Rainbow Creek TMDL – Total Nitrogen and Total Phosphorus
Regional Board Hearing

Presented by

Alan Monji, Benjamin Tobler, & Craig Carlisle

San Diego Regional Water Quality Control Board

December 8, 2004

Overview of Rainbow Creek TMDL

- TMDL Technical Report (Alan Monji)
- Implementation Plan (Ben Tobler)
- Closing Comments (Craig Carlisle)

Presentation Overview

- TMDL Basics
- Overview of the Rainbow Creek TMDL
- Public Outreach Efforts
- Rainbow Creek TMDL Modifications

Overview

- **TMDL Basics**
- Overview of the Rainbow Creek TMDL
- Public Outreach
- Rainbow Creek TMDL Modifications

TMDL Basics

- **As enacted in 1972, §303(d) of the Clean Water Act requires States to:**
  - Identify waters not meeting State water quality standards -- §303(d) list
  - Develop a TMDL for each pollutant for each listed water

TMDL Basics

Purpose of TMDLs is ...

- Attain Water Quality Objectives and Restore Beneficial Uses

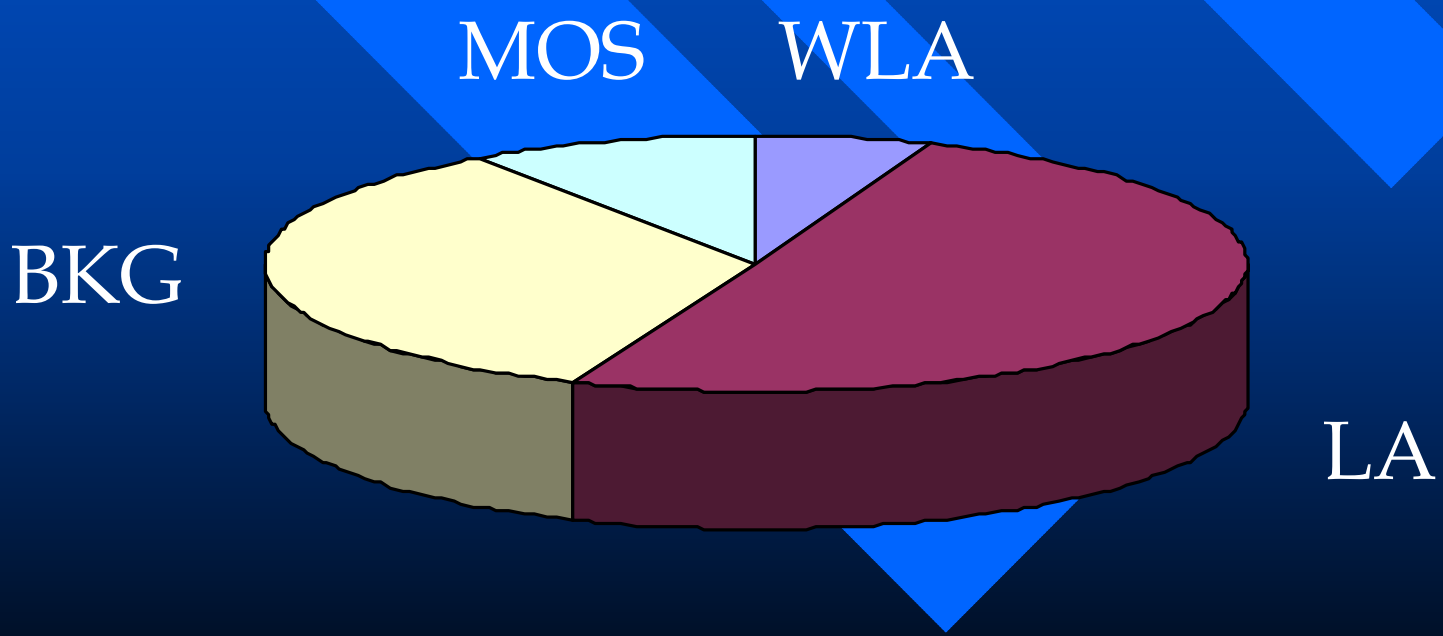
TMDL Basics

Total Maximum Daily Load -

The amount of a specific pollutant that a waterbody can receive and still attain water quality objectives and assure beneficial uses

TMDL Development

TMDL = Σ WLA + Σ LA + Bkg + MOS



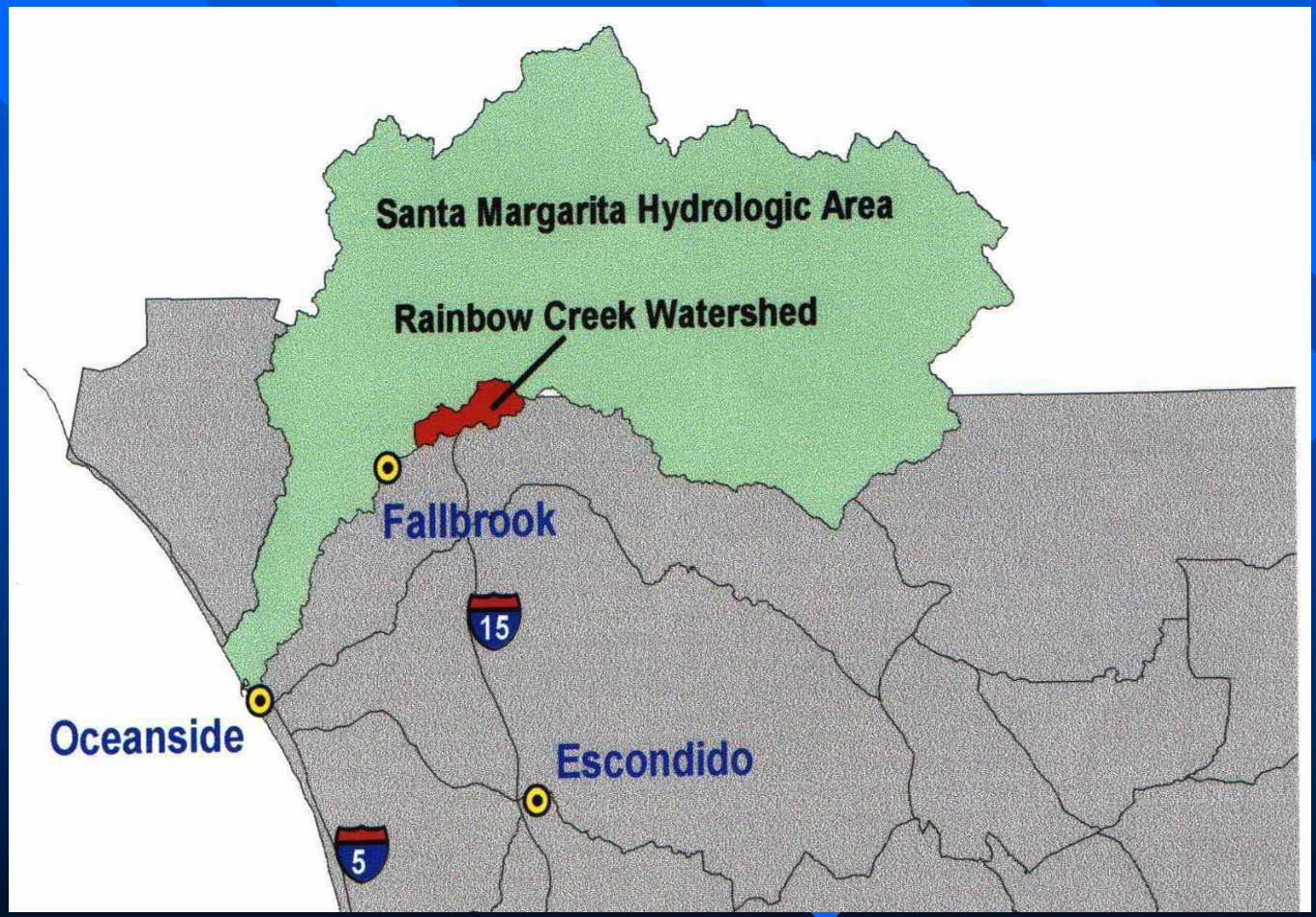
TMDL Required Elements

- Problem Statement
- Numeric Targets
- Source Analysis
- Linkage Analysis
- Pollutant Load Allocations (WLA & LA)
- Margin of Safety (MOS)
- Seasonal Variation & Critical Condition
- Implementation and Monitoring Strategy

Overview

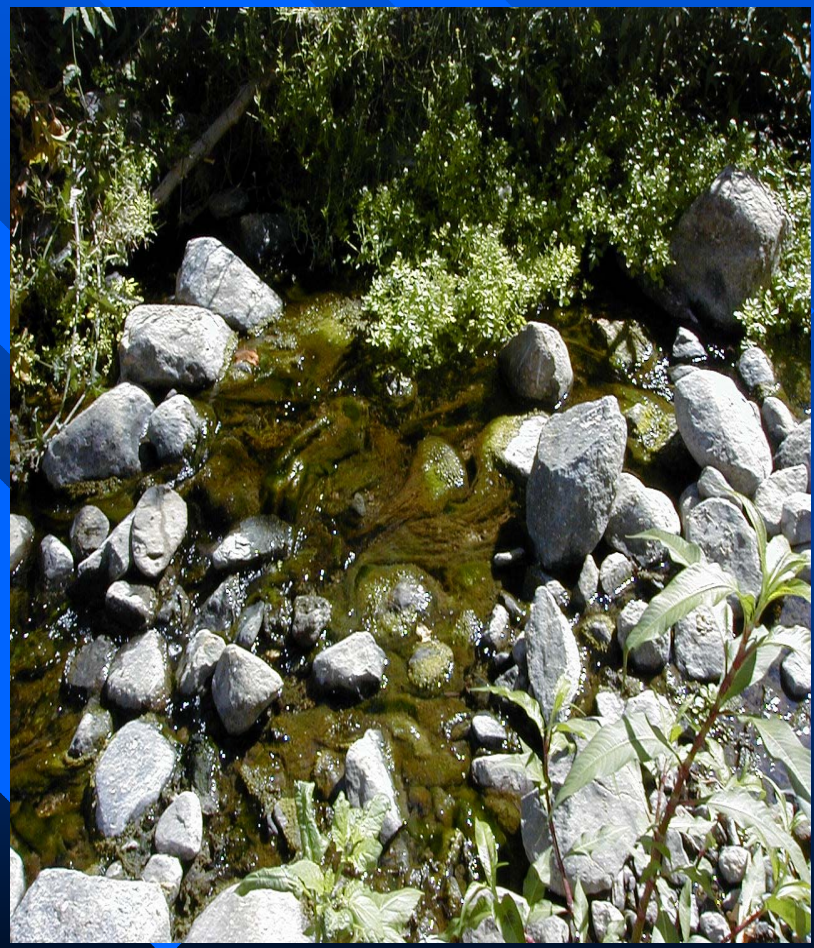
- TMDL Basics
- **Overview of the Rainbow Creek TMDL**
- Public Outreach
- Rainbow Creek TMDL Modifications

Rainbow Creek



Rainbow Creek - Problem Statement

- 1996 303 (d) List for Eutrophic Conditions
- Excess N & P input causes algal growth
- 2002 – Total Nitrogen and Total Phosphorus (Nutrients)



Rainbow Creek - Problem Statement Continued

- **Elevated TN, TP, and NO_3 Above the WQO**
- **Beneficial Uses Affected**
  - Warm Freshwater and Cold Freshwater Habitat
  - Contact and Non Contact Water Recreation
  - Wildlife Habitat
  - Municipal and Domestic Supply

Numeric Targets

- Biostimulatory Substances Objective
  - TN = 1.0 mg/L
  - TP = 0.1 mg/L
- Nitrate in Municipal Supply
  - NO_3-N = 10 mg/L

Water Quality Objectives Exceeded

- **Rainbow Creek Water Quality Data (2000)**
  - **TN: 2 to 23 mg/l**
  - **TP: <0.05 to 1.6 mg/l**
  - Appendix B
- **Numeric Targets** (Water Quality Objective)
  - TN = 1.0 mg/L
  - TP = 0.1 mg/L

Other Nutrient Criteria

- **USEPA Recommended Nutrient Criteria**:
  - TN = 0.5 mg/L and TP = 0.03 mg/L
  - Potential Reference Conditions
  - Best attainable condition at this time.
- **Other Nutrient Studies**

Dodds 1998:

  - TN = 0.9 mg/L and TP = 0.04 mg/L

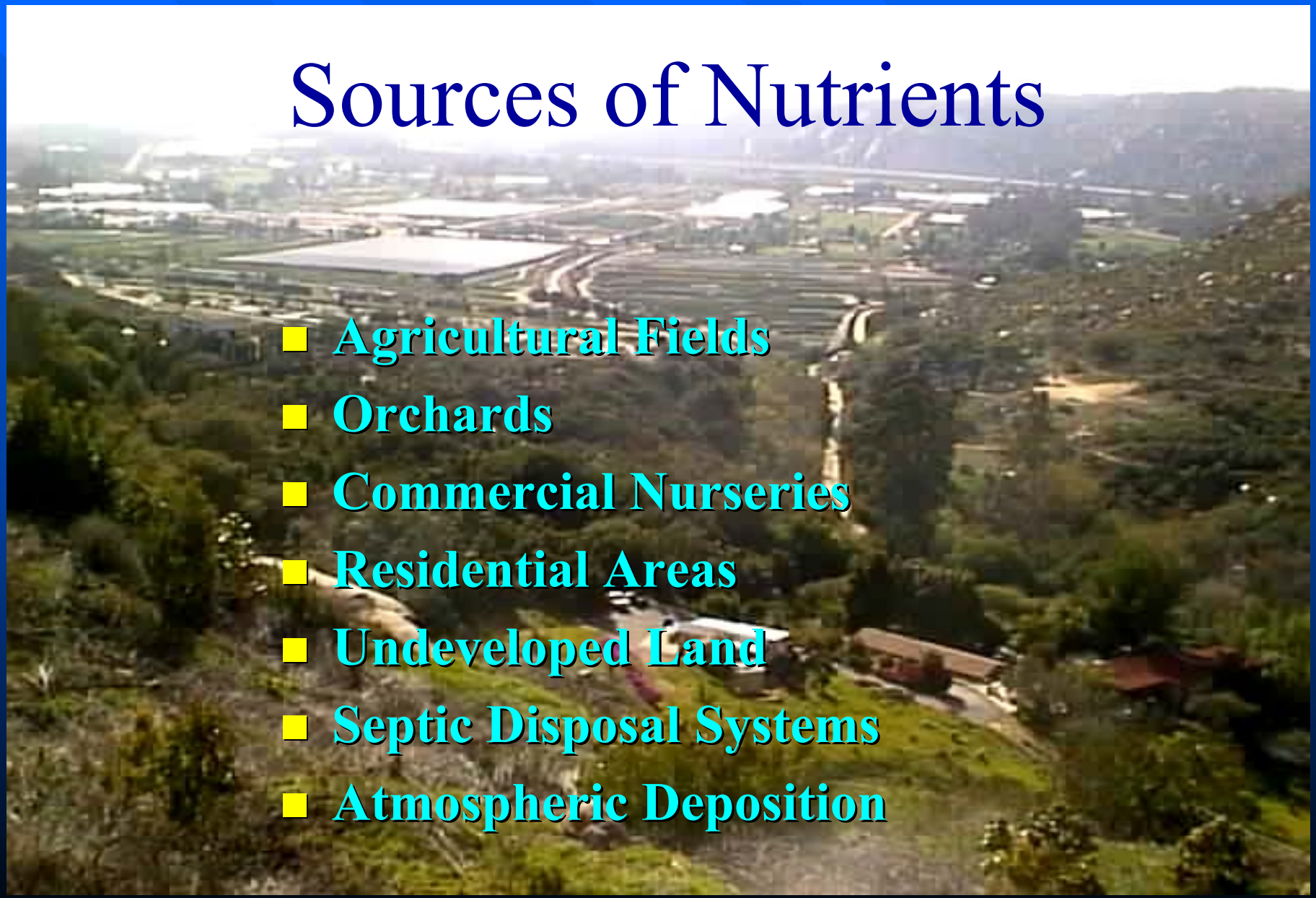
Dodds & Welch 2000:

  - TN= <3 mg/L and TP = <0.4 mg/L

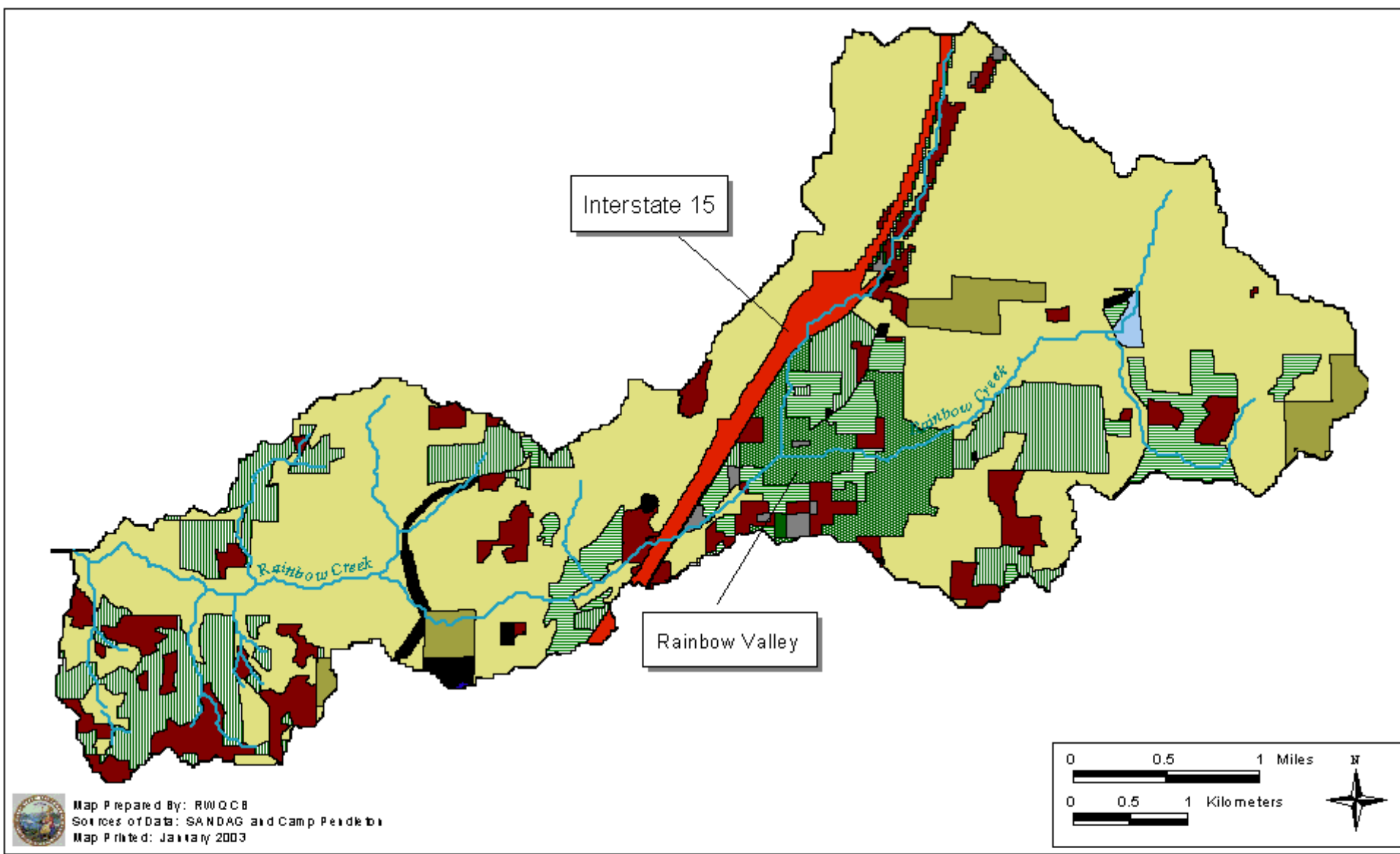
USEPA Regional Technical Advisory Group (RTAG)

- **Regional Nutrient Criteria for Central and Southern Calif.**
- **Adoption of New Nutrient Criteria**
  - TMDL recalculated
  - Draft Basin Plan Amendment, Att. A
- http://www.epa.gov/ost/standards/nutrient.html

Sources of Nutrients



- Agricultural Fields
- Orchards
- Commercial Nurseries
- Residential Areas
- Undeveloped Land
- Septic Disposal Systems
- Atmospheric Deposition



Land Use and Acreage (percentage of total)

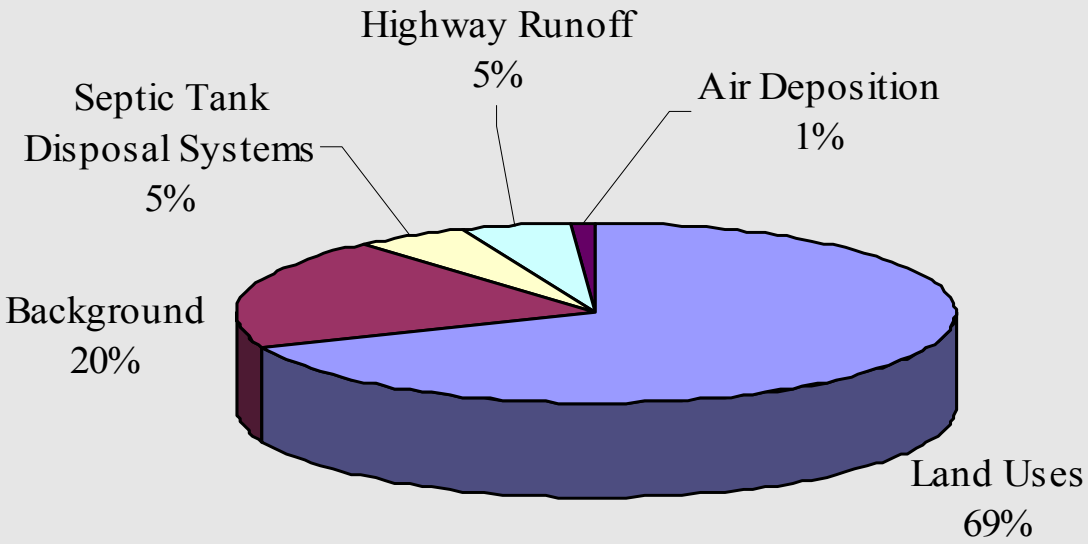
339 (4.8%)	Commercial Nurseries	223 (3.2%)	Preserves	214 (3.0%)	Freeway Corridor
436 (6.1%)	Agricultural Fields	4,342 (61.3%)	Vacant Not Graded	20 (0.3%)	Prison
781 (11.0%)	Orchards	618 (8.7%)	Residential Areas	34 (0.5%)	Urban Areas
5 (<0.1%)	Park	73 (1.0%)	Communication/Utilities	2 (<0.1%)	Water

Figure A-2: Rainbow Creek Watershed 2000 Land Use

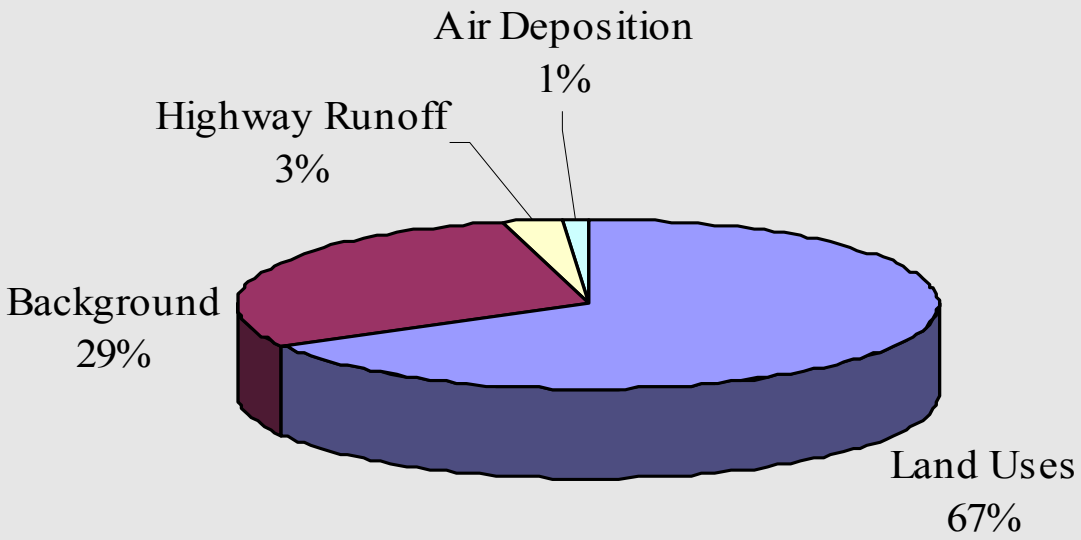
Source Assessment

Source Type	Method of Estimation	Annual TN Load Estimate kg N/yr	Annual TP Load Estimate kg N/yr
Land Uses (surface runoff)	Export Coefficients * Acreage	2,662	262
Caltrans I-15 (storm water runoff)	Runoff Volume * Typical Highway Concentrations	187	12
Background (surface runoff)	Flow * Regional Background Concentration	779	116
Septic Tank Disposal Systems (ground water)	Flow * Baseflow Concentrations	200	N/A
Air Deposition (surface water)	Deposition Rate * area of surface water	40	2
	Total	3,868	392

Annual Total Nitrogen by Source Type



Annual Total Phosphorus by Source Type



TMDL Calculations

- **Low and Moderate-High Flows ∗ Numeric Target = TMDL**
  - TN TMDL = 1,658 kg/yr
  - TP TMDL = 165 kg/yr

- **Very High Flows (≥ 40 cfs) Excluded**
  - Very high magnitude flows
  - Occur less than 2% of the time

Load Allocations

In summary, the TMDL equation is:

$$TMDL = \sum(WLA) + \sum(LA) + Background + MOS$$

	Total Nitrogen	Total Phosphorus
∑ WLA	82 kg N/yr	8 kg P/yr
∑ LA	714 kg N/yr	33 kg P/yr
Background	779 kg N/yr	116 kg P/yr
MOS (5%)	83 kg N/yr	8 kg P/yr
TMDL	1,658 kg N/yr	165 kg P/yr

Total Nitrogen WLA and LA

Source	CURRENT Annual Load Kg N/Yr	TARGET Annual Load Kg N/ Yr	% Reduction
Point Sources			
Caltrans Highway Runoff	187	49	74
Unidentified Sources and Future Point Sources		33	
County of San Diego	***	***	
Non Point Sources			
Commercial Nurseries	507	116	77
Agricultural Fields	655	151	77
Orchards	790	182	77
Park	7	3	50
Residential	650	149	77
Urban Areas	53	27	50
Septic Tank Disposal Systems	200	46	77
Air Deposition	40	40	0

Total Phosphorus WLA and LA

Source	CURRENT Annual Load Kg N/Yr	TARGET Annual Load Kg N/ Yr	% Reduction
Point Sources			
Caltrans Highway Runoff	12	5	58
Unidentified Sources and Future Point Sources		3	
County of San Diego	***	***	
Non Point Sources			
Commercial Nurseries	27	3	90
Agricultural Fields	35	4	90
Orchards	63	6	90
Park	0.2	0.1	50
Residential	125	12	90
Urban Areas	11	6	50
Air Deposition	2	3	0

Overview

- TMDL Basics
- Overview of the Rainbow Creek TMDL
- **Public Outreach**
- Rainbow Creek TMDL Modifications

Rainbow Creek TMDL – Public Outreach (1999 to Dec 2004)

- **Board Hearings**
  - May 2002, Dec 2004
- **Public Workshops**
  - April 1999, Nov 2000, April 2002, Nov 2004
- **Technical Advisory Committee Meetings**
  - 19 Meetings
  - Fallbrook
- **Santa Margarita River Water Quality Monitoring Group**
  - 5 Meetings

Rainbow Creek TMDL – Public Outreach (1999 to Dec 2004) Cont.

- **Individual Meetings**
  - Caltrans (3)
  - County of San Diego (10)
- **Appendix I – List of Events**

Rainbow Creek TMDL – Public Outreach (1999 to Dec 2004)

- **Public Notice of Workshops and Hearings**
  - Union Tribune San Diego (>800,000 readers)
  - North County Times (~93,000 subscribers)
  - Press – Enterprise Riverside (~188,000 subscribers)

Rainbow Creek TMDL – Public Outreach (1999 to Dec 2004)

- **Mailing Lists**
  - Agenda mailing list (209 subscribers)
  - Interested parties – Rainbow Creek (52 subscribers)
- **Electronic Mailing Lists**
  - Agenda mailing list (~360 subscribers)
  - Rainbow Creek (31 subscribers)
- **Regional Board Website**
  - Rainbow Creek TMDL

Overview

- TMDL Basics
- Overview of the Rainbow Creek TMDL
- Public Outreach
- **Rainbow Creek TMDL Modifications**

Rainbow Creek TMDL – Modification Since May 2002

- **Background Nutrient Calculations**
  - Revised calculation to use stream flow data
  - Used available water quality data from the City of San Diego

Modifications Since May 2002 - Background Nutrient Levels

- **City of San Diego Data (Reference):**
  - **TN Mean = 0.47 mg/L,** (SE = 0.09, n = 12)
  - **TP Mean = 0.07 mg/L,** (SE = 0.01, n = 12)

- **Background =** (Flow Volume * Reference Concentration)
  - App D and E
- Biostimulatory Substances WQO
  - TN = 1.0 mg/l
  - TP = 0.1 mg/l

12 Reference Streams In San Diego County

- Wilson Creek
- Pine Valley Creek
- Kitchen Creek
- San Vincente Reservoir
- Cottonwood Creek
- Conejos Creek
- Boulder Creek
- San Diego River
- Cedar Creek
- Bloomdale Creek
- Santa Ysabel Creek

Rainbow Creek TMDL – Modifications Since May 2002

- **Data Gap Issues**
  - Questions on the technical basis of TMDL
- **Data Gaps Addressed**
  - Revisions to TMDL
  - Adaptive Implementation Plan
  - Margin of Safety

Rainbow Creek TMDL – Update Since May 2002

- **Response to Comments (Ch 11, App M)**
- **Economic Section (Ch 12)**
- **Caltrans as WLA (Ch 4 and 6)**
- **Regulatory Authority, Implementation Action Plan, Implementation Monitoring (Ch 8, 9 and 10)**

Regulatory Framework

- ***Point Source Discharge – Subject to Federal & State Law***
- ***Nonpoint Source Discharge – Subject to State Law***

Regulatory Framework

- ***Point Source Discharges***
  - ***Caltrans***
    - ***Storm water runoff from I-15***
    - ***NPDES Storm Water Permit***
  - ***County of San Diego***
    - ***Urban runoff***
    - ***NPDES Storm Water Permit***

Nonpoint Source Discharges

- *CA Nonpoint Source Pollution Control Program, 1999*
- *CA Policy for Implementation and Enforcement of the NPS Control Program, 2004*
  - *WDR's, Waivers or Basin Plan Prohibitions*
  - *Third-Party Agreements - MAA with County of San Diego*

Nonpoint Source Discharges
Land Use Activities

- ***Commercial nurseries***
- ***Agricultural fields***
- ***Orchards***
- ***Parks***
- ***Residential***
- ***Urban***
- ***Septic tank disposal systems***

Implementation Action Plan Objectives

- ***Mandate point source waste load reductions in NPDES Permits***
- ***Mandate NPS nutrient load reductions from the 7 land use areas***
- ***Promote establishment of a MAA between RB and County***

Implementation Action Plan Objectives - Continued

- ***Promote establishment of a MOU between RB and other agencies, organizations, and universities for assistance (technical, financial, etc…)***
- ***Establish mechanisms to track management measures***

Implementation Schedule

- ***Phased Load Reduction***
  - ***20% Reduction Every 4 Years for 12 Years***
  - ***14% Reduction in final 4 Years***
  - ***16 Years Total Duration***

Implementation Schedule (TN)

Source	Annual Total Nitrogen Load Allocations			
	-20% 2009 kg/yr	-20% 2013 kg/yr	-20% 2017 kg/yr	-14% 2021 kg/yr
Waste Load Allocations				
Caltrans highway runoff	122	49	49	49
Unidentified & future point sources	33	33	33	33
Load Allocations				
Commercial nurseries	396	315	202	116
Agricultural fields	511	405	261	151
Orchards	617	480	315	182
Park	5	3	3	3
Residential areas	507	401	260	149
Urban areas	40	27	27	27
Septic tank disposal systems	200	100	46	46
Air deposition	40	40	40	40
Background	779	779	779	779
MOS (not allocated)	83	83	83	83
Total	**3,333**	**2,715**	**2,098**	**1,658**

Implementation Schedule (TP)

Source	Total Phosphorus Allocations			
	2009 kg P/yr[1]	2013 kg P/yr[1]	2017 kg P/yr[1]	2021 kg P/yr[1]
Caltrans highway runoff	8	5	5	5
Unidentified and future point source discharge	3	3	3	3
Point Source (WLA) Subtotal	**11**	**8**	**8**	**8**
Commercial nurseries	20	15	10	3
Agricultural fields	30	20	15	4
Orchards	50	40	25	6
Park	0.15	0.10	0.10	0.10
Residential areas	100	75	45	12
Urban areas	9	6	6	6
Air deposition	2	2	2	2
Non-Point Source (LA) Subtotal	**211**	**158**	**103**	**33**
Total WLA & LA[2]	**222**	**166**	**111**	**41**
Background	**116**	**116**	**116**	**116**
Margin of Safety	**8**	**8**	**8**	**8**
Total Allocations for Total Phosphorus TMDL	**346**	**290**	**235**	**165**

Implementation Actions

- ***Regional Board***
- ***County of San Diego***
- ***Caltrans***
- ***CA Dept. Forestry & Fire Protection***

Regional Board Actions

- ***Request SWRCB amend Caltrans permit to incorporate nutrient WLA***
- ***Enforce County NPDES permit***
- ***Issue investigative order to County to submit NRMP***
- ***Establish Management Agency Agreement (MAA) with County for NRMP Implementation***
- ***Issue investigative order to County for groundwater investigation***

Regional Board Actions (continued)

- ***CA Dept. of Forestry***
  - ***Continued investigation of their discharge***
- ***Identify opportunities to establish MOUs with other agencies or organizations***

Regional Board Actions (continued)

- ***Regulate NPS discharges via WDRs, Waivers or Discharge Prohibitions***
- ***Enforcement actions as appropriate***
- ***Review and revise existing WDRs as necessary***
- ***Recommend high priority for grants***
- ***Incorporate § Section 13291 regulations in Basin Plan***

County of San Diego Actions

- ***Control storm water discharges (NPDES)***
- ***Submit & implement Nutrient Reduction Management Plan (§13225)***
- ***Submit GW Investigation Workplan and report (§13225)***
- ***Establish MAA with Regional Board to control Nonpoint Source Discharges***

Caltrans

- ***Meet waste load allocations***
  - ***NPDES Permit (Order No. 99-06-DWQ)***
- ***Submit progress reports***

CA Dept. Forestry & Fire Protection – Rainbow Conservation Camp

- *Continue to investigate percolation ponds and report to Regional Board*
- *Evaluate discharge*
  - *Determine the impact of the nutrient loads from this facility to Rainbow Creek.*

Monitoring Program

- ***Assess success in achieving reductions and attaining Water Quality Objectives***
- ***Regional Board to receive annual report from County of SD***

Monitoring Elements

- ***Surface Water – Stations / Frequency / Parameters***
- ***Groundwater – Stations / Frequency / Parameters***
- ***Hydrology***
- ***Algal Biomass***
- ***Biological Assessment Monitoring***
- ***Reports***

Economic Considerations

Item	First Year Cost[1]	Subsequent Annual Cost[1]
Develop/Revise NRMP	$10,000 - $50,000	$2,000 - $10,000
Surface Water Monitoring Program[2]	$70,600 - $125,000	$70,600 - $125,000
Ground Water and Septic Investigation Program[3]	$54,000 - $102,500	$31,000 - $58,000
Equipment and Outreach[4]	$45,500 - $66,000	$9,000 - $20,000
Total	$180,100 - $343,500	$112,600 - $213,000

Rainbow Creek TMDL
Summary & Conclusions

- **Excess nitrogen and phosphorus is being discharged into Rainbow Creek**
- **TMDL is appropriate mechanism to address the variety of point and non-point sources**

Rainbow Creek TMDL
Summary & Conclusions

- **Address implementation details after adoption.**
- **Scientific certainty not necessary**

Recent Sampling Results

- **Collected two samples Dec. 5**
- **Total Nitrogen = 39 & 43 mg/L**
  (Nitrogen objective = 1 mg/L)
- **Total Phosphorus = 0.83 & 0.88 mg/L**
  (Phosphorus objective = 0.1 mg/L)

Issues Raised in 2002

- **Listing for nitrogen and phosphorus**
- **Background calculations revised**
- **Targets are feasible**

Issues Raised in 2002 (continued)

- **Standard might change**
- **Expand economics section**

Other Issues Addressed

- **October 15, 2004 Draft Technical Report**
- **Notification and public outreach**
- **Scientific validity**
- **Requests for delays**

Other Issues Addressed

- Atmospheric deposition
- Impairment not pervasive
- Current voluntary actions sufficient (TMDL not needed)

Rainbow Creek TMDL
Other Issues Addressed

- **Link between nutrient levels and aquatic conditions**
- **Allowance for seasonality**
- **Adopt alternative/interim targets**

Rainbow Creek TMDL

Recommendations

- **Close public comment period**
- **Schedule TMDL for adoption**