

Appendix C – Assessment of Biostimulation

Appendix C – Assessment of Biostimulation	1
Tables	1
Figures	1
C.1 Water Quality Standards and Screening Criteria.....	3
C.2 Salinas River Reference Sites.....	7
C.2.1 Diel Data for Reference Sites	7
C.3 Lower Salinas River and Old Salinas River.....	9
C.3.1 Dissolved Oxygen: Diel Data, Pre-dawn Sampling, and Grab Samples	9
C.3.2 Old Salinas River and Lower Salinas River: Nutrients, Chlorophyll a and Algal Cover Data	19
C.4 Lower Salinas River Tributaries – Quail Creek, Chualar Creek, Blanco Drain	20
C.4.1 Dissolved Oxygen, Nutrient, Chlorophyll a, and Algal Cover Data	20
C.5 Reclamation Canal-Tembladero Slough	27
C.5.1 Dissolved Oxygen: Diel Data, Pre-dawn Sampling, and Grab Samples	27
C.5.2 Nutrients, Chlorophyll a and Algal Cover Data	34
C.6 Reclamation Canal Tributaries – Espinosa Slough, Santa Rita Creek, Gabilan Creek, Natividad Creek, Alisal Creek, Alisal Slough	35
C.6.1 Dissolved Oxygen: Pre-dawn Sampling, and Grab Samples.....	35
C.6.2 Nutrients, Chlorophyll a and Algal Cover Data	39
C.7 Moro Cojo Slough	44
C.7.1 Dissolved Oxygen: Grab Samples.....	44
C.7.2 Nutrients, Chlorophyll a and Algal Cover Data	45
C.8 Photo Documentation of Biostimulatory Conditions	45

Tables

Table 1. WQOs and Screening Criteria Used as Indicators of Biostimulation.	3
Table 2. Biostimulation Assessment Matrix.....	4
Table 3. % Algal Cover, Old Salinas River and lower Salinas River monitoring sites. ..	20

Figures

Figure 1. Diel Data Reference Site: 309KNG-Salinas River @ King City.....	7
Figure 2. Diel Data Reference Site: 309DSA-Salinas River @ San Ardo.....	8
Figure 3. Diel Data Old Salinas River @ Monterey Dunes Aug 18-19, 2004.....	9
Figure 4. Diel Data Salinas River @ Davis Rd. Aug 18-19, 2004.....	10
Figure 5. Diel Data Salinas River @ Davis Rd. Sept. 8-9, 2005.....	11
Figure 6. Diel Data Salinas River @ Davis Rd. Aug 30-31, 2006.....	12
Figure 7. Diel Data Salinas River @ Davis Rd. Nov. 5-6, 2006.....	13
Figure 8. Monthly DO grab samples – Old Salinas River @ Potrero Rd.	14
Figure 9. Monthly DO grab samples – Old Salinas River @ Monterey Dunes.	15
Figure 10. Monthly DO grab samples – Salinas River @ Highway 1.....	16
Figure 11. Monthly DO grab samples – Salinas River @ Spreckels.....	17
Figure 12. Monthly DO grab samples – Salinas River @ Chualar.....	18
Figure -13. Monthly DO grab samples – Salinas River @ Gonzalez.....	19
Figure 14. Nitrate and Chlorophyll a average concentrations, lower Salinas River.	20
Figure 15. Nitrate and Chlorophyll a average concentrations, Old Salinas River.	20

Figure 16. Pre-dawn dissolved oxygen monitoring, and monthly DO grab samples – Quail Creek @ Potter Rd.....	21
Figure 17. Nitrate and Chlorophyll a average concentrations, Quail Creek; and percent algal cover statistics.	22
Figure 18. Monthly DO grab samples – Chualar Creek.....	23
Figure 19. Nitrate and Chlorophyll a average concentrations, Chualar Creek; and percent algal cover statistics.	24
Figure 20. Monthly DO grab samples – Blanco Drain	25
Figure 21. Nitrate and Chlorophyll a average concentrations, Blanco Drain; and percent algal cover statistics.	26
Figure 22. Diel Data Tembladero Slough @ Molera Rd. Aug 18-19, 2004.....	27
Figure23. Diel Data Tembladero Slough @ Preston Rd. Aug 30-31, 2006.	28
Figure 24. Monthly DO grab samples – Tembladero Slough @ 309TDW	29
Figure 25. Monthly DO grab samples – Tembladero Slough @ 309TEMPRS.	29
Figure 26. Monthly DO grab samples – Tembladero Slough @ 309TEH.....	30
Figure 27. Monthly DO grab samples – Merritt Ditch @ 309MER.....	30
Figure 28 Diel Data Reclamation Canal @ Boronda Rd. Aug 30-31, 2006.	31
Figure 29. Pre-dawn dissolved oxygen monitoring – Reclamation Canal @ Airport Rd.	32
Figure 30. Monthly DO grab samples – lower and upper Reclamation Canal.	33
Figure 31. Nitrate and Chlorophyll a average concentrations, Tembladero Slough and Merritt Ditch; and percent algal cover statistics.	34
Figure 32. Nitrate and Chlorophyll a average concentrations, Reclamation Canal (Lower and Upper); and percent algal cover statistics.	35
Figure 33. Monthly DO grab samples – Espinosa Slough.....	36
Figure 34. Monthly DO grab samples – Alisal Slough.	36
Figure 35. Monthly DO grab samples – Santa Rita Creek.....	37
Figure 36. Monthly DO grab samples – Gabilan Creek.....	37
Figure 37. Monthly DO grab samples – Natividad Creek.	38
Figure 38. Monthly DO grab samples – Alisal Creek @ Hartnell and Airport roads.	38
Figure 39. Nitrate and Chlorophyll a average concentrations, Espinosa Slough; and percent algal cover statistics.	39
Figure 40. Nitrate and Chlorophyll a average concentrations, Alisal Slough; and percent algal cover statistics.	40
Figure 41. Nitrate and Chlorophyll a average concentrations, Santa Rita Creek; and percent algal cover statistics.	41
Figure 42. Nitrate and Chlorophyll a average concentrations, lower Gabilan Creek (sites 309GAB, GAB-VET, 309-GABIL-31), ; and percent algal cover statistics.	42
Figure 43. Nitrate and Chlorophyll a average concentrations, lower Natividad Creek (sites 309NAD, NAT-LAS, NAT-FRE), ; and percent algal cover statistics.....	43
Figure 44. Nitrate and Chlorophyll a average concentrations, lower Alisal Creek (sites 309HRT, 309UAL.....	43
Figure 45. Monthly DO grab samples – Moro Cojo Slough.	44
Figure 46. Nitrate and Chlorophyll a average concentrations, Moro Cojo Slough (sites 306MORMLN, 306MOR and 306-MOROC-32 – Slough Mile Zero to Slough Mile 1.7)), .	45
Figure 47. Location of photo monitoring sites.....	46
Figure 48. Photo documentation of biostimulation.	46

C.1 Water Quality Standards and Screening Criteria

Table 1. WQOs and Screening Criteria Used as Indicators of Biostimulation.

Water Quality Objectives (Regulatory Standards)		
Constituent Parameter	Source of Water Quality Objective	Numeric Water Quality Objective
Dissolved Oxygen	General Inland Surface Waters numeric objective	Dissolved Oxygen shall not be depressed below 5.0 mg/L Median values should not fall below 85% saturation.
	Basin Plan numeric objective WARM, COLD, SPWN	Dissolved Oxygen shall not be depressed below 5.0 mg/L (WARM) Dissolved Oxygen shall not be depressed below 7.0 mg/L (COLD, SPWN)
pH	General Inland Surface Waters numeric objective	pH value shall not be depressed below 7.0 or raised above 8.5.
	Basin Plan numeric objective MUN, AGR, REC1, REC-2	The pH value shall neither be depressed below 6.5 nor raised above 8.3.
	Basin Plan numeric objective WARM, COLD	pH value shall not be depressed below 7.0 or raised above 8.5
Biostimulatory Substances	Basin Plan General Objected for all Inland Surface Waters, Enclosed Bays, and Estuaries	Basin Plan narrative objective: <i>"Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses."</i> (Basin Plan, Chapter 3)
Additional Indicators Supporting Evidence for Biostimulation and Nutrient over-enrichment (Many of these are NOT Regulatory Standards, and should not be used as stand-alone guidelines; but they can provide additional weight of evidence)		
Constituent – Parameter	Source of Screening Criteria	Screening Criteria/Method
Wide diel swings in DO - pH	Wide diel swings widely reported in scientific literature as indicating potential biostimulation	Observational – compare diel swings to reference sites (reference sites show diel DO variation of less than 1 mg/L).
Early morning DO crashes (pre-dawn sampling program)	Early morning DO crashes widely reported in scientific literature as indicating potential biostimulation	Early morning DO crashes, depressed below Basin Plan numeric objectives
Low dissolved oxygen and/or oxygen super saturation	Basin Plan Objectives and California Surface Water Ambient Monitoring Program Technical Report ^A	1) Below Basin Plan Objectives: 7.0 mg/L (COLD, SPWN), or 5.0 mg/L (general objective); or below Basin Plan saturation objective of median 85% saturation; – and/or – 2) Exceeding 13 mg/L = evidence of supersaturated conditions and potential nutrient over-enrichment and biostimulation.
Chlorophyll a	California Surface Water Ambient Monitoring Program Technical Report ^A	Exceeding 15 mg/L = supporting evidence of potential nutrient over-enrichment and biostimulation.
Evidence of nitrogen enrichment relative to Central Coast reference conditions	California Surface Water Ambient Monitoring Program Technical Report ^A	NO ₃ -N exceeding 1/mg/L = evidence of nutrient enrichment (Assessed using geomean of all samples at monitoring site > 1mg/L).
Evidence of phosphorus enrichment relative to reference conditions	USEPA 25 th percentile reference approach for rivers and streams (USEPA, 2000)	Orthophosphate-P exceeding 25 th percentile of inland streams for hydrologic unit 309 (Salinas Watershed) = 0.074 mg/L (evidence of enrichment assessed using geomean of all samples at HUC309 monitoring sites > 0.074mg/L).
Percent Floating Algal Cover	California Surface Water Ambient Monitoring Program Technical Report ^A	One or more observances of 50% cover or greater = supporting evidence of potential nutrient over-enrichment and biostimulation.
Photo evidence of nuisance algae	-	Photo documentation of nuisance algae and aquatic plant growth, etc.
Fish Kills	-	Visual evidence or reporting of fish kills likely or possibly related to dissolved oxygen problems.
Downstream Impacts	USEPA Scientific Advisory Board (2010) stressed the importance of recognizing downstream impacts ^B	Observational: assess whether stream reach showing elevated nutrient concentrations (> 1mg/L NO ₃ -N; see nutrient enrichment screening criteria above) has downstream outlet discharging directly into waterbody which shows evidence of biostimulation problems (as indicated by screening values-weight of evidence in this Table).

^A Worcester, K., D. M. Paradies, and M. Adams. 2010. Interpreting Narrative Objectives for Biostimulatory Substances for California Central Coast Waters. Surface Water Ambient Monitoring Program (SWAMP) Technical Report, July 2010.

^B U.S. EPA Science Advisory Board Review of "Empirical Approaches for Nutrient Criteria Derivation". U.S Environmental Protection Agency. April 27, 2010.

Table 2. Biostimulation Assessment Matrix.

Stream Reach	DO Problems			Nutrient Enrichment	Elevated Algal Biomass		Other indicators of Biostimulatory problems			Biostimulatory Impairment in Stream Reach?
	Wide Diel DO Swings	Pre-dawn DO crashes	Low DO and/or DO supersaturation	NO3-N exceeding reference conditions; or orthophosphate-P exceeding reference conditions	Chlorophyll a exceeding reference conditions	Excess floating algal cover ($\geq 50\%$ cover)	Downstream nutrient impacts to waterbody exhibiting biostimulation	Reported fish kills likely or possibly linked to DO problems	Photo documentation of excessive algal biomass	
Old Salinas River @ Potrero Rd.	No data	No data	Yes	Yes	Yes	No data	Yes (Elkhorn Slough)	Yes	No	Yes
Old Salinas River @ Monterey Dunes	Yes	Yes	Yes	Yes	Yes	Yes	Yes (Elkhorn Slough)	Yes	Yes	Yes
Salinas River @ Hwy. 1	No data	No data	Yes	Yes	Yes	No	Yes (Elkhorn Slough)	No	No	Yes
Salinas River @ Davis Rd.	Yes	Yes	Yes	Yes	No	Yes	Yes (Elkhorn Slough)	No	Yes	Yes
Salinas River @ Spreckels	No data	No data	No	No	No	No	No	No	No	No - based on DO and algal biomass problems not being expressed
Salinas River @ Chualar	No data	No data	No	Yes	No	No	No (no biostim observed at Salinas Riv. @ Spreckels)	No	No	No - based on DO and algal biomass problems not being expressed
Salinas River @ Gonzalez	No data	No data	No	Yes	No	No	No (no biostim observed at Salinas Riv. @ Spreckels)	No	No	No - based on DO and algal biomass problems not being expressed
Tembadero Slough @ Molera	No	No	No	Yes	Yes	No data	Yes	Yes	Yes	No – based on DO problems not being expressed; however, <u>downstream nutrient impacts to Elkhorn Slough are present</u>
Tembadero Slough @ Preston Rd	No	No	Yes	Yes	Yes	No data	Yes (Elkhorn Slough)	Yes	Yes	Yes
Tembadero Slough @ Haro Rd	No data	No data	Yes	Yes	No	No	Yes (Elkhorn Slough)	Yes	No	No – based on algal biomass problems not being expressed; however, <u>downstream nutrient impacts to Elkhorn Slough are present</u>

Stream Reach	DO Problems			Nutrient Enrichment	Elevated Algal Biomass		Other indicators of Biostimulatory problems			Biostimulatory Impairment in Stream Reach?
	Wide Diel DO Swings	Pre-dawn DO crashes	Low DO and/or DO supersaturation	NO3-N exceeding reference conditions; or orthophosphate-P exceeding reference conditions	Chlorophyll a exceeding reference conditions	Excess floating algal cover ($\geq 50\%$ cover)	Downstream nutrient impacts to waterbody exhibiting biostimulation	Reported fish kills likely or possibly linked to DO problems	Photo documentation of excessive algal biomass	
Merritt Ditch upstream of Hwy 183	No data	No data	Yes	Yes	No	Yes	Yes (Tembladero Slough and Elkhorn Slough)	No	No	Yes
Lower Reclamation Canal San Jon Rd. to Victor Rd.	Yes	Yes	Yes	Yes	Yes	Yes	Yes (Tembladero Slough and Elkhorn Slough)	Yes	Yes	Yes
Upper Reclamation Canal Airport Rd. to La Guardia	No data	Yes	Yes	Yes	Yes	Yes	Yes (Tembladero Slough and Elkhorn Slough)	No	Yes	Yes
Quail Creek Hwy 101 to Potter Rd.	No data	No	No	Yes	No	Yes	No (biostimulation not present in Salinas Riv. above Sprekels)	No	Yes	No- based on DO problems not being expressed
Chualar Creek River Road to Old Stage Rd. and unnamed tributary	No data	No data	No	Yes	No	No	No (biostimulation not present in Salinas Riv. above Sprekels)	No	No	No- based on DO and algal biomass problems not being expressed
Blanco Drain @ pump	No data	No data	No	Yes	No	Yes	Yes (Salinas River below Spreckels)	No	Yes	No – based on DO problems not being expressed; however, <u>downstream nutrient impacts</u> to Salinas River below Spreckels are present
Espinosa Slough @ site 309ESP	No data	No data	Yes	Yes	No	No	Yes (lower Reclamation Canal)	No	No	No – based on algal biomass problems not being expressed; however, <u>downstream nutrient impacts</u> to Reclamation Canal are present

Stream Reach	DO Problems			Nutrient Enrichment	Elevated Algal Biomass		Other indicators of Biostimulatory problems			Biostimulatory Impairment in Stream Reach?
	Wide Diel DO Swings	Pre-dawn DO crashes	Low DO and/or DO supersaturation	NO3-N exceeding reference conditions; or orthophosphate-P exceeding reference conditions	Chlorophyll a exceeding reference conditions	Excess floating algal cover ($\geq 50\%$ cover)	Downstream nutrient impacts to waterbody exhibiting biostimulation	Reported fish kills likely or possibly linked to DO problems	Photo documentation of excessive algal biomass	
Alisal Slough @ White Barn	No data	No data	No	Yes	No	No	Yes (lower Reclamation Canal)	No	No	No – based on DO and algal biomass problems not being expressed; however, <u>downstream nutrient impacts to Salinas River below Spreckels</u> are present
Santa Rita Creek @ Santa Rita park	No data	No data	Yes	Yes	Yes	No	Yes (lower Reclamation Canal)	No	Yes	Yes
Gabilan Creek @ Boronda Rd.	No data	No data	Yes	Yes	No	No	Yes (lower Reclamation Canal)	No	No	No – based on algal biomass problems not being expressed; however, <u>downstream nutrient impacts to Reclamation Canal</u> are present
Natividad Creek - Las Casitas to Boronda Rd.	No data	No data	Yes (median DO saturation below Basin Plan objective)	Yes	No	No	Yes (lower Reclamation Canal)	No	No	No – based on algal biomass problems not being expressed; however, <u>downstream nutrient impacts to Reclamation Canal</u> are present
Alisal Creek - Hartnell and Boronda Rds.	No data	No data	No	Yes	Yes	No data	Yes (lower Reclamation Canal)	No	Yes	No – based on DO problems not being expressed; however, <u>downstream nutrient impacts to Reclamation Canal</u> are present
Moro Cojo Slough, sites 306MORMLN, 306MOR, 306-MOROC-32	No data	No data	Yes	Yes (orthophosphate exceeding reference conditions)	No	Yes	Yes (Elkhorn Slough)	No	Yes	Yes

C.2 Salinas River Reference Sites

C.2.1 Diel Data for Reference Sites

Figure 1. Diel Data Reference Site: 309KNG-Salinas River @ King City.

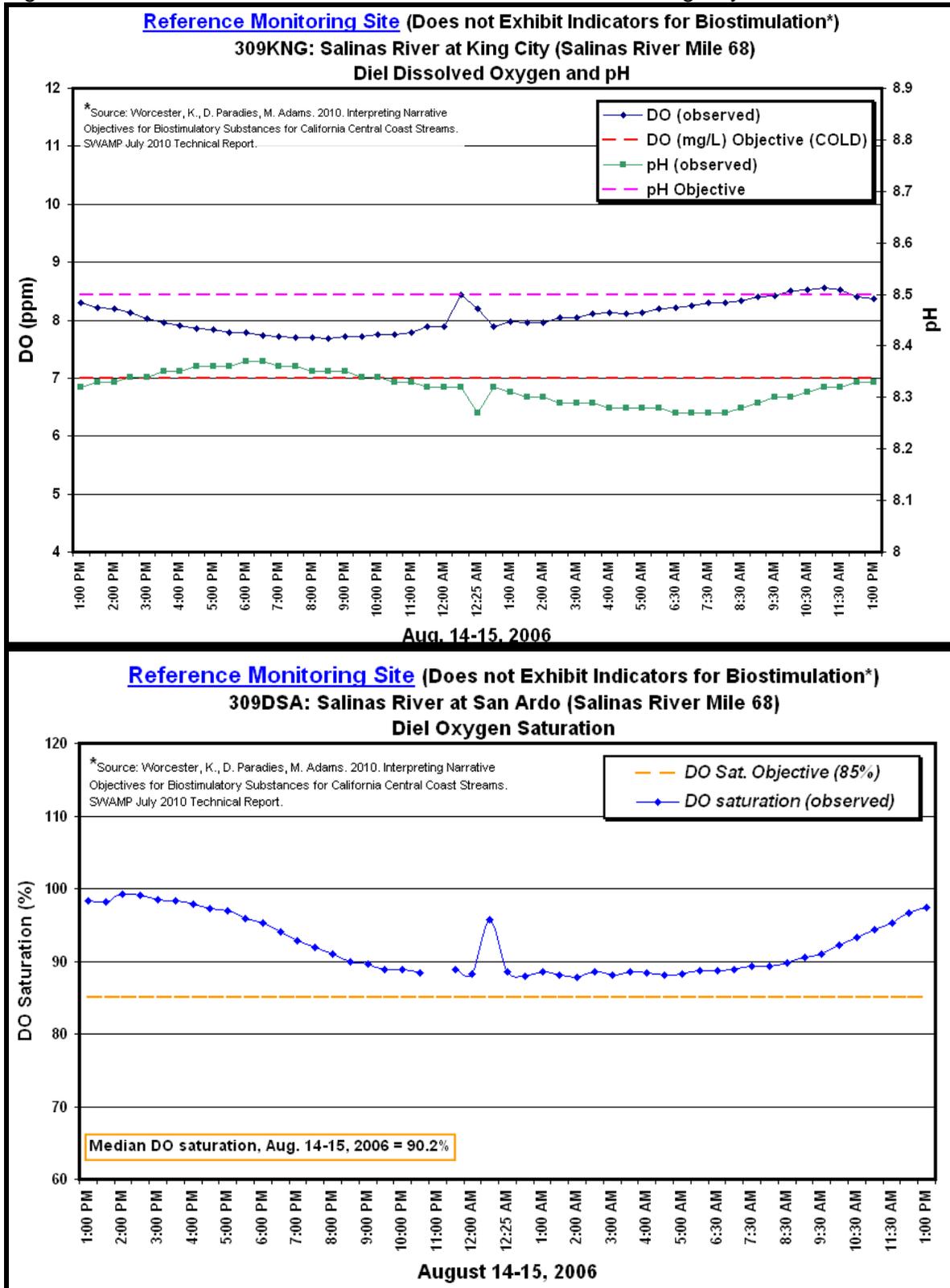
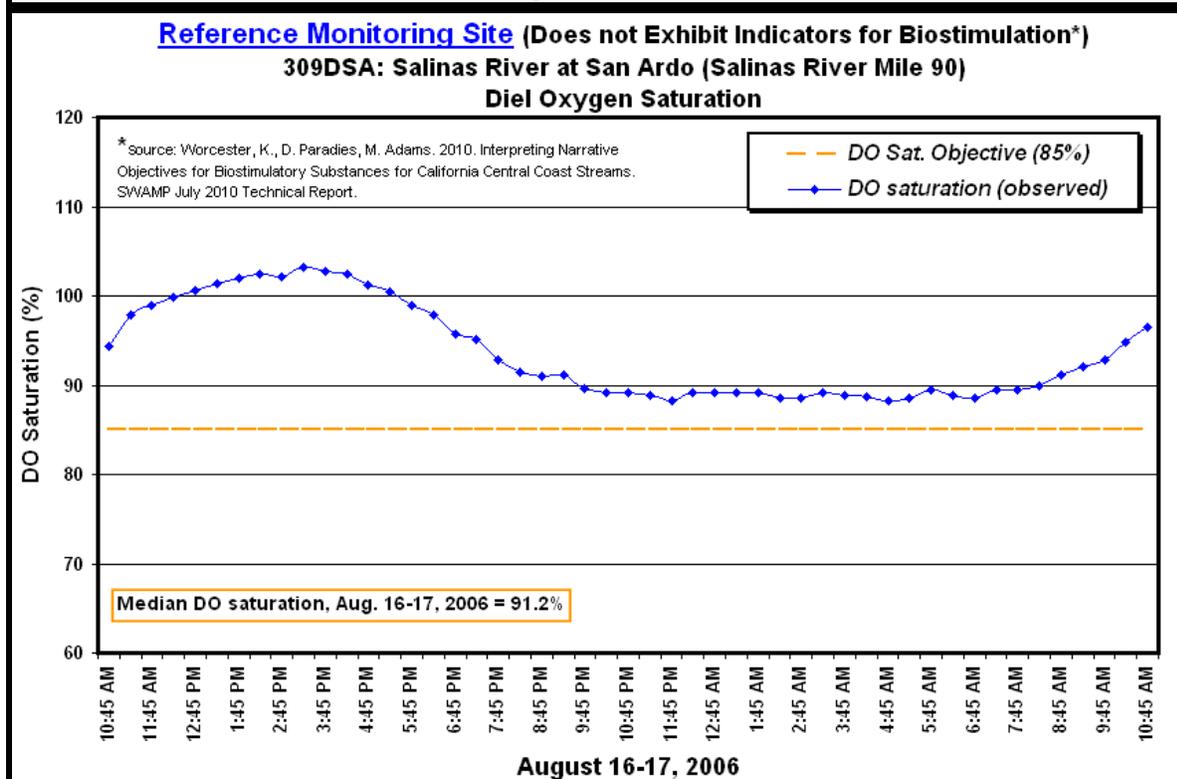
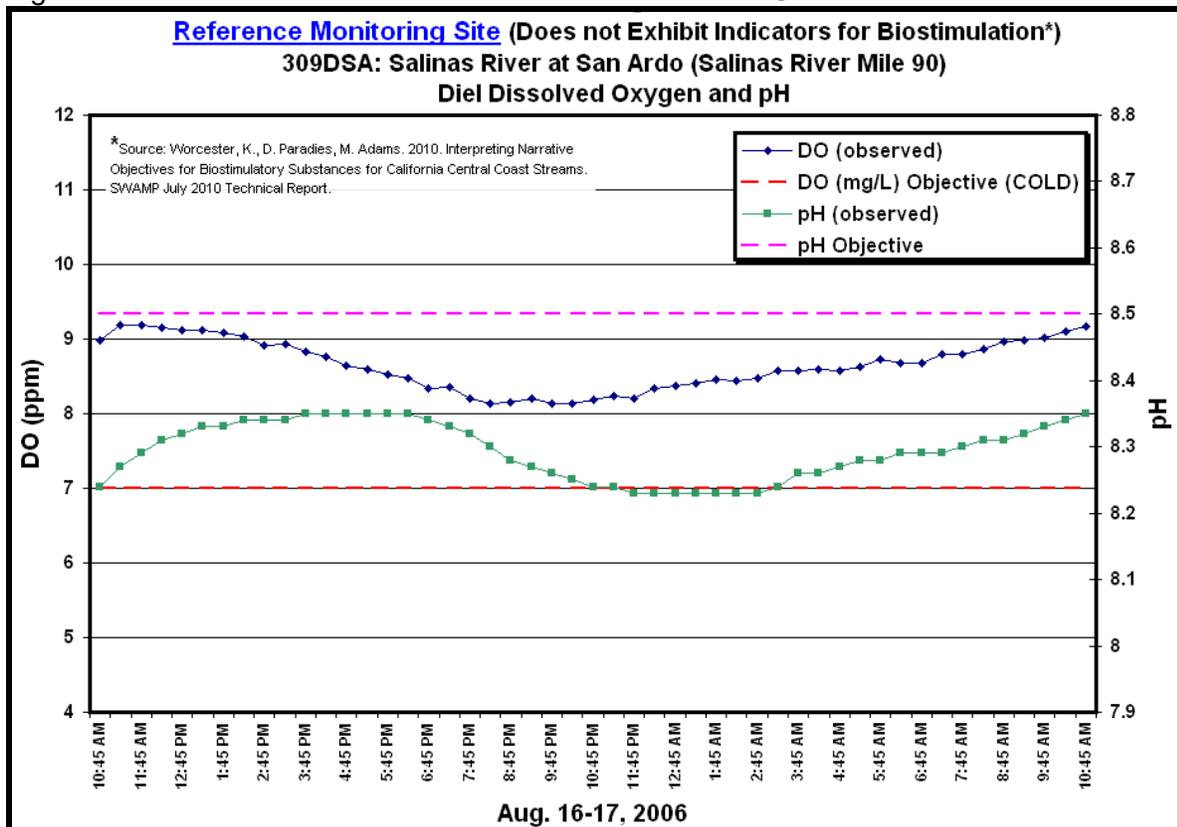


Figure 2. Diel Data Reference Site: 309DSA-Salinas River @ San Ardo.



C.3 Lower Salinas River and Old Salinas River

C.3.1 Dissolved Oxygen: Diel Data, Pre-dawn Sampling, and Grab Samples

Figure 3. Diel Data Old Salinas River @ Monterey Dunes Aug 18-19, 2004.

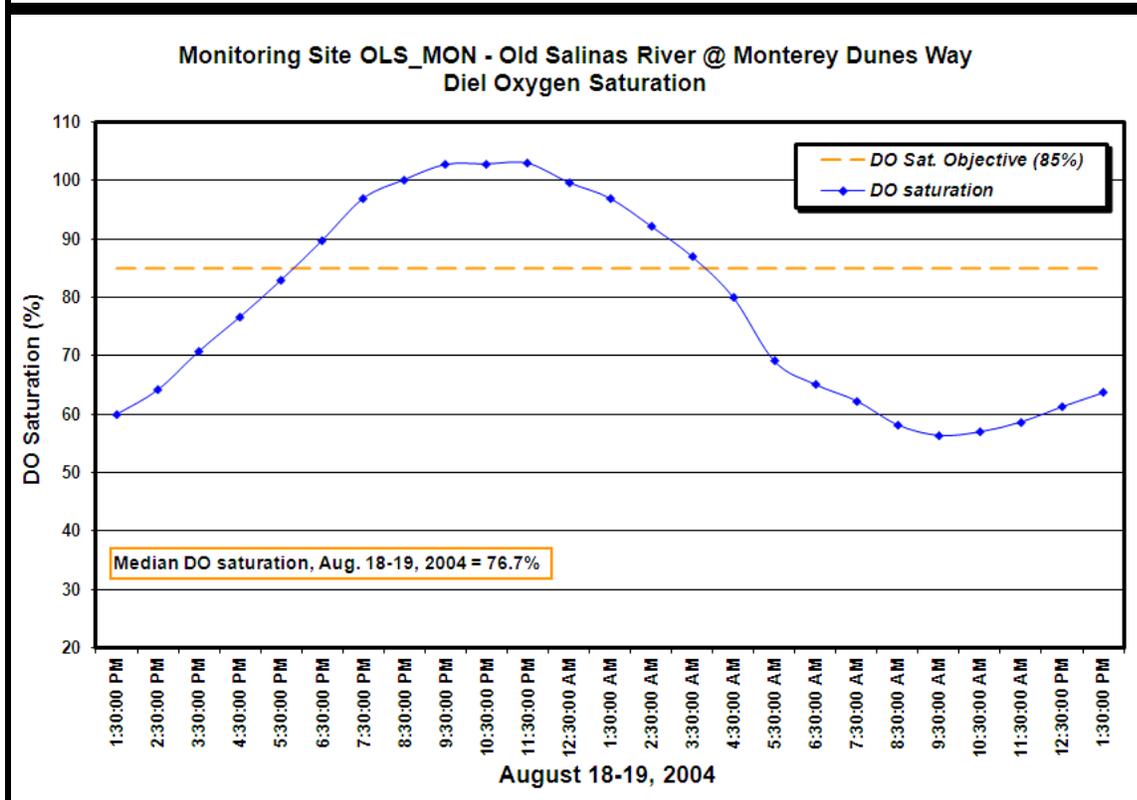
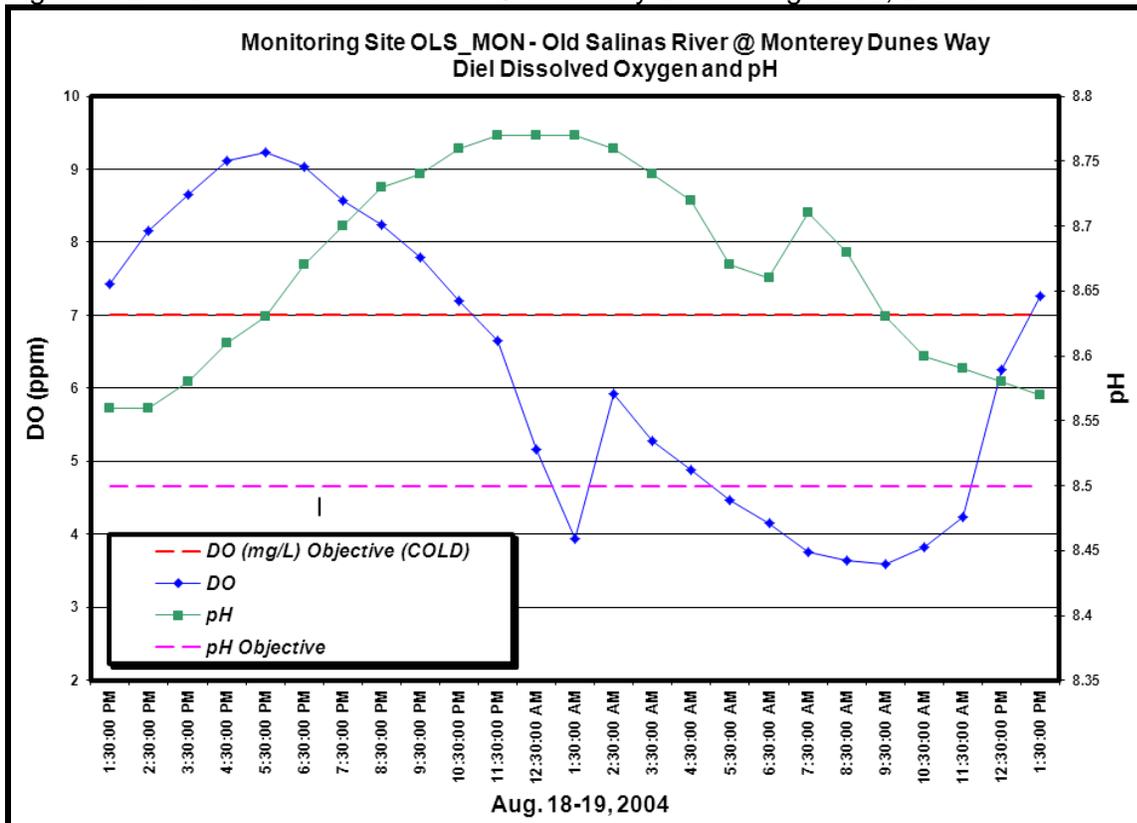


Figure 4. Diel Data Salinas River @ Davis Rd. Aug 18-19, 2004.

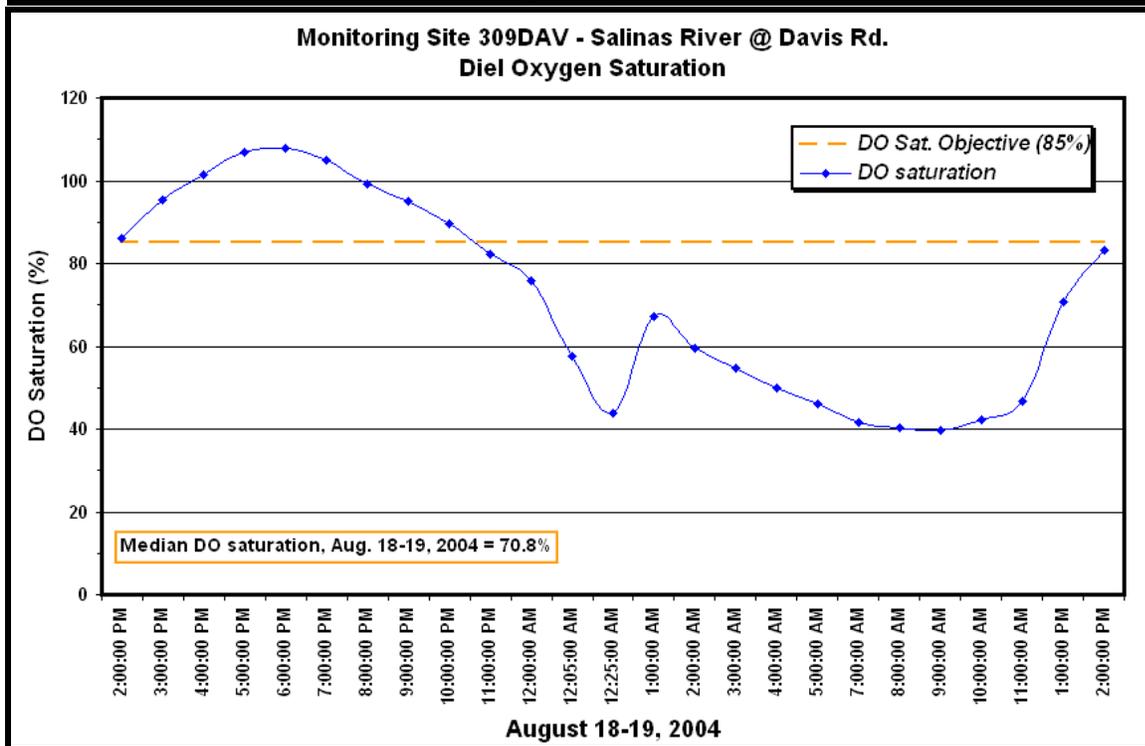
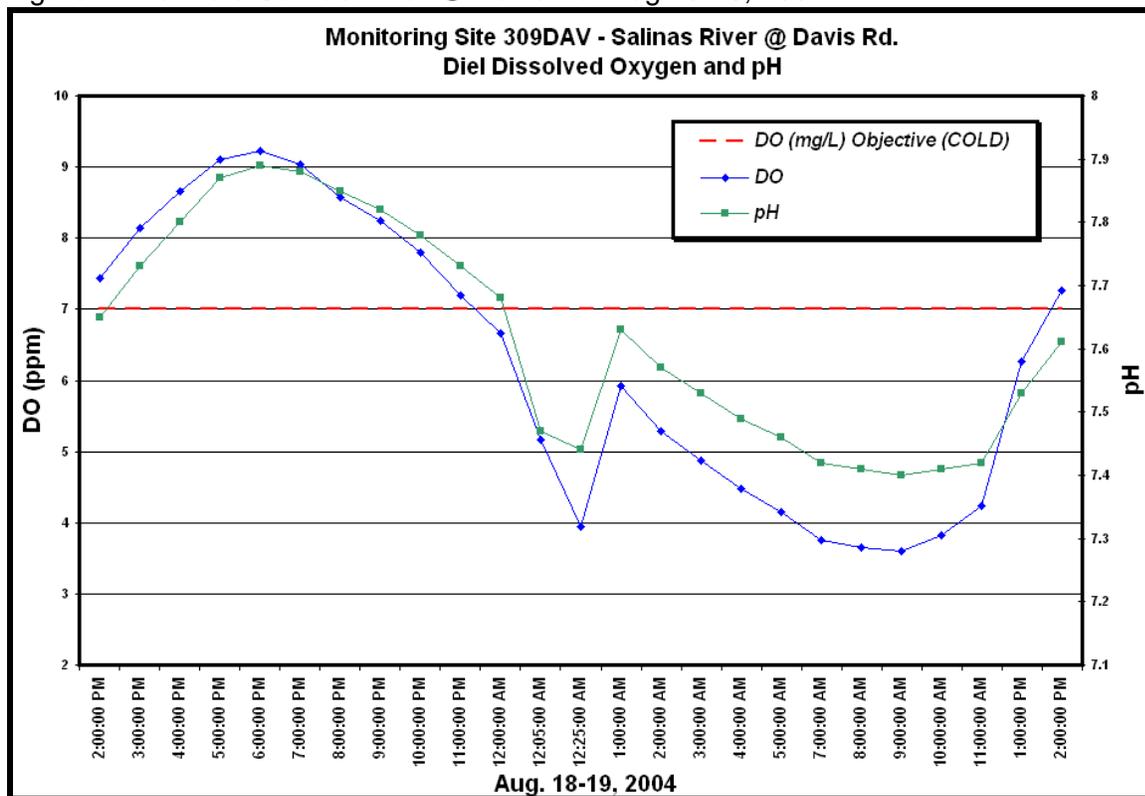


Figure 5. Diel Data Salinas River @ Davis Rd. Sept. 8-9, 2005.

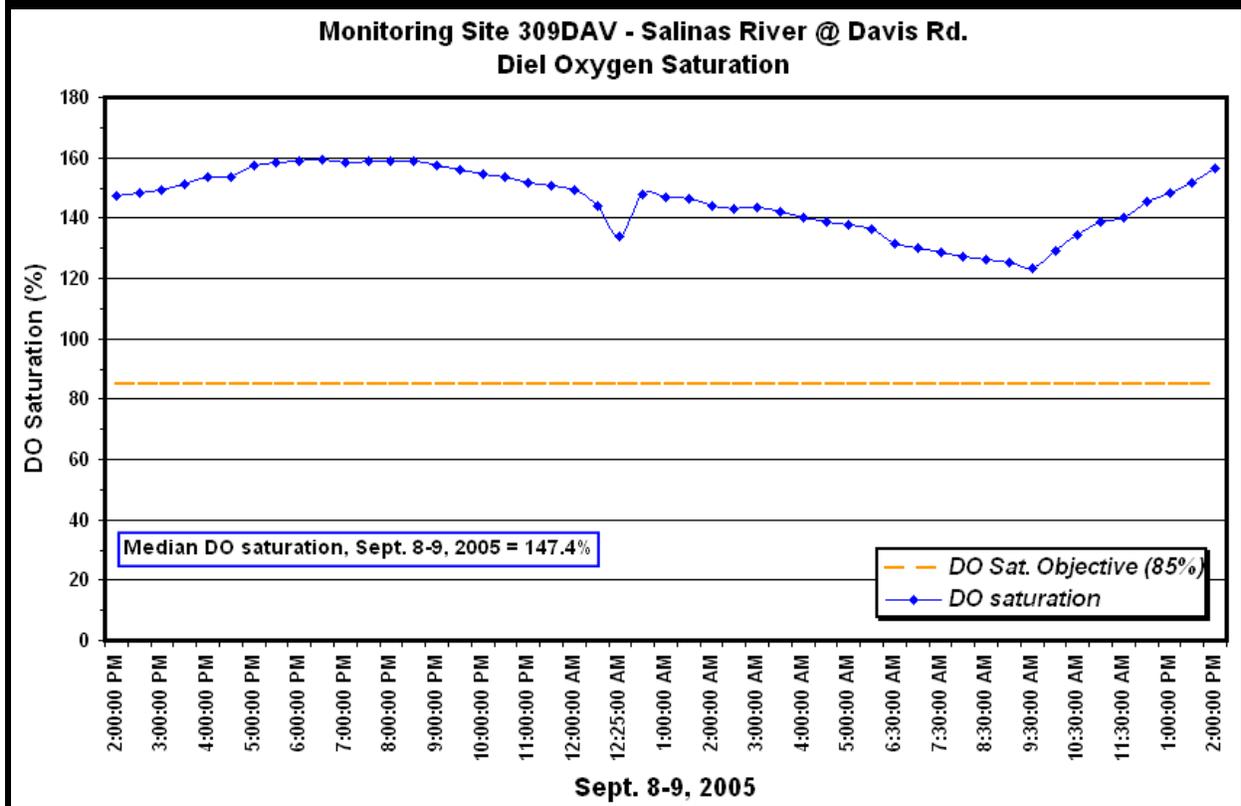
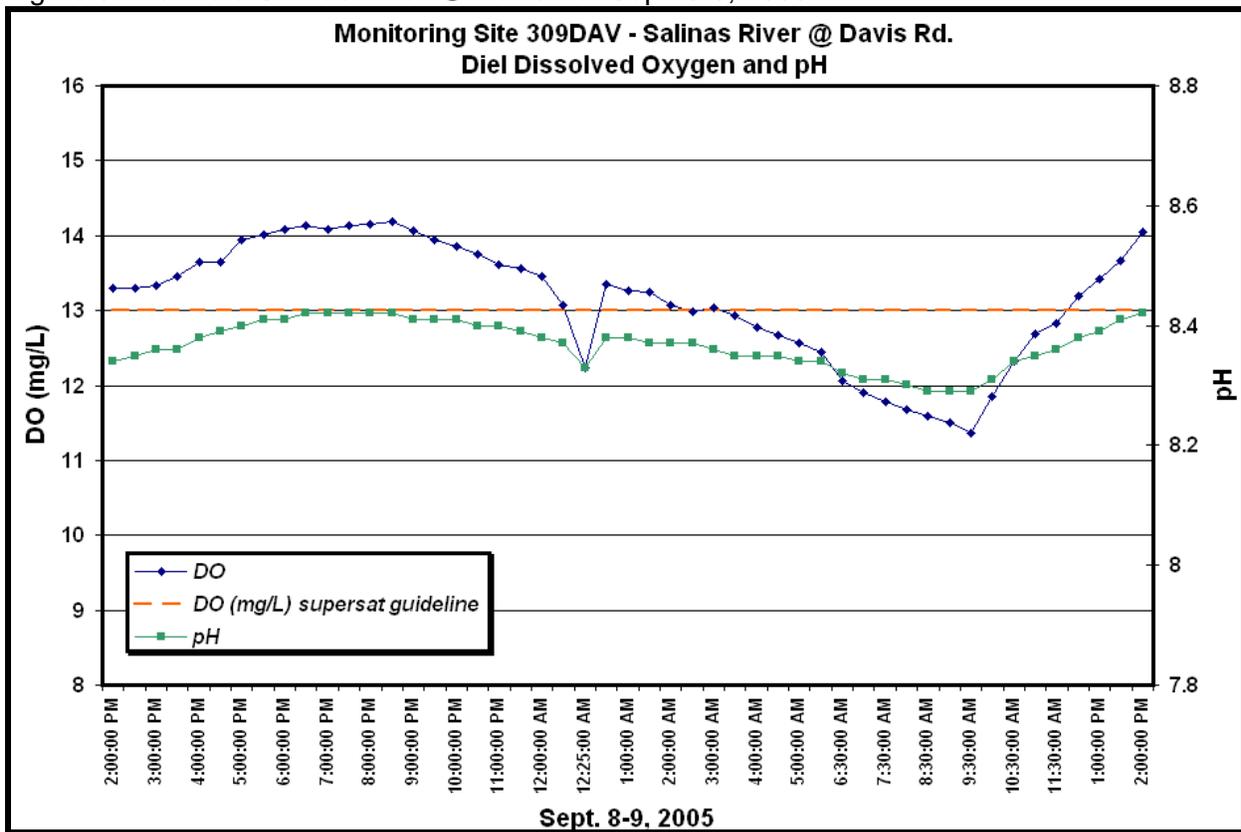


Figure 6. Diel Data Salinas River @ Davis Rd. Aug 30-31, 2006.

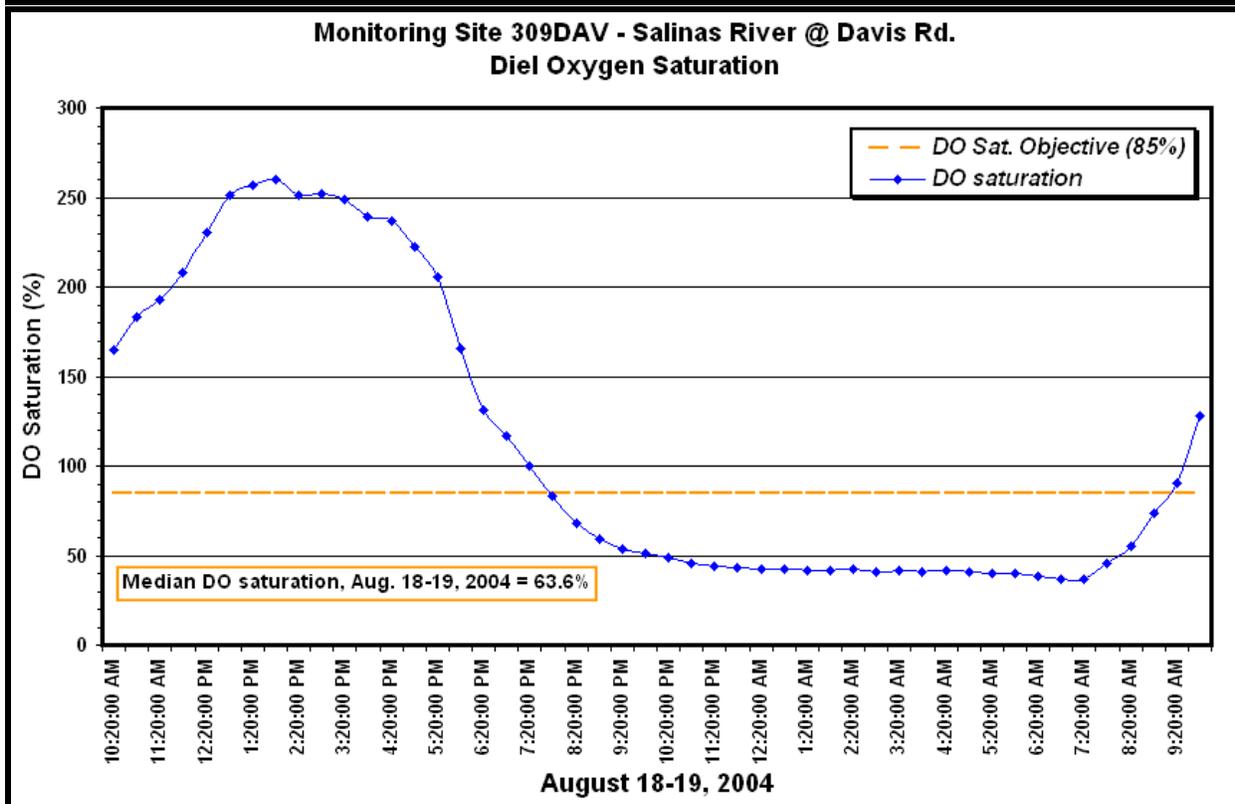
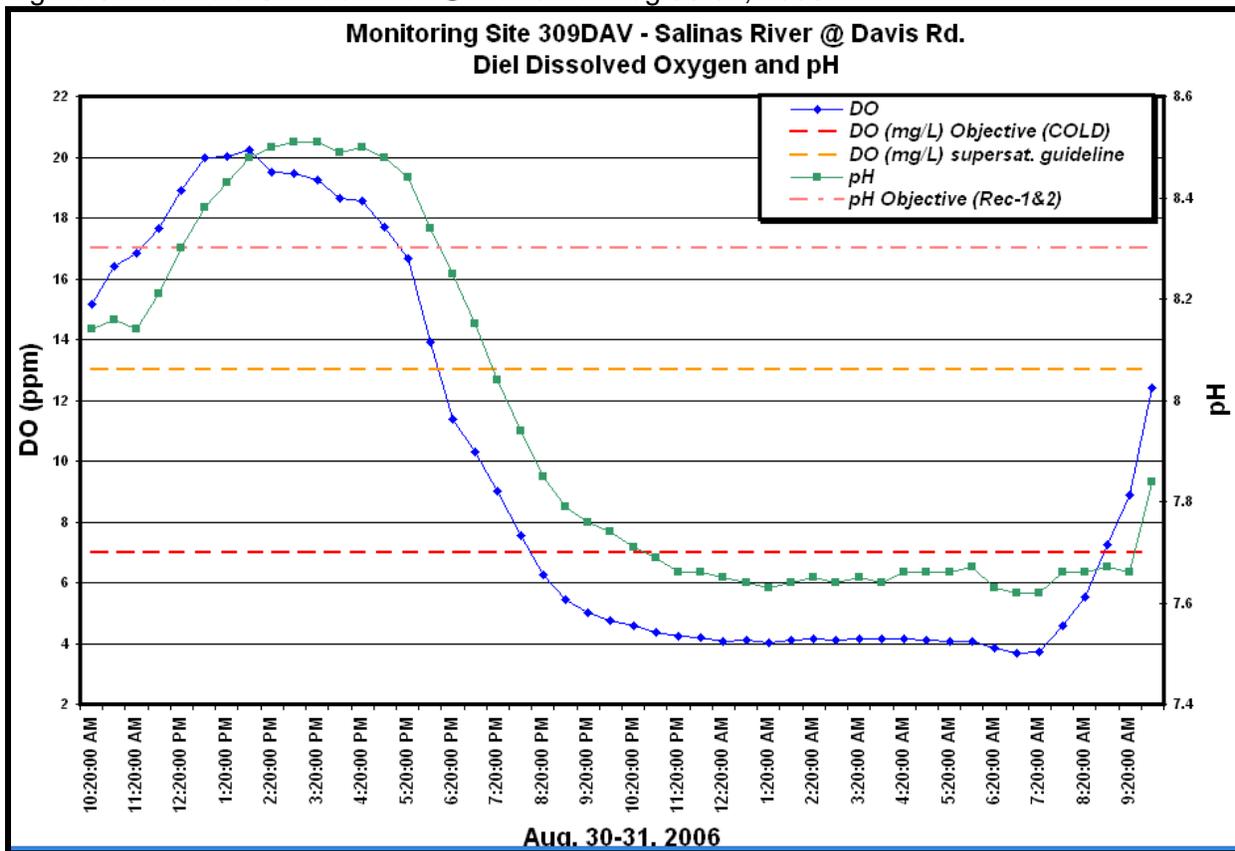


Figure 7. Diel Data Salinas River @ Davis Rd. Nov. 5-6, 2006

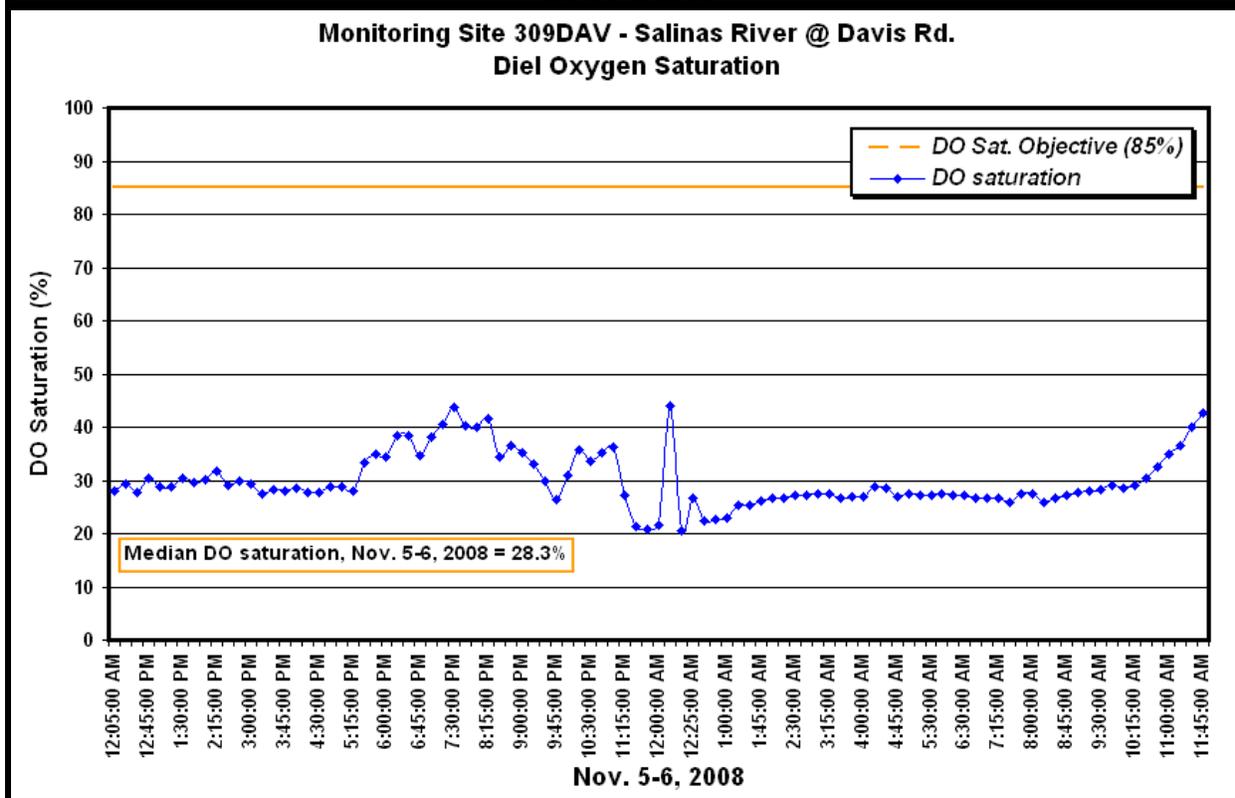
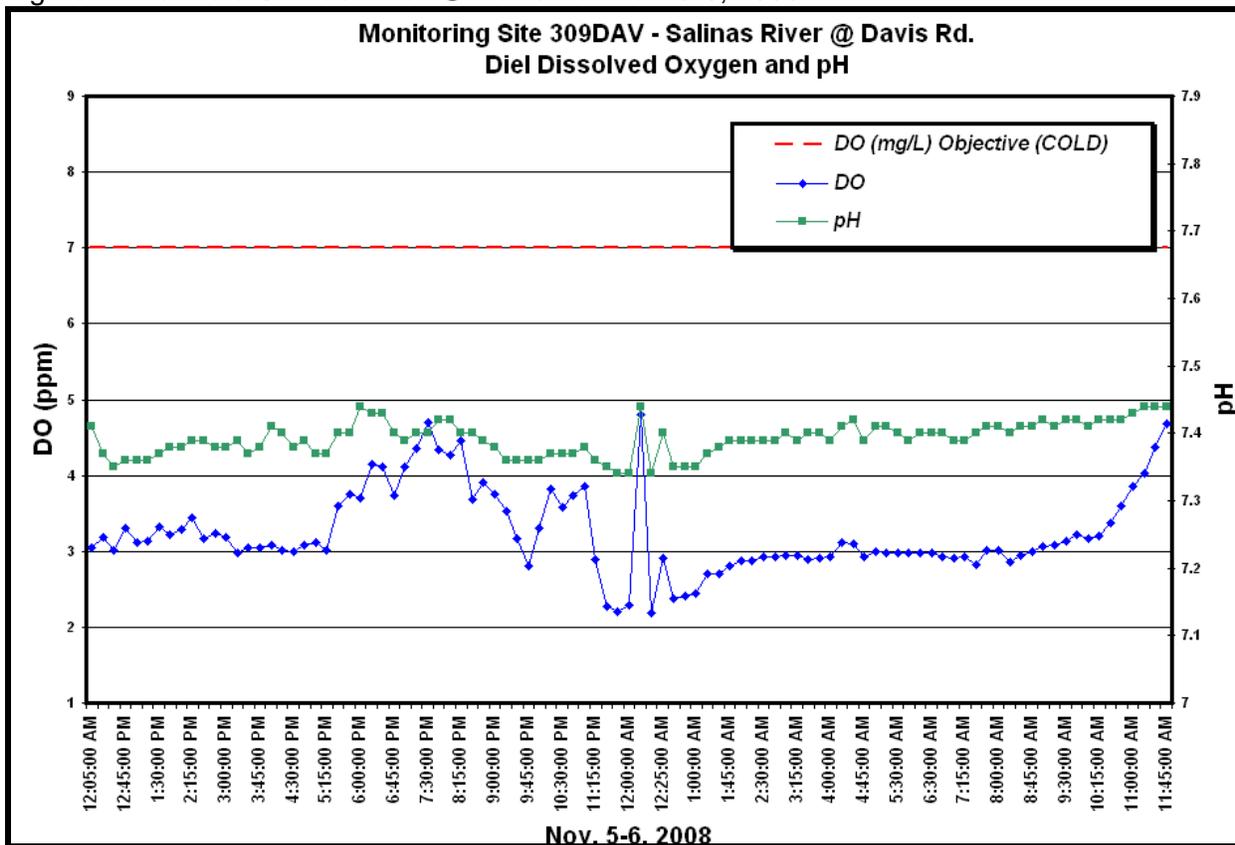


Figure 8. Monthly DO grab samples – Old Salinas River @ Potrero Rd.

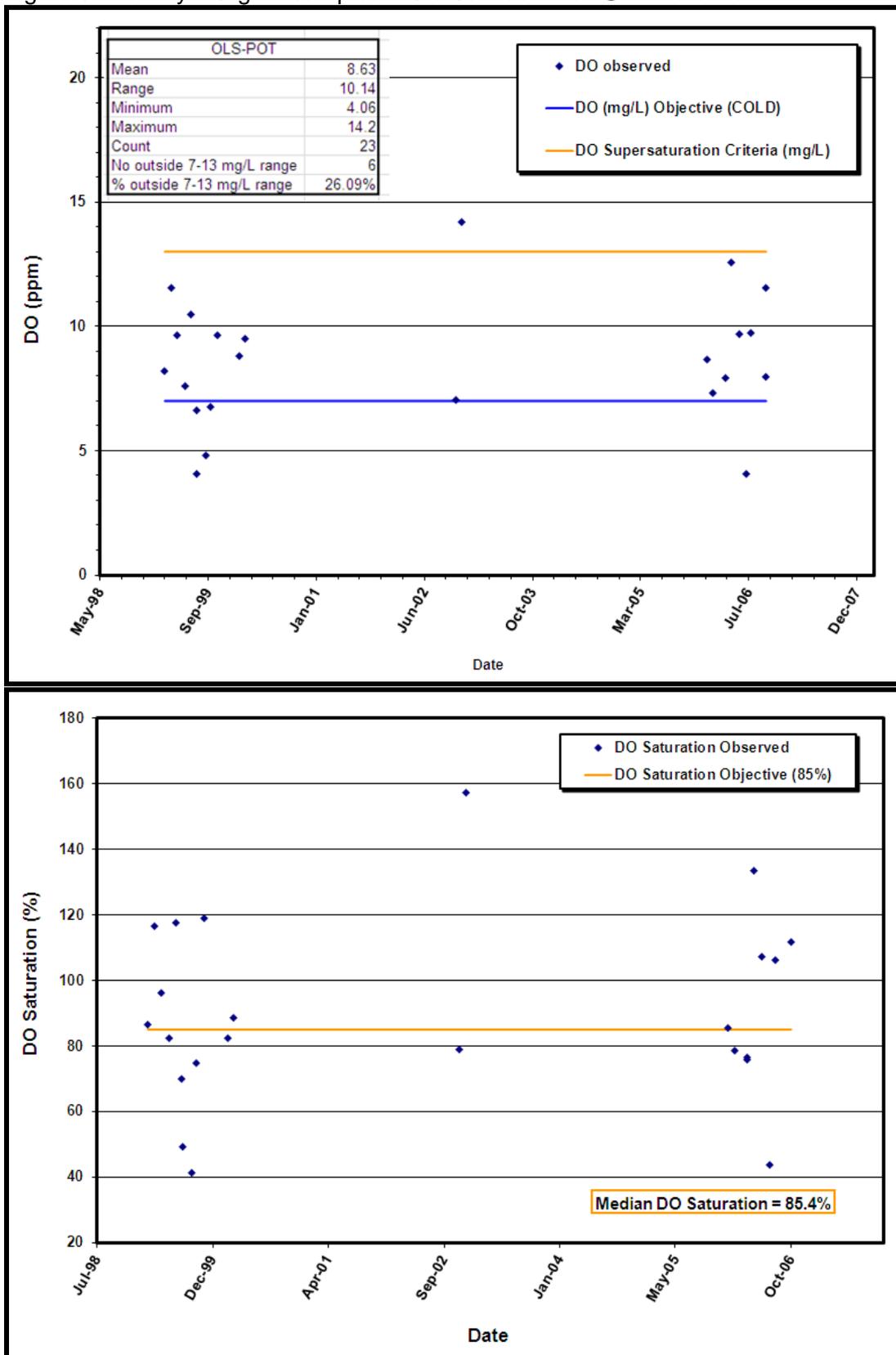


Figure 9. Monthly DO grab samples – Old Salinas River @ Monterey Dunes.

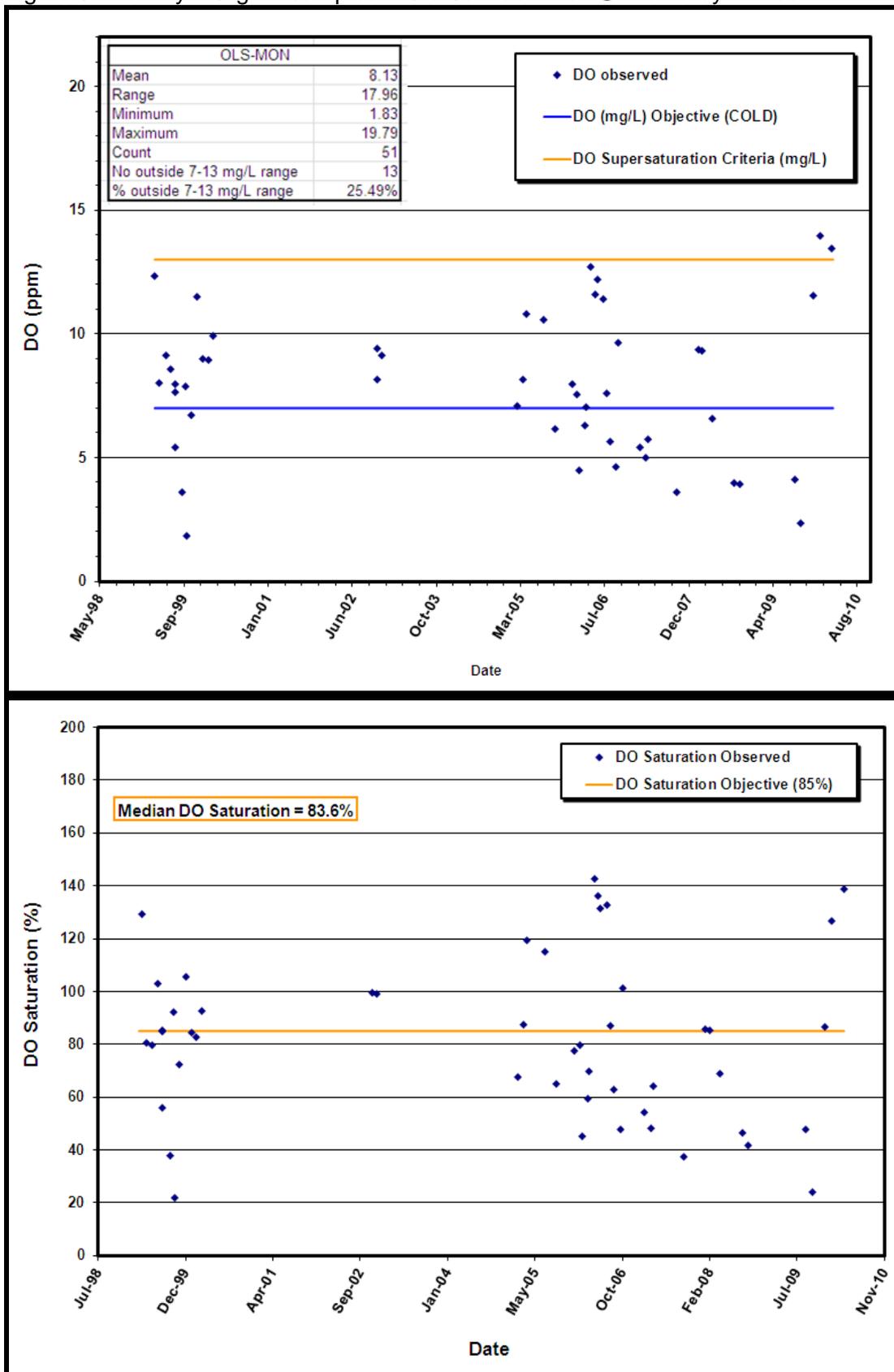


Figure 10. Monthly DO grab samples – Salinas River @ Highway 1.

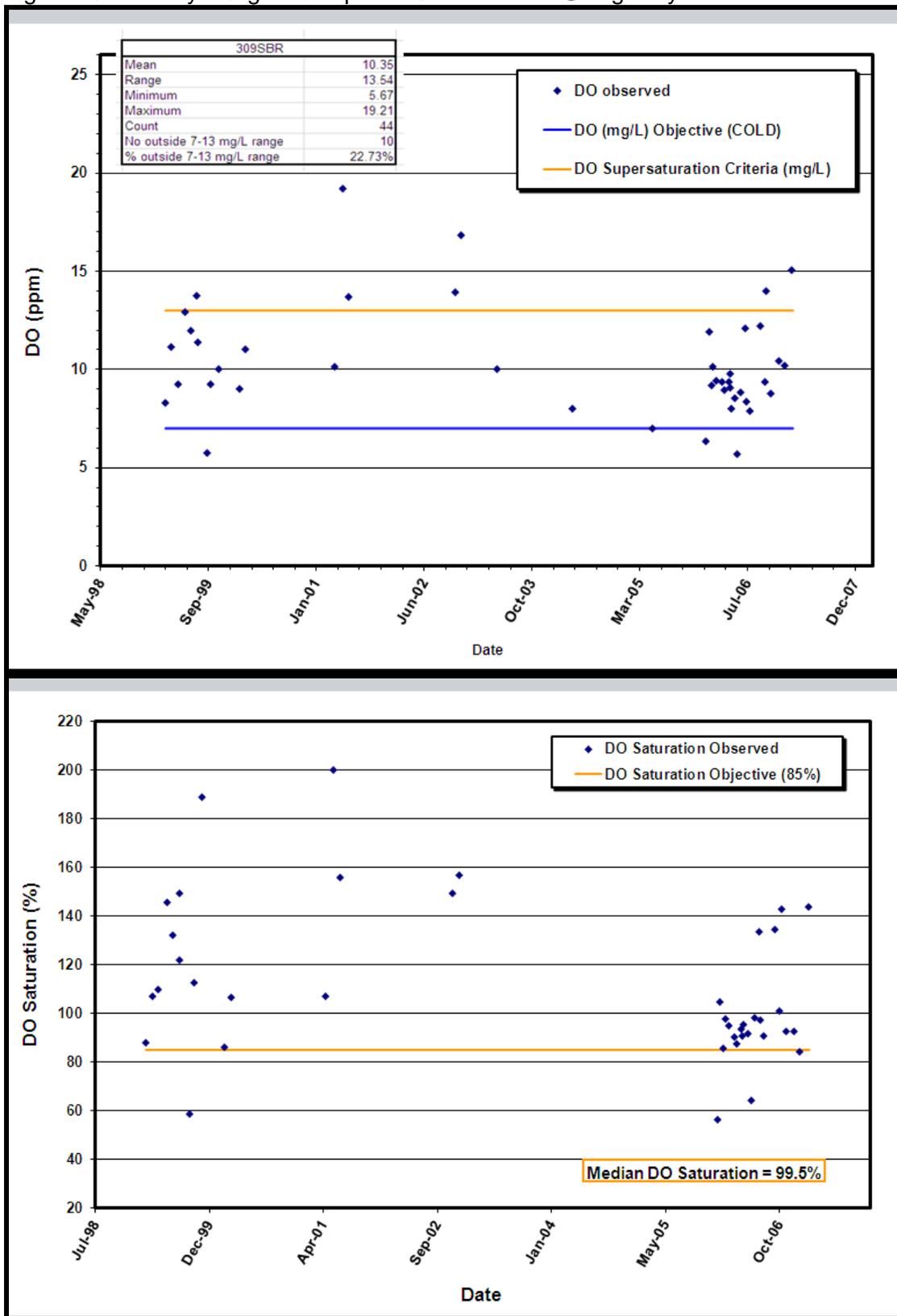


Figure 11. Monthly DO grab samples – Salinas River @ Spreckels.

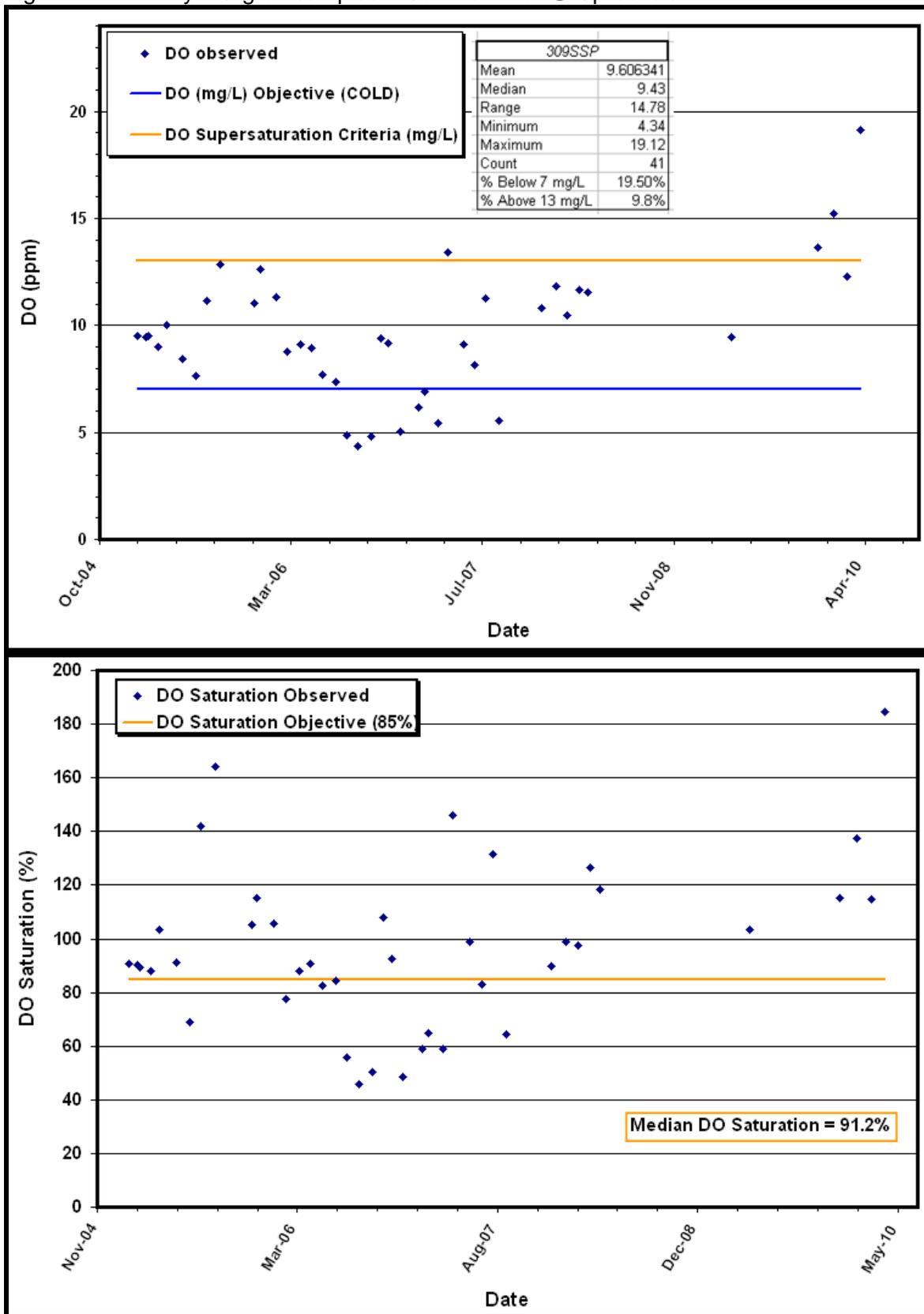


Figure 12. Monthly DO grab samples – Salinas River @ Chualar.

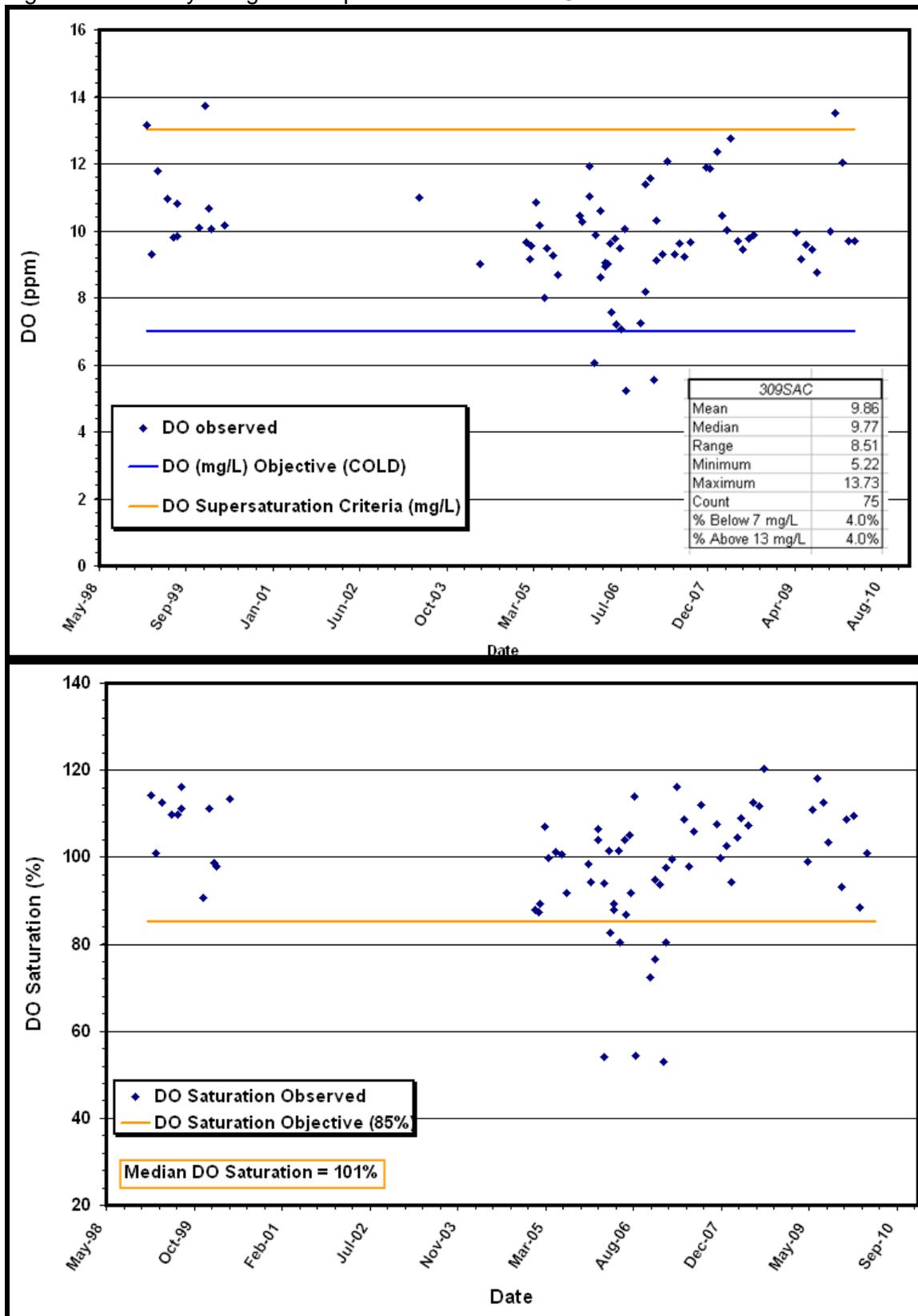
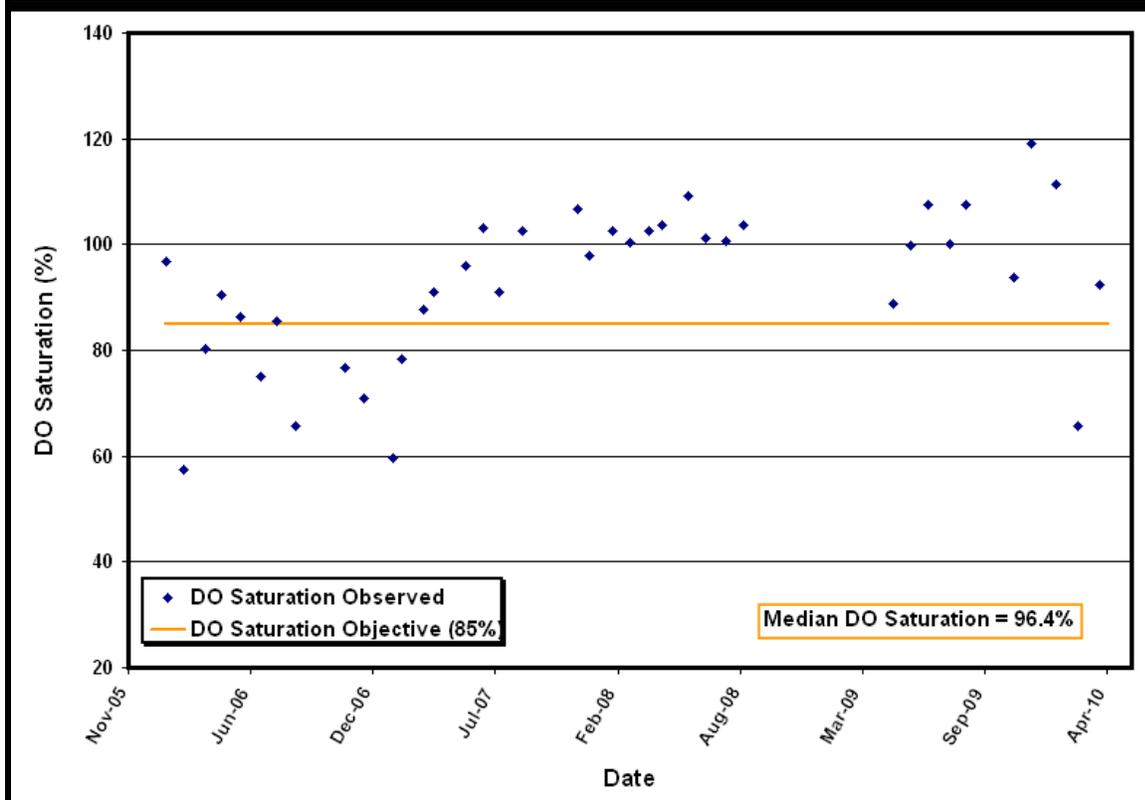
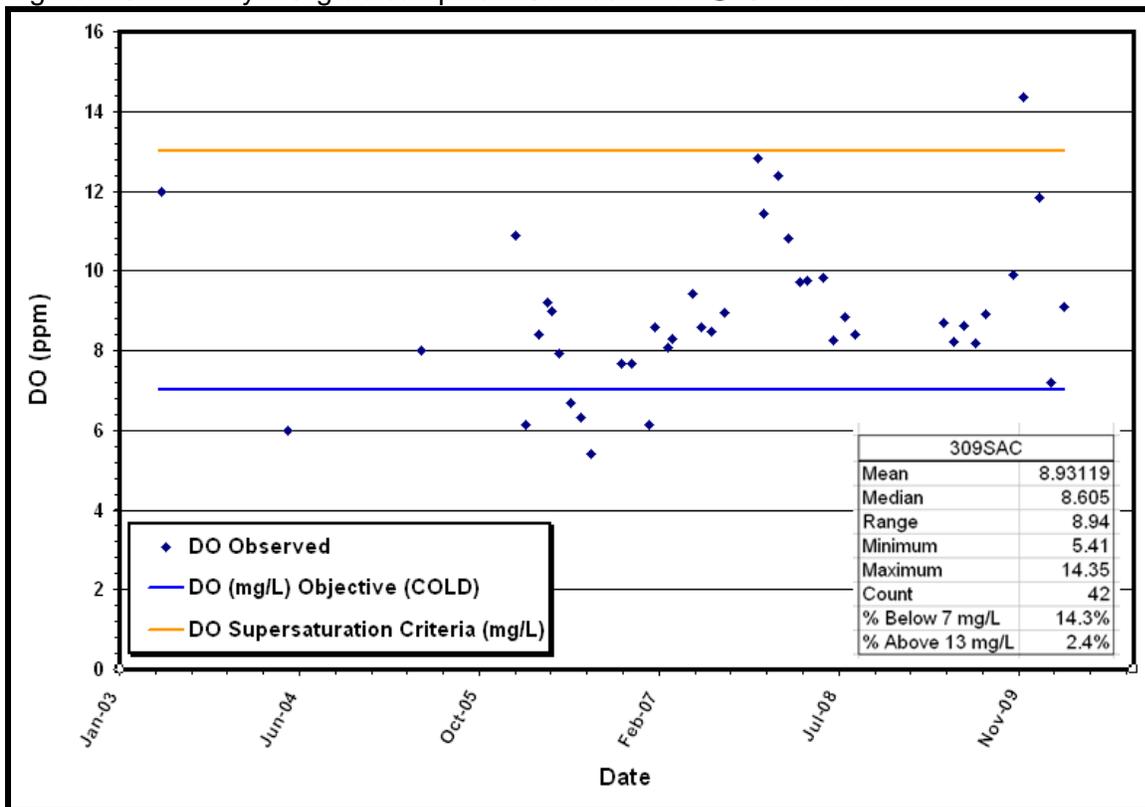


Figure -13. Monthly DO grab samples – Salinas River @ Gonzalez.



C.3.2 Old Salinas River and Lower Salinas River: Nutrients, Chlorophyll a and Algal Cover Data

Figure 14. Nitrate and Chlorophyll a average concentrations, lower Salinas River.

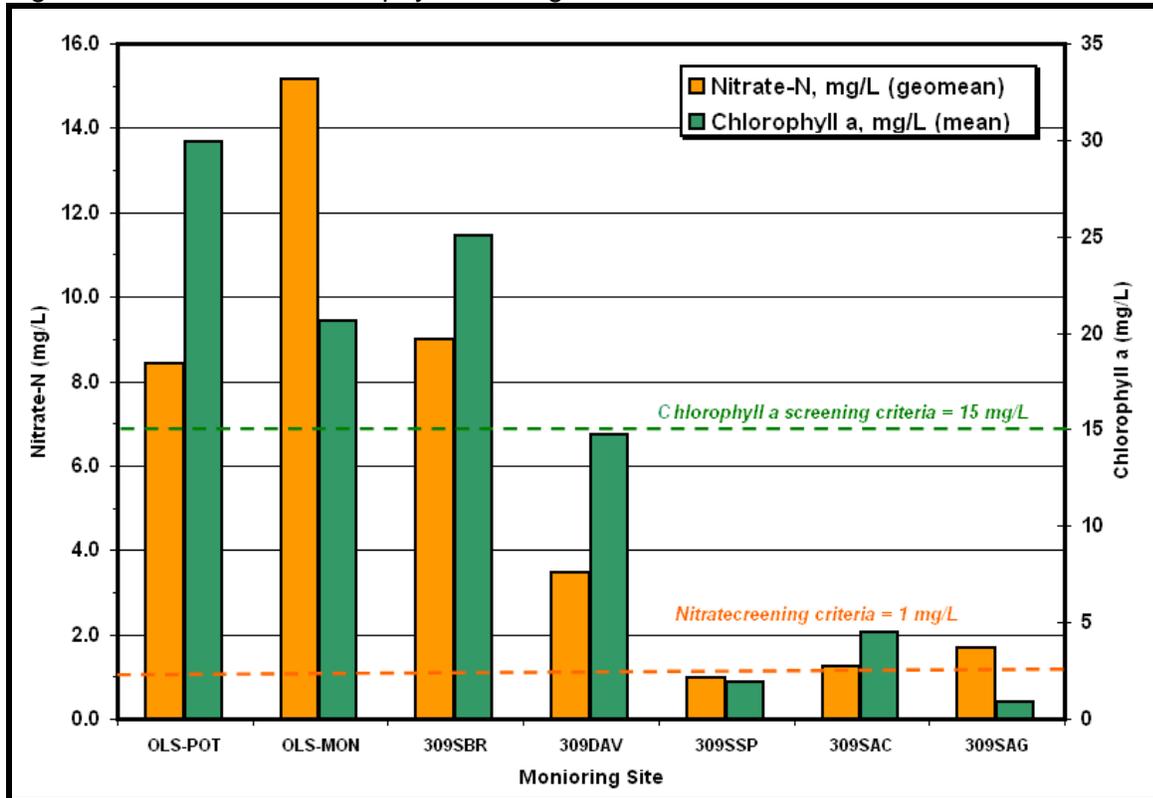


Table 3. % Algal Cover, Old Salinas River and lower Salinas River monitoring sites.

OLS-MON		309SBR		309DAV		309SAC	
Mean	3.93	Mean	0.56	Mean	3.33	Mean	0.75
Minimum	0	Minimum	0	Minimum	0	Minimum	0
Maximum	90	Maximum	5	Maximum	60	Maximum	5
Sum	110	Sum	5	Sum	867	Sum	12
Observations	28	Observations	9	Observations	40	Observations	16

Figure 15. Nitrate and Chlorophyll a average concentrations, Old Salinas River.

C.4 Lower Salinas River Tributaries – Quail Creek, Chualar Creek, Blanco Drain

C.4.1 Dissolved Oxygen, Nutrient, Chlorophyll a, and Algal Cover Data

Figure 16. Pre-dawn dissolved oxygen monitoring, and monthly DO grab samples – Quail Creek @ Potter Rd.

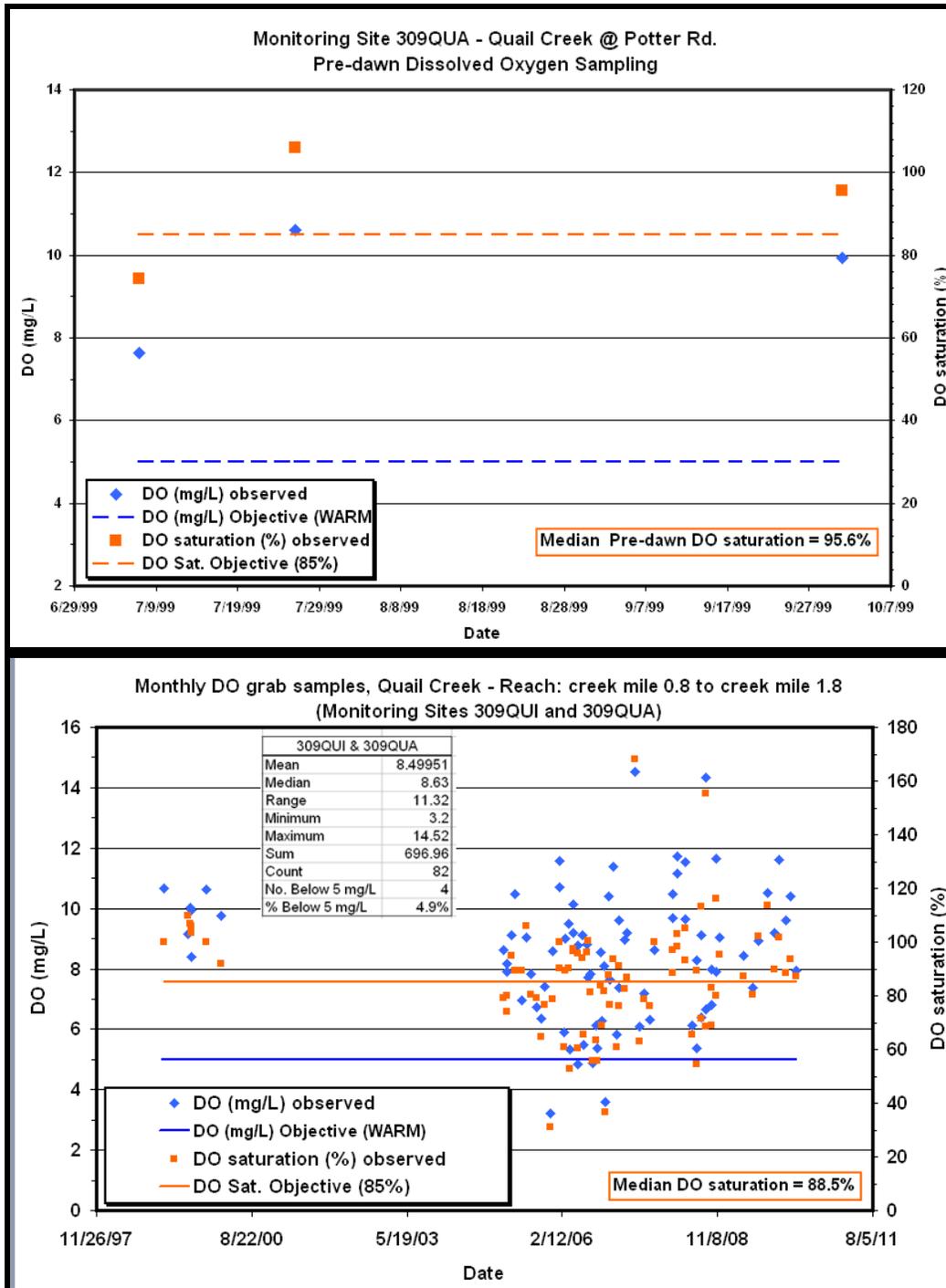
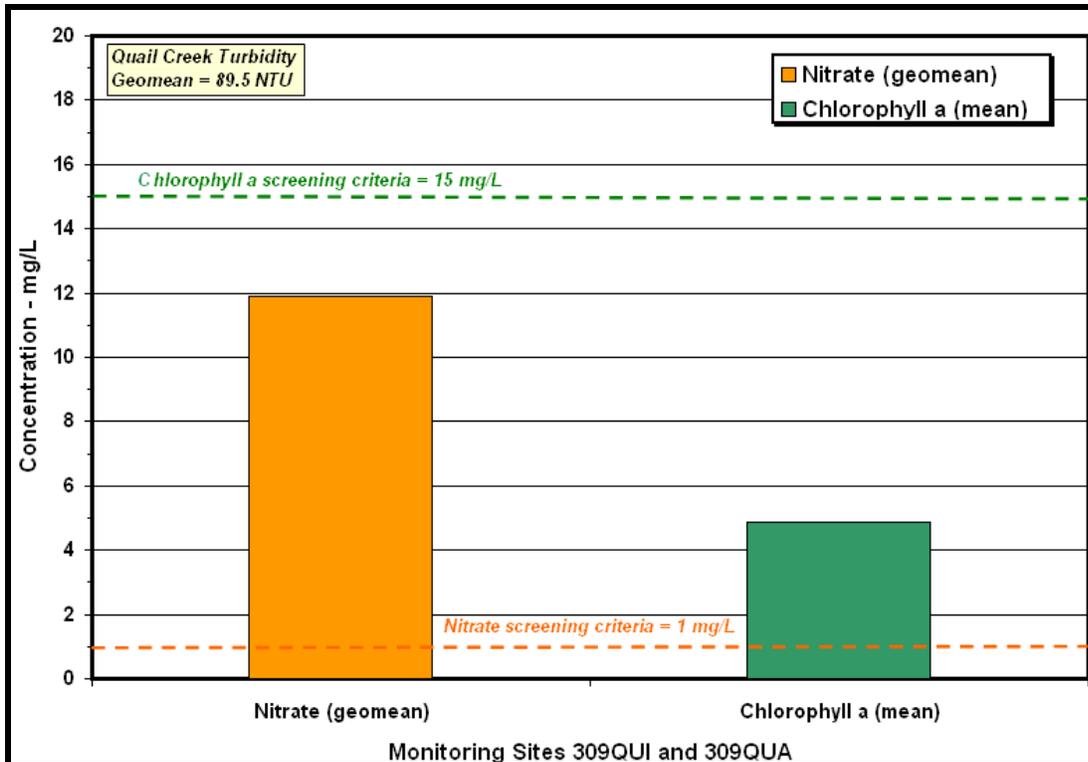


Figure 17. Nitrate and Chlorophyll a average concentrations, Quail Creek; and percent algal cover statistics.



309QUI and 309QUA % Algal Cover	
Mean	14.81
Median	0
Range	100
Minimum	0
Maximum	100
Observations	26

Figure 18. Monthly DO grab samples – Chualar Creek

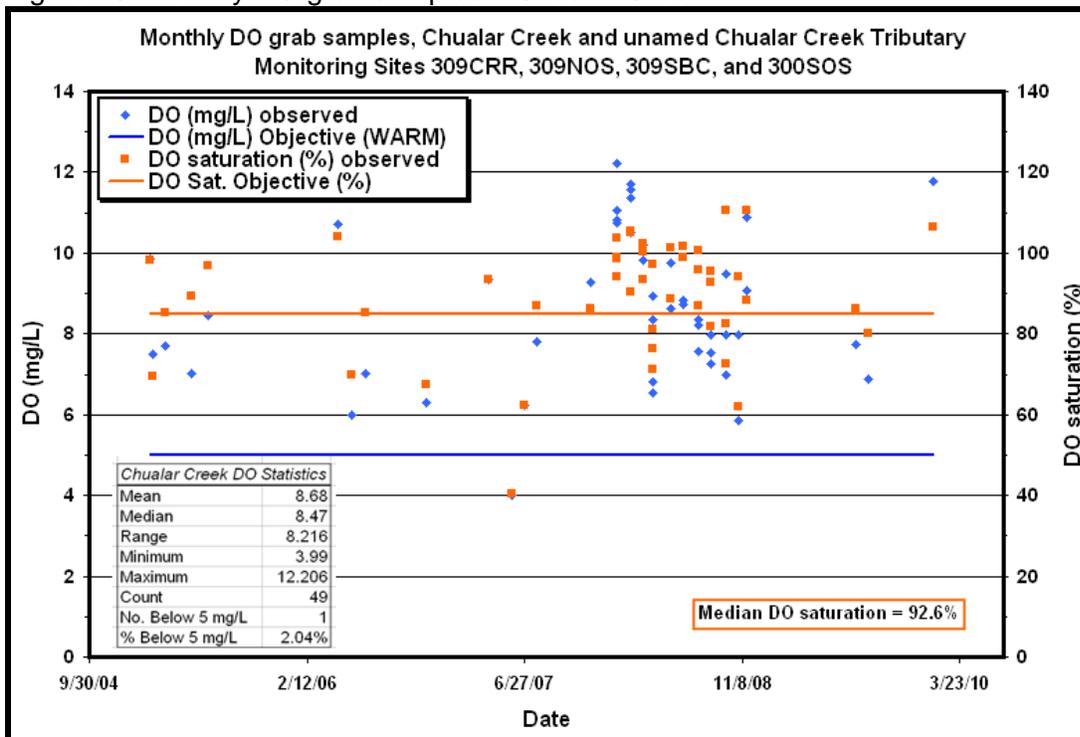
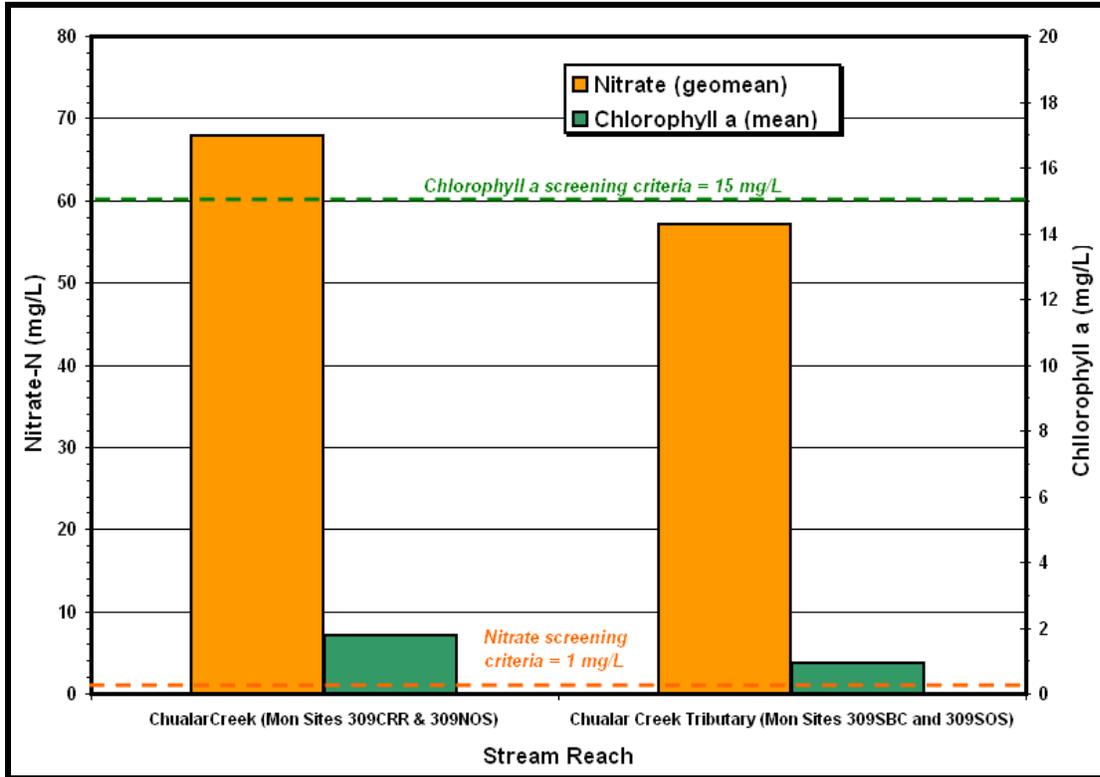


Figure 19. Nitrate and Chlorophyll a average concentrations, Chualar Creek; and percent algal cover statistics.



Site 309CRR % Algal Cover	
Mean	0
Median	0
Range	0
Minimum	0
Maximum	0
Observations	12

Figure 20. Monthly DO grab samples – Blanco Drain

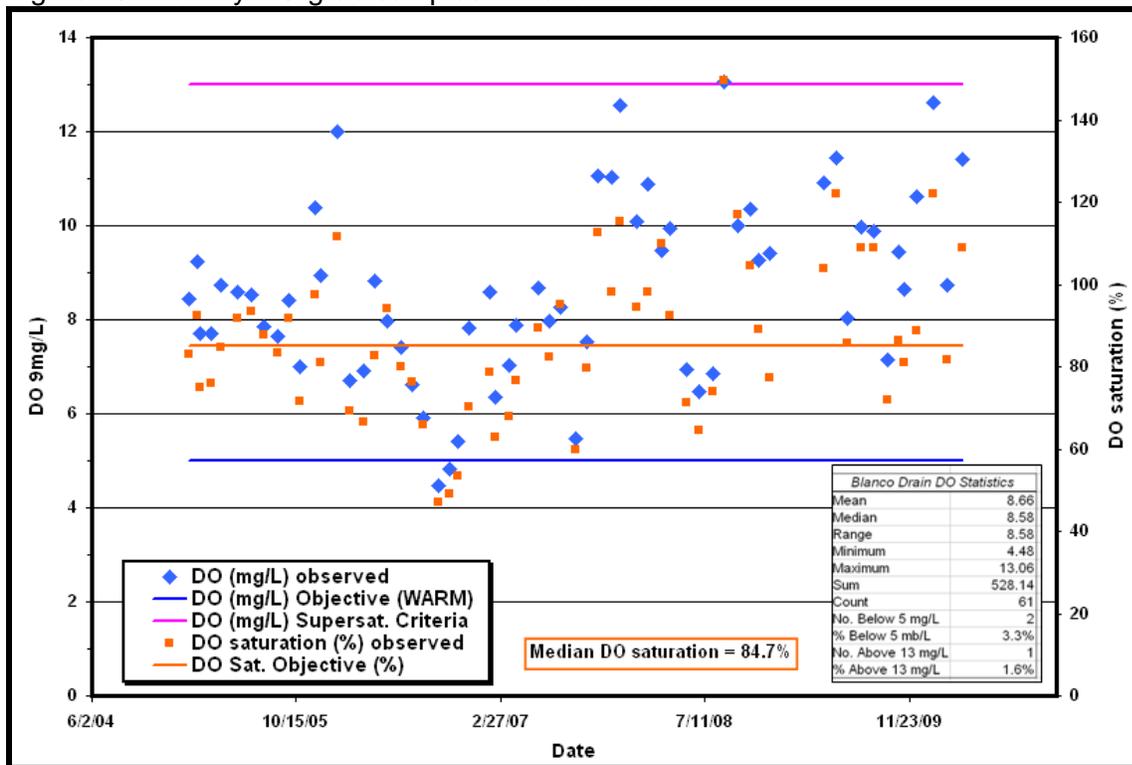
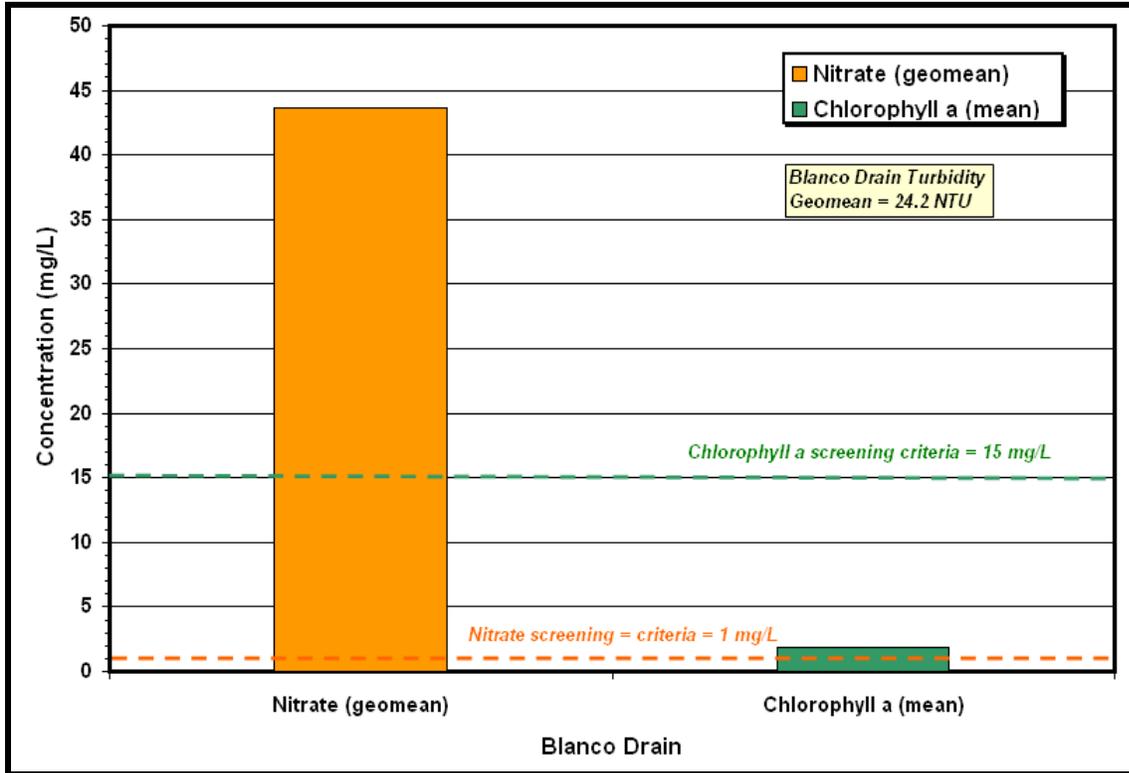


Figure 21. Nitrate and Chlorophyll a average concentrations, Blanco Drain; and percent algal cover statistics.



Site BLA-PUM % Algal Cover	
Mean	64.64
Median	90
Range	100
Minimum	0
Maximum	100
Observations	14

C.5 Reclamation Canal-Tembladero Slough

C.5.1 Dissolved Oxygen: Diel Data, Pre-dawn Sampling, and Grab Samples

Figure 22. Diel Data Tembladero Slough @ Molera Rd. Aug 18-19, 2004.

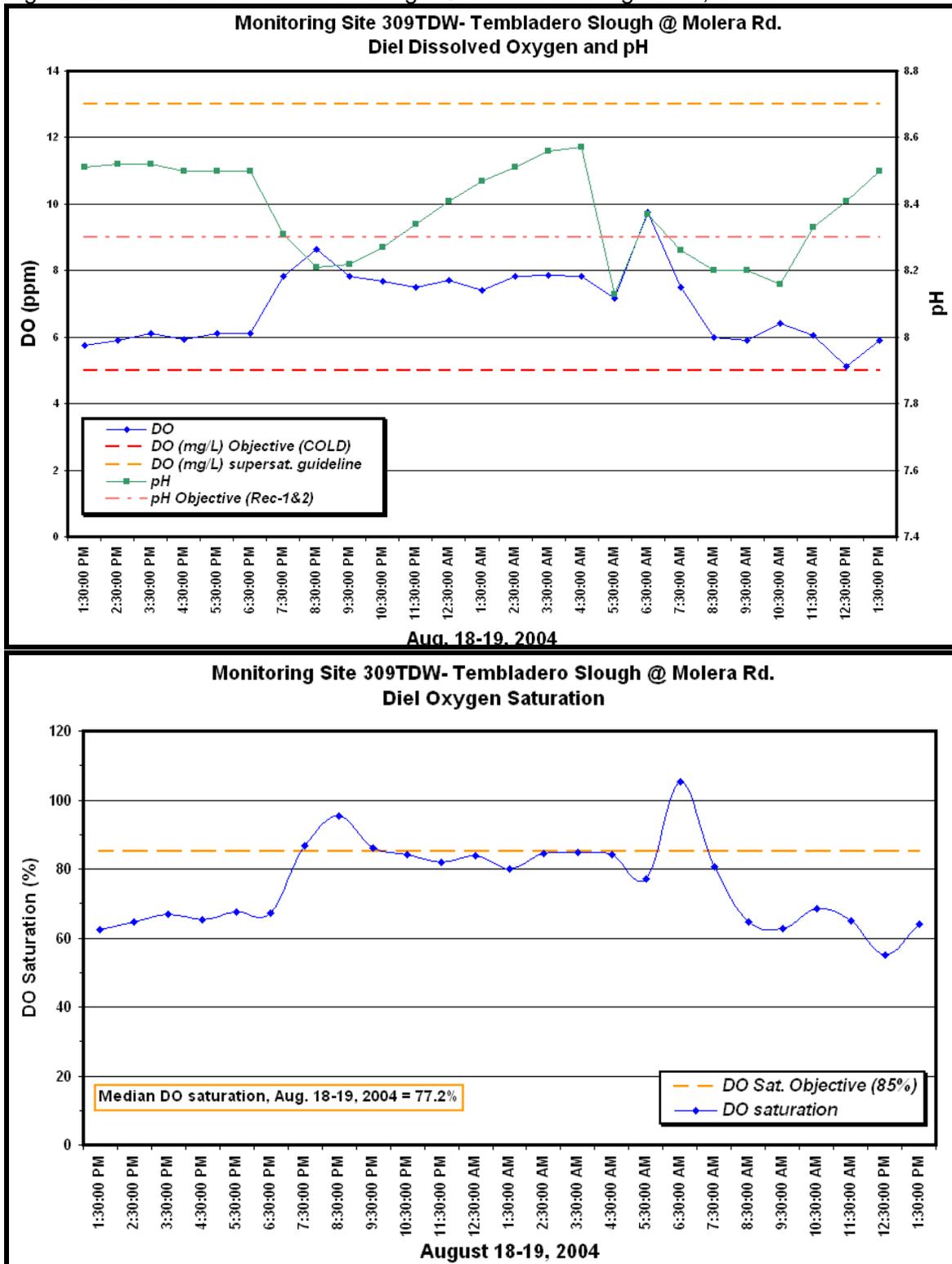


Figure23. Diel Data Tembladero Slough @ Preston Rd. Aug 30-31, 2006.

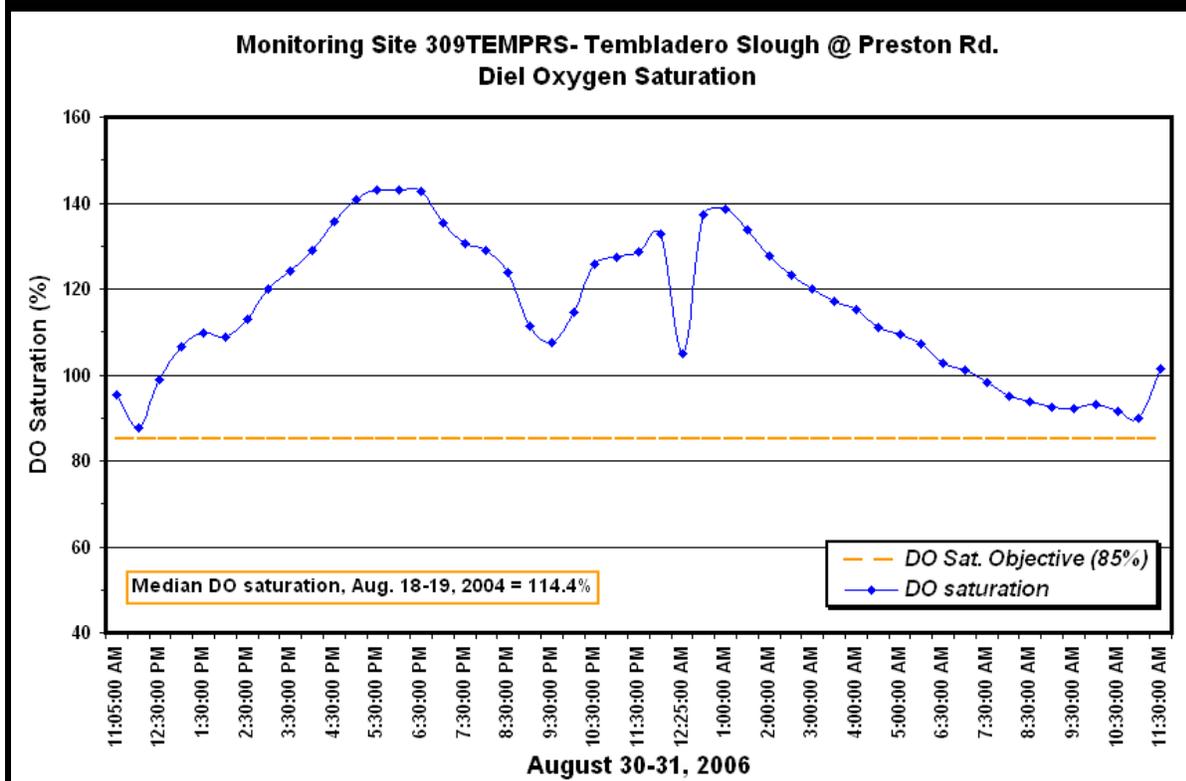
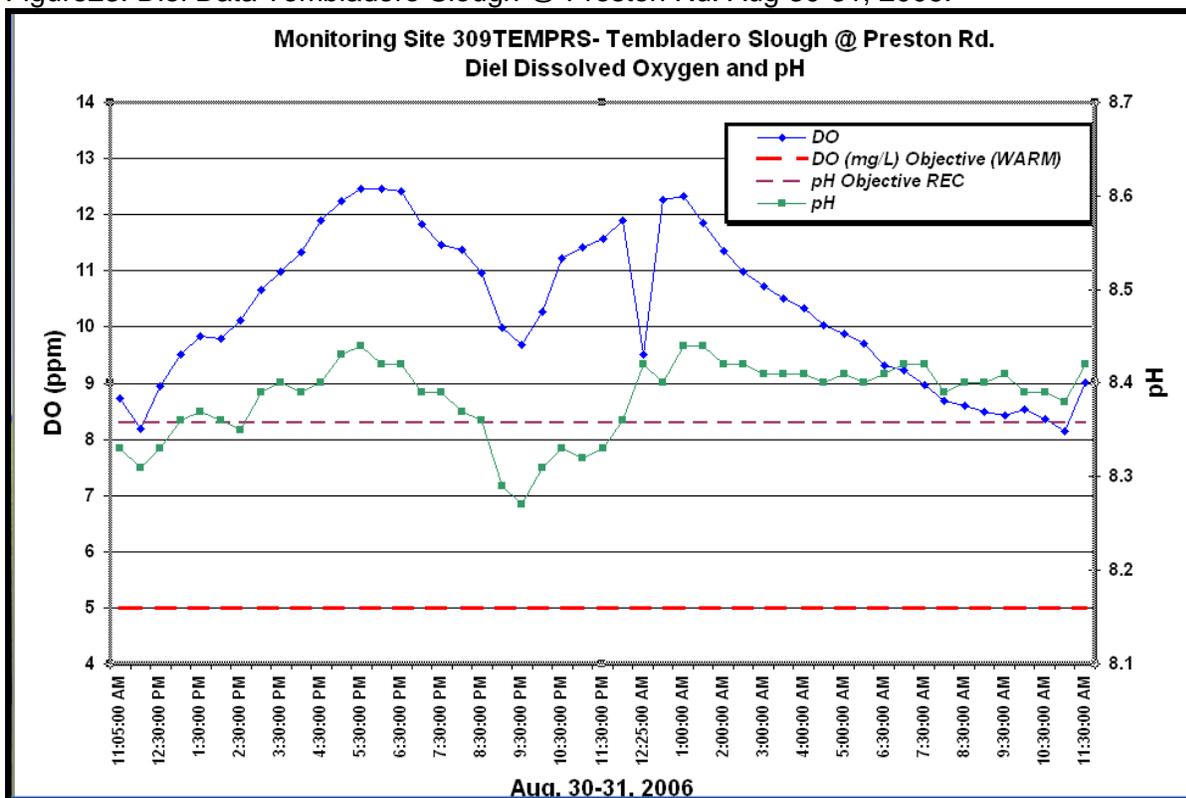


Figure 24. Monthly DO grab samples – Tembladero Slough @ 309TDW

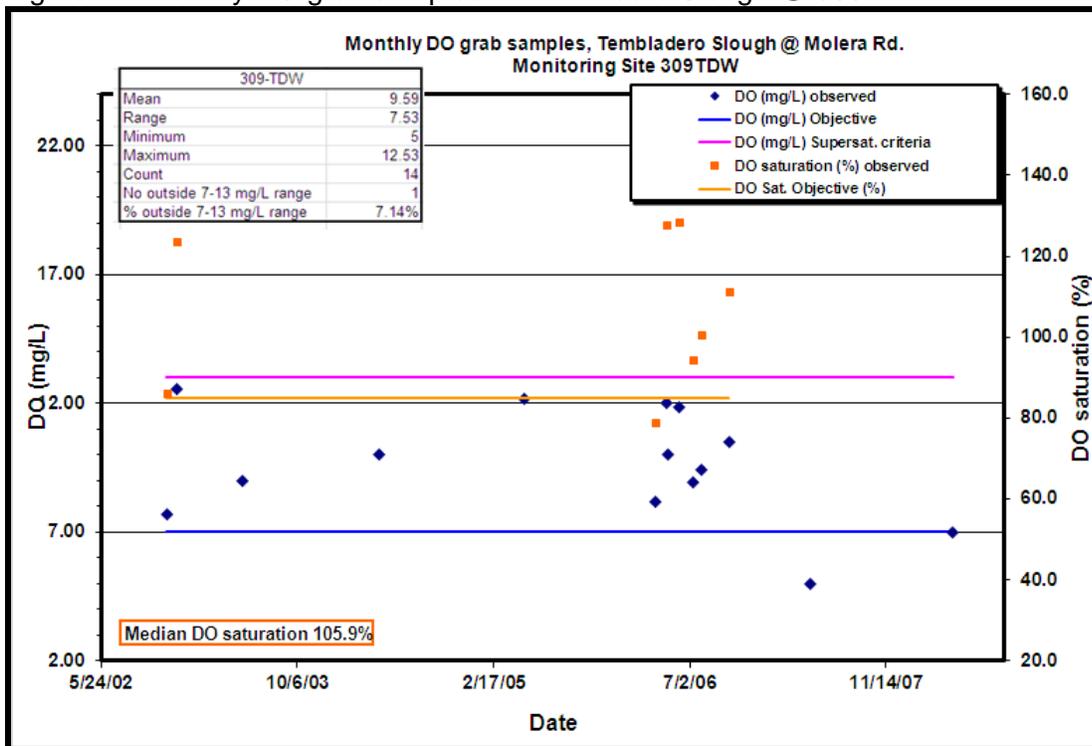


Figure 25. Monthly DO grab samples – Tembladero Slough @ 309TEMPRS.

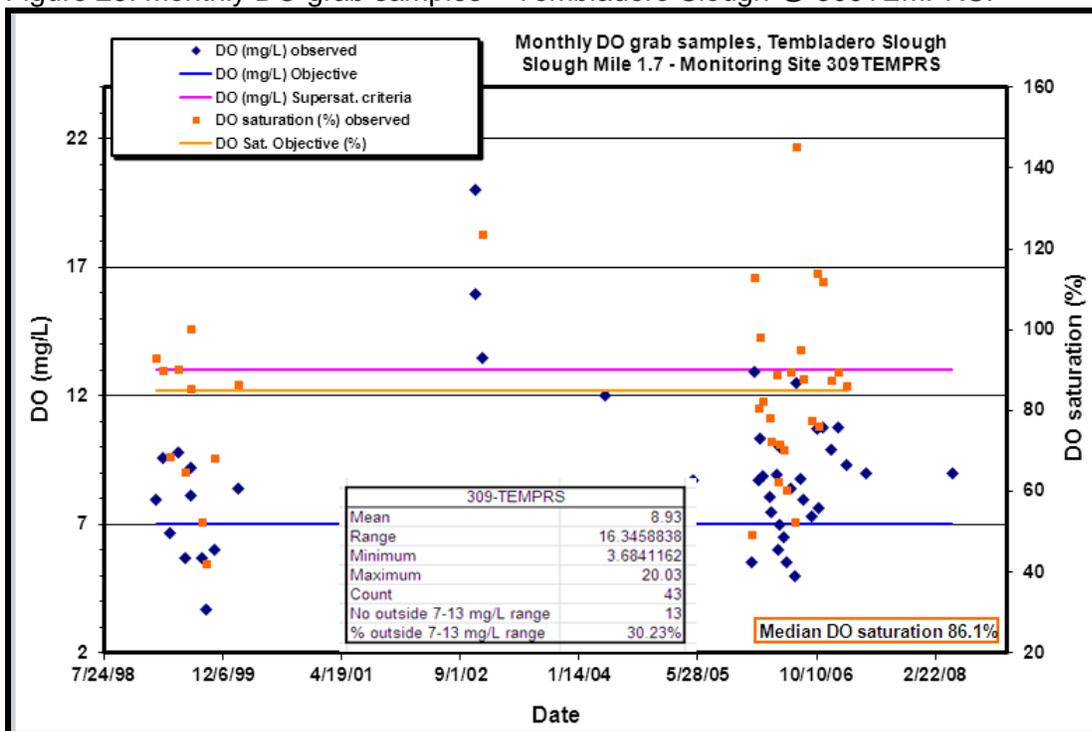


Figure 26. Monthly DO grab samples – Tembladero Slough @ 309TEH.

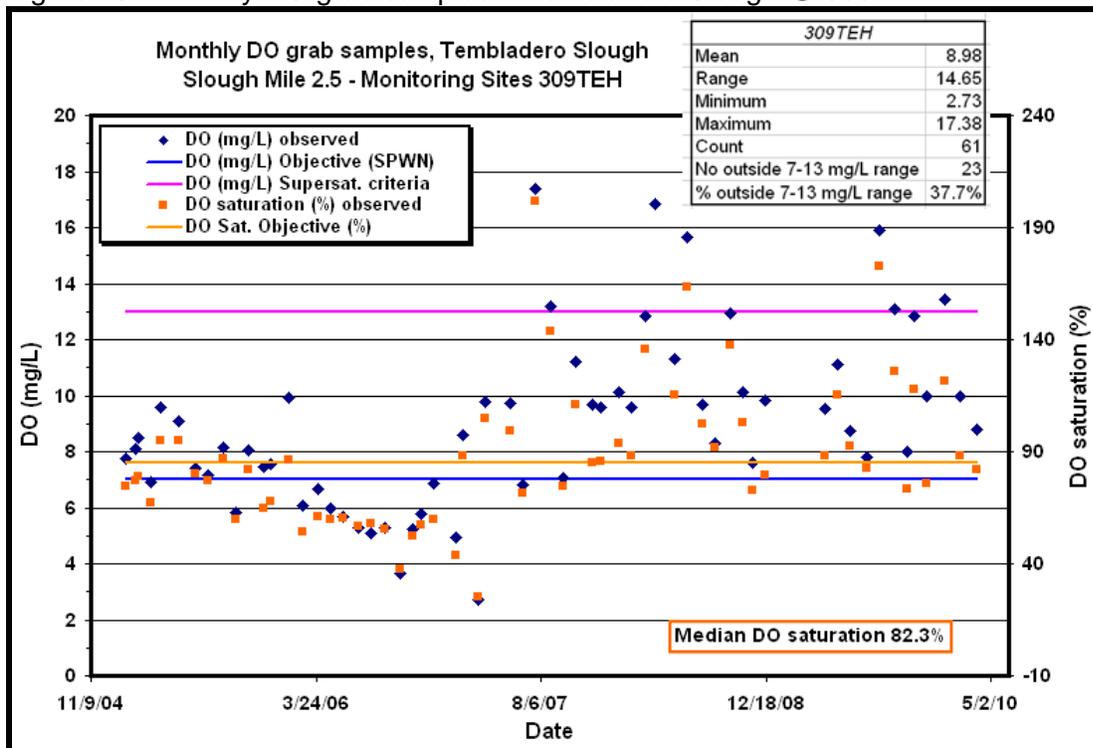


Figure 27. Monthly DO grab samples – Merritt Ditch @ 309MER.

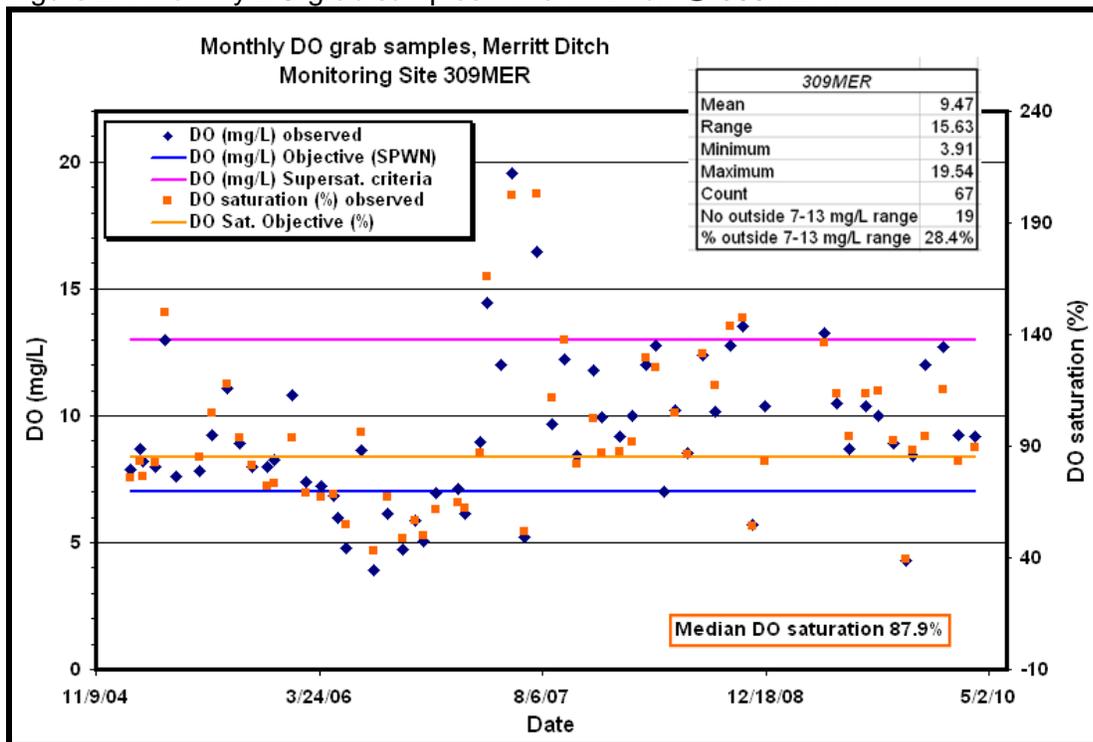


Figure 28 Diel Data Reclamation Canal @ Boronda Rd. Aug 30-31, 2006.

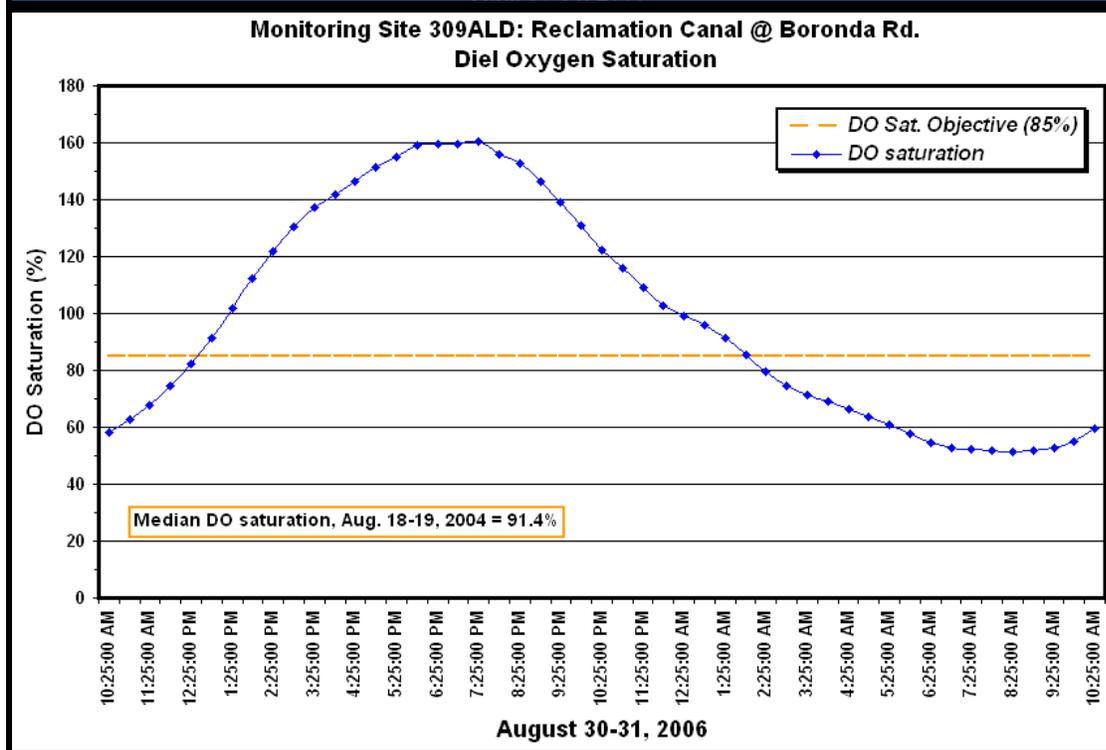
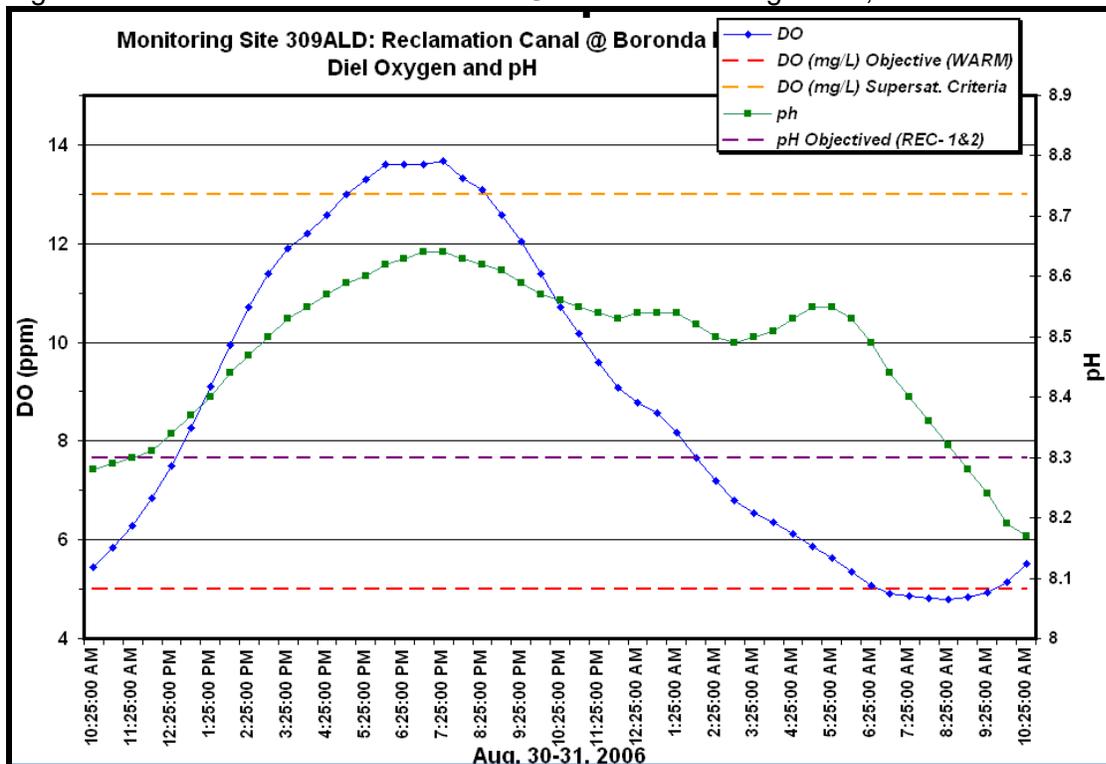


Figure 29. Pre-dawn dissolved oxygen monitoring – Reclamation Canal @ Airport Rd.

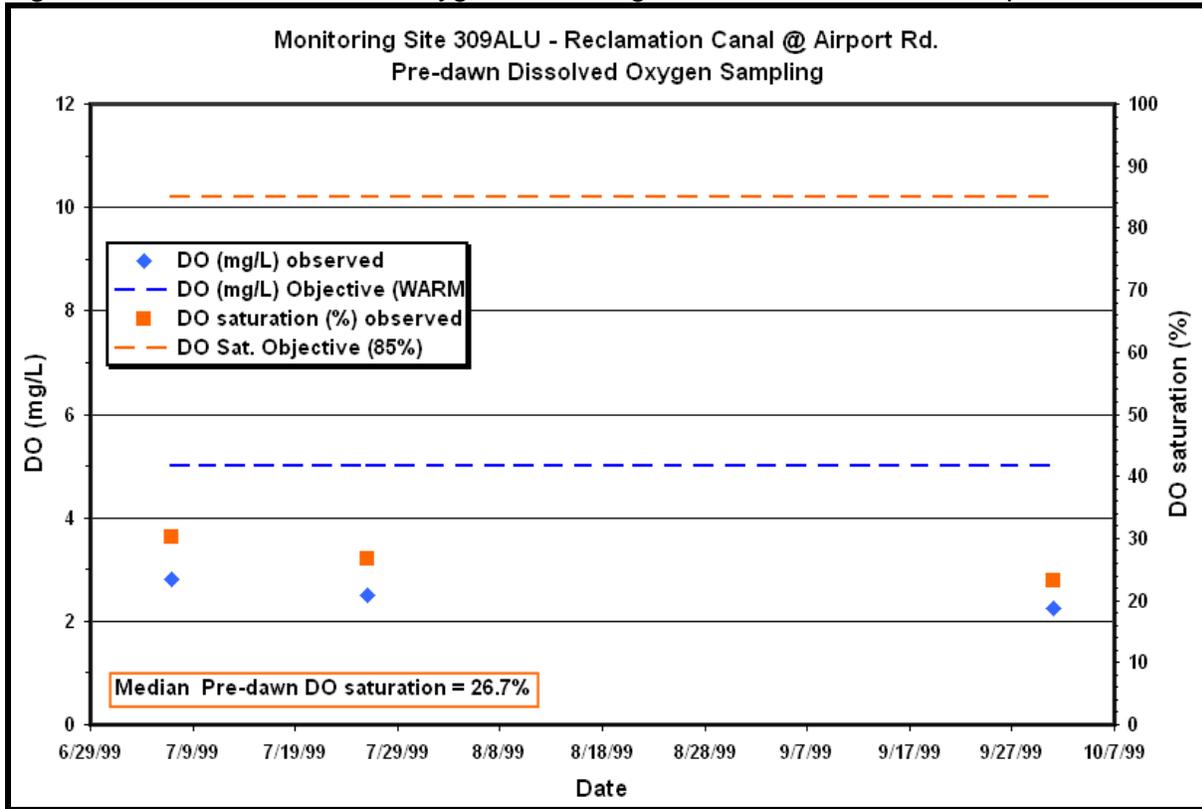
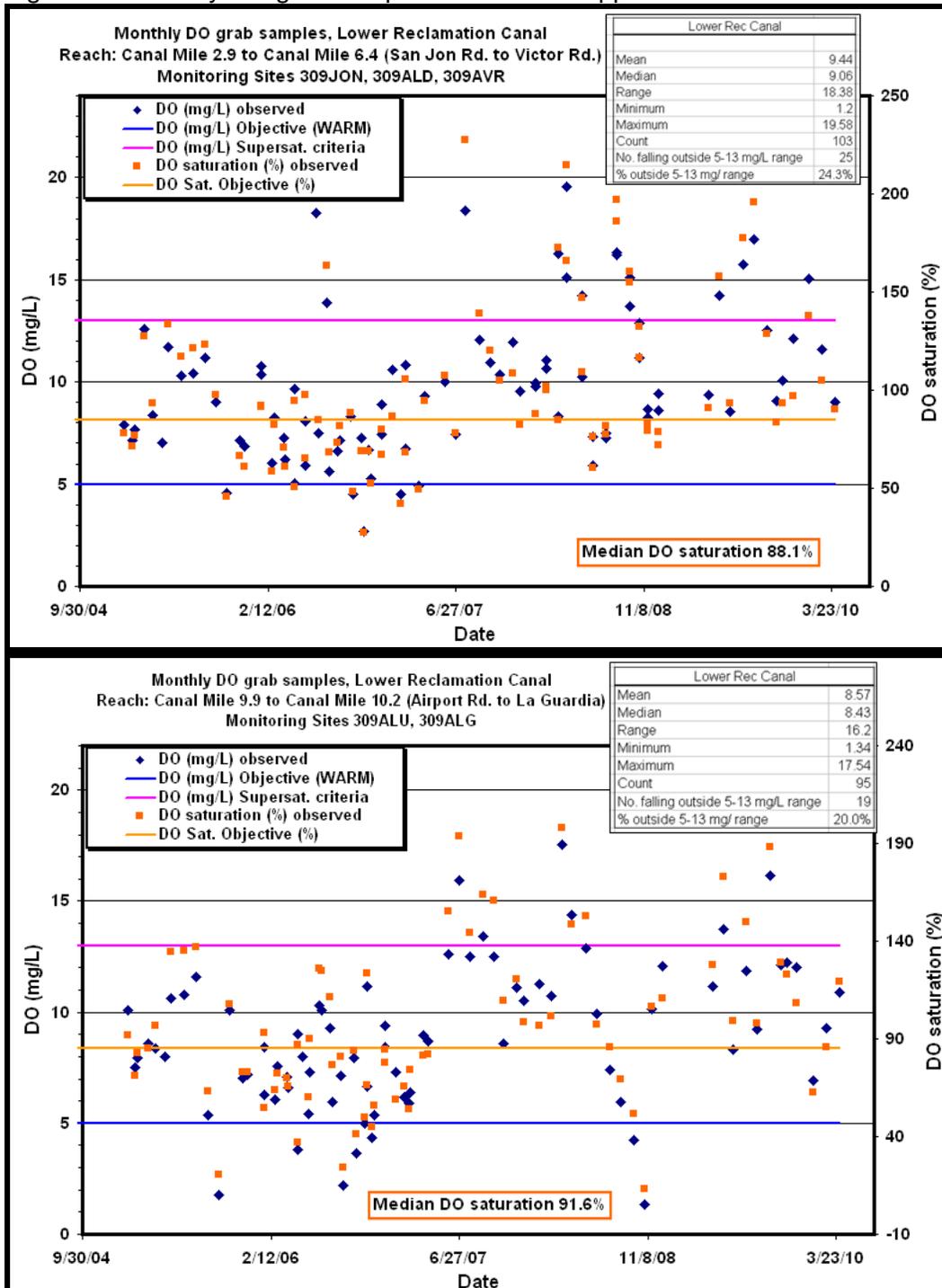
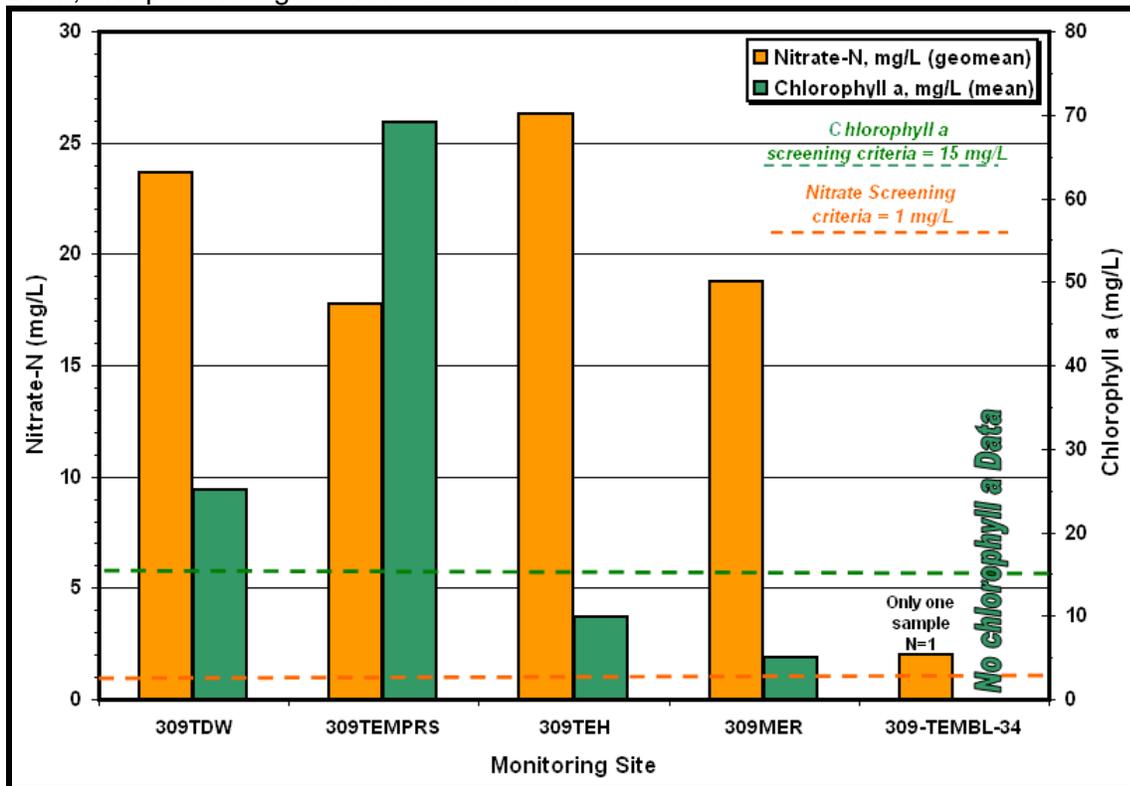


Figure 30. Monthly DO grab samples – lower and upper Reclamation Canal.



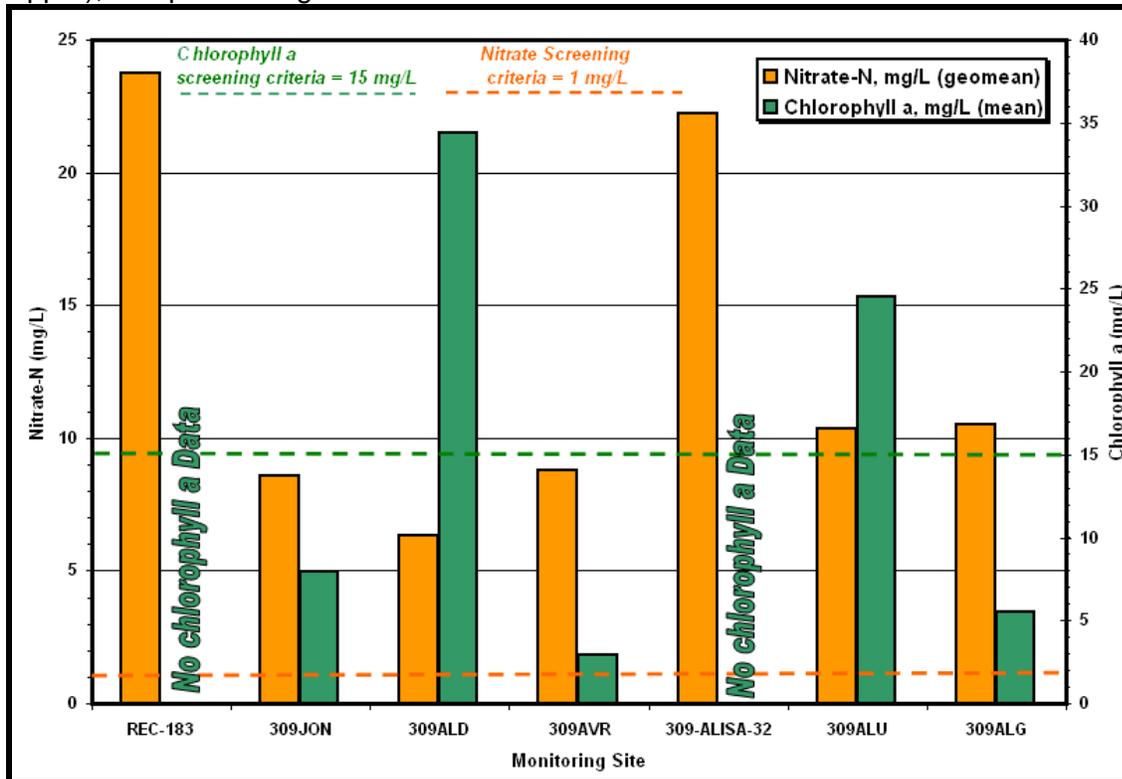
C.5.2 Nutrients, Chlorophyll a and Algal Cover Data

Figure 31. Nitrate and Chlorophyll a average concentrations, Tembladero Slough and Merritt Ditch; and percent algal cover statistics.



309TDW-Algal Cover	309TEM-Algal Cover	309TEH-Algal Cover	309MER-Algal Cover
no data	Mean 0.00	Mean 0.00	Mean 35
	Range 0	Range 0	Range 100
	Minimum 0	Minimum 0	Minimum 0
	Maximum 0	Maximum 0	Maximum 100
	Observations 14	Observations 11	Observations 13

Figure 32. Nitrate and Chlorophyll a average concentrations, Reclamation Canal (Lower and Upper); and percent algal cover statistics.



	309JON-Lower Rec Canal	309ALD-Lower Rec Canal	309ALU-Upper Rec Canal	309ALG-Upper Rec Canal
Mean	23.75	Mean 0.92	Mean 0.14	Mean 13.57
Range	75	Range 10	Range 2	Range 50
Minimum	0	Minimum 0	Minimum 0	Minimum 0
Maximum	75	Maximum 10	Maximum 2	Maximum 50
Observations	12	Observations 13	Observations 14	Observations 14

C.6 Reclamation Canal Tributaries – Espinosa Slough, Santa Rita Creek, Gabilan Creek, Natividad Creek, Alisal Creek, Alisal Slough

C.6.1 Dissolved Oxygen: Pre-dawn Sampling, and Grab Samples

Figure 33. Monthly DO grab samples – Espinosa Slough.

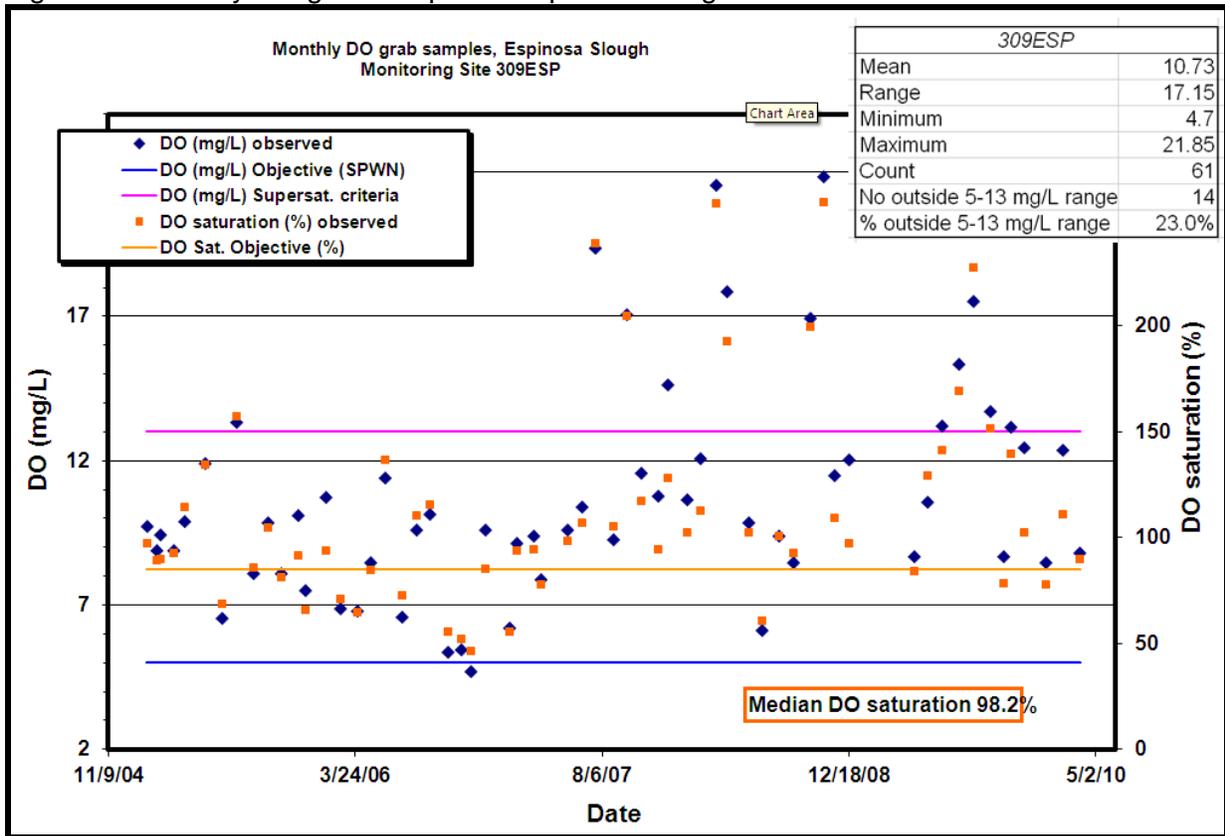


Figure 34. Monthly DO grab samples – Alisal Slough.

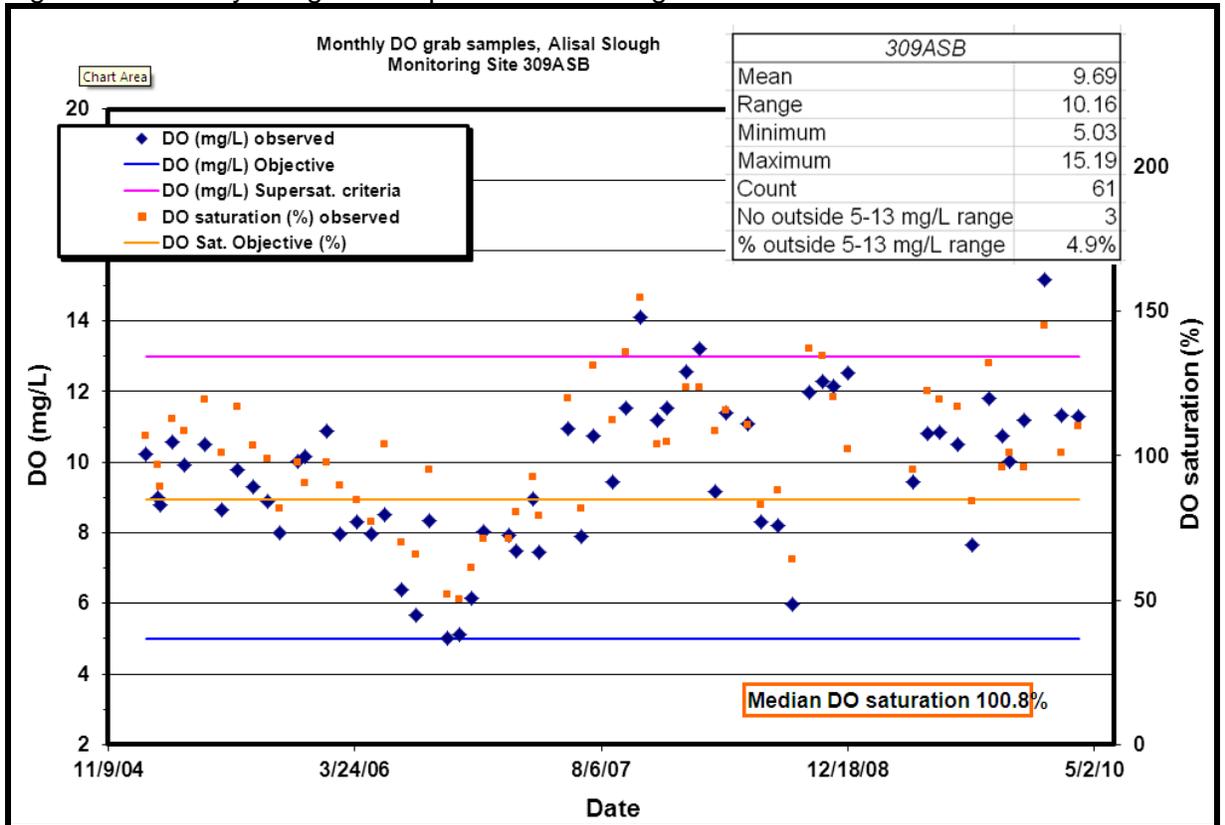


Figure 35. Monthly DO grab samples – Santa Rita Creek.

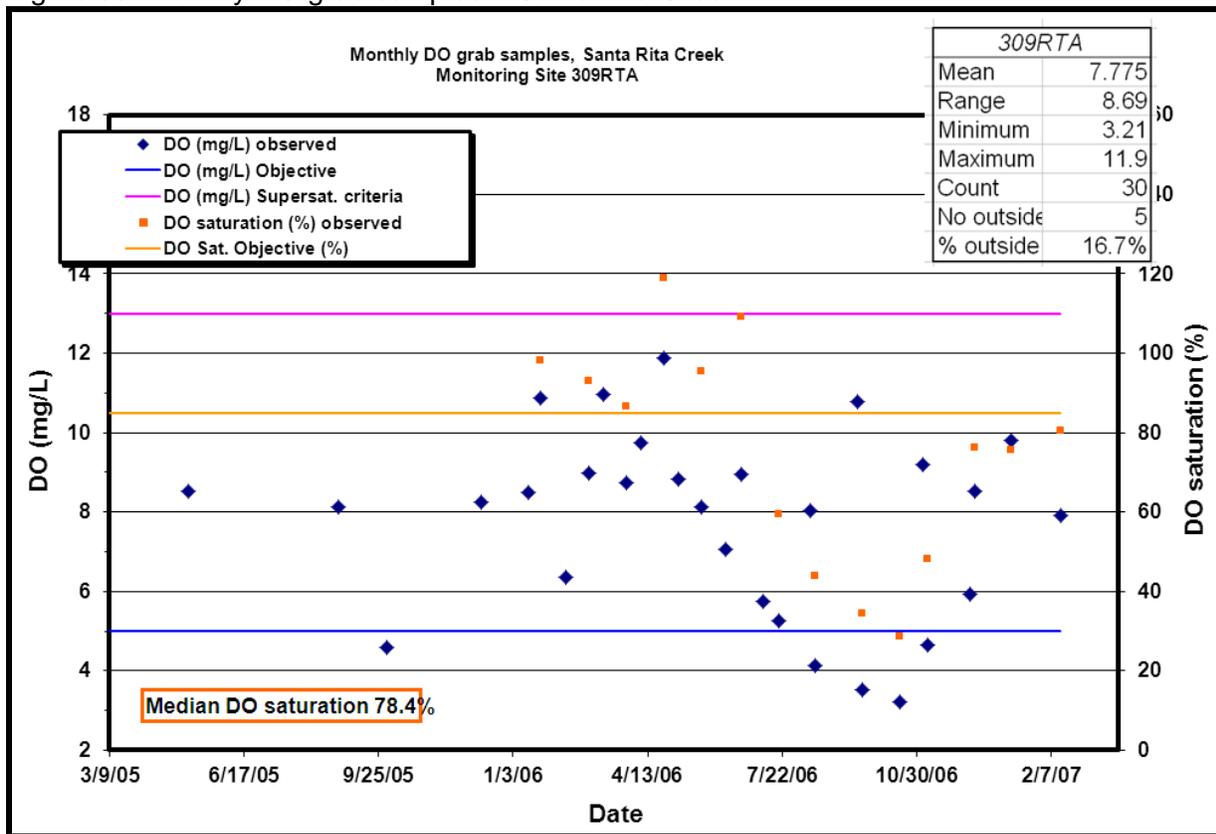


Figure 36. Monthly DO grab samples – Gabilan Creek.

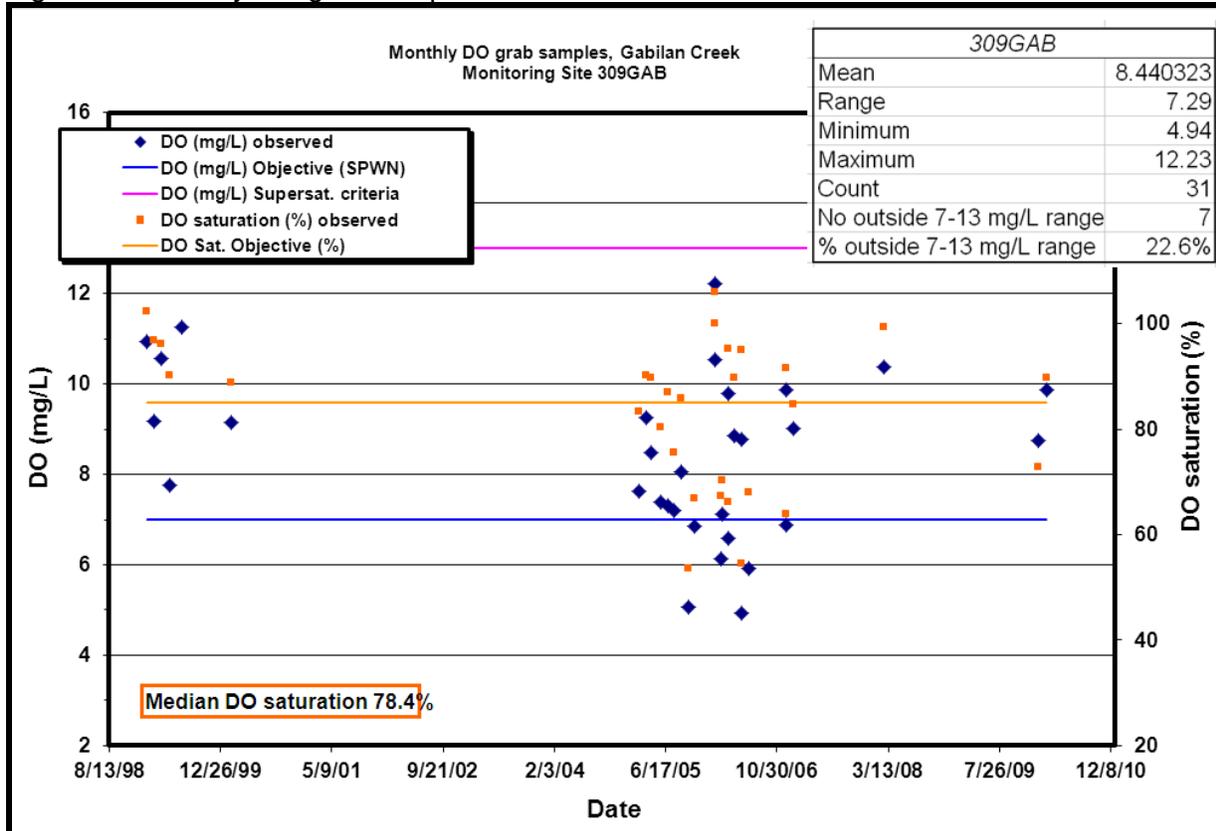


Figure 37. Monthly DO grab samples – Natividad Creek.

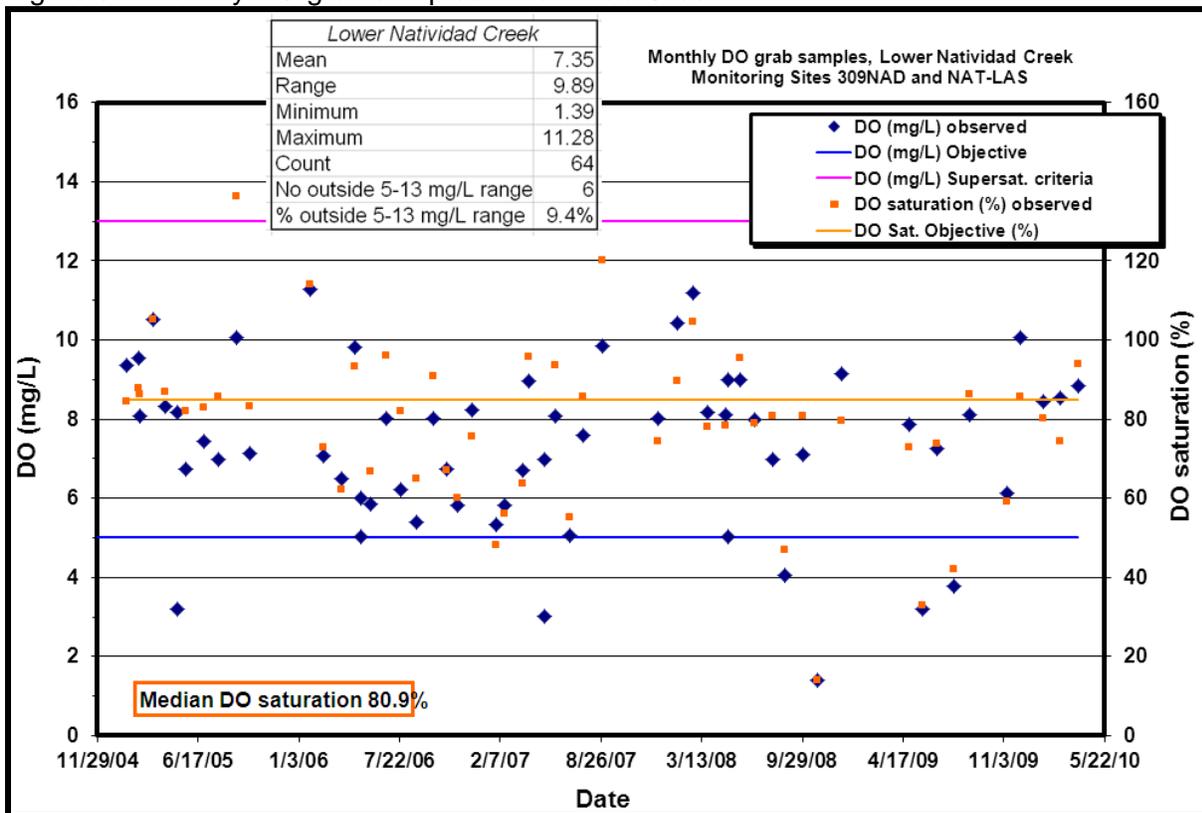
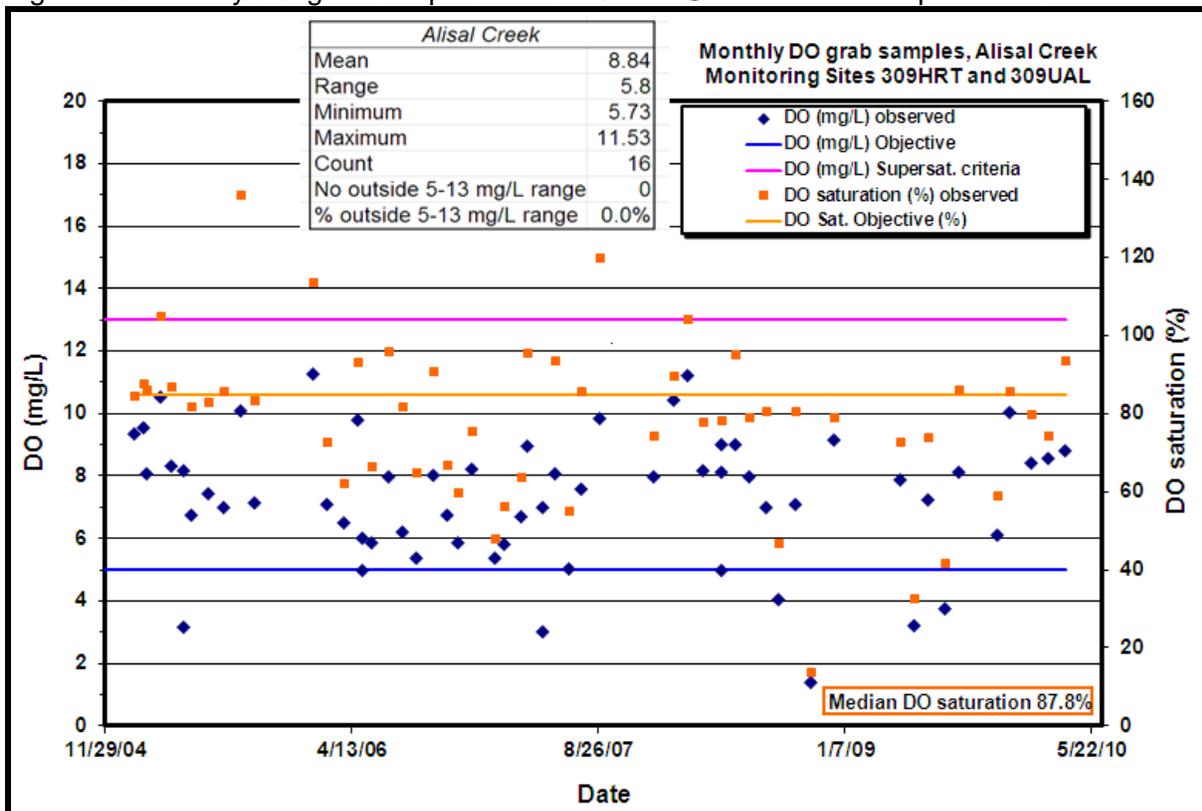
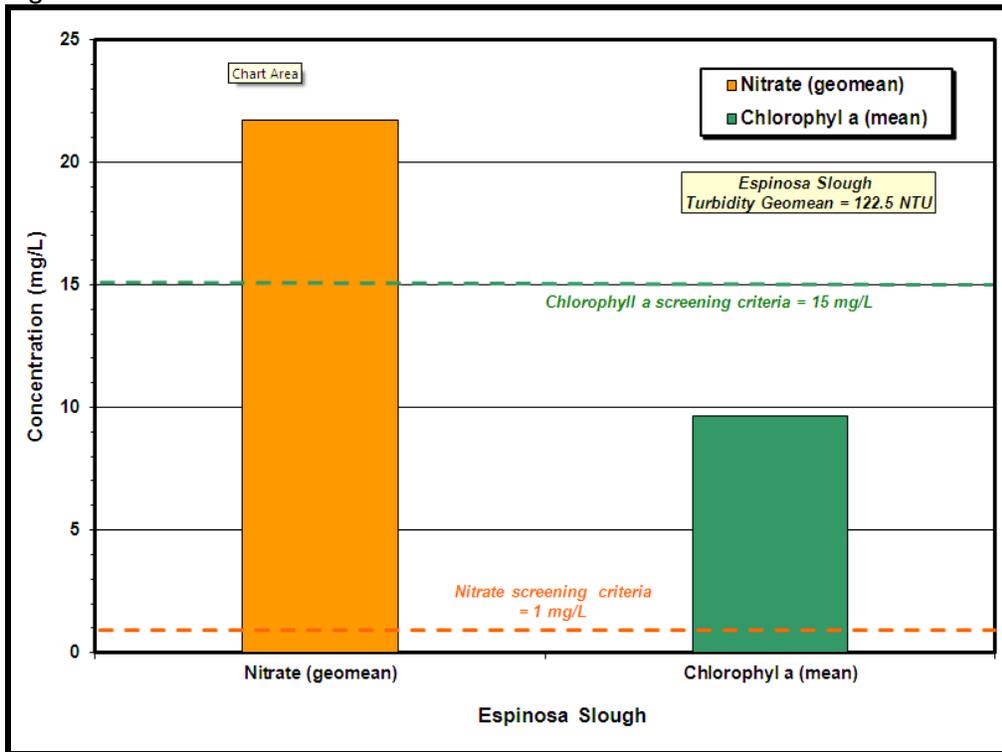


Figure 38. Monthly DO grab samples – Alisal Creek @ Hartnell and Airport roads.



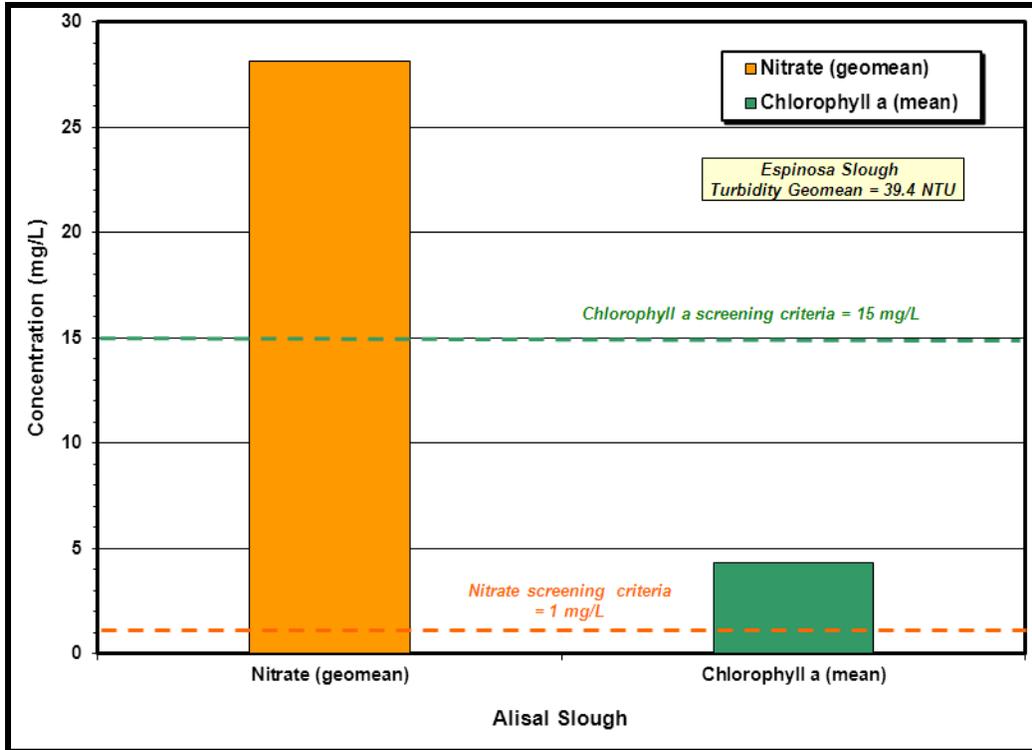
C.6.2 Nutrients, Chlorophyll a and Algal Cover Data

Figure 39. Nitrate and Chlorophyll a average concentrations, Espinosa Slough; and percent algal cover statistics.



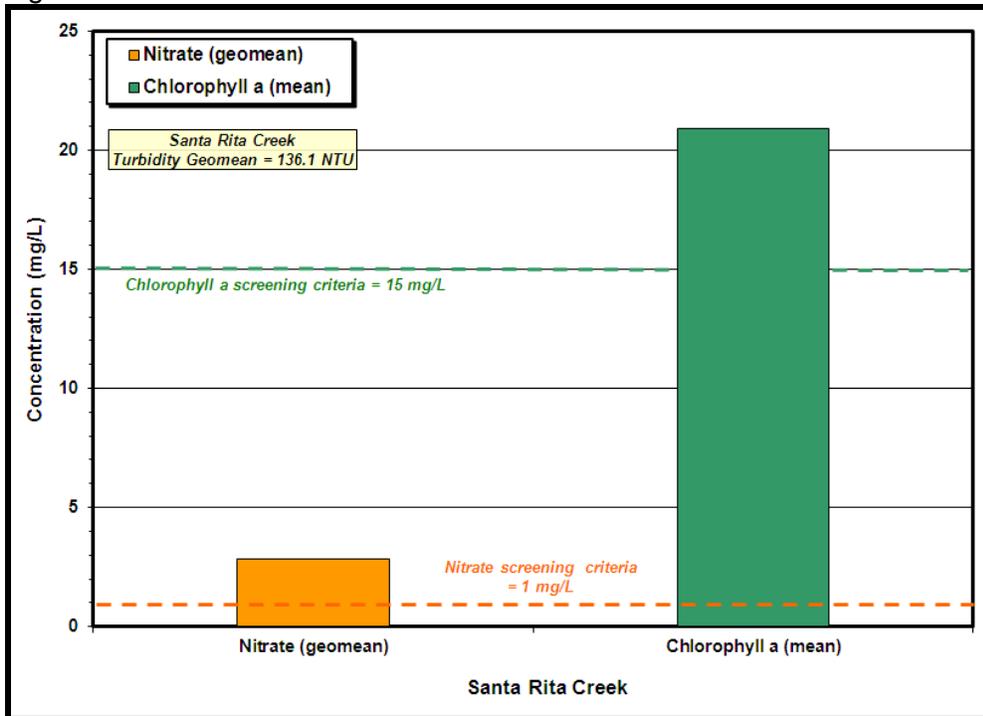
309ESP- % Algal Cover	
Mean	0.00
Range	0
Minimum	0
Maximum	0
Observations	12

Figure 40. Nitrate and Chlorophyll a average concentrations, Alisal Slough; and percent algal cover statistics.



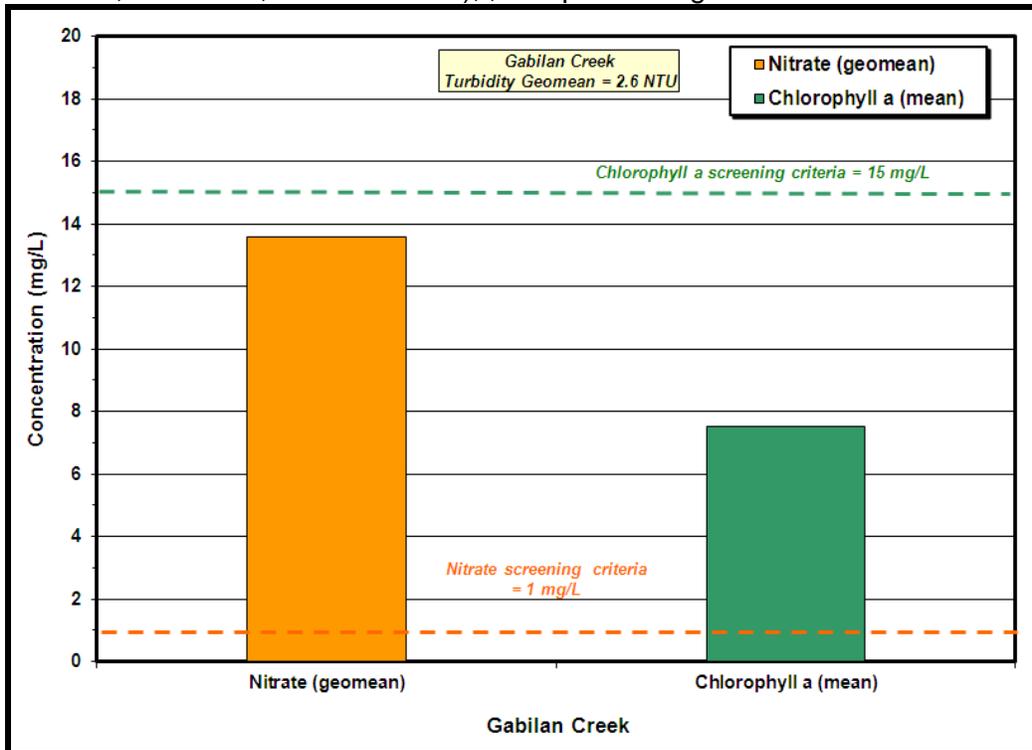
309ASB - % Algal Cover	
Mean	2.22
Range	25
Minimum	0
Maximum	25
Observations	27

Figure 41. Nitrate and Chlorophyll a average concentrations, Santa Rita Creek; and percent algal cover statistics.



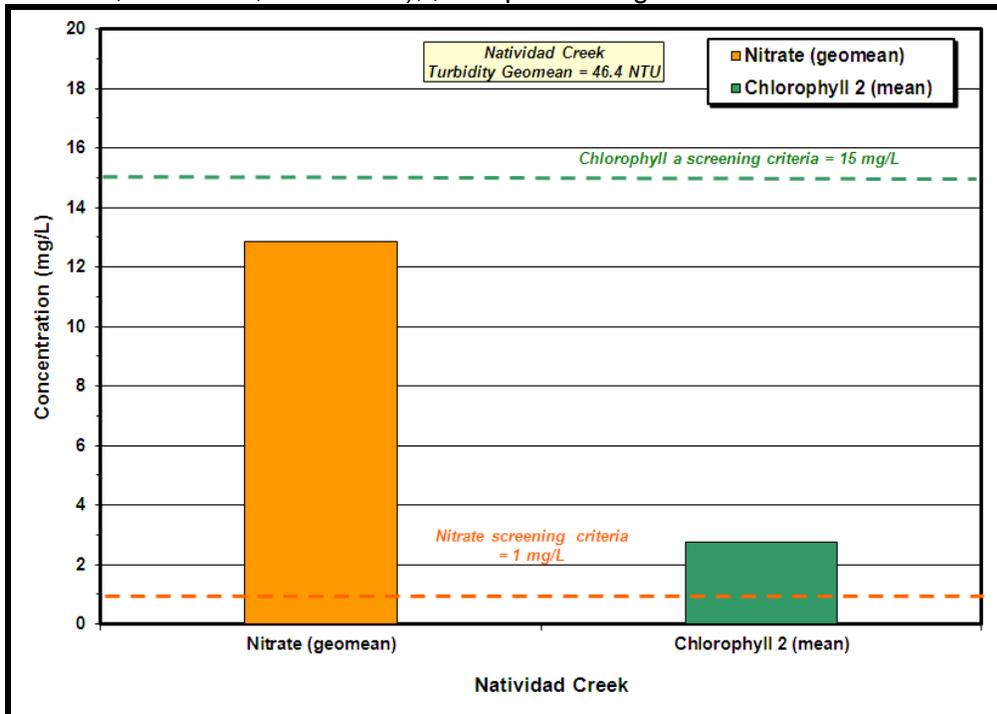
309RTA - % Algal Cover	
Mean	0.7
Range	10
Minimum	0
Maximum	10
Observations	14

Figure 42. Nitrate and Chlorophyll a average concentrations, lower Gabilan Creek (sites 309GAB, GAB-VET, 309-GABIL-31), ; and percent algal cover statistics.



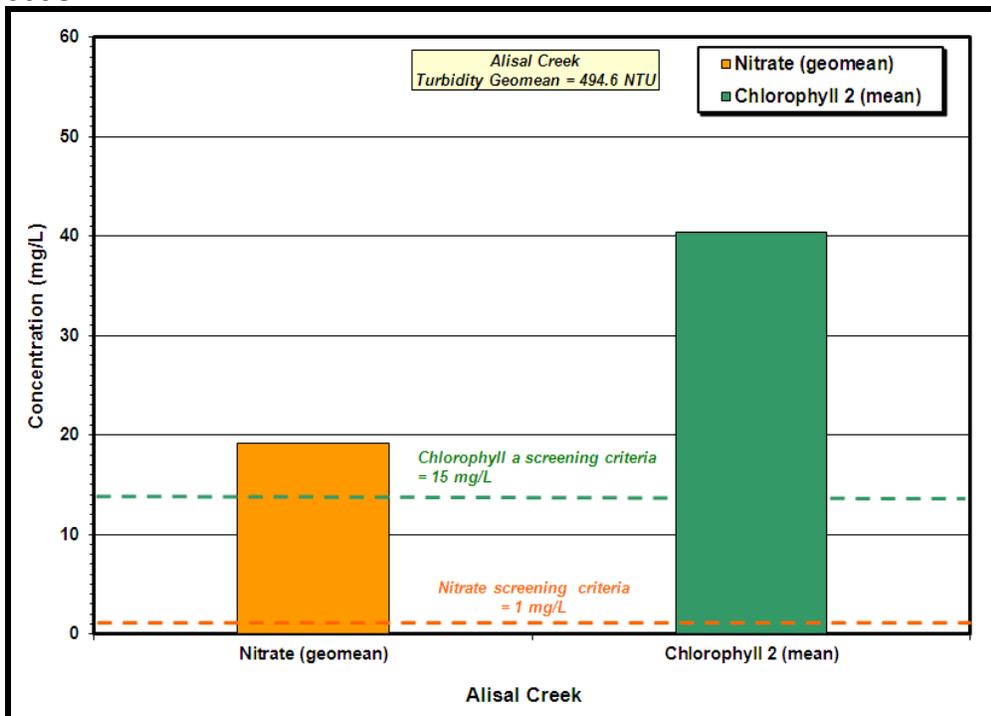
309GAB - % Algal Cover	
Mean	0
Range	0
Minimum	0
Maximum	0
Observations	16

Figure 43. Nitrate and Chlorophyll a average concentrations, lower Natividad Creek (sites 309NAD, NAT-LAS, NAT-FRE); ; and percent algal cover statistics.



309NAD - % Algal Cover	
Mean	0
Range	0
Minimum	0
Maximum	0
Observations	13

Figure 44. Nitrate and Chlorophyll a average concentrations, lower Alisal Creek (sites 309HRT, 309UAL).

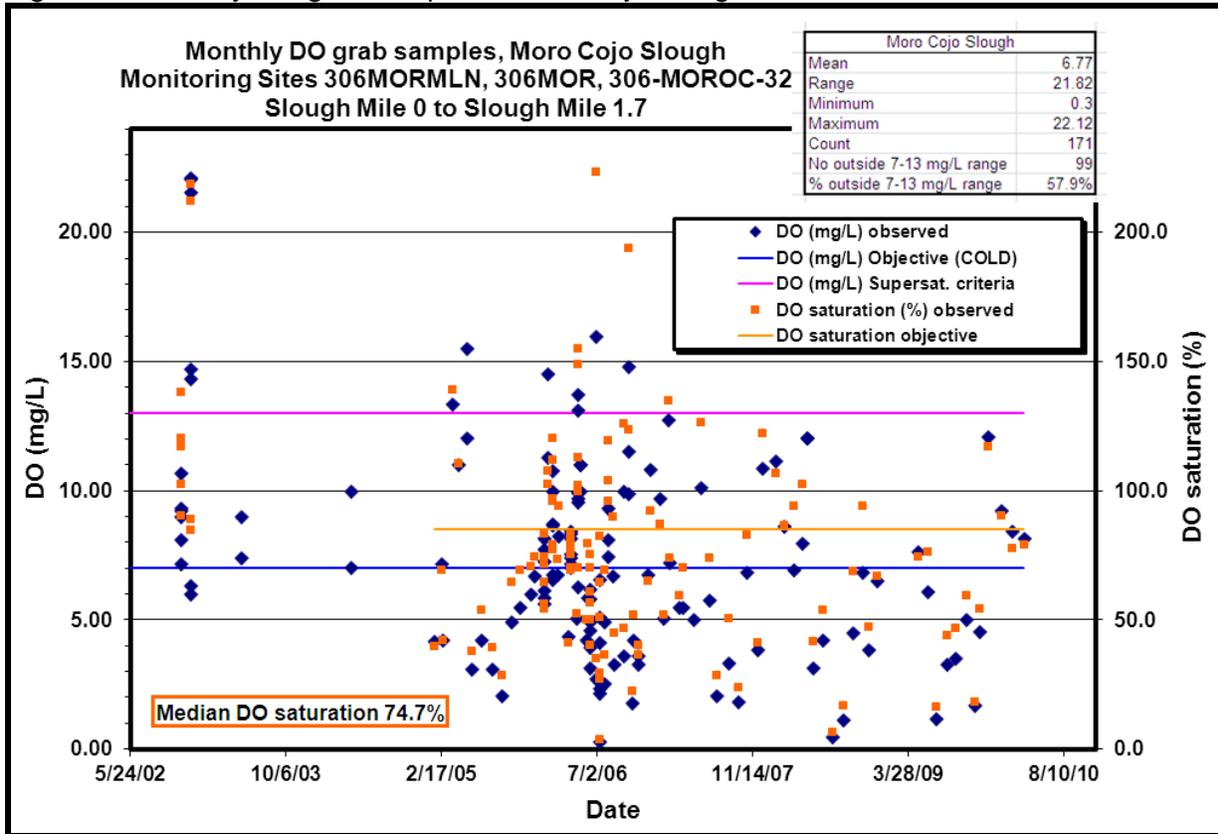


No algal % cover observations.

C.7 Moro Cojo Slough

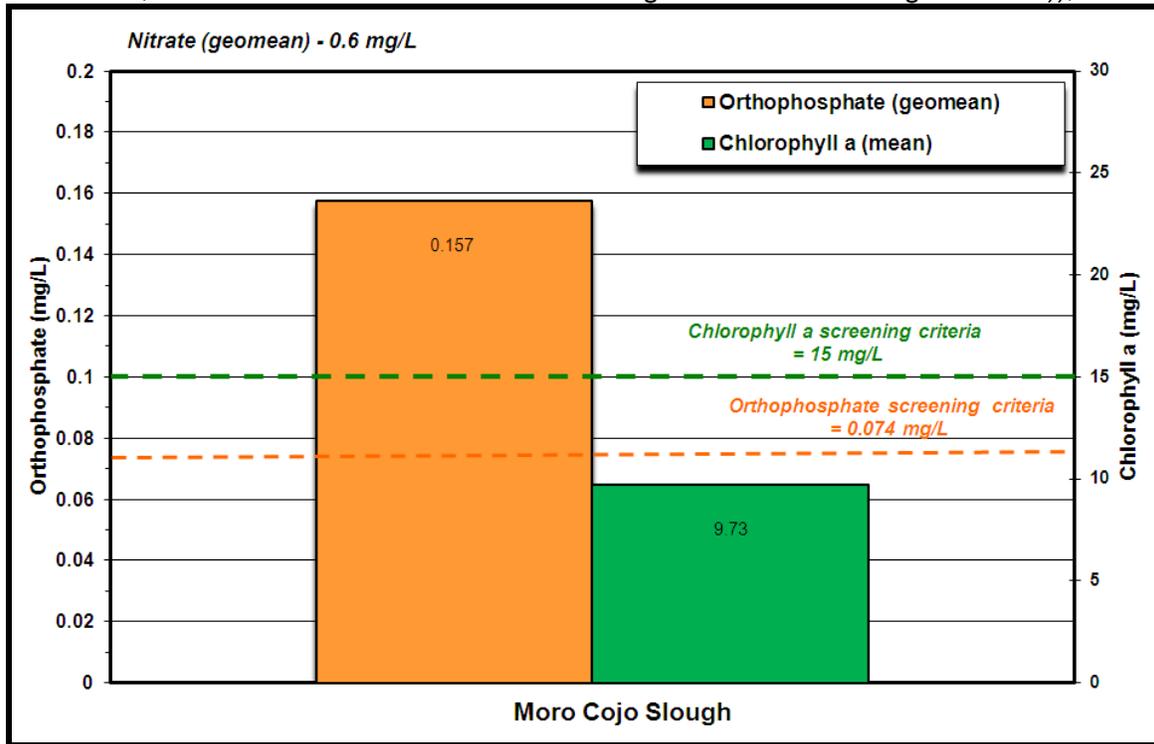
C.7.1 Dissolved Oxygen: Grab Samples

Figure 45. Monthly DO grab samples – Moro Cojo Slough.



C.7.2 Nutrients, Chlorophyll a and Algal Cover Data

Figure 46. Nitrate and Chlorophyll a average concentrations, Moro Cojo Slough (sites 306MORMLN, 306MOR and 306-MOROC-32 – Slough Mile Zero to Slough Mile 1.7), .



Moro Cojo - % Algal Cover	
Mean	10.42
Range	80
Minimum	0
Maximum	80
Observations	24

C.8 Photo Documentation of Biostimulatory Conditions

CCAMP staff periodically photo-document evidence of biostimulation and excessive algal growth at water quality monitoring sites in the Project Area Figure 47. shows the location of photo monitored sites. The photographic documentation for these sites is presented in Figure 48

Figure 47. Location of photo monitoring sites.

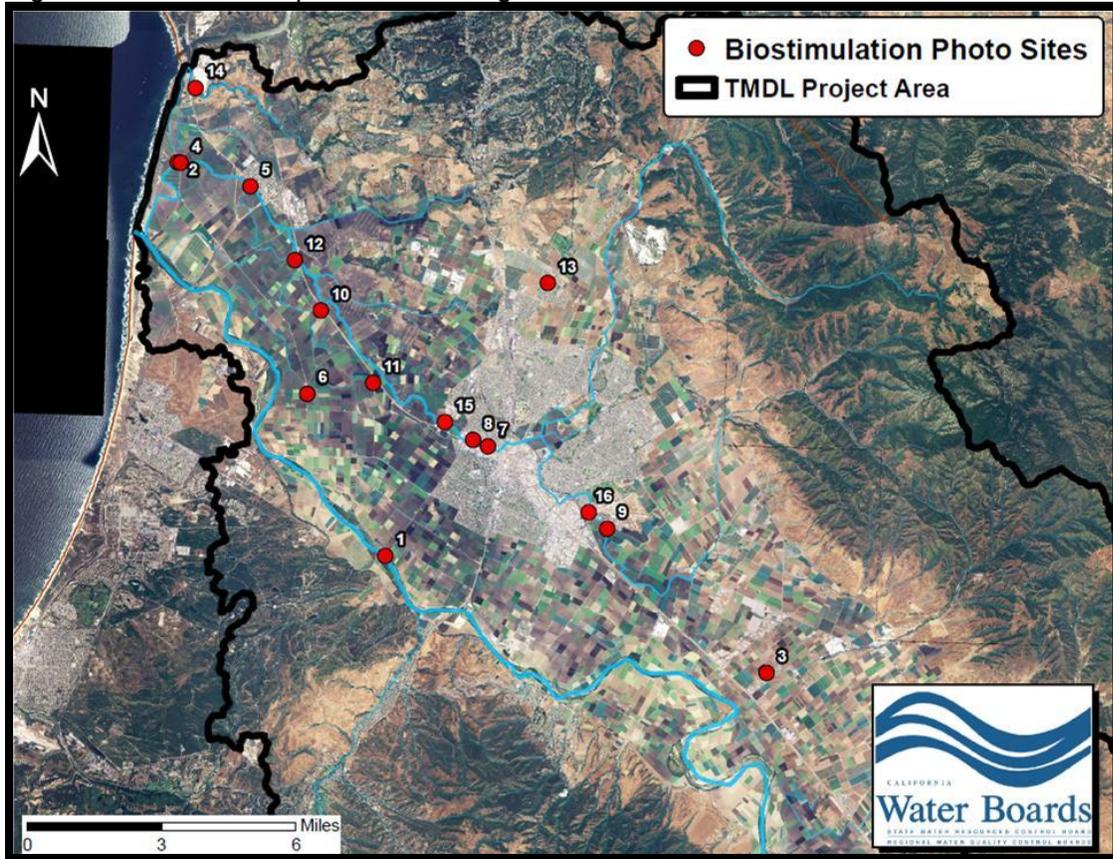


Figure 48. Photo documentation of biostimulation.



Photo documentation



Photo documentation



Photo documentation

Site 13



Santa Rita Creek @ Russell Rd.
June 2005
Photo: Joel Casagrande



Site 14

Moro Cojo Slough @ Moss Landing Rd.
Sept. 2011
Photo: Mary Adams

Moro Cojo Slough
Sept. 2006
Photo: Mary Adams

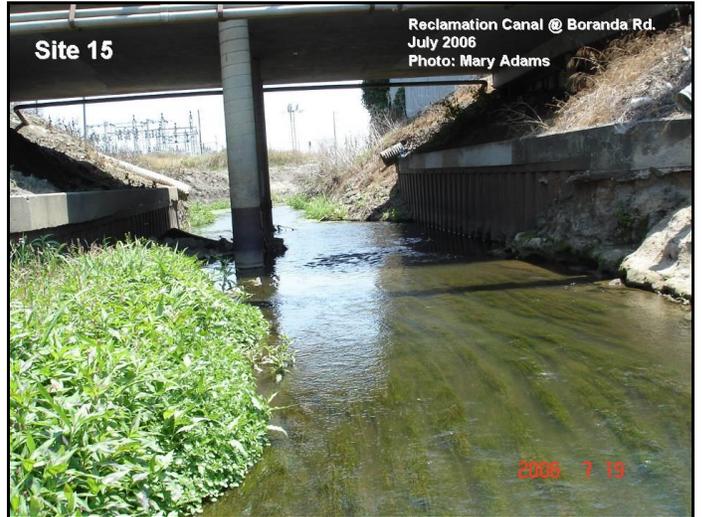
Site 14



2006 9 26

Site 15

Reclamation Canal @ Boranda Rd.
July 2006
Photo: Mary Adams



2006 7 19

Site 16



Reclamation Canal @ Airport Rd.
August 2006
Photo: Mary Adams

2006 8 15

Site 16



2006 7 19