	110	16	yes
10/24/05	50	44	yes	20	24	yes	10	16	yes
10/31/05	<10	29	yes	10	18	yes	<10	16	yes
11/7/05	<10	29	yes	110	29	yes	<10	16	yes
11/14/05	10	29	yes	<10	29	yes	10	16	yes
11/21/05	<10	14	yes	10	19	yes	<10	10	yes
11/30/05	20		ID	<10		ID	<10		ID
12/5/05	30	14	yes	20	19	yes	<10	10	yes
12/12/05	10	14	yes	24	14	yes	10	10	yes
12/19/05	80	22	yes	20	16	yes	<10	10	yes
12/27/05	10	22	yes	40	21	yes	<10	10	yes
1/3/06	3000	59	no	6000	75	no	12000	41	no
1/9/06	<10	47	no	<10	65	no	<10	41	no
1/17/06	<10	47	no	380	113	no	<10	41	no
1/23/06	<10	31	no	40	130	no	<10	41	no
1/30/06	<10	31	no	<10	98	no	<10	41	no
2/6/06	<10	10	yes	<10	27	yes	<10	10	yes
2/14/06	<10	10	yes	10	27	yes	<10	10	yes
2/21/06	<10	10	yes	10	13	yes	<10	10	yes
2/27/06	40	13	yes	<10	10	yes	<10	10	yes
3/6/06	10	13	yes	<10	10	yes	10	10	yes
3/15/06	<10	13	yes	<10	10	yes	<10	10	yes
3/20/06	10	13	yes	50	14	yes	10	10	yes
3/27/06	<10	13	yes	10	14	yes	<10	10	yes

(grey) Sampling results on these dates may have been influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

(yellow) Running 30-day geometric mean > 200 organisms/100 mL based on 5 or more samples per 30-day period or Fecal Coliform sample > 400 organisms/100mL

(blue) Both criteria of the Fecal Coliform TMDL met

(outlined box) Geomean unable to be calculated since less than 5 samples taken from the preceding 30-day period

* Geometric means and 30-day objective are based on 5 samples from the preceding 30-day period

TNTC = Too Numerous to Count

ID = Insufficient Data to Compare to Objective

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TABLE 2

RUNNING GEOMEAN OF FECAL COLIFORM CONCENTRATIONS IN NEWPORT BAY

April 2005-March 2006

LOWER BAY STATIONS

	10th Street Beach			Alvarado/ Bay Isle Beach			N Street Beach		
	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*
4/4/05	270	33	yes	10	12	yes	<10	11	yes
4/11/05	<10	29	yes	<10	10	yes	<10	10	yes
4/18/05	<10	29	yes	<10	10	yes	<10	10	yes
4/25/05	6200	70	no	5600	35	no	50	14	yes
5/2/05	<10	70	no	20	41	no	<10	14	yes
5/9/05	20	42	no	10	41	no	10	14	yes
5/16/05	<10	42	no	<10	41	no	<10	14	yes
5/23/05	<10	42	no	10	41	no	<10	14	yes
5/31/05	<10	11	yes	30	14	yes	<10	10	yes
6/6/05	<10	11	yes	10	12	yes	<10	10	yes
6/15/05	<10		ID	10		ID	10		ID
6/20/05	<10	10	yes	<10	12	yes	<10	10	yes
6/27/05	<10	10	yes	<10	12	yes	<10	10	yes
7/5/05	<10	10	yes	<10	10	yes	<10	10	yes
7/11/05	<10	10	yes	<10	10	yes	<10	10	yes
7/18/05	<10	10	yes	20	11	yes	<10	10	yes
7/25/05	<10	10	yes	20	13	yes	<10	10	yes
8/2/05	10	10	yes	<10	13	yes	20	11	yes
8/8/05	<10	10	yes	10	13	yes	<10	11	yes
8/15/05	<10	10	yes	<10	13	yes	10	11	yes
8/22/05	<10	10	yes	<10	11	yes	<10	11	yes
8/29/05	<10	10	yes	20	11	yes	<10	11	yes
9/6/05	<10	10	yes	10	11	yes	10	10	yes
9/14/05	10		ID	10		ID	<10		ID
9/19/05	<10	10	yes	20	13	yes	<10	10	yes
9/28/05	30		ID	10		ID	<10		ID
10/3/05	<10	12	yes	10	11	yes	10	10	yes
10/11/05	30	16	yes	10	11	yes	<10	10	yes
10/17/05	10	16	yes	10	11	yes	20	11	yes
10/24/05	150	27	yes	10	10	yes	6	10	yes
10/31/05	30	27	yes	<10	10	yes	<10	10	yes
11/7/05	70	39	yes	10	10	yes	20	12	yes
11/14/05	<10	32	yes	<10	10	yes	<10	12	yes
11/21/05	<10	32	yes	20	11	yes	10	10	yes
11/30/05	<10		ID	50		ID	<10		ID
12/5/05	10	15	yes	<10	16	yes	<10	11	yes
12/12/05	160	17	yes	30	20	yes	10	10	yes
12/19/05	<10	17	yes	10	20	yes	<10	10	yes
12/27/05	240	33	yes	60	25	yes	<10	10	yes
1/3/06	11000	133	no	10000	71	no	520	22	no
1/9/06	80	202	no	<10	71	no	<10	22	no
1/17/06	4400	392	no	<10	57	no	<10	22	no
1/23/06	10	392	no	5800	203	no	<10	22	no
1/30/06	<10	208	no	<10	142	no	<10	22	no
2/6/06	<10	51	no	<10	36	no	<10	10	yes
2/14/06	<10	34	no	<10	36	no	<10	10	yes
2/21/06	<10	10	yes	60	51	no	10	10	yes
2/27/06	20	11	yes	<10	14	yes	10	10	yes
3/6/06	30	14	yes	20	16	yes	10	10	yes
3/15/06	<10	14	yes	<10	16	yes	<10	10	yes
3/20/06	20	16	yes	<10	16	yes	<10	10	yes
3/27/06	20	19	yes	70	17	yes	<10	10	yes

Sampling results on these dates may have been influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

Running 30-day geometric mean > 200 organisms/100 mL based on 5 or more samples per 30-day period or Fecal Coliform sample > 400 organisms/100mL

Both criteria of the Fecal Coliform TMDL met

Geomean unable to be calculated since less than 5 samples taken from the preceding 30-day period

* Geometric means and 30-day objective are based on 5 samples from the preceding 30-day period

TNTC = Too Numerous to Count

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TABLE 2

RUNNING GEOMEAN OF FECAL COLIFORM CONCENTRATIONS IN NEWPORT BAY

April 2005-March 2006

LOWER BAY STATIONS

	Garnet Avenue Beach			Ruby Avenue Beach			Sapphire Avenue Beach		
	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*
4/4/05	<10	28	no	<10	10	yes	10	14	yes
4/11/05	30	14	yes	<10	10	yes	10	14	yes
4/18/05	<10	12	yes	<10	10	yes	<10	14	yes
4/25/05	7800	47	no	7000	37	no	4200	33	no
5/2/05	20	54	no	10	37	no	30	42	no
5/9/05	10	54	no	20	43	no	10	42	no
5/16/05	<10	44	no	<10	43	no	<10	42	no
5/23/05	<10	44	no	10	43	no	10	42	no
5/31/05	10	11	yes	10	11	yes	<10	12	yes
6/6/05	30	12	yes	10	11	yes	60	14	yes
6/15/05	<10		ID	60		ID	20		ID
6/20/05	<10	12	yes	20	16	yes	<10	16	yes
6/27/05	<10	12	yes	<10	16	yes	<10	16	yes
7/5/05	10	12	yes	<10	16	yes	<10	16	yes
7/11/05	<10	10	yes	10	16	yes	<10	11	yes
7/18/05	<10	10	yes	<10	11	yes	<10	10	yes
7/25/05	<10	10	yes	10	10	yes	10	10	yes
8/2/05	<10	10	yes	10	10	yes	<10	10	yes
8/8/05	10	10	yes	<10	10	yes	20	11	yes
8/15/05	<10	10	yes	<10	10	yes	<10	11	yes
8/22/05	<10	10	yes	<10	10	yes	<10	11	yes
8/29/05	10	10	yes	<10	10	yes	<10	11	yes
9/6/05	<10	10	yes	<10	10	yes	<10	11	yes
9/14/05	50		ID	<10		ID	<10		ID
9/19/05	<10	14	yes	40	13	yes	10	10	yes
9/28/05	10		ID	10		ID	<10		ID
10/3/05	10	14	yes	30	16	yes	20	11	yes
10/11/05	20	16	yes	<10	16	yes	<10	11	yes
10/17/05	40	15	yes	30	20	yes	120	19	yes
10/24/05	<10	15	yes	<10	16	yes	<10	19	yes
10/31/05	10	15	yes	<10	16	yes	10	19	yes
11/7/05	10	15	yes	<10	12	yes	40	22	yes
11/14/05	<10	13	yes	<10	12	yes	10	22	yes
11/21/05	<10	10	yes	<10	10	yes	<10	13	yes
11/30/05	<10		ID	10		ID	<10		ID
12/5/05	520	22	no	<10	10	yes	<10	13	yes
12/12/05	<10	22	no	<10	10	yes	<10	10	yes
12/19/05	<10	22	no	18000	45	no	20	11	yes
12/27/05	<10	22	no	120	74	no	<10	11	yes
1/3/06	5000	76	no	2000	212	no	4000	38	no
1/9/06	20	40	no	10	212	no	10	38	no
1/17/06	<10	40	no	40	280	no	<10	38	no
1/23/06	<10	40	no	<10	63	no	<10	33	no
1/30/06	<10	40	no	640	87	no	10	33	no
2/6/06	<10	11	yes	<10	30	no	<10	10	yes
2/14/06	<10	10	yes	<10	30	no	<10	10	yes
2/21/06	10	10	yes	<10	23	no	<10	10	yes
2/27/06	<10	10	yes	<10	23	no	<10	10	yes
3/6/06	10	10	yes	<10	10	yes	<10	10	yes
3/15/06	<10	10	yes	<10	10	yes	<10	10	yes
3/20/06	<10	10	yes	<10	10	yes	10	10	yes
3/27/06	10	10	yes	<10	10	yes	<10	10	yes

(grey) Sampling results on these dates may have been influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

(yellow) Running 30-day geometric mean > 200 organisms/100 mL based on 5 or more samples per 30-day period or Fecal Coliform sample > 400 organisms/100mL

(blue) Both criteria of the Fecal Coliform TMDL met

(boxed) Geomean unable to be calculated since less than 5 samples taken from the preceding 30-day period

* Geometric means and 30-day objective are based on 5 samples from the preceding 30-day period

TNTC = Too Numerous to Count

ID = Insufficient Data to Compare to Objective

NS = Not Sampled

Cw/C = Confluent Growth with Coliforms

TABLE 2

RUNNING GEOMEAN OF FECAL COLIFORM CONCENTRATIONS IN NEWPORT BAY

April 2005-March 2006

LOWER BAY STATIONS

	Grand Canal			Abalone Avenue Beach			Park Avenue Beach		
	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*
4/4/05	<10	16	yes	20	11	yes	<10	11	yes
4/11/05	<10	16	yes	<10	11	yes	<10	11	yes
4/18/05	30	16	yes	10	11	yes	<10	11	yes
4/25/05	730	29	no	210	21	yes	4800	39	no
5/2/05	40	39	no	<10	21	yes	10	34	no
5/9/05	30	48	no	<10	18	yes	<10	34	no
5/16/05	10	48	no	<10	18	yes	<10	34	no
5/23/05	20	45	no	<10	18	yes	10	34	no
5/31/05	20	22	yes	10	10	yes	<10	10	yes
6/6/05	<10	16	yes	20	11	yes	20	11	yes
6/15/05	<10		ID	<10		ID	10		ID
6/20/05	10	13	yes	10	11	yes	<10	11	yes
6/27/05	20	13	yes	<10	11	yes	<10	11	yes
7/5/05	<10	11	yes	<10	11	yes	20	13	yes
7/11/05	470	25	no	<10	10	yes	10	11	yes
7/18/05	10	25	no	<10	10	yes	10	11	yes
7/25/05	70	37	no	<10	10	yes	<10	11	yes
8/2/05	30	40	no	110	16	yes	20	13	yes
8/8/05	<10	40	no	120	27	yes	<10	11	yes
8/15/05	10	18	yes	60	38	yes	<10	11	yes
8/22/05	10	18	yes	<10	38	yes	<10	11	yes
8/29/05	60	18	yes	10	38	yes	50	16	yes
9/6/05	40	19	yes	<10	24	yes	<10	14	yes
9/14/05	<10		ID	<10		ID	<10		ID
9/19/05	<10	19	yes	<10	10	yes	<10	14	yes
9/28/05	30		ID	10		ID	<10		ID
10/3/05	20	19	yes	<10	10	yes	10	10	yes
10/11/05	20	16	yes	10	10	yes	10	10	yes
10/17/05	20	19	yes	<10	10	yes	60	14	yes
10/24/05	70	28	yes	<10	10	yes	<10	14	yes
10/31/05	10	22	yes	<10	10	yes	20	16	yes
11/7/05	10	19	yes	<10	10	yes	20	19	yes
11/14/05	70	25	yes	40	13	yes	10	19	yes
11/21/05	10	22	yes	<10	13	yes	<10	13	yes
11/30/05	20		ID	<10		ID	<10		ID
12/5/05	<10	17	yes	<10	13	yes	<10	11	yes
12/12/05	<10	17	yes	10	13	yes	<10	10	yes
12/19/05	<10	11	yes	10	10	yes	<10	10	yes
12/27/05	30	14	yes	<10	10	yes	<10	10	yes
1/3/06	1000	31	no	2000	29	no	4000	33	no
1/9/06	20	36	no	<10	29	no	10	33	no
1/17/06	<10	36	no	<10	29	no	<10	33	no
1/23/06	10	36	no	<10	29	no	10	33	no
1/30/06	10	29	no	<10	29	no	<10	33	no
2/6/06	30	14	yes	<10	10	yes	<10	10	yes
2/14/06	10	12	yes	170	18	yes	<10	10	yes
2/21/06	<10	12	yes	<10	18	yes	<10	10	yes
2/27/06	<10	12	yes	<10	18	yes	10	10	yes
3/6/06	NS		ID	20	20	yes	10	10	yes
3/15/06	<10		ID	<10	20	yes	<10	10	yes
3/20/06	<10		ID	<10	11	yes	<10	10	yes
3/27/06	10		ID	<10	11	yes	<10	10	yes

(Grey shading) Sampling results on these dates may have been influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

(Yellow shading) Running 30-day geometric mean > 200 organisms/100 mL based on 5 or more samples per 30-day period or Fecal Coliform sample > 400 organisms/100mL

(Blue shading) Both criteria of the Fecal Coliform TMDL met

(Outlined box) Geomean unable to be calculated since less than 5 samples taken from the preceding 30-day period

* Geometric means and 30-day objective are based on 5 samples from the preceding 30-day period

TNTC = Too Numerous to Count

ID = Insufficient Data to Compare to Objective

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Cw/C = Confluent Growth with Coliforms

TABLE 2

RUNNING GEOMEAN OF FECAL COLIFORM CONCENTRATIONS IN NEWPORT BAY

April 2005-March 2006

LOWER BAY STATIONS

	Onyx Avenue Beach			Promontory Point Channel			Harbor Patrol Beach		
	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*
4/4/05	60	16	yes	10	10	yes	10	30	yes
4/11/05	<10	16	yes	<10	10	yes	430	43	no
4/18/05	10	16	yes	<10	10	yes	80	44	no
4/25/05	7400	62	no	4600	34	no	>820	107	no
5/2/05	120	88	no	<10	34	no	10	78	no
5/9/05	20	71	no	<10	34	no	810	187	no
5/16/05	<10	71	no	<10	34	no	110	142	no
5/23/05	10	71	no	<10	34	no	400	196	no
5/31/05	<10	19	yes	<10	10	yes	650	187	no
6/6/05	<10	11	yes	<10	10	yes	50	259	no
6/15/05	10		ID	<10		ID	80		ID
6/20/05	<10	10	yes	<10	10	yes	<10	101	no
6/27/05	30	12	yes	<10	10	yes	80	73	no
7/5/05	<10	12	yes	<10	10	yes	30	39	yes
7/11/05	10	12	yes	<10	10	yes	30	36	yes
7/18/05	10	12	yes	<10	10	yes	10	24	yes
7/25/05	10	12	yes	<10	10	yes	<10	24	yes
8/2/05	20	11	yes	<10	10	yes	100	25	yes
8/8/05	10	11	yes	<10	10	yes	60	28	yes
8/15/05	10	11	yes	<10	10	yes	50	31	yes
8/22/05	10	11	yes	<10	10	yes	10	31	yes
8/29/05	10	11	yes	<10	10	yes	<10	31	yes
9/6/05	10	10	yes	<10	10	yes	<10	20	yes
9/14/05	20		ID	<10		ID	<10		ID
9/19/05	10	11	yes	<10	10	yes	<10	10	yes
9/28/05	<10		ID	<10		ID	<10		ID
10/3/05	10	11	yes	<10	10	yes	20	11	yes
10/11/05	<10	11	yes	<10	10	yes	<10	11	yes
10/17/05	540	22	no	<10	10	yes	10	11	yes
10/24/05	<10	22	no	<10	10	yes	70	17	yes
10/31/05	<10	22	no	<10	10	yes	10	17	yes
11/7/05	10	22	no	<10	10	yes	10	15	yes
11/14/05	60	32	no	<10	10	yes	30	18	yes
11/21/05	<10	14	yes	<10	10	yes	<10	18	yes
11/30/05	<10		ID	<10		ID	20		ID
12/5/05	<10	14	yes	<10	10	yes	<10	14	yes
12/12/05	10	14	yes	<10	10	yes	<10	14	yes
12/19/05	<10	10	yes	<10	10	yes	<10	11	yes
12/27/05	<10	10	yes	<10	10	yes	10	11	yes
1/3/06	2000	29	no	1080	26	no	820	24	no
1/9/06	<10	29	no	<10	26	no	50	33	no
1/17/06	<10	29	no	<10	26	no	<10	33	no
1/23/06	20	33	no	<10	26	no	<10	33	no
1/30/06	20	38	no	<10	26	no	<10	33	no
2/6/06	<10	13	yes	<10	10	yes	40	18	yes
2/14/06	<10	13	yes	<10	10	yes	<10	13	yes
2/21/06	<10	13	yes	20	11	yes	10	13	yes
2/27/06	70	17	yes	<10	11	yes	80	20	yes
3/6/06	<10	15	yes	<10	11	yes	20	23	yes
3/15/06	<10	15	yes	<10	11	yes	40	23	yes
3/20/06	<10	15	yes	<10	11	yes	50	32	yes
3/27/06	40	19	yes	<10	10	yes	30	39	yes

(grey) Sampling results on these dates may have been influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

(yellow) Running 30-day geometric mean > 200 organisms/100 mL based on 5 or more samples per 30-day period or Fecal Coliform sample > 400 organisms/100mL

(blue) Both criteria of the Fecal Coliform TMDL met

(outlined box) Geomean unable to be calculated since less than 5 samples taken from the preceding 30-day period

* Geometric means and 30-day objective are based on 5 samples from the preceding 30-day period

TNTC = Too Numerous to Count

ID = Insufficient Data to Compare to Objective

NS = Not Sampled

CwC = Confluent Growth with Coliforms

TABLE 2

RUNNING GEOMEAN OF FECAL COLIFORM CONCENTRATIONS IN NEWPORT BAY

April 2005-March 2006

LOWER BAY STATIONS

	Rocky Point Beach Fecal Coliform	Rocky Point Beach Geomean*	Rocky Point Beach 30-day period met objective*
4/4/05	<10	11	yes
4/11/05	<10	11	yes
4/18/05	10	11	yes
4/25/05	30	14	yes
5/2/05	<10	12	yes
5/9/05	<10	12	yes
5/16/05	40	16	yes
5/23/05	20	19	yes
5/31/05	10	15	yes
6/6/05	<10	15	yes
6/15/05	<10		ID
6/20/05	<10	11	yes
6/27/05	<10	10	yes
7/5/05	<10	10	yes
7/11/05	10	10	yes
7/18/05	<10	10	yes
7/25/05	<10	10	yes
8/2/05	20	11	yes
8/8/05	<10	11	yes
8/15/05	20	13	yes
8/22/05	10	13	yes
8/29/05	80	20	yes
9/6/05	<10	17	yes
9/14/05	<10		ID
9/19/05	<10	15	yes
9/28/05	<10		ID
10/3/05	<10	10	yes
10/11/05	<10	10	yes
10/17/05	<10	10	yes
10/24/05	<10	10	yes
10/31/05	<10	10	yes
11/7/05	<10	10	yes
11/14/05	10	10	yes
11/21/05	<10	10	yes
11/30/05	<10		ID
12/5/05	<10	10	yes
12/12/05	<10	10	yes
12/19/05	<10	10	yes
12/27/05	10	10	yes
1/3/06	10	10	yes
1/9/06	10	10	yes
1/17/06	<10	10	yes
1/23/06	<10	10	yes
1/30/06	<10	10	yes
2/6/06	10	10	yes
2/14/06	<10	10	yes
2/21/06	<10	10	yes
2/27/06	10	10	yes
3/6/06	10	10	yes
3/15/06	<10	10	yes
3/20/06	<10	10	yes
3/27/06	<10	10	yes

Sampling results on these dates may have been influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

Running 30-day geometric mean > 200 organisms/100 mL based on 5 or more samples per 30-day period or Fecal Coliform sample > 400 organisms/100mL

Both criteria of the Fecal Coliform TMDL met

Geomean unable to be calculated since less than 5 samples taken from the preceding 30-day period

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TABLE 2

RUNNING GEOMEAN OF FECAL COLIFORM CONCENTRATIONS IN NEWPORT BAY

April 2005-March 2006

UPPER BAY STATIONS

	Bayshore Beach			De Anza Launch			Newport Dunes West		
	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*
4/4/05	30	20	yes	<10	18	yes	20	102	yes
4/11/05	<10	18	yes	<10	14	yes	20	59	yes
4/18/05	<10	18	yes	<10	14	yes	460	79	no
4/25/05	8000	47	no	TNTC	72	no	9400	192	no
5/2/05	10	47	no	NS		ID	20	128	no
5/9/05	<10	38	no	10		ID	60	160	no
5/16/05	20	44	no	10		ID	<10	139	no
5/23/05	30	54	no	10		ID	<10	65	no
5/31/05	10	14	yes	<10		ID	10	16	yes
6/6/05	<10	14	yes	<10	10	yes	<10	14	yes
6/15/05	<10		ID	10		ID	40		ID
6/20/05	<10	12	yes	<10	10	yes	<10	13	yes
6/27/05	<10	10	yes	<10	10	yes	<10	13	yes
7/5/05	10	10	yes	<10	10	yes	<10	13	yes
7/11/05	10	10	yes	<10	10	yes	<10	13	yes
7/18/05	<10	10	yes	<10	10	yes	<10	10	yes
7/25/05	<10	10	yes	20	11	yes	<10	10	yes
8/2/05	10	10	yes	<10	11	yes	80	15	yes
8/8/05	20	11	yes	<10	11	yes	<10	15	yes
8/15/05	<10	11	yes	<10	11	yes	10	15	yes
8/22/05	40	15	yes	<10	11	yes	<10	15	yes
8/29/05	10	15	yes	<10	10	yes	10	15	yes
9/6/05	<10	15	yes	<10	10	yes	<10	10	yes
9/14/05	<10		ID	30		ID	20		ID
9/19/05	10	13	yes	<10	12	yes	<10	11	yes
9/28/05	10		ID	<10		ID	<10		ID
10/3/05	<10	10	yes	<10	12	yes	50	16	yes
10/11/05	20	11	yes	10	12	yes	<10	16	yes
10/17/05	20	13	yes	30	12	yes	410	29	no
10/24/05	<10	13	yes	10	12	yes	<10	29	no
10/31/05	<10	13	yes	<10	12	yes	20	33	no
11/7/05	10	13	yes	100	20	yes	10	24	no
11/14/05	<10	11	yes	<10	20	yes	40	32	no
11/21/05	<10	10	yes	<10	16	yes	<10	15	yes
11/30/05	10		ID	590		ID	70		ID
12/5/05	<10	10	yes	<10	36	no	20	22	yes
12/12/05	20	11	yes	<10	23	no	20	26	yes
12/19/05	10	11	yes	<10	23	no	<10	19	yes
12/27/05	10	11	yes	10	23	no	20	22	yes
1/3/06	4000	38	no	17000	44	no	14000	65	no
1/9/06	10	38	no	10	44	no	570	126	no
1/17/06	<10	33	no	<10	44	no	<10	110	no
1/23/06	<10	33	no	30	55	no	350	224	no
1/30/06	<10	33	no	10	55	no	10	195	no
2/6/06	10	10	yes	<10	12	yes	230	86	no
2/14/06	<10	10	yes	310	25	yes	30	47	yes
2/21/06	100	16	yes	80	38	yes	50	66	yes
2/27/06	20	18	yes	<10	30	yes	20	37	yes
3/6/06	60	26	yes	50	42	yes	390	77	yes
3/15/06	<10	26	yes	<10	42	yes	10	41	yes
3/20/06	120	43	yes	550	47	no	540	73	no
3/27/06	20	31	yes	<10	31	no	30	66	no

(Grey) Sampling results on these dates may have been influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

(Yellow) Running 30-day geometric mean > 200 organisms/100 mL based on 5 or more samples per 30-day period or Fecal Coliform sample > 400 organisms/100mL

(Blue) Both criteria of the Fecal Coliform TMDL met

(Box) Geomean unable to be calculated since less than 5 samples taken from the preceding 30-day period

* Geometric means and 30-day objective are based on 5 samples from the preceding 30-day period

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TABLE 2

RUNNING GEOMEAN OF FECAL COLIFORM CONCENTRATIONS IN NEWPORT BAY

April 2005-March 2006

UPPER BAY STATIONS

	Newport Dunes Middle			Newport Dunes East			Newport Dunes North		
	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*
4/4/05	50	63	yes	170	161	no	6200	338	no
4/11/05	10	41	yes	60	138	no	70	245	no
4/18/05	<10	26	yes	<10	110	no	30	168	no
4/25/05	11000	64	no	19000	267	no	TNTC	616	no
5/2/05	50	77	no	260	219	no	220	648	no
5/9/05	30	70	no	110	201	no	40	236	no
5/16/05	20	80	no	<10	140	no	10	160	no
5/23/05	10	80	no	20	161	no	40	170	no
5/31/05	10	20	yes	<10	36	yes	<10	32	yes
6/6/05	<10	14	yes	<10	19	yes	<10	17	yes
6/15/05	20		ID	<10		ID	<10		ID
6/20/05	20	13	yes	10	11	yes	20	15	yes
6/27/05	10	13	yes	<10	10	yes	<10	11	yes
7/5/05	10	13	yes	<10	10	yes	<10	11	yes
7/11/05	10	13	yes	<10	10	yes	10	11	yes
7/18/05	10	11	yes	20	11	yes	100	18	yes
7/25/05	<10	10	yes	<10	11	yes	10	16	yes
8/2/05	<10	10	yes	30	14	yes	<10	16	yes
8/8/05	<10	10	yes	60	20	yes	340	32	yes
8/15/05	10	10	yes	10	20	yes	100	51	yes
8/22/05	<10	10	yes	10	18	yes	10	32	yes
8/29/05	<10	10	yes	<10	18	yes	50	44	yes
9/6/05	<10	10	yes	<10	14	yes	10	44	yes
9/14/05	<10		ID	<10		ID	<10		ID
9/19/05	10	10	yes	<10	10	yes	<10	14	yes
9/28/05	<10		ID	<10		ID	10		ID
10/3/05	<10	10	yes	30	12	yes	10	10	yes
10/11/05	<10	10	yes	<10	12	yes	<10	10	yes
10/17/05	390	21	yes	310	25	yes	170	18	yes
10/24/05	30	26	yes	20	28	yes	40	23	yes
10/31/05	<10	26	yes	130	47	yes	30	29	yes
11/7/05	<10	26	yes	10	38	yes	10	29	yes
11/14/05	100	41	yes	110	62	yes	40	38	yes
11/21/05	<10	20	yes	30	39	yes	<10	22	yes
11/30/05	60		ID	80		ID	20		ID
12/5/05	20	26	yes	<10	31	yes	<10	15	yes
12/12/05	<10	26	yes	100	48	yes	70	22	yes
12/19/05	20	19	yes	110	48	yes	20	19	yes
12/27/05	50	26	yes	160	68	yes	100	31	yes
1/3/06	Cw/C	96	no	Cw/C	234	no	17000	119	no
1/9/06	450	178	no	840	568	no	150	204	no
1/17/06	50	246	no	<10	358	no	10	139	no
1/23/06	670	496	no	270	429	no	10	121	no
1/30/06	20	413	no	10	246	no	10	76	no
2/6/06	420	166	no	5600	166	no	100	27	yes
2/14/06	80	118	no	40	90	no	330	32	yes
2/21/06	80	129	no	100	143	no	380	66	yes
2/27/06	20	64	no	70	109	no	100	105	yes
3/6/06	60	80	no	380	226	no	140	177	yes
3/15/06	<10	38	yes	20	73	yes	20	129	yes
3/20/06	440	53	no	350	113	yes	340	129	yes
3/27/06	60	50	no	280	139	yes	20	72	yes

Sampling results on these dates may have been influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

Running 30-day geometric mean > 200 organisms/100 mL based on 5 or more samples per 30-day period or Fecal Coliform sample > 400 organisms/100mL

Both criteria of the Fecal Coliform TMDL met

Geomean unable to be calculated since less than 5 samples taken from the preceding 30-day period

* Geometric means and 30-day objective are based on 5 samples from the preceding 30-day period

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TABLE 2

RUNNING GEOMEAN OF FECAL COLIFORM CONCENTRATIONS IN NEWPORT BAY

April 2005-March 2006

UPPER BAY STATIONS

	North Star Beach			Vaughn's Launch			Ski Zone		
	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*
4/4/05	<10	40	yes	20		ID	<10		ID
4/11/05	10	25	yes	NS		ID	NS		ID
4/18/05	<10	25	yes	NS		ID	NS		ID
4/25/05	Cw/C	65	no	NS		ID	NS		ID
5/2/05	<10	53	no	680		ID	NS		ID
5/9/05	160	91	no	NS		ID	NS		ID
5/16/05	<10	91	no	NS		ID	NS		ID
5/23/05	<10	91	no	NS		ID	NS		ID
5/31/05	<10	17	yes	10		ID	NS		ID
6/6/05	10	17	yes	NS		ID	NS		ID
6/15/05	30		ID	NS		ID	NS		ID
6/20/05	10	12	yes	30		ID	NS		ID
6/27/05	<10	12	yes	NS		ID	NS		ID
7/5/05	220	23	yes	<10		ID	NS		ID
7/11/05	30	29	yes	NS		ID	NS		ID
7/18/05	<10	23	yes	NS		ID	NS		ID
7/25/05	20	27	yes	NS		ID	NS		ID
8/2/05	<10	27	yes	<10		ID	NS		ID
8/8/05	<10	14	yes	NS		ID	NS		ID
8/15/05	20	13	yes	<10		ID	NS		ID
8/22/05	<10	13	yes	<10		ID	<10		ID
8/29/05	10	11	yes	10		ID	NS		ID
9/6/05	<10	11	yes	<10		ID	<10		ID
9/14/05	10		ID	<10		ID	NS		ID
9/19/05	<10	10	yes	30	12	yes	NS		ID
9/28/05	<10		ID	100		ID	NS		ID
10/3/05	<10	10	yes	10	20	yes	10		ID
10/11/05	<10	10	yes	10	20	yes	NS		ID
10/17/05	99	16	yes	130	33	yes	490		ID
10/24/05	30	20	yes	70	39	yes	NS		ID
10/31/05	30	25	yes	50	34	yes	NS		ID
11/7/05	<10	25	yes	10	34	yes	<10		ID
11/14/05	<10	25	yes	40	45	yes	70		ID
11/21/05	<10	16	yes	40	35	yes	NS		ID
11/30/05	<10		ID	<10		ID	190		ID
12/5/05	<10	10	yes	<10	17	yes	10		ID
12/12/05	10	10	yes	10	17	yes	10		ID
12/19/05	<10	10	yes	NS		ID	NS		ID
12/27/05	20	11	yes	60		ID	10		ID
1/3/06	21000	53	no	28000		ID	56000		ID
1/9/06	40	70	no	110		ID	NS		ID
1/17/06	<10	70	no	NS		ID	NS		ID
1/23/06	<10	70	no	NS		ID	NS		ID
1/30/06	<10	61	no	10		ID	NS		ID
2/6/06	<10	13	yes	NS		ID	NS		ID
2/14/06	70	15	yes	60		ID	50		ID
2/21/06	350	30	yes	NS		ID	NS		ID
2/27/06	10	30	yes	80		ID	20		ID
3/6/06	210	55	yes	NS		ID	NS		ID
3/15/06	<10	55	yes	20		ID	10		ID
3/20/06	1000	94	no	NS		ID	NS		ID
3/27/06	<10	46	no	<10		ID	<10		ID

(grey) Sampling results on these dates may have been influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

(orange) Running 30-day geometric mean > 200 organisms/100 mL based on 5 or more samples per 30-day period or Fecal Coliform sample > 400 organisms/100mL

(blue) Both criteria of the Fecal Coliform TMDL met

(outlined box) Geomean unable to be calculated since less than 5 samples taken from the preceding 30-day period

* Geometric means and 30-day objective are based on 5 samples from the preceding 30-day period

TNTC = Too Numerous to Count

ID = Insufficient Data to Compare to Objective

NS = Not Sampled

CwC = Confluent Growth with Coliforms

TABLE 2

RUNNING GEOMEAN OF FECAL COLIFORM CONCENTRATIONS IN NEWPORT BAY

April 2005-March 2006

TRIBUTARY STATIONS

	Back Bay Dr. Drain			Big Canyon Wash			Santa Ana Delhi Channel		
	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*	Fecal Coliform	Geomean*	30-day period met objective*
4/4/05	40	79	NA	70		NA	470		NA
4/11/05	20	79	NA	NS		NA	170		NA
4/18/05	NS		NA	70		NA	13000		NA
4/25/05	NS		NA	520		NA	TNTC		NA
5/2/05	19000		NA	20		NA	760	1995	NA
5/9/05	NS		NA	NS		NA	650	2128	NA
5/16/05	NS		NA	<10		NA	100	1914	NA
5/23/05	NS		NA	40		NA	200	831	NA
5/31/05	NS		NA	80		NA	320	316	NA
6/6/05	NS		NA	NS		NA	140	225	NA
6/15/05	NS		NA	NS		NA	190		NA
6/20/05	NS		NA	220		NA	140	189	NA
6/27/05	NS		NA	60		NA	160	180	NA
7/5/05	NS		NA	220		NA	420	190	NA
7/11/05	NS		NA	80		NA	710	263	NA
7/18/05	NS		NA	10	75	NA	280	285	NA
7/25/05	NS		NA	NS		NA	4600	572	NA
8/2/05	NS		NA	80		NA	18000	1472	NA
8/8/05	NS		NA	80		NA	19000	3155	NA
8/15/05	NS		NA	350		NA	570	3020	NA
8/22/05	NS		NA	360		NA	580	3493	NA
8/29/05	NS		NA	320	192	NA	580	2309	NA
9/6/05	NS		NA	190	228	NA	400	1078	NA
9/14/05	860		NA	10		NA	490		NA
9/19/05	550		NA	100	117	NA	1010	582	NA
9/28/05	2600		NA	70		NA	TNTC		NA
10/3/05	400		NA	200	77	NA	830	1457	NA
10/11/05	270	668	NA	140	72	NA	2600	2119	NA
10/17/05	1000	688	NA	18000	323	NA	Cw/C	5111	NA
10/24/05	720	726	NA	150	351	NA	2600	6175	NA
10/31/05	200	435	NA	160	414	NA	390	2446	NA
11/7/05	600	472	NA	200	414	NA	1120	2597	NA
11/14/05	200	444	NA	100	387	NA	930	2114	NA
11/21/05	130	295	NA	290	169	NA	560	900	NA
11/30/05	70		NA	170		NA	1170		NA
12/5/05	70	150	NA	210	183	NA	1000	926	NA
12/12/05	140	112	NA	250	192	NA	250	686	NA
12/19/05	80	93	NA	NS		NA	280	540	NA
12/27/05	60	80	NA	450		NA	3800	792	NA
1/3/06	560	121	NA	1000		NA	14000	1301	NA
1/9/06	260	158	NA	110		NA	210	952	NA
1/17/06	1000	234	NA	NS		NA	200	910	NA
1/23/06	40	204	NA	130		NA	70	690	NA
1/30/06	240	269	NA	110		NA	150	362	NA
2/6/06	150	206	NA	320		NA	180	151	NA
2/14/06	100	170	NA	250		NA	130	137	NA
2/21/06	<10	68	NA	NS		NA	3600	245	NA
2/27/06	30	64	NA	280		NA	210	305	NA
3/6/06	<10	34	NA	120		NA	200	323	NA
3/15/06	<10	20	NA	200		NA	350	369	NA
3/20/06	60	18	NA	210		NA	440	471	NA
3/27/06	2000	51	NA	30	133	NA	340	294	NA

Sampling results on these dates may have been influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

Running 30-day geometric mean > 200 organisms/100 mL based on 5 or more samples per 30-day period or Fecal Coliform sample > 400 organisms/100mL

Both criteria of the Fecal Coliform TMDL met

Geomean unable to be calculated since less than 5 samples taken from the preceding 30-day period

TNTC = Too Numerous to Count

ID = Insufficient Data to Compare to Objective

NS = Not Sampled

Cw/C = Confluent Growth with Coliforms

TABLE 2

RUNNING GEOMEAN OF FECAL COLIFORM CONCENTRATIONS IN NEWPORT BAY

April 2005-March 2006

TRIBUTARY STATIONS

	San Diego Creek @ Campus Dr.		
	Fecal Coliform	Geomean*	30-day period met objective*
4/4/05	210	358	no
4/11/05	100	274	no
4/18/05	1000	337	no
4/25/05	Cw/C	812	no
5/2/05	1000	966	no
5/9/05	560	1175	no
5/16/05	430	1573	no
5/23/05	100	993	no
5/31/05	80	286	no
6/6/05	50	157	no
6/15/05	10		ID
6/20/05	30	41	yes
6/27/05	70	38	yes
7/5/05	100	40	yes
7/11/05	<10	29	yes
7/18/05	30	36	yes
7/25/05	60	42	yes
8/2/05	30	35	yes
8/8/05	30	28	yes
8/15/05	100	44	yes
8/22/05	10	35	yes
8/29/05	<10	25	yes
9/6/05	10	20	yes
9/14/05	10		ID
9/19/05	10	10	yes
9/28/05	260		ID
10/3/05	220	36	yes
10/11/05	150	61	yes
10/17/05	72000	362	no
10/24/05	800	869	no
10/31/05	130	756	no
11/7/05	100	646	no
11/14/05	420	793	no
11/21/05	140	228	no
11/30/05	240		ID
12/5/05	500	234	no
12/12/05	130	247	no
12/19/05	70	173	no
12/27/05	60	146	no
1/3/06	36000	397	no
1/9/06	320	363	no
1/17/06	130	363	no
1/23/06	80	373	no
1/30/06	30	324	no
2/6/06	80	96	yes
2/14/06	30	60	yes
2/21/06	3000	112	no
2/27/06	50	102	no
3/6/06	220	151	no
3/15/06	80	151	no
3/20/06	2200	357	no
3/27/06	30	142	no

(Grey) Sampling results on these dates may have been influenced by rainfall (within 72 hours of 0.1 inch of precipitation)

(Yellow) Running 30-day geometric mean > 200 organisms/100 mL based on 5 or more samples per 30-day period or Fecal Coliform sample > 400 organisms/100mL

(Blue) Both criteria of the Fecal Coliform TMDL met

(Box) Geomean unable to be calculated since less than 5 samples taken from the preceding 30-day period

TNTC = Too Numerous to Count

ID = Insufficient Data to Compare to Objective

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Cw/C = Confluent Growth with Coliforms

Table 3
Summary of REC-1 Fecal Coliform Objective Compliance - Dry Season

	2001	2002	2003	2004	2005
Number of Sampling Dates Possibly Influenced by Rain[1]	2	0	2	1	2
Number of Stations Meeting Standards ≥75% of the time	21	21	17	23	21
Stations Meeting Standards ≥75% of the time					43rd Street Beach
	38th Street Beach			38th Street Beach	38th Street Beach
				Lido Yacht Club Beach	
	Via Genoa Beach	Via Genoa Beach	**Via Genoa Beach**	**Via Genoa Beach**	Via Genoa Beach
				Rhine Channel	Rhine Channel
			19th Street Beach	**19th Street Beach**	19th Street Beach
	15th Street Beach	**15th Street Beach**	15th Street Beach	**15th Street Beach**	15th Street Beach
	10th Street Beach	**10th Street Beach**		**10th Street Beach**	10th Street Beach
	Alvarado/ Bay Isle Beach	Alvarado/ Bay Isle Beach	Alvarado/ Bay Isle Beach	**Alvarado/ Bay Isle Beach**	Alvarado/ Bay Isle Beach
	N Street Beach	**N Street Beach**	N Street Beach	N Street Beach	**N Street Beach**
	Garnet Avenue Beach	Garnet Avenue Beach		Garnet Avenue Beach	Garnet Avenue Beach
	Ruby Avenue Beach	**Ruby Avenue Beach**	Ruby Avenue Beach	**Ruby Avenue Beach**	Ruby Avenue Beach
	Sapphire Avenue Beach	**Sapphire Avenue Beach**	Sapphire Avenue Beach	**Sapphire Avenue Beach**	Sapphire Avenue Beach
		Grand Canal	**Grand Canal**	Grand Canal	
	Abalone Avenue Beach	**Abalone Avenue Beach**	**Abalone Avenue Beach**	**Abalone Avenue Beach**	**Abalone Avenue Beach**
	Park Avenue Beach	**Park Avenue Beach**	Park Avenue Beach	**Park Avenue Beach**	Park Avenue Beach
	Onyx Avenue Beach	**Onyx Avenue Beach**	Onyx Avenue Beach	**Onyx Avenue Beach**	Onyx Avenue Beach
	Promontory Point Channel	**Promontory Point Channel**	**Promontory Point Channel**	**Promontory Point Channel**	Promontory Point Channel
	Rocky Point Beach	Rocky Point Beach	Rocky Point Beach		**Rocky Point Beach**
	Bayshore Beach	**Bayshore Beach**	Bayshore Beach	Bayshore Beach	Bayshore Beach
	De Anza Launch	De Anza Launch	De Anza Launch	De Anza Launch	De Anza Launch
	Newport Dunes West	**Newport Dunes West**	Newport Dunes West	Newport Dunes West	
	Newport Dunes Middle	**Newport Dunes Middle**	Newport Dunes Middle	Newport Dunes Middle	Newport Dunes Middle
	Newport Dunes East	**Newport Dunes East**		Newport Dunes East	
		Newport Dunes North			
	North Star Beach	North Star Beach		North Star Beach	North Star Beach
	San Diego Creek @ Campus[2]				

Bold Text indicates site met standards 100% of the time

[1] Sampling conducted within 72 hours of 0.1 inch of precipitation

[2] While San Diego Creek is not included within the TMDL, data has been collected and evaluated as it is tributary to Newport Bay.

Table 3 (continued)
Summary of REC-1 Fecal Coliform Objective Compliance - Dry Season

	2001	2002	2003	2004	2005
Number of Sampling Dates Possibly Influenced by Rain[1]	2	0	2	1	2
Number of Stations Meeting Standards ≤45% of the time	2	5	5	2	1
Stations Meeting Standards ≤ 45% of the time	33rd Street Channel Newport Blvd. Bridge	43rd Street Beach 33rd Street Channel Newport Blvd. Bridge Rhine Channel Harbor Patrol Beach	43rd Street Beach 33rd Street Channel Newport Blvd. Bridge Harbor Patrol Beach Newport Dunes North	33rd Street Channel Harbor Patrol Beach	33rd Street Channel

Bold Text indicates site met standards 100% of the time
[1] Sampling conducted within 72 hours of 0.1 inch of precipitation
[2] While San Diego Creek is not included within the TMDL, data has been collected and evaluated as it is tributary to Newport Bay.

Table 4
Summary of REC-1 Fecal Coliform Objective Compliance - Wet Season

	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006
Number of Sampling Dates Possibly Influenced by Rain[1]	9	6	7	13	6
Number of Stations Meeting Standards ≥75% of the time	7	1	8	0	13
Stations Meeting Standards ≥75% of the time	Via Genoa Beach 15th Street Beach N Street Beach Ruby Avenue Beach Abalone Avenue Beach Promontory Point Channel Rocky Point Beach	15th Street Beach	Rhine Channel N Street Beach Sapphire Avenue Beach Abalone Avenue Beach Park Avenue Beach Promontory Point Channel Harbor Patrol Beach Rocky Point Beach		Via Genoa Beach Rhine Channel 19th Street Beach 15th Street Beach N Street Beach Sapphire Avenue Beach Grand Canal Abalone Avenue Beach Park Avenue Beach Promontory Point Channel Harbor Patrol Beach **Rocky Point Beach** Bayshore Beach

Bold Text indicates site met standards 100% of the time
[1] Sampling conducted within 72 hours of 0.1 inch of precipitation
[2] While San Diego Creek is not included within the TMDL, data has been collected and evaluated as it is tributary to Newport Bay.

Table 4 (continued)
Summary of REC-1 Fecal Coliform Objective Compliance - Wet Season

	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006
Number of Sampling Dates Possibly Influenced by Rain[1]	9	6	7	13	6
Number of Stations Meeting Standards ≤ 45% of the time	10	6	10	29	3
Stations Meeting Standards ≤ 45% of the time		43rd Street Beach	43rd Street Beach	43rd Street Beach	Newport Blvd. Bridge
			38th Street Beach	38th Street Beach	
	33rd Street Channel	33rd Street Channel		33rd Street Channel	
				Lido Yacht Club Beach	
			Via Genoa Beach	Via Genoa Beach	
		Newport Blvd. Bridge		Newport Blvd. Bridge	
				Rhine Channel	
	19th Street Beach			19th Street Beach	
				15th Street Beach	
	10th Street Beach	10th Street Beach	10th Street Beach	10th Street Beach	
				Alvarado/ Bay Isle Beach	
				N Street Beach	
				Garnet Avenue Beach	
				Ruby Avenue Beach	
				Sapphire Avenue Beach	
				Grand Canal	
				Abalone Avenue Beach	
				Park Avenue Beach	
	Onyx Avenue Beach		Onyx Avenue Beach	Onyx Avenue Beach	
				Promontory Point Channel	
		Harbor Patrol Beach		Harbor Patrol Beach	
				Rocky Point Beach	
				Bayshore Beach	
			De Anza Launch	De Anza Launch	
	Newport Dunes West			Newport Dunes West	
	Newport Dunes Middle		Newport Dunes Middle	Newport Dunes Middle	
	Newport Dunes East		Newport Dunes East	Newport Dunes East	
	Newport Dunes North		Newport Dunes North	Newport Dunes North	Newport Dunes North
	North Star Beach		North Star Beach	North Star Beach	
	San Diego Creek @ Campus Dr.[2]	San Diego Creek @ Campus Dr.[2]			San Diego Creek @ Campus Dr.[2]

Bold Text indicates site met standards 100% of the time
[1] Sampling conducted within 72 hours of 0.1 inch of precipitation
[2] While San Diego Creek is not included within the TMDL, data has been collected and evaluated as it is tributary to Newport Bay.

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[1] Sampling conducted within 72 hours of 0.1 inch of precipitation
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California Regional Water Quality Control Board
Santa Ana Region

Winston H. Hickox
Secretary for Environmental Protection

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Gray Davis
Governor

COUNTY EXECUTIVE OFFICE
JAN 10 2000

January 7, 2000

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REQUEST FOR TECHNICAL REPORTS FOR THE IMPLEMENTATION OF THE TOTAL MAXIMUM DAILY LOAD FOR FECAL COLIFORM IN NEWPORT BAY

Dear Supervisor Wilson, Messrs. Roeder, Danner, Rudat, Ream, Dunek, and Huston, Ms. Mittermeier and Ms. Hall Hart, and Mr. Tamaribuchi:

On April 9, 1998, the California Regional Water Quality Control Board, Santa Ana Region, (Regional Board) adopted Resolution No. 99-10, which amended the Water Quality Control Plan for the Santa Ana River Basin (Basin Plan) to establish a Total Maximum Daily Load (TMDL) for fecal coliform in Newport Bay. The TMDL is the maximum load of fecal coliform that can be discharged to the Bay while assuring that the Bay's beneficial uses (e.g., recreation and shellfish harvesting uses) are protected. This TMDL was approved by the State Water Resources Control Board (SWRCB) on July 15, 1999, and by the Office of Administrative Law (OAL) on December 30, 1999, whence the TMDL became effective. For your information, the TMDL has also been submitted to the US EPA, which has already endorsed it; formal approval is also anticipated in the near future.

As you know, Board staff worked closely with the members of the Newport Bay Watershed Management and Executive Committees in the development of this TMDL. All parties sought to recommend a TMDL that would fulfill its legal obligations to achieve water quality objectives and protect beneficial uses, but which also recognized the significant uncertainties and difficulties associated with the fecal coliform problem. The adopted TMDL reflects consensus on a phased approach, whereby plans for further studies are to be submitted in accordance with a specific schedule, and whereby a detailed implementation plan will be developed later, based on the results of these studies. The study results may also indicate the need for revision of the TMDL; the Regional Board has committed to the review of the TMDL as warranted. A copy of the adopted TMDL is attached for your reference.

Pursuant to Water Code Section 13267, this letter is a request for technical reports that provide plans for further study and analysis, as required by the TMDL. We note that, in some cases (identified below), the plans required by the TMDL have already been or are being developed as part of the Health Risk Assessment (HRA) being conducted for the Bay. Please be aware that Regional Board approval of all the plans is required. We intend to present the proposed and, in some cases completed plans to the Regional Board at the earliest opportunity, following the submittal of your response to this request. As discussed below, we will recommend that the Regional Board accept the completed plans for modeling bacterial inputs and fate and for assessment of the recreational beneficial use of the Bay. You should be aware that Regional Board consideration of the plans will take place at a public hearing, and the Regional Board may require changes based on the input provided.

Pursuant to the Basin Plan requirements for the TMDL for fecal coliform in Newport Bay, and Section 13267 of the California Water Code, the County of Orange and the Cities of Irvine, Tustin, Newport Beach, Lake Forest, Santa Ana, Orange, and Costa Mesa, and the Irvine Company are hereby requested to submit the following, by the dates specified. These plans and schedules may be submitted together in a single report or separate reports for each task and jurisdiction.

1. Routine Monitoring Program (Section 3.a.ii.a)

"By January 30, 2000 the County of Orange, the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest and Newport Beach, and the agricultural operators in the Newport Bay watershed shall propose a plan for routine monitoring to determine compliance with the bacterial quality objectives in the Bay. At a minimum, the proposed plan shall include the collection of five (5) samples/30-days at the stations specified in Table 5-9h and shown in Figure 5-1 and analysis of the samples for total and fecal coliform and enterococci. Reports of the collected data shall be submitted monthly. An annual report summarizing the data collected for the year and evaluating compliance with the water quality objectives shall be submitted by September 1 of each year.

In lieu of this coordinated, regional monitoring plan, one or more of the parties identified in the preceding paragraph may submit an individual or group plan to conduct routine monitoring in areas solely within their jurisdiction to determine compliance with the bacterial objectives in the Bay (if appropriate). Any such individual or group plans shall also be submitted by January 30, 2000. Reports of the data collected pursuant to approved individual/group plan(s) shall be submitted monthly and an annual report summarizing the data and evaluating compliance with water quality objectives shall be submitted by September 1 of each year.

The monitoring plan(s) shall be implemented upon Regional Board approval."

We are aware that the Orange County Health Care Agency (OCHCA) is implementing a monitoring program that meets most of the requirements cited above and it is acceptable for this monitoring program to be continued to provide for compliance with these requirements. The one difference between what is required by the TMDL and the monitoring being conducted by the OCHCA is that the OCHCA currently monitors for E.coli bacteria instead of fecal coliform. Since the Basin Plan objectives and the TMDL specifically address fecal coliform, monitoring for fecal coliform must be conducted as specified above. However, we also realize that E.coli bacteria constitute 80-90% of the fecal coliforms measured by the fecal coliform test method, and that the E.coli test method employed by OCHCA offers substantial time and resource savings. Therefore, we are willing to consider the use of E.coli monitoring as a surrogate for fecal coliform, provided that the relationship between E.coli and fecal coliform is demonstrated by the proposed monitoring program. Therefore, if you wish to use the OCHCA's monitoring program to comply with the above cited requirements, then you are requested to include in your proposed monitoring plan a plan for demonstrating the relationship between E.coli bacteria and fecal coliform.

2. Water Quality Model for Bacterial Indicators (Section 3.a.ii.b)

"By January 30, 2000, the County of Orange, the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest, and Newport Beach and the agricultural operators in the Newport Bay watershed shall submit a plan for the development and submittal of a water quality model to be completed by 13 months after Regional Board approval of the plan. The model shall be capable of analysis of fecal coliform inputs to Newport Bay, the fate of those inputs, and the effect of those inputs on compliance with bacterial quality objectives in the Bay."

As stated above, staff will recommend that the Regional Board find that the water quality model development effort that is part of the HRA satisfies the above requirement of the TMDL, provided that the model is capable of analysis of fecal coliform inputs to Newport Bay.

3. Beneficial Use Assessment (Section 3.a.ii.c)

"By January 30, 2000, the County of Orange, the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest and Newport Beach shall submit a plan to complete, by 13 months after Regional Board approval of the plan, a beneficial use assessment to identify and quantify water contact recreation activities in Newport Bay. By 13 months after Regional Board approval of the beneficial use assessment plan, these parties shall submit a report of the results of the water contact recreation beneficial use assessment."

By February 1, 2001, the County of Orange , the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest and Newport Beach shall submit a plan to complete, by 13 months after Regional Board approval of the plan, a beneficial use assessment to identify and quantify shellfish harvesting activities in Newport Bay. By 13 months after Regional Board approval of the beneficial use assessment plan, these parties shall submit a report of the results of the shellfish harvesting beneficial use assessment.

The beneficial use assessment reports shall contain recommendations for prioritizing areas within Newport Bay for purposes of evaluation and implementation of cost-effective and reasonable control actions as part of the TMDL process. The Regional Board will consider these recommendations and make its determinations regarding high priority water contact recreation and shellfish harvesting areas at a duly noticed public hearing. These determinations will be considered in establishing interim WLAs and LAs and compliance dates (Task 10, Table 5-9g)."

A workplan for assessment of the body contact recreation beneficial use throughout Newport Bay has been developed as part of the HRA and work has already been conducted pursuant to it. Staff has indicated our belief that the plan to conduct the assessment is appropriate and we will recommend its approval to the Regional Board. However, a plan and schedule for assessing the shellfish harvesting beneficial uses will need to be submitted. We are aware that the development of a workplan is underway.

4. Source Identification and Characterization (Section 3.a.ii.d)

"By March 1, 2000, the County of Orange and the City of Newport Beach shall submit a proposed plan for a program, to be completed within 7 months after Regional Board approval of the plan to identify and characterize fecal coliform inputs to The Dunes Resort. In lieu of this coordinated plan, each of these parties may submit an individual plan to identify and characterize fecal coliform inputs to The Dunes Resort. Any such individual plan shall also be submitted by March 1, 2000 and completed within 7 months after Regional Board approval of the plan(s).

By March 1, 2000, the County of Orange and the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest, and Newport Beach shall submit a proposed plan for a program, to be completed within 13 months after Regional Board approval of the plan to identify and characterize fecal coliform inputs to Newport Bay from urban runoff, including stormwater. In lieu of this coordinated, regional plan, one or more of these parties may submit an individual or group plan to identify and characterize fecal coliform inputs to the Bay from urban runoff from areas within its jurisdiction. Any such individual or group plan shall also be submitted by March 1, 2000 and completed within 13 months after Regional Board approval of the plan(s).

By April 1, 2000, the agricultural operators in the Newport Bay watershed shall submit a proposed plan for a program, to be completed within 16 months after Regional Board approval of the plan, to identify and characterize fecal coliform inputs to Newport Bay from agricultural runoff, including stormwater. In lieu of this coordinated plan, one or more of the agricultural operators may submit an individual or group plan to identify and characterize fecal coliform inputs to the Bay from agricultural runoff from areas within their jurisdiction. Any such individual or group plan shall also be submitted by April 1, 2000 and completed within 16 months after Regional Board approval of the plan(s).

By April 1, 2000 the County of Orange and the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest, and Newport Beach shall submit a proposed plan for a program, to be completed within 16 months after Regional Board approval of the plan, to identify and characterize fecal coliform inputs to Newport Bay from natural sources. In lieu of this coordinated, regional plan, one or more of these parties may submit an individual or group plan to identify and characterize fecal coliform inputs to the Bay from natural sources from areas within its jurisdiction. Any such individual or group plan shall also be submitted by April 1, 2000 and completed within 16 months after Regional Board approval of the plan(s)."

5. Evaluation of Vessel Waste Control Program (Section 3.a.ii.e)

"By April 1, 2000, the County of Orange and the City of Newport Beach shall submit a plan to complete, by one year after Regional Board approval of the plan, an assessment of the effectiveness of the vessel waste control program implemented by those agencies in Newport Bay. The plan shall be implemented upon approval by the Regional Board. A report of the study results shall be submitted, together with recommendations for changes to the vessel waste program necessary to ensure compliance with this TMDL.

The Regional Board will consider appropriate changes to the vessel waste control program. These changes shall be implemented in accordance with a schedule to be established by the Regional Board."

6. TMDL, WLA and LA Evaluation and Source Monitoring Program Section 3.a.ii.f)

"By 3 months after completion of Tasks 2, 4a, and 6 as shown in Table 5-9g of the TMDL' the County of Orange, the Cities of Tustin, Irvine, Costa Mesa Santa Ana, Orange, Lake Forest and Newport Beach, and the agricultural operators in the Newport Bay watershed shall propose a plan for evaluation and source monitoring to determine compliance with the WLAs and LAs specified in Table 5-9f. In lieu of this coordinated, regional plan, one or more of these parties may submit an individual or group plan to conduct TMDL, WLA, LA and Source Evaluation monitoring from areas solely within their jurisdiction. Any such individual or group plan shall also be submitted by 3 months after completion of Tasks 2, 4a, and 6 as shown in Table 5-9g. Reports of the data collected pursuant to approved individual/group plan(s) shall be submitted monthly and an annual report summarizing the data and evaluating compliance with WLAs and LAs shall be submitted by September 1 of each year. The annual report shall also include an evaluation of the effectiveness of control measures implemented to control sources of fecal coliform, and recommendations for any changes to the control measures needed to ensure compliance with the TMDL, WLAs, and LAs.

The evaluation and source monitoring plan(s) shall be implemented upon Regional Board approval."

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7. Updated TMDL Report (Section 3.a.ii.g)

"By 6 months after completion of Tasks 2, 4a, and 6 as shown in Table 5-9g of the TMDL' the County of Orange, the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest and Newport Beach, and the agricultural operators in the Newport Bay watershed shall submit Updated TMDL Reports as specified in Table 5-9g. These updated TMDL reports shall, at a minimum, integrate and evaluate the results of the studies required in Table 5-9g (Task 1 – 7). The reports shall include recommendations for revisions to the TMDL, if appropriate and for interim WLAs, LAs and compliance schedules."

This request for monitoring and technical information applies to the County of Orange, each individual City within the Newport Bay Watershed, and the Irvine Company. The Regional Board and its staff have worked with the Newport Bay Watershed Executive Committee in the development of this TMDL and it is our assumption that this Committee will assume the responsibility for preparing a coordinated response to this request. However, the County, each City, and the Irvine Company is severally responsible for ensuring compliance with this request for monitoring and technical information, and for the implementation of the TMDL for fecal coliform in the Newport Bay Watershed within the areas of the watershed within their respective jurisdictions. We are obligated to advise you that failure to submit the requested monitoring and technical information by the specified deadline may subject the County, each City, and the Irvine Company to potential civil liability pursuant to Section 13268 of the California Water Code.

Should there be any questions, please contact me at (909) 782-3284, Joanne Schneider at (909) 782-3287, or Ken Theisen at (909) 320-2028.

Sincerely,

Gerard J. Thibeault
Executive Officer
Santa Ana Regional Water Quality Control Board

Attachment: Copy of Basin Plan TMDL for Fecal Coliform in Newport Bay Watershed

cc (w/ Attachment): Regional Board
Newport Bay Pathogen TMDL Mailing List

COUNTY EXECUTIVE OFFICE
JAN 18 2000

Attachment to Resolution No. 99-10

Amendment to the Santa Ana Region Basin Plan

Chapter 5 - Implementation Plan, Discussion of Newport Bay Watershed (page 5-39 et seq.)

3. Bacterial Contamination

Bacterial contamination of the waters of Newport Bay can directly affect two designated beneficial uses: water-contact recreation (**REC-1**) and shellfish harvesting (**SHEL**). The Orange County Health Care Agency (OCHCA) conducts routine bacteriological monitoring and more detailed sanitary surveys as necessary, and is responsible for closure of areas to recreational and shellfish harvesting uses if warranted by the results.

Because of consistently high levels of total coliform bacteria, the upper portion of Upper Newport Bay (Upper Bay) has been closed to these uses since 1974. In 1978, the shellfish harvesting prohibition area was expanded to include all of the Upper Bay, and the OCHCA generally advises against the consumption of shellfish harvested anywhere in the Bay. Bacterial objectives established to protect shellfish harvesting activities are rarely met in the Bay. (Fecal coliform objectives for the protection of shellfish harvesting and water-contact recreation are shown in Chapter 4, "Enclosed Bays and Estuaries". The OCHCA has relied on total coliform standards specified in the California Health and Safety Code. Fecal coliform are a subset of total coliform.) Certain areas in the lower parts of the Upper Bay and in Lower Newport Bay (Lower Bay) are also closed to water-contact recreation on a temporary basis, generally in response to storms. In these areas, there is generally good compliance with water-contact recreation bacterial objectives in the summer.

Data collected by the OCHCA demonstrate that tributary inflows, composed of urban and agricultural runoff, including stormwater, are the principal sources of coliform input to the Bay. As expected, there are more violations of bacterial standards in the Bay during wet weather, when tributary flows are higher, than in dry weather. There are few data on the exact sources of the coliform in this runoff. Coliform has diverse origins, including: manure fertilizers which may be applied to agricultural crops and to commercial and residential landscaping; the fecal wastes of humans, household pets and wildlife; and other sources. Special investigations by OCHCA have demonstrated that food wastes are a significant source of coliform. Many restaurants wash down equipment and floor mats into storm drains tributary to the Bay and may improperly dispose of food waste such that it eventually washes into the Bay. Such discharges likely contribute to the chronic bacterial quality problems in certain parts of the Bay.

Another source of bacterial input to the Bay is the discharge of vessel sanitary wastes. Newport Bay has been designated a no-discharge harbor for vessel sanitary wastes since 1976. Despite this prohibition, discharges of these wastes have continued to occur. Since these wastes are of human origin, they pose a potentially significant public health threat.

The Regional Board, the City of Newport Beach (City), the County of Orange, the City of Newport Beach Harbor Quality Committee, and other parties have taken or stimulated actions to enforce the vessel waste discharge prohibition. The principal focus of these efforts has been to make compliance with the prohibition convenient and therefore more likely. Vessel waste pumpouts have been installed at key locations around the Bay and are inspected routinely by the OCHCA. A City ordinance addresses people-intensive boating activities to ensure proper disposal of sanitary wastes. The ordinance requires that sailing clubs, harbor tour, and boat charter operations install pumpouts for their vessels. Another City ordinance addresses vessel waste disposal by persons living on their boats. Efforts have also been made to ensure that there are adequate public rest rooms onshore. The City also sponsors an extensive public education campaign designed to advise both residents and visitors of the discharge prohibition, the significance of violations, and of the location of pumpouts and rest room facilities. The effectiveness of these extensive vessel waste control efforts is not known.

As noted, the fecal waste of wildlife, including waterfowl that inhabit the Bay and its environs, is a source of coliform input. The fecal coliform from these natural sources may contribute to the violations of water quality objectives and the loss of beneficial uses, but it is currently unknown to what extent these natural sources contribute to, or cause, the violations of bacterial quality objectives in Newport Bay.

Reports prepared by Regional Board staff describe the bacterial quality problems in the Bay in greater detail and discuss the technical basis for the fecal coliform TMDL that follows (21, 22). Implementation of this TMDL is expected to address these bacterial quality problems and to assure attainment of water quality standards, that is, compliance with water quality objectives and protection of beneficial uses.

3.a. Fecal Coliform TMDL

A prioritized, phased approach to the control of bacterial quality in the Bay is specified in this TMDL. This approach is appropriate, given the complexity of the problem, the paucity of relevant data on bacterial sources and fate, the expected difficulties in identifying and implementing appropriate control measures, and uncertainty regarding the nature and attainability of the SHEL use in the Bay. The phased approach is intended to allow for additional monitoring and assessment to address areas of uncertainty and for future revision and refinement of the TMDL as warranted by these studies.

Table 5-9f summarizes the TMDL, Waste Load Allocations (WLAs) for point sources of fecal coliform inputs and Load Allocations (LAs) for nonpoint source inputs. As shown, the TMDL, WLAs and LAs are established to assure compliance with water contact recreation standards no later than December 30, 2014 and with shellfish standards no later than December 30, 2019. WLAs are specified for vessel waste and urban runoff, including stormwater, the quality of which is regulated under a County-wide NPDES permit issued by the Regional Board. This runoff is thus regulated as a point source, even though it is diffuse in origin. LAs are specified for fecal coliform inputs from agricultural runoff, including stormwater, and natural sources. The TMDL is to be adjusted, as appropriate, based upon completion of the studies contained in Table 5-9g. Upon completion of these studies, an updated TMDL report will be prepared summarizing the results of the studies and making recommendations regarding implementation of the TMDL. The results of the studies may lead to recommendations for changes to the TMDL specified in Table 5-9f to assure compliance with existing Basin Plan standards (objectives and beneficial uses). The study results may also lead to recommendations for changes to the Basin Plan objectives and/or beneficial uses. If such standards changes are approved through the Basin Plan amendment process, then appropriate changes to the TMDL would be required to assure attainment of the revised standards. Revision of the TMDL, if appropriate, would also be considered through the Basin Plan amendment process.

Upon completion and consideration of the studies and any appropriate Basin Plan amendments, a plan for compliance with the TMDL specified in Table 5-9f, or with an approved amended TMDL, shall be established. It is expected that this plan will specify a phased compliance approach, based on consideration of such factors as geographic location, the priority assigned by the Regional Board to specific locations for control actions (see Section 3.a.ii, "Beneficial Use Assessment"), season, etc. Interim WLAs, LAs and compliance dates that lead to ultimate compliance with the TMDL will be established.

The TMDL and its allocations contain a significant margin of safety. The margin of safety can be either incorporated implicitly through analytical approaches and assumptions used to develop the TMDL or added explicitly as a separate component of the TMDL. A substantial margin of safety is implicitly incorporated in the TMDL in the fact that the TMDL does not apply criteria for dilution, natural die-off, and tidal flushing. The TMDL, WLAs, and LAs are established at concentrations equivalent to the water quality objectives.

Table 5-9f: Total Maximum Daily Load, Waste Load Allocations, and Load Allocations for Fecal Coliform in Newport Bay

Total Maximum Daily Load for Fecal Coliform in Newport Bay	Waste Load Allocations for Fecal Coliform in Urban Runoff, including stormwater, Discharges to Newport Bay	Load Allocations for Fecal Coliform in Agricultural Runoff, including stormwater, Discharges to Newport Bay	Load Allocations for Fecal Coliform from Natural Sources in all Discharges to Newport Bay	Waste Load Allocations for Vessel Waste
As soon as possible but no later than December 30, 2013			**In Effect**	**In Effect**
5-Sample/30-days Geometric Mean less than 200 organisms/100 mL, and not more than 10% of the samples exceed 400 organisms/ 100 mL for any 30-day period.	5-Sample/30-days Geometric Mean less than 200 organisms/100 mL, and not more than 10% of the samples exceed 400 organisms/ 100 mL for any 30-day period.	5-Sample/30-days Geometric Mean less than 200 organisms/ 100 mL, and not more than 10% of the samples exceed 400 organisms/ 100 mL for any 30-day period.	5-Sample/30-days Geometric Mean less than 200 organisms/100 mL, and not more than 10% of the samples exceed 400 organisms/ 100 mL for any 30-day period.	0 MPN/100 mL No discharge.
As soon as possible but no later than December 30, 2019				**In Effect**
Monthly Median less than 14 MPN/100 mL, and not more than 10% of the samples exceed 43 MPN/100 mL.	Monthly Median less than 14 MPN/100 mL, and not more than 10% of the samples exceed 43 MPN/100 mL.	Monthly Median less than 14 MPN/100 mL, and not more than 10% of the samples exceed 43 MPN/100 mL.	Monthly Median less than 14 MPN/100 mL, and not more than 10% of the samples exceed 43 MPN/100 mL.	0 MPN/100 mL No discharge.

Table 5-9g: Fecal Coliform Implementation Plan/Schedule Report Due Dates

Task	Description	Compliance Date-As soon As Possible but No Later Than
Task 1	Routine Monitoring Program (Section 3.a.ii.a) a) Submit Proposed Routine Monitoring Plan(s)[1] b) Implement Routine Monitoring Plan(s) c) Submit Monthly and Annual Reports (Reporting Period: April 1-March 31)	a) January 30, 2000 b) Upon Regional Board Approval of Plan(s) c) Monthly within 30 days, Annual Report by September 1
Task 2	Water Quality Model for Bacterial Indicators (Section 3.a.ii.b) a) Submit Proposed Model Development Plan b) Submit Calibrated Model and Model Documentation	a) January 30, 2000 b) 13 months after Regional Board approval of plan(s)
Task 3	Beneficial Use Assessment Plan (Section 3.a.ii.c) Submit Proposed Assessment Plan for: a) REC-1 b) SHEL	a) January 30, 2000 b) March 1, 2001
Task 4	Beneficial Use Assessment Report (3.a.ii.c) Submit Beneficial Use Assessment Report for: a) REC-1 b) SHEL	a) 13 months after Regional Board approval of plan(s) b) 13 months after Regional Board approval of plan(s)
Task 5	Source Identification and Characterization Plan(s) (Section 3.a.ii.d) Submit Proposed Source Identification Plans for: a) The Dunes Resort b) Urban Runoff (including stormwater) c) Agriculture (including stormwater) d) Natural Sources	a) March 1, 2000 b) March 1, 2000 c) April 1, 2000 d) April 1, 2000

Table 5-9g: Fecal Coliform Implementation Plan/Schedule Report Due Dates

Task	Description	Compliance Date-As Soon As Possible but No Later Than
Task 6	Source Identification and Characterization Reports (Section 3.a.ii.d) Submit Source Identification and Characterization Reports for: a) The Dunes Resort b) Urban Runoff (including stormwater) c) Agriculture (including stormwater) d) Natural Sources	a) 7 months after Regional Board approval of plan(s) b) 13 months after Regional Board approval of plan(s) c) 16 months after Regional Board approval of plan(s) d) 16 months after Regional Board approval of plan(s)
Task 7	Evaluation of Vessel Waste Program (Section 3.a.ii.e) a) Submit Proposed Plan for Evaluating the Current Vessel Waste Program b) Submit Report on the Evaluation of the Vessel Waste Program	a) April 1, 2000 b) 12 months after Regional Board approval of plan
Task 8	TMDL, WLA, and LA Evaluation and Source Monitoring Program (Section 3.a.ii.f) a) Submit Proposed Evaluation and Source Monitoring Program Plan(s) b) Implement Evaluation and Source Monitoring Plan(s) c) Submit Monthly and Annual Reports (Reporting Period: April 1-March 31)	a) 3 months after completion of Tasks 2, 4a, and 6 b) Upon Regional Board approval of plan(s) c) Monthly within 30 days, Annual Report by September 1
Task 9	Updated TMDL Report Submit updated TMDL report for: a) REC-1 b) SHEL	a) 6 months after completion of Tasks 2, 4a, 6, and 7 b) 6 months after completion of Tasks 2, 4b, 6, and 7

Table 5-9g: Fecal Coliform Implementation Plan/Schedule Report Due Dates

Task	Description	Compliance Date-As Soon As Possible but No Later Than
Task 10	Adjust TMDL, if necessary; adopt interim WLAs, LAs, and Compliance Dates (Section 3.a.ii.h) a) REC-1 b) SHEL	a) 12 months after completion of Updated TMDL Report for REC-1 (Task 9.a) b) 12 months after completion of Updated TMDL Report for SHEL (Task 9.b)

[1]Note: Provided that the monitoring program plan(s) fulfills the minimum requirements specified in this TMDL, approval of the TMDL shall constitute Regional Board approval of the monitoring program plan(s).

3.a.i. TMDL Implementation

As soon as possible but no later than the dates specified in Table 5-9g, the County of Orange, the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest and Newport Beach and agricultural operators in the Newport Bay watershed shall submit the plans and schedules shown in Table 5-9g and described in Section 3.a.ii. Subsequent phases of TMDL implementation shall take into account the results of the monitoring and assessment efforts required by the initial study phase of the TMDL implementation plan and other relevant studies.

The following sections describe the requirements for the submittal of plans by dischargers in the Newport Bay watershed to complete specific monitoring, investigations and analyses. In each and every case, the plans submitted by the named dischargers will be considered for approval by the Regional Board at a duly noticed public hearing as specified in Chapter 1.5, Division 3, Title 23 of the California Code of Regulations (Section 647 et seq.). The plans are to be implemented upon Regional Board approval and completed as specified in Table 5-9g.

3.a.ii. Monitoring and Assessment

Routine monitoring and special investigations and analyses are an important part of this phased TMDL. Routine monitoring is necessary to assess compliance with the bacterial quality objectives in the Bay and with the WLAs and LAs specified in the TMDL. Special investigations and analyses are needed to identify and characterize sources of fecal coliform input and to determine their fate in the Bay so that appropriate control measures can be developed and implemented. The effectiveness of current and future bacterial control measures needs to be evaluated. The results of these studies may warrant future changes to this TMDL.

3.a.ii.a. Routine Monitoring

By January 30, 2000, the County of Orange, the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest and Newport Beach, and the agricultural operators in the Newport Bay watershed shall propose a plan for routine monitoring to determine compliance with the bacterial quality objectives in the Bay. At a minimum, the proposed plan shall include the collection of five (5) samples/30-days at the stations specified in Table 5-9h and shown in Figure 5-1 and analysis of the samples for total and fecal coliform and enterococci. Reports of the collected data shall be submitted monthly. An annual report summarizing the data collected for the year and evaluating compliance with the water quality objectives shall be submitted by September 1 of each year.

In lieu of this coordinated, regional monitoring plan, one or more of the parties identified in the preceding paragraph may submit an individual or group plan to conduct routine monitoring in areas solely within their jurisdiction to determine compliance with the bacterial objectives in the Bay (if appropriate). Any such individual or group plans shall also be submitted by January 30, 2000. Reports of the data collected pursuant to approved individual/group plan(s) shall be submitted monthly and an annual report summarizing the data and evaluating compliance with water quality objectives shall be submitted by September 1 of each year.

The monitoring plan(s) shall be implemented upon Regional Board approval.

Table 5-9h

Newport Bay Sampling Stations for Routine Compliance Monitoring with Bacterial Quality Objectives (see Figure 1 for Station Locations)

Ski Zone	33rd Street	Park Avenue
Vaughns Launch	Rhine Channel	Via Genoa
Northstar Beach	De Anza	Alvarado/Bay Is.
Abalone Avenue	Promontory Pt.	10th Street
Dunes East	Bayshore Beach	15th Street
Dunes Middle	Onyx Avenue	19th Street
Dunes West	Garnet Avenue	Lido Island Yacht Club
Dunes North	Ruby Avenue	Harbor Patrol
43rd Street	Sapphire Avenue	N Street Beach
38th Street	Newport Blvd. Bridge	Rocky Point
San Diego Creek @ Campus Dr.	Santa Ana Delhi Channel	Big Canyon Wash
Backbay Dr. Drain		

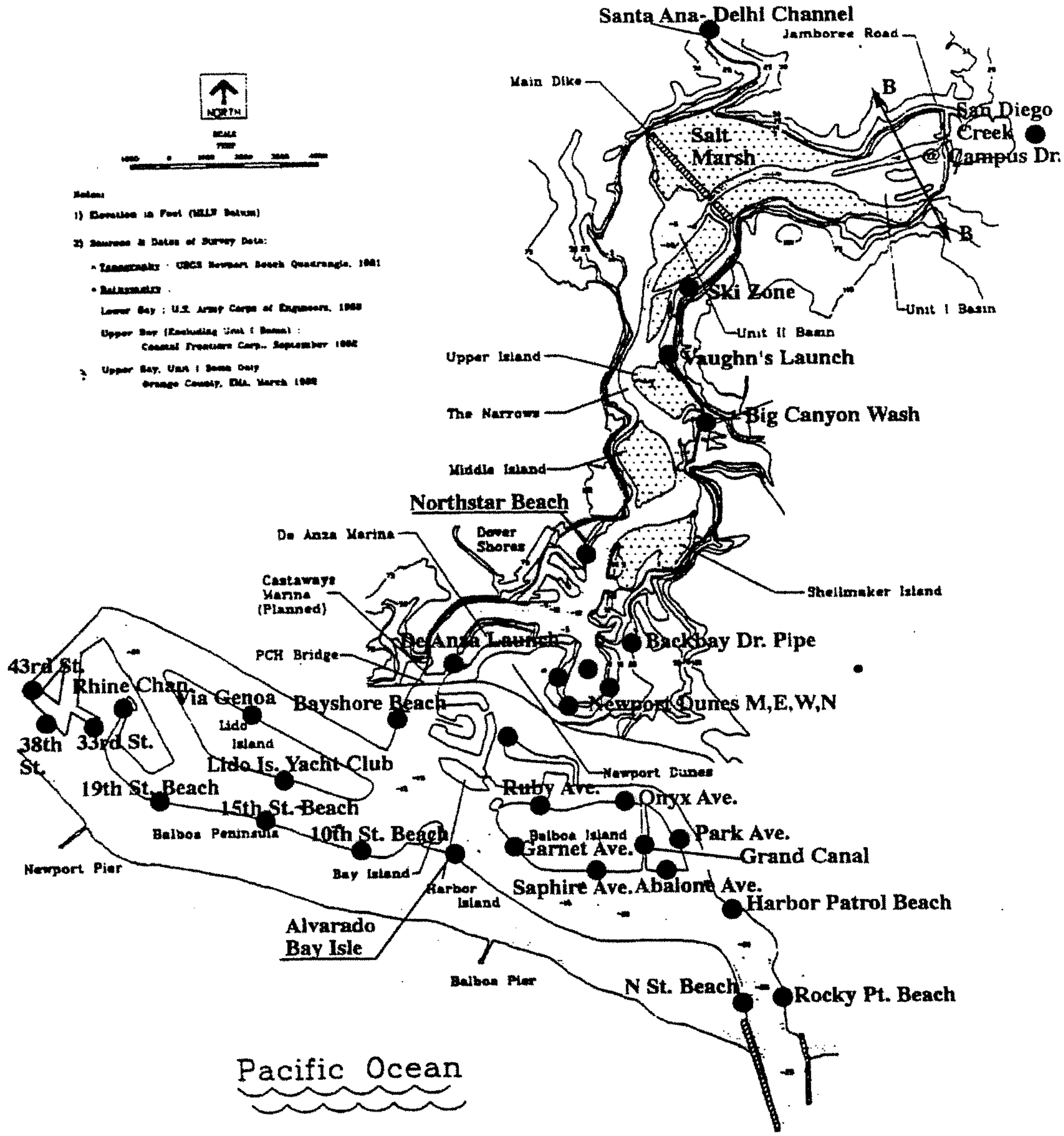


Figure 5-1: Newport Bay Bacterial Quality Monitoring Stations

3.a.ii.b. Fate of Bacterial Inputs

By January 30, 2000, the County of Orange, the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest, and Newport Beach and the agricultural operators in the Newport Bay watershed shall submit a plan for the development and submittal of a water quality model to be completed by 13 months after Regional Board approval of the plan. The model shall be capable of analysis of fecal coliform inputs to Newport Bay, the fate of those inputs, and the effect of those inputs on compliance with bacterial quality objectives in the Bay.

3.a.ii.c. Beneficial Use Assessment

By January 30, 2000, the County of Orange, the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest and Newport Beach shall submit a plan to complete, by 13 months after Regional Board approval of the plan, a beneficial use assessment to identify and quantify water contact recreation activities in Newport Bay. By 13 months after Regional Board approval of the beneficial use assessment plan, these parties shall submit a report of the results of the water contact recreation beneficial use assessment.

By March 1, 2001, the County of Orange , the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest and Newport Beach shall submit a plan to complete, by 13 months after Regional Board approval of the plan, a beneficial use assessment to identify and quantify shellfish harvesting activities in Newport Bay. By 13 months after Regional Board approval of the beneficial use assessment plan, these parties shall submit a report of the results of the shellfish harvesting beneficial use assessment.

The beneficial use assessment reports shall contain recommendations for prioritizing areas within Newport Bay for purposes of evaluation and implementation of cost-effective and reasonable control actions as part of the TMDL process. The Regional Board will consider these recommendations and make its determinations regarding high priority water contact recreation and shellfish harvesting areas at a duly noticed public hearing. These determinations will be considered in establishing interim WLAs and LAs and compliance dates (Task 10, Table 5-9g).

3.a.ii.d. Source Identification and Characterization

By March 1, 2000, the County of Orange and the City of Newport Beach shall submit a proposed plan for a program, to be completed within 7 months after Regional Board approval of the plan to identify and characterize fecal coliform inputs to The Dunes Resort. In lieu of this coordinated plan, each of these parties may submit an individual plan to identify and characterize fecal coliform inputs to The Dunes Resort. Any such individual plan shall also be submitted by March 1, 2000 and completed within 7 months after Regional Board approval of the plan(s).

By March 1, 2000, the County of Orange and the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest, and Newport Beach shall submit a proposed plan for a program, to be completed within 13 months after Regional Board approval of the plan to identify and characterize fecal coliform inputs to Newport Bay from urban runoff, including stormwater. In lieu of this coordinated, regional plan, one or more of these parties may submit an individual or group plan to identify and characterize fecal coliform inputs to the Bay from urban runoff from areas within its jurisdiction. Any such individual or group plan shall also be submitted by March 1, 2000 and completed within 13 months after Regional Board approval of the plan(s).

By April 1, 2000, the agricultural operators in the Newport Bay watershed shall submit a proposed plan for a program, to be completed within 16 months after Regional Board approval of the plan, to identify and characterize fecal coliform inputs to Newport Bay from agricultural runoff, including stormwater. In lieu of this coordinated plan, one or more of the agricultural operators may submit an individual or group plan to identify and characterize fecal coliform inputs to the Bay from agricultural runoff from areas within their jurisdiction. Any such individual or group plan shall also be submitted by April 1, 2000, and completed within 16 months after Regional Board approval of the plan(s).

By April 1, 2000, the County of Orange and the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest, and Newport Beach shall submit a proposed plan for a program, to be completed within 16 months after Regional Board approval of the plan, to identify and characterize fecal coliform inputs to Newport Bay from natural sources. In lieu of this coordinated, regional plan, one or more of these parties may submit an individual or group plan to identify and characterize fecal coliform inputs to the Bay from natural sources from areas within its jurisdiction. Any such individual or group plan shall also be submitted by April 1, 2000 and completed within 16 months after Regional Board approval of the plan(s).

3.a.ii.e. Evaluation of Vessel Waste Control Program

By April 1, 2000, the County of Orange and the City of Newport Beach shall submit a plan to complete, by one year after Regional Board approval of the plan, an assessment of the effectiveness of the vessel waste control program implemented by those agencies in Newport Bay. The plan shall be implemented upon approval by the Regional Board. A report of the study results shall be submitted, together with recommendations for changes to the vessel waste program necessary to ensure compliance with this TMDL.

The Regional Board will consider appropriate changes to the vessel waste control program. These changes shall be implemented in accordance with a schedule to be established by the Regional Board.

3.a.ii.f. TMDL, WLA and LA Evaluation and Source Monitoring Program

By 3 months after completion of Tasks 2, 4a, and 6 as shown in Table 5-9g, the County of Orange, the Cities of Tustin, Irvine, Costa Mesa Santa Ana, Orange, Lake Forest and Newport Beach, and the agricultural operators in the Newport Bay watershed shall propose a plan for evaluation and source monitoring to determine compliance with the WLAs and LAs specified in Table 5-9f. In lieu of this coordinated, regional plan, one or more of these parties may submit an individual or group plan to conduct TMDL, WLA, LA and Source Evaluation monitoring from areas solely within their jurisdiction. Any such individual or group plan shall also be submitted by 3 months after completion of Tasks 2, 4a, and 6 as shown in Table 5-9g. Reports of the data collected pursuant to approved individual/group plan(s) shall be submitted monthly and an annual report summarizing the data and evaluating compliance with WLAs and LAs shall be submitted by September 1 of each year. The annual report shall also include an evaluation of the effectiveness of control measures implemented to control sources of fecal coliform, and recommendations for any changes to the control measures needed to ensure compliance with the TMDL, WLAs, and LAs.

The evaluation and source monitoring plan(s) shall be implemented upon Regional Board approval.

3.a.ii.g. Updated TMDL Report

The County of Orange, the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Orange, Lake Forest and Newport Beach, and the agricultural operators in the Newport Bay watershed shall submit Updated TMDL Reports as specified in Table 5-9g. These updated TMDL reports shall, at a minimum, integrate and evaluate the results of the studies required in Table 5-9g (Task 1 – 7). The evaluate the results of the studies required in Table 5-9g (Task 1 – 7). The reports shall include recommendations for revisions to the TMDL, if appropriate and for interim WLAs, LAs and compliance schedules

3.a.ii.h. Adjust TMDL; Adopt Interim WLA, LAs and Compliance Dates

Based on the results of the studies required by Table 5-9g and recommendations made in the Updated TMDL Reports, changes to the TMDL for fecal coliform may be warranted. Such changes would be considered through the Basin Plan Amendment process. Upon completion and consideration of the studies and any appropriate Basin Plan amendments, interim WLAs and LAs that lead to ultimate compliance with the TMDL specified in Table 5-9f, or with an approved amended TMDL, will be established with interim compliance dates. Schedules will also be established for submittal of implementation plans for control measures to achieve compliance with these WLAs, LAs, and compliance dates. These implementation plans will be considered by the Regional Board at a duly noticed public hearing.

The Regional Board is committed to the review of this TMDL every three years or more frequently if warranted by these or other studies. The County of Orange, the Cities of Tustin, Irvine, Costa Mesa, Santa Ana, Lake Forest, and Newport Beach, The Irvine Company and the Irvine Ranch Water District have undertaken to prepare a health risk assessment for Newport Bay for water contact recreation and shellfish harvesting beneficial uses. This study will evaluate whether exceedances of fecal coliform objectives correlates with actual impairment of beneficial uses and may recommend revisions to the Basin Plan objectives and/or beneficial use designations. Because this study is in progress, it is not required by this TMDL implementation plan, but will be considered in conjunction with the studies required by the implementation plan.

NEPTUNE AND COMPANY, INC.
8550 West 14th Ave, Suite 100
Lakewood CO 80215
Phone: (720) 746-1803
Fax: (720) 746-1605

MEMORANDUM

To: Amanda Carr

From: Mark Fitzgerald

Date: 08/22/2006

Subject: Preliminary Statistical Analysis of Fecal Coliform in Newport Bay

The following report provides a statistical analysis of fecal coliform concentrations collected for Newport Bay over the years 2001-2005. The analyses were primarily exploratory in nature, looking for simple patterns that might be useful in providing insight into the system in Newport Bay.

The primary analyses looked for decreasing trends in fecal coliform over the span of the five years of monitoring. There is little evidence of decrease for any monitoring station during wet weather. However, several stations do have statistically significant decreasing trends in concentration for dry weather: 43rd Street Beach, 38th Street Beach, 33rd Street Channel, Rhine Channel, 19th Street Beach, 15th Street Beach, Alvarado Bay Isle Beach, North Street Beach, Garnet Avenue Beach, Promontory Point Channel, and Harbor Patrol Beach. Many of these stations had low concentrations even in 2001. However, for some stations, the decreases have led to an improved chance to meet the REC-1 standard. For Santa Ana Delhi Channel and Big Canyon Wash, there is a statistically significant decrease in the probability of failing the REC-1 standard, though the overall probability of failing is still relatively high.

We consider these analyses preliminary in the sense that the models are primarily data-based, incorporating little information outside of the data itself, which included only sample concentrations along with date and rainfall. With more time and effort, the analyses could be improved, using more sophisticated models with greater scientific guidance. Several suggestions are made, regarding tools for future efforts.

I. Introduction

This appendix provides statistical analyses of fecal coliform measurements for Newport Bay from 2001-2005. Methods for modeling and visualizing the data are presented, and further modeling and data collection efforts are recommended.

The primary goal of the current analysis is to model the changes in fecal coliform concentrations over time. A secondary goal is to see if there are clusters of stations (locations within the bay) that behave similarly, to guide future data collection.

Current data is limited to sampling station, sample date, concentration, and an indicator of whether rainfall was greater than or less than 0.1 inches in the 72 hours prior to the sample. Samples are available weekly for each station, with occasional gaps in data collection. While more detailed data, such as (localized) runoff volumes or sedimentation, could lead to a more complete, biologically-based (rather than purely data-based) model, the methods described in this report are compatible with and provide a basis for more complex models.

II. Statistical Analyses

This section discusses results of the current modeling efforts. Three different ways of exploring trends in the data are presented, along with an exploratory look at clustering stations.

II.A. Linear Regression on Individual Concentration Measurements

The linear regression model is used here primarily to assess change in median concentration of fecal coliform over time. (Note: assuming a lognormal distribution for the data, the median and geometric mean are equal.) Of particular interest is whether stations exhibit significant decreases in median concentration over the five years of data collection.

Linear regression is a method for exploring the relationship of a variable of interest, the response variable, with one or more explanatory variables that might be used to predict the response. For purposes of this report, fecal coliform concentrations are the response variable, and the explanatory variables are date and presence of rainfall. Date will be incorporated in the model in two ways: 1) to account for seasonal trends; and 2) to account for a steady decrease (or increase) over time. The seasonal component is fit as a simple sine wave that has a minimum at January 31. [If the model estimated a maximum rather than a minimum on January 31, the amplitude was instead set to zero, since it makes little sense to have higher coliform growth during cold than warm weather.] Some other options for the seasonal component were considered, including a sine wave with a different phase and a nonparametric grouping approach, but there was no significant improvement in fit. Note that since there were no rainfall events recorded for the months of June through September over the course of the 2001-2005 data, there is no assessment of fit for the sine curve at its peak. However, since warmer temperatures should lead to higher bacterial growth, the curve's peak during the warmer months may serve as a reasonable approximation.

Many of the fecal coliform samples were reported as censored; that is, as being above or below some specified value. The regression models fit to this data explicitly dealt with the censored data, assuming a lognormal distribution for the sampling. For further discussion of modeling censored data, see Section III.A. There were many samples that were simply reported as "Too Numerous to Count" or "Confluent Growth with Coliform." Both of these results were handled similarly, by considering the sample to have been reported as: ">200,000 organisms/100 mL."

The presence of rainfall has a strong effect on fecal coliform concentrations, with significantly increased fecal coliform concentrations when rainfall was detected (defined as greater than 0.1 inches in the 72 hours prior to sampling). The effect was implemented in the model in two different ways. One approach was simply to allow for a multiplicative effect on the estimated median in the presence of rain. The other was to fit a separate model for data collected in wet times than for data collected in dry times (or equivalently, a single model with a full interaction term for rainfall). Fitting separate models for the dry and wet might be both necessary for model fit, as well as for making useful inference. Since changes in land use are more likely to affect coliform growth in wet periods, allowing for different time trends for dry and wet may be important. Also, since most management practices are currently aimed at dry periods, assessing trend separately for dry periods may be more useful in assessing the effect of management practices. The data supported the use of separate trends for dry and wet (i.e. the interaction terms were statistically significant.)

The primary formal statistical inference examined is a test for trend over time. A linear trend in log-concentration is fit, and a test is performed to determine if the trend is statistically different, using a likelihood ratio test. The plots are presented with the estimated trend, regardless of the level of significance, to indicate the direction indicated by the data, though the trend should not be considered "real" unless statistical significance has been observed.

The regression model for each station and wet/dry status has the form:

$$\text{Log(Concentration)} = \beta_0 + \beta_1 * \sin[2\pi * (\text{DayOfYear} - 31)/365] + \beta_2 * \text{Date} + \text{Error}.$$

Date is coded in days, and Error is assumed to be a normal random variable with mean zero.

II.A.1 Results

The results of the linear regression model are presented in a plot for each sampling station in Figures Section I (pages B-13-47). The observed concentrations are plotted versus time, using the '+' symbol for right-censored samples (values above a detection limit), the 'x' symbol for left-censored samples (values below a detection limit), and a 'o' for uncensored samples. Observations plotted in blue represent samples taken during wet periods, while observations plotted in green represent observations taken in dry periods. Fitted values from the regression are also plotted, represented by the blue line for the fit during wet periods and the green line for the dry periods. (Note that since these curves were plotted for actual times in the past when the weather was dry or wet, the lines represent hypothetical conditions at certain times – e.g. an estimate is plotted for both wet and dry, regardless of the actual conditions.) The dotted, horizontal, red lines are simply reference points at the 200 and 400 organisms/100 mL level. Statistical significance of the overall trend with time is indicated by line for the fitted values. If the line is solid, a statistically significant trend with time has been detected. If the line is dashed, the trend is not statistically significant.

Statistical significance of the trend was determined by a likelihood ratio test, comparing the model without trend to the model with trend. A p-value for the test was obtained, and statistical significance was then determined using the false discovery method to account for multiple comparisons. (See Section III.B for more details.) The p-value for the likelihood tests are given at the top of the plot, in blue for wet periods and green for dry periods. In this case, statistical significance required a p-value less than or equal to 0.0074.

No stations exhibited significant trends for wet weather. However, several stations exhibited significant, decreasing trends in concentration during dry weather. These included: 43rd Street Beach, 38th Street Beach, 33rd Street Channel, Rhine Channel, 19th Street Beach, 15th Street Beach, Alvarado Bay Isle Beach, North Street Beach, Garnet Avenue Beach, Promontory Point Channel, and Harbor Patrol Beach.

Further exploration is warranted, to discover why these 11 stations might be seeing a significance decrease in concentration over time while the other 24 stations are not (keeping in mind that many of the other stations do exhibit a negative trend, but a trend too small to declare statistically significant). Perhaps other variables such as land use or management practice changes can explain the trends.

II.B. Linear Regression on Grouped Data

The model provided in Section II.A assesses the trend in concentration directly. It models the data in its most raw form and is thus likely to best characterize the system. However, the output of that model does not directly relate to a desired standard. A quantity that relates more directly to the REC-1 standard for fecal coliform is the geometric mean of five samples taken within 30 days, since one portion of the REC-1 standard states that this statistic is supposed to be lower than 200 organisms/100 mL.

II.B.1. Using Fitted Values from Linear Regression on Concentrations

The model from Section II.A does allow for evaluation of the standard, in that it provides a predictive distribution for samples at any given point in time, provided rainfall is known. These can be used to generate a distribution for a geometric mean of five samples taken at 5 specified times, and thus produce a probability that a geometric mean of five samples exceeds the threshold of interest. The primary difficulty with this method is that the rainfall must be specified. That is, one must specify which of the five samples take place during wet periods. There is such a large number of different ways that rainfall can be specified that it is difficult to summarize the results succinctly. However, to provide an example, Figure II-1 gives prediction intervals for geometric means under two scenarios: one in which all 5 samples are taken during dry periods (represented by the green lines), and one in which the middle of the 5 samples is taken in a wet period (represented by the blue lines). For each, the assumption is the 5 samples are taken exactly one week apart, with the middle date being the date used for plotting. The solid lines represent the best prediction for the geometric mean, and the dotted lines represent lower and upper 95% prediction bounds for a geometric mean. If one would like to predict for 5 samples with rainfall occurring once but at a different time, another calculation is required, and likewise for 5 samples with more than one rainfall event, or for a different number of samples.

II.B.2. Fitting Regressions Directly to Geometric Means

An alternative approach is to directly model the geometric means. Two difficulties arise with this approach. The first problem is dealing with censoring. When taking a geometric mean of censored samples, the geometric mean itself should be censored, but it is not clear how to handle the case of taking a geometric mean when there is both right- and left-censoring. See Section III.A for more discussion of geometric means in the presence of censoring. Censor-adjusted geometric means can be used, but the estimates are not always stable for samples of size 5. While handling the censoring explicitly is a preferred approach, the computational difficulties of doing so prohibited that model from being handled in this report.

For the purposes of this section, the censoring is ignored, and the detection limit is used as a surrogate value when calculating geometric means. Five consecutive samples were used to calculate geometric means, using non-overlapping samples for subsequent geometric means.

The second problem in dealing with geometric means is that rainfall must be handled in a different manner, since each geometric mean may average over a different number of samples taken in wet periods. The fitted model used the form:

$$\text{Log(Geometric Mean)} = \beta_0 + \beta_1 * \sin[2\pi * (\text{DayOfYear} - 31)/365] + \beta_2 * \text{Date} + \beta_2 * (\text{\# of Rains}) + \text{Error}$$

The plots of these model fits are given in Figures Section III (pages B-49-83). The plots follow the same format as the plots from the linear regression, except that a different color scheme is used to represent the number of rainy samples averaged in the geometric mean, with green representing 0 rains, cyan representing 1 rain, blue representing 2 rains, and black representing 3 or more rains. The fitted curves follow the same color scheme.

In this analysis, only one station indicates a significant decreasing trend over time, the Rhine Channel. The lower number of significant decreasing trends may be due in part to the loss of information in going from raw censored values to uncensored averages, but is likely due more to the fact that rainy samples and dry samples are now mixed together, and no significant decreasing trends were seen for wet weather.

II.C. Logistic Regressions

One requirement of the REC-1 standard is that no more than 10% of samples collected in a 30 day period exceed 400 organisms/100 mL. This standard can be addressed by estimating the probability that a single sample of fecal coliform exceeds 400 organisms/100 mL. The logistic regression model provides an appropriate framework. Logistic regression is a method for modeling a binary response – in this case, whether or not a sample exceeded a threshold. That is, rather than modeling concentrations directly, the samples are converted to a simple yes or no – "yes" if the sample exceeded 400 organisms/mL, or "no" otherwise. Logistic regression then models the probability of a "yes" (or more accurately, the log-odds of a "yes," which is directly related to probability). There may be some loss of information in converting actual concentrations to a binary response, but it does allow for direct modeling of a quantity of interest.

In all other respects, the logistic regression model was fit in exactly the same way as the linear regression model of section II.A, by relating probability of exceeding the threshold to station, rainfall, trend over time, and a sine curve to represent seasonal variability. The model in this case is:

$$\theta = ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 * \sin[2\pi * (\text{DayOfYear} - 31)/365] + \beta_2 * \text{Date} + \text{Error},$$

where p is the probability of exceeding the threshold of 400 organisms/mL, and error is again modeled as a normal random variable with mean 0. θ can be converted to p with the transformation:

$$p = \frac{e^{\theta}}{1+e^{\theta}}.$$

II.C.1 Results

The results of the logistic regression models are again presented graphically in Figures Section IV (pages B-84-118). The observations are again plotted versus date, where an observation of 1 represents a sample exceeding 400 organisms/100 mL, and a 0 represents a sample below that threshold. Again, observations plotted in blue represent samples taken during wet periods, while observations plotted in green represent observations taken in dry periods. Fitted probabilities from the logistic regression model are also plotted, represented by the blue line for the fit during wet periods and the green line for the dry periods. (Again, since these are plotted for actual times in the past when the weather was either dry or wet, the lines represent hypothetical conditions at certain times.)

Statistical significance of the overall trend with time is again indicated by a solid line instead of a dashed line for the model fits. Only three significant decreasing trends were identified: Abalone Avenue Beach, Santa Ana Delhi Channel, and Big Canyon Wash, again only for the samples in dry periods. There are no significant trends during wet weather. The fact that many fewer significant trends were found for the logistic regression than for the linear regression of Section II.A is due to a couple of factors. 1) There is a loss of information in going from actual concentrations to a binary above/below threshold response. 2) The significant decreases observed in the linear regression were mostly for stations where the probability of exceeding the threshold was already quite low.

Note: the logistic regression model can over-fit the data, when there are too few observations that exceed (or too few that do not exceed) the threshold. For example, Abalone Avenue Beach and Park Avenue Beach have only observation each that exceed the threshold during the dry period, and thus the model for those stations over-compensates its fit to that one observation. The fits from those models are included for completeness, but should not be over-interpreted.

II.D. Clustering

Clustering is a generic term for classifying entities into groups. A wide variety of clustering techniques are available, and each performs well under different scenarios. Generally, more important than the clustering technique are the variables chosen on which to perform clustering. Clustering can be a useful tool for exploratory analyses, when attempting to better understand a system, find components that may be related, or simplify a working model. However, as a general rule, caution should be exercised in making inference based on clustering algorithms, as many clustering algorithms are based on ad hoc criteria, rather than a formal decision framework.

In studying Newport Bay, there may be insight to be gained regarding clusters of stations. Stations that cluster might be an indication of common run-off patterns, flushing, etc. Any clustering patterns found should be examined for external information, such as known water currents or common sources, and further, more formal scientific analysis undertaken to see if the clusters indeed make sense.

In this report, our goal is simply to give an indication of how clustering techniques might be used to further insight, rather than present a formal clustering algorithm. As such, the k-means algorithm ["A k-means clustering algorithm," Hartigan, J. A. and Wong, M. A., *Applied Statistics 28* (1979)] was used, a simple but often-used clustering method. The algorithm requires specification of the number of clusters to look for (which is one of its drawbacks), and five was used for illustrative purposes. Two different sets of clustering were then performed, to show the sensitivity, and the importance of looking at data in multiple ways.

In the first clustering, stations are clustered based on the log of the fitted median concentration (over the 2001-2005 time frame) during wet weather conditions and the log of the fitted median during dry weather conditions, using the results of the linear regression from II.A to obtain the fitted values. The five clusters of stations found are:

> *Cluster 1*: N Street Beach, Abalone Avenue Beach, Promontory Point Channel, Rocky Point Beach
>
> *Cluster 2*: 38th Street Beach, Lido Yacht Club Beach, Rhine Channel, 15th Street Beach, Harbor Patrol Beach, Newport Dunes Middle, Newport Dunes West, Newport Dunes East, Vaughn's Launch
>
> *Cluster 3*: Via Genoa Beach, 19th Street Beach, 10th Street Beach, Alvarado Bay Isle Beach, Garnet Avenue Beach, Ruby Avenue Beach, Sapphire Avenue Beach, Grand Canal, Park Avenue Beach, Onyx Avenue Beach, Ski Zone, North Star Beach, De Anza Launch, Bayshore Beach
>
> *Cluster 4*: 43rd Street Beach, 33rd Street Channel, Newport Blvd Bridge, Newport Dunes North, Big Canyon Wash, Back Bay Dr Drain
>
> *Cluster 5*: San Diego Creek Campus Dr, Santa Ana Delhi Channel

The clusters are shown graphically in Figure V-1 and geographically in Figure V-2. These clusters turn out to be defined primarily by the overall concentration level, which may not provide much insight into the behavior of the system, other than a notion of which stations are farthest from meeting standards. The lack of clear separation between Clusters 2 and 3, and between Clusters 3 and 4, perhaps indicates that fewer than 5 clusters should have been chosen.

In the second clustering, the exact same data – fitted mean concentrations during wet and dry periods – is used. However, the two values are transformed to the following variables: 1) log of the average of the wet and dry periods; and 2) the log of the ratio between wet and dry periods. A somewhat different story is told by this clustering, giving the following clusters:

> *Cluster A:* 43rd Street Beach, 38th Street Beach, 33rd Street Channel, Lido Yacht Club Beach, 15th Street Beach, Newport Dunes Middle, Newport Dunes West, Newport Dunes East, Newport Dunes North, North Star Beach, Big Canyon Wash
>
> *Cluster B:* Back Bay Dr Drain
>
> *Cluster C:* N Street Beach, Abalone Avenue Beach, Rocky Point Beach

Cluster D: Via Genoa Beach, Rhine Channel, 19th Street Beach, 10th Street Beach, Alvarado Bay Isle Beach, Garnet Avenue Beach, Ruby Avenue Beach, Sapphire Avenue Beach, Grand Canal, Park Avenue Beach, Onyx Avenue Beach, Promontory Point Channel, Harbor Patrol Beach, Vaughn's Launch, Ski Zone, De Anza Launch, Bayshore Beach

Cluster E: Newport Blvd Bridge, San Diego Creek Campus Dr, Santa Ana Delhi Channel

The clusters are shown graphically in Figure V-3 and geographically in Figure V-4. In this case, the Back Bay Drive Drain is singled out its own cluster, which may make sense, given that it is diverted during the dry portion of the year. Cluster C clusters spatially in the southeast portion of Newport Bay. The spatial cluster would also include Harbor Patrol Beach, which is assigned to Cluster D, though the plot does show that Harbor Patrol Beach is well separated from Cluster D and might be its own cluster if more than five had been allowed. And the highest three stations in average concentration are clustered in Cluster E. Perhaps these clusters have more scientific meaning than the previous cluster, because the two variables under examination have been transformed to represent two different aspects of the system – overall concentration and the change between wet and dry conditions.

These clusters might be used in further analysis, by analyzing these sets of stations together. For example, the linear regression model of Section II.A might be used with all of the stations in a cluster together. By combining them, the similarities might be exploited to produce a better model. For example, if the rainfall, seasonal effects, or baseline levels are similar across the stations, a single estimate for these effects can be produced, utilizing samples from all of the stations, rather than estimating a separate parameter for each. Unfortunately, with the clusters generated above, significant differences were still found among the stations, so the stations were analyzed separately, though with further clustering and the right variables available, the clustering might produce greater benefit.

III. Recommendations for Future Analyses

The modeling performed in Section II of this report is intended primarily as examples of the types of analyses that can be performed for bacterial data in a system. More detailed, more scientifically-based models might be undertaken, with more time and more comprehensive data. This section discusses several ways in which current methods might be improved, what data might further analysis, and other recommendations for analysis.

III.A. Censored Data

As noted in Section II.A, the fecal coliform concentrations are sometimes censored. The censoring was accommodated by the regression fits for those analyses. Any statistical analysis of this data is subject to strong biases if it does not accommodate the censoring. This section provides a discussion of censored data and provides examples of the effect of censoring for some simple examples.

Data censoring is a common issue in environmental statistics, where laboratory measurements of concentrations are utilized. Left-censoring is most common, where concentrations are too low to be detected accurately, and data is simply reported as below a detection limit. Right-censoring is uncommon for chemical concentrations but less infrequent for biological concentrations. Right-censoring means that the concentration is not known precisely – only that it is greater than some detection limit.

Common practice for left-censoring is to assign a surrogate value for the concentration – typically the detection limit, half the detection limit, or zero. For left-censoring, this practice generally produces reasonable results, but only when the detection limits are adequately low. Because right-censoring is less pervasive, there is less agreement on an acceptable method of assigning surrogate values, though using the detection limit is most common.

The primary advantage of assigning surrogate values is that standard statistical procedures can be used, by plugging in the surrogate values for the censored observations. However, there can be considerable loss of information when ignoring the censoring, and substantial bias may be introduced into estimates based on the surrogate values.

An alternative to surrogate values is the incorporation of the uncertainty about the censored values directly into the analysis. Maximum likelihood methods can accommodate censoring directly, though computation can sometimes be non-trivial. Data imputation methods utilize surrogate values, but choose the surrogate values based on model fits. Nonparametric methods are aimed at making statistical inference with minimal assumptions about probability distributions; rather than attempt to model the data directly, they model some simpler characteristic of the data, such as ranking or grouping. For example, Section II.C utilized a nonparametric approach by converting the raw concentrations into two groupings – above or below 400 organisms/100 mL. A good reference for statistical methods for censored data is: *Nondetects And Data Analysis: Statistics for Censored Environmental Data*, by D.R. Helsel, Wiley-Interscience 2005.

The primary disadvantage of approaches that model the censoring explicitly is that a probability model must be assumed. That is, one must specify whether the distribution of the data is normal, lognormal, etc. This modeling assumption should not be considered a major disadvantage, however, since most statistical methods and environmental regulations are ultimately based on a model assumption. For example, the use of the geometric mean as a measure of the center of data derives from the lognormal distribution, in which the geometric mean corresponds to the median.

Below are three examples to demonstrate the use of maximum likelihood for censored data, when the inference goal is an estimate of the geometric mean.

Example 1:

Consider the following data (fecal coliform concentrations from 43rd Street Beach from 4/2/2001 to 6/4/2001):

20 20 <10 10 <10 250 <10 10 <10 70

This data has four left-censored observations, concentrations known only to be less than 10. Ignoring the censoring gives a geometric mean of 19.25. If, instead, we explicitly model the censoring and assume a lognormal distribution for the concentrations, our estimate of the geometric mean becomes 12.41. Given the low estimate of the geometric mean, the model has intrinsically estimated the censored values to be well below 10 (actually around 3.3), and adjusted the final estimate appropriately.

Example 2:

Consider another sample of data with left-censoring (fecal coliform concentrations from Big Canyon Wash from 5/3/2004 to 7/6/2004):

100 150 80 450 130 200 360 <10 500 80

Again, one of the concentrations is only known to be less than 10. Ignoring the censoring gives a geometric mean of 135.07, while the censoring-based estimate that assumes a lognormal distribution gives a geometric mean of 128.91. The difference between these two estimates in this case, while noticeable, is relatively small compared to the last example. Due to the high estimate of the geometric mean, the model has intrinsically estimated the censored value to be much closer to 10 in this case (actually around 6.3), and adjusted the final estimate appropriately.

Example 3:

Now consider a sample of data with right-censoring (fecal coliform concentrations from Newport Boulevard Bridge from 4/2/2001 to 6/4/2001):

100 70 10 70 30 >40,000 7,200 30 20,000 200

In this case, we have one observation that is known only to be greater than 40,000. Ignoring the censoring gives a geometric mean of 295.52, while the estimate that assumes a lognormal distribution and explicitly models the censoring produces a geometric mean of 341.57. Again, the model has intrinsically estimated the censored value to some value about 40,000 (actually around 170,000) and adjusted the final estimate appropriately.

III.B. Multiple Comparisons

Analysis of the 35 monitoring stations in Newport Bay will often produce 35 estimates or multiple tests. However, most statistical methods are designed for producing a single estimate or a single test, and some accommodation should be made for the multiple analyses. This section briefly discusses the problem for multiple tests.

Statistical tests are designed to allow for a certain false positive rate when performing hypothesis tests. Thus, when examining an entire system, and performing multiple tests for statistical significance, as was the case in this report when testing for significance of trend at each individual station, there is need to adjust the false positive rate. A typically accepted false positive rate for statistical tests is 5%. When 35 stations are tested, one would expect about 5% x 35, or about 2, stations to produce a false positive, even if no station has a *real* positive. This problem is known as a multiple comparisons problem.

Several techniques have been developed to adjust the significance level, to achieve an acceptable false positive rate for the suite of statistical tests. By lowering the significance level for each test, the overall false positive rate will be lowered. However, there is a trade-off between a lower false positive rate and a lower false negative rate. Many multiple comparison methods are overly conservative, assuring a desirable false positive rate, but potentially increasing the false negative rate well beyond acceptable levels. The False Discovery Rate method of Benjamini and Hochberg ["On the Adaptive Control of the False Discovery Rate in Multiple Testing with Independent Statistics", Benjamini, Y. and Hochberg, Y., *Journal of Educational and Behavioral Statistics*, Vol. 25] provides a nice balance, guaranteeing an overall false positive rate without large increases in false negative rate.

The details of this method are beyond the scope of this report, but it is available in most common statistical software packages.

For future analyses, hierarchical models for the data may be productive, allowing more sharing of information between stations, as well as accommodating multiple comparisons naturally. A hierarchical structure is a powerful tool that models an entire system at once, allowing for differences between components (such as stations) but simultaneously linking the components, to allow similarities between components to be exploited. Components that have little data (like a new monitoring station) or noisy data (like an unreliable monitoring station) would primarily utilize information from other stations, while stations with lots of clean data will essentially be treated individually. Hierarchical models are incredibly useful and flexible, but implementation may be non-trivial, as computational burden can be high.

III.C. Data Collection and Incorporation of Scientific Information

The modeling presented in this report is limited by the available information – station, date, and regional rainfall greater than or less than 0.1 inches. The scientific inference that can be made from the models is limited similarly. Future efforts could be aided by more detailed data collection. Scientific judgment is the best guide to what data would best aid understanding of the system

- Detailed rainfall data – there is a considerable amount of variability in concentrations after rainfall events. Some of that variability might be accounted for, if the actual amount of rainfall, rather than a high/low amount.
- Temperature – the seasonal effect used in the model in this report is really a surrogate for temperature, but actual temperature measurements might help explain some of the variability seen within a given season.
- Flow data – rainfall data is a surrogate for the amount of water flowing past a station, but better estimates of flow might account for differential rainfall at the different stations, and provide information about flushing.
- Water chemistry – other measures of the environment in which the bacteria are growing would likely be a great aid to modeling.
- Land use – since land use can have a heavy influence on bacterial growth, information on land use and land use change may be important.

System-wide measurements of these types of data would help modeling efforts, and localized measurements, to account for station-to-station variability would help even further. The current modeling efforts treated stations individually, since they behaved too differently with respect to the variables that were available. The goal of a more comprehensive model would be to model the system as a whole, and develop a better understanding of which variables are similar across stations and which are truly different, which in turn may lead to greater scientific understanding by forcing the question of why they are different.

More data is always better from the perspective of modeling, but there are costs associated with data collection that cannot be ignored. When deciding whether or not further data collection is worthwhile, a more formal decision framework can help.

III.D. Decision Framework

All of the analyses presented in this report are to be considered exploratory in nature. That is, the goal of the analyses is insight from the data. Though there are some formal inference procedures used, such as hypothesis testing for the detection of trends, those were intended primarily as filters, to focus attention on the trends that are larger than chance would dictate.

In cases where decisions are to be based on the analysis, more formal methods can and should be applied. A formal decision framework can capture important qualities that lie outside of the data, such as expert scientific opinion, sampling cost, value of information, and benefit to the public.

Regulatory requirements may dictate how much of the effort is spent in addressing bacterial growth. However, regulatory requirements tend to be based on generic circumstances and historical methods. A formal decision structure can help guide efforts toward the more specific circumstances of a local effort, while addressing the realities of regulatory mandates.

FIGURES

Figure I−1: Linear Regression for 43rd Street Beach

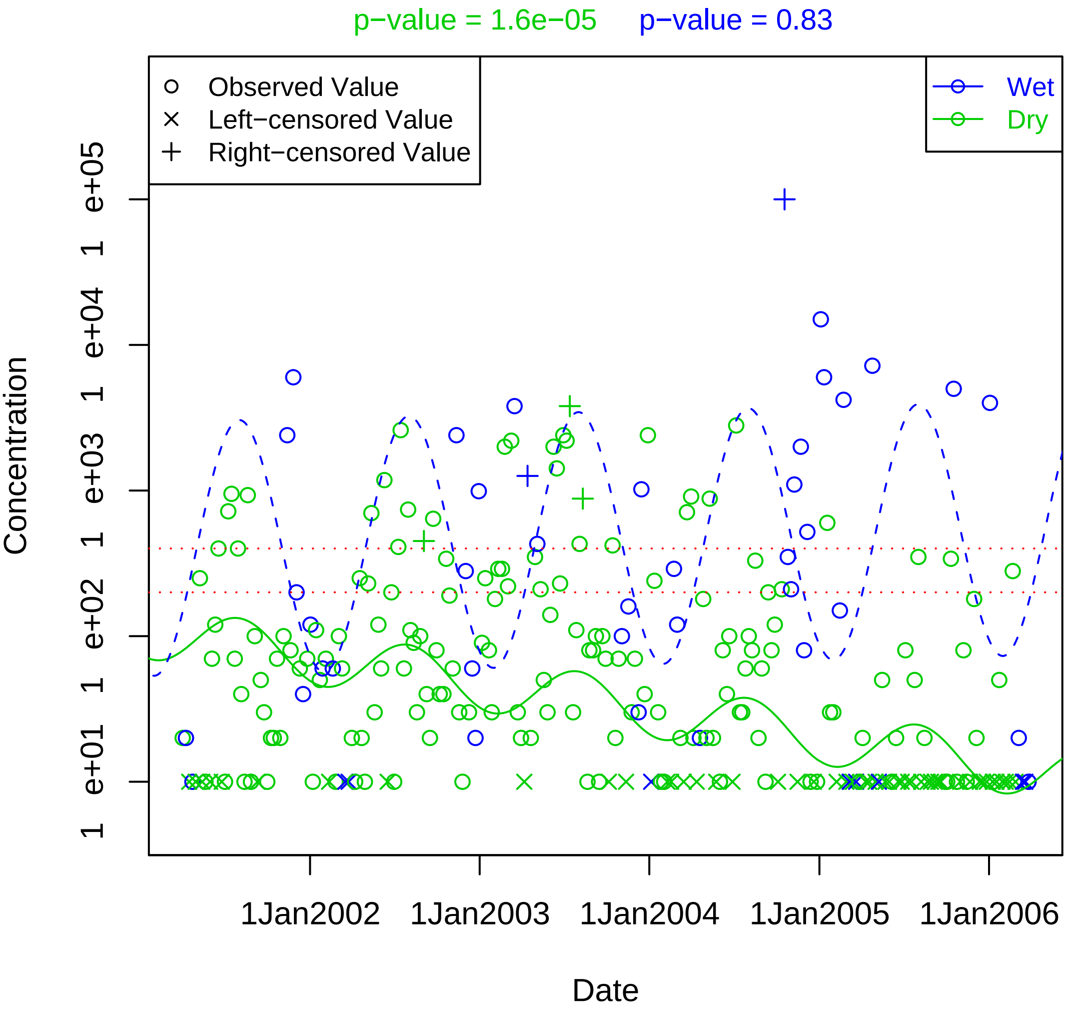


Figure I−2: Linear Regression for 38th Street Beach

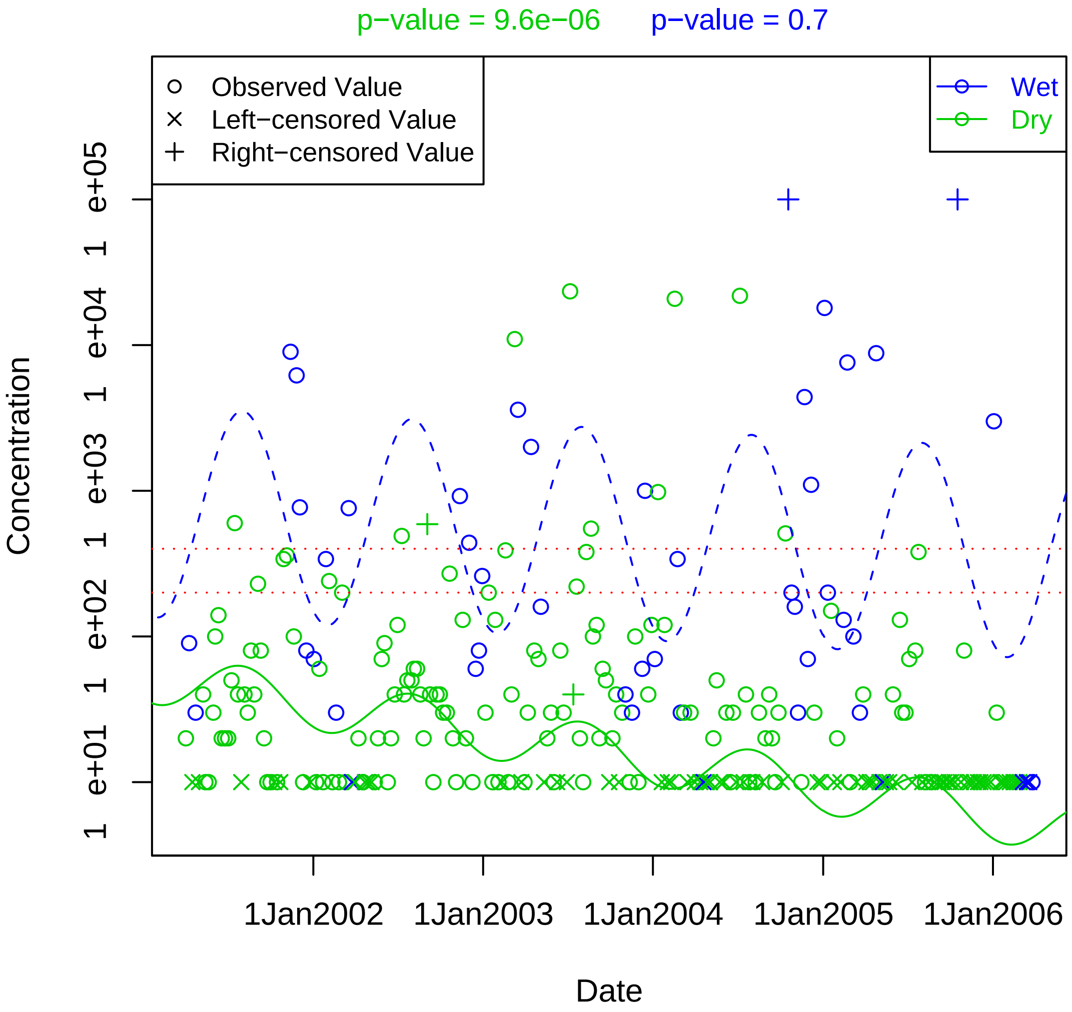


Figure I−3: Linear Regression for 33rd Street Channel

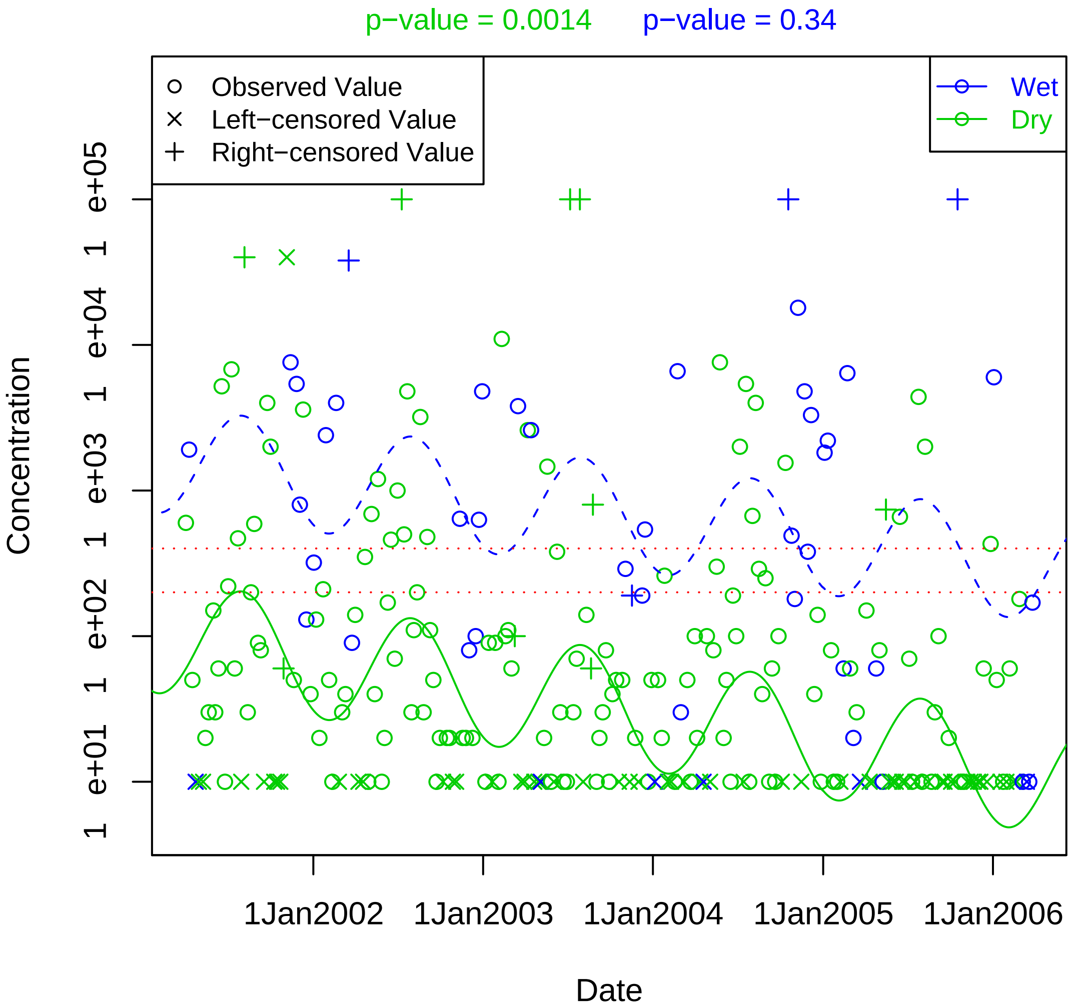


Figure I−4: Linear Regression for Lido Yacht Club Beach

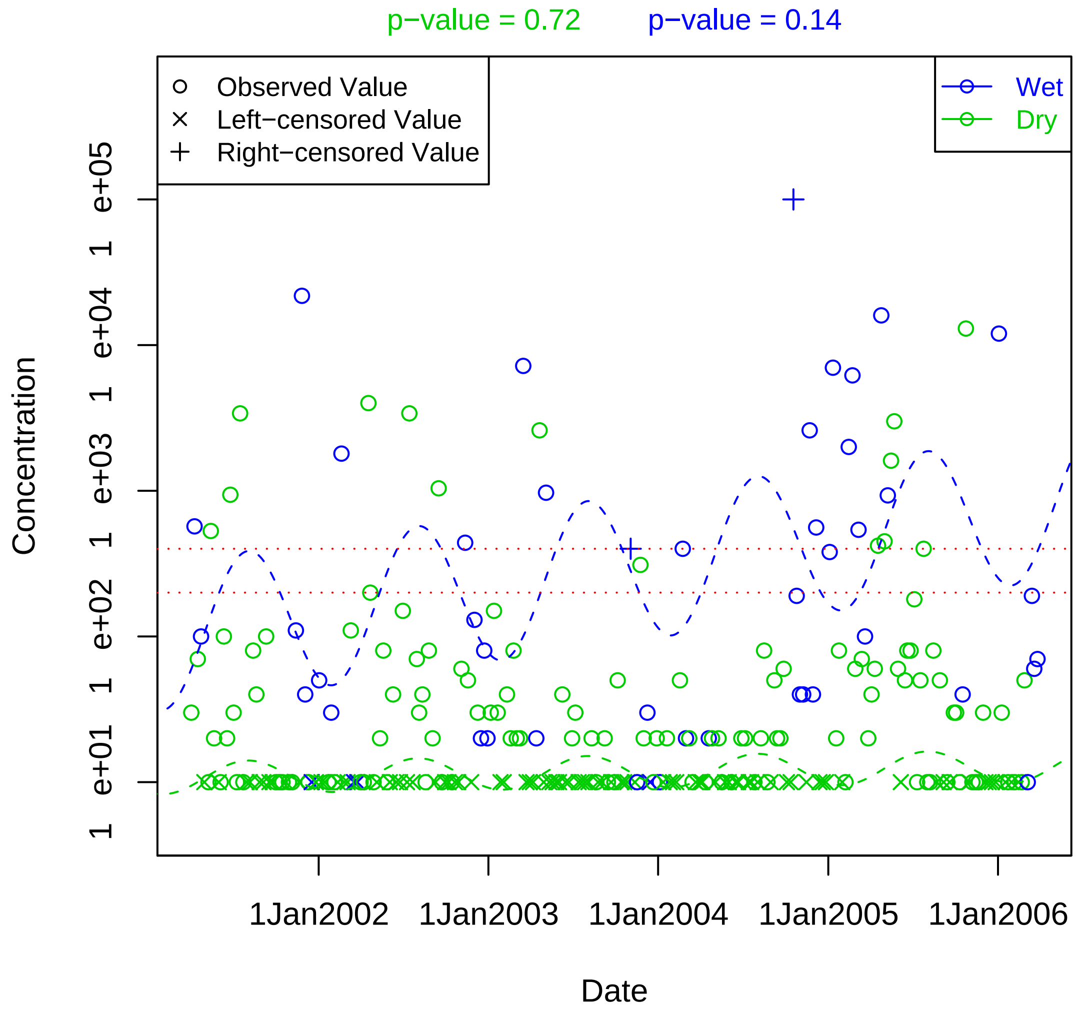


Figure I−5: Linear Regression for Via Genoa Beach

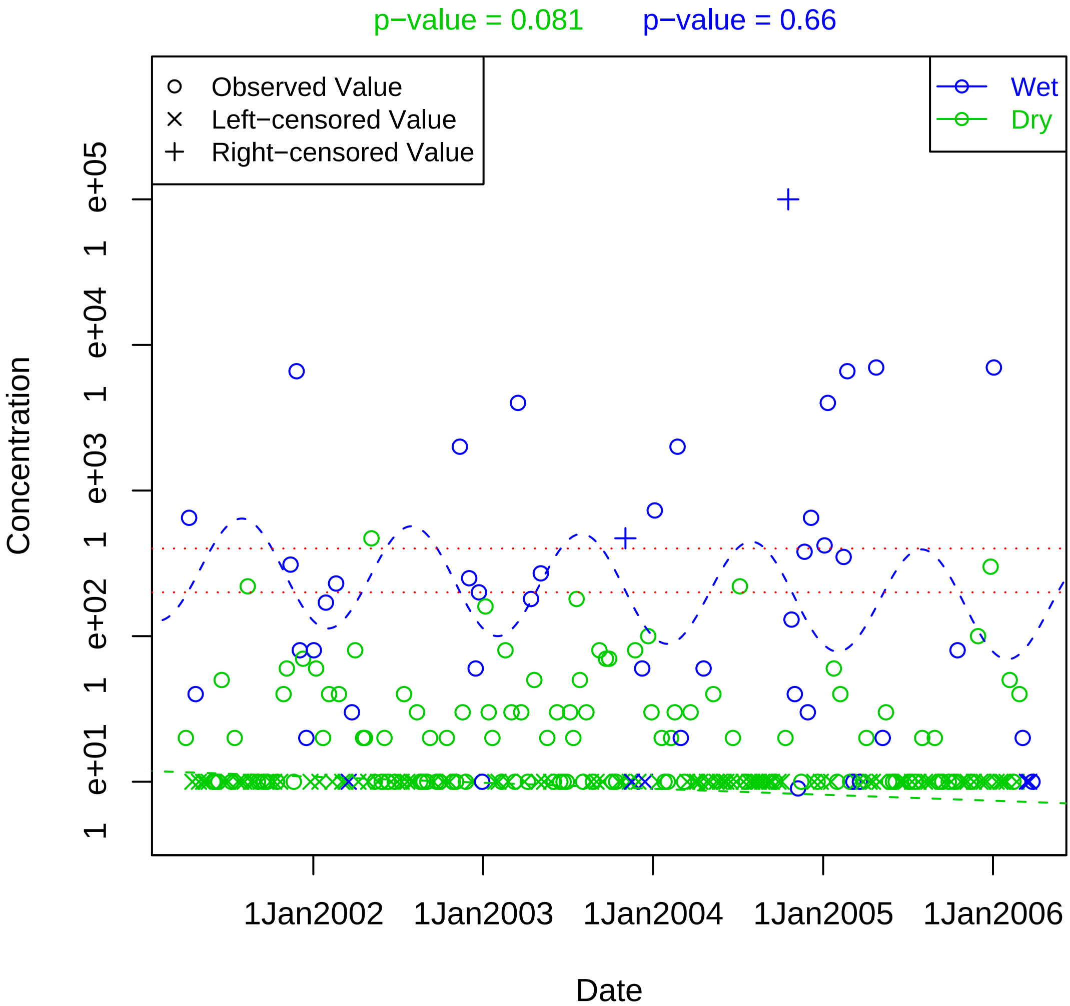


Figure I−6: Linear Regression for Newport Blvd Bridge

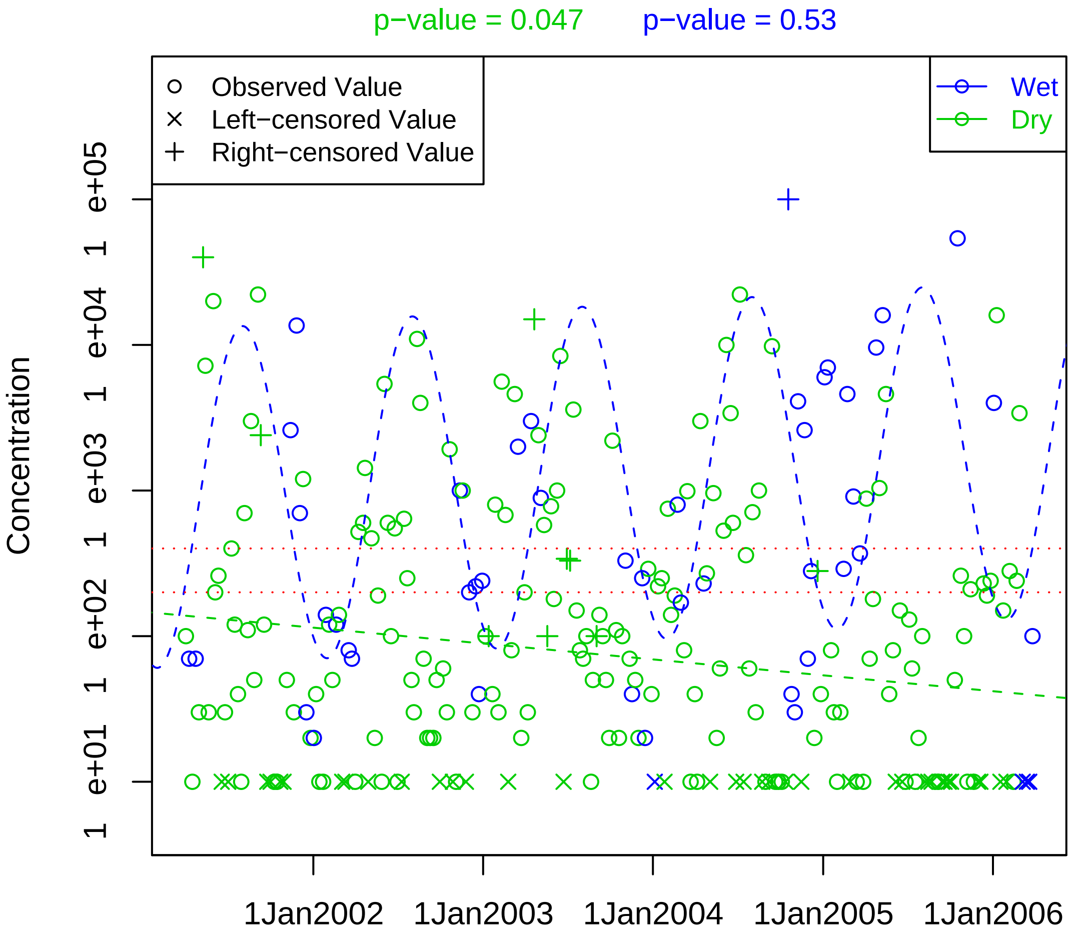


Figure I−7: Linear Regression for Rhine Channel

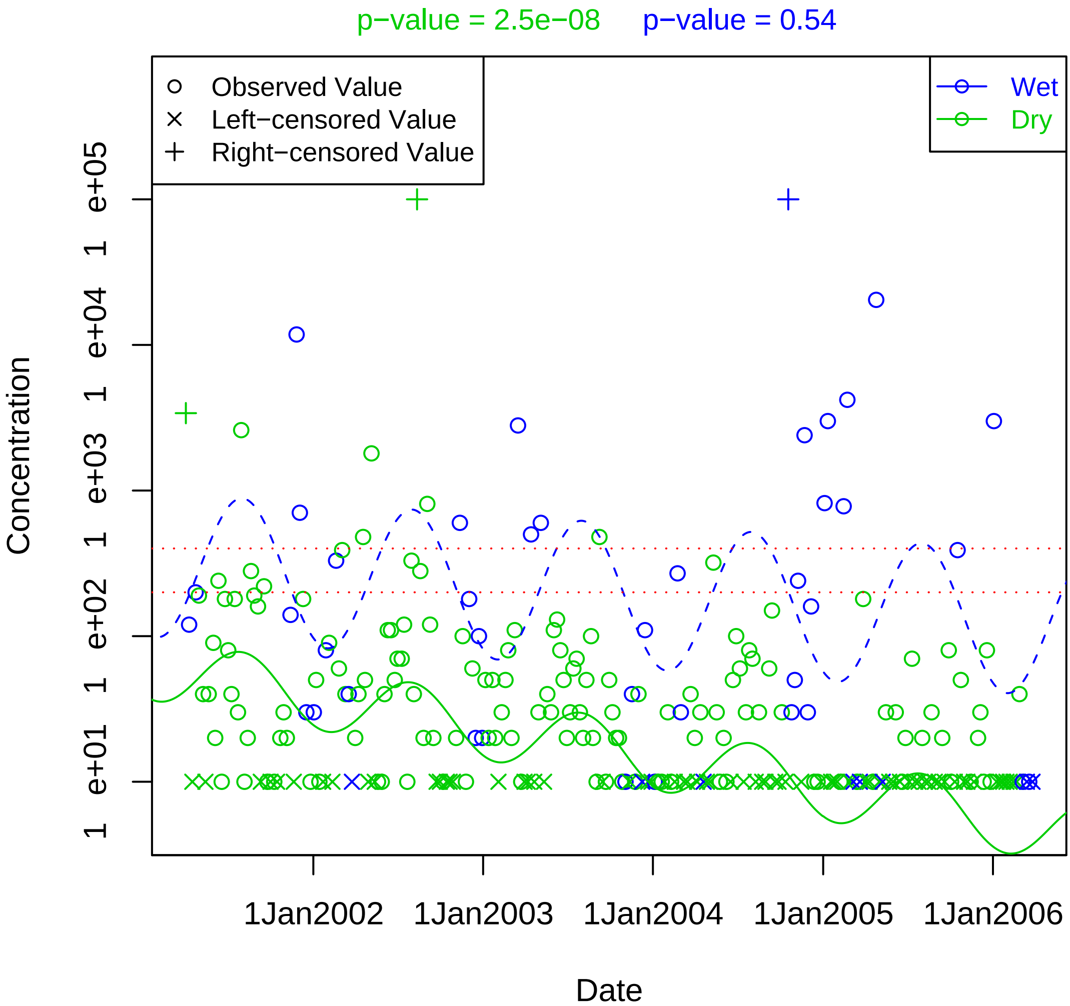


Figure I−8: Linear Regression for 19th Street Beach

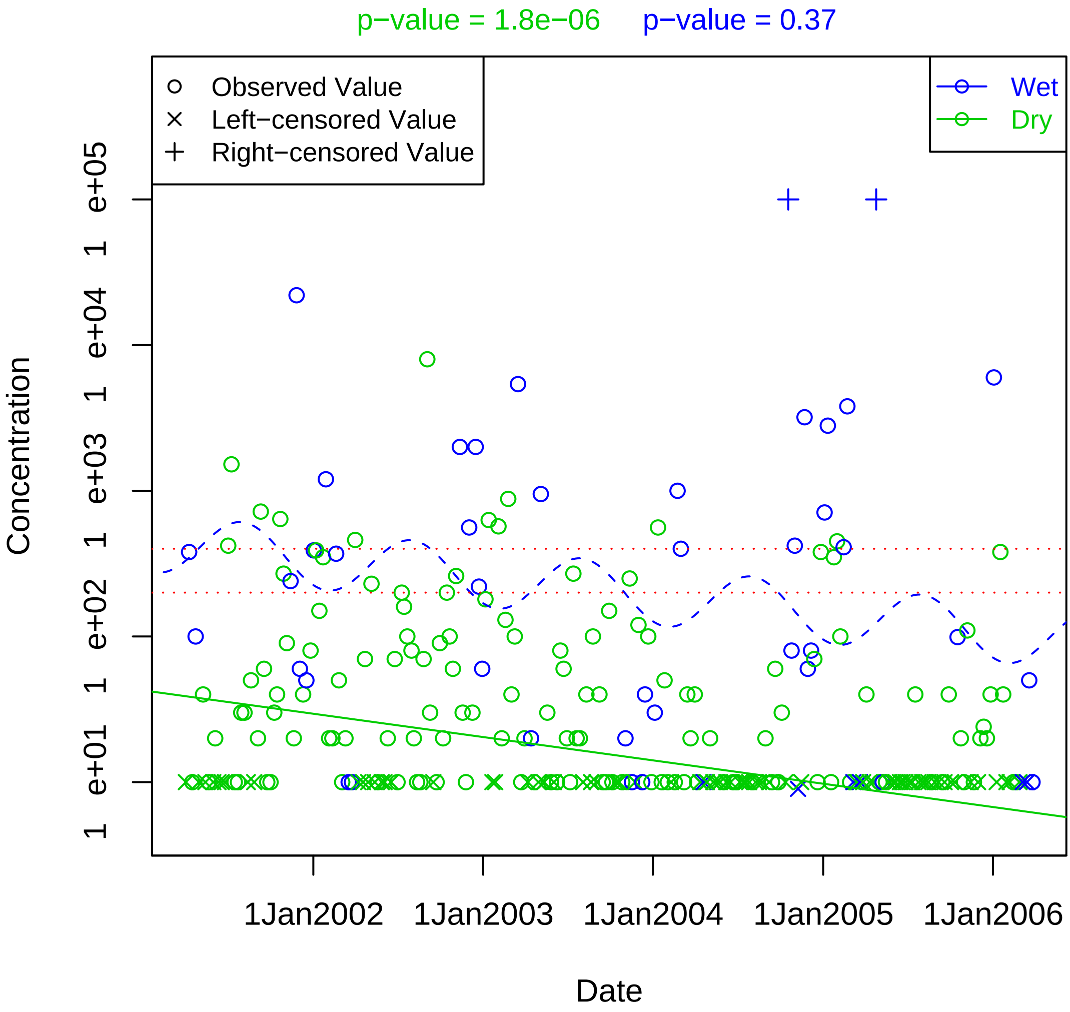


Figure I−9: Linear Regression for 15th Street Beach

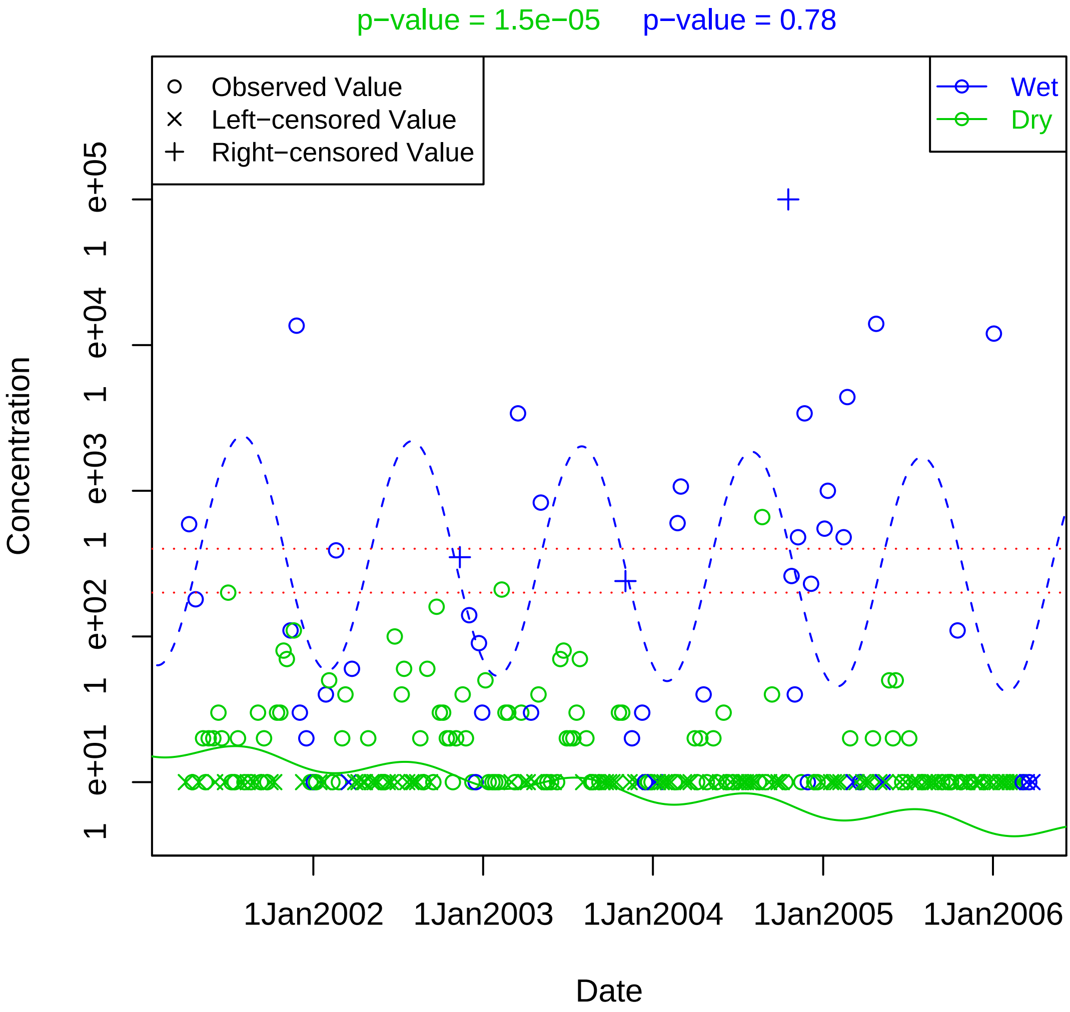


Figure I−10: Linear Regression for 10th Street Beach

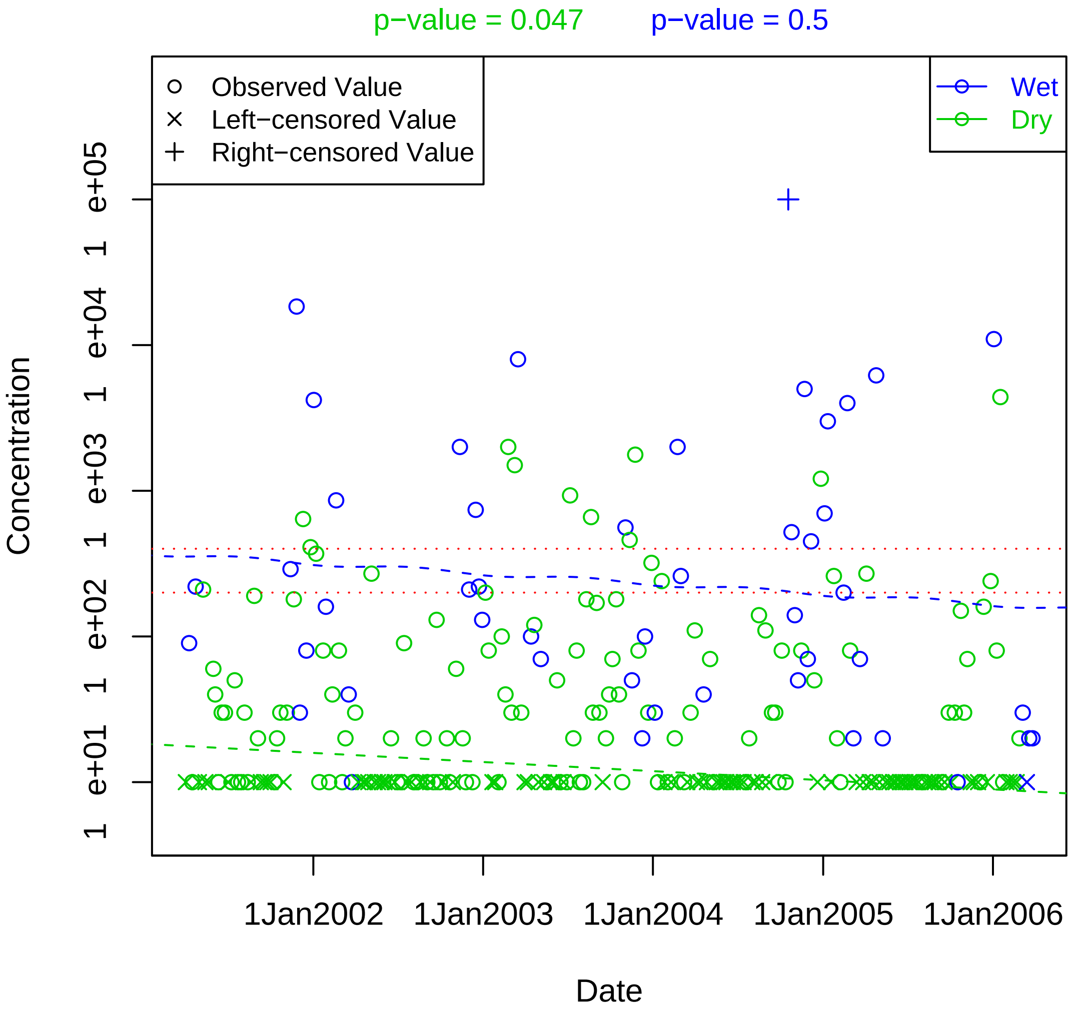


Figure I−11: Linear Regression for Alvarado Bay Isle Beach

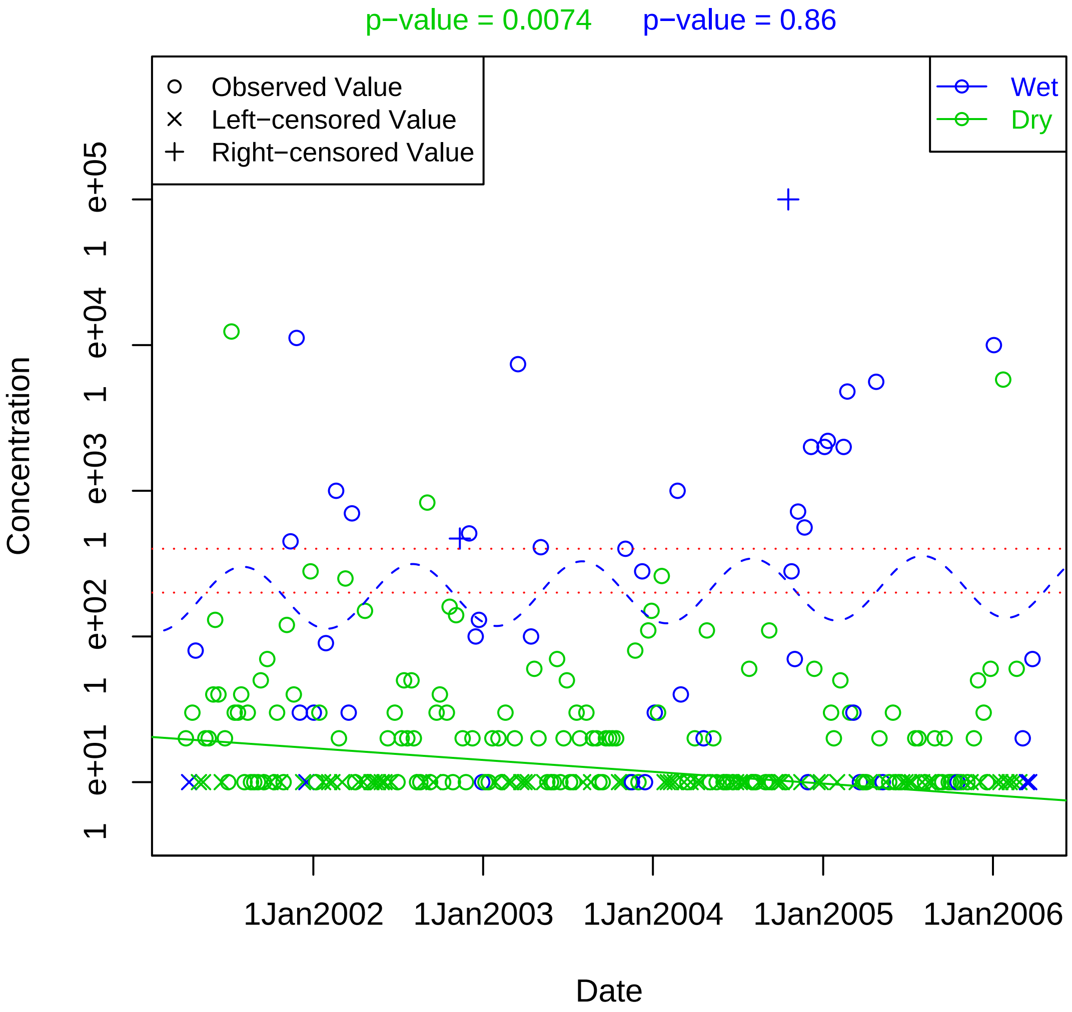


Figure I−12: Linear Regression for N Street Beach

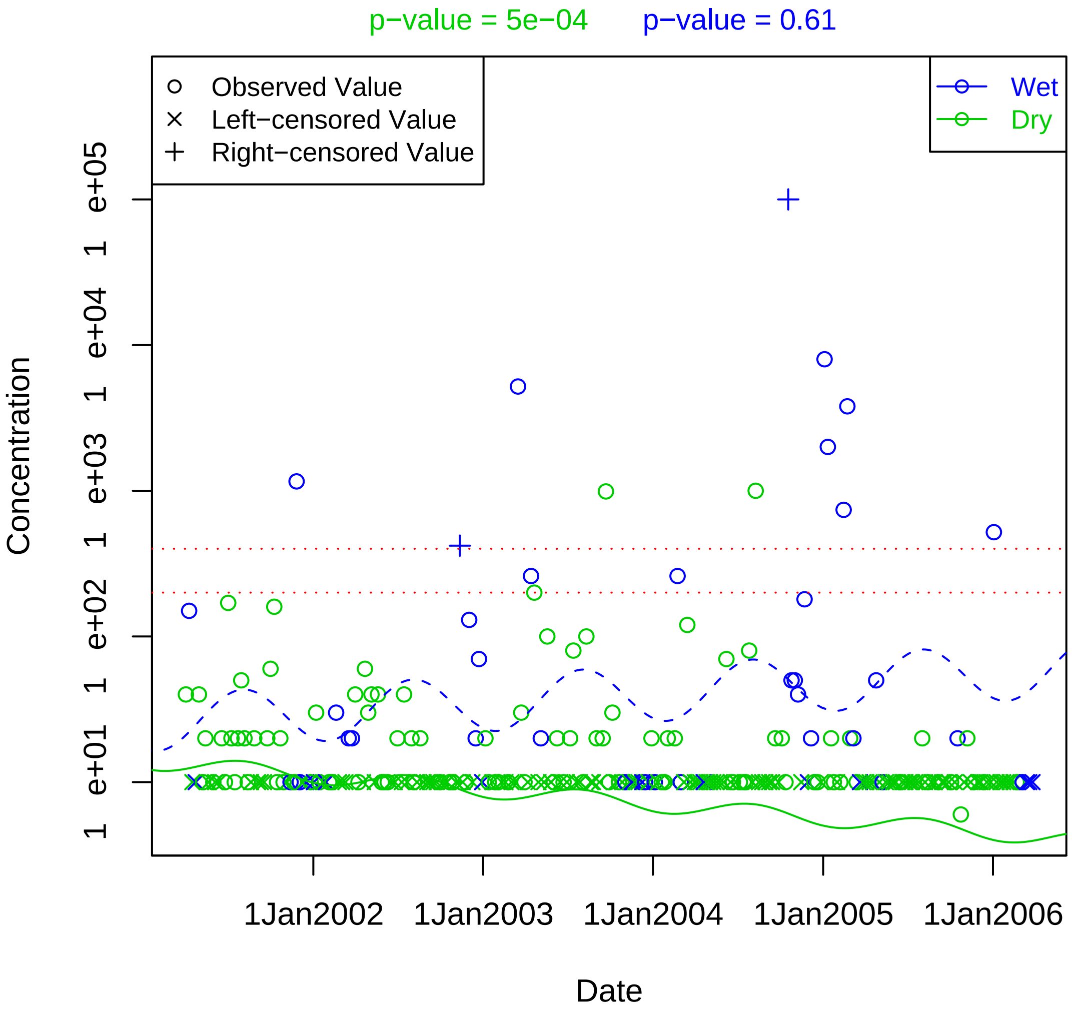


Figure I−13: Linear Regression for Garnet Avenue Beach

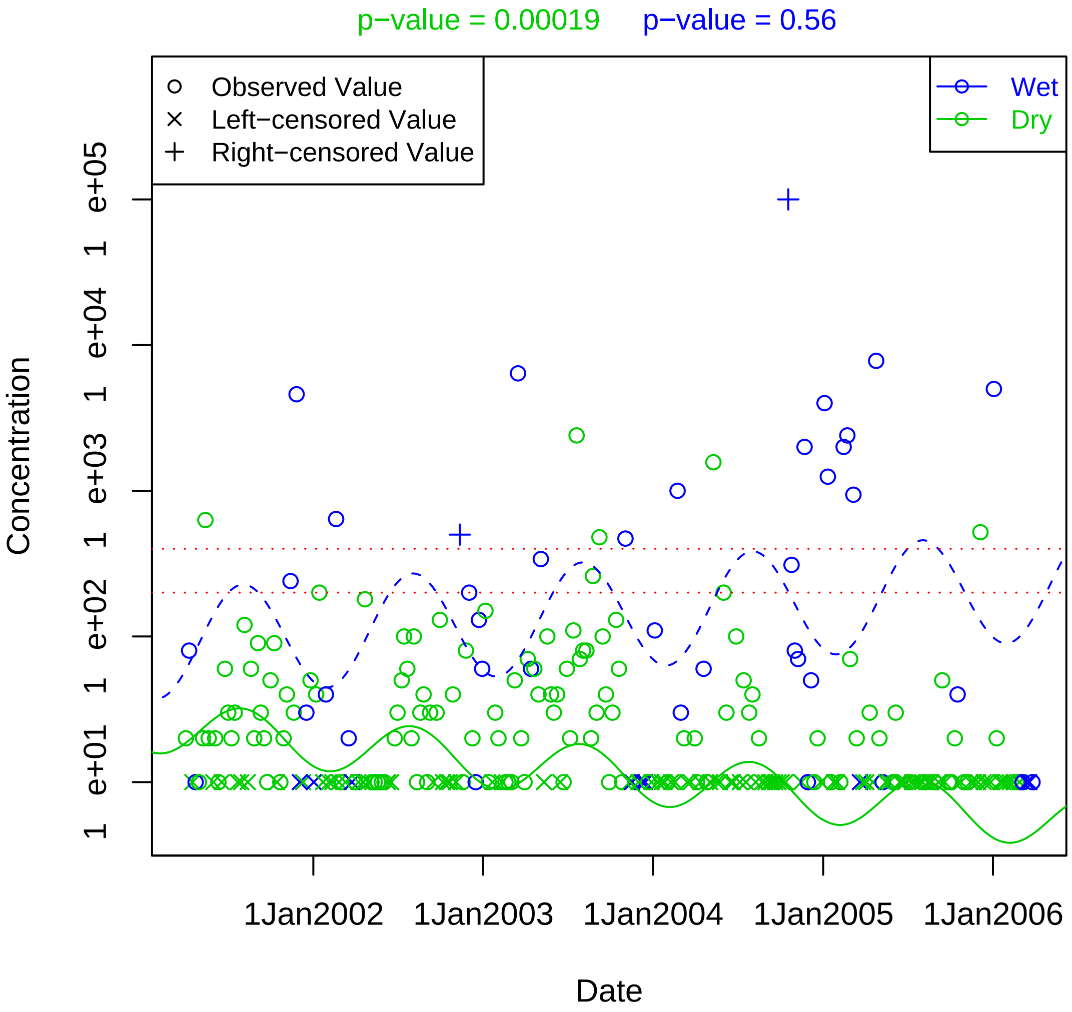


Figure I−14: Linear Regression for Ruby Avenue Beach

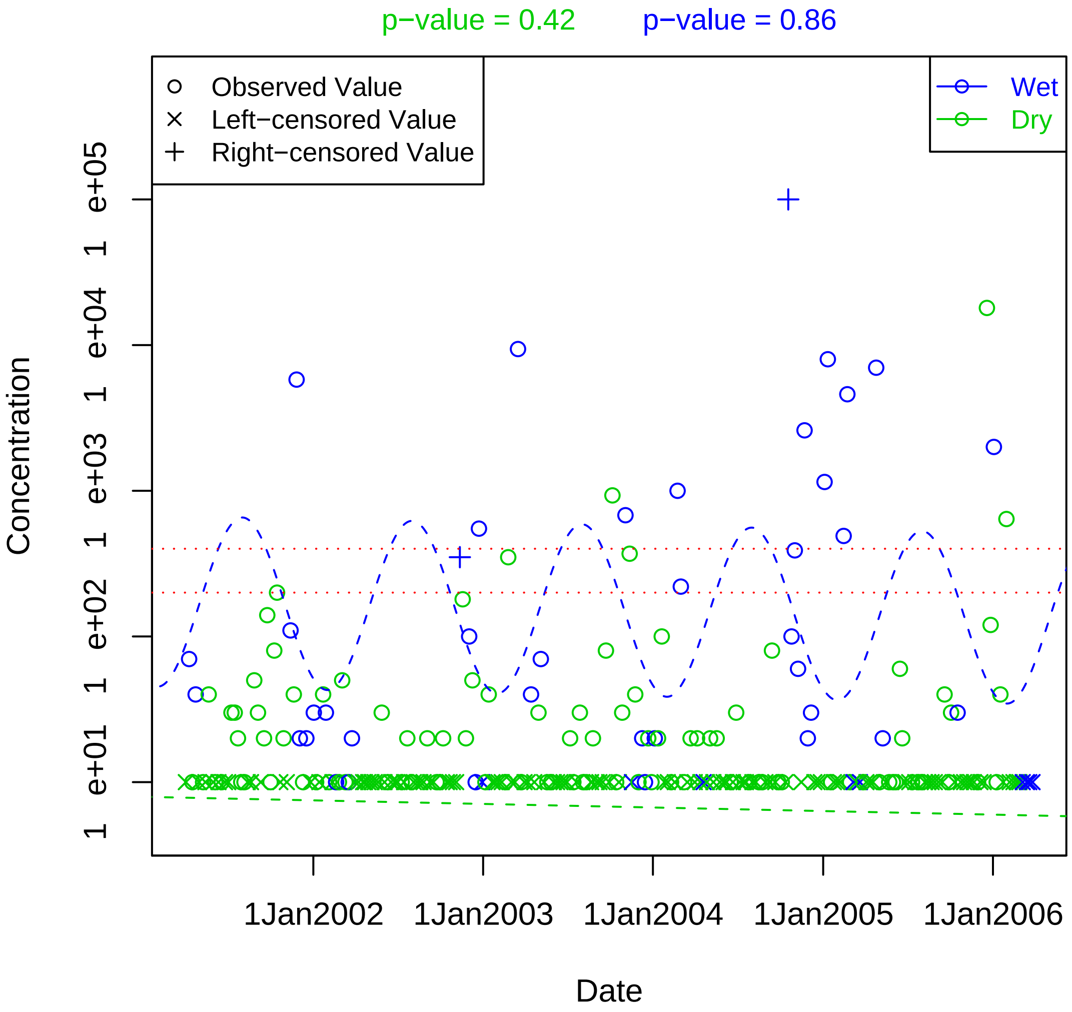


Figure I−15: Linear Regression for Sapphire Avenue Beach

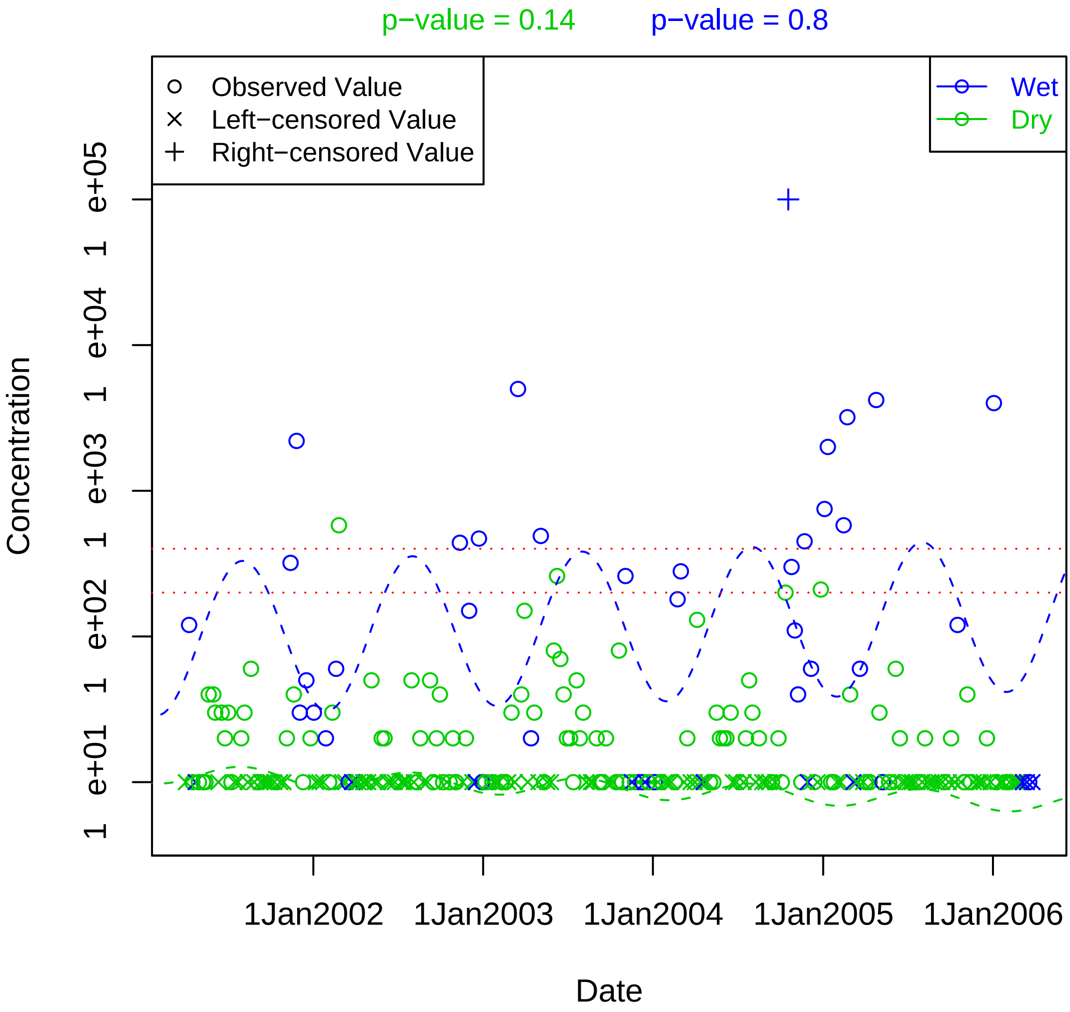


Figure I−16: Linear Regression for Grand Canal

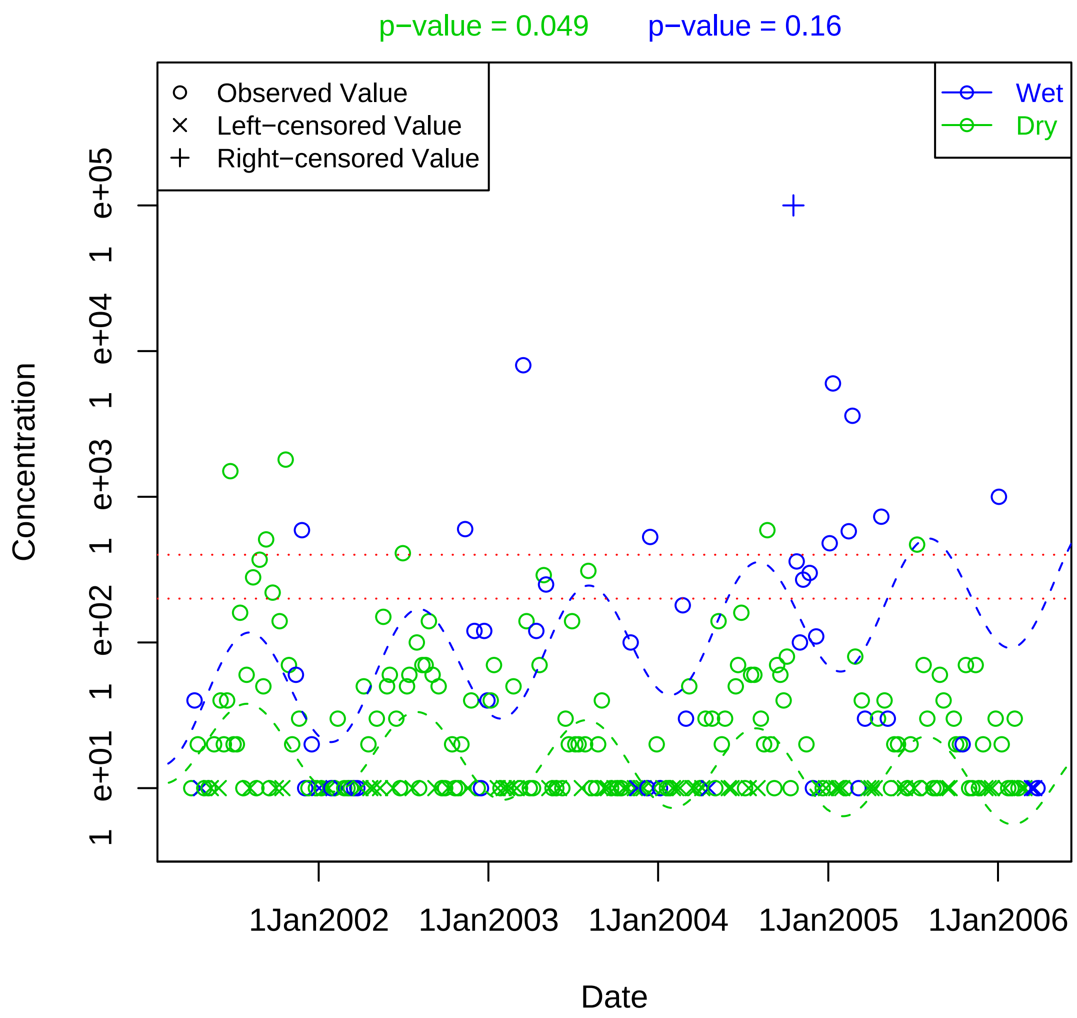


Figure I−17: Linear Regression for Abalone Avenue Beach

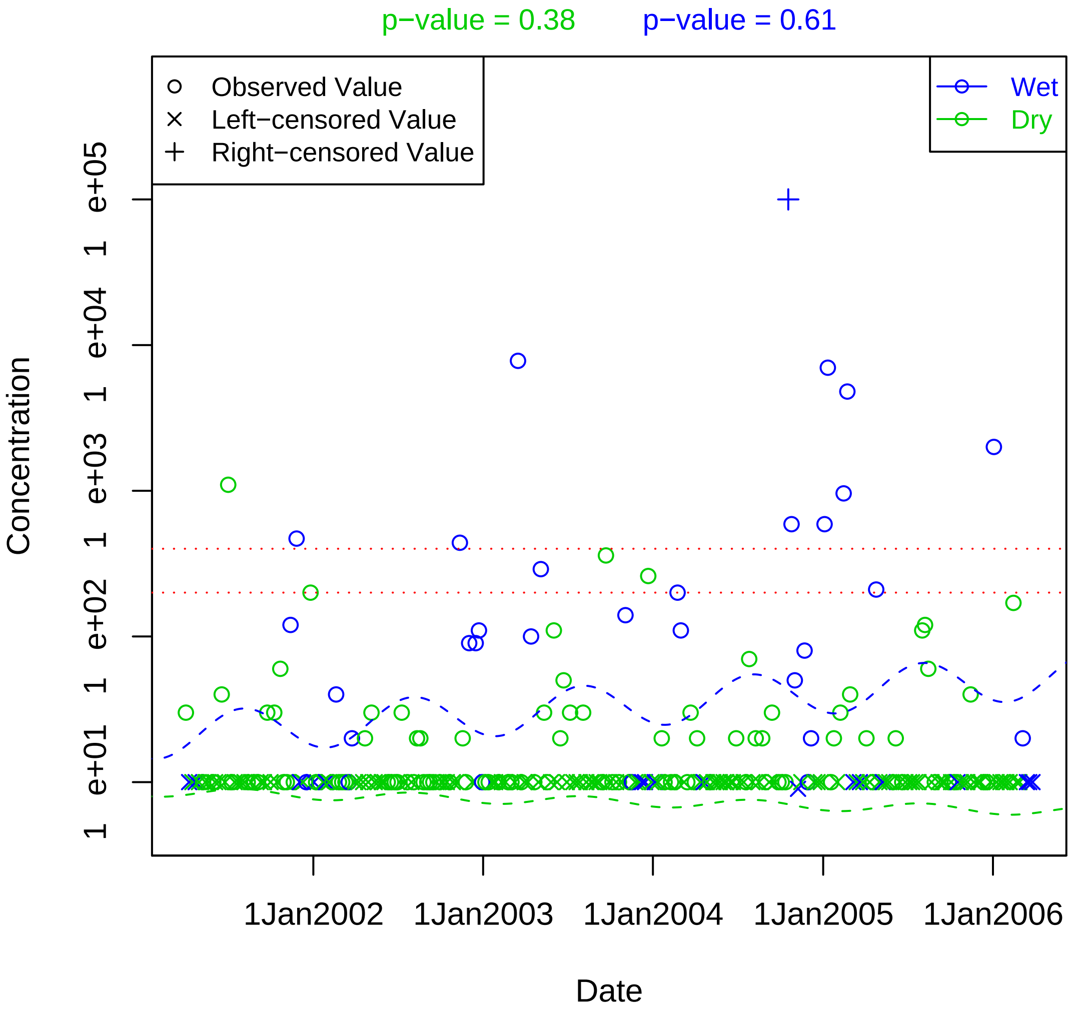
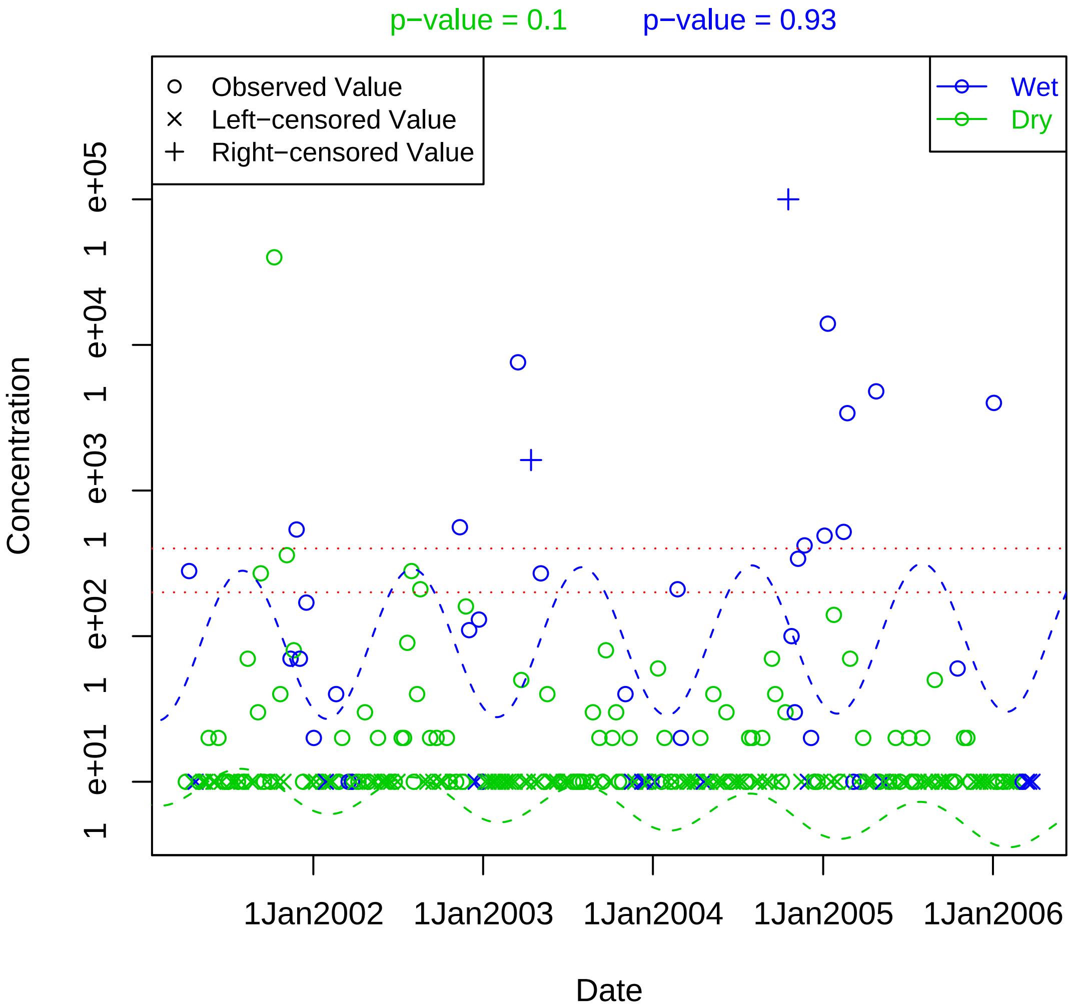


Figure I−18: Linear Regression for Park Avenue Beach



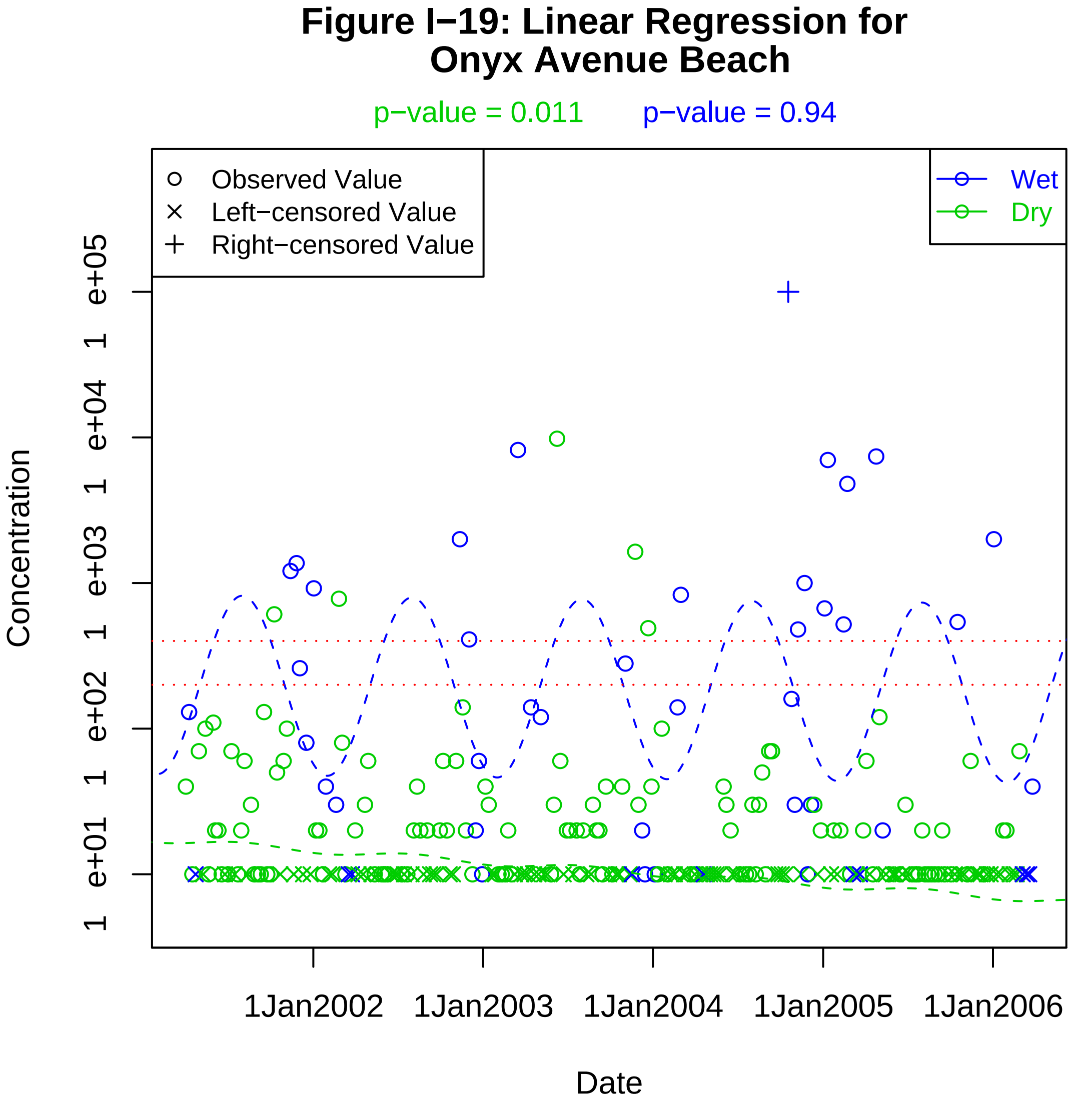


Figure I−19: Linear Regression for
Onyx Avenue Beach
p−value = 0.011
p−value = 0.94
Observed Value
Left−censored Value
Right−censored Value
Wet
Dry
Concentration
1 e+01
1 e+02
1 e+03
1 e+04
1 e+05
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

Figure I−20: Linear Regression for Promontory Point Channel

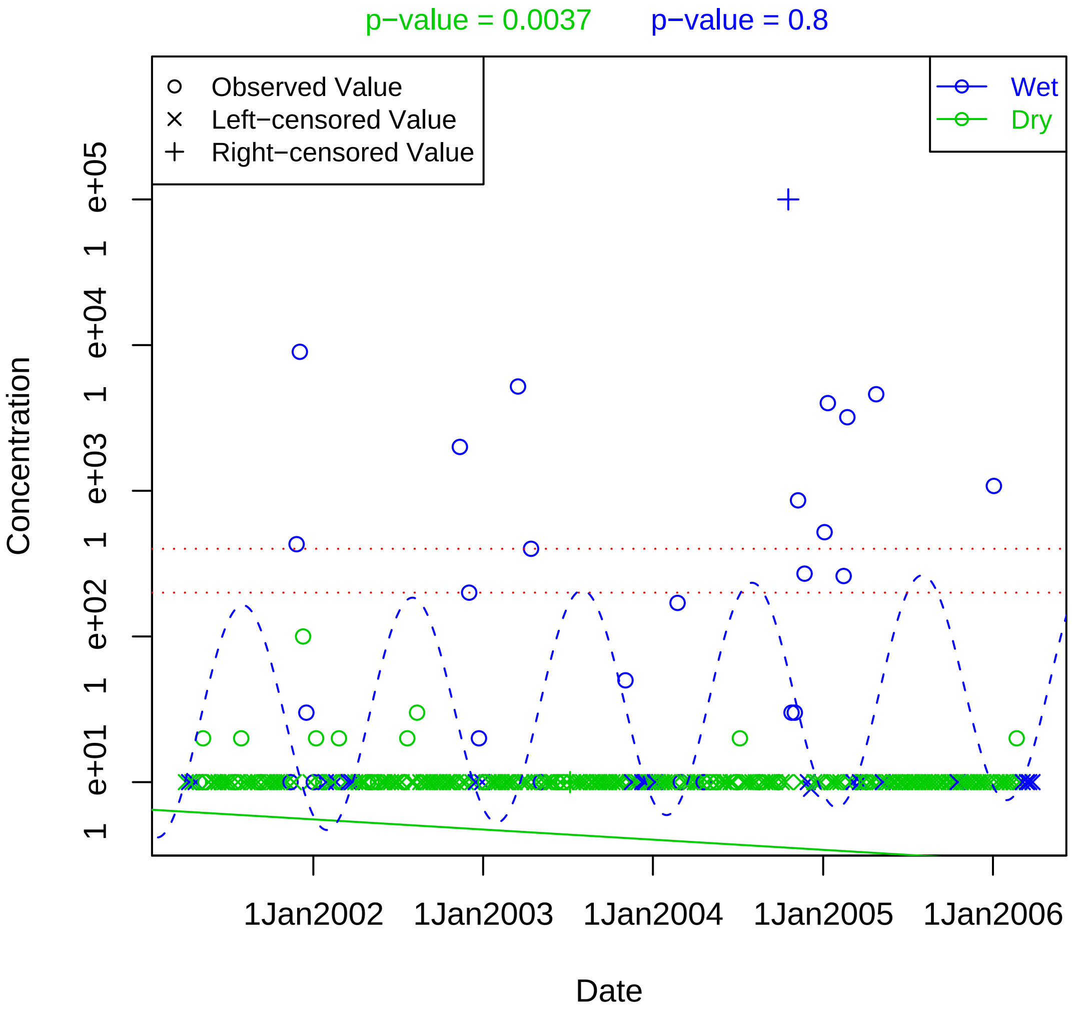


Figure I−21: Linear Regression for Harbor Patrol Beach

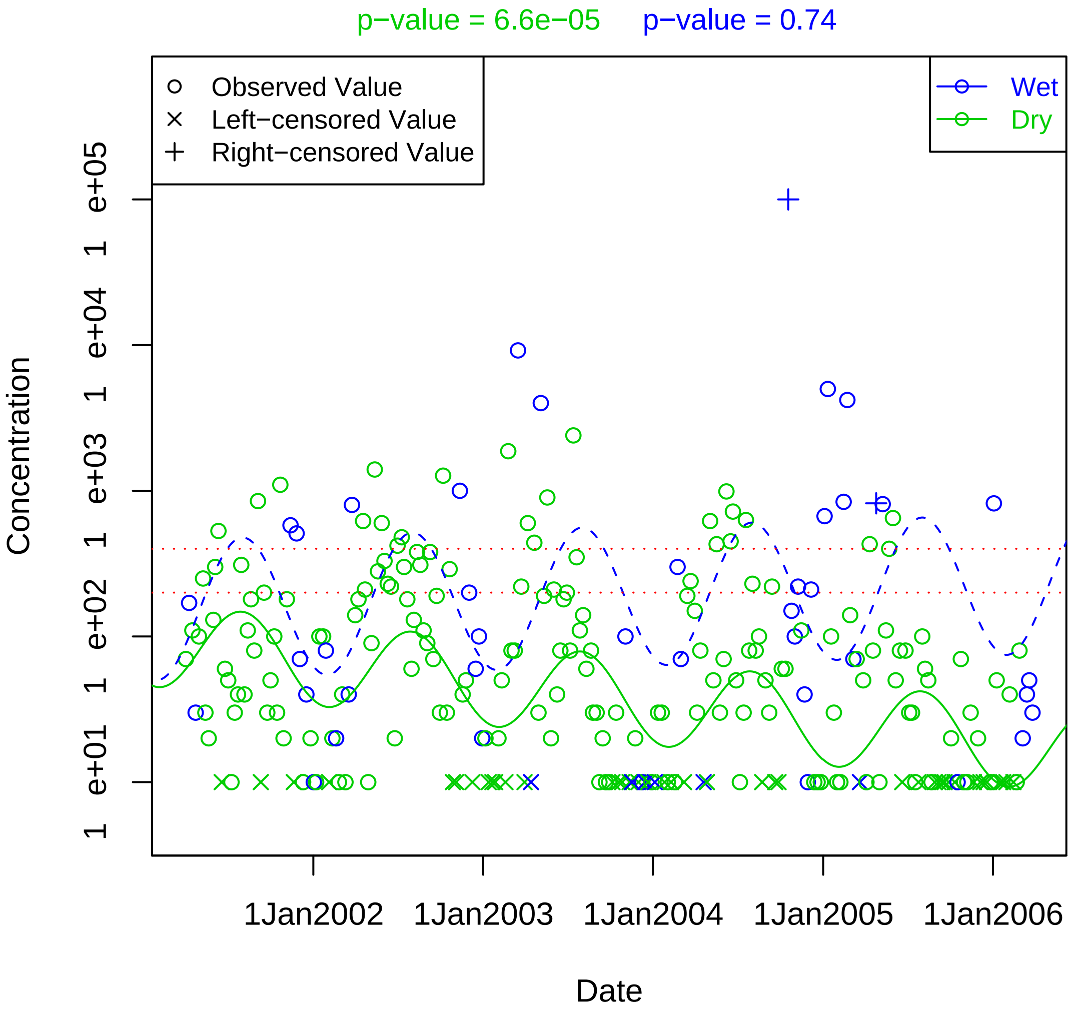


Figure I−22: Linear Regression for Rocky Point Beach

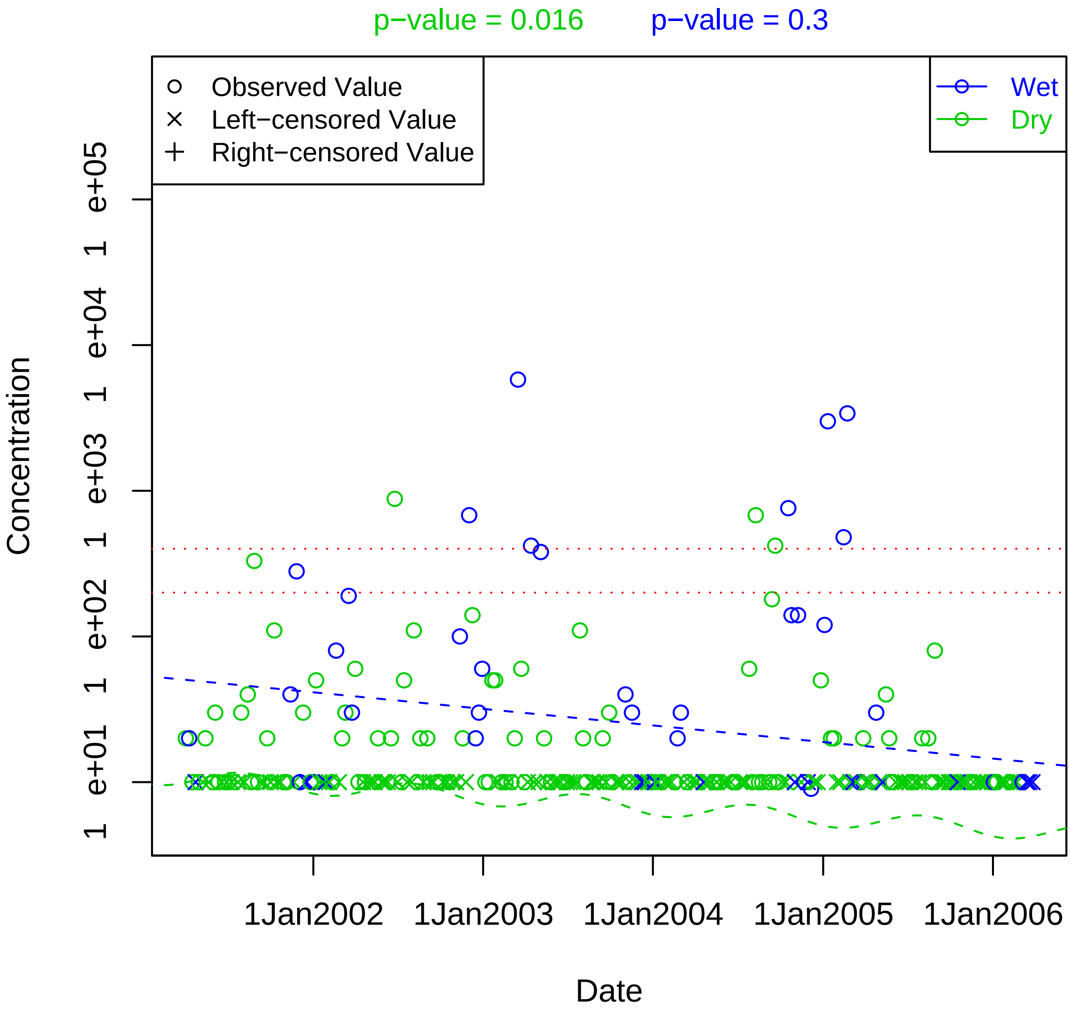
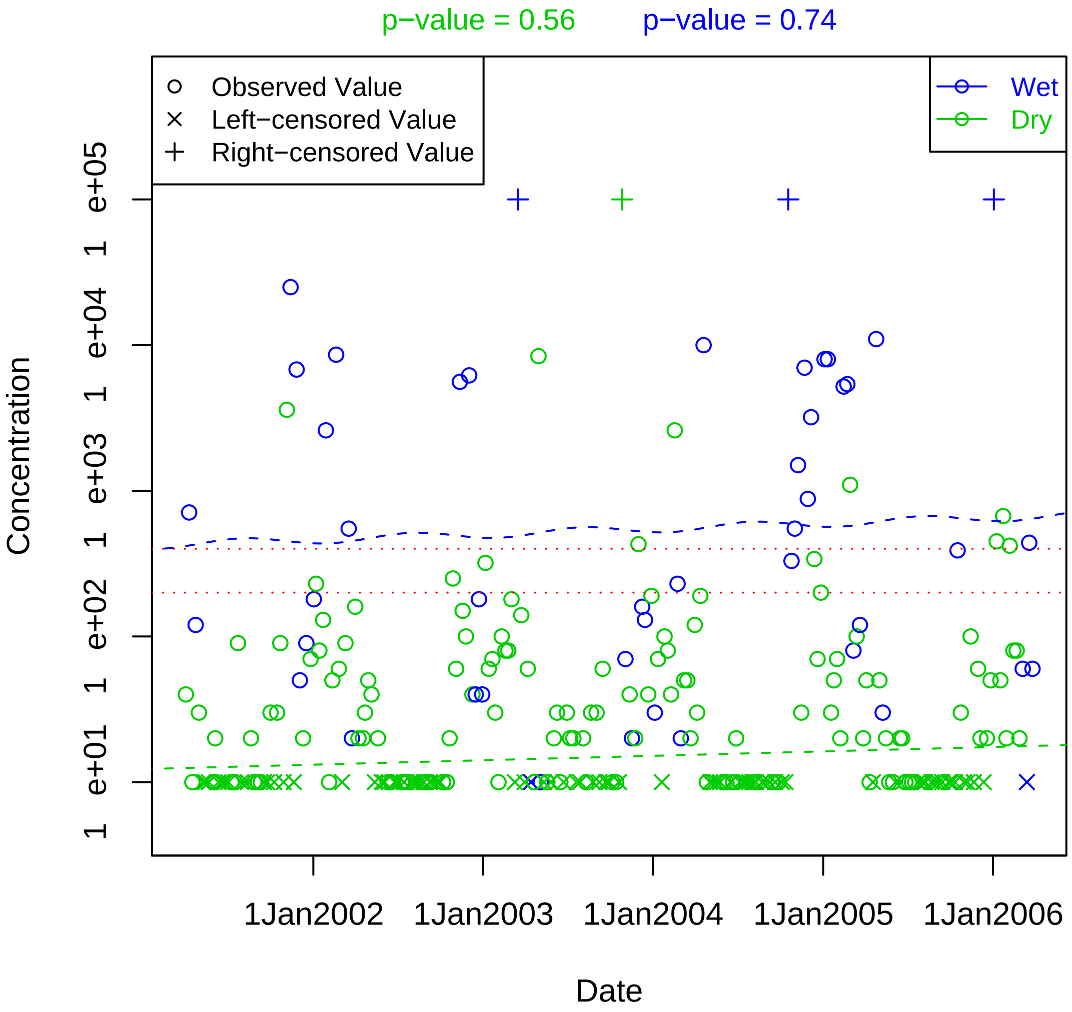


Figure I−23: Linear Regression for Newport Dunes Middle



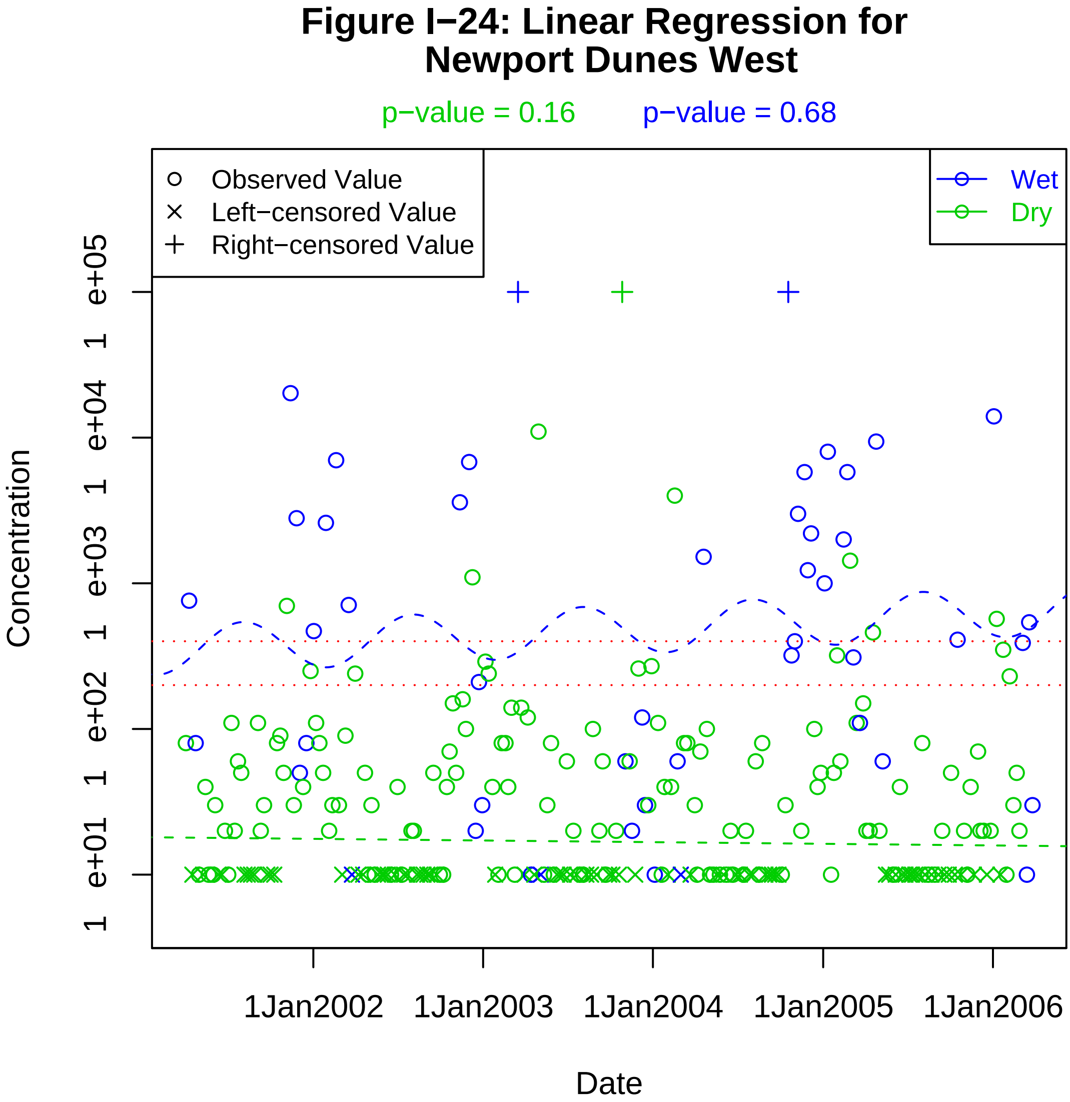


Figure I−24: Linear Regression for
Newport Dunes West
p−value = 0.16
p−value = 0.68
Observed Value
Left−censored Value
Right−censored Value
Wet
Dry
Concentration
1 e+05
1 e+04
1 e+03
1 e+02
1 e+01
1
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

Figure I−25: Linear Regression for Newport Dunes East

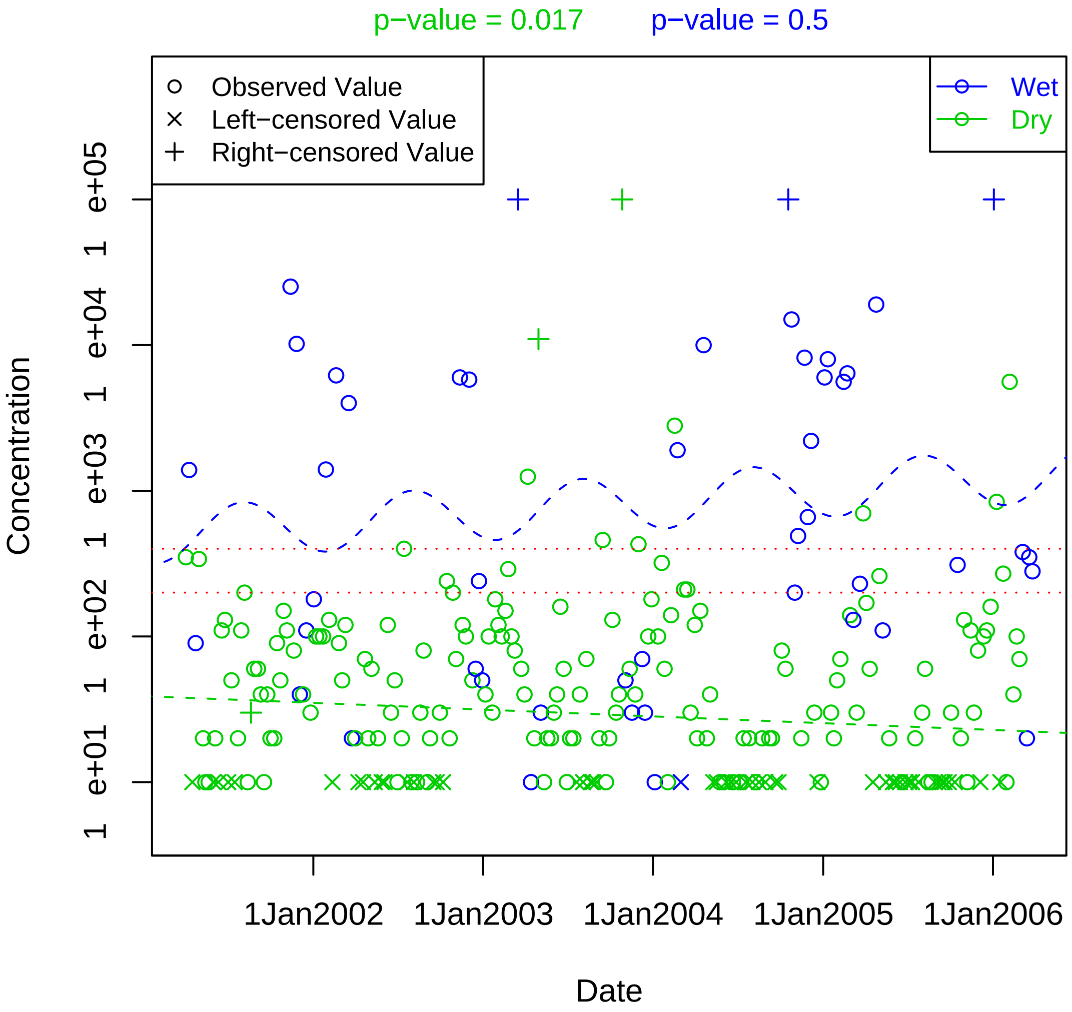


Figure I−26: Linear Regression for Newport Dunes North

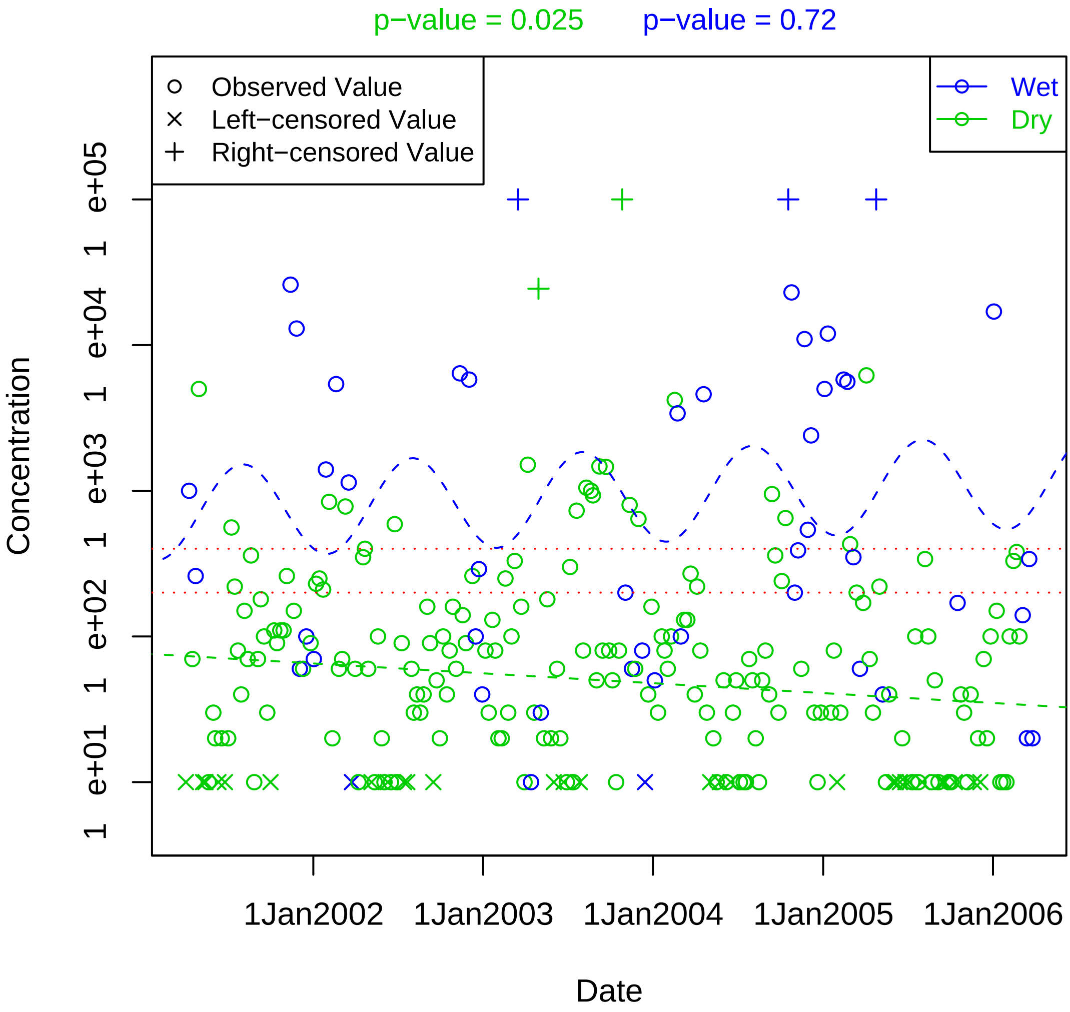


Figure I−27: Linear Regression for Vaughn s Launch

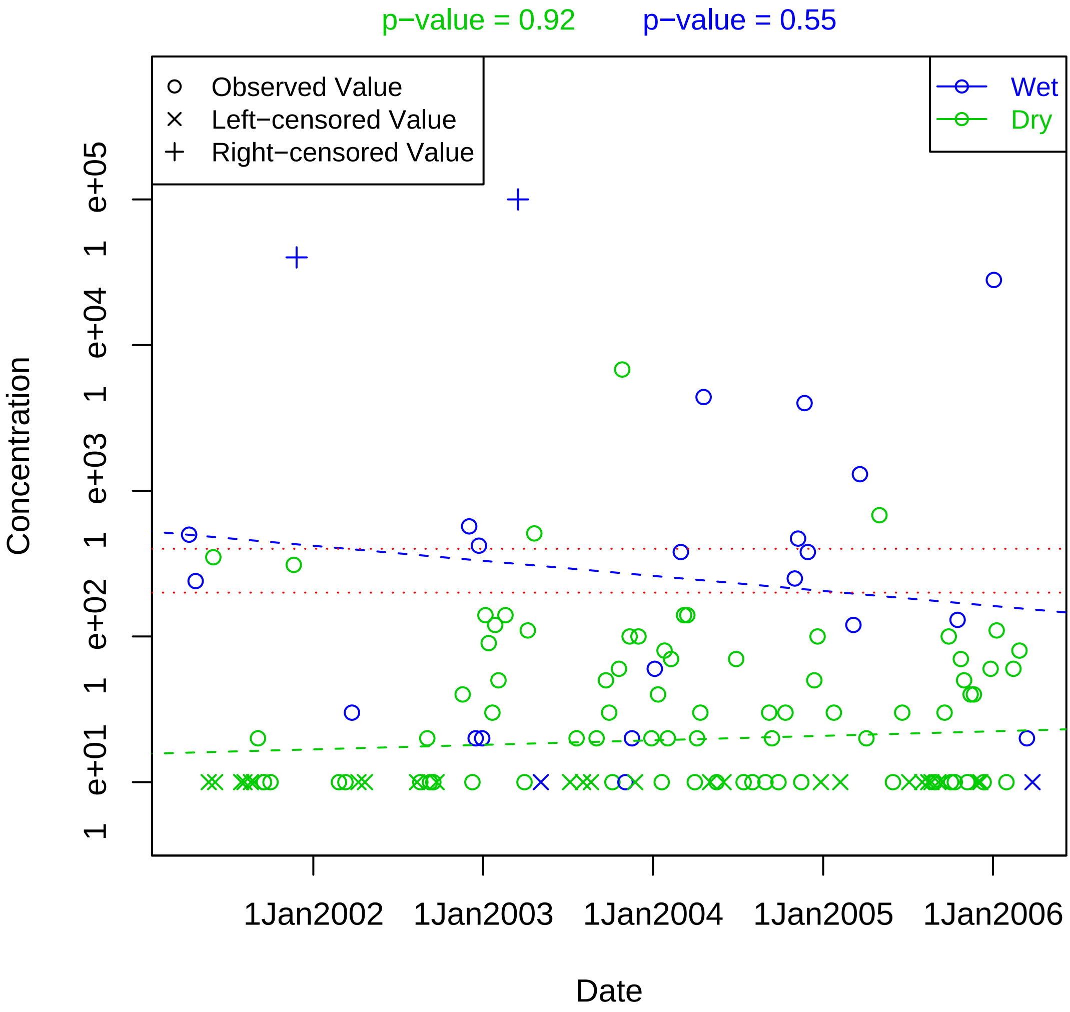


Figure I−28: Linear Regression for Ski Zone

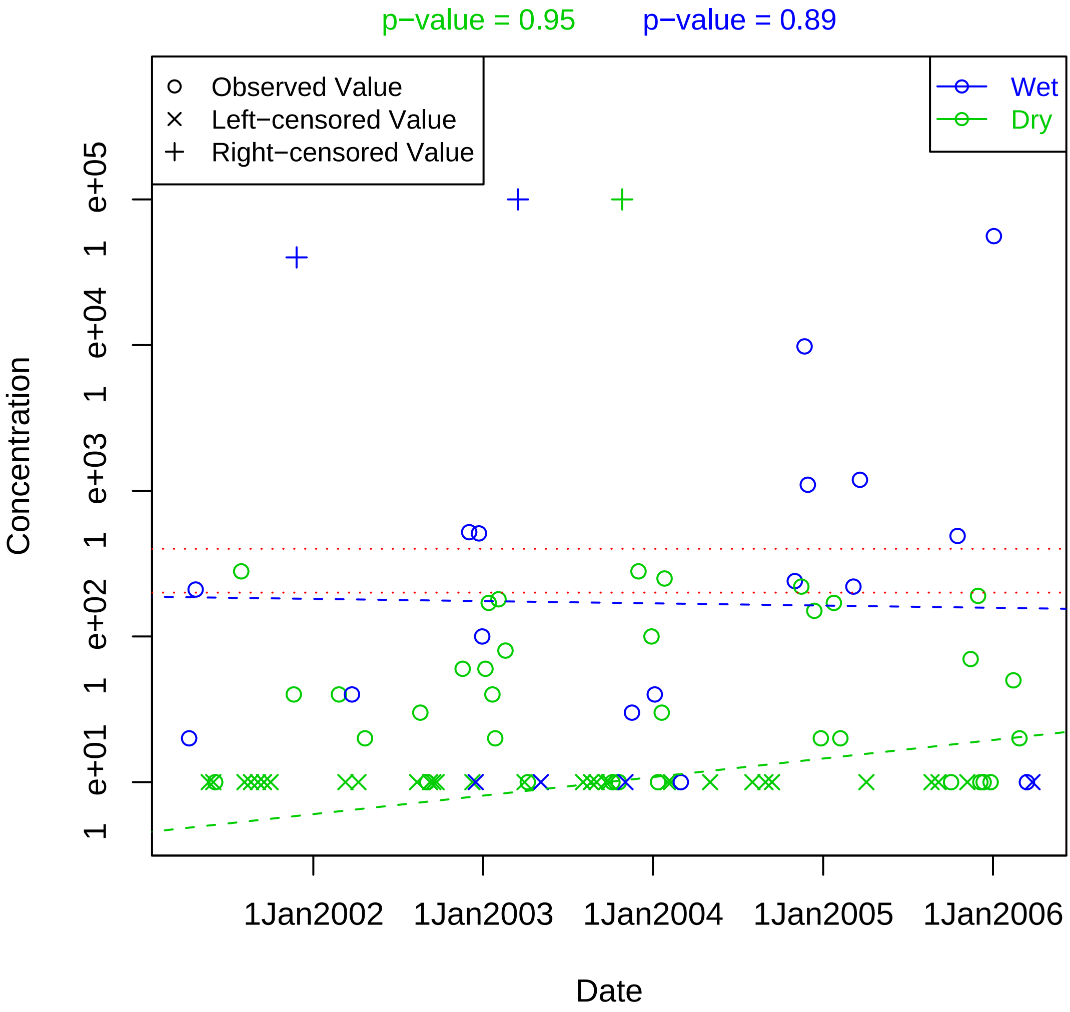


Figure I−29: Linear Regression for North Star Beach

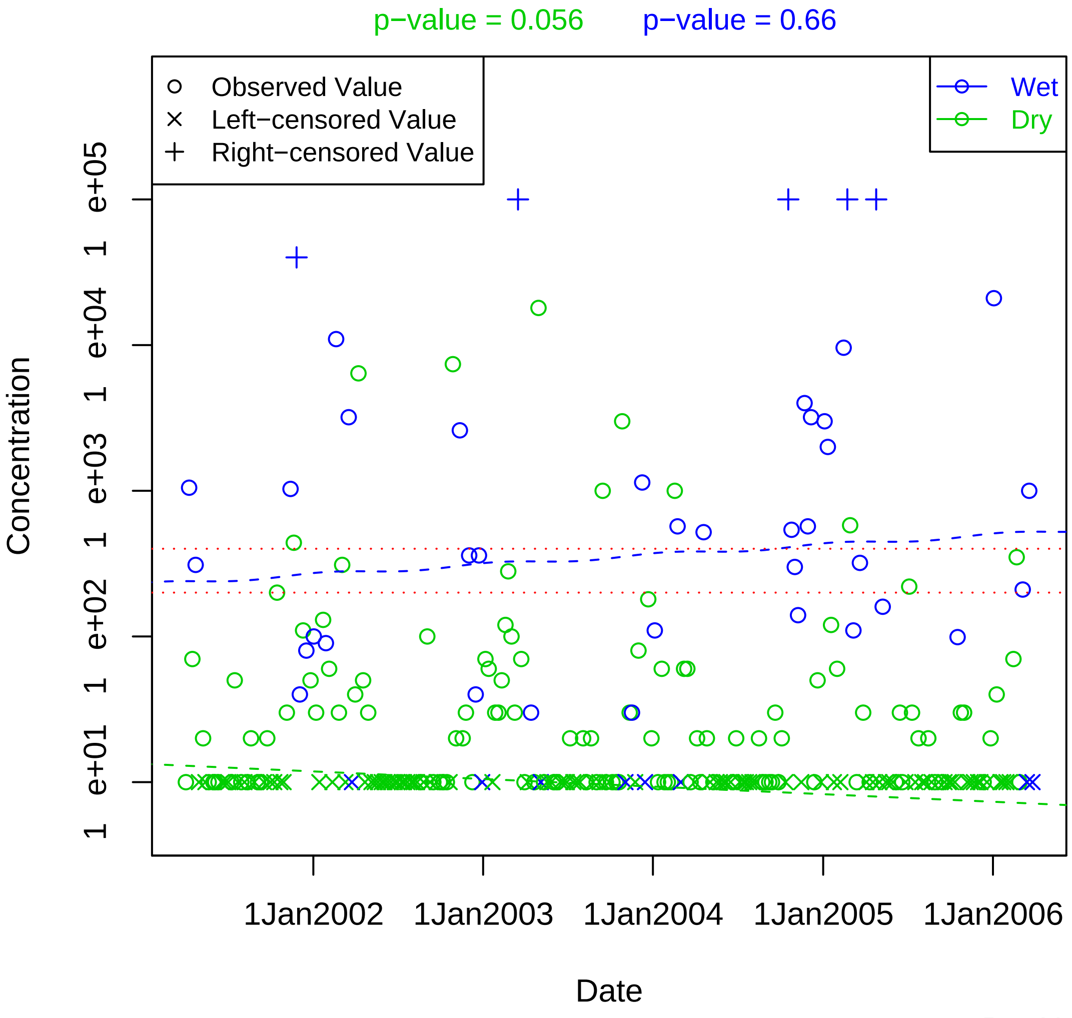


Figure I−30: Linear Regression for De Anza Launch

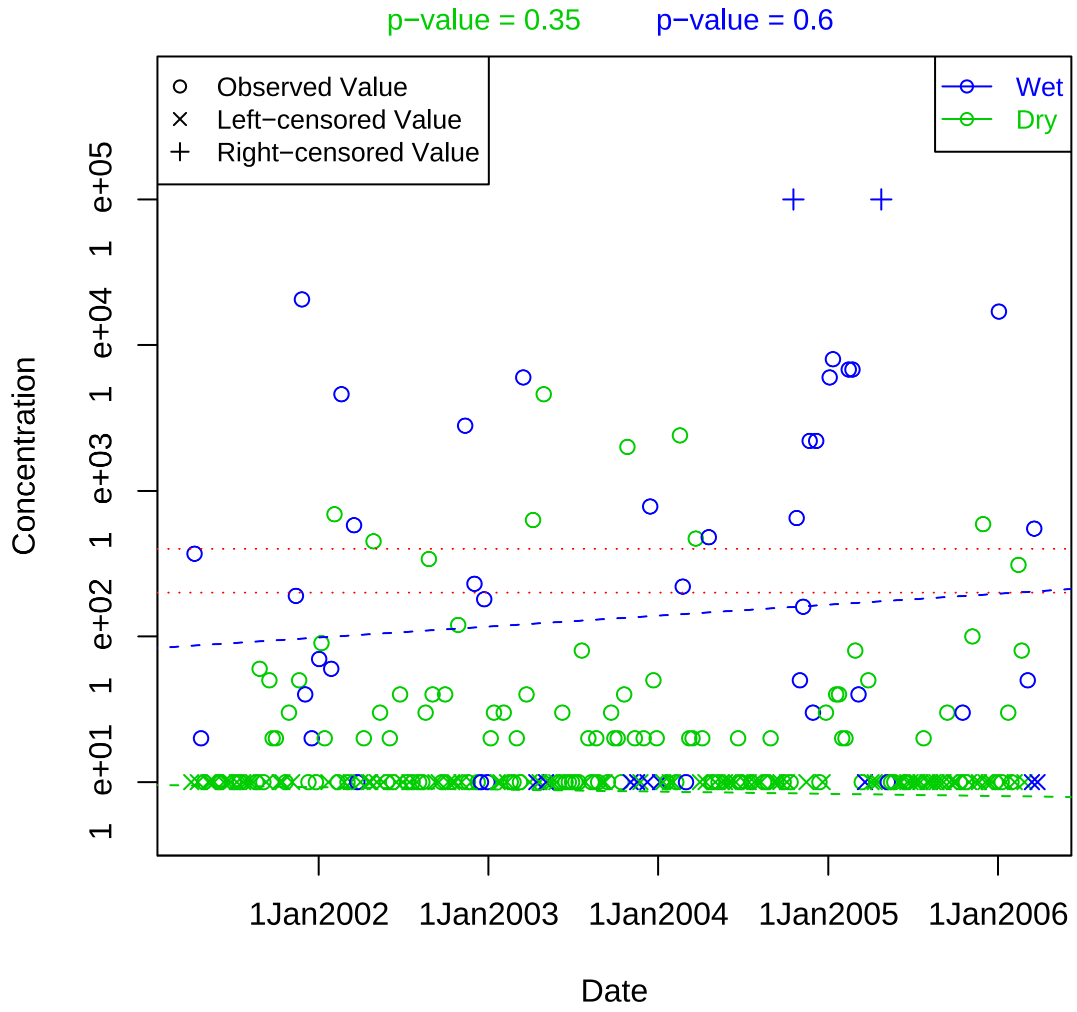


Figure I−31: Linear Regression for Bayshore Beach

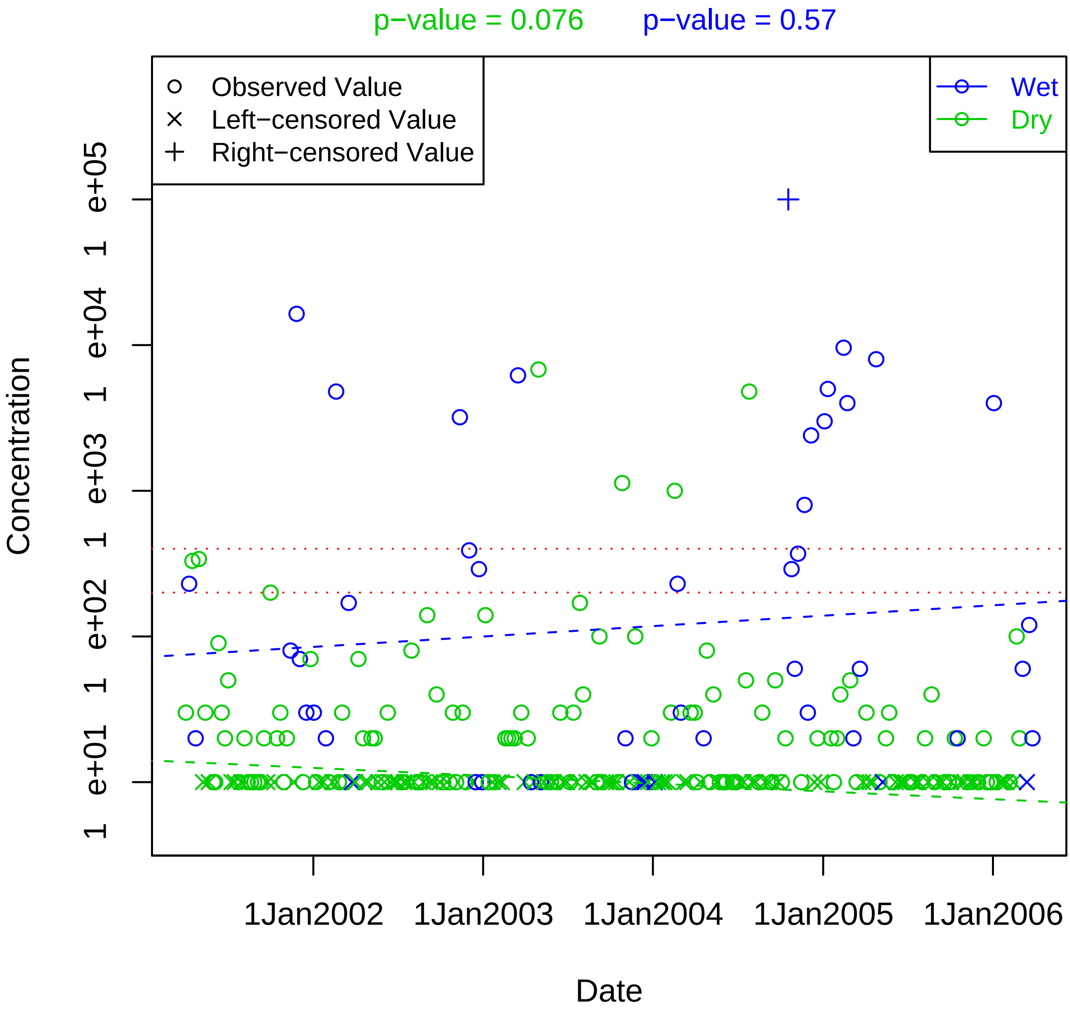


Figure I−32: Linear Regression for San Diego Creek Campus Dr

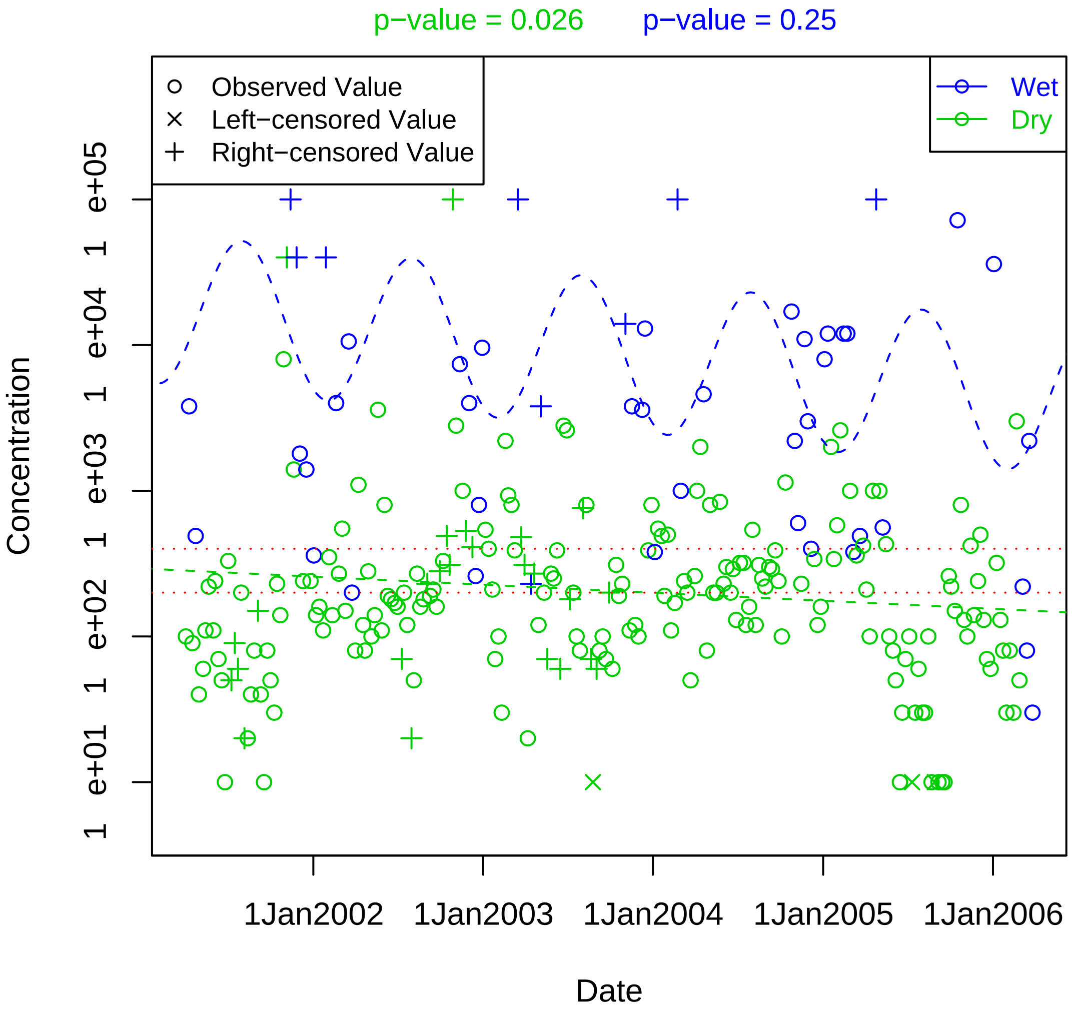


Figure I−33: Linear Regression for Santa Ana Delhi Channel

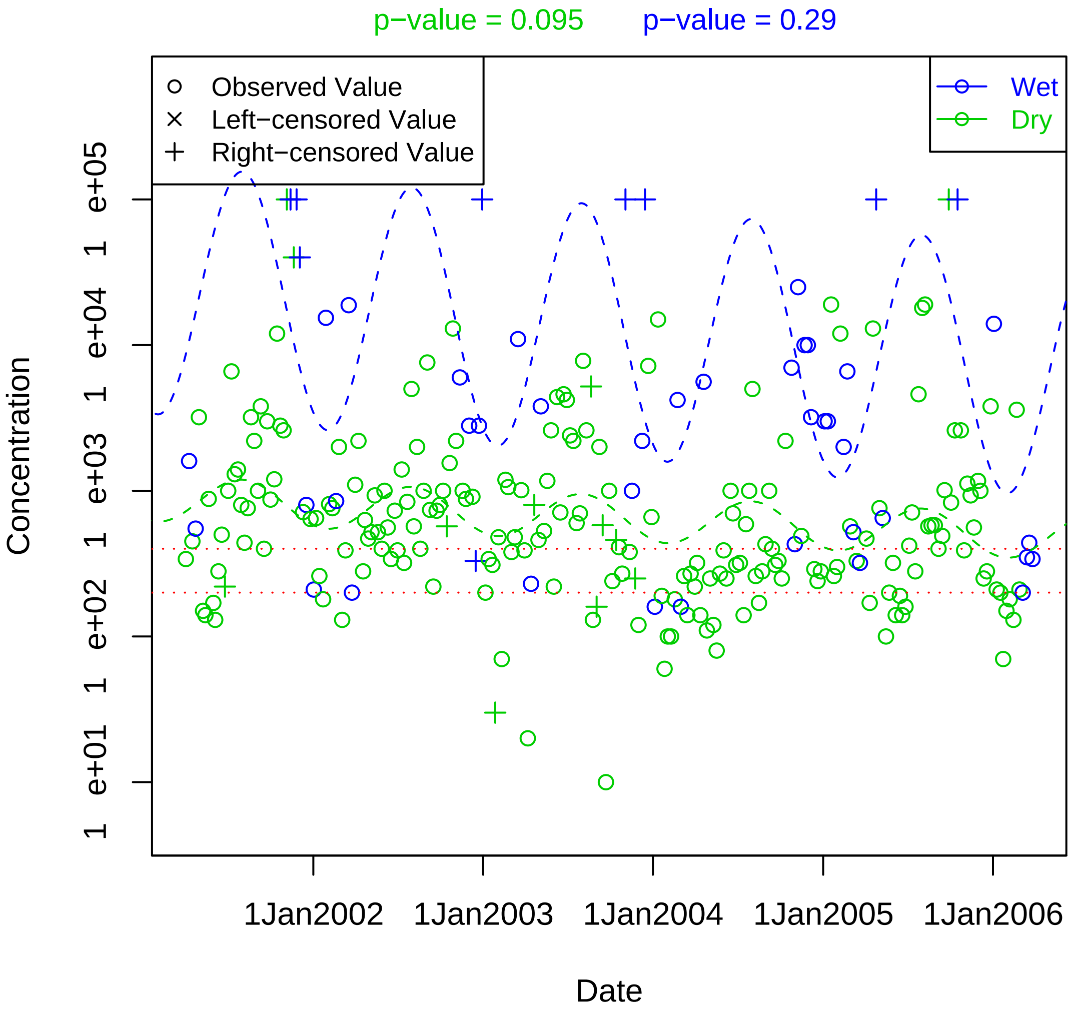


Figure I−34: Linear Regression for Big Canyon Wash

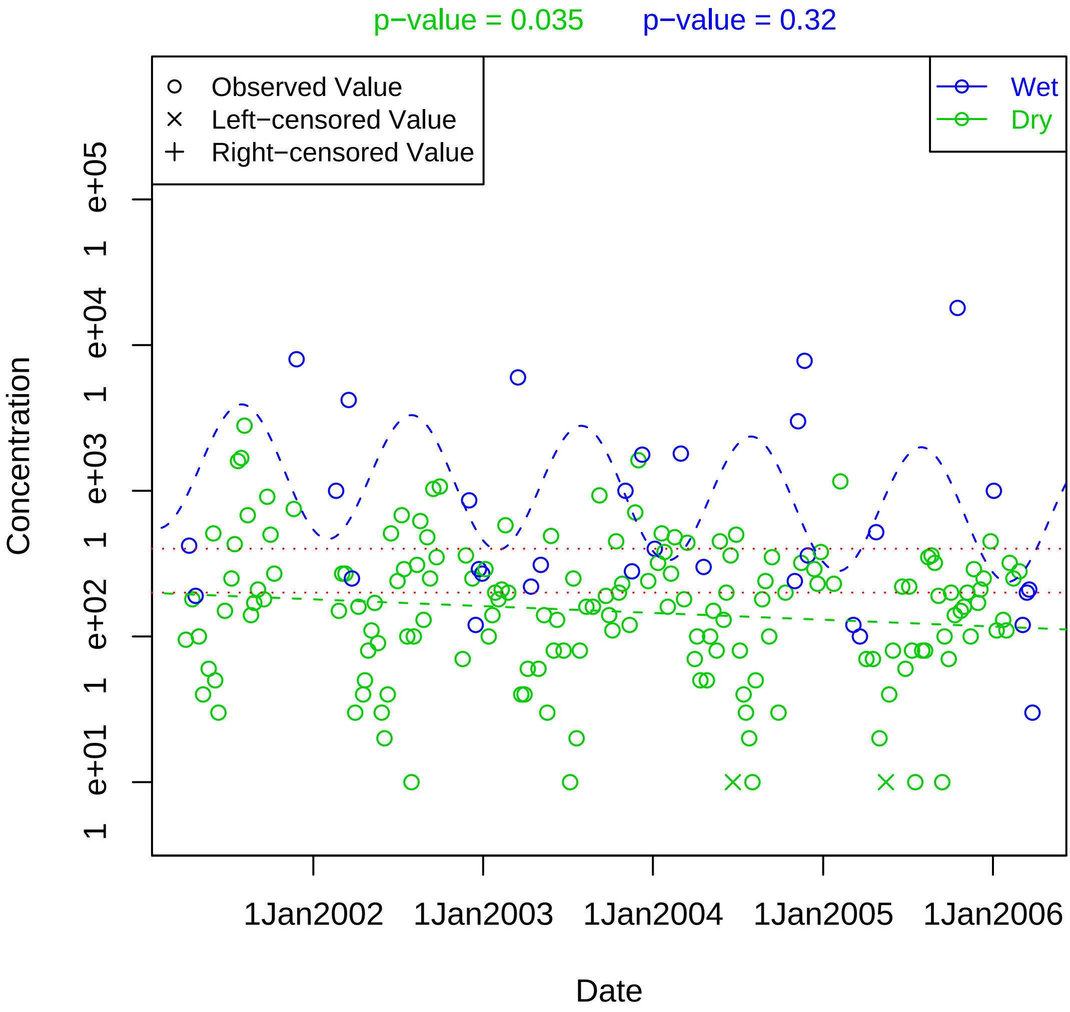


Figure I−35: Linear Regression for Back Bay Dr Drain

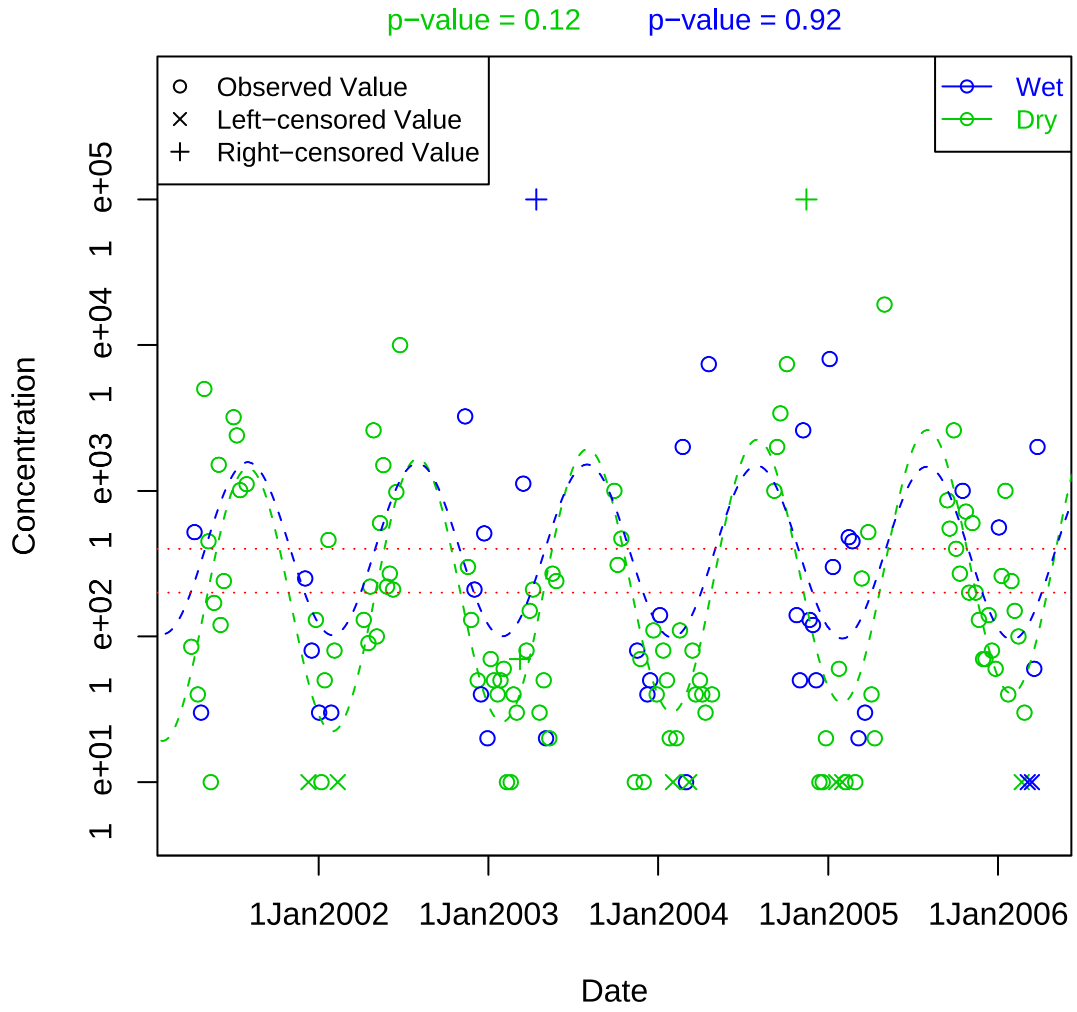


Figure II−1: Fitted geometric means for Newport Blvd Bridge

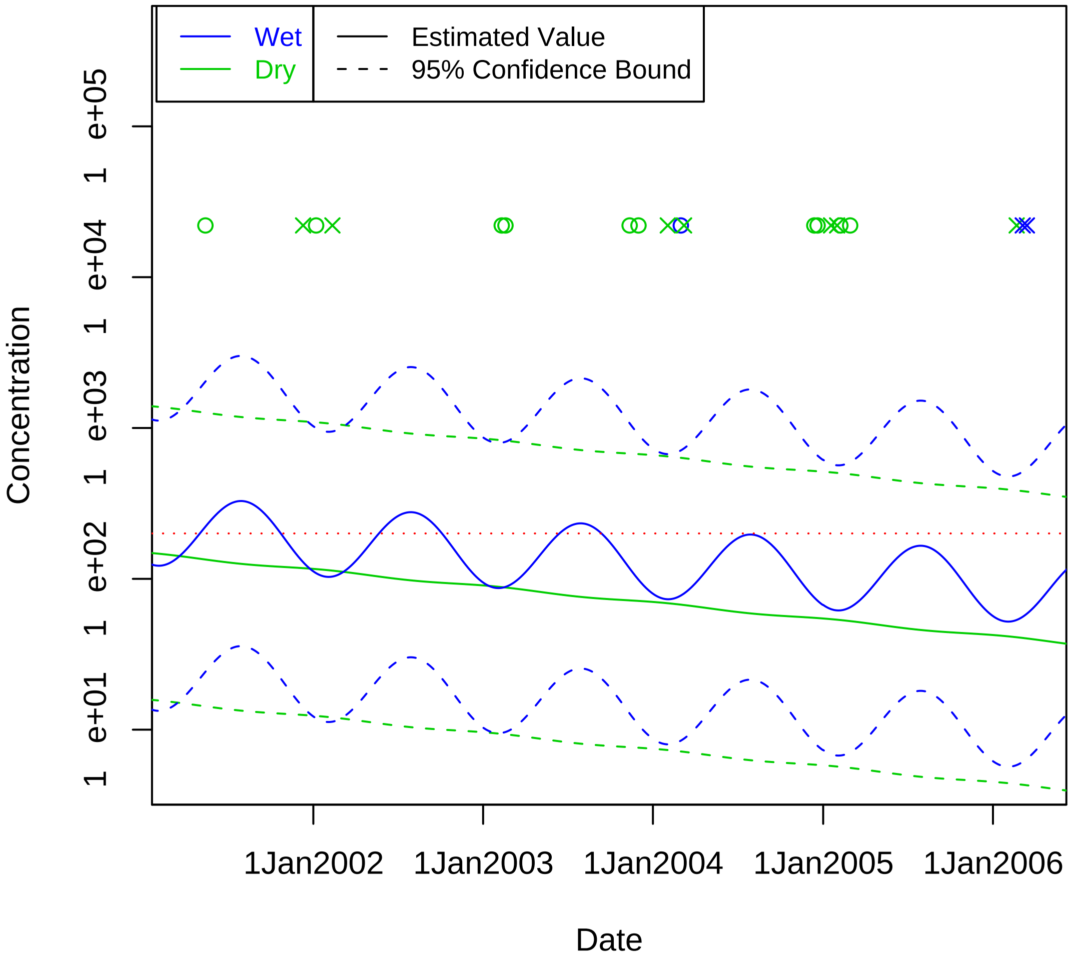


Figure III−1: Linear Regression on Geometric Means for 43rd Street Beach

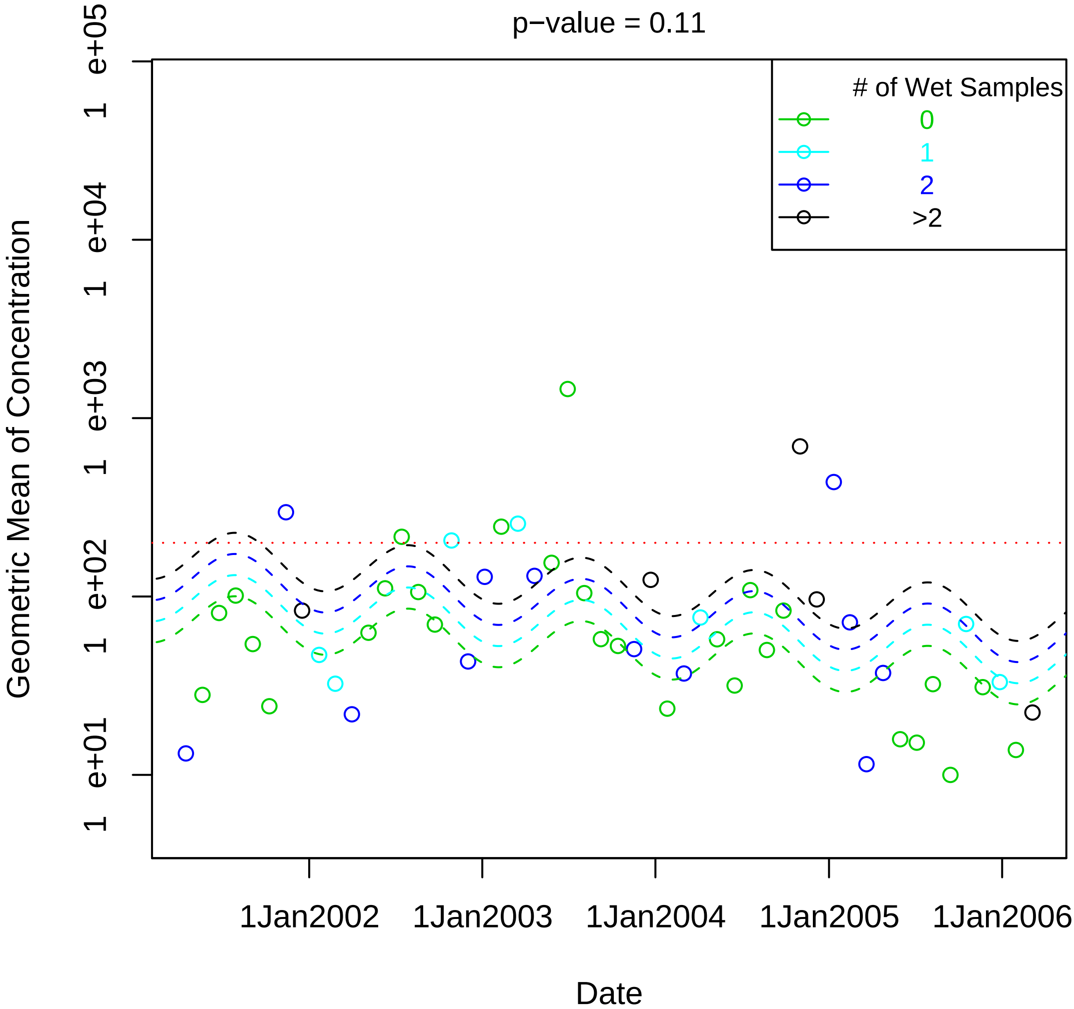


Figure III−2: Linear Regression on Geometric Means for 38th Street Beach

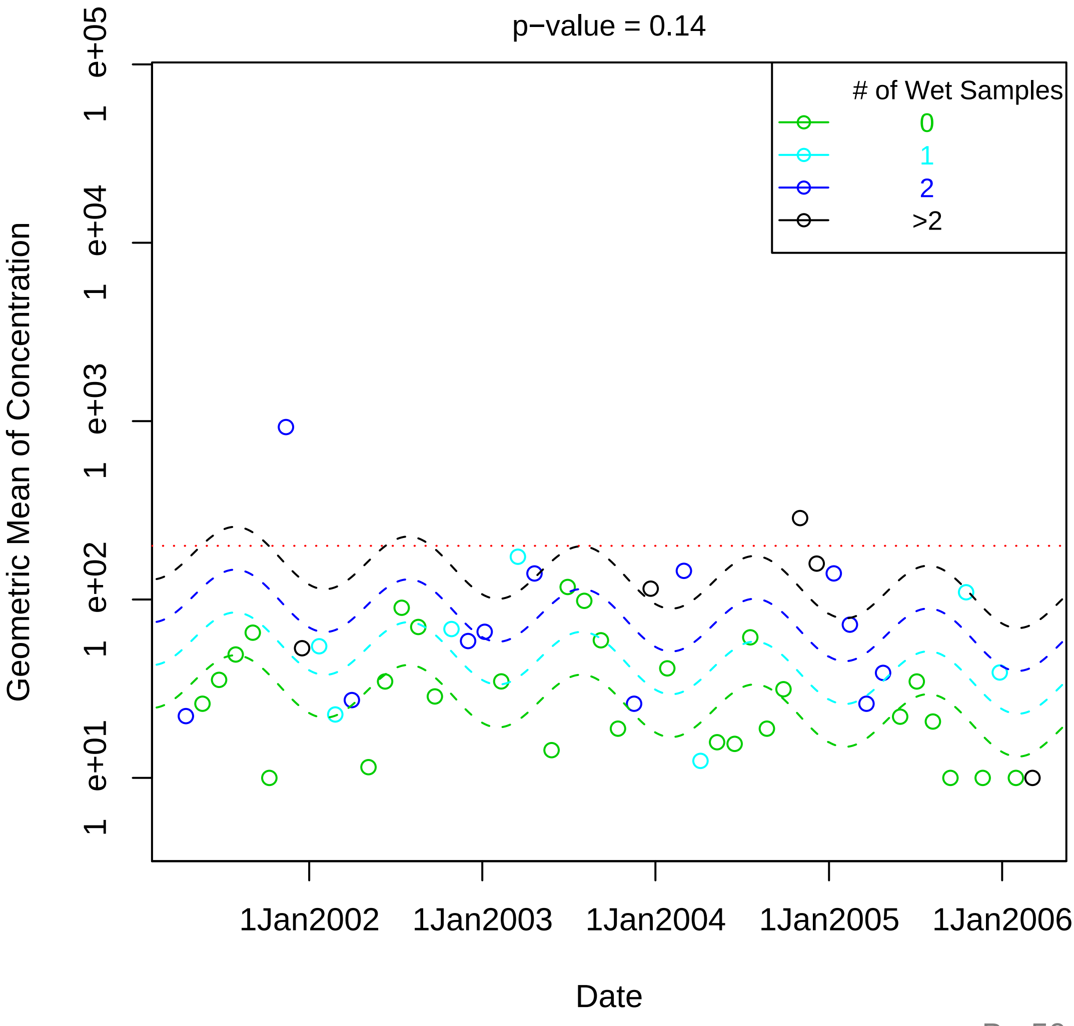


Figure III−3: Linear Regression on Geometric Means for 33rd Street Channel

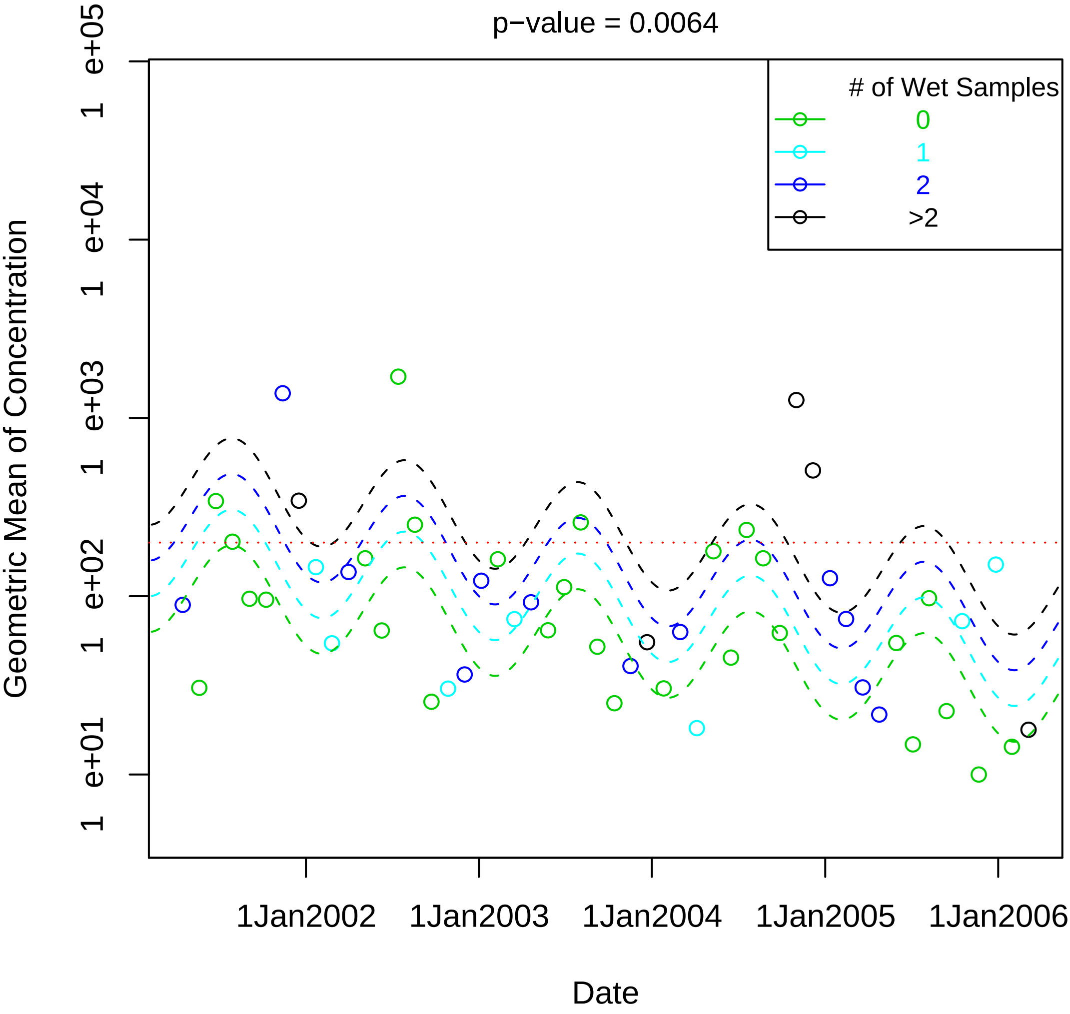


Figure III−4: Linear Regression on Geometric Means for Lido Yacht Club Beach

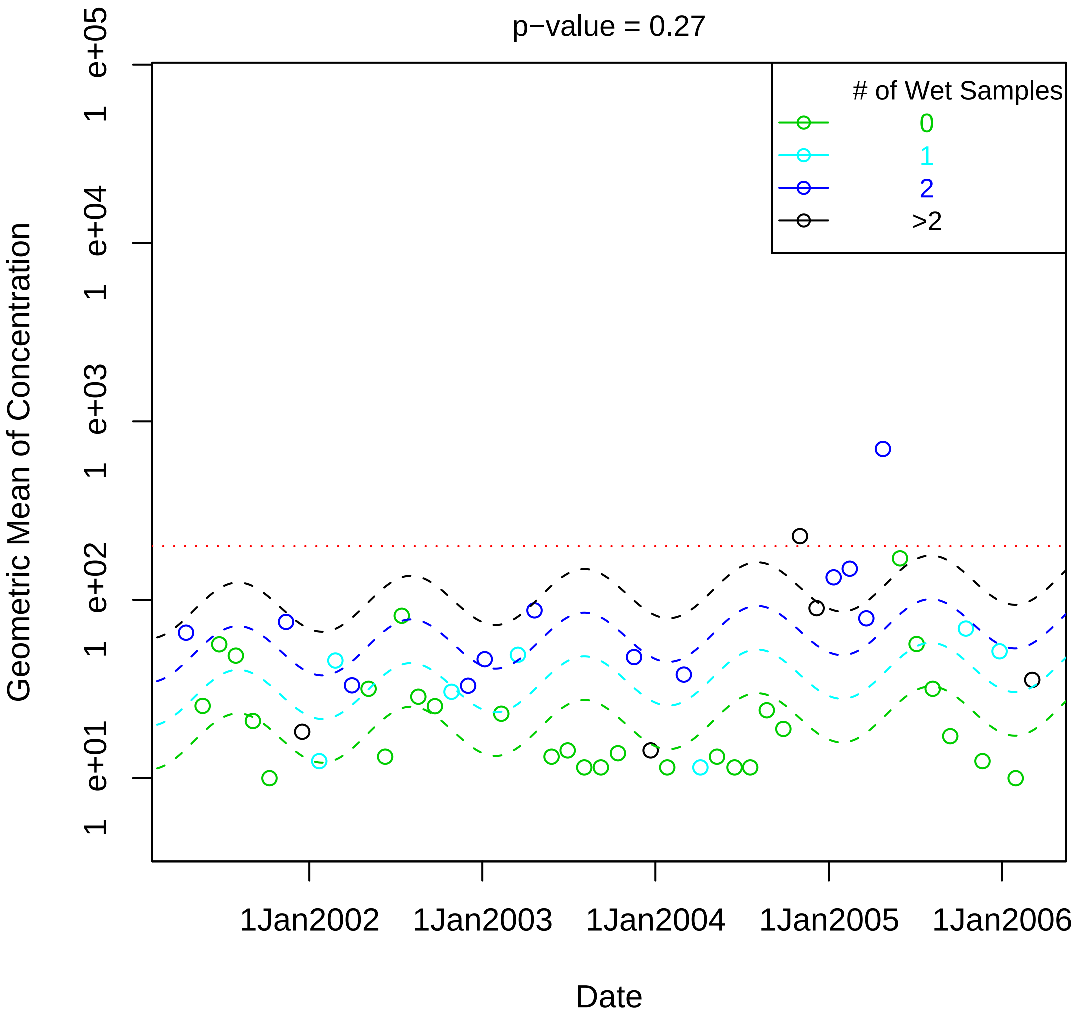


Figure III−5: Linear Regression on Geometric Means for Via Genoa Beach

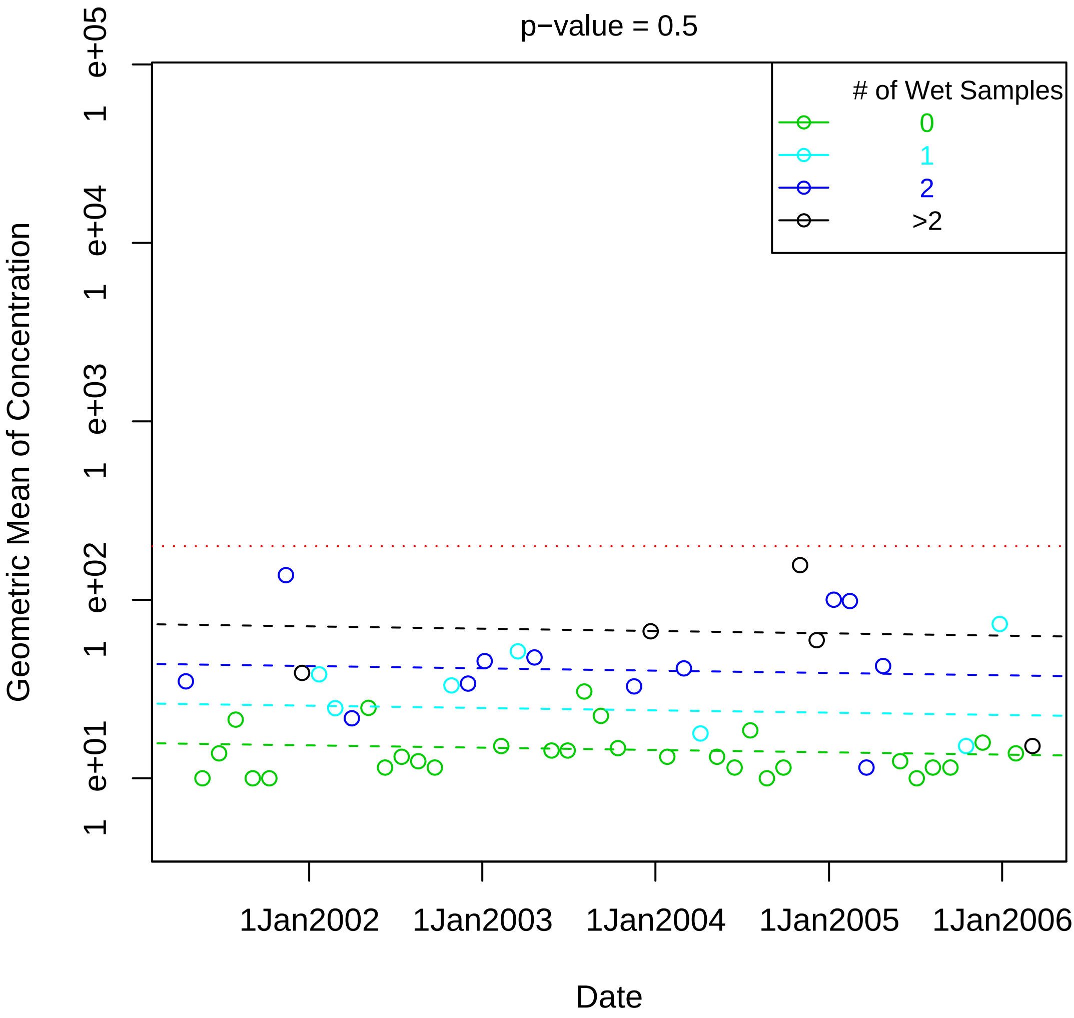


Figure III−6: Linear Regression on Geometric Means for Newport Blvd Bridge

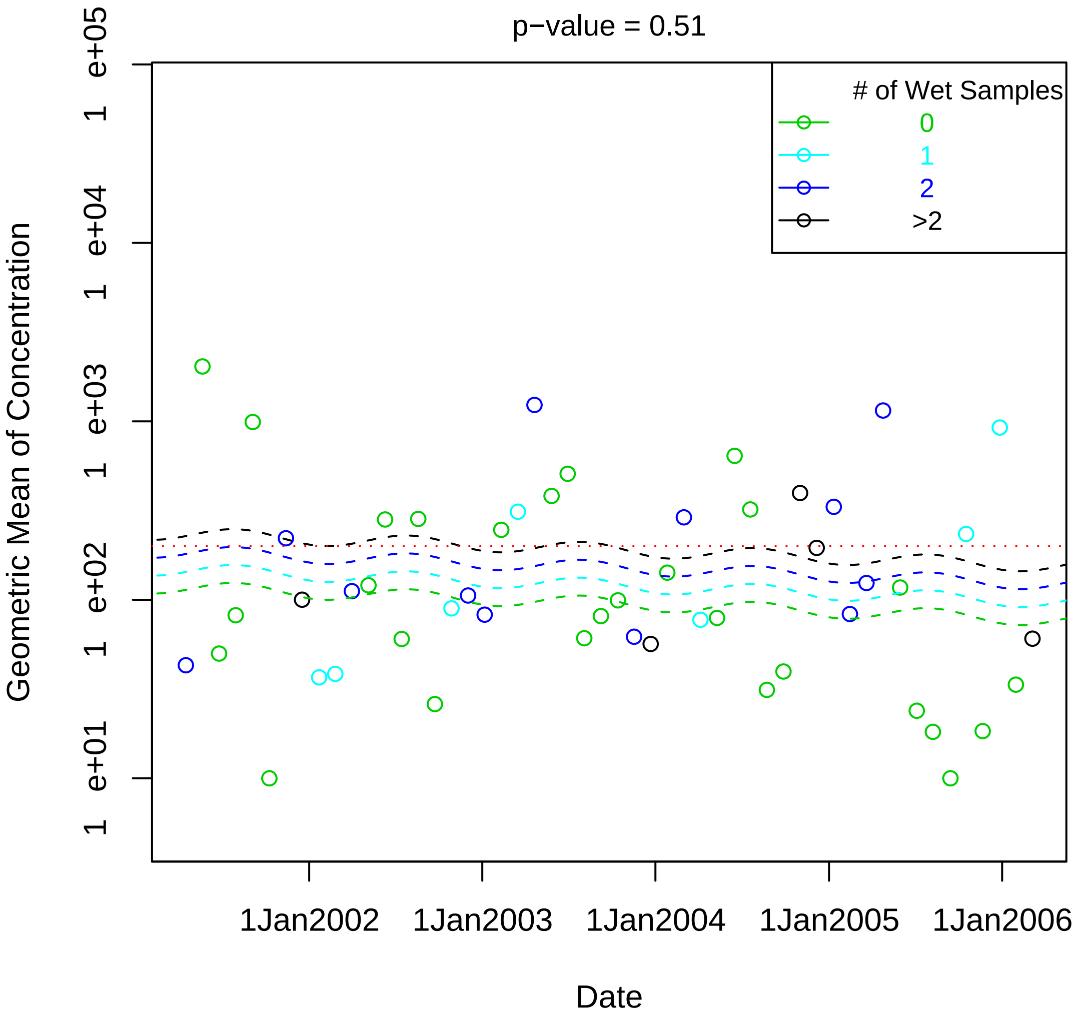


Figure III−7: Linear Regression on Geometric Means for Rhine Channel

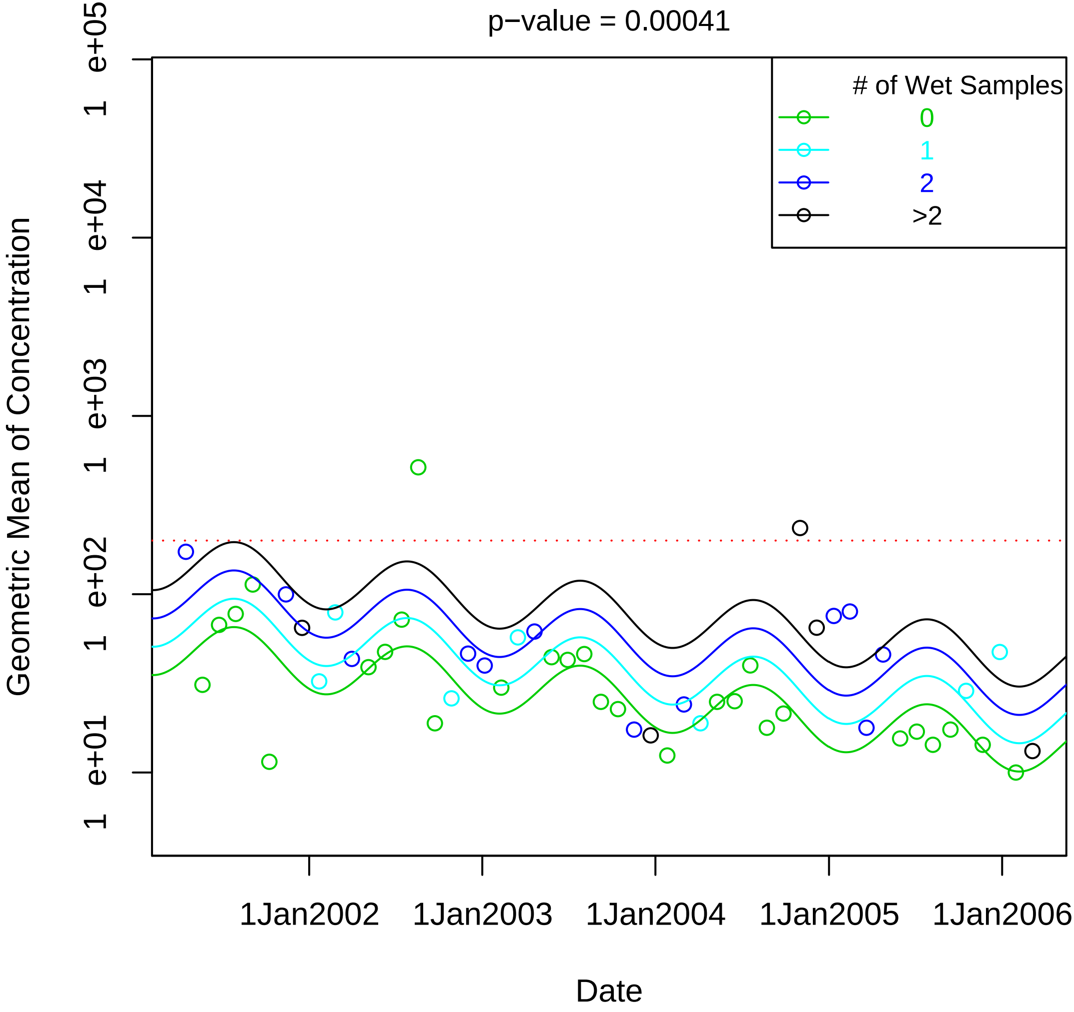
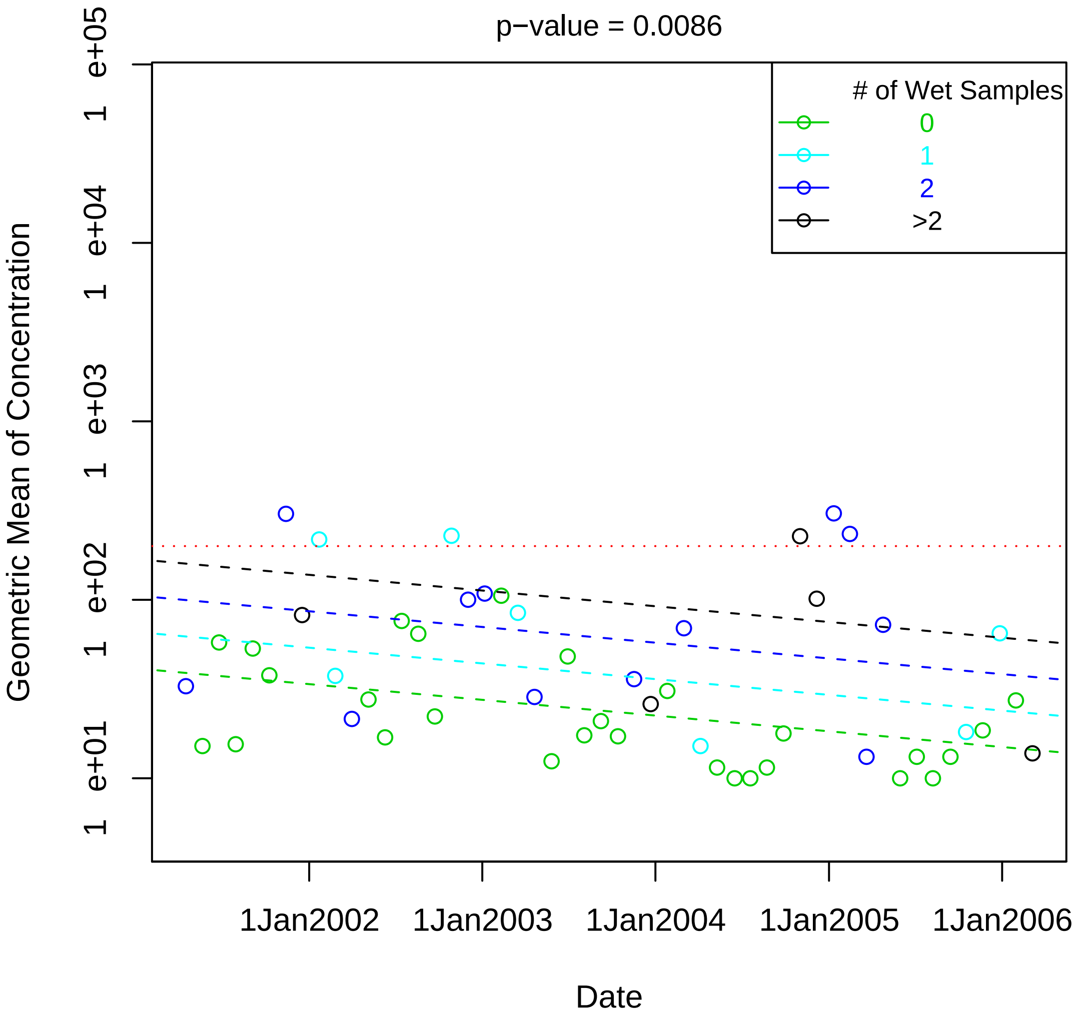


Figure III−8: Linear Regression on Geometric Means for 19th Street Beach



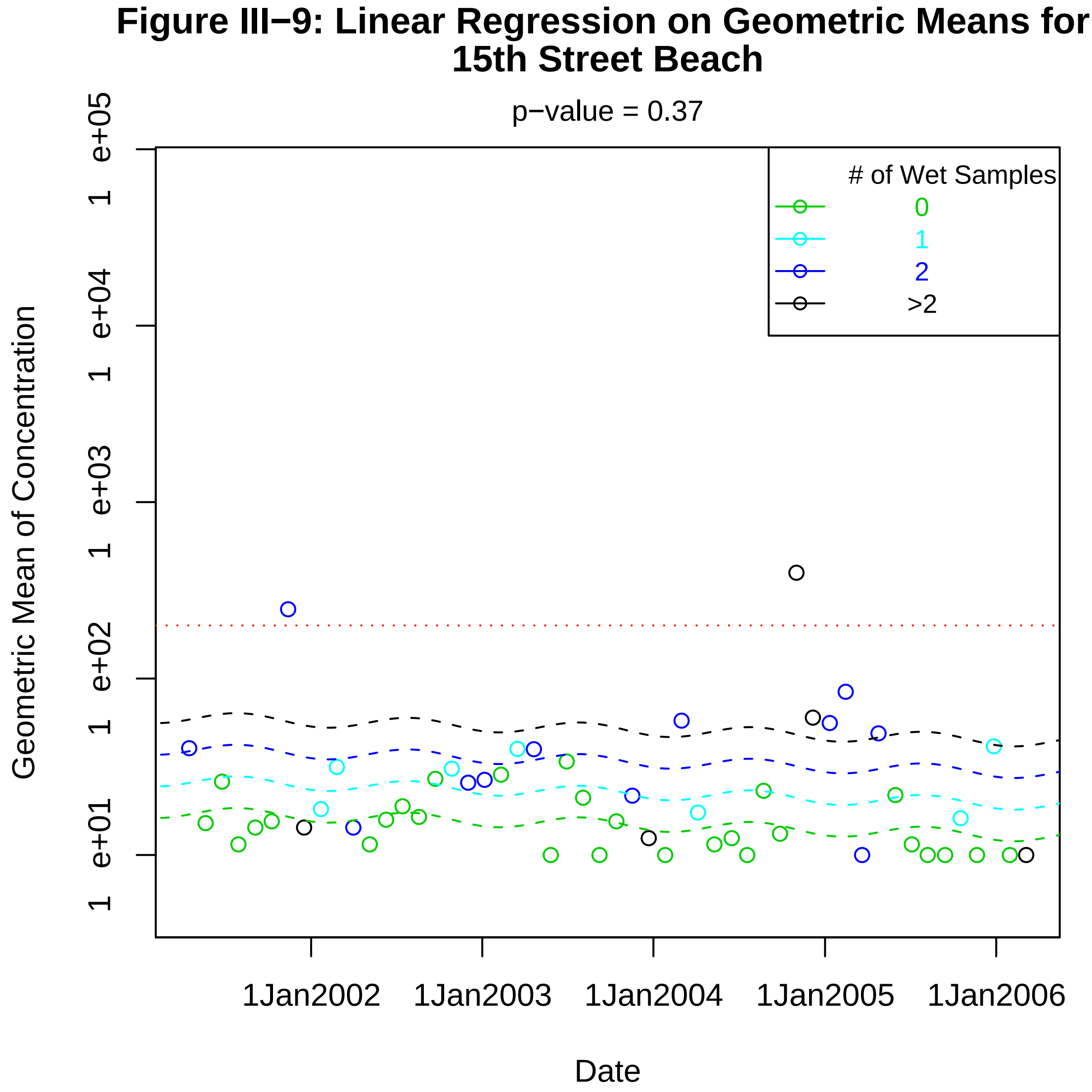


Figure III−9: Linear Regression on Geometric Means for
15th Street Beach
p−value = 0.37
# of Wet Samples
0
1
2
>2
Geometric Mean of Concentration
1 e+01
1 e+02
1 e+03
1 e+04
1 e+05
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

Figure III−10: Linear Regression on Geometric Means for 10th Street Beach

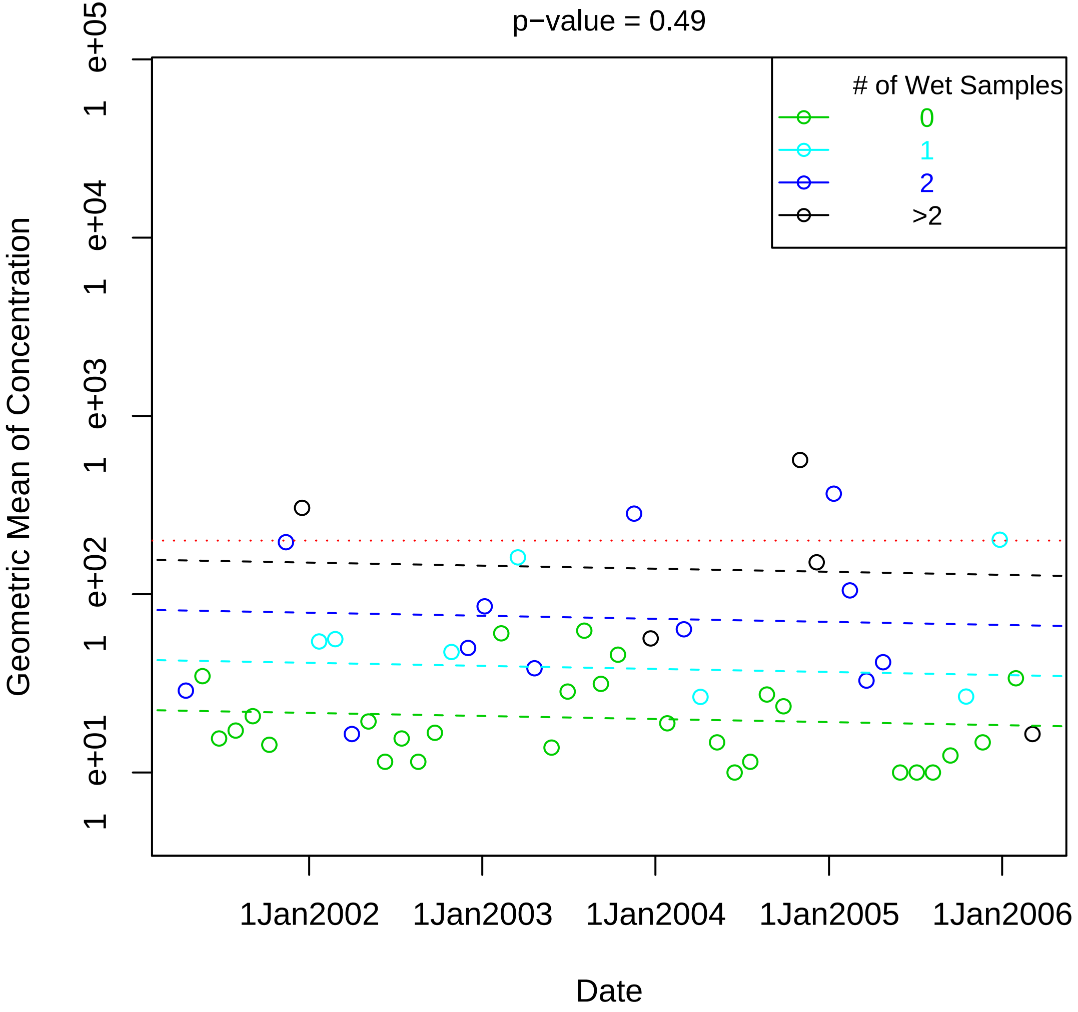


Figure III-11: Linear Regression on Geometric Means for Alvarado Bay Isle Beach

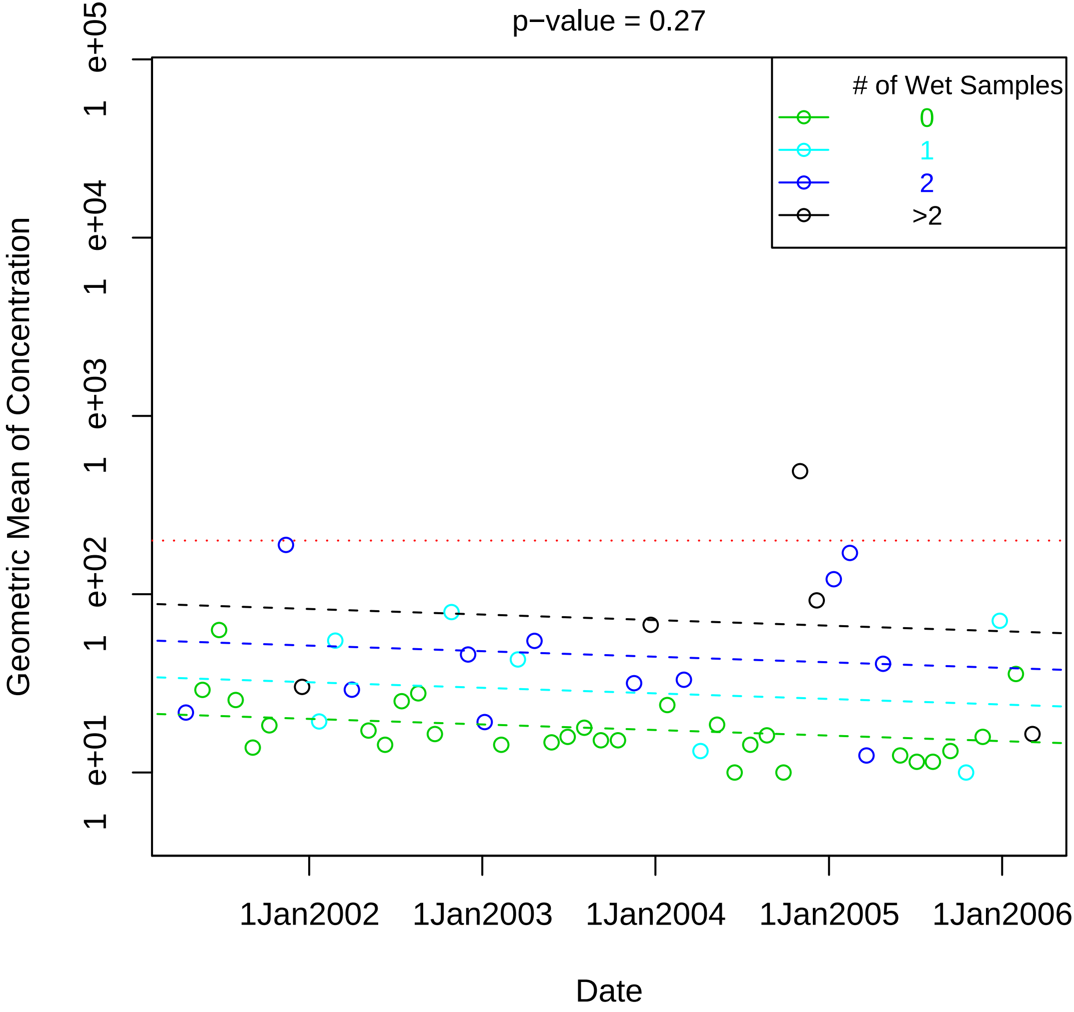


Figure III−12: Linear Regression on Geometric Means for N Street Beach

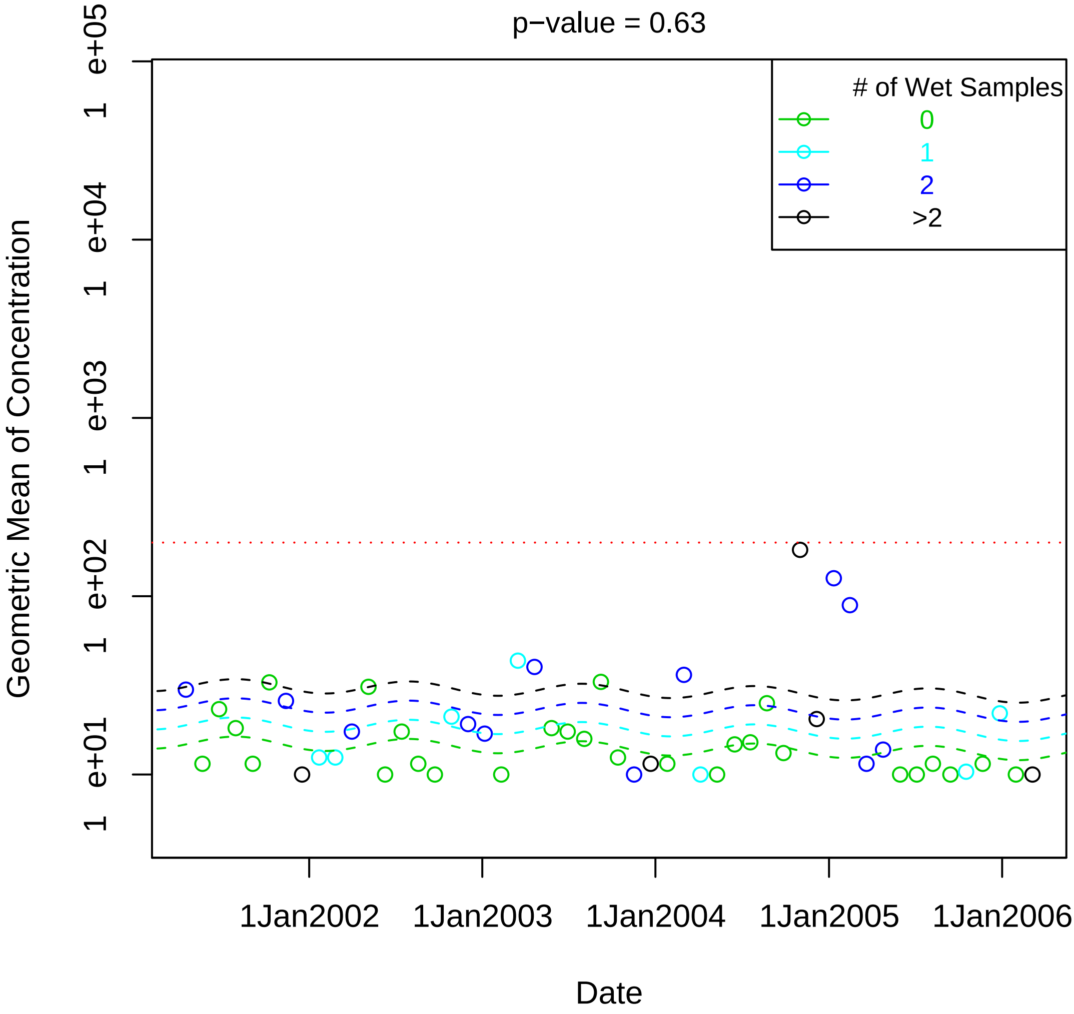


Figure III−13: Linear Regression on Geometric Means for Garnet Avenue Beach

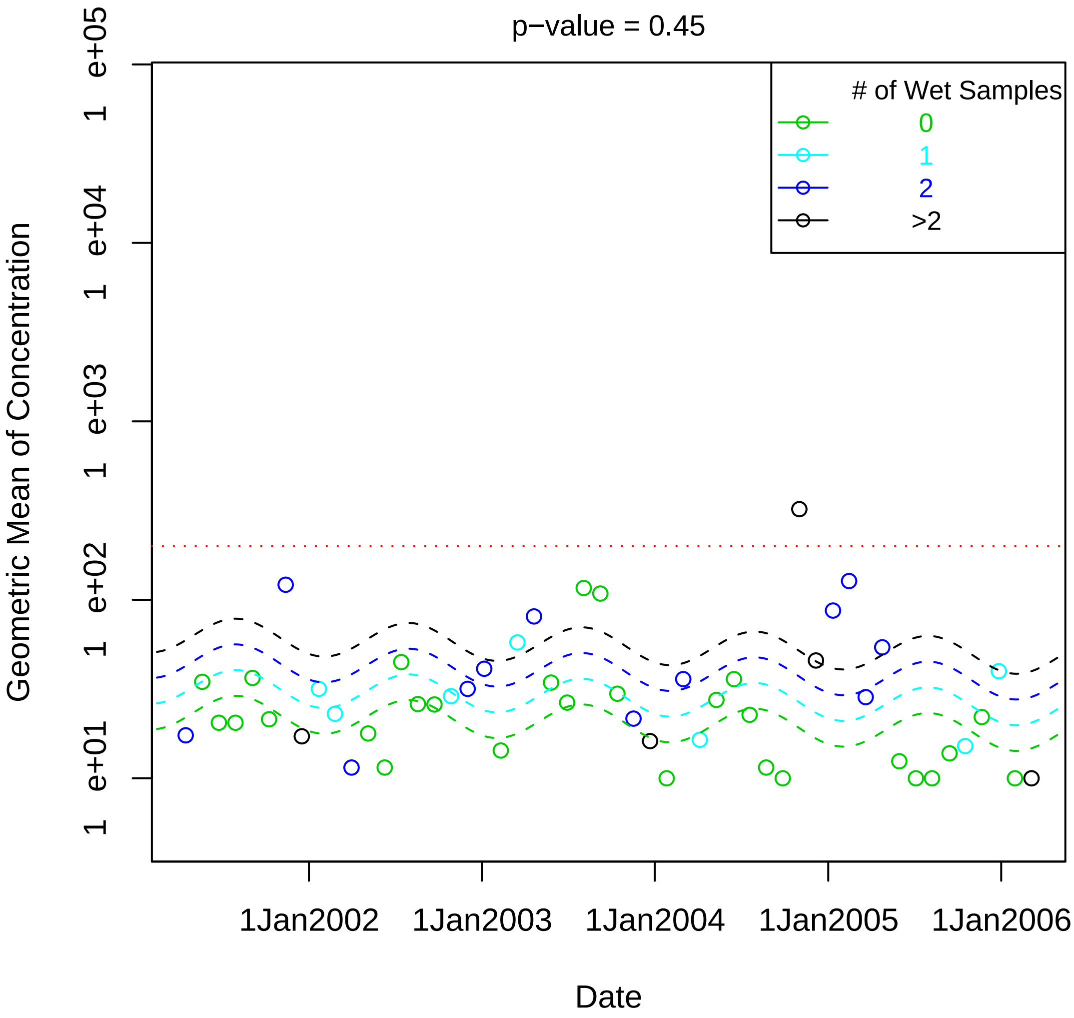


Figure III−14: Linear Regression on Geometric Means for Ruby Avenue Beach

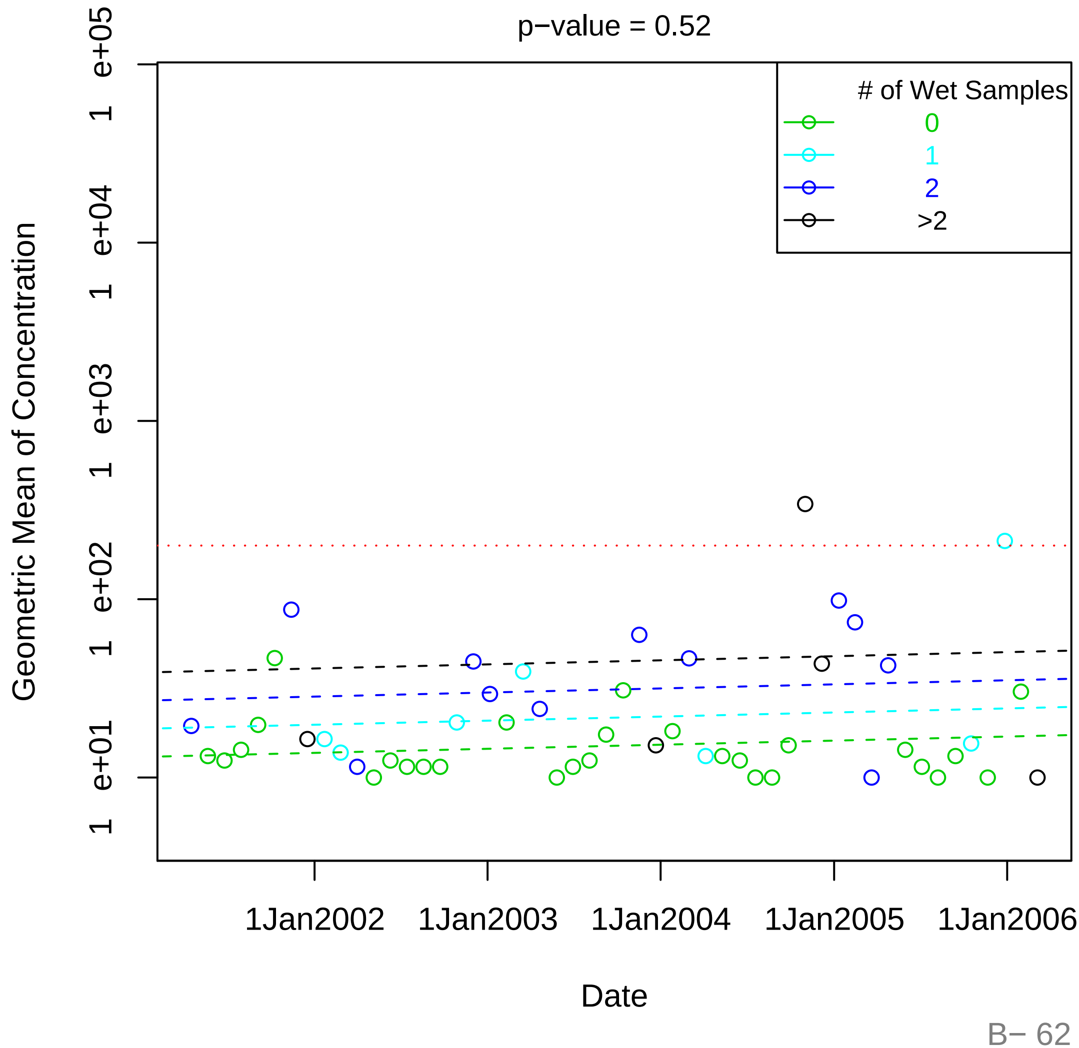


Figure III−15: Linear Regression on Geometric Means for Sapphire Avenue Beach

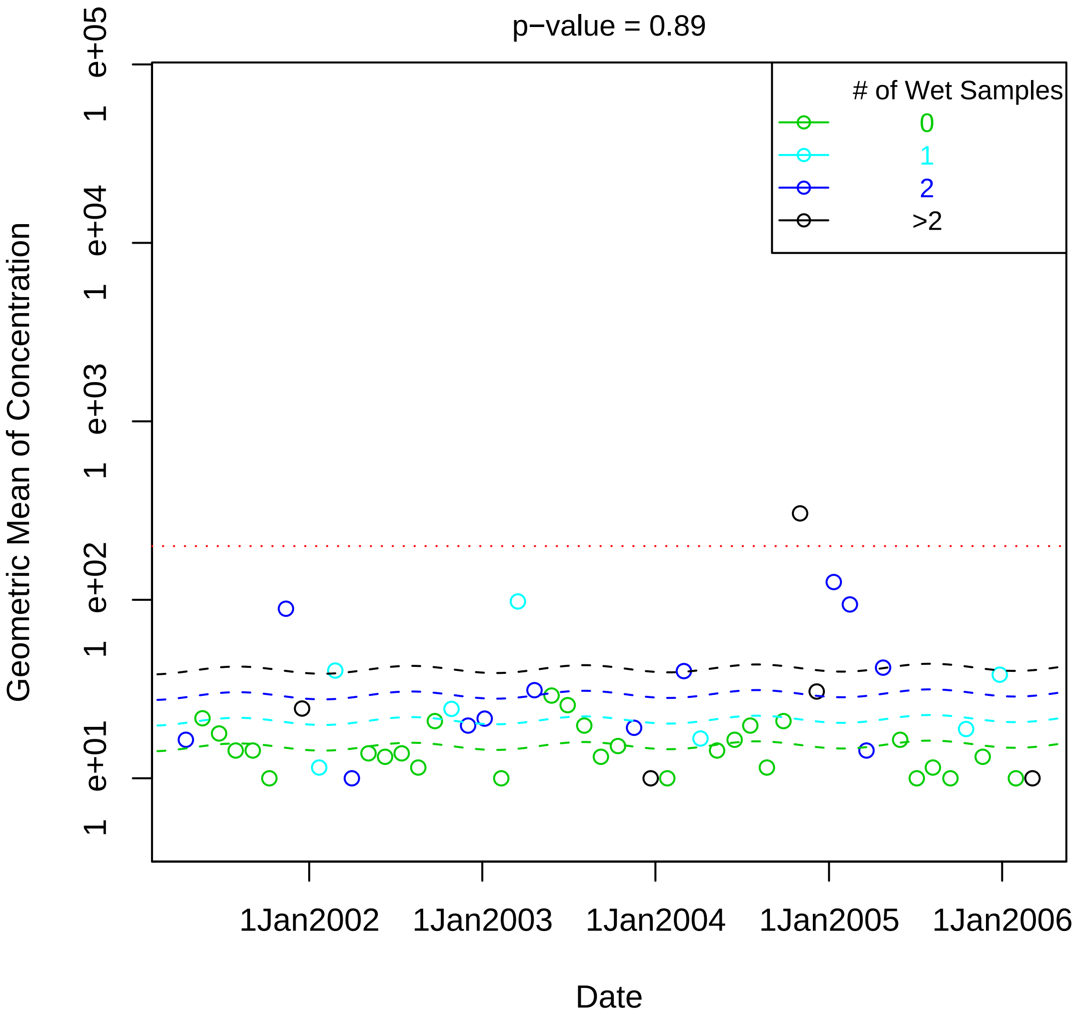


Figure III−16: Linear Regression on Geometric Means for Grand Canal

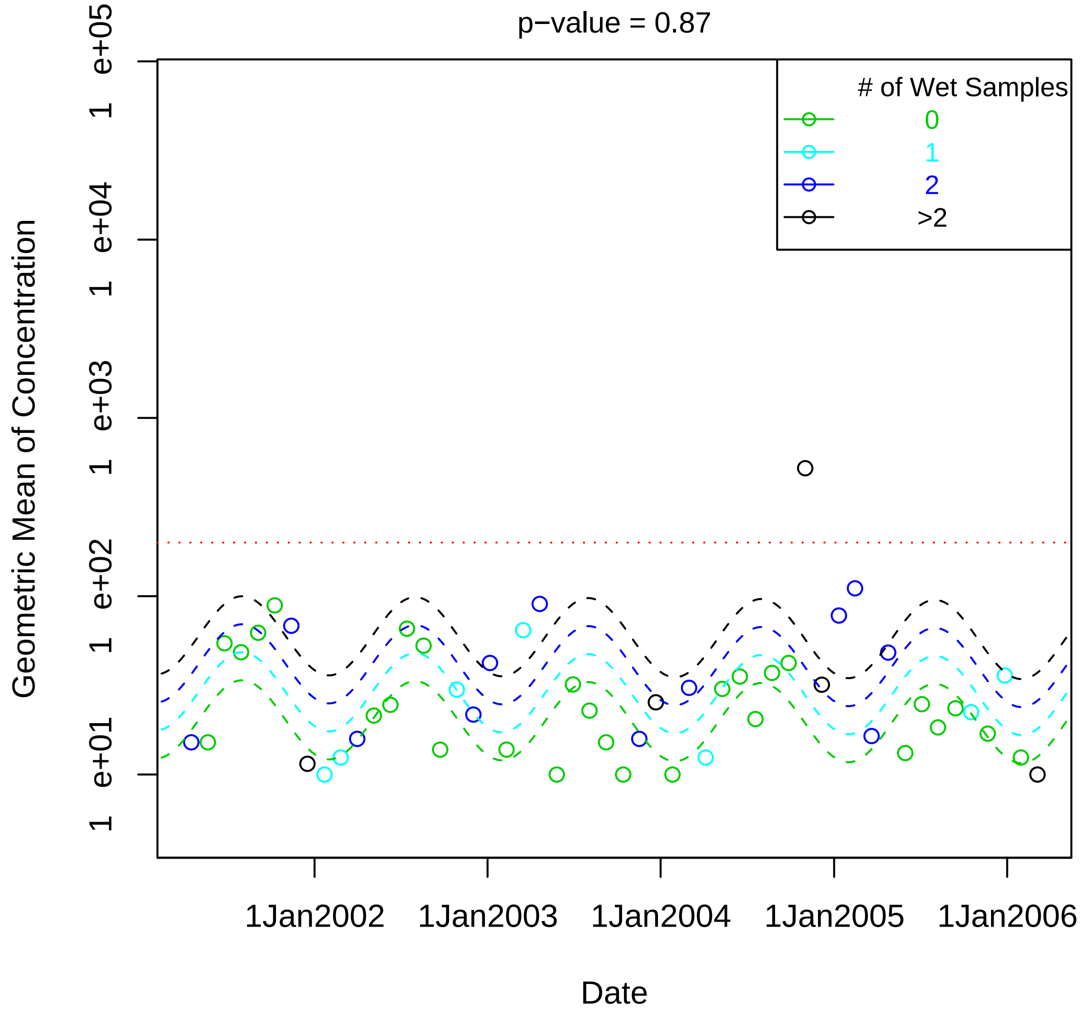


Figure III−17: Linear Regression on Geometric Means for Abalone Avenue Beach

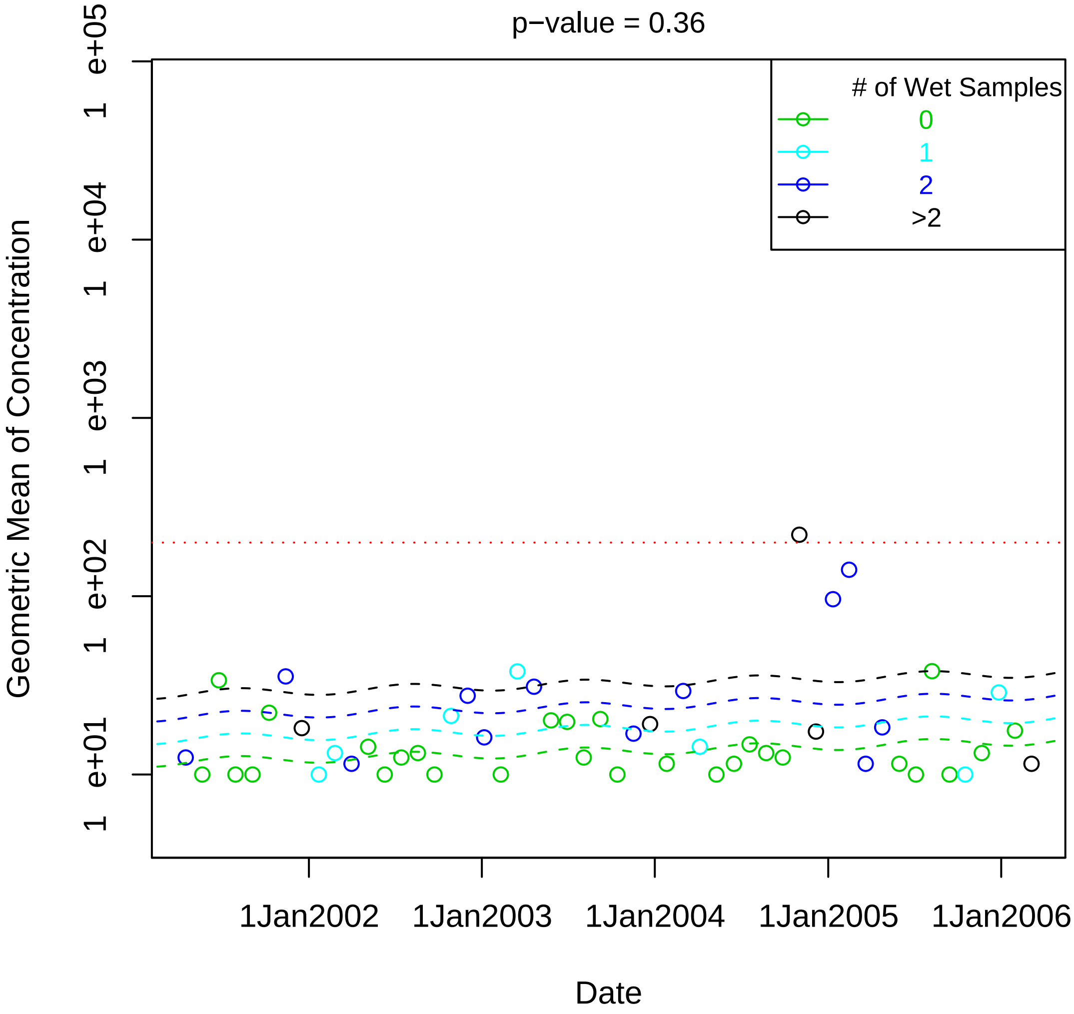


Figure III−18: Linear Regression on Geometric Means for Park Avenue Beach

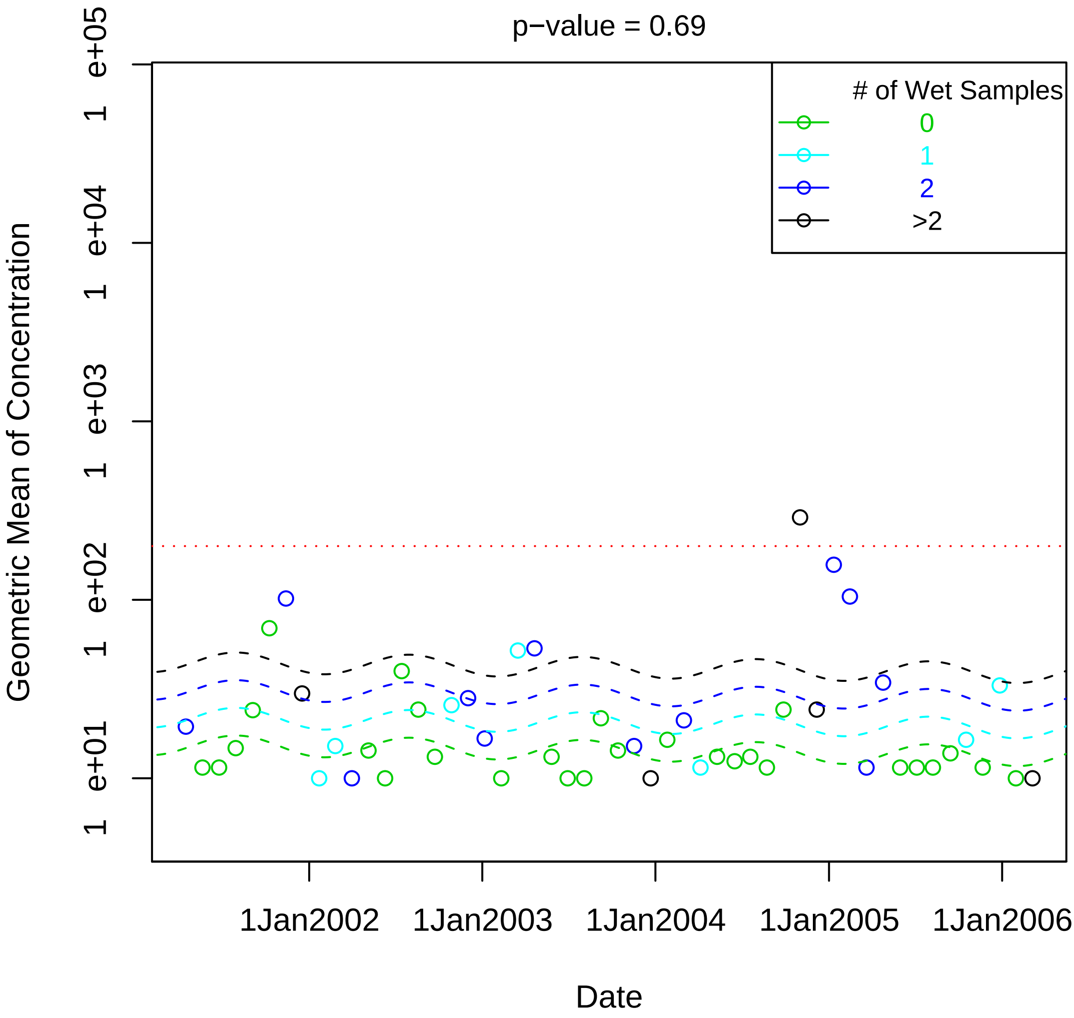


Figure III−19: Linear Regression on Geometric Means for Onyx Avenue Beach

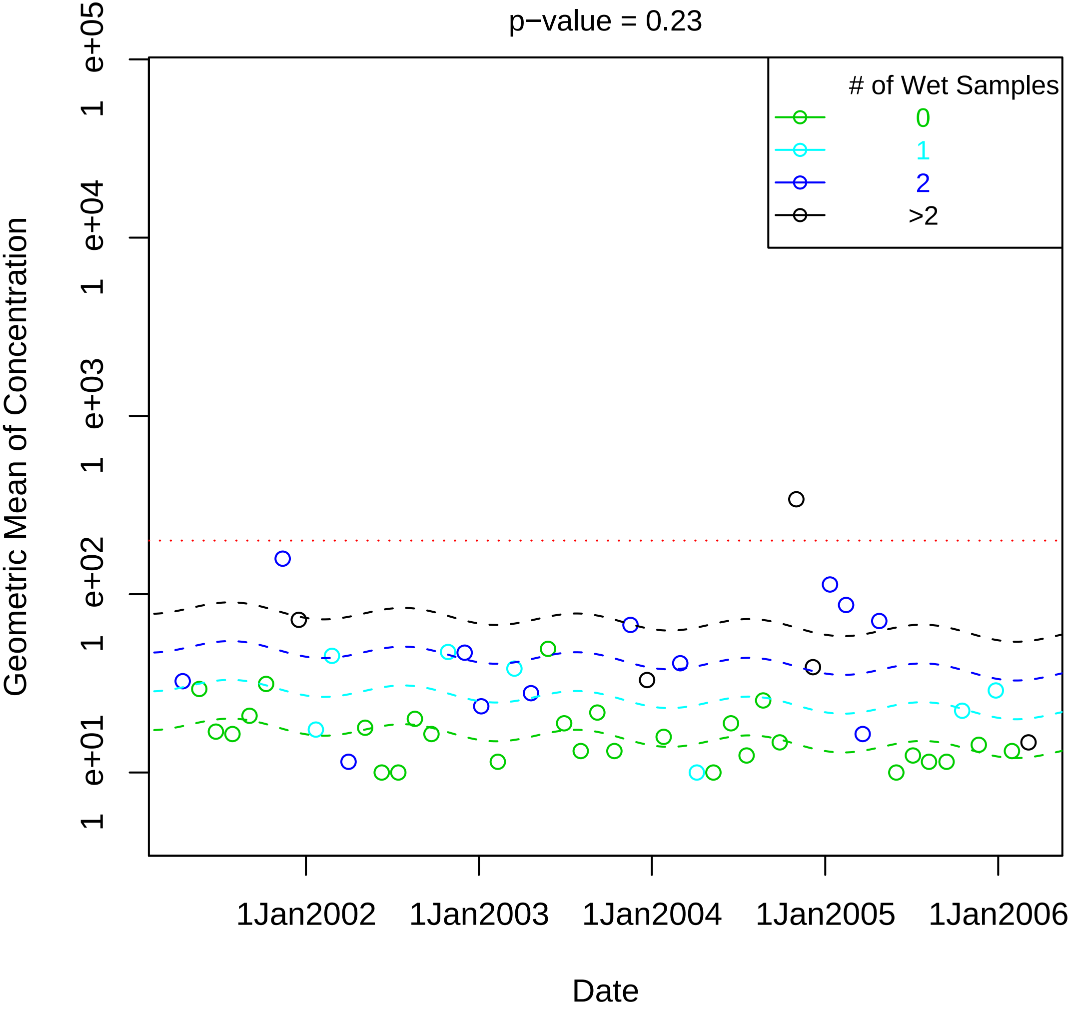


Figure III−20: Linear Regression on Geometric Means for Promontory Point Channel

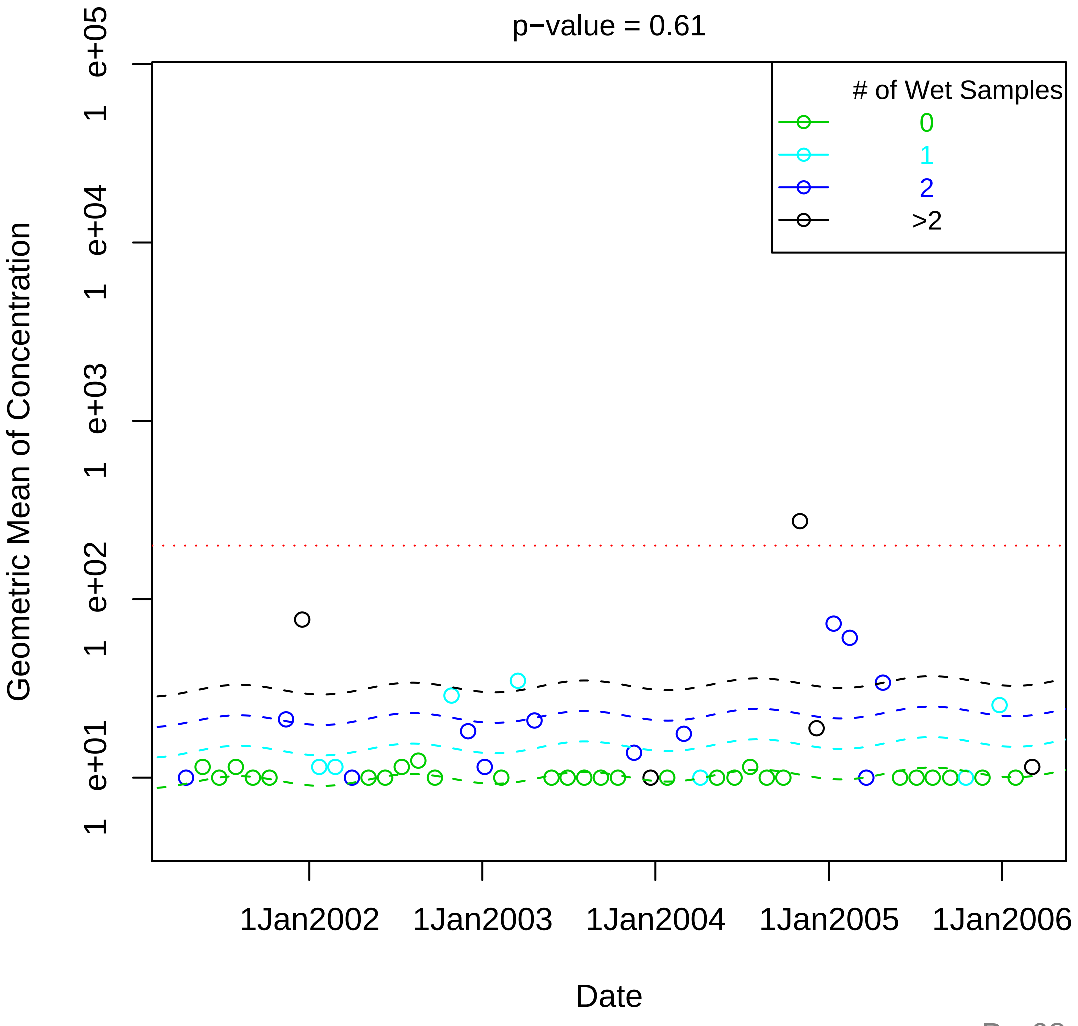


Figure III−21: Linear Regression on Geometric Means for Harbor Patrol Beach

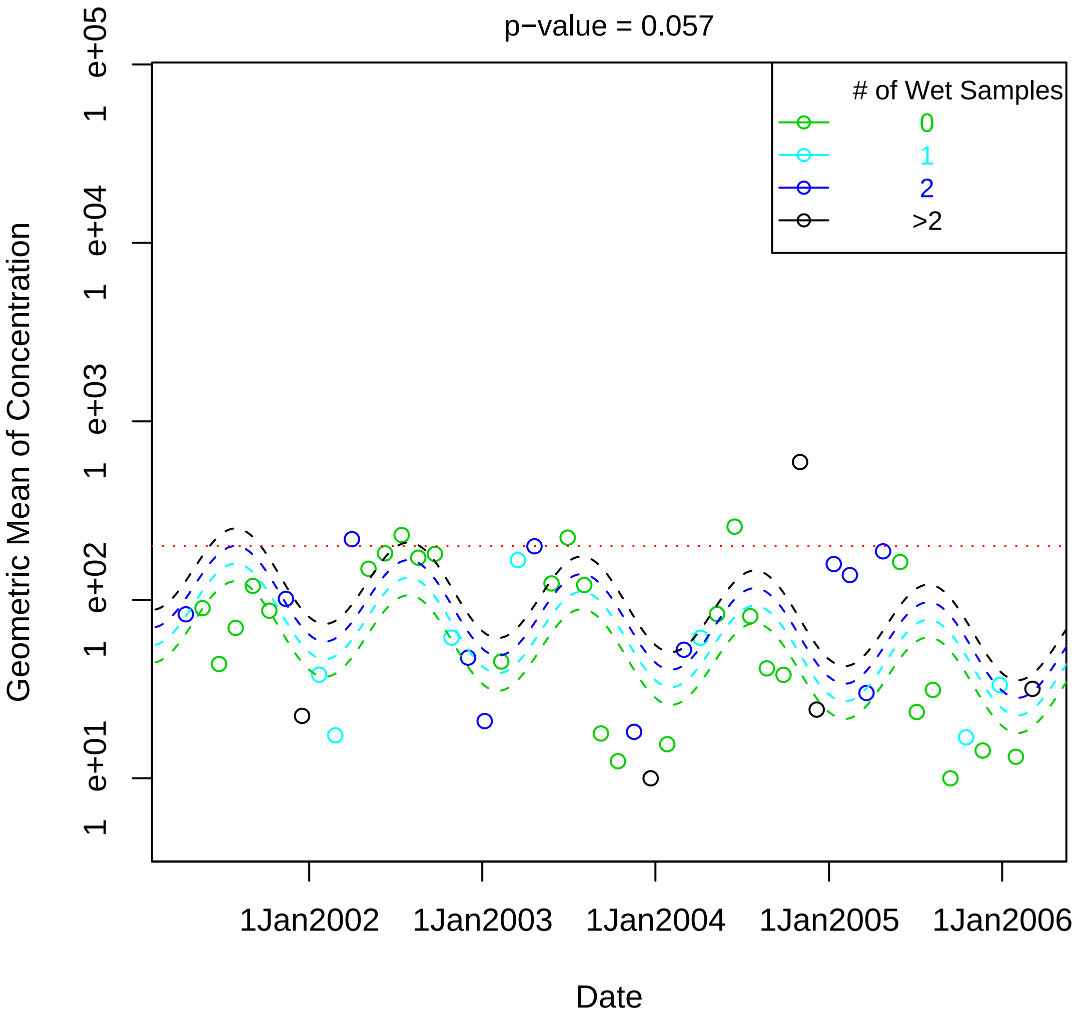


Figure III−22: Linear Regression on Geometric Means for Rocky Point Beach

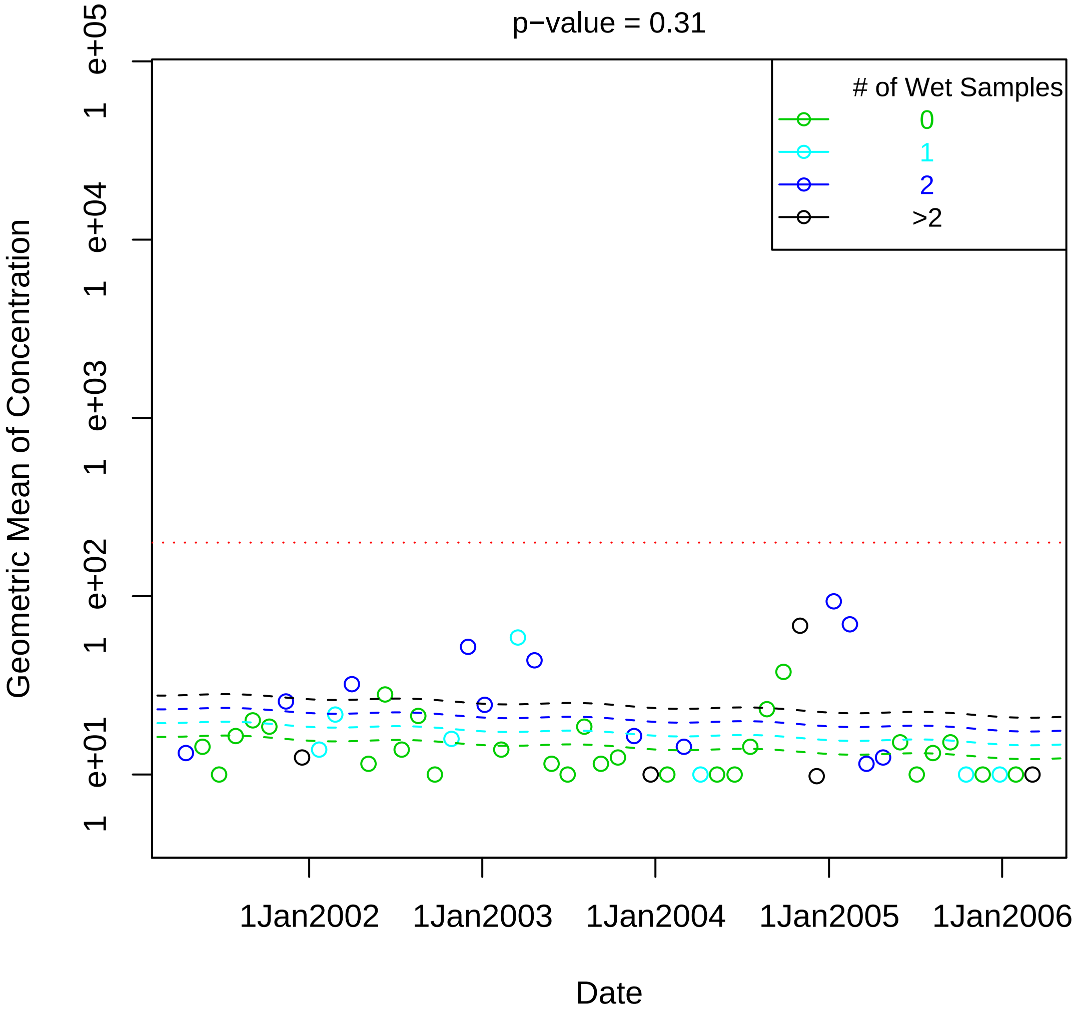


Figure III−23: Linear Regression on Geometric Means for Newport Dunes Middle

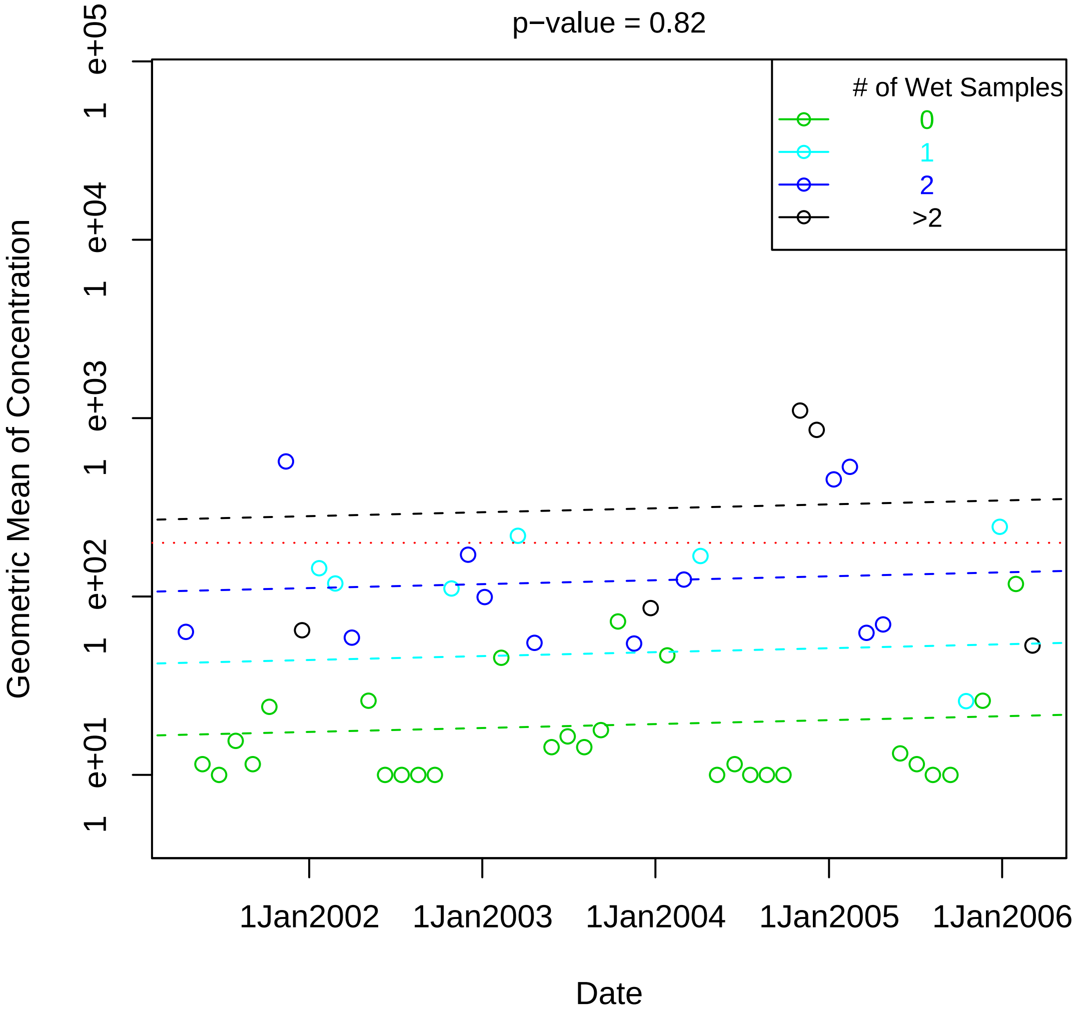


Figure III−24: Linear Regression on Geometric Means for Newport Dunes West

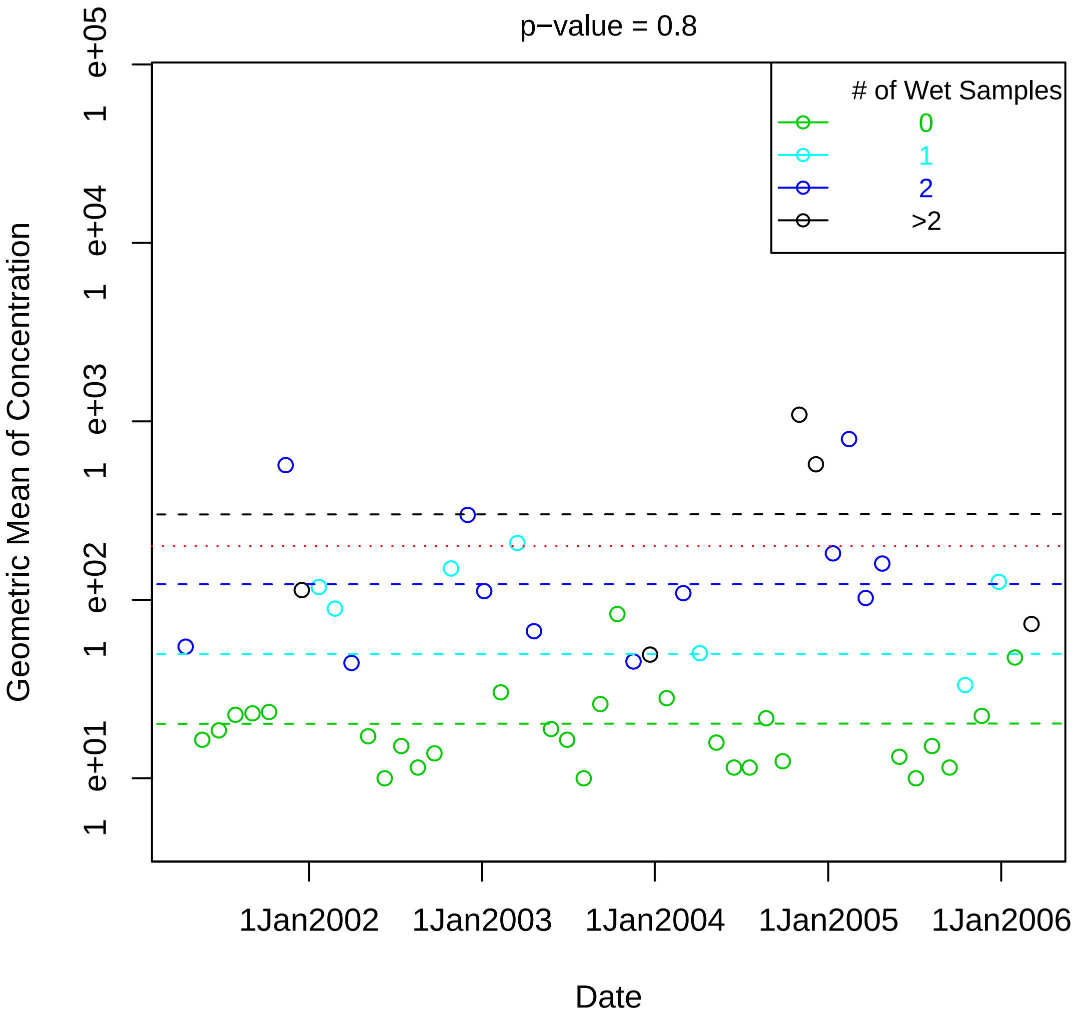


Figure III−25: Linear Regression on Geometric Means for Newport Dunes East

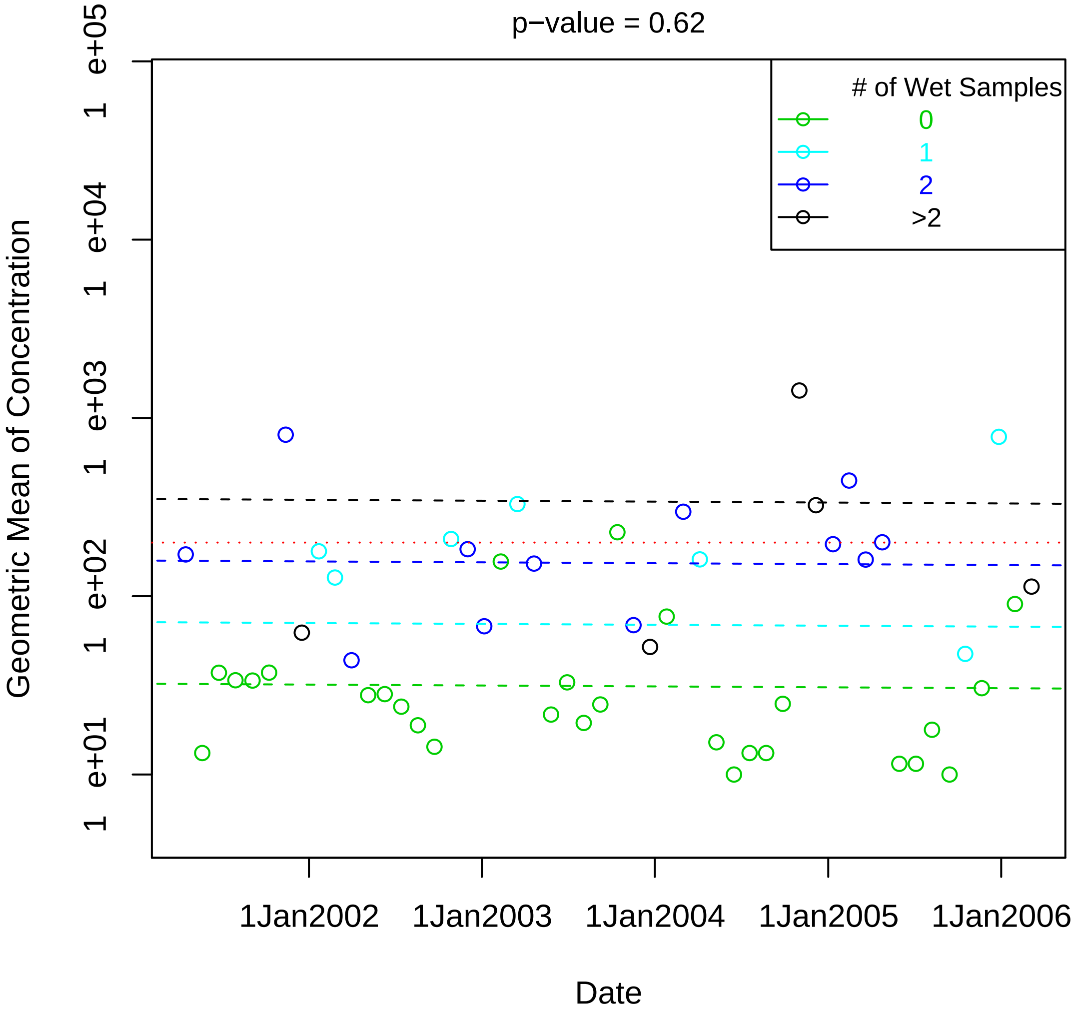


Figure III−26: Linear Regression on Geometric Means for Newport Dunes North

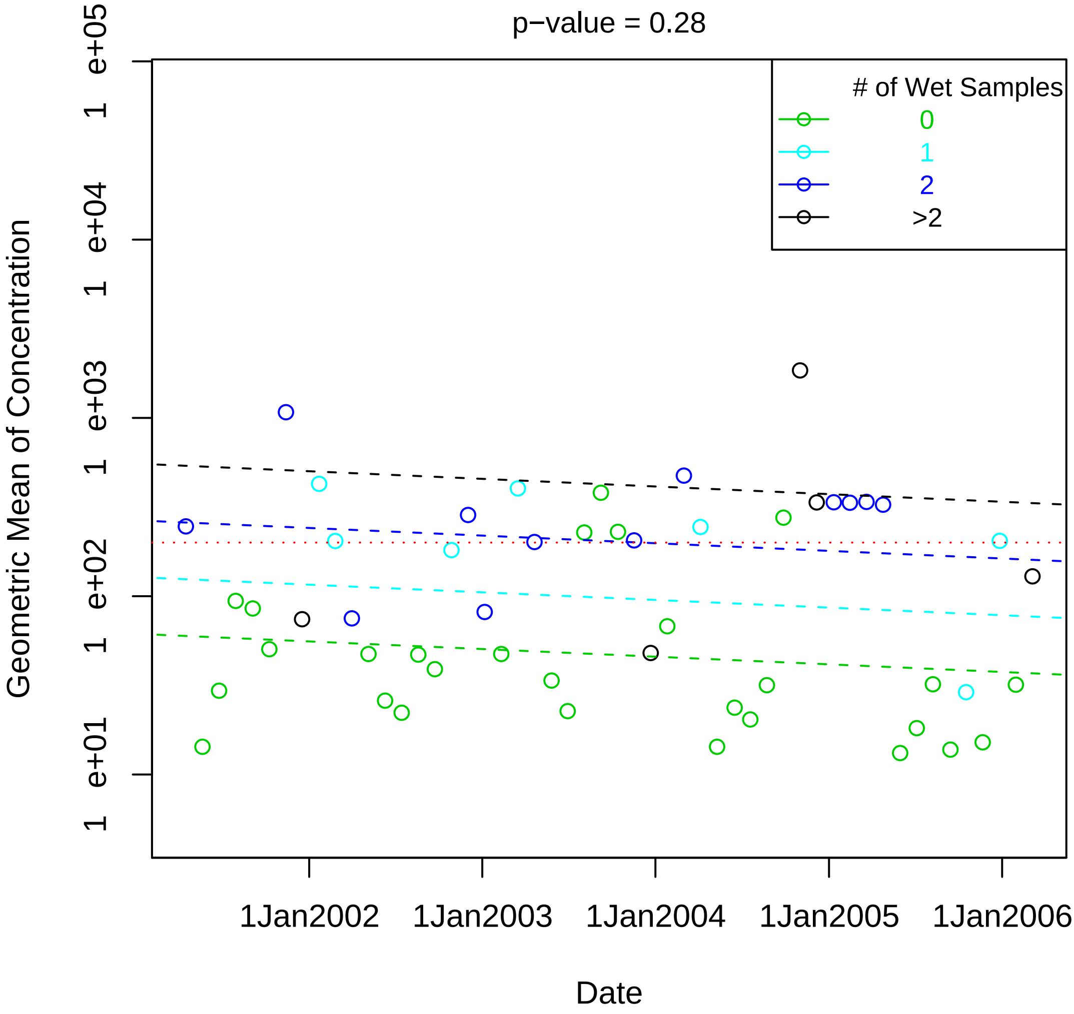


Figure III−27: Linear Regression on Geometric Means for Vaughn s Launch

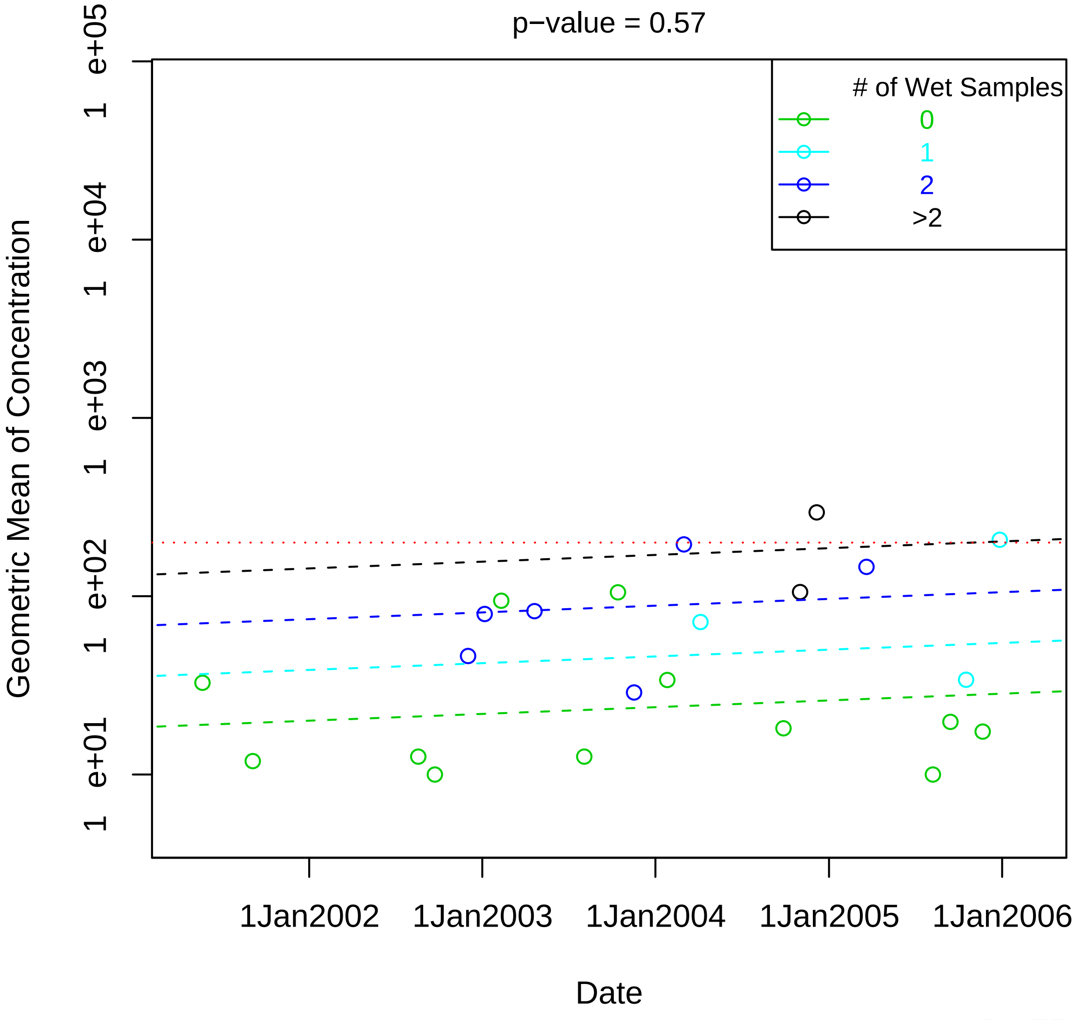


Figure III−28: Linear Regression on Geometric Means for Ski Zone

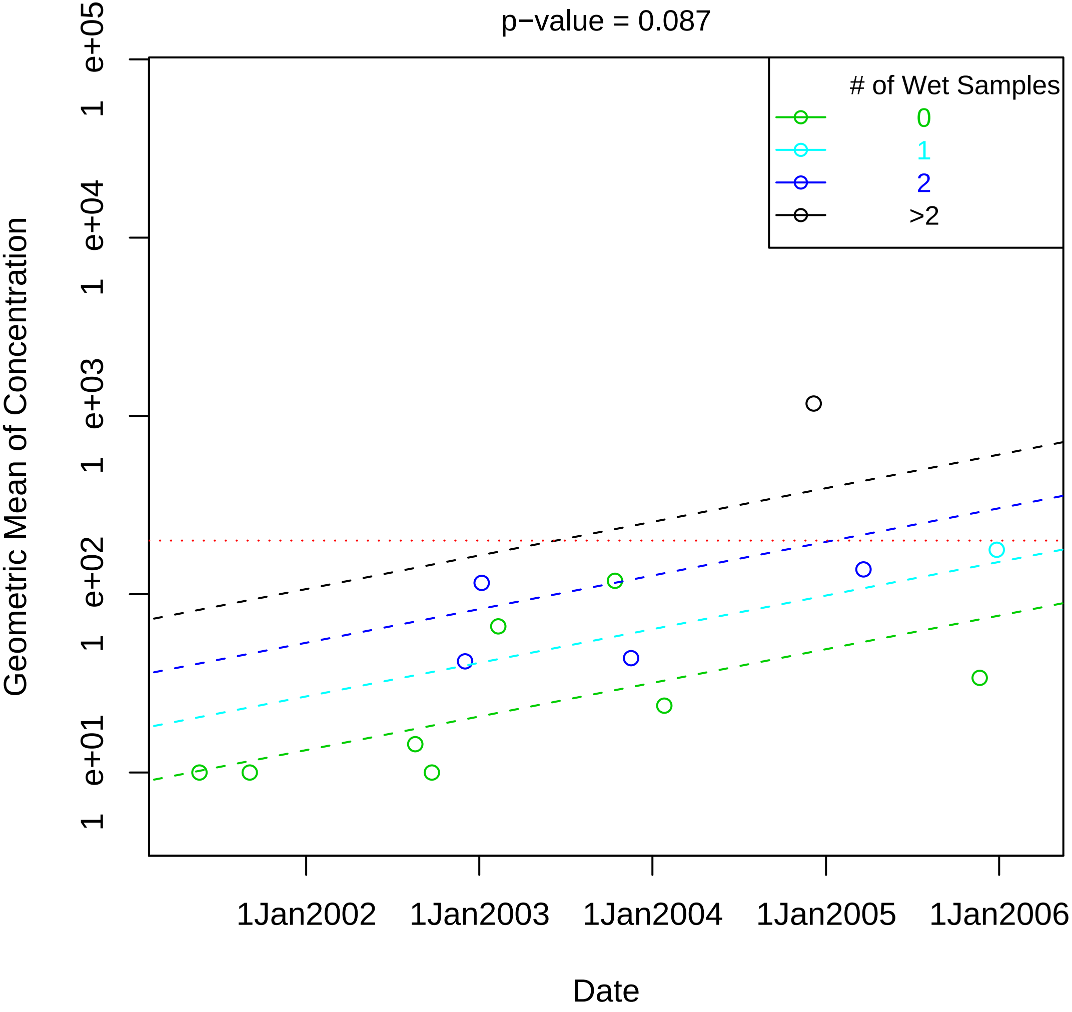


Figure III−29: Linear Regression on Geometric Means for North Star Beach

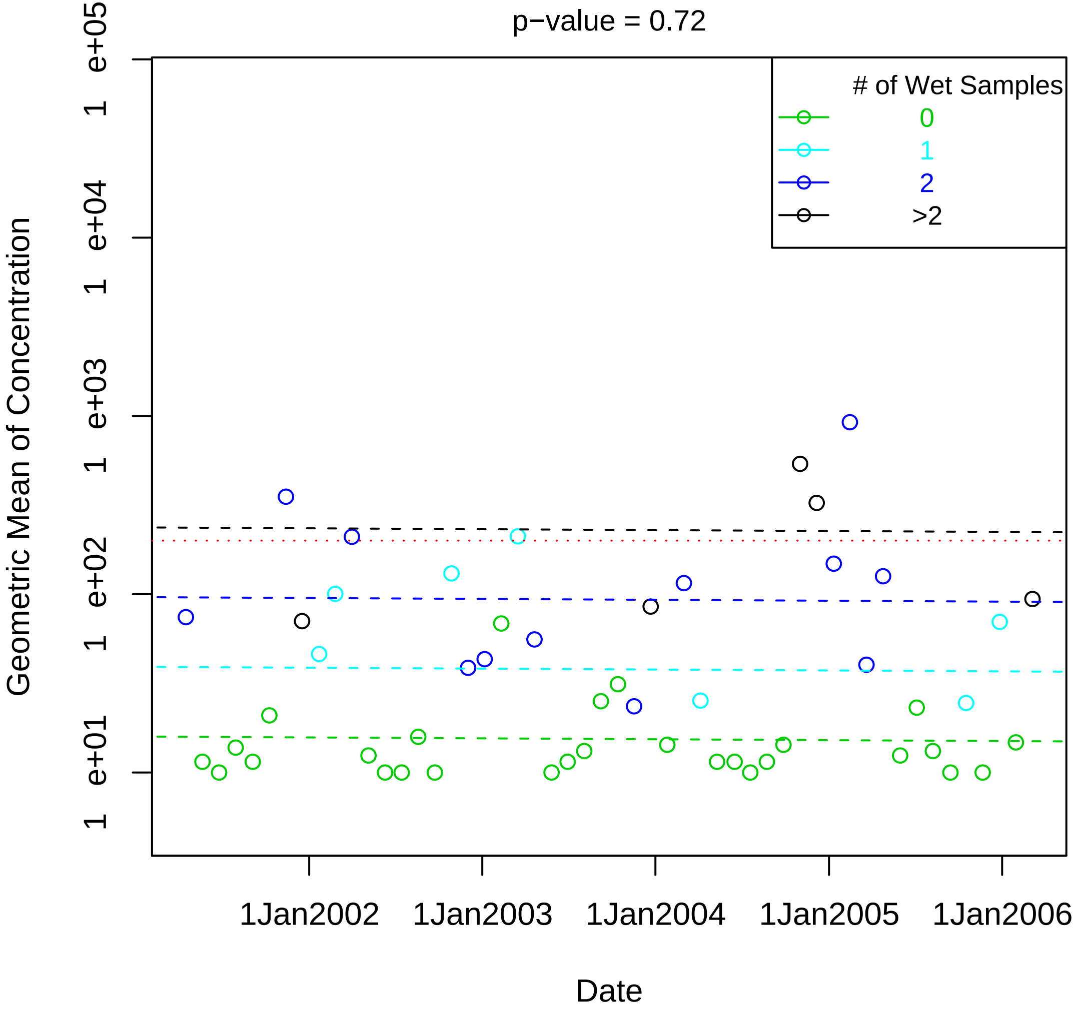


Figure III−30: Linear Regression on Geometric Means for De Anza Launch

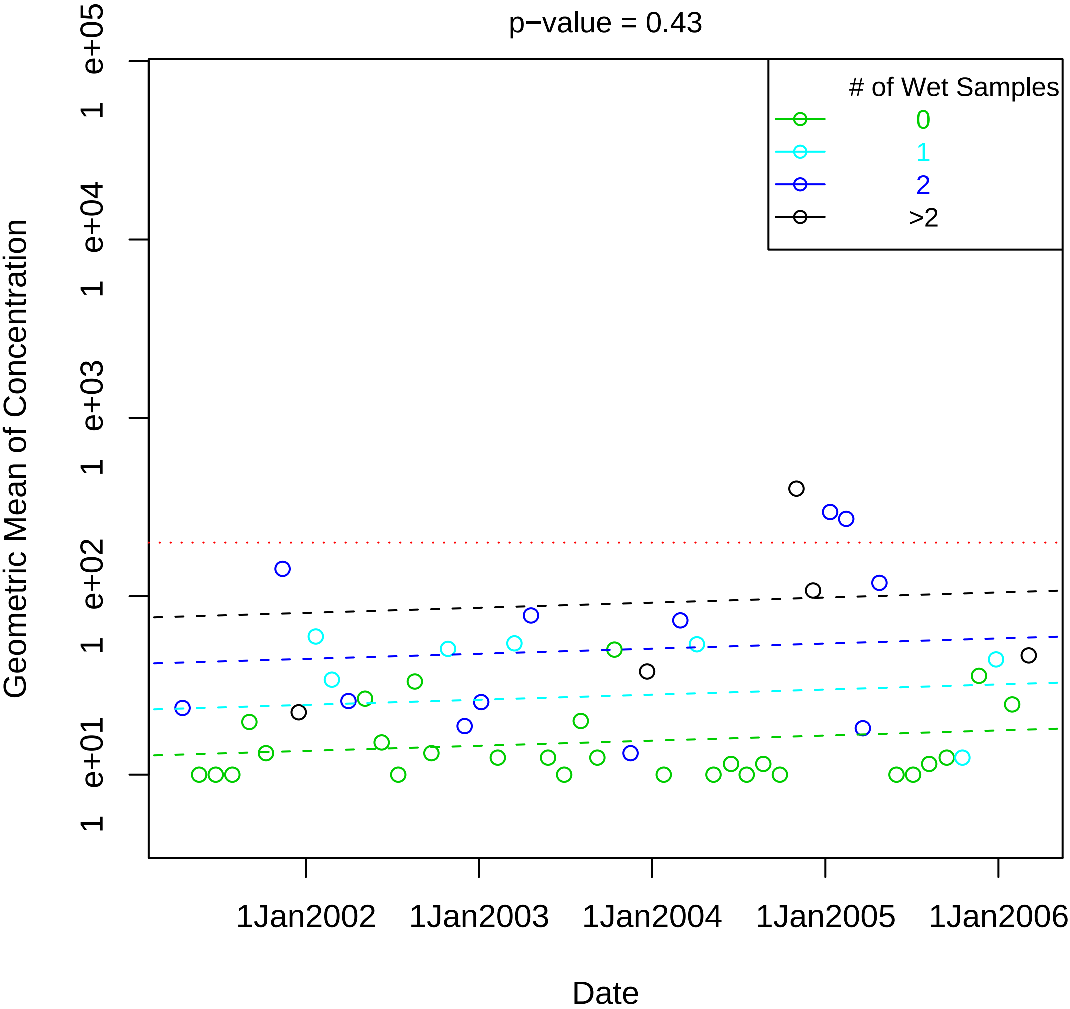
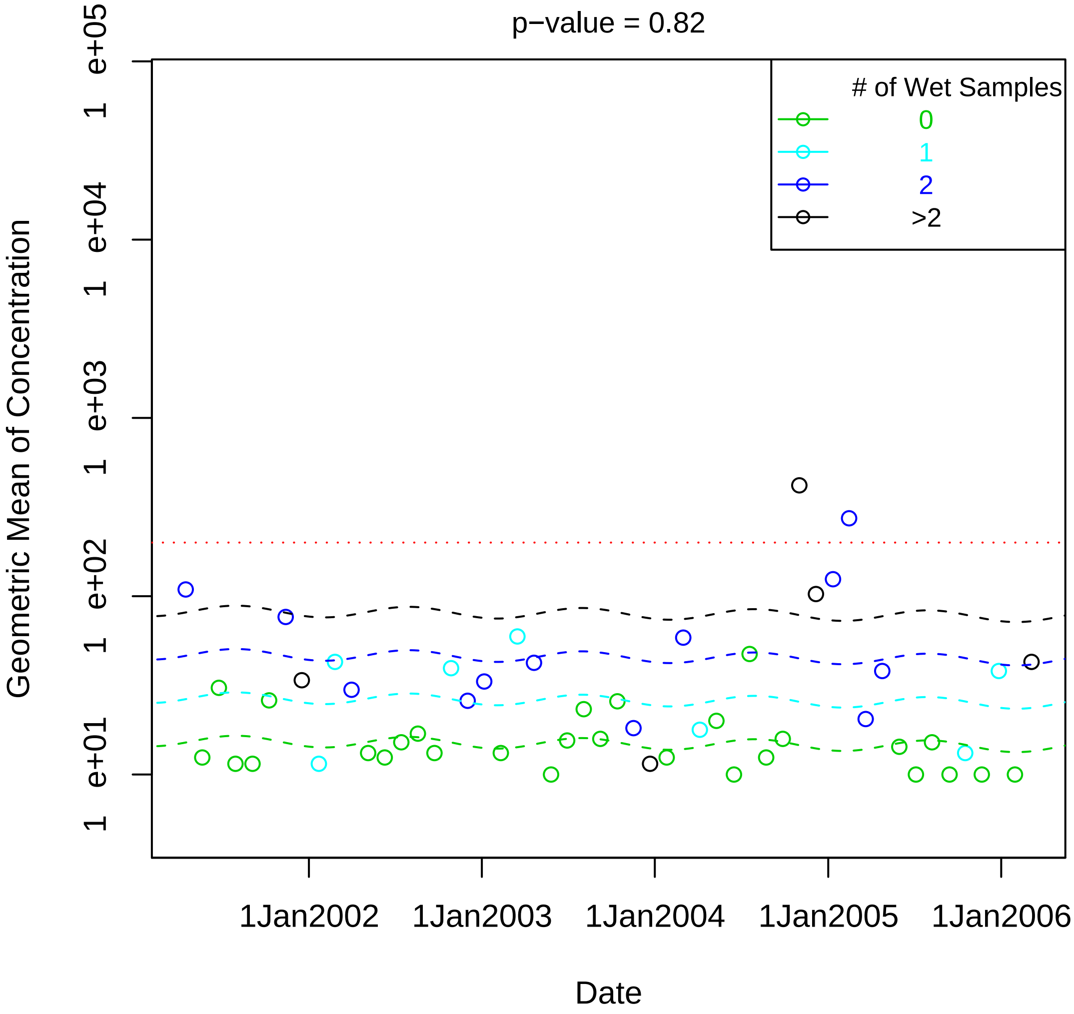


Figure III−31: Linear Regression on Geometric Means for Bayshore Beach



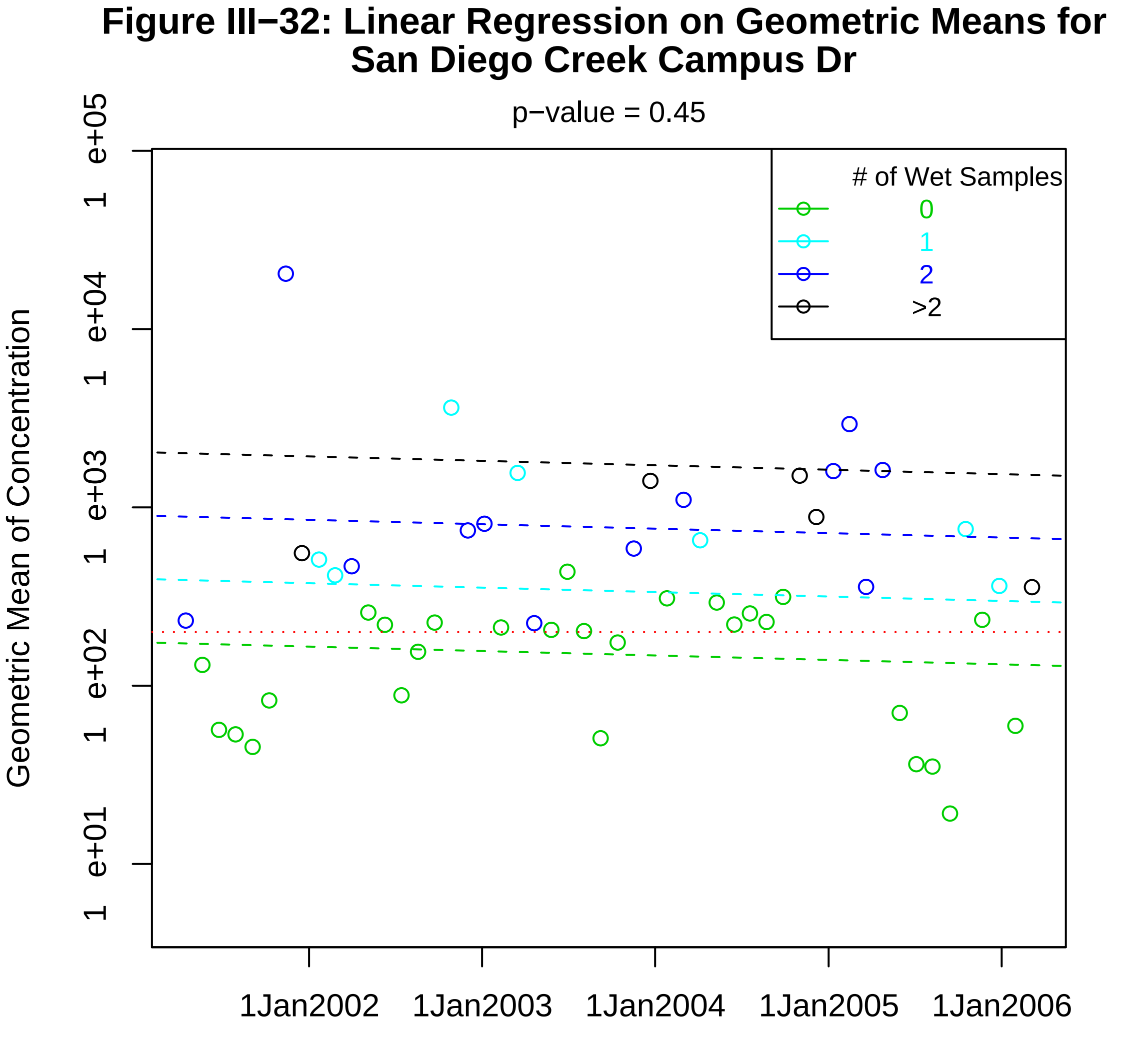


Figure III−32: Linear Regression on Geometric Means for
San Diego Creek Campus Dr
p−value = 0.45
# of Wet Samples
0
1
2
>2
Geometric Mean of Concentration
1 e+01
1 e+02
1 e+03
1 e+04
1 e+05
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

Figure III−33: Linear Regression on Geometric Means for Santa Ana Delhi Channel

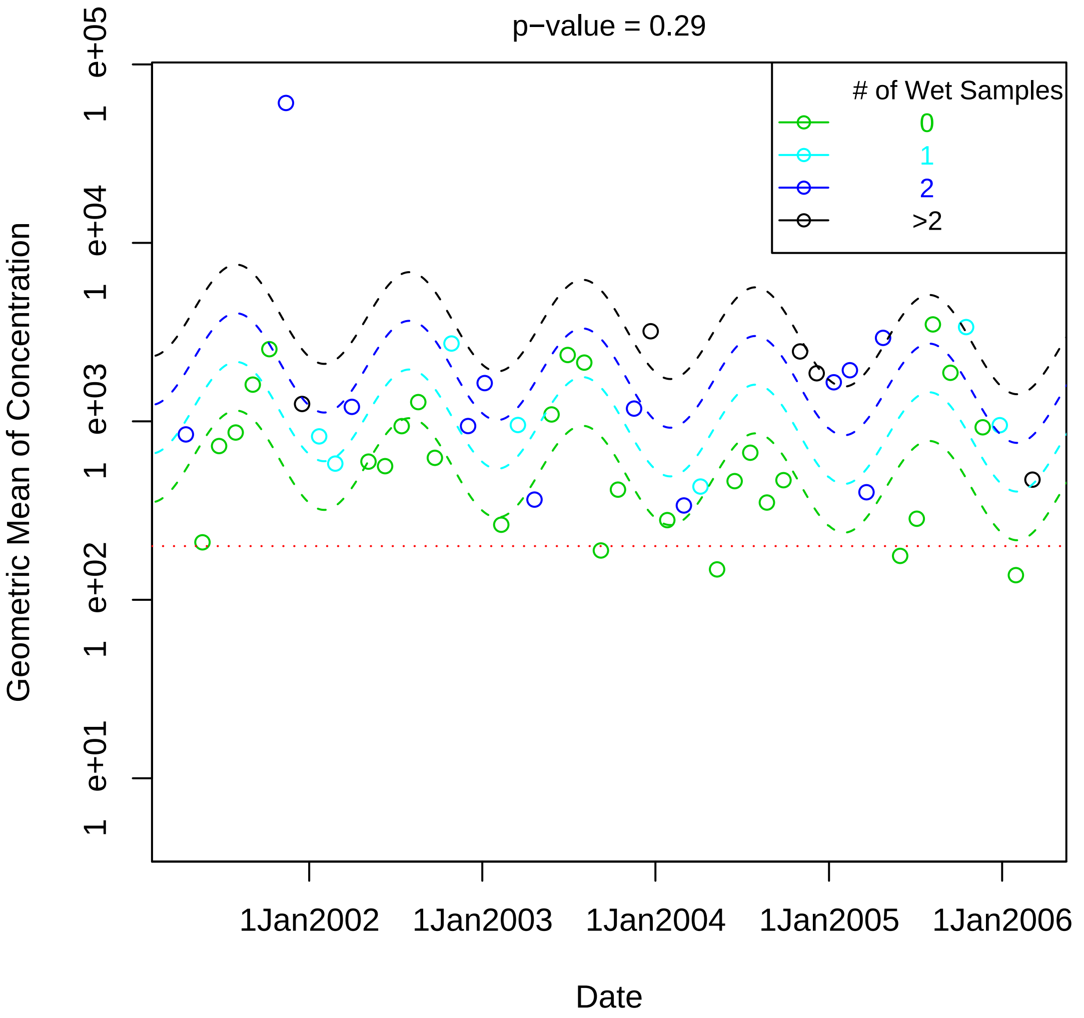


Figure III−34: Linear Regression on Geometric Means for Big Canyon Wash

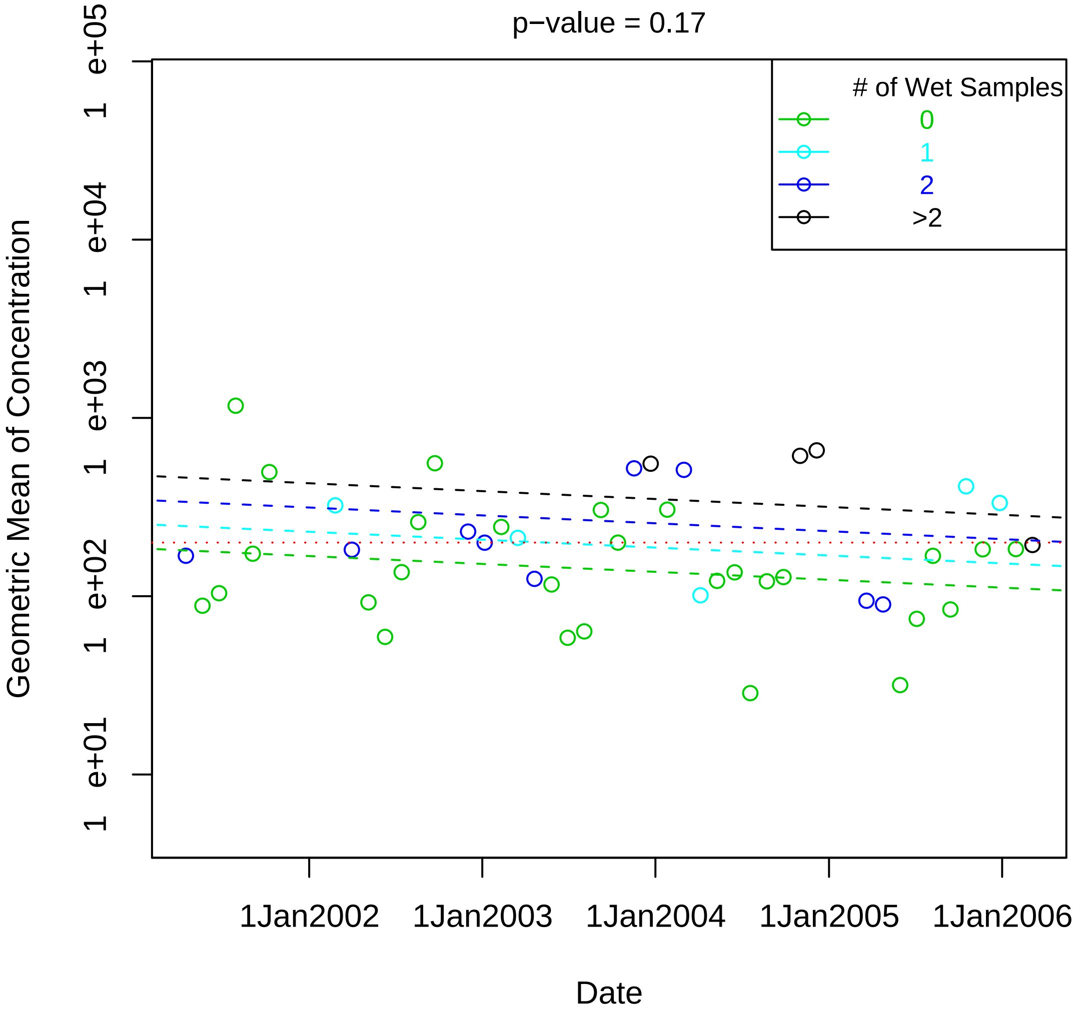
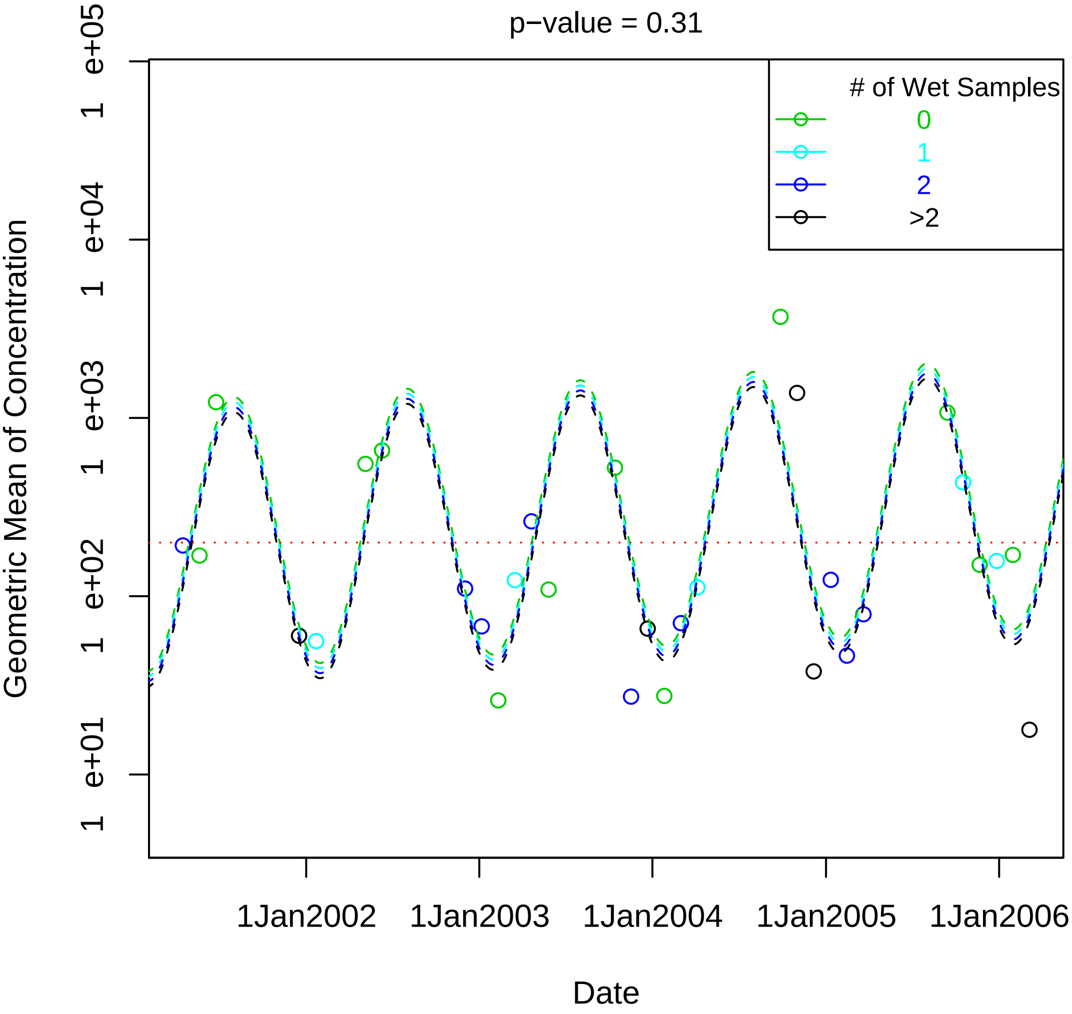


Figure III−35: Linear Regression on Geometric Means for Back Bay Dr Drain



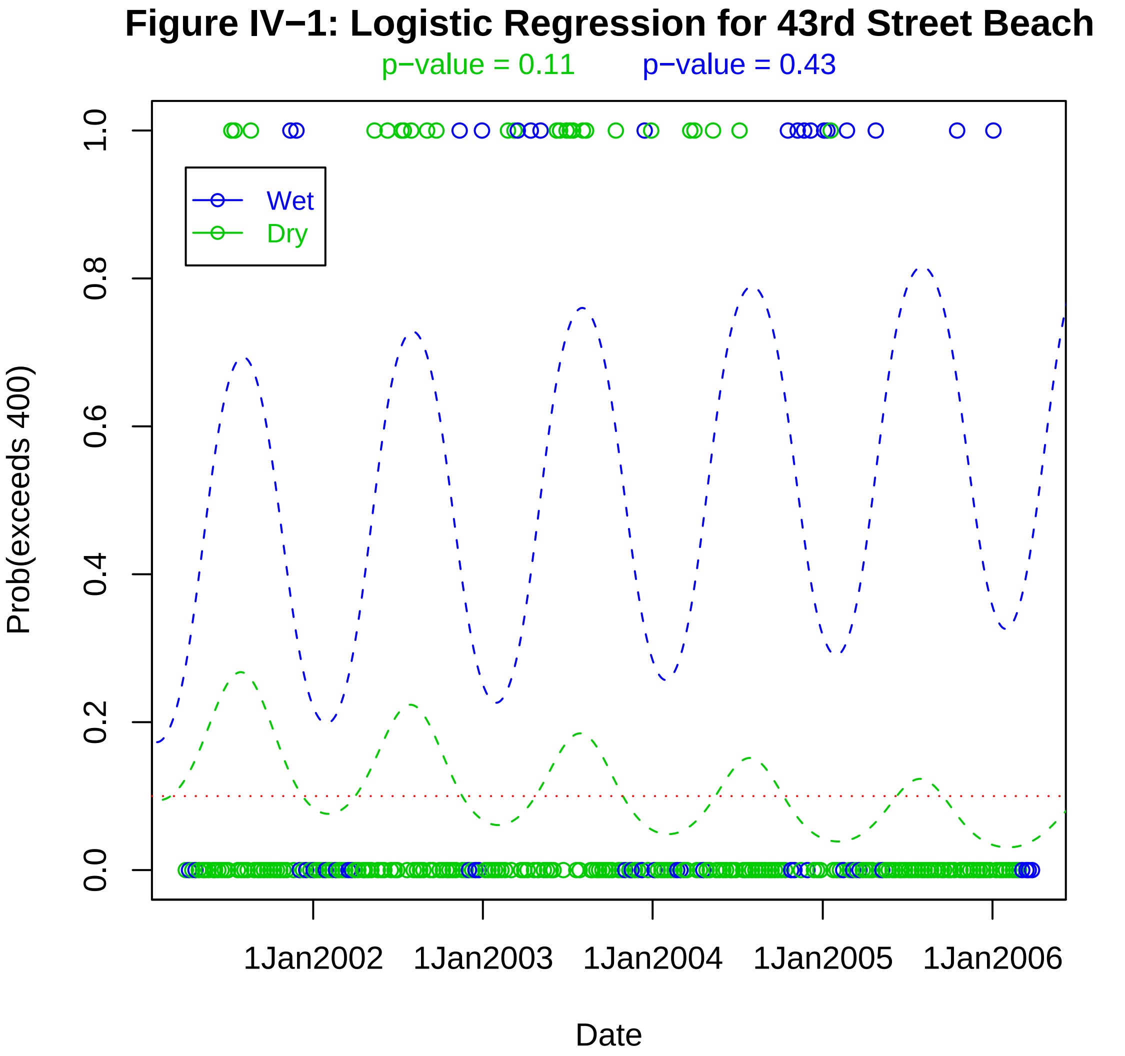


Figure IV−1: Logistic Regression for 43rd Street Beach
p−value = 0.11
p−value = 0.43
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

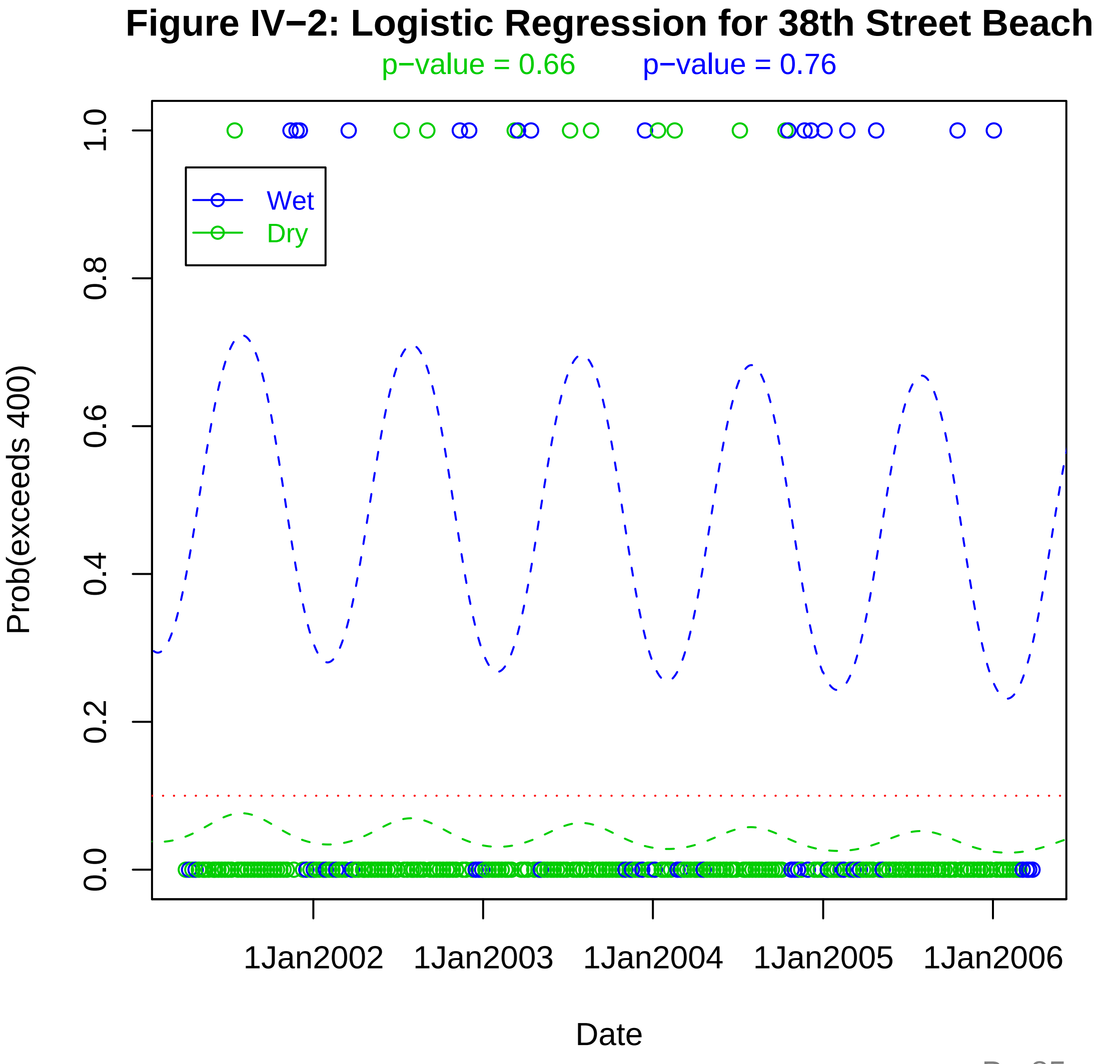


Figure IV−2: Logistic Regression for 38th Street Beach
p−value = 0.66
p−value = 0.76
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

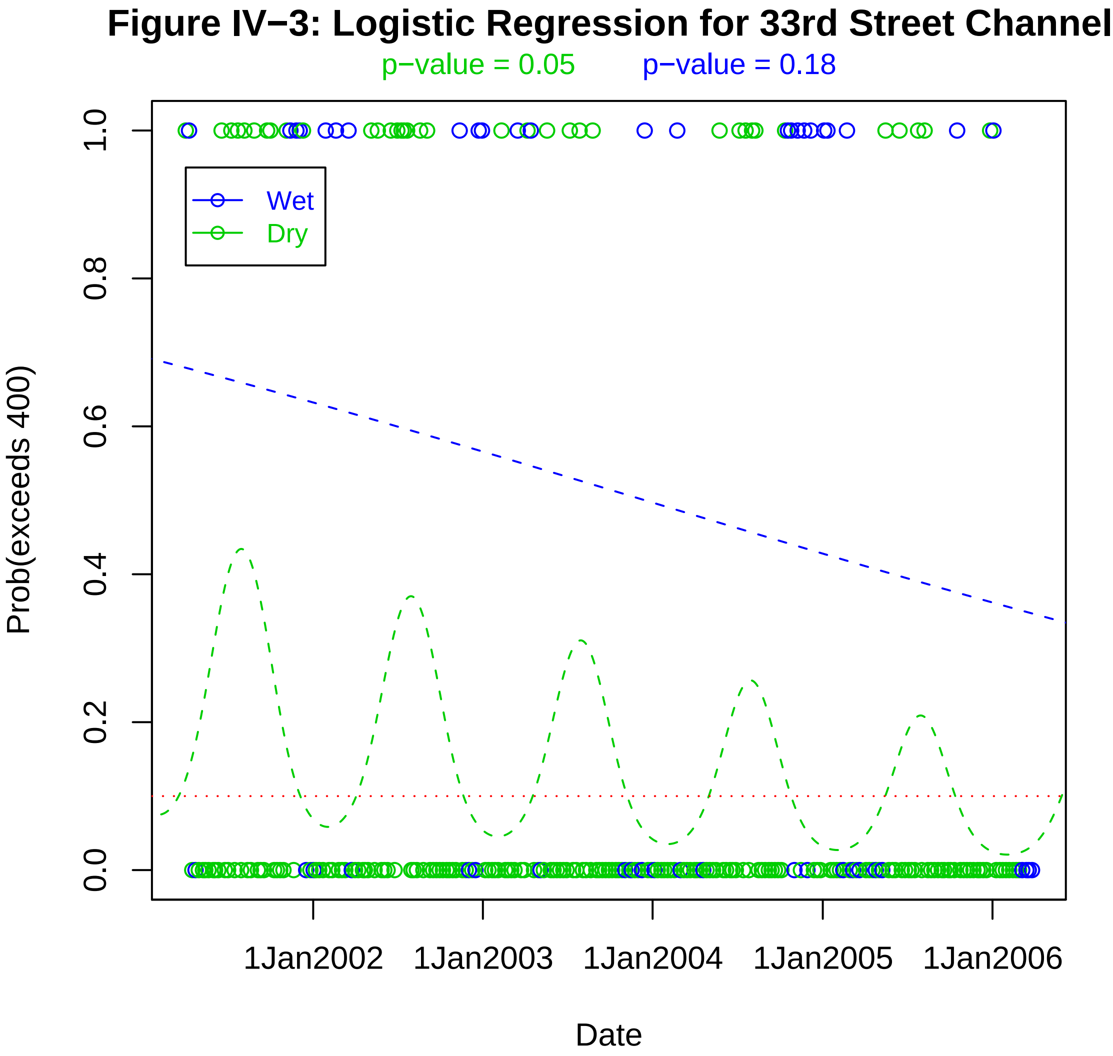


Figure IV−3: Logistic Regression for 33rd Street Channel
p−value = 0.05
p−value = 0.18
Wet
Dry
Prob(exceeds 400)
1.0
0.8
0.6
0.4
0.2
0.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

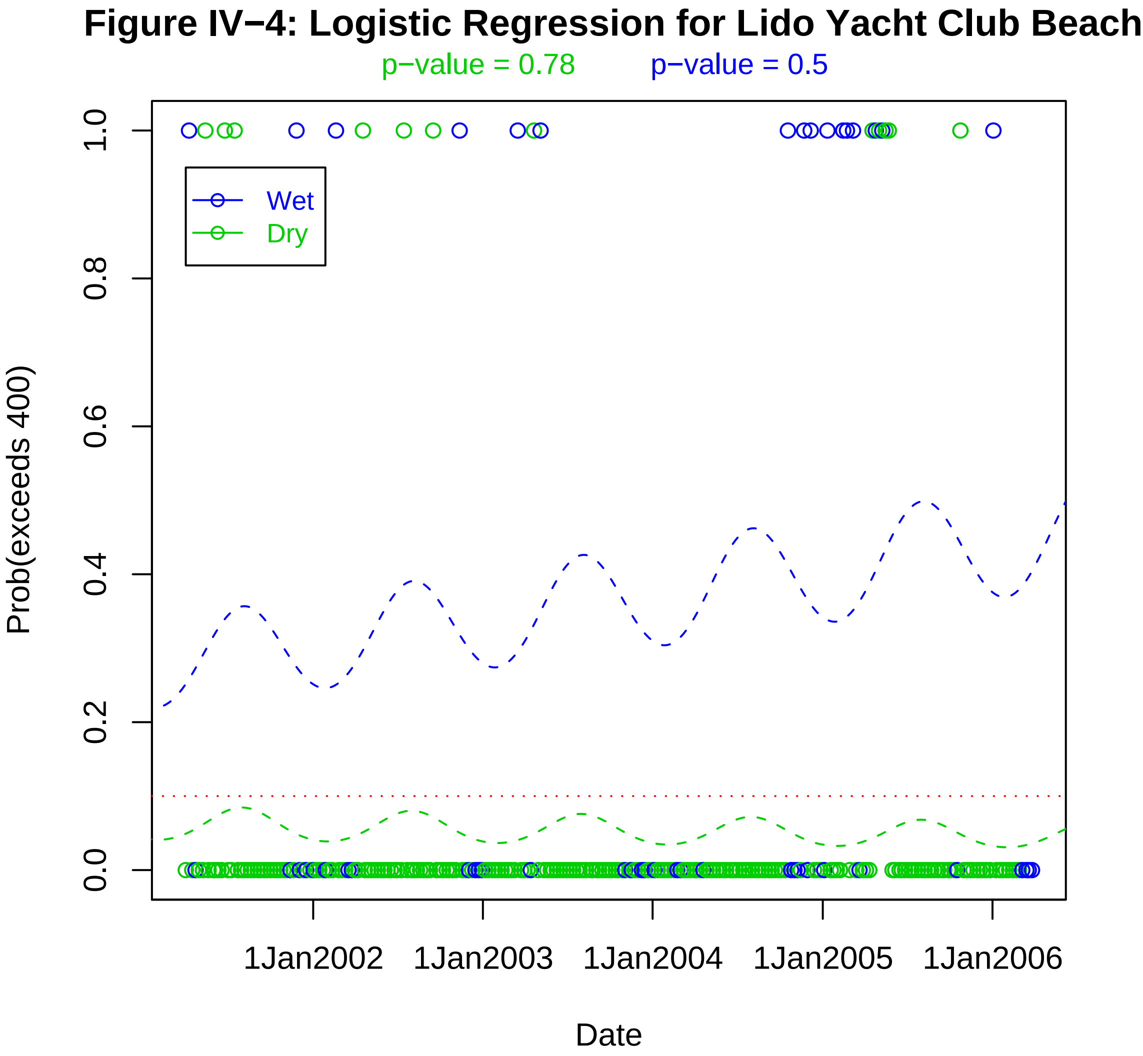


Figure IV−4: Logistic Regression for Lido Yacht Club Beach
p−value = 0.78
p−value = 0.5
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

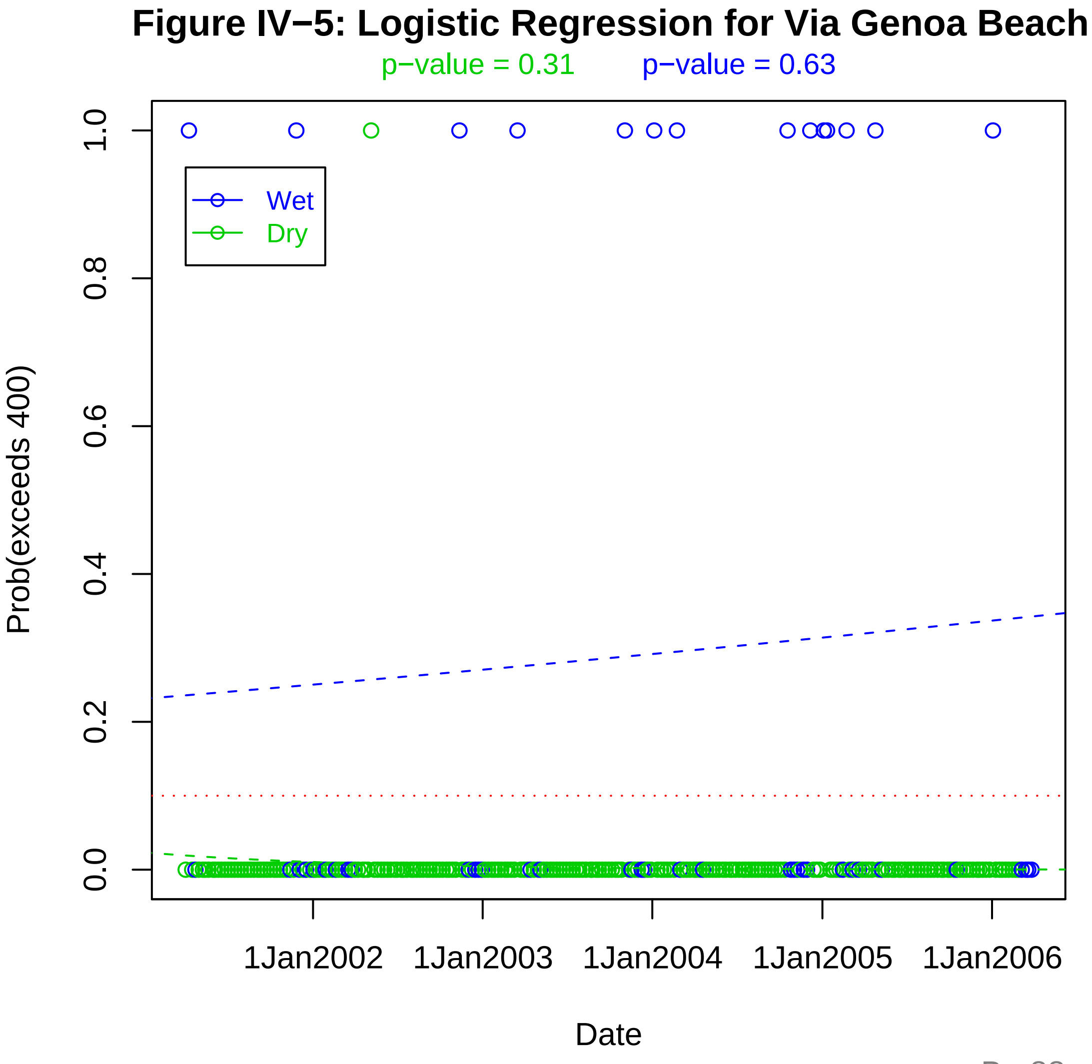
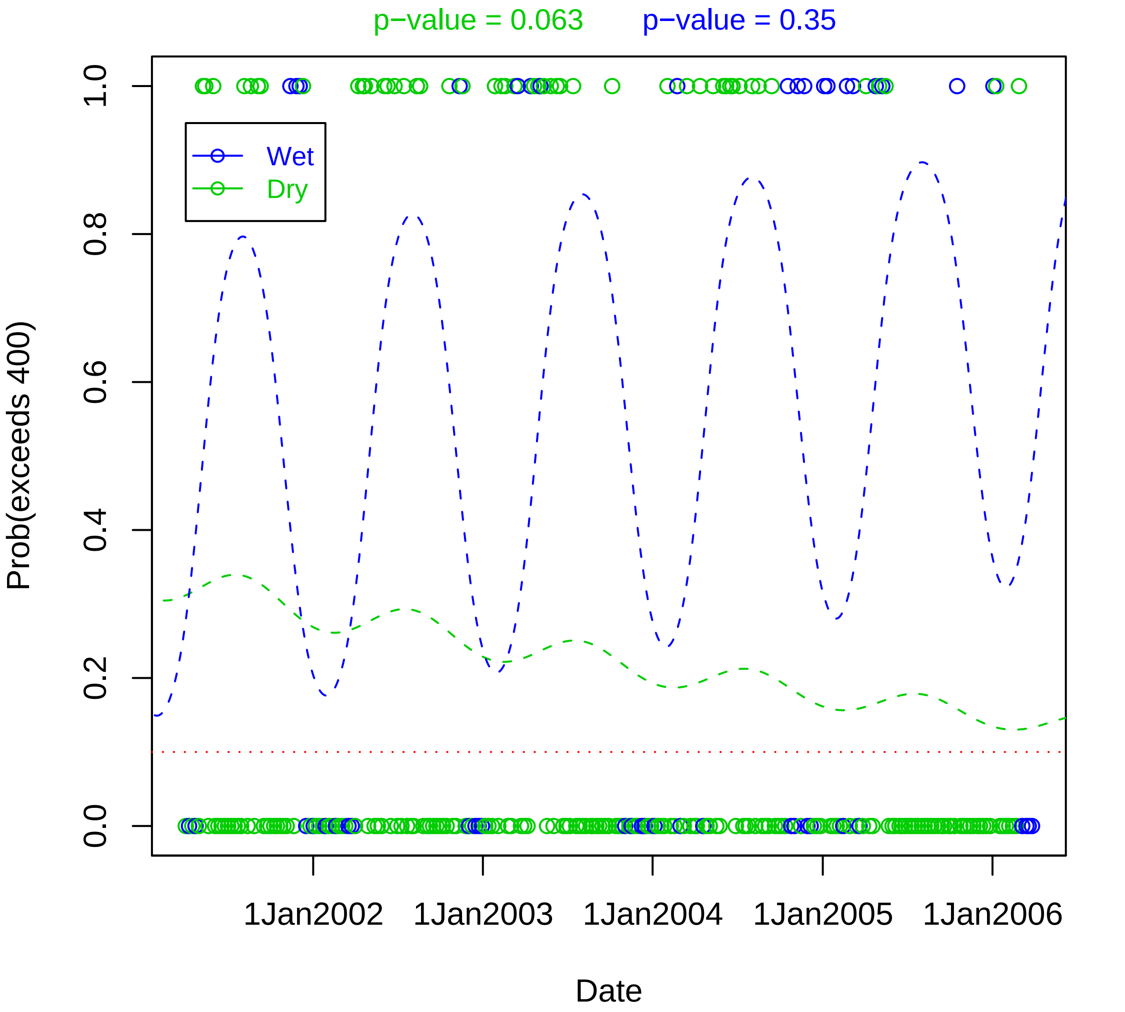


Figure IV−5: Logistic Regression for Via Genoa Beach
p−value = 0.31
p−value = 0.63
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

Figure IV−6: Logistic Regression for Newport Blvd Bridge



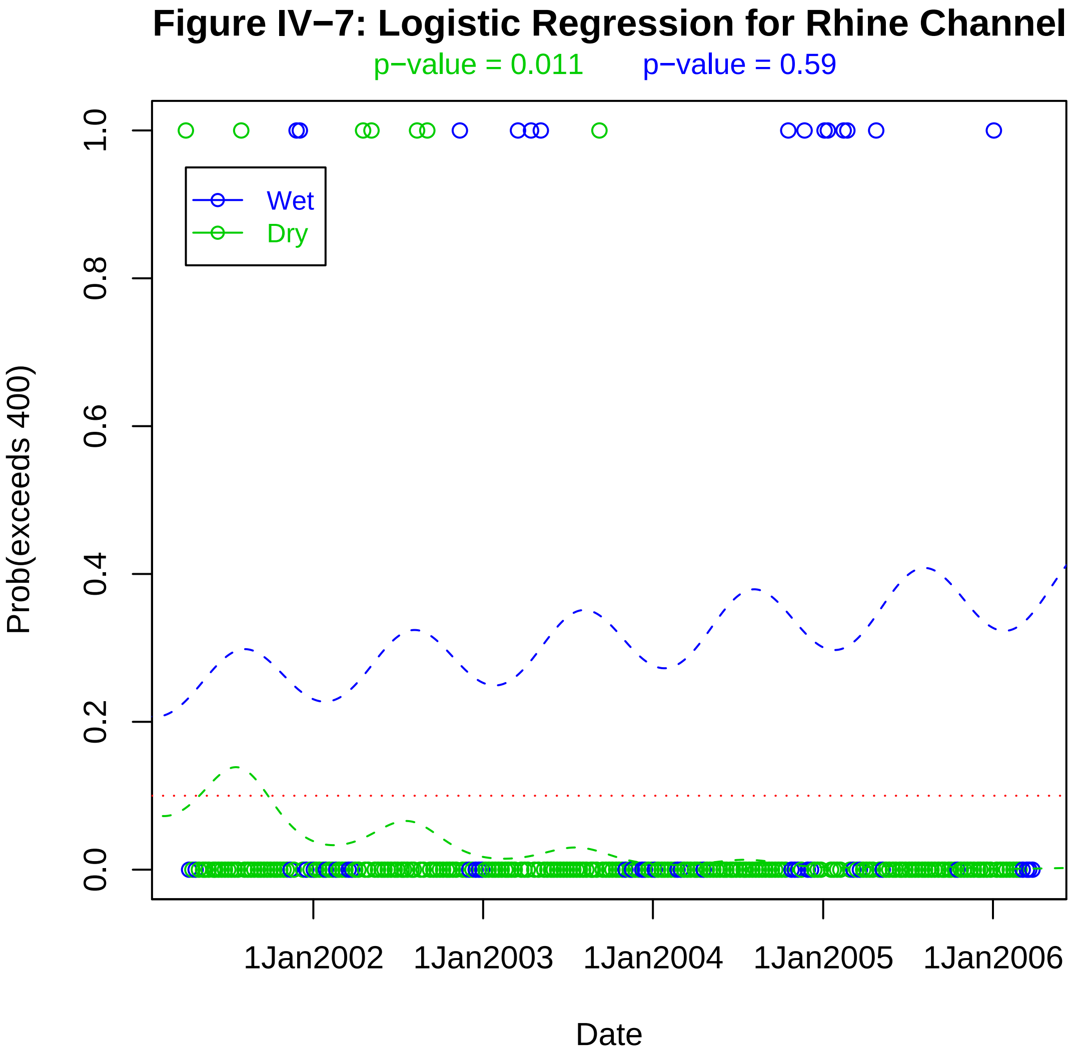


Figure IV−7: Logistic Regression for Rhine Channel
p−value = 0.011
p−value = 0.59
Wet
Dry
Prob(exceeds 400)
1.0
0.8
0.6
0.4
0.2
0.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

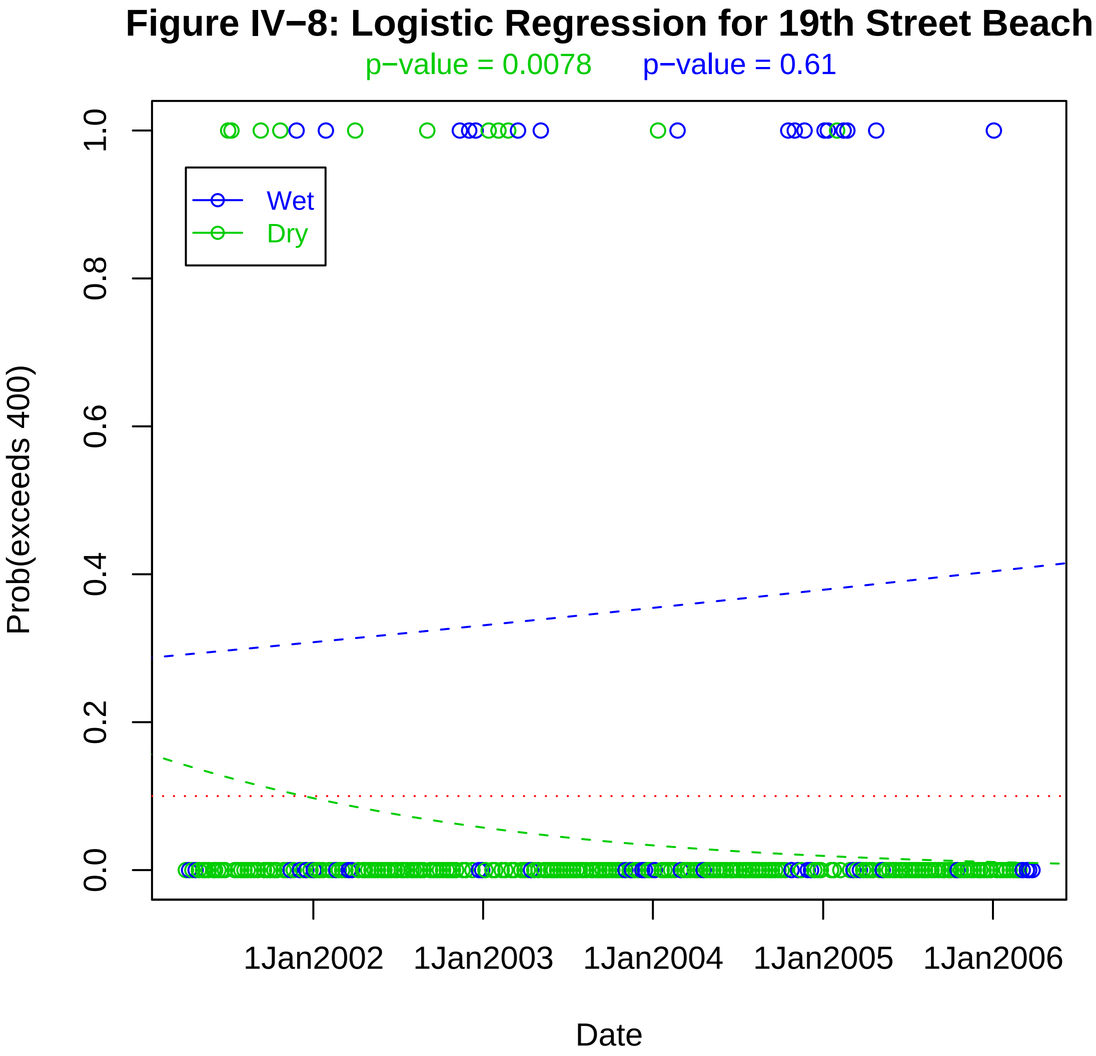


Figure IV−8: Logistic Regression for 19th Street Beach
p−value = 0.0078
p−value = 0.61
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

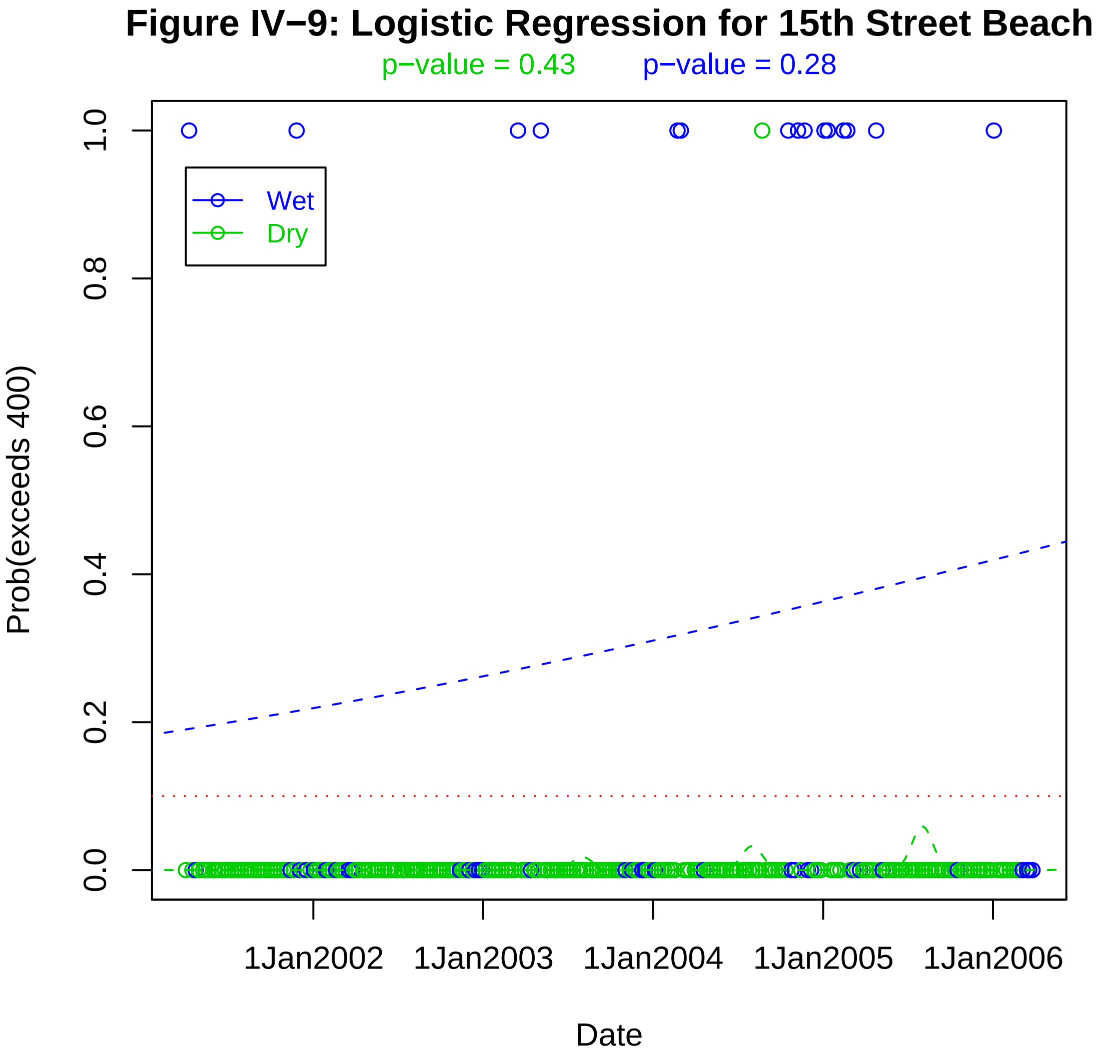


Figure IV−9: Logistic Regression for 15th Street Beach
p−value = 0.43
p−value = 0.28
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

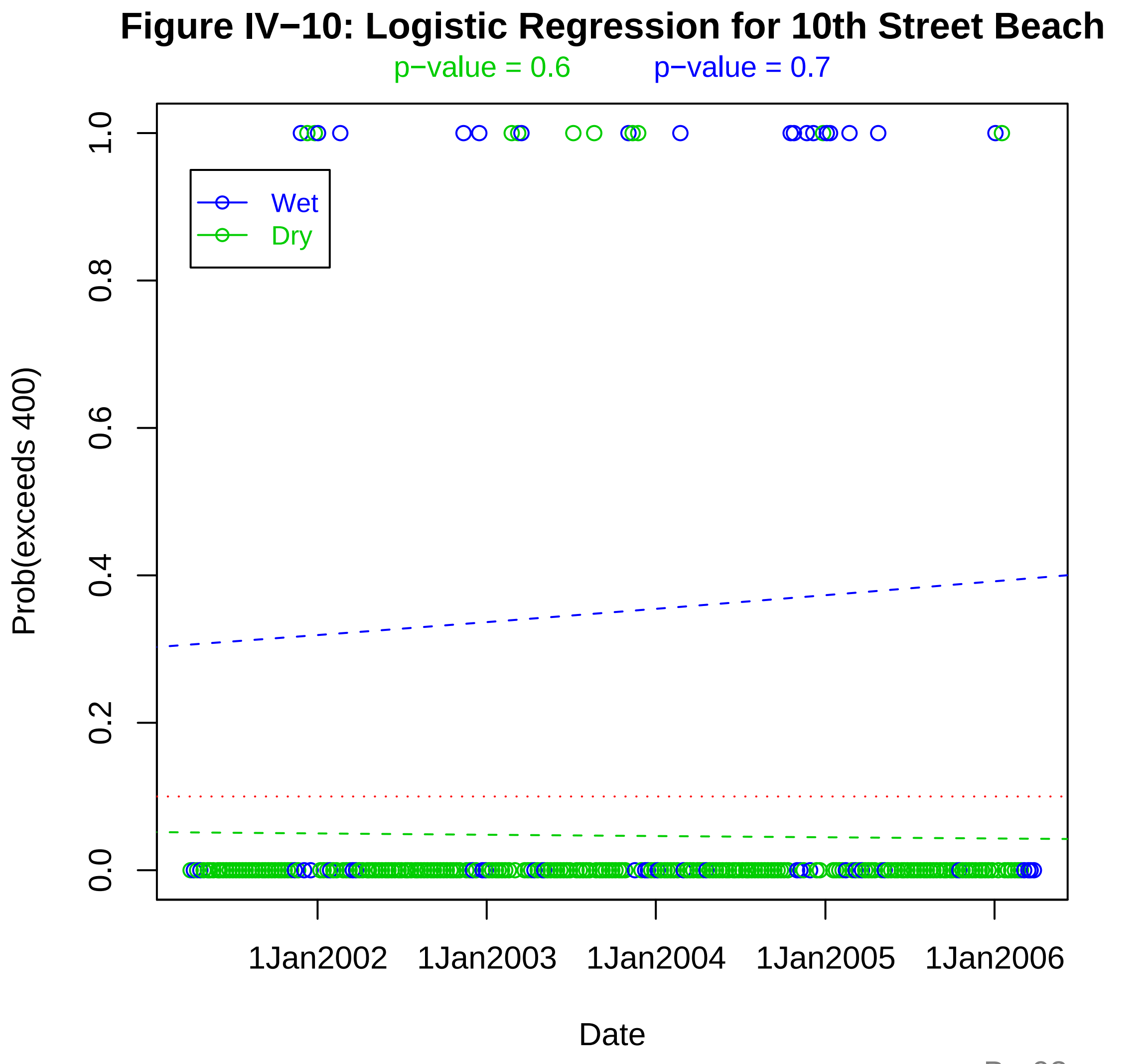


Figure IV−10: Logistic Regression for 10th Street Beach
p−value = 0.6
p−value = 0.7
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

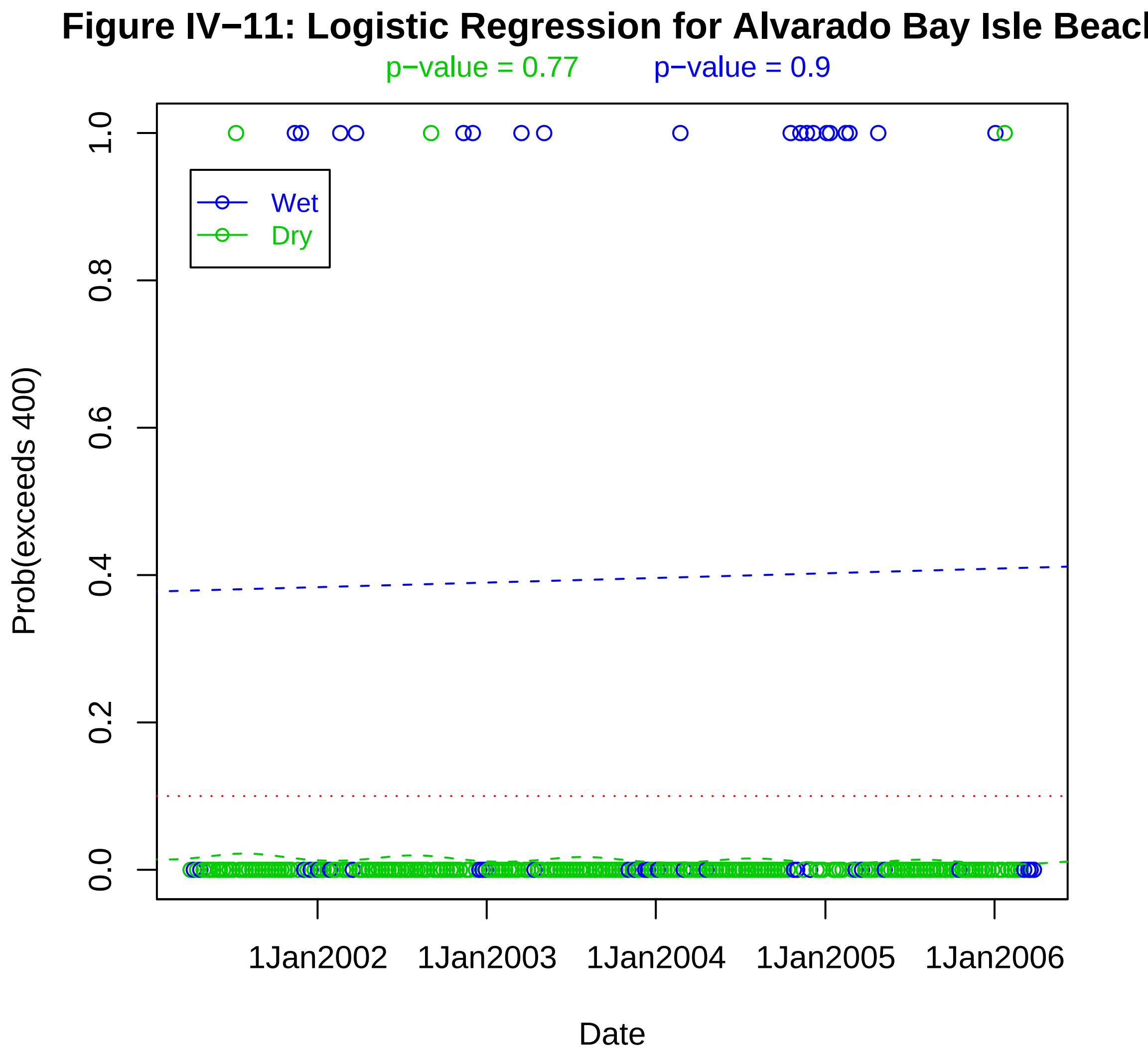


Figure IV−11: Logistic Regression for Alvarado Bay Isle Beach
p−value = 0.77
p−value = 0.9
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

Figure IV−12: Logistic Regression for N Street Beach

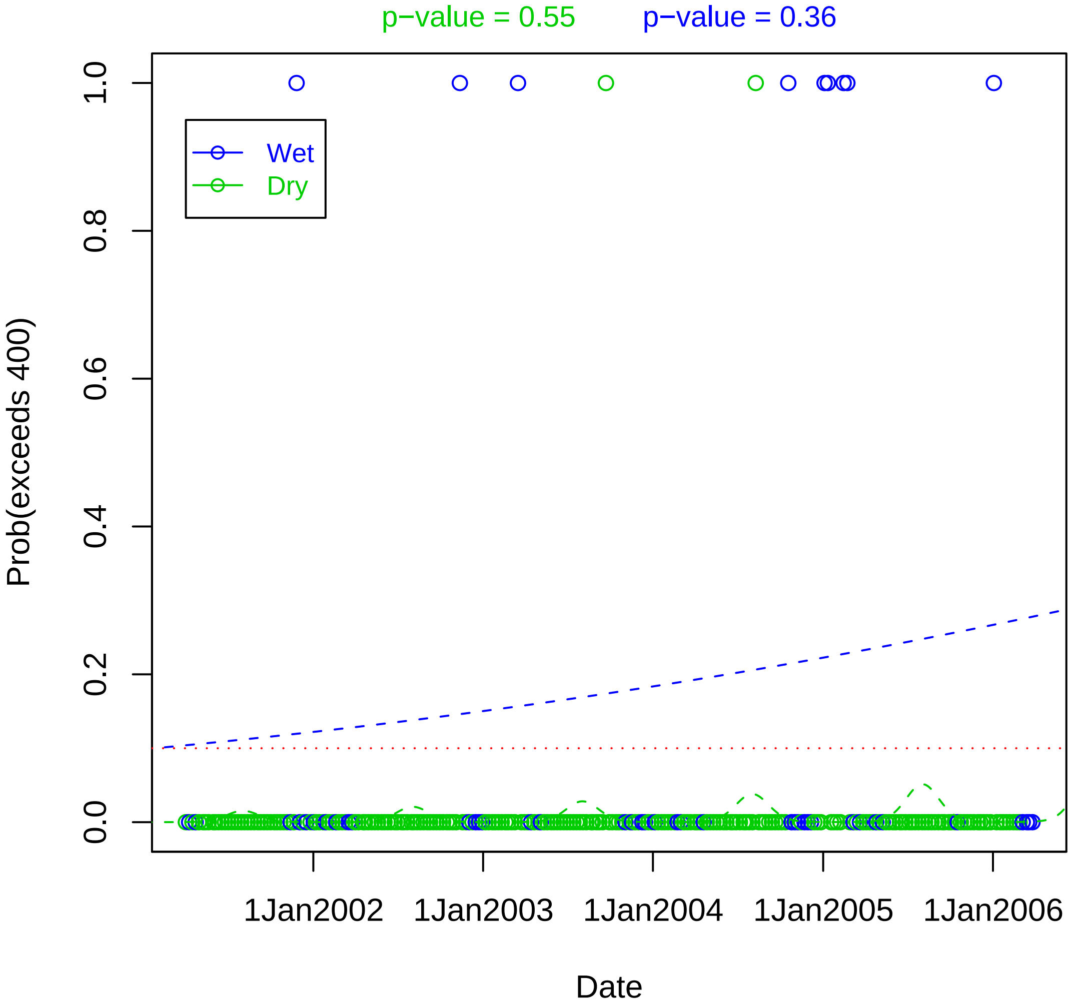


Figure IV−13: Logistic Regression for Garnet Avenue Beach

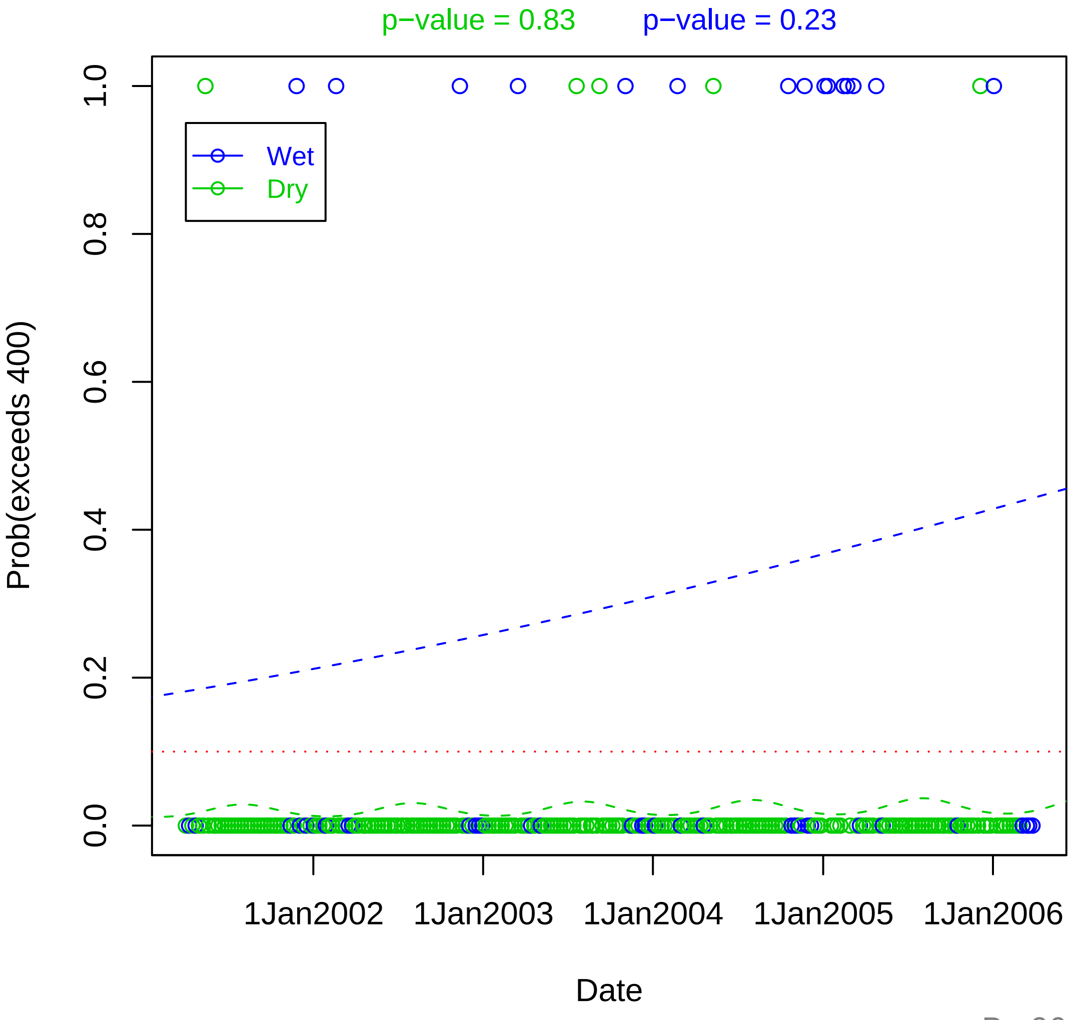
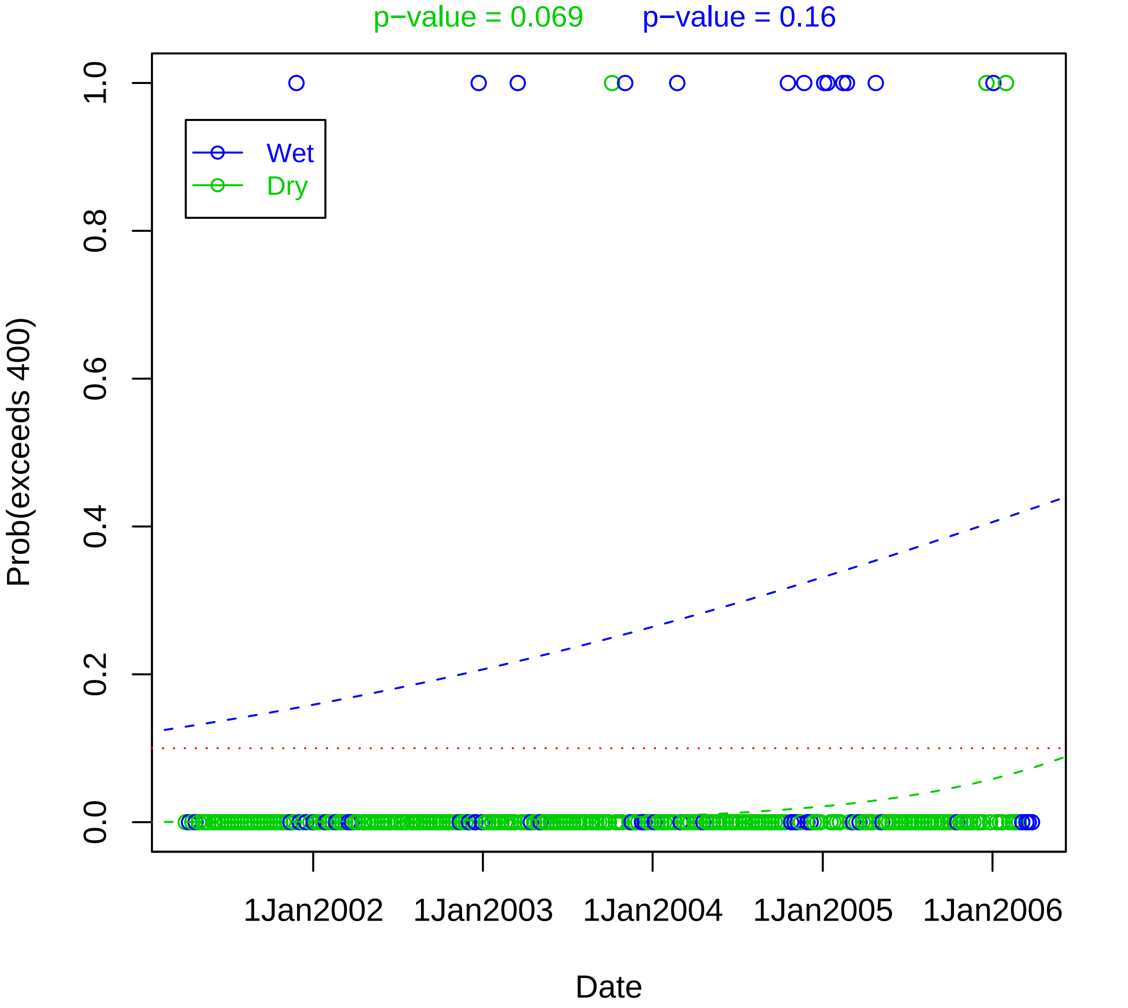


Figure IV−14: Logistic Regression for Ruby Avenue Beach



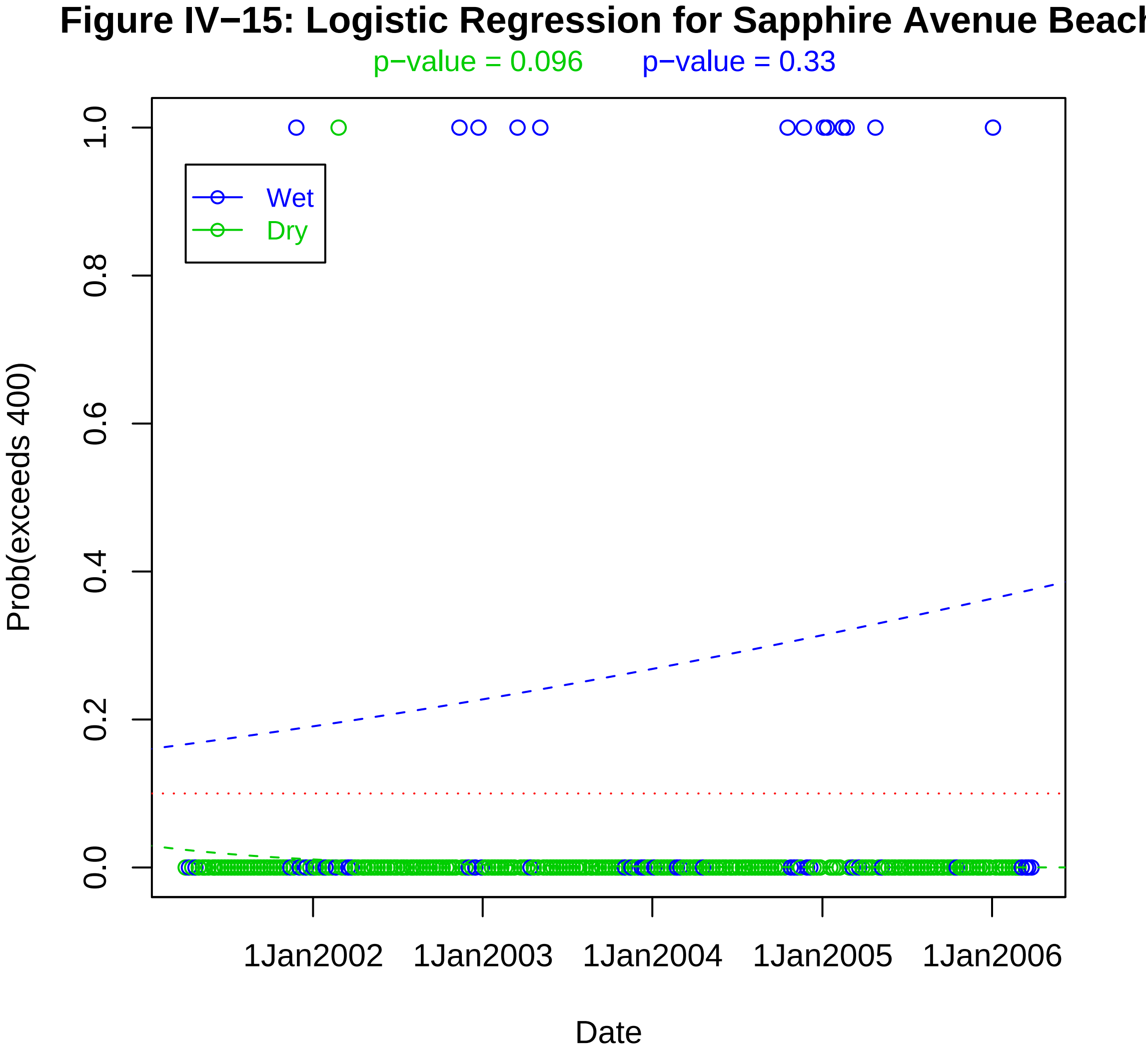


Figure IV−15: Logistic Regression for Sapphire Avenue Beach
p−value = 0.096
p−value = 0.33
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

Figure IV−16: Logistic Regression for Grand Canal

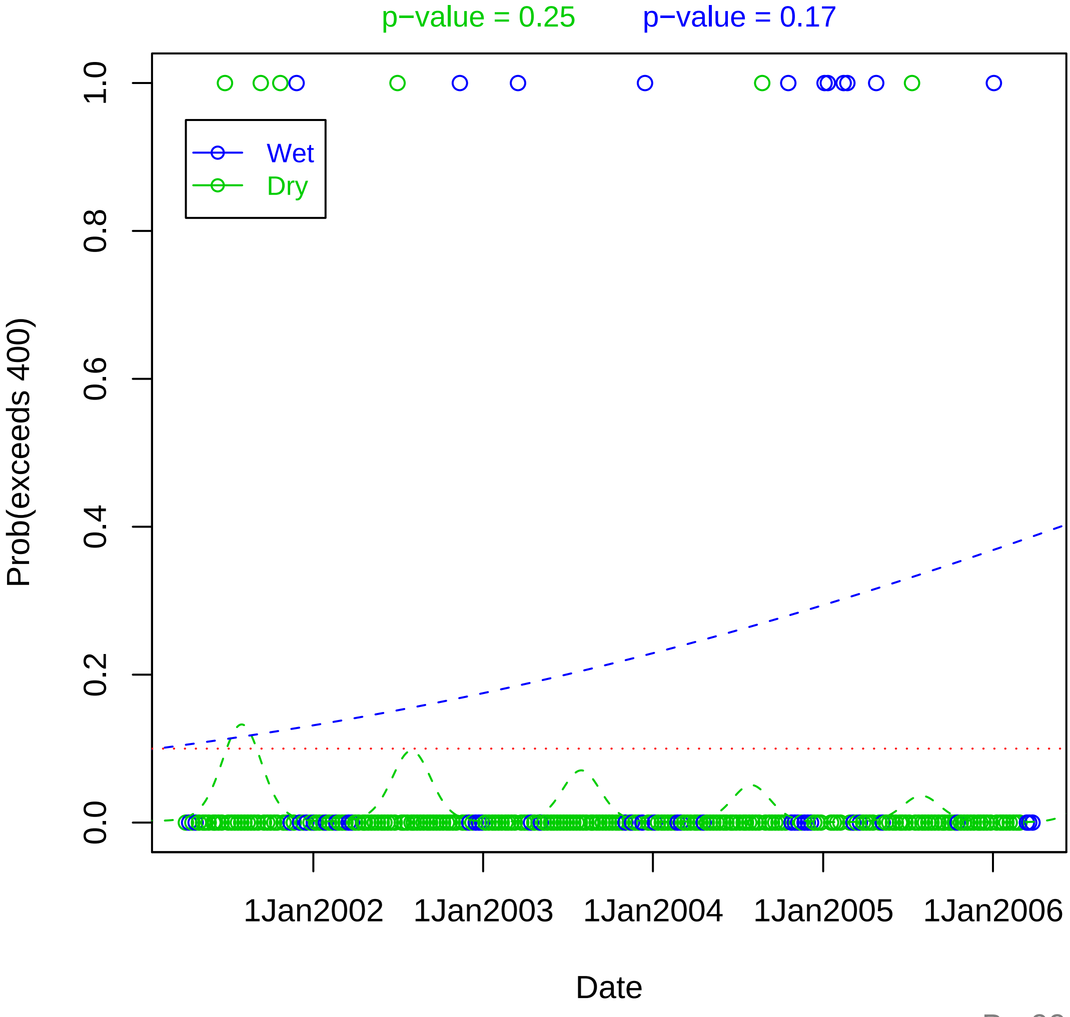


Figure IV−17: Logistic Regression for Abalone Avenue Beach

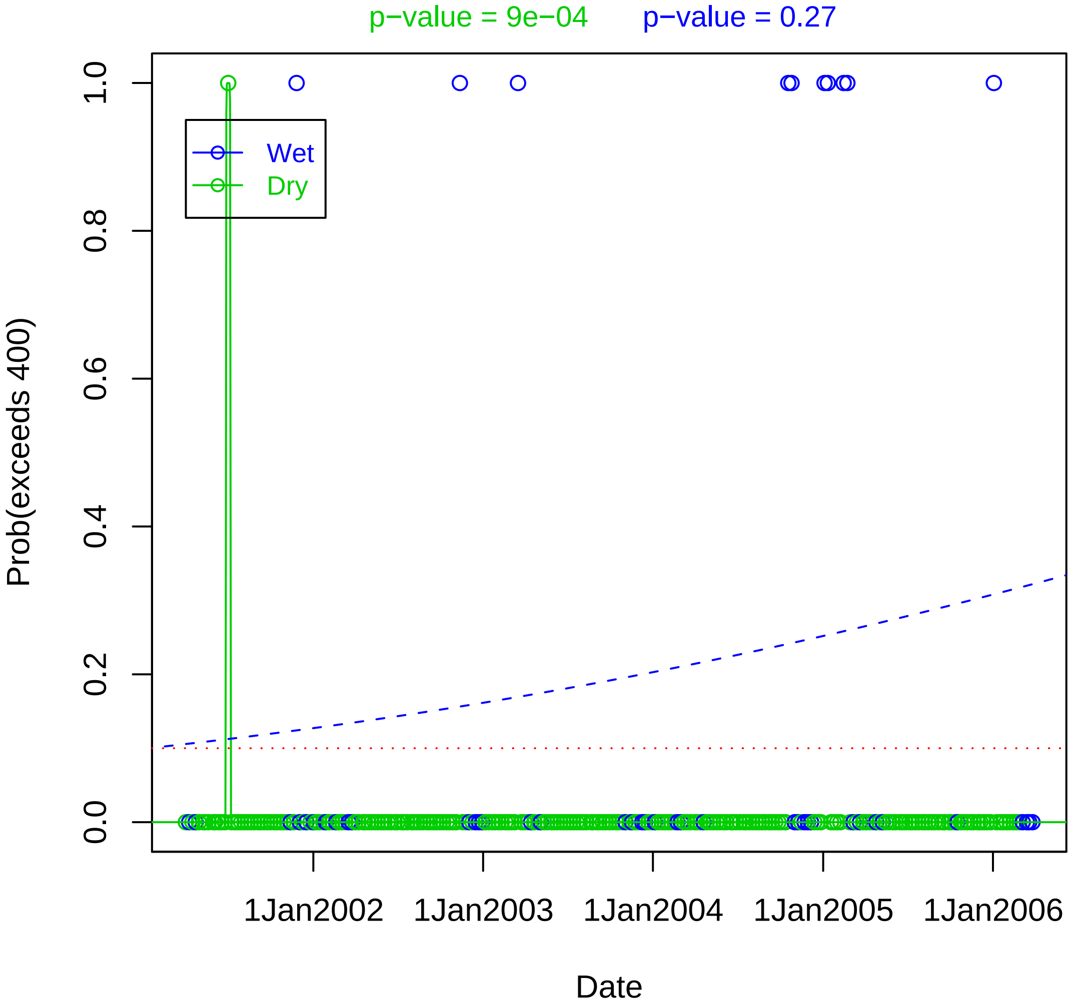


Figure IV−18: Logistic Regression for Park Avenue Beach

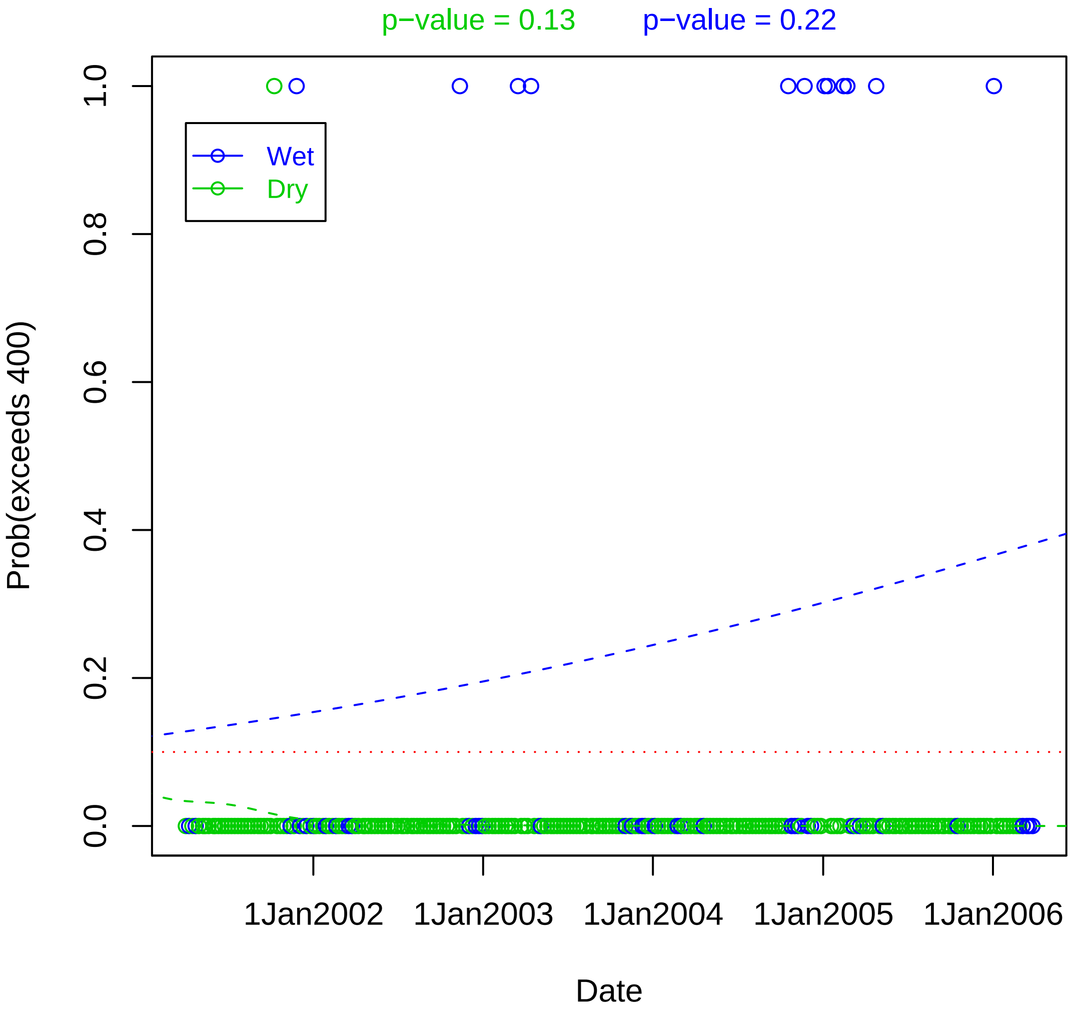


Figure IV−19: Logistic Regression for Onyx Avenue Beach

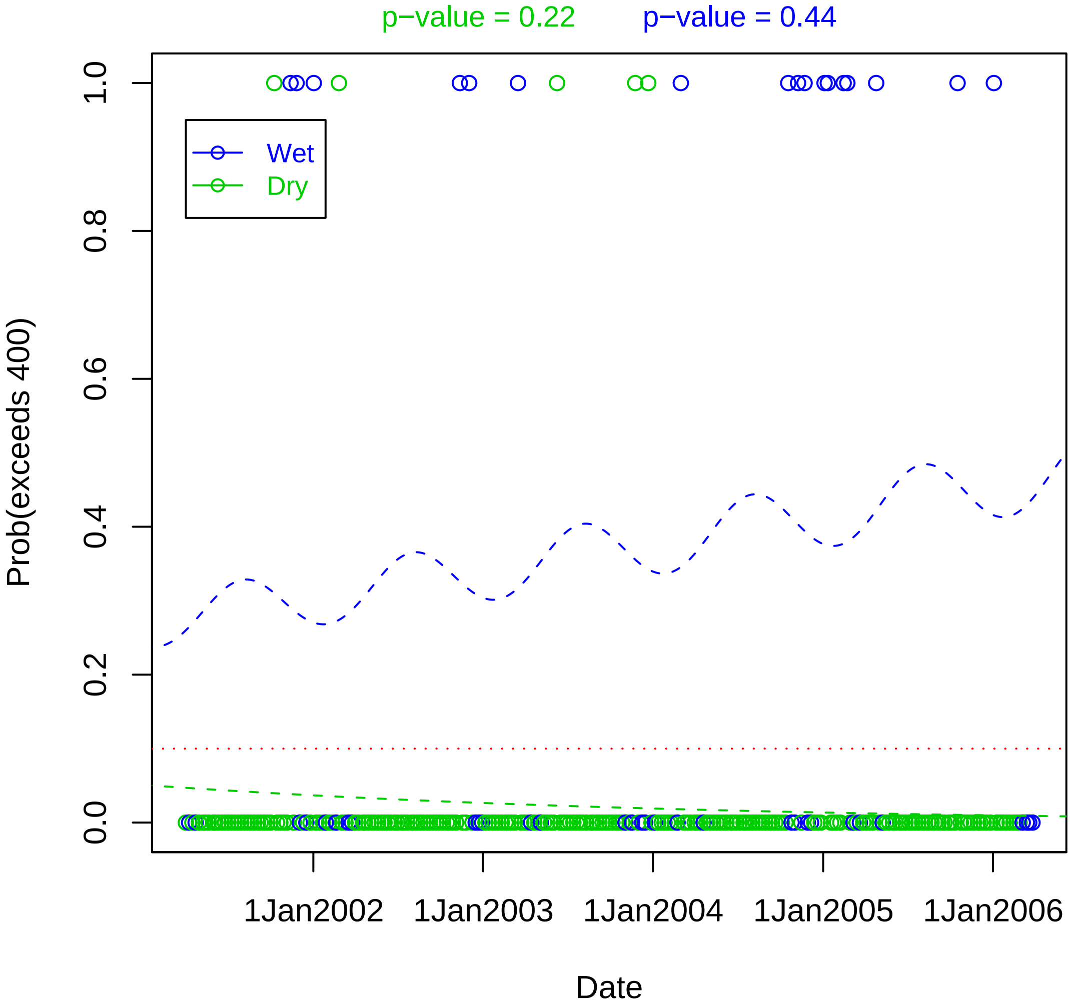


Figure IV−20: Logistic Regression for Promontory Point Chann

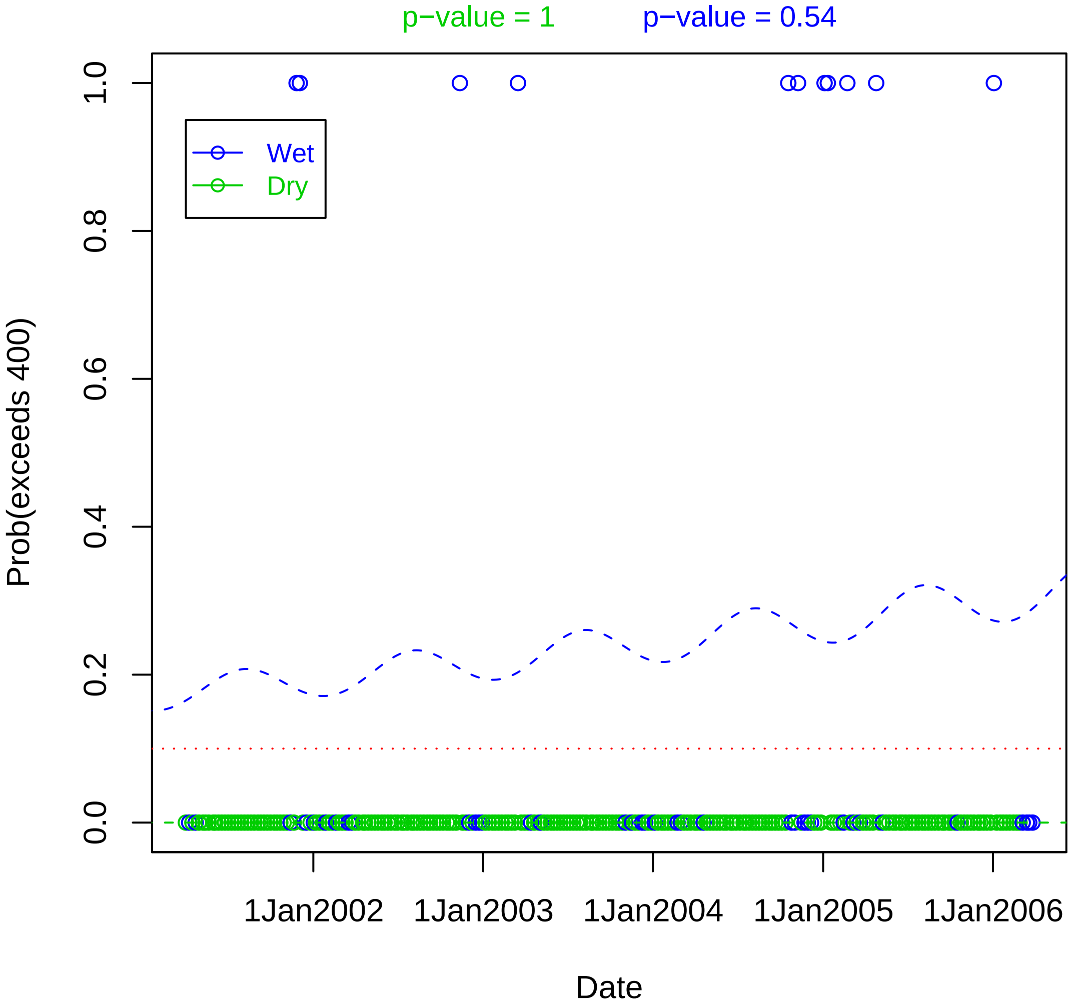


Figure IV−21: Logistic Regression for Harbor Patrol Beach

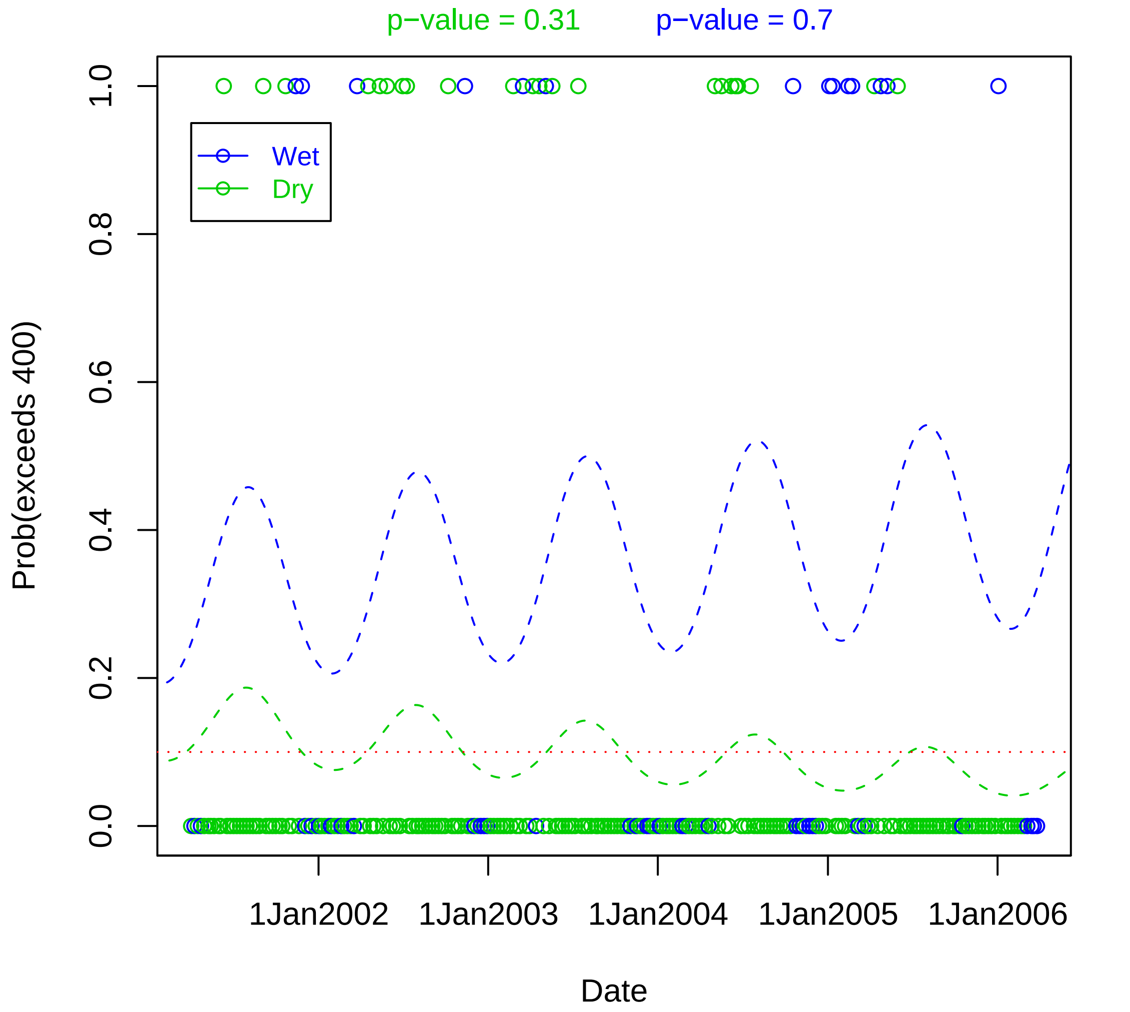


Figure IV−22: Logistic Regression for Rocky Point Beach

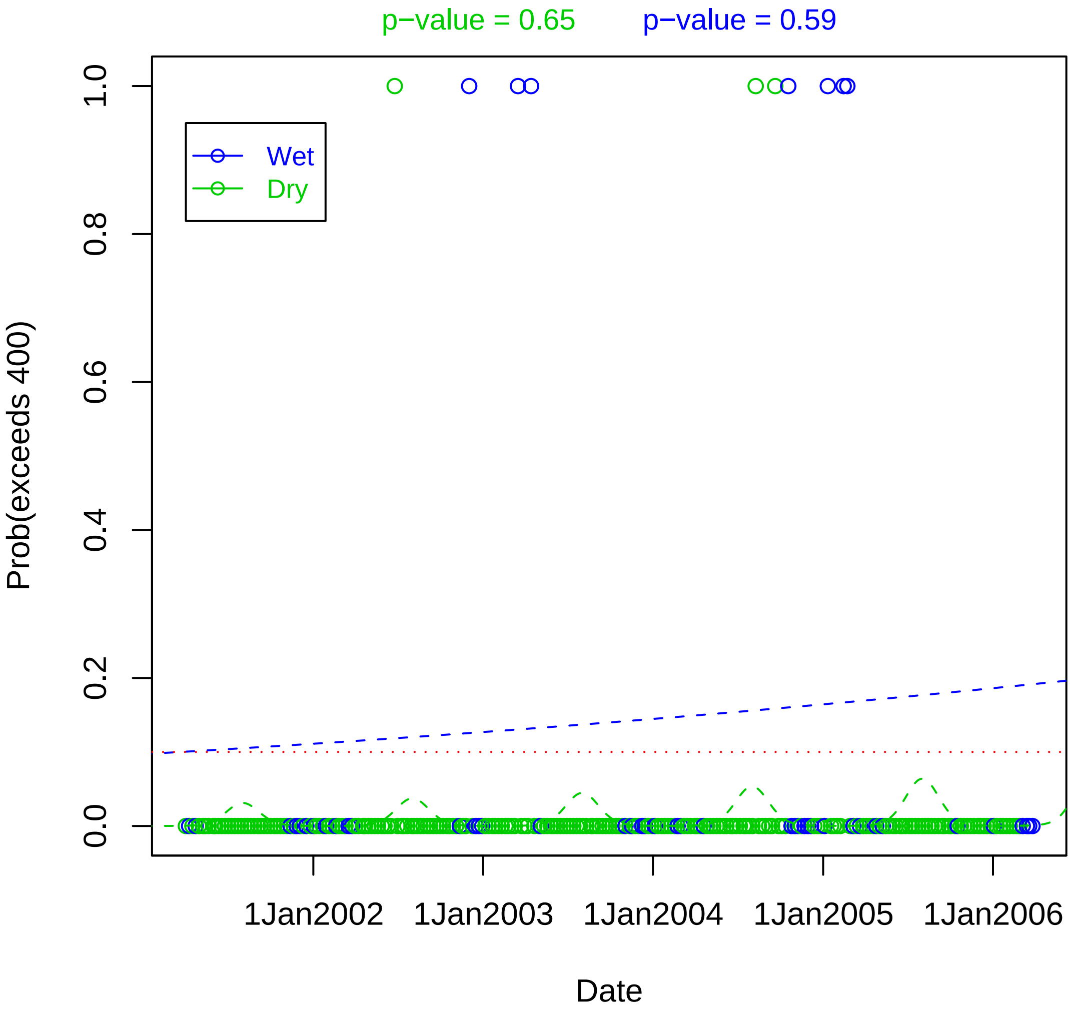
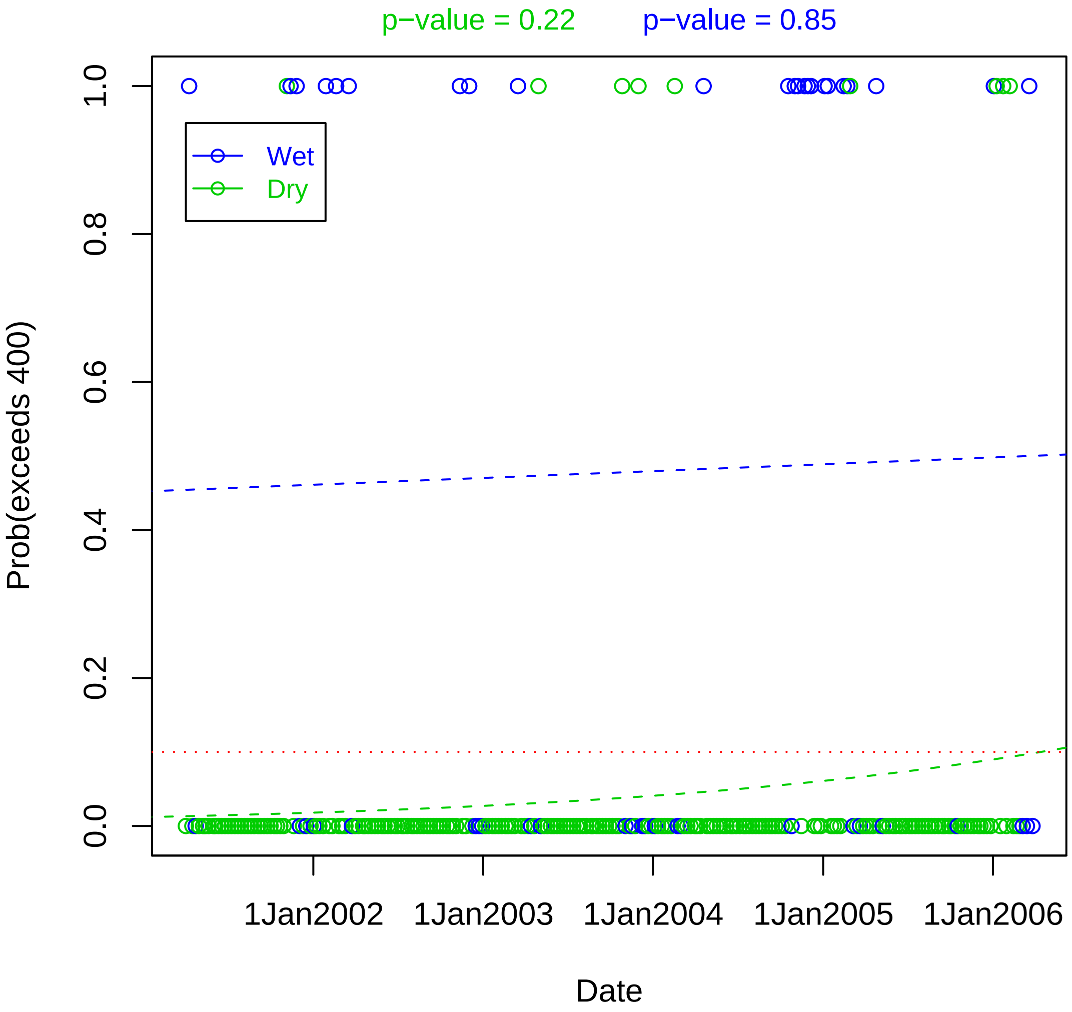


Figure IV−23: Logistic Regression for Newport Dunes Middle



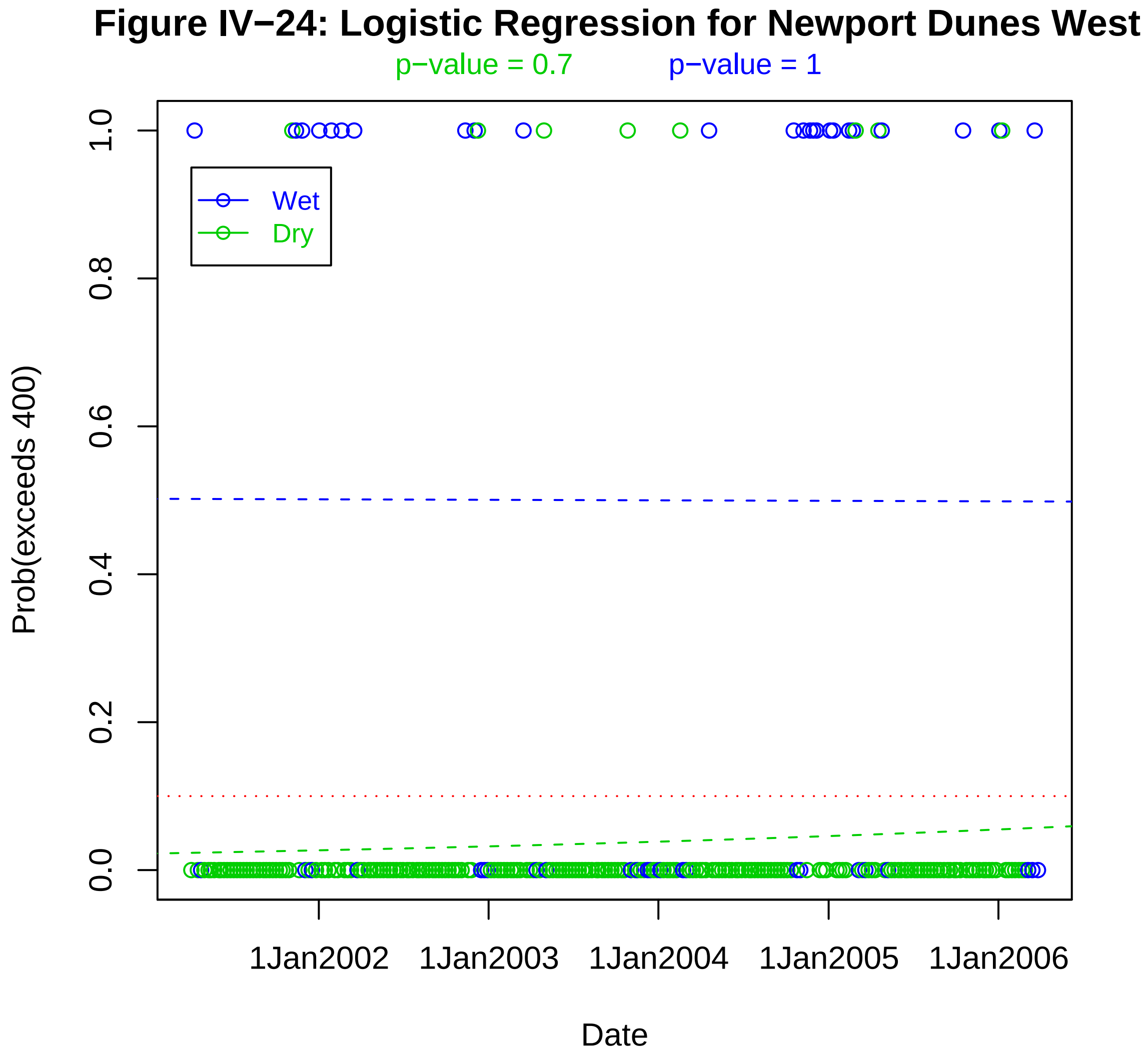


Figure IV−24: Logistic Regression for Newport Dunes West
p−value = 0.7
p−value = 1
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

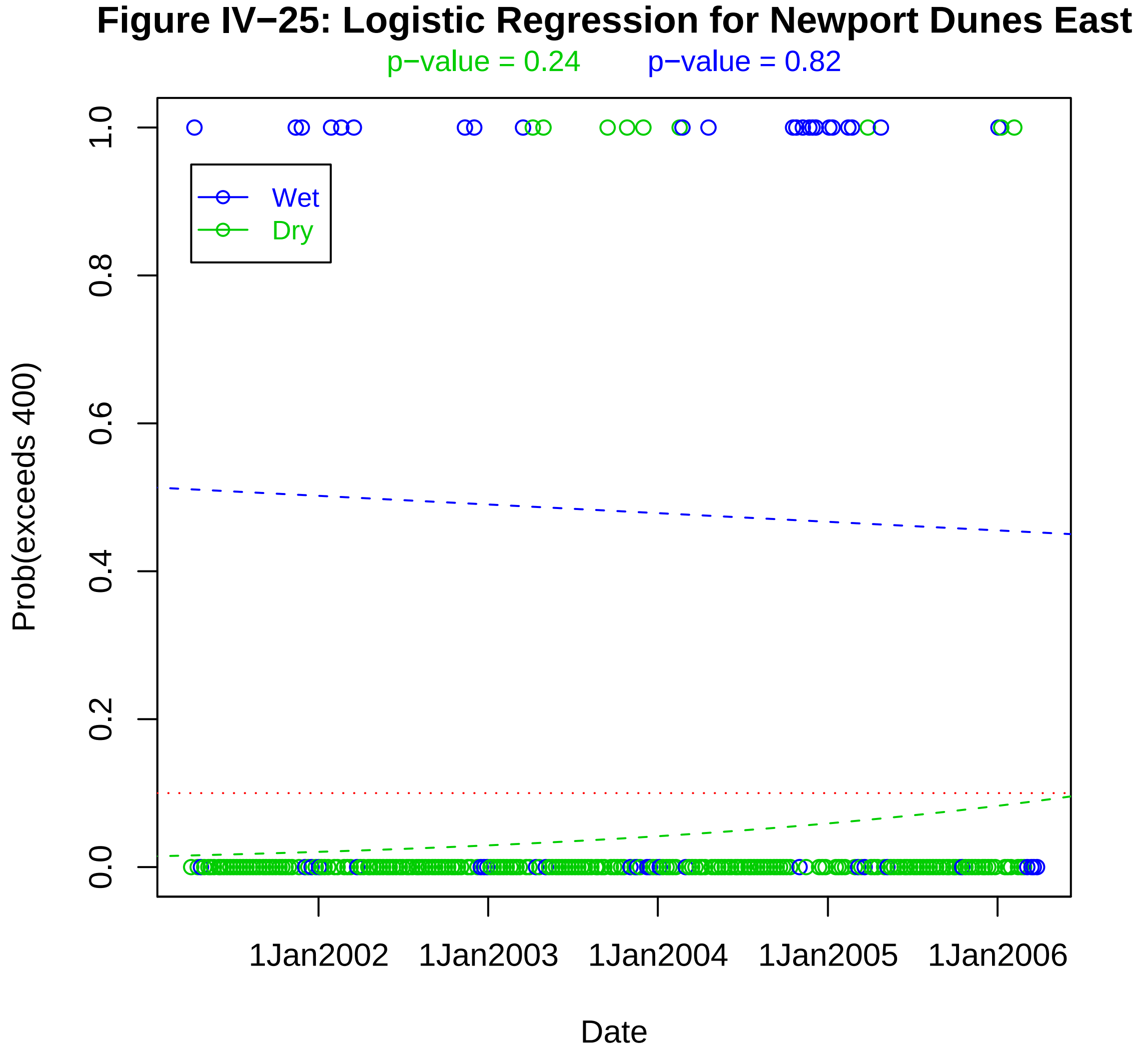


Figure IV−25: Logistic Regression for Newport Dunes East
p−value = 0.24
p−value = 0.82
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

Figure IV−26: Logistic Regression for Newport Dunes North

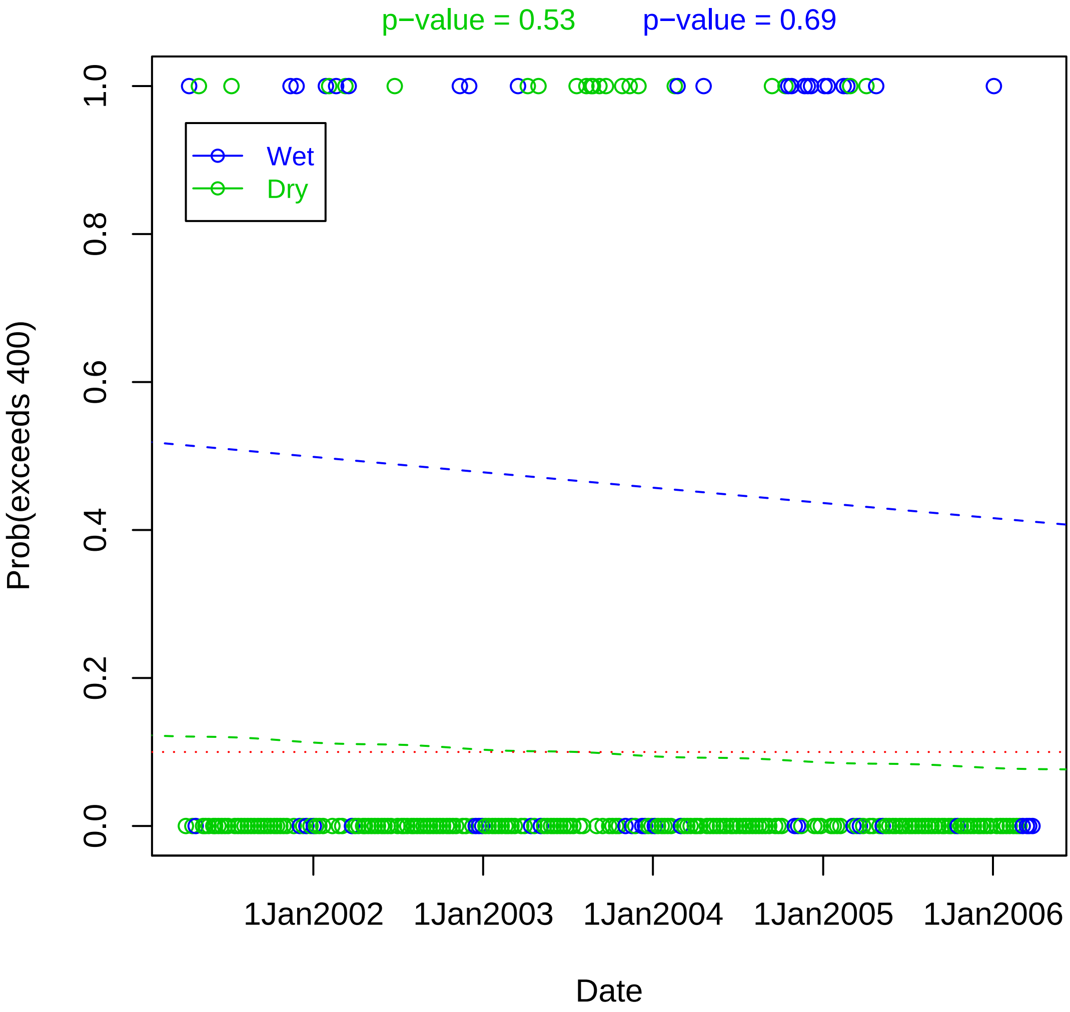
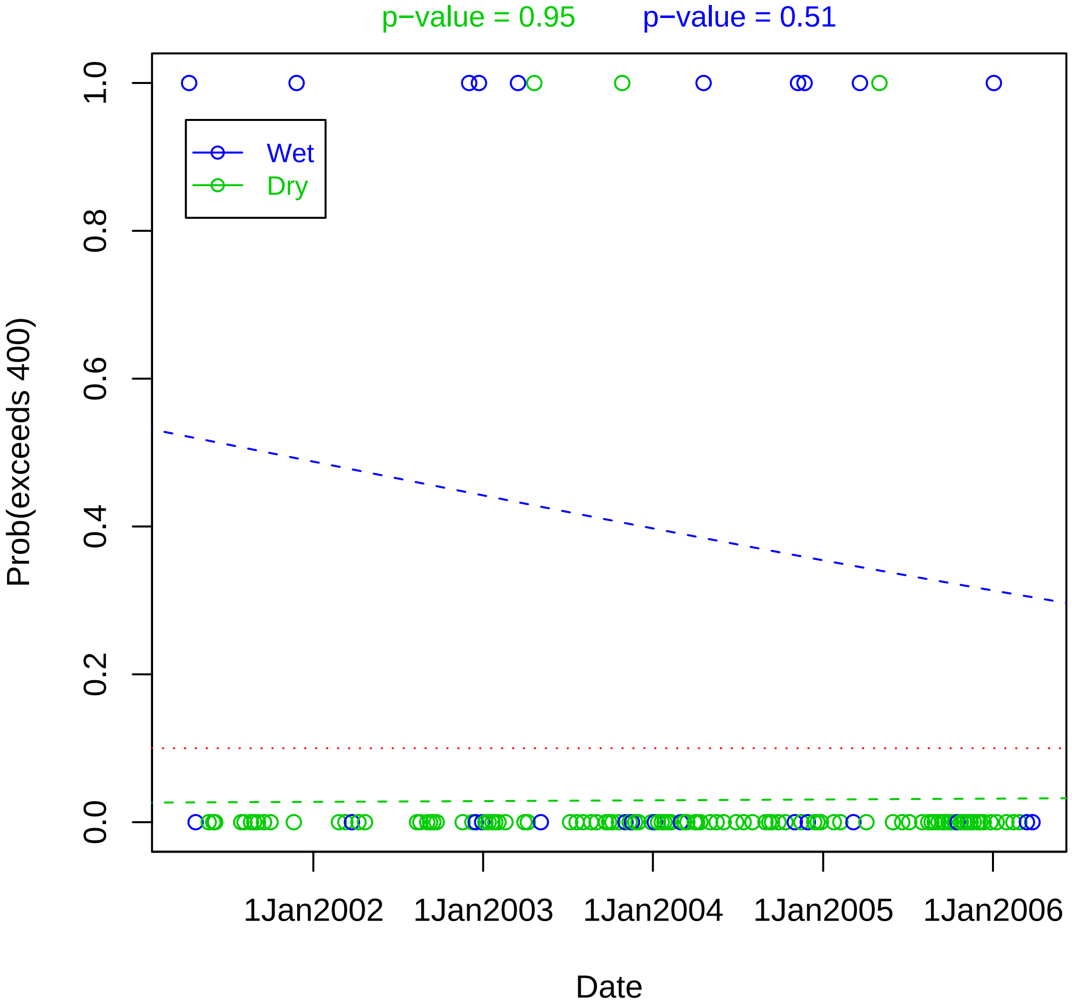


Figure IV−27: Logistic Regression for Vaughn s Launch



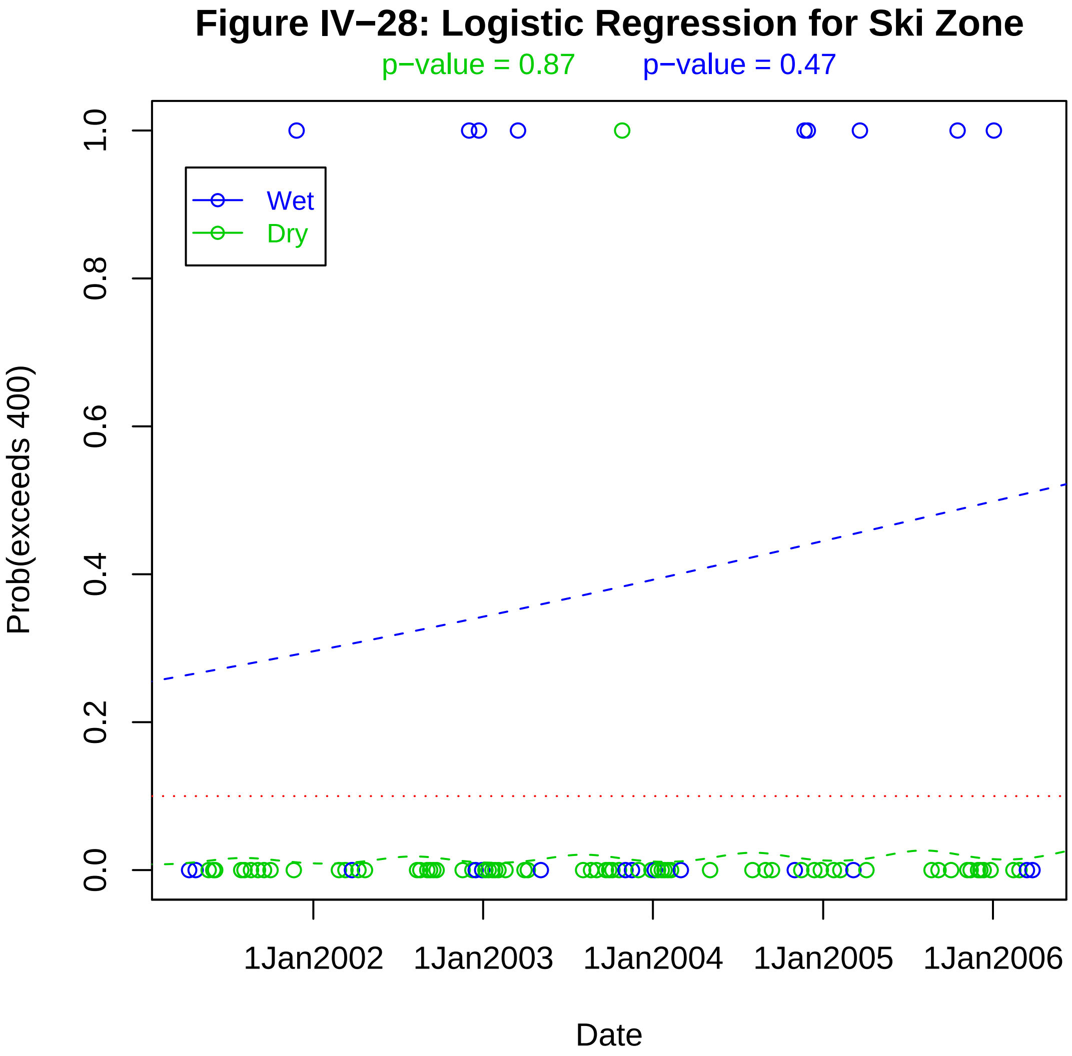


Figure IV−28: Logistic Regression for Ski Zone
p−value = 0.87
p−value = 0.47
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

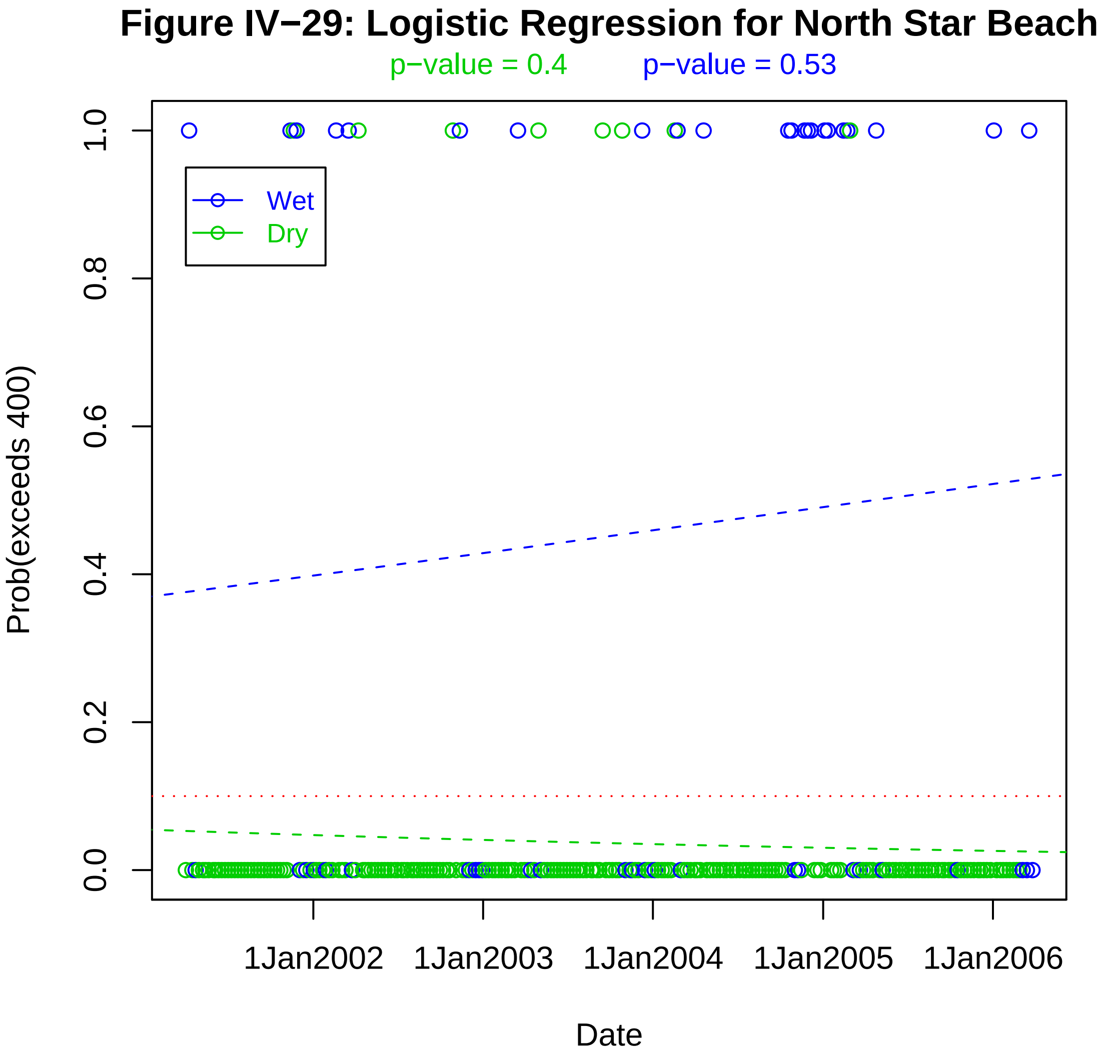


Figure IV−29: Logistic Regression for North Star Beach
p−value = 0.4
p−value = 0.53
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

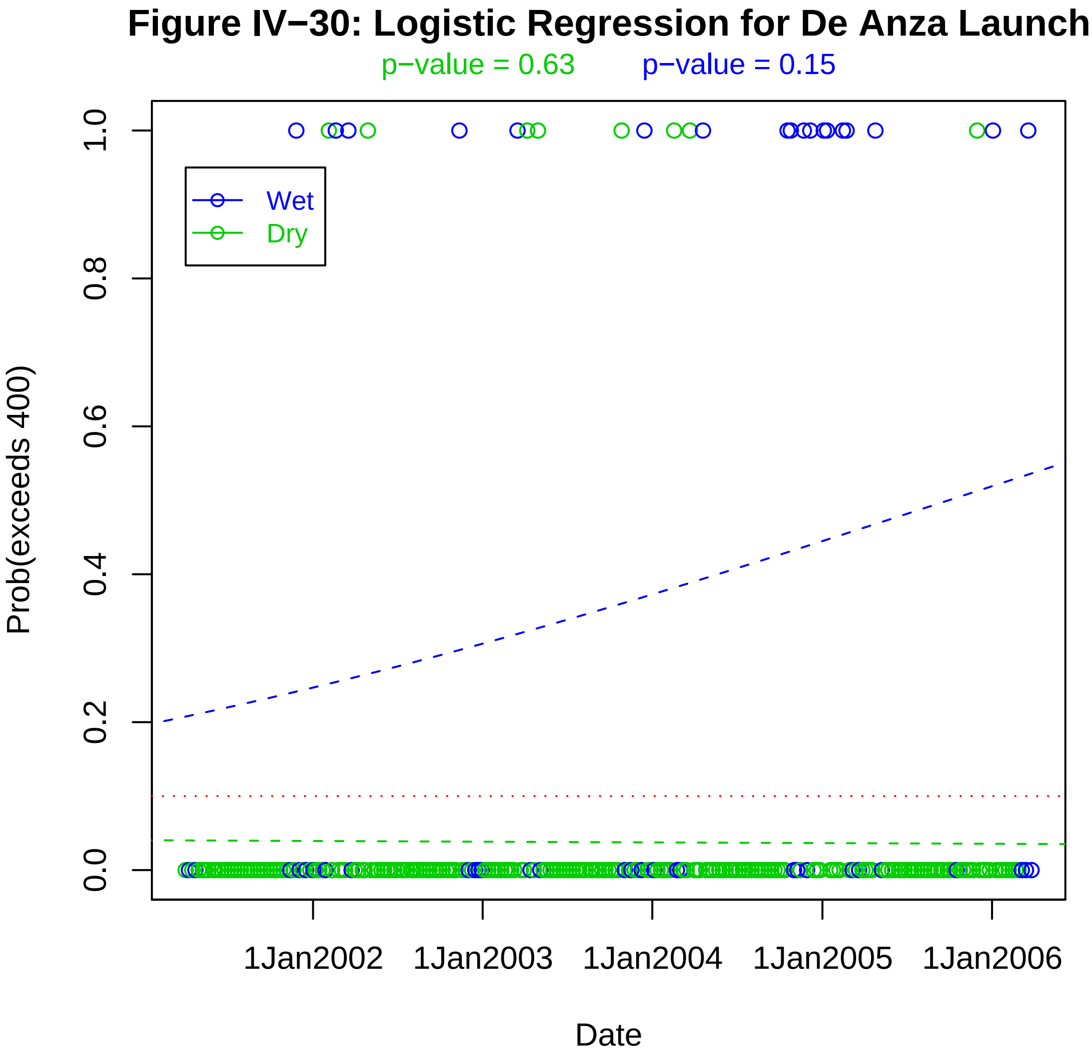


Figure IV−30: Logistic Regression for De Anza Launch
p−value = 0.63
p−value = 0.15
Wet
Dry
Prob(exceeds 400)
1.0
0.8
0.6
0.4
0.2
0.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

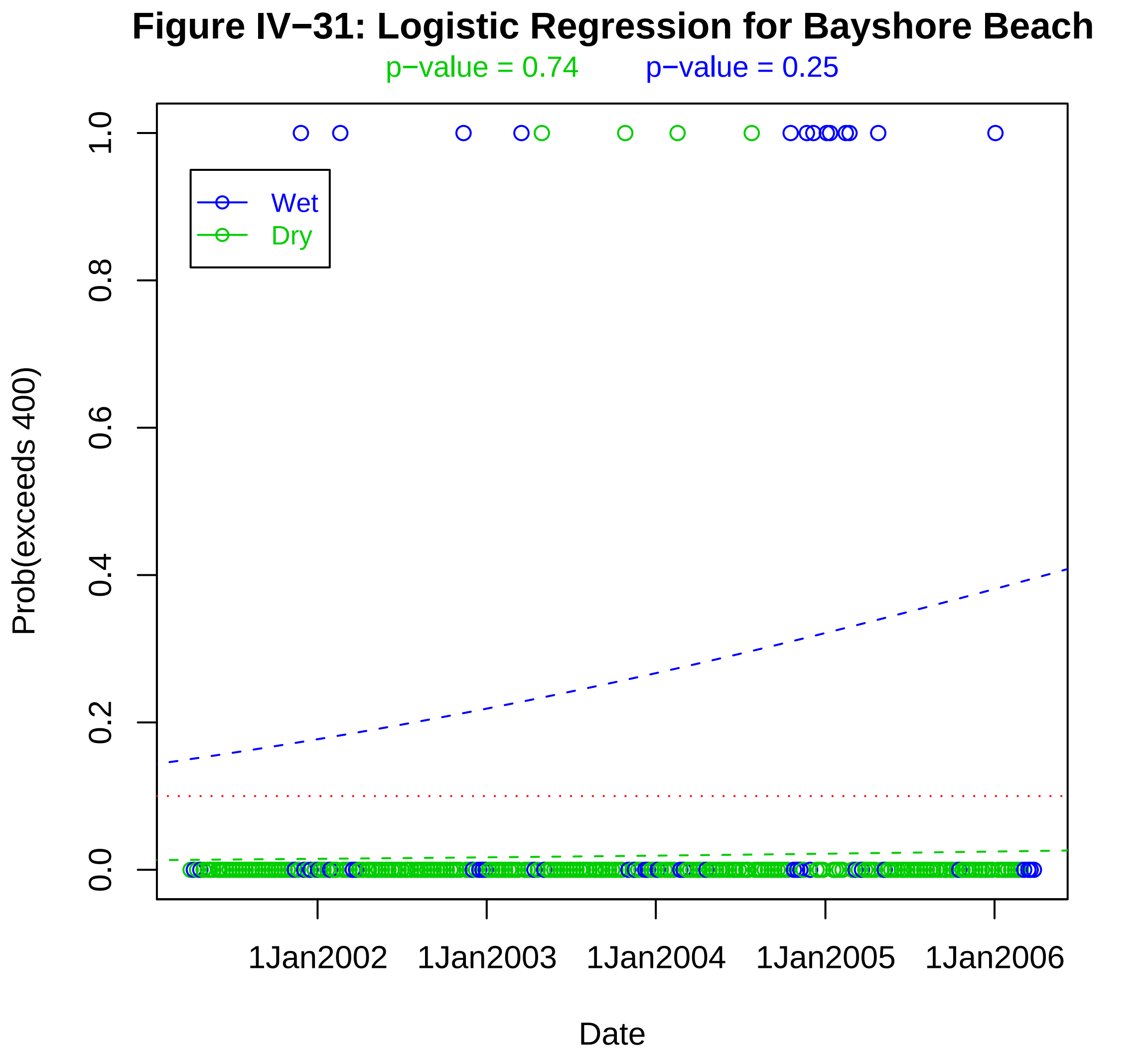


Figure IV−31: Logistic Regression for Bayshore Beach
p−value = 0.74
p−value = 0.25
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

Figure IV−32: Logistic Regression for San Diego Creek Campus

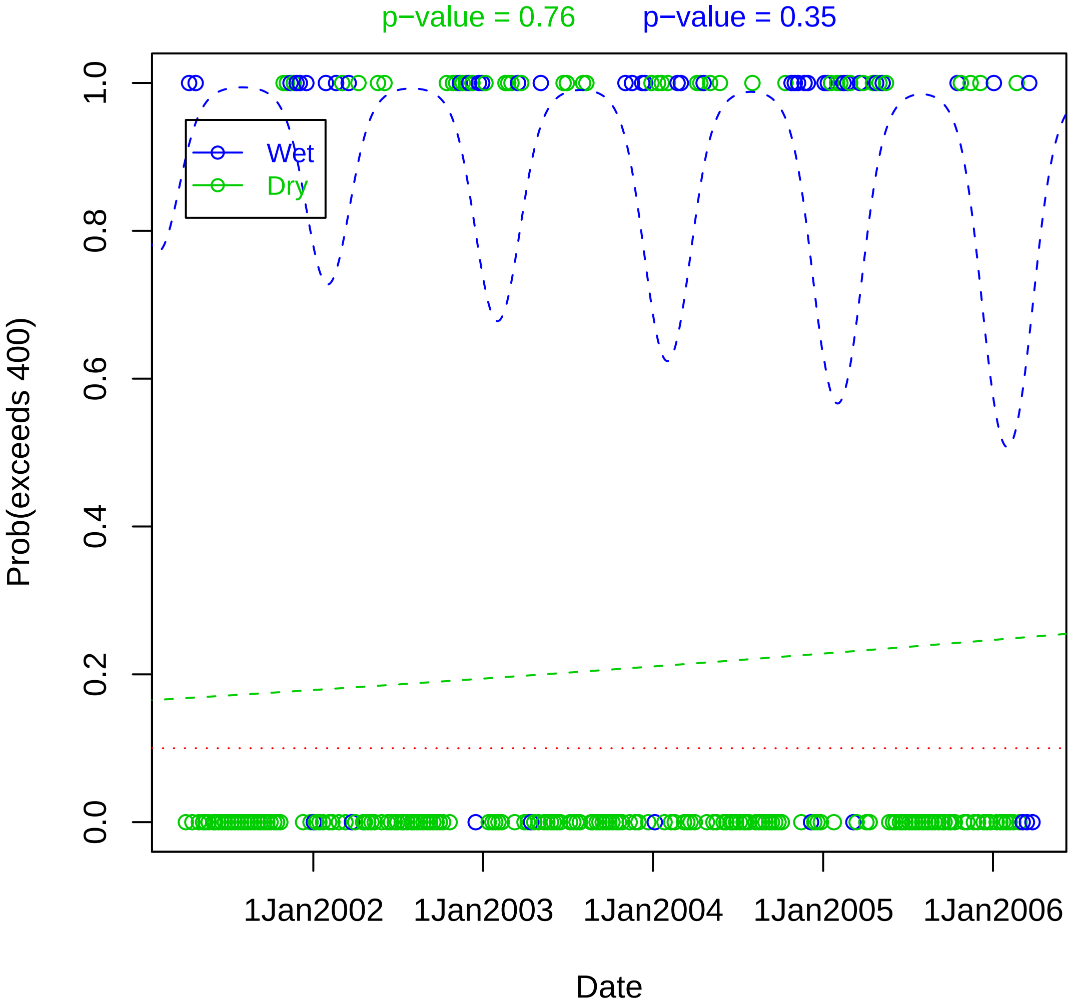


Figure IV−33: Logistic Regression for Santa Ana Delhi Channe

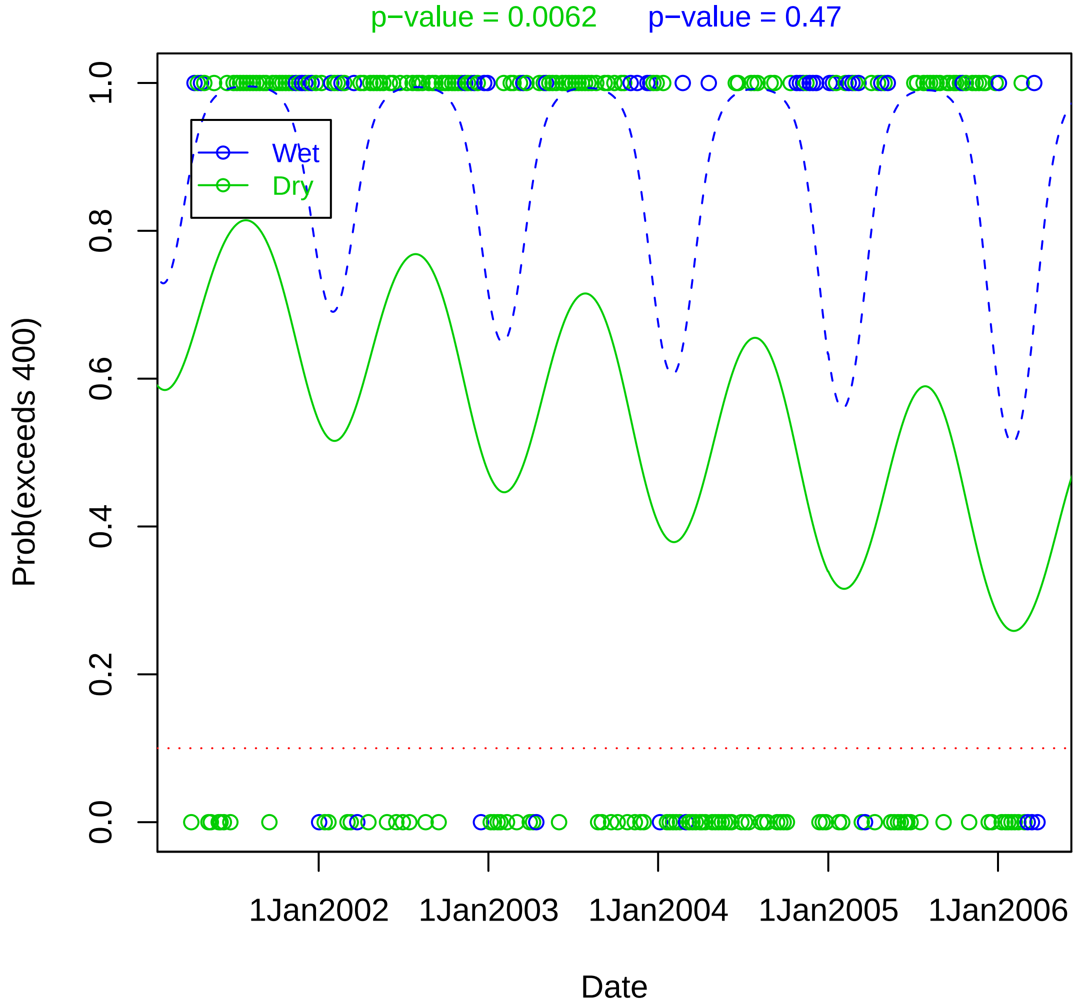
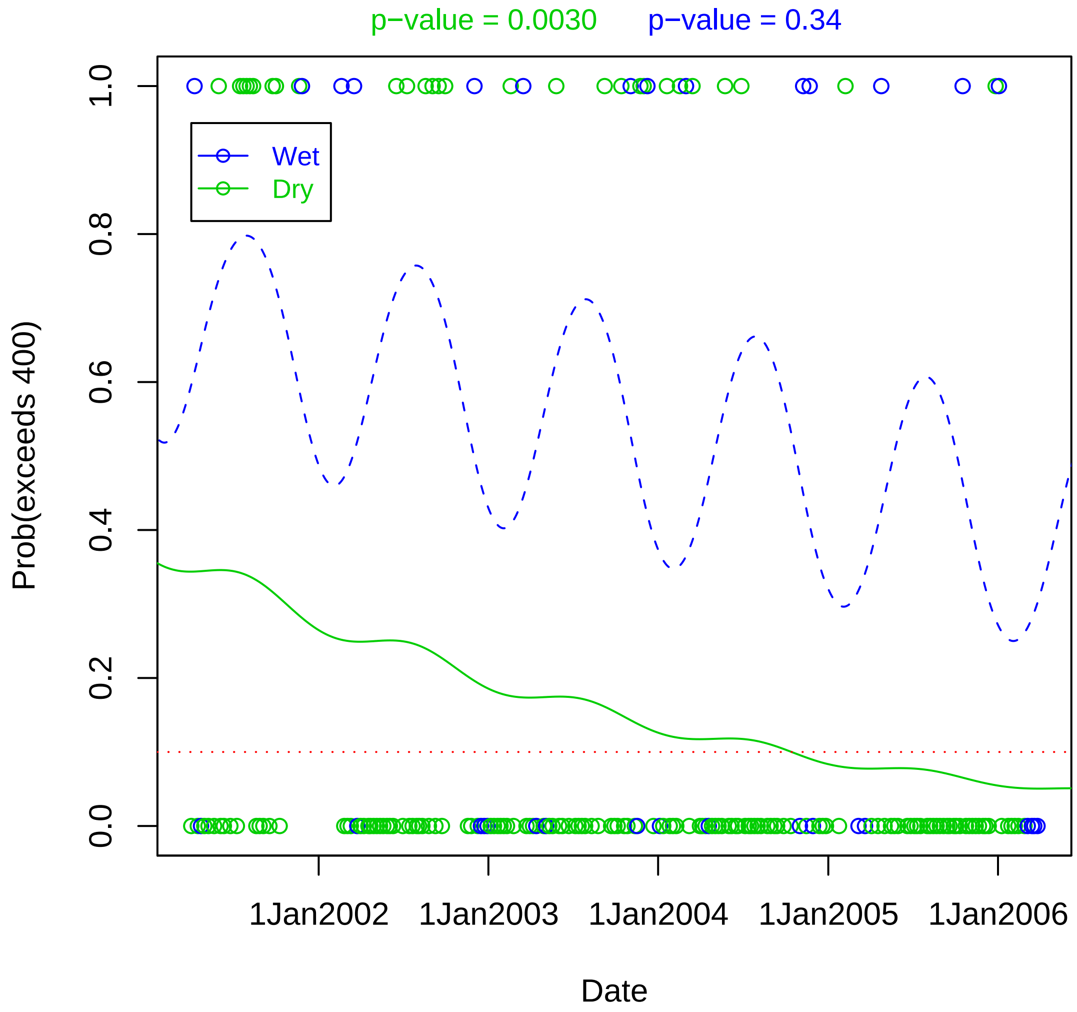


Figure IV−34: Logistic Regression for Big Canyon Wash



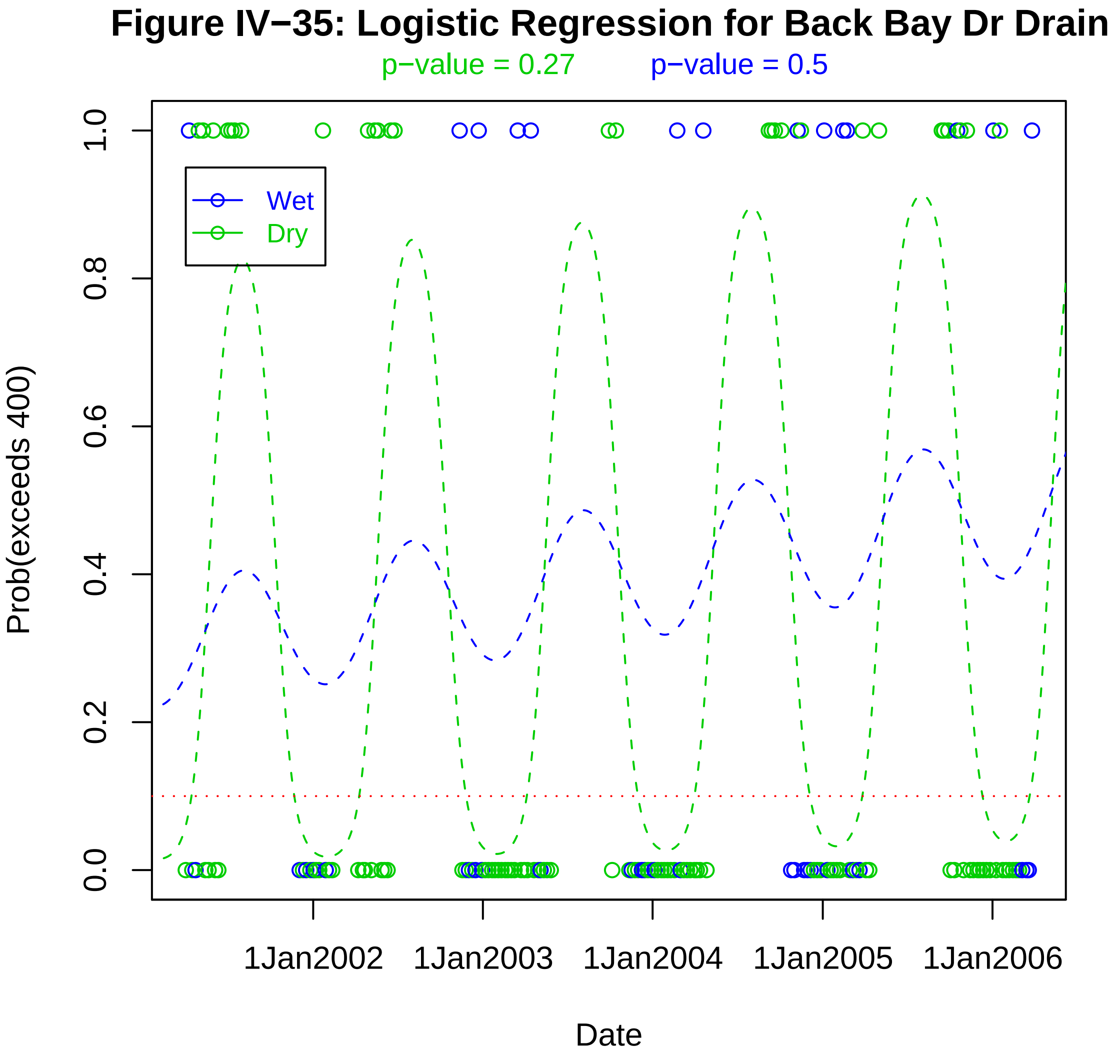


Figure IV−35: Logistic Regression for Back Bay Dr Drain
p−value = 0.27
p−value = 0.5
Wet
Dry
Prob(exceeds 400)
0.0
0.2
0.4
0.6
0.8
1.0
1Jan2002
1Jan2003
1Jan2004
1Jan2005
1Jan2006
Date

Figure V−1: Clustering Based on Fitted Means for Wet and Dry Periods

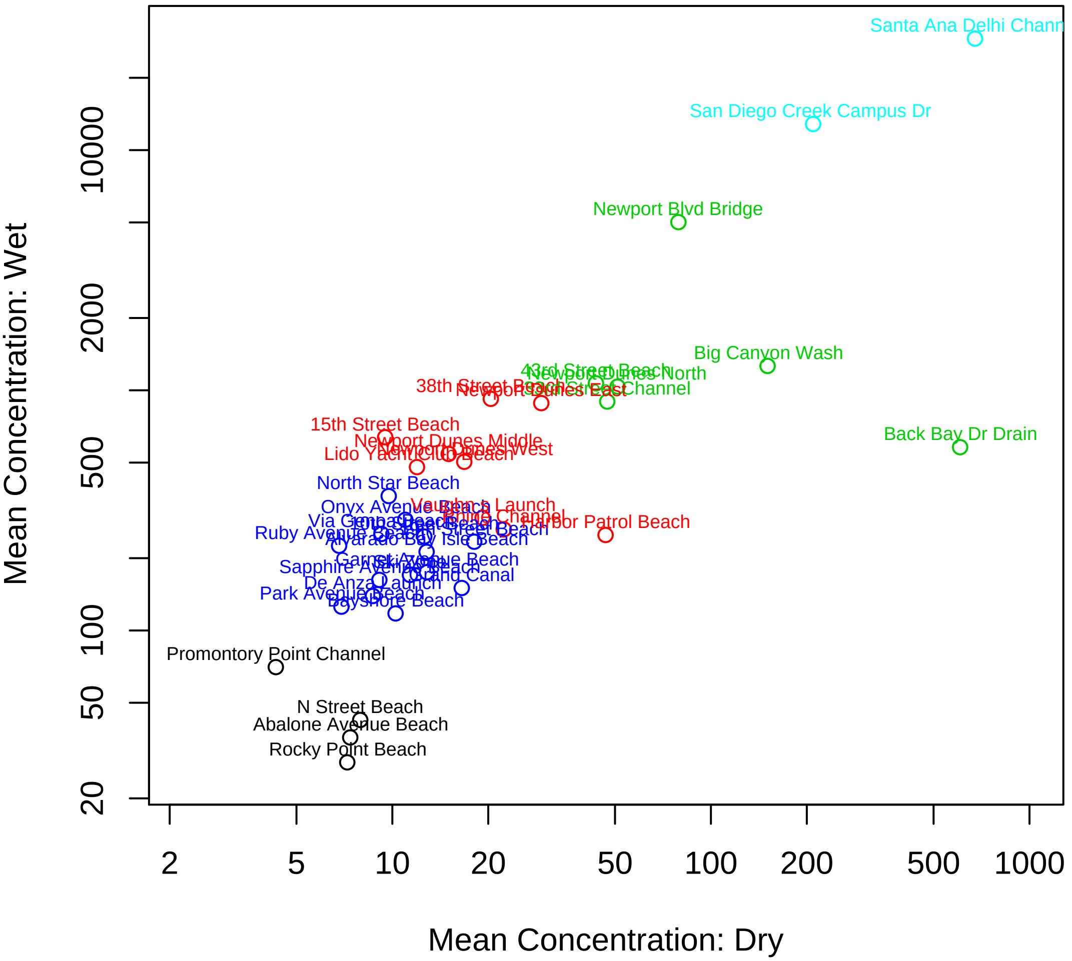


Figure V-2: Clustering Based on Fitted Means for Wet and Dry Periods

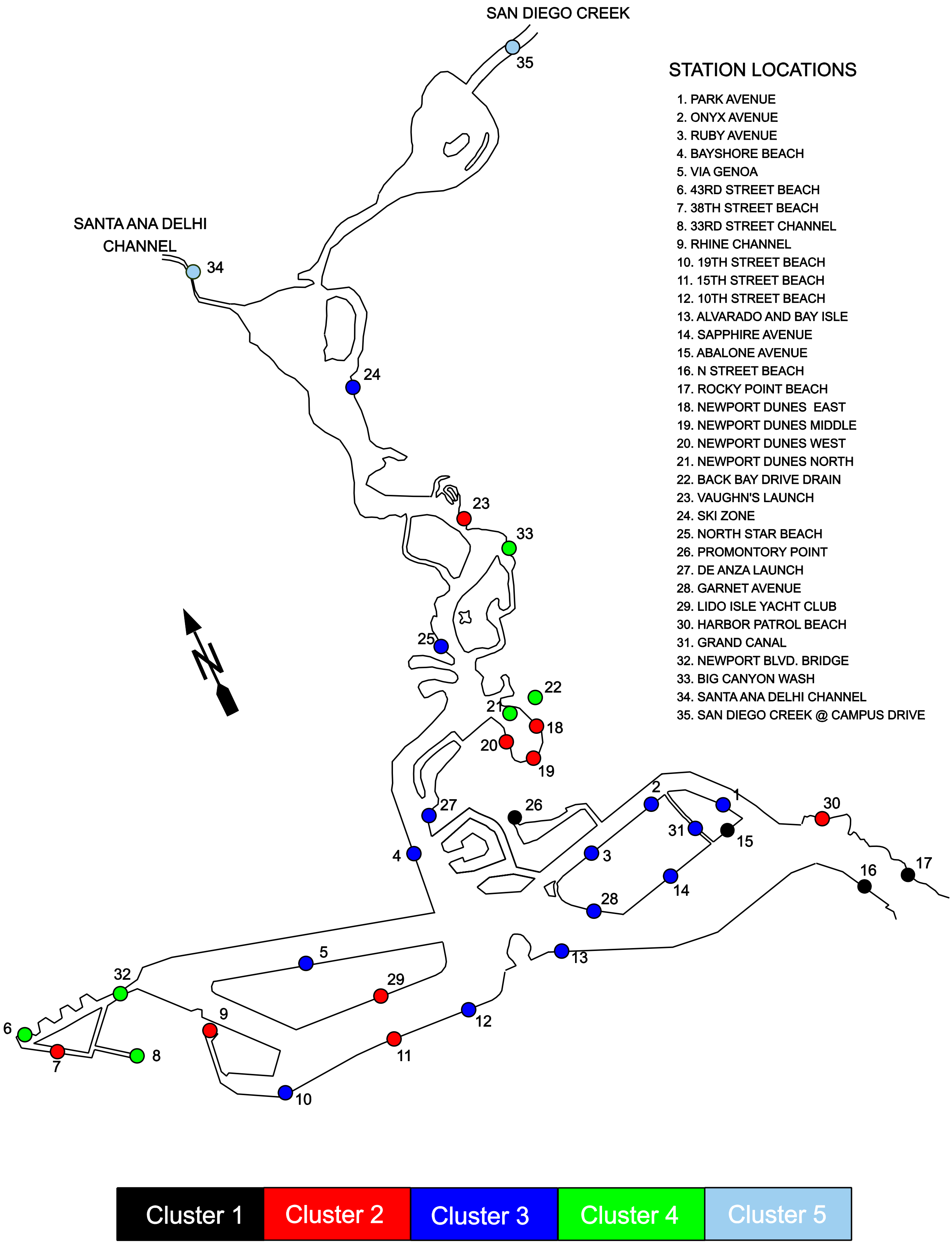


Figure V−3: Clustering Based on Average and Ratio for Wet and Dry Periods

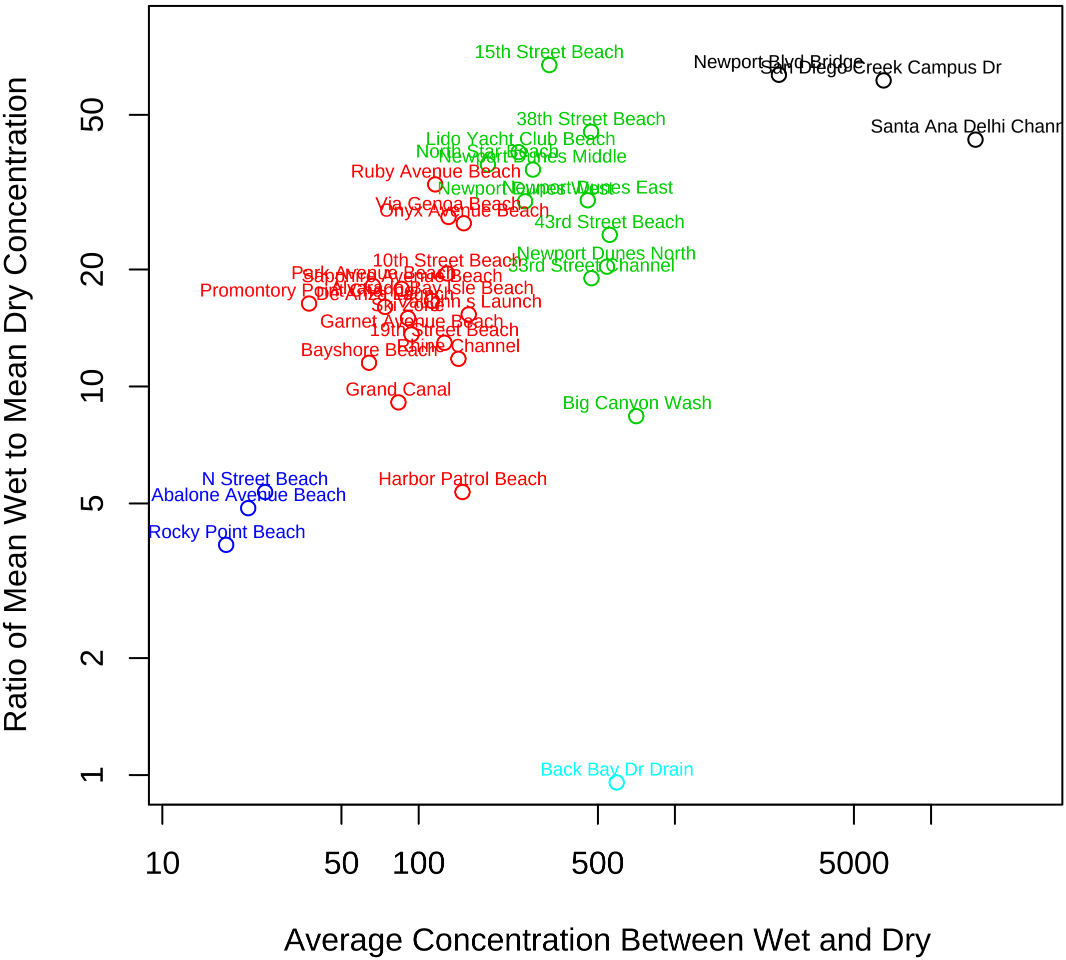


Figure V-4: Clustering Based on Average and Ratio for Wet and Dry Periods