



# Introduction to the Clean Water Act

Webcast Sponsored by EPA's Watershed Academy

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U.S. Environmental Protection Agency




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## Topics for Today's Webcast

- Clean Water Act (CWA) regulatory scope and key terms
  - History of the CWA
  - Water Quality-Based vs. Technology-Based Approaches
  - Water Quality-Based approaches under the CWA
    - **Water Quality Standards**
    - **Other CWA programs “driven by” water quality standards (e.g., TMDLs)**
- 

## CWA REGULATORY SCOPE: KEY TERMS

- **POLLUTANT**
- **POINT SOURCE**
- **WATERS OF THE U.S.**

## Pollutant

- Means dredged spoil, solid waste, incinerator residue, filter backwash, sewage sludge, munitions, chemical wastes, biological materials, (some) radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water

*CWA Sec. 502(6)*

*--A subset of "pollution" (all types of manmade alteration of waterbodies)*

## Pollution

- The man-made or man-induced alteration of the chemical, physical, biological and radiological integrity of the water



CWA Sec. 502(19)



## Pollutant or Non-Pollutant Pollution?

- PCBs
- Copper
- Temperature
- Pathogenic viruses
- Dissolved oxygen
- pH
- Nutrients (P and N)
- Chlorophyll a
- "Poor" score on a biosurvey (per aquatic life)



## Question on a "Hot" Topic:

Would lower stream flows resulting from increased incidence and severity of droughts due to climate change be:

- 1) pollution?
- 2) pollutant?
- 3) non-pollutant pollution?



## Point Source

- Any discernable, confined, discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, rolling stock, concentrated animal feeding operation, *some* vessels, or other floating craft from which pollutants are or may be discharged. (CWA Sec. 502(14))

– **does not include** “return flows from *irrigated agriculture*” or “agricultural stormwater”

Nonpoint Source: all sources besides PS

## Waters of the United States

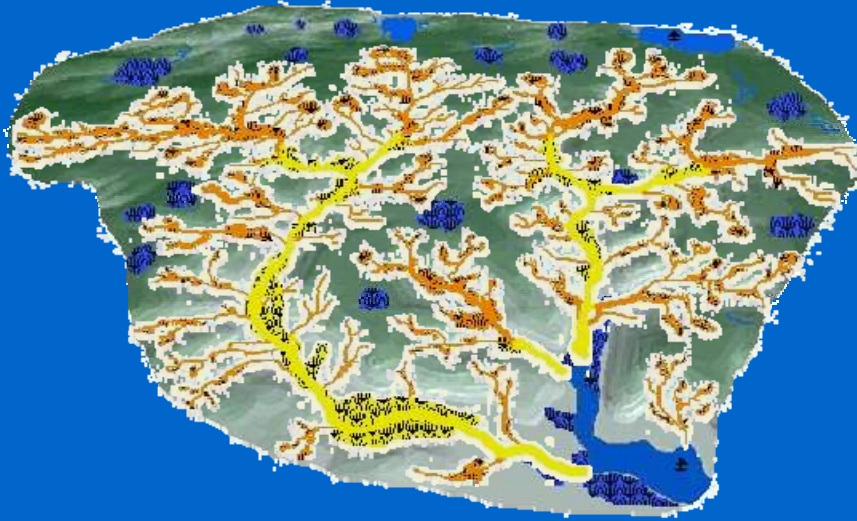
33 CFR 328

- **Waters used in interstate/foreign commerce**
  - Traditional “**Sec. 10**” navigable waters
- **All interstate waters and interstate wetlands**
- **Intrastate waters whose destruction/degradation would affect interstate/foreign commerce**
- **Tributaries to and impoundments of all of the above**
- **Territorial seas at cyclical high tide mark**
- **Wetlands adjacent to waters listed above**

Includes surface waters only-- not ground water

## Scope of Clean Water Act

Non-navigable Lakes, Rivers, Streams  
and Nearby Wetlands



## Scope of Clean Water Act

Navigable Waters and Nearby Wetlands



## History of the CWA

- Rivers and Harbors Act (1899)
- Water Pollution Control Act (1948)
- Federal Water Pollution Control Act (1956)
- Water Quality Act (1965)
- Federal Water Pollution Control Act Amendments (1972)
  - **Clean Water Act (1977)**
  - **Water Quality Act (1987)**
  - **BEACH Act (2000)**

## History of the CWA (cont.)

- Pre-CWA (1972): water quality-based approach
- Post-CWA, "Era I": technology-based approach
- CWA "Era II":
  - **technology-based**, *backed up by*
  - **water quality-based**

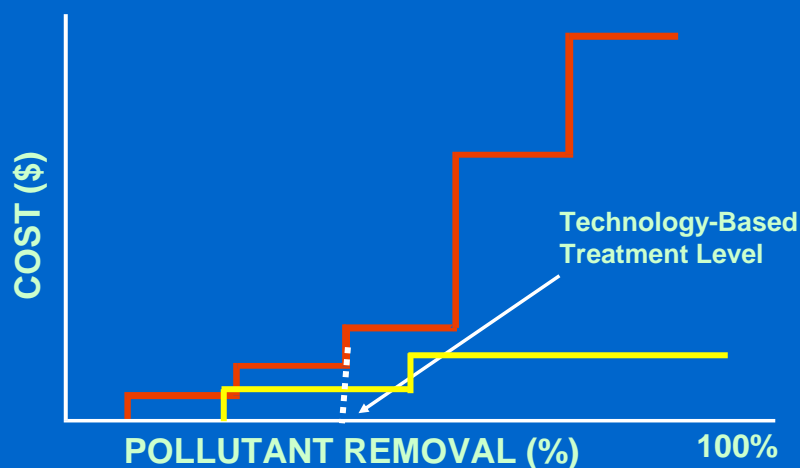
## CWA: Tech-Based vs. WQ-Based

- **Technology-Based**
  - Source > Pollutant > **(Waterbody)**
- **Water Quality-Based**
  - **Waterbody** > Pollutant > Source

## T-B Approach in CWA

- Limits apply regardless of condition of receiving water, or relative contribution from one particular source
  - Based on cost-effectiveness test (Not cost/benefit)
  - Regulatory/enforceable only for “point sources”
- Same limits placed on all PS within each industrial grouping,
  - Apply nationwide
- Virtually all municipal sewage plants must achieve “secondary treatment”, or equivalent


## Cost-Effectiveness Analysis




## EPA Effluent Guidelines Regulation Packages

- **EPA has issued “packages” for over 50 major categories of industries**
  - Most broken down into numerous subcategories, the actual total is several hundred
- **More information:**  
[www.epa.gov/waterscience/guide](http://www.epa.gov/waterscience/guide)

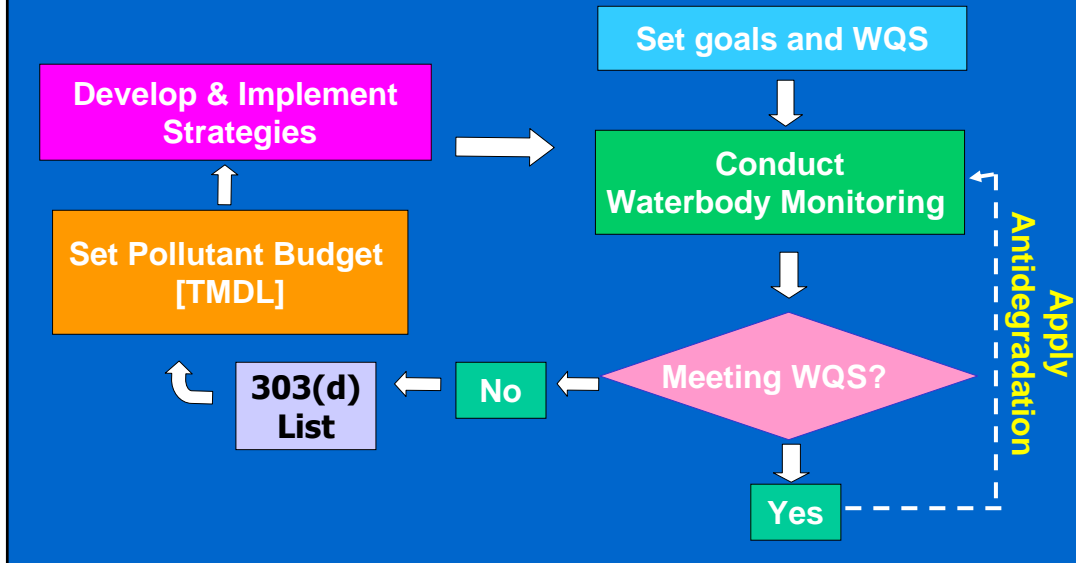
## WQ-Based Approach in CWA

- Tech-based limits on point sources (existing and new) still apply
  - Additional (mandatory) limits placed on PS, only where ambient water quality standards (WQS) still not met after T-B implemented
  - New limits “driven by” WQS, not technical feasibility or economics
  - Total Maximum Daily Load (TMDL) consistent with meeting WQS set for waterbody/pollutant.
    - Overall load (cap) then allocated among all sources.
    - Needed nonpoint source (NPS) reductions indicated, but unlike PS reductions, not mandatory
- 

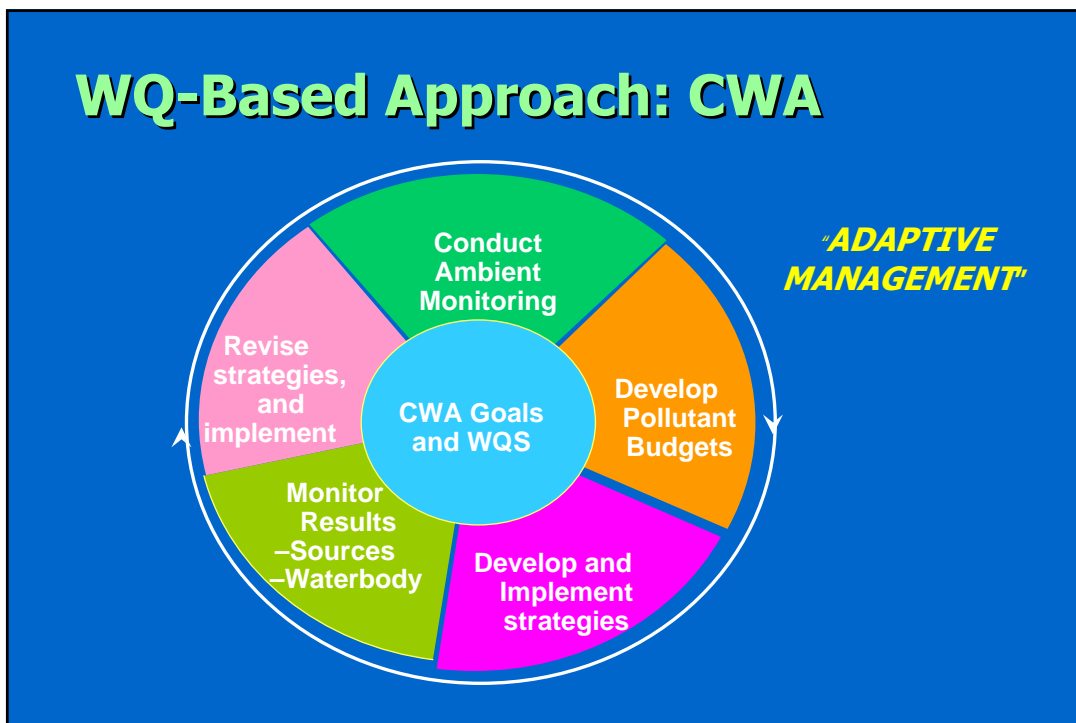
## Tech-based or WQ-based?

- “improve water quality”
  - “implement cost effective controls”
  - “reduce loadings to the waterbody”
  - “implement measures to reduce loadings to the maximum extent practicable/feasible”
  - “employ the best available technology economically achievable.”
  - “make progress toward meeting water quality goals”
- 

## CWA: WQ-Based Approach



## WQ-Based Approach: CWA



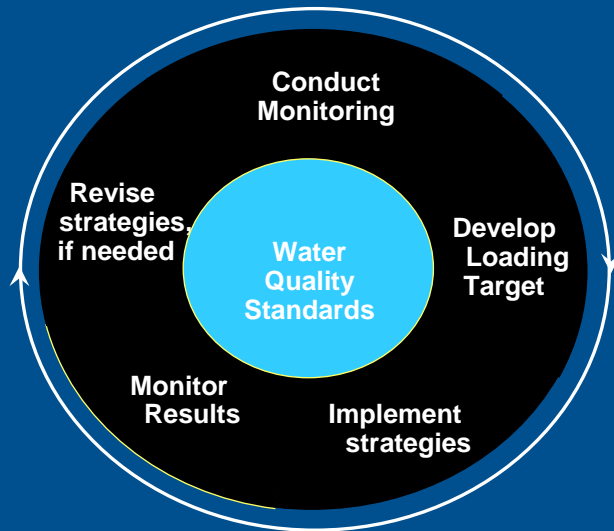
## CWA GOALS: WQ-BASED

- "Restore and maintain the chemical, physical and biological integrity of the Nation's waters"
- "Water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water"  
*(Fishable/Swimmable Goal)*

## Questions



## CWA: WQ-Based Approach



## Water Quality Standards: Purposes/Uses

Set Goals and Water Quality Standards

- Benchmark for assessment of waterbody condition
- Basis for:
  - TMDLs
  - WQ- based limits for PS (WQBELs)
  - Watershed plans per NPS programs
- Program/project evaluation
  - TMDL, NPDES, 319, SRF, non-CWA programs

# BEWARE !!!

--- of the word  
**"STANDARDS"**

... *when talking to "clean  
water nerds" like*

***Yours Truly***



## Water Quality Standards

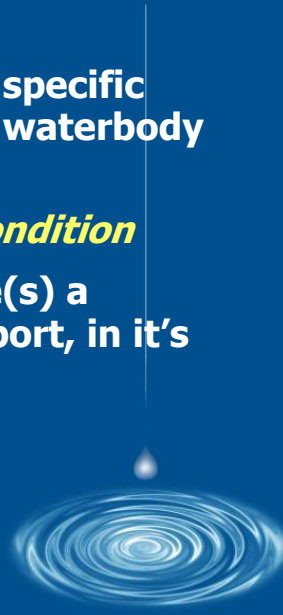
- **Must address all surface waters (i.e., waters of US/state)**
  - **Groundwater standards not required by CWA**
- **Key elements**
  - **Designated uses** (those uses society has decided it wants a waterbody to be able to support)
  - **Water quality criteria** (conditions supportive of one or more designated use)
  - **Antidegradation**
- **General policies (discretionary)**
  - **Mixing zones** for point source discharges
  - **Design conditions:** low stream flows, etc

## WQS Setting: Process

- WQS established by states, territories and authorized tribes
- EPA must review/approve prior to becoming effective per federal CWA
- If EPA disapproves a state or tribe WQS and state or tribe doesn't revise it, EPA promulgates a WQS
- Public review and comment at state, tribal, and federal levels (if EPA promulgates)
- States must review their WQS every three years and submit them to EPA
  - “Triennial Review”

## WQS: Designated Uses

- **Expression, in WQS, of a use for a specific waterbody that society wants the waterbody to be able to support**
  - ***regardless of current use(s)/condition***
    - **not simply a statement of use(s) a waterbody does or could support, in it's present condition**
    - **not a “posting”**
    - **think “desired use(s)”**



# Why do we need clean water?

...list uses, values, services important to **YOU**



## WQS: Designated Use Categories

- Drinking Water Source
  - **Treated/Untreated**
- Human Contact
  - **Contact (Primary), Noncontact (Secondary)**
- Catching/eating Fish
- Aquatic life
  - **Warmwater species/habitat**
  - **Coldwater species/habitat**
- Agriculture water supply
- Industrial water supply
- Religious/cultural practices



**FACT**  
*or Fiction*

**Before a state, tribe, territory assigns one or more designated uses to a waterbody, they must monitor uses and water quality in that waterbody.**

Set Goals and Water Quality Standards

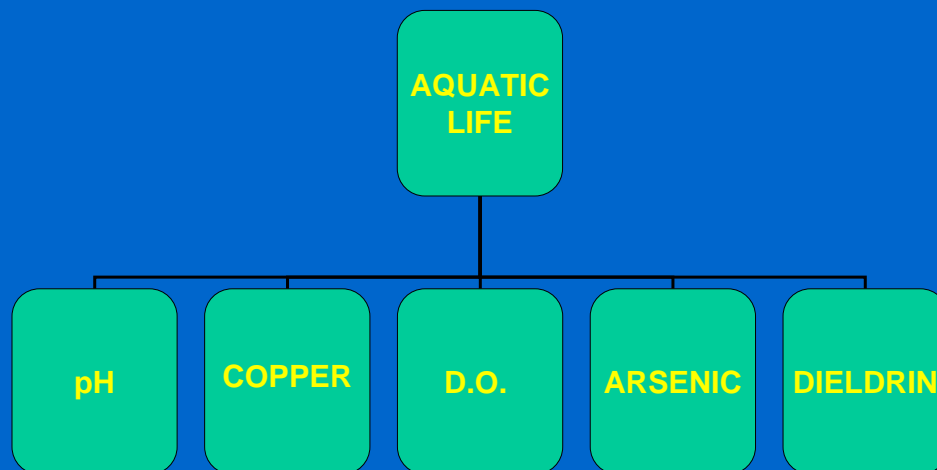
## WQS: Use Classifications

**WWAL** = Warm Water Aquatic Life  
**CWAL** = Cold Water Aquatic Life  
**2C** = Secondary Contact Recreation  
**1C** = Primary Contact Recreation  
**A** = Agricultural Water Supply  
**I** = Industrial Water Supply  
**PWS** = Public Water Supply

## WQS: Water Quality Criteria (WQC)

- “Elements of state water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use.”
  - 40 CFR 131.3 (b)
- Must have for enough parameters to ensure DU(s) would be supported, if all WQC met
- **Must be based on a sound scientific rationale**  
Technical/economic feasibility of meeting “off the table”

## WQS: DU and WQC



## WQS: Narrative Criteria

- Waters must be "free from"
  - Putrescent or otherwise objectionable bottom deposits
  - Oil, scum, and floating debris in amounts that are unsightly
  - Nuisance levels of odor, color, or other conditions
  - Undesirable or nuisance aquatic life
  - Substances in amounts toxic to humans or aquatic life



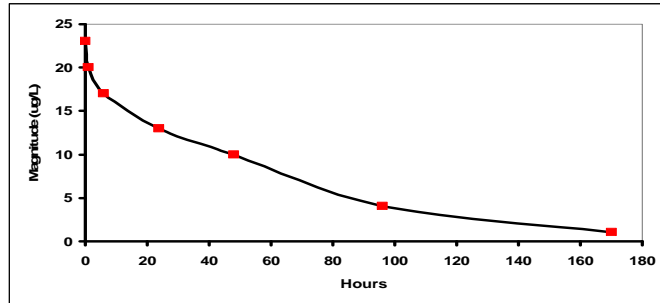
Usually apply to all waters, regardless of use designation

## WQS: Numeric Criteria

- Parameter-specific: copper, dioxin, total P, dissolved oxygen, etc.
  - Concentration / Magnitude
    - 1 mg/L, 35 bacteria/100 ml, 75° F, pH 6 to 9
  - Duration / Exposure Interval
    - Acute: instantaneous, 1-hour, 1-day, etc.
    - Chronic: 4-day, 7-day, 30-day, year(s), etc.
  - Frequency / Recovery Interval
    - 1 year, 3 years, 10 years, etc.

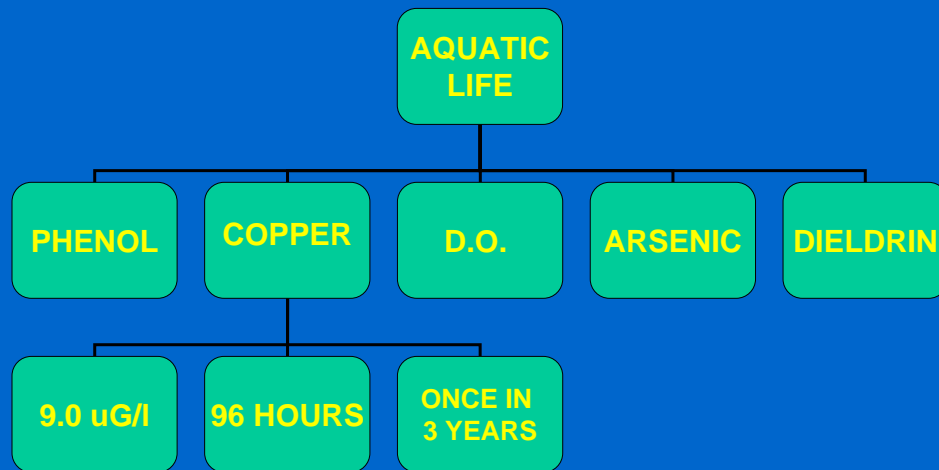
# Intensity of Stress vs. Length of Exposure Period

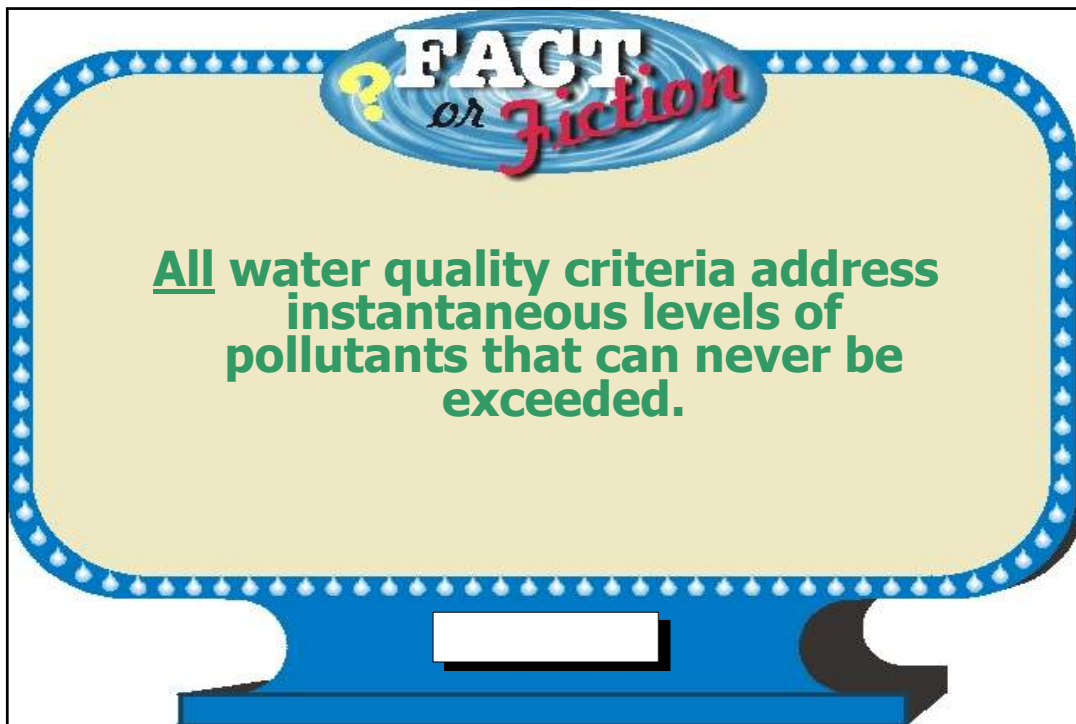
Magnitude vs. Duration  
LC 50 – Ethylmethyl Nasteel



EPA acute WQC for aquatic life (aka CMC): 1 hr average  
EPA chronic WQC for aquatic life (aka CCC): 96 hour average

# WQC: BIG PICTURE





Set Goals and Water Quality Standards

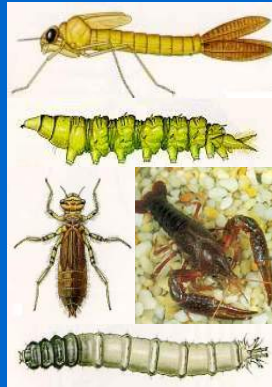
## WQS: Biological Criteria

- **Applicable to aquatic life, not human health**
- **Field sampling/studies needed**
  - Not lab-based
- **Fish, macroinvertebrates, plants, etc.**
  - Number of individuals, species, categories
  - Mass of species, feeding guilds, trophic levels
  - Specialists verses generalists
  - Tolerant verses intolerant
- **Compare conditions at "study site" with relatively unimpacted "reference site"**

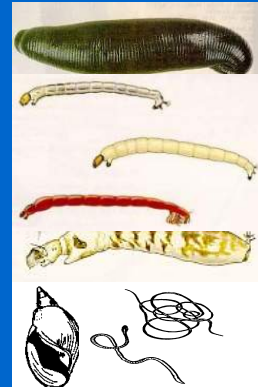
## Biological Criteria



Good



Mid-Range

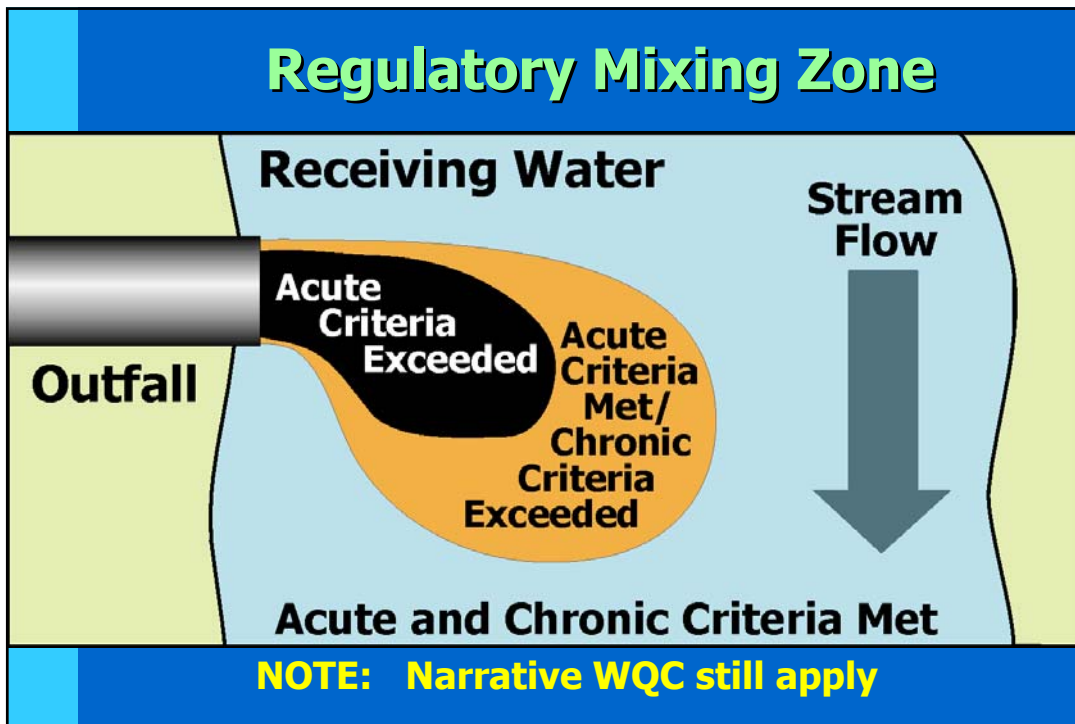


Poor

## WQS: General Provisions


- **Spatial/Areal**
  - Mixing zones
- **Temporal**
  - Low streamflow
  - High streamflow
- **Natural Conditions**





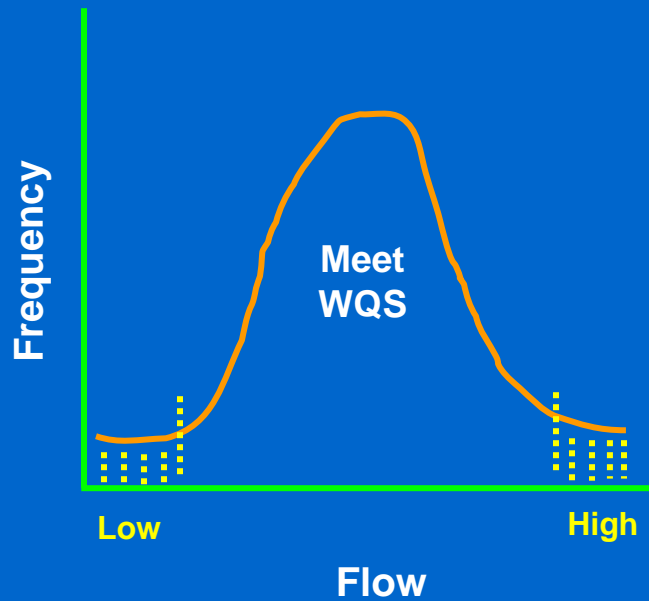
Set Goals and Water Quality Standards

## “DESIGN” CONDITIONS



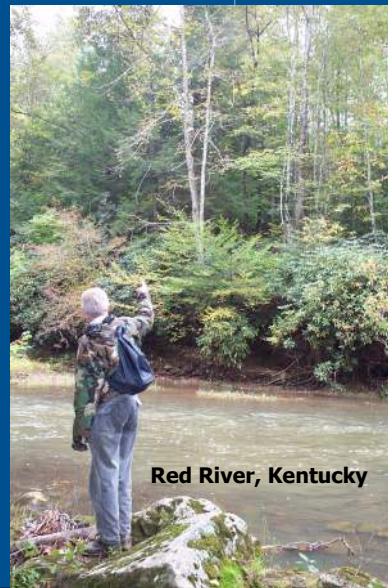
- **Allow certain WQC to be exceeded during rare events**
  - Extreme low flows: 7Q10, 1Q3
    - usually applied to continuous dischargers, e.g. municipal sewage plants, industrial facilities
  - Exceptional high flows
    - most relevant to storm-dependent discharges, e.g., municipal storm water

## Extreme Low/High Stream Flow



## WQS: Antidegradation

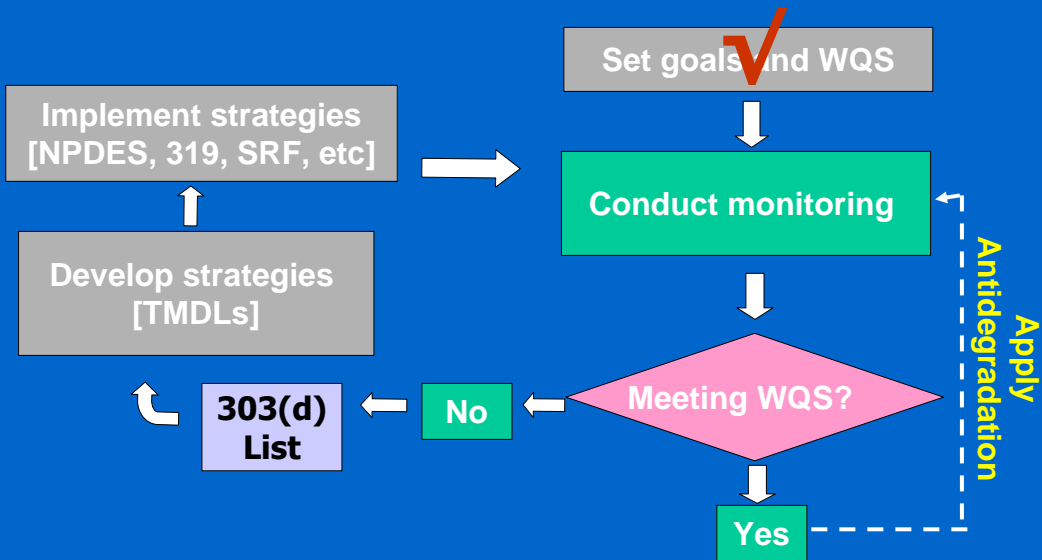
- **Purpose: Maintain high water quality**
  - Prevent unnecessary deterioration of existing “better than water quality criteria” conditions
  - Can allow some degradation in certain circumstances
  - Can’t allow drop in WQ that would result in exceeding WQC



# Questions



## CWA: WQ-Based



# WATERBODY ASSESSMENT

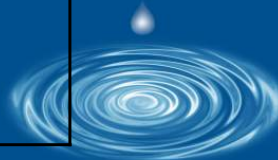
- **Information Collection**
  - Ambient monitoring
  - Modeling
  - Source ID, land use analysis
- **Data Evaluation (QA/QC)**
- **Data Analysis/Interpretation**
  - What does it tell us about ambient WQ?



## WATERS MONITORED OR OTHERWISE ASSESSED—NATIONWIDE

(2004 305(b) Reports from States)

WATERBODY TYPE	TOTAL INVENTORY	PERCENT ASSESSED
<b>RIVERS &amp; STREAMS</b> (miles)	<b>3,533,205</b>	<b>16%</b>
<b>LAKES</b> (acres)	41,700,000	<b>39%</b>
<b>ESTUARIES</b> (square miles)	87,000	<b>29%</b>



## Key Assessment Terminology

	Magnitude/ Concentration	Duration/ Averaging Period	Frequency/ Recovery Interval
Digression	X		
Excursion	X	X	
Exceedence ( →303(d) list )	X	X	X

## Water Quality Reports required by the Clean Water Act:

Conduct Monitoring

- **Section 305(b)** - National Water Quality Inventory  
– [www.epa.gov/ow/national/](http://www.epa.gov/ow/national/)
- **Section 303(d)** - Threatened and Impaired Waters List  
– [www.epa.gov/owow/tmdl/atlas/](http://www.epa.gov/owow/tmdl/atlas/)

## WATER QUALITY CONDITIONS NATIONWIDE

(2004 305(b) Reports <http://www.epa.gov/305b/>)

Conduct Monitoring

Waterbody Type	Good but Threatened (% of Assessed)	Impaired (% of Assessed)
River (miles)	16,,000 (3%)	312,000 (44%)
Lakes (acres)	160,000 (1%)	10,788,000 (64%)
Estuaries (sq.miles)	87 (< 1%)	59,000 (30%)

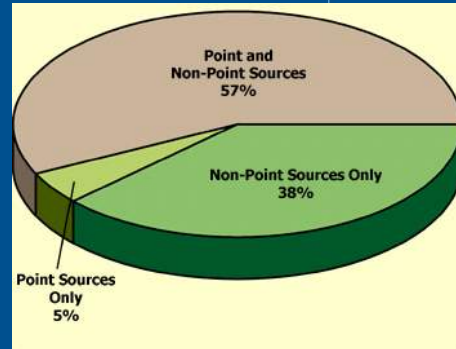
## CAUSES OF IMPAIRMENT

Nutrients/organic enrichment	12,000
Pathogens	10,500
Sediment/turbidity	9,400
Metals other than mercury	9,300
Mercury	9,100
Toxics: Organics	5,500
PCBs	3,100
Pesticides	1,600
Dioxins	400
Acid/Base imbalance	3,800
Heat	3,000
Salinity, total dissolved solids	1,500
Habitat alteration	1,000

## Sources of Stressors Causing Impairment: by Category

### Nationally . . .

- 45%-55 % combination of point and nonpoint sources
- 35%-45% nonpoint sources only
- 5-10% point sources only

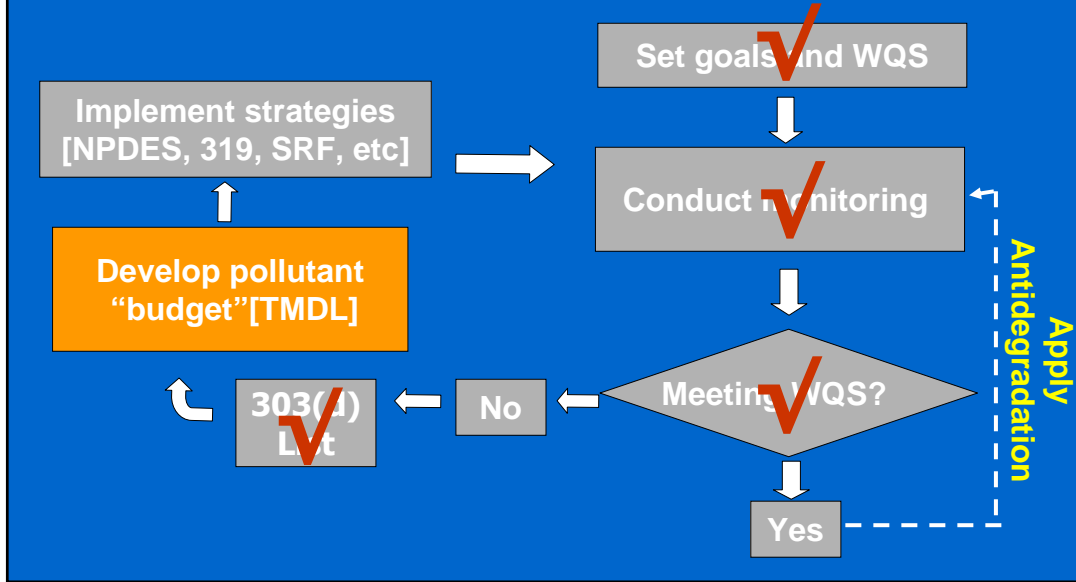


Example: Texas

## PERCENT RIVER MILES AFFECTED BY

Agriculture	25%
Removal of Streamside Vegetation	3%
Alteration of Stream Flow	5%
Channel Modification	5%
Municipal Sewage Plants	5%
Urban Stormwater	5%
Industrial Point Sources	4%
Resource Extraction	4%

## CWA: WQ-Based



## Addressing 303(d) Waters: Establishing Total Maximum Daily Loads (TMDLs)

Develop Strategies



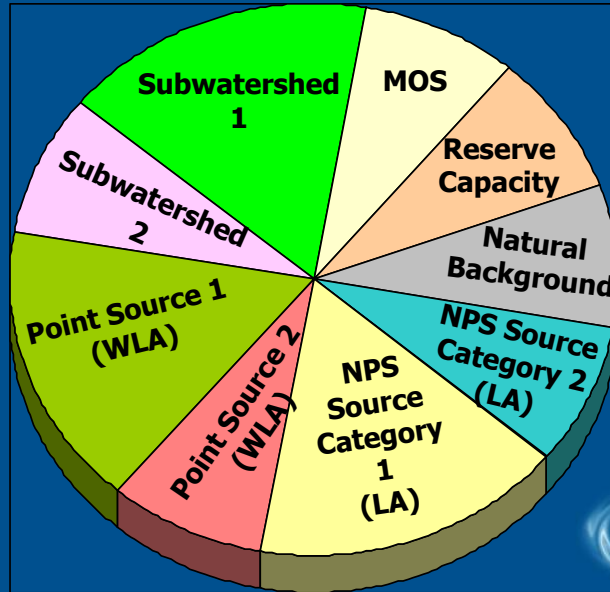
[www.epa.gov/owow/tmdl](http://www.epa.gov/owow/tmdl)

# TMDLs: THE BOTTOM LINE

- A "pollutant budget" (or "diet")
  - **maximum loading rate consistent with meeting WQS**
- The total TMDL (overall budget) called "**TMDL cap**", for loading (assimilative) capacity



# TMDL Allocation



## Implementation Tools

- Regulatory
  - Section 402 - NPDES permits
  - Section 404 - Wetlands
  - Section 401 – State WQ certification
  - CZARA coastal management
- Voluntary
  - Section 319 - Nonpoint Source Program
  - Section 320 – National Estuary Program
- Funding
  - SRF loan program
  - Section 319 - Nonpoint Source Program
  - Section 106 - Monitoring/assessment



## NPDES Permitting under Sec. 402

- **Illegal for point source to discharge pollutants to surface waters without a permit**
- **Permit is a license granting permission to discharge**
  - **Not a right**: permit is revocable “for cause” (e.g., non-compliance)
  - **No guarantee against more stringent future requirements**

## NPDES Program: Coverage

- Industrial and municipal wastewater
- Industrial, urban, and construction-related storm water runoff
- Concentrated animal feeding operations (CAFOs)
- Active, inactive, and some abandoned mines
- Some ships and other vessels
- Offshore oil rigs
- Discharges from RCRA remedial action activity meeting point source definition



[www.epa.gov/npdes](http://www.epa.gov/npdes)

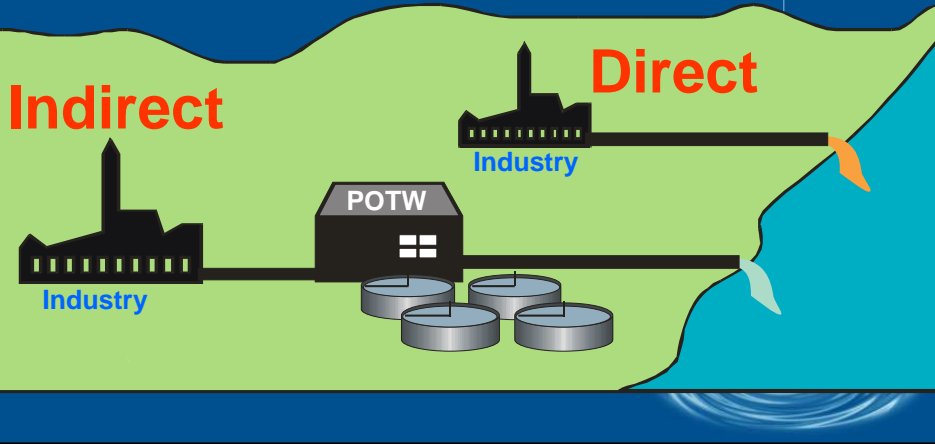


## Types of NPDES Permits

- ~60,000 entities covered by individual permits
  - **Majors: 4100 POTWs, 3300 others**
  - **Minors: 11,000 POTWs, 42,500 others**
- ~50,000 entities covered by 200 non-stormwater general permits
- ~500,000 entities covered by **stormwater** general permits
  - **Mostly construction sites**



## Direct and Indirect Discharges

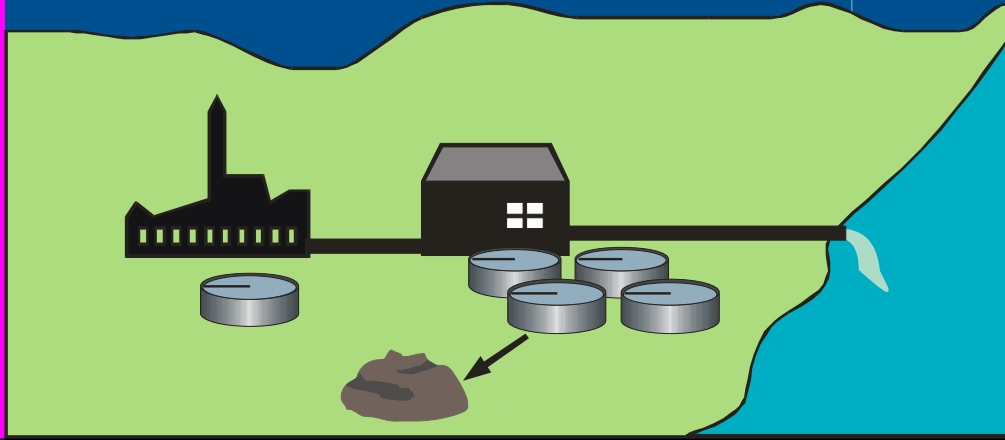


## Pretreatment

- Applies to POTWs >5 MGD
  - Objective: Prevent upset, pass-through, sludge contamination, etc. from “incoming **toxics**”
  - Prohibits discharge of explosive, highly flammable, and extremely corrosive substances into municipal sewers
  - Oversight of compliance of “indirect dischargers” with EPA-issued tech-based limits (“categorical”)
  - “Local limits” addressing additional problems, including meeting WQ-based limits for POTWs

## Sludge (aka Biosolids)

[www.epa.gov/owm/mtb/biosolids/503pe/index.htm](http://www.epa.gov/owm/mtb/biosolids/503pe/index.htm)



## Municipal Sewage Sludge (Section 503)

- EPA regulations dealing with **disposal/use** of sewage sludge
- Addresses toxics, pathogens, and "vectors"
- Generators, processors, disposers, and users usually need some sort of permit

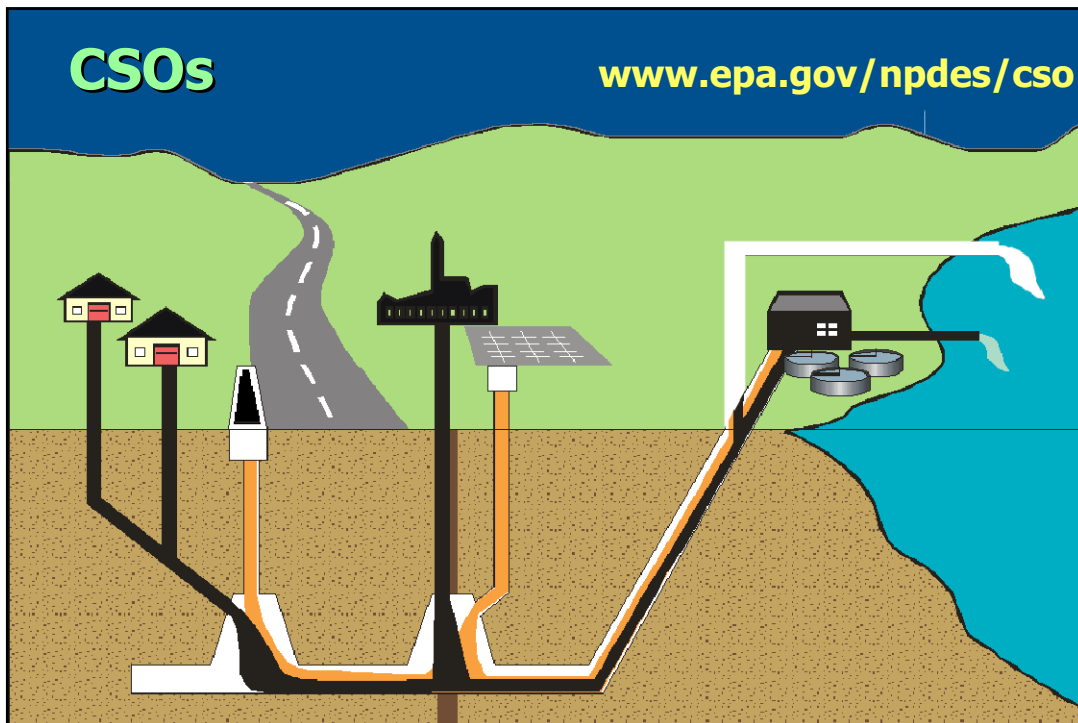


# Municipal Wet Weather Flows

- Combined Sewer Overflows (CSOs)
- Municipal Separate Sewer Systems (MS4s)



PHOTO: GORDON ENGLAND



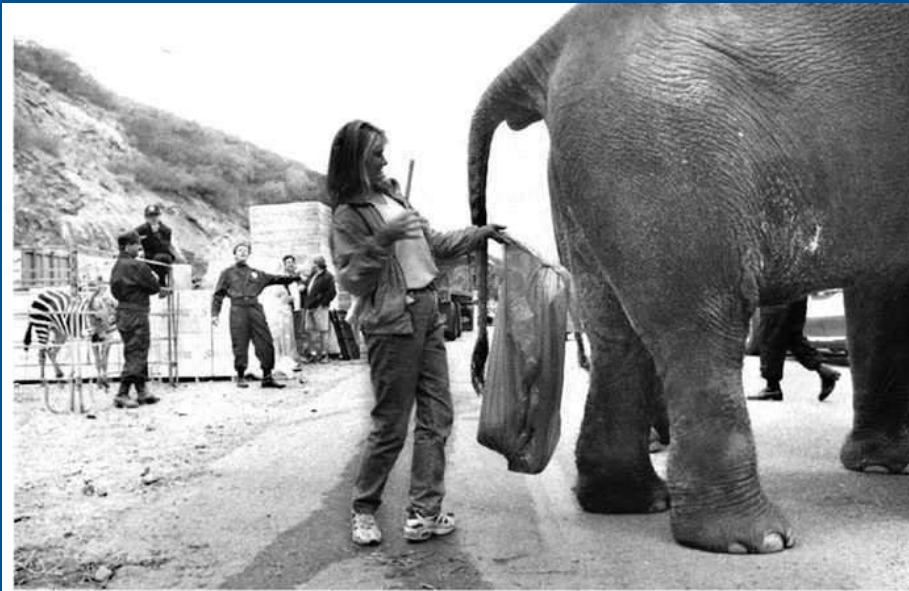


# What is Nonpoint Source Pollution?

What's the definition of nonpoint source used in the CWA?







## Section 404

- Governs placing of dredged and fill material into waters of the U.S.
- "Sequencing"
  - **AVOIDANCE:** Avoid impacts to maximum extent practicable
  - **MINIMIZATION:** Design project to keep effects on wetlands as small as practicable (only after avoidance)
  - **COMPENSATION:** Only after avoidance and minimization
    - Restoration of previously destroyed/damaged wetlands the preferred method

## 319: Nonpoint Source (NPS) Program

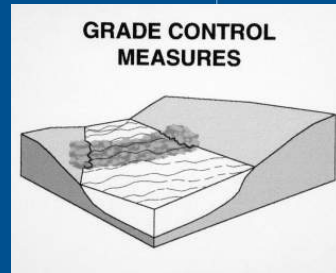


- State or tribal NPS management programs
- Federal grants to states and tribes
  - **Approx. \$200 million/yr.**



## 401: State and Tribal Oversight of Federal Permitting

- Coverage
  - EPA-issued NPDES permits
  - FERC licensing of dams
  - Section 404 permits
- No federal permit/license issued without state certification that authorized activity is consistent with attainment of WQS
  - Downstream states and authorized tribes also have 401 leverage
- Certification often issued with conditions
  - Vegetated buffer areas, BMPs, mitigation, wetland restoration, modified hydrodam operations, etc.



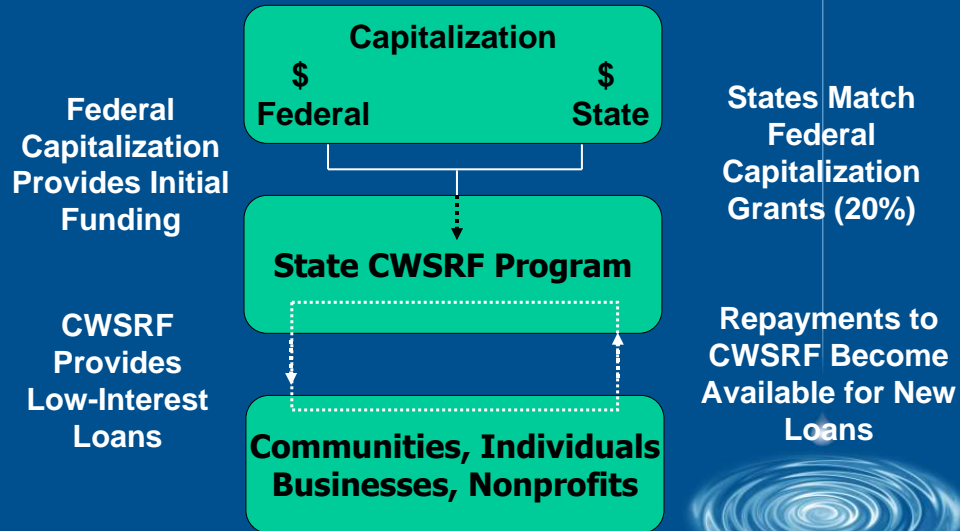
## Minimum Elements of 319 Watershed Plans Include

- Assessment of current condition of waterbody
- Identification of the sources that need to be controlled, including estimates current loads from each type.
- Estimate of the total load reductions needed from all sources, as well as from each key source type, *in order to meet WQS*
- Management measures/BMPs needed for each key source type, and indication of where critical to implement
- Estimate of amounts of technical/ financial assistance needed
- Listing of legal authorities to be employed
- Schedule for implementing management measures
- Monitoring plan to evaluate effectiveness of implementation

[www.epa.gov/owow/nps/watershed\\_handbook](http://www.epa.gov/owow/nps/watershed_handbook)



## CWSRF—A Revolving Fund



## CW SRF: THE NUMBERS

- The CWSRFs have issued nearly \$63 billion in loans since program initiated in 1988.
  - **Nearly 20,700 loans** (> \$2 billion for NPS and NEP efforts)
  - **FY07— \$5.3 billion, in just over 2000 loans**
- 2009 Economic Stimulus Bill (ARRA)
  - **\$4 billion to CW-SRF (\$2 billion to DW-SRF)**
  - **20% “green reserve” set aside**
    - “green infrastructure”, water savings, energy savings to water utilities, and “innovative” projects
  - **Significant % for grants, not just loans**

## Questions



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# Next Watershed Academy Webcast

Introduction to Clean Water Act: Water  
Quality Standards

Thursday, September 10, 2009



Registration will open approximately three weeks  
prior to the Webcast at:

[www.epa.gov/watershedwebcasts](http://www.epa.gov/watershedwebcasts)

