

# Overview of California's TMDL Program: Goals and Research Needs



CALIFORNIA

## Water Boards

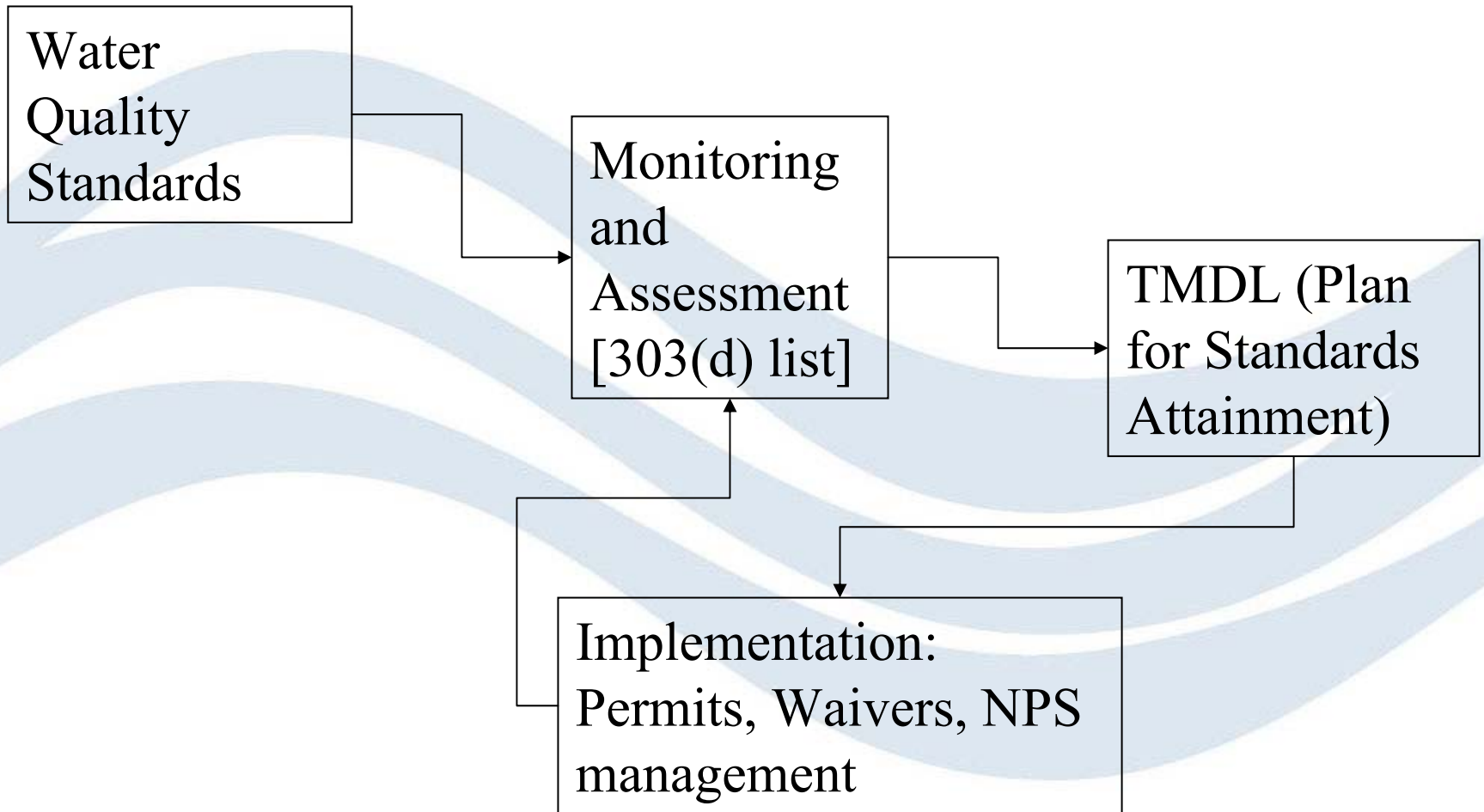
STATE WATER RESOURCES CONTROL BOARD

REGIONAL WATER QUALITY CONTROL BOARDS

# Clean Water Act Basics

- Purpose:
  - “Restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.”
- Section 303(d):
  - Identify where standards not met and establish loads for pollutants

# Basic Steps for Identifying and Restoring Polluted Waters



# Water Quality Standards

- Standards = Water quality objective and beneficial use of water
- Beneficial use of water examples = drinking water, swimming, fish consumption, preservation of aquatic resources
- Water quality objective = numeric or narrative
- Examples: 45 mg NO<sub>3</sub>/L **or** log mean of 200 fecal coliform/100 ml

# Monitoring and Assessment

- Surface Water Ambient Monitoring Program begun in 2000
- Section 303(d) requirement of finding waters not meeting standards
- Several “lists” developed since mid-1970’s
- Scrutiny of 1998 and 2002 lists

# Listing Policy

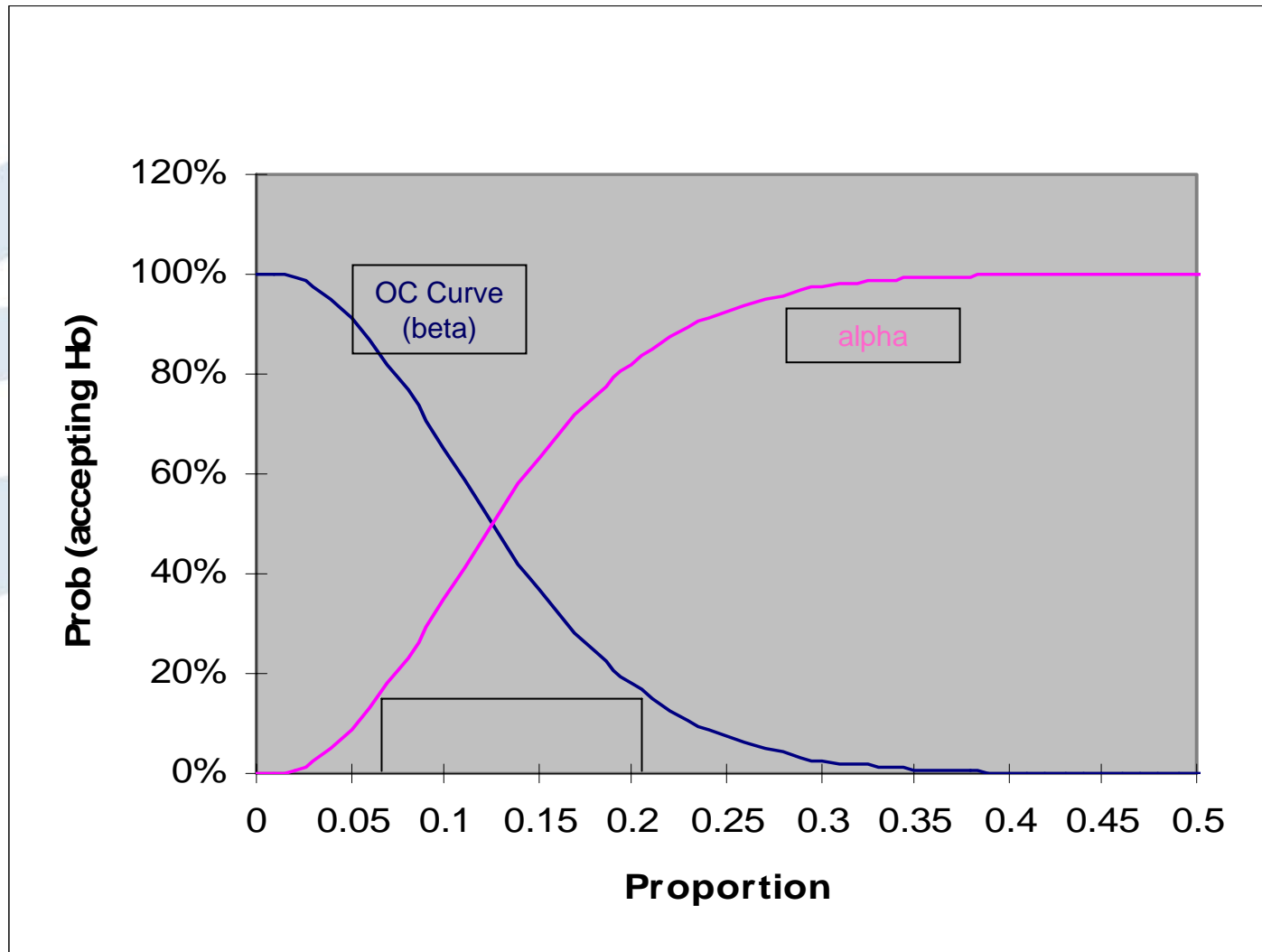
- Weight of Evidence Approach
- Listing and Delisting Factors
- Implementation measures
  - Solicitation
  - Data quality
  - Data quantity
  - Approval process
- Example



# Statistical Analysis

- Binomial statistics (only two possible answers)
- Balance alpha and beta errors using Acceptance Sampling by Attributes
- For listing, acceptable exceedance frequency ( $r_1$ ), unacceptable exceedance frequency ( $r_2$ ),  $k = \#$ hits,  $N =$  sample size
- $\alpha = P(k \geq k_{list} | k_{list}, N) = I(r_1, k_{list}, N - k_{list} + 1)$
- $\beta = P(k \leq k_{list} - 1 | k_{list}, N) = 1 - I(r_2, k_{list}, N - k_{list} + 1)$
- Balanced Error =  $\text{Min } | \alpha - \beta |$  where  $r_1 < r_2 < 1$  and  $\alpha$  and  $\beta \leq$  acceptable level

# Analyzing Data



# Example: Toxic Pollutants

- Priority pollutants, metals, chlorine, and nutrients.
- List
  - $H_0$ : Actual exceedance proportion  $\leq 3\%$
  - $H_a$ : Actual exceedance proportion  $> 18\%$
  - $\alpha$  and  $\beta \leq 0.20$
- Delist
  - $H_0$ : Actual exceedance proportion  $\geq 18\%$
  - $H_a$ : Actual exceedance proportion  $< 3\%$
  - $\alpha$  and  $\beta \leq 0.10$

# Example – Perchlorate



# Perchlorate

- Narrative Standard interpreted using Public Health Goal (6 ppb)
- Since 2002, treatment of ground water
- Pre-2002 data not used because not representative of current conditions
- At drinking water intake:
  - 28 samples
  - 2 exceed PHG
- Do not list (This pollutant is not a problem here)

# Top Water Quality Problems

Problem	Percent of Listed Waters
Pathogens	41
Nutrients	28
Pesticides	27
Metals	27
Sediment	20

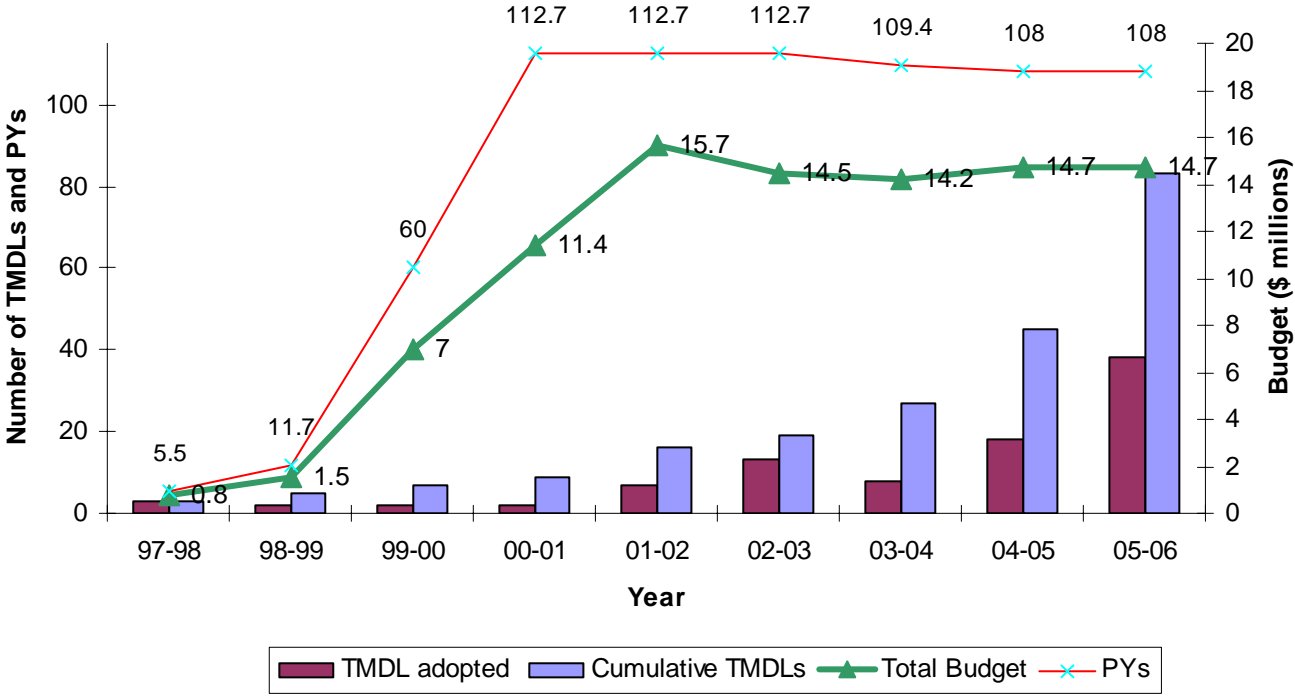
# Total Maximum Daily Load

TMDL =

(CWA 303(d)(1)(C); 40 CFR  
130.2(I).)

- WLAs for point sources
- +  
• LAs for nonpoint sources (NPS) and natural background
- +  
• Seasonal variations
- +  
• Margin of safety (to address any uncertainty)

# TMDLs Adopted



# Research Needs

- Increase quantity and quality of TMDLs
  - Researcher involvement in TMDLs
  - Advisory role during TMDL development
  - Formal peer review
- Improve watershed and water quality modeling
  - Pathogen sources and transport
  - Nutrient loading
  - Bioaccumulative pollutants (e.g., mercury)
  - Management practice simulation

# Research Needs

- Improve understanding and consideration of atmospheric deposition in TMDLs
  - Modeling tools are need to quantify inputs
  - Predicting load reductions for air sources
  - Identifying sources of atmospheric deposition to water bodies
- Example

# Annual Mean Loading\*

(mt Nitrogen/yr)

Watershed	Water Reclamation Plants	Atmospheric Deposition (Dry)	
		Direct	Indirect
LA River	1,042	0.2	5,600
Malibu Creek	142	0.07	220
San Gabriel River	2,380	1.4	4,710

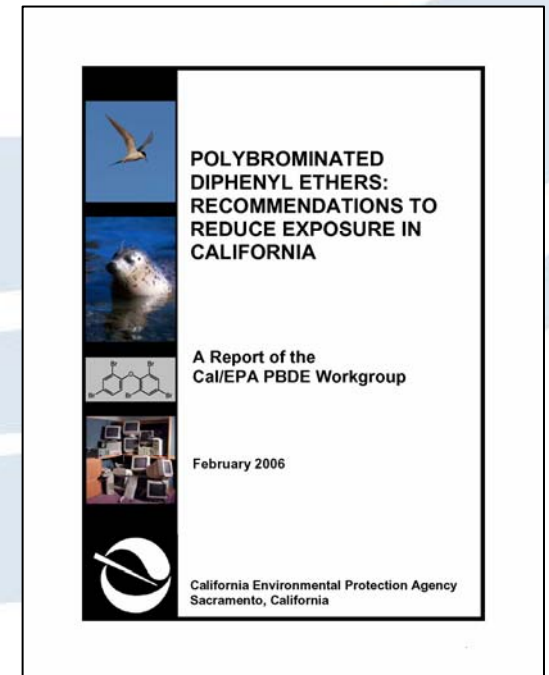
\*Stoizenbach (UCLA) and Schiff (SCCWRP)

# Research Needs

- Improve information on Management Practice effectiveness
  - NPS management practices implemented under tight budgets and effectiveness evaluation often dropped
  - Need focus on agricultural, forestry and urban runoff

# Research Needs Beyond TMDLs

- Beneficial use designations need to be more specific (tiered uses)
- Water quality objectives
  - Translating narrative objectives
  - Developing objectives for sediment
    - Indicators, bioavailability, salinity effects
  - Developing bio-criteria
- Focus on “emerging” pollutants
  - PBDEs
  - Invasive species



# Questions?

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