



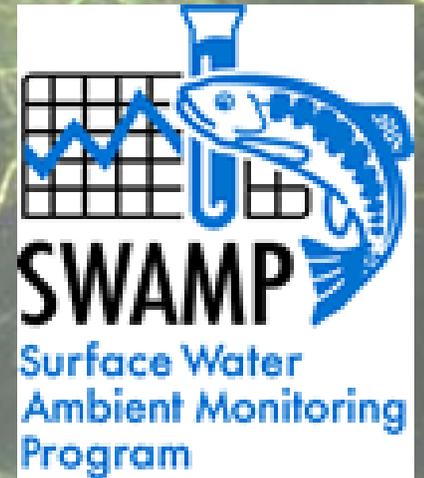
FRESHWATER BIOASSESSMENT WORKSHOP

INTRODUCTION TO 2007 SWAMP PROCEDURES

June 2007

Jim Harrington

WPCL Bioassessment Laboratory





PRESENTATION 2

"IN THE BEGINNING"



History of Bioassessment in California



California Department
Of Fish and Game

Hot Creek Hatchery
NPDES Permit



1993 in permit

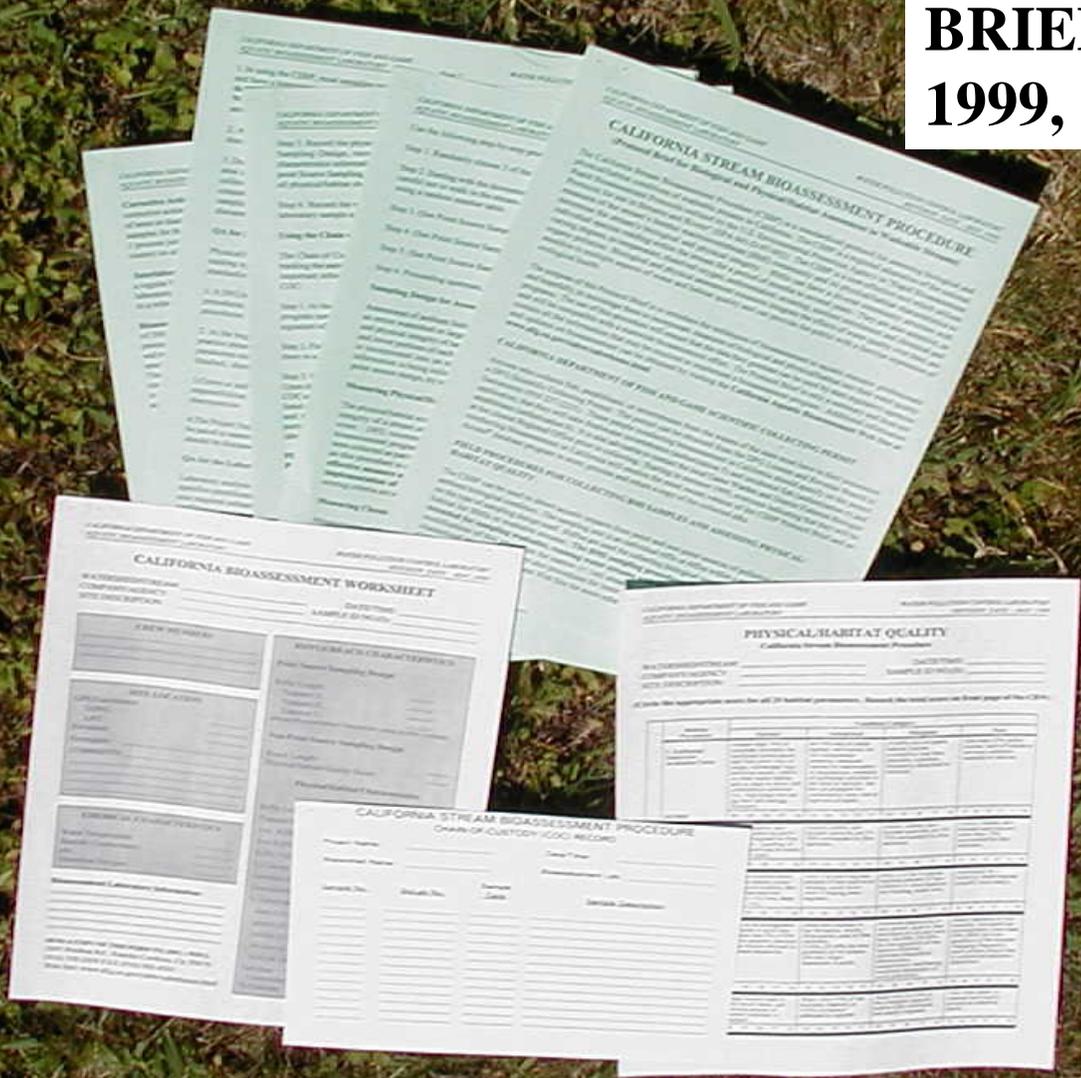
No response

1999-2004

2005 SI process

Continue monitoring

**CSBP PROTOCOL
BRIEF – 1993, 1996,
1999, CSBP 2004**



Rapid Biological Assessment

California Stream Bioassessment Procedure (CSBP)

Cost effective

**0.5 mm Mesh
D-frame Net
Richest Habitat (Riffle)
Sample 18 ft² Habitat
3 Replicate Samples or
1 Composite**



**Benthic
Macroinvertebraes**

Rapid Biological Assessment

Rapid Physical/Habitat

U.S. EPA RBP

Quantify:

Canopy Cover

Stream Size

Substrate

Flow



08 21 2001



California Aquatic Bioassessment Workgroup

- 1994** Established as a forum to communicate and exchange information
- 1995** Finalization of the California Stream Bioassessment Procedures (CSBP)
- 1996** Formulate the process for developing biocriteria in California
- 1997-1999** Provided a forum for updating attendees on bioassessment and gave examples of current projects
- 2000- 2006** Conduct various workgroup sessions, platform presentation and panel discussion



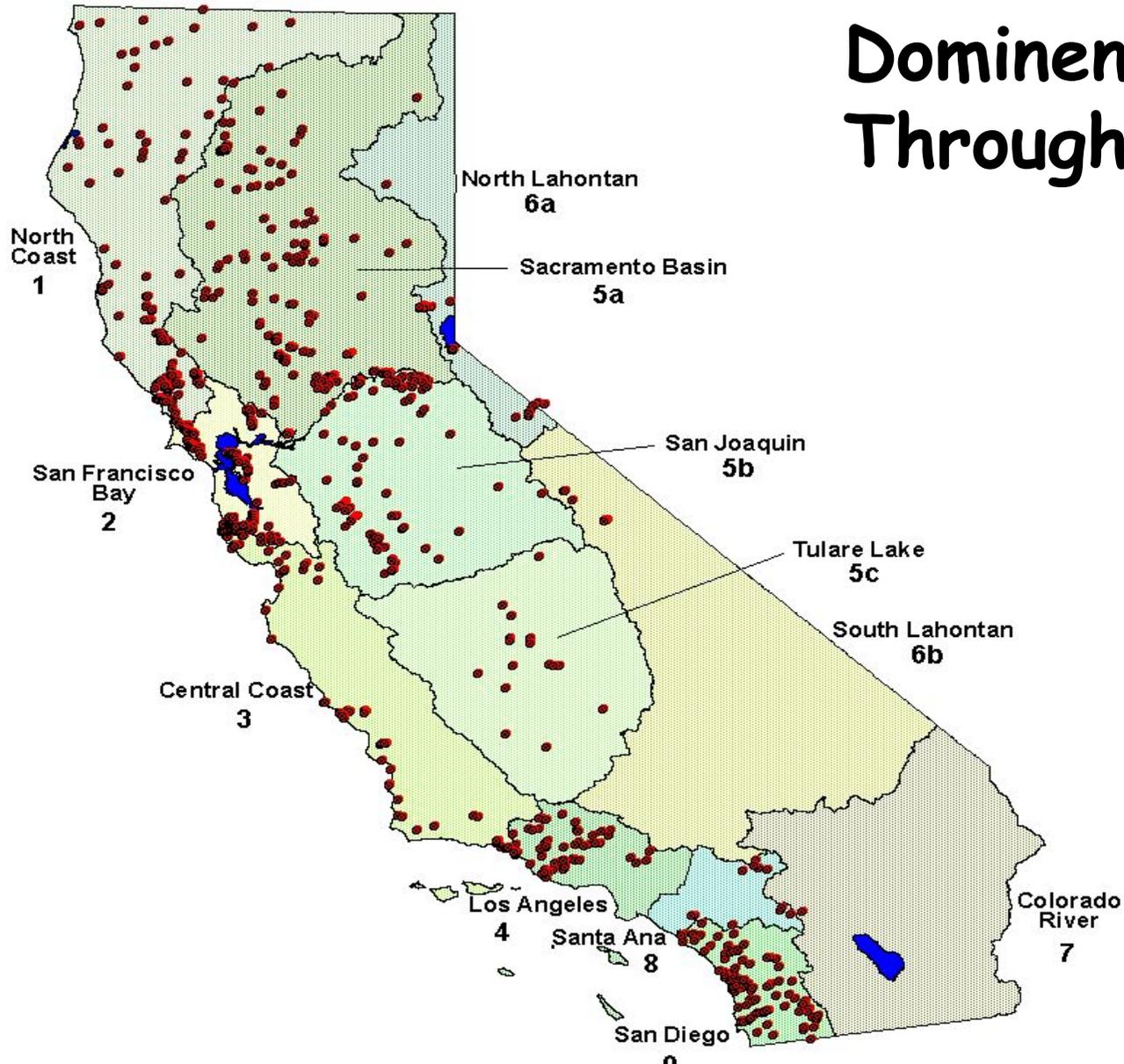
NEXT CABW MEETING

NOVEMBER 29-30, 2007

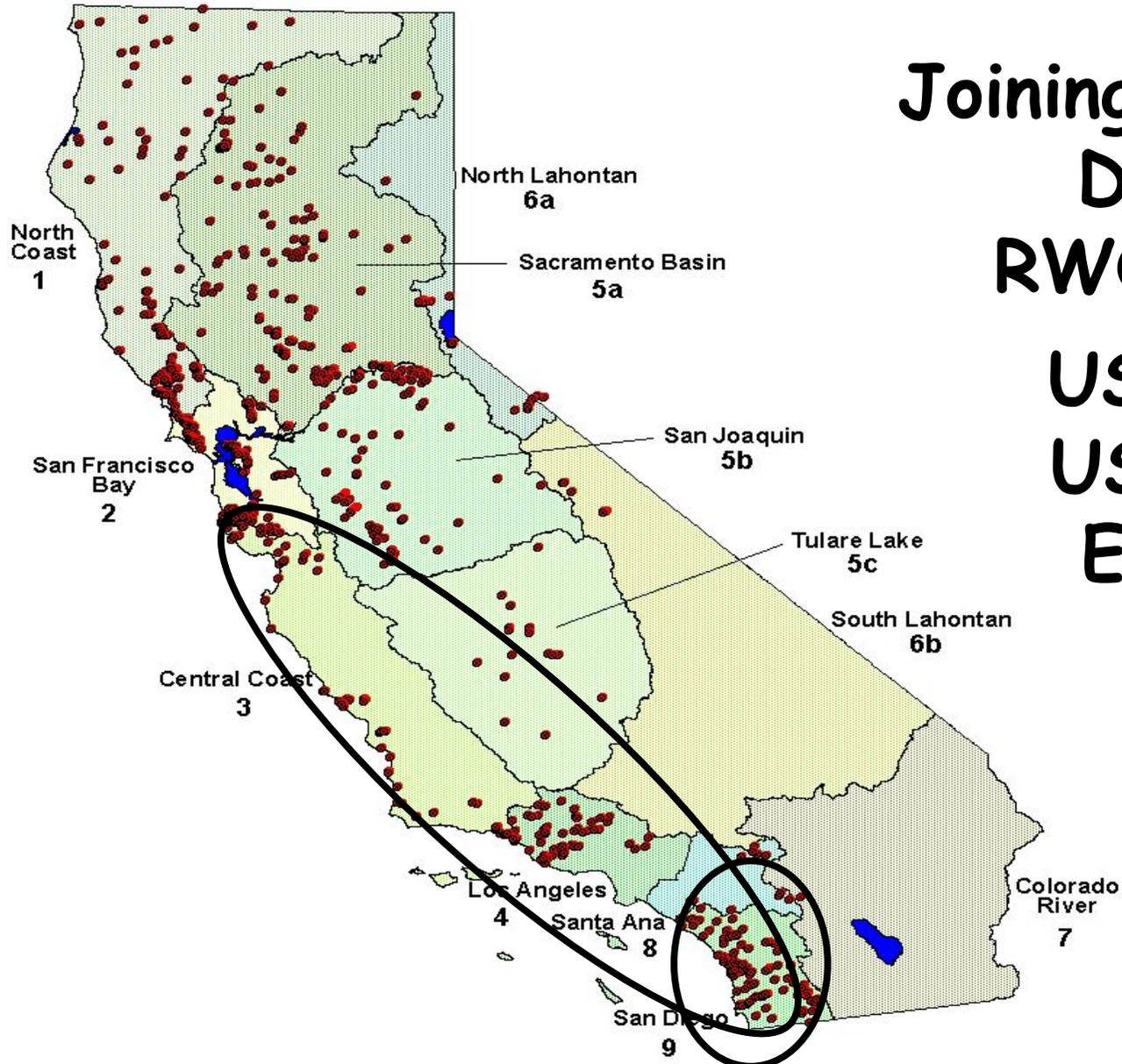
UC DAVIS

ABL Sites by SWQCB Region

The CSBP was
Dominant protocol
Throughout California



Southern California IBI



Joining Forces

DFG

RWQCBs

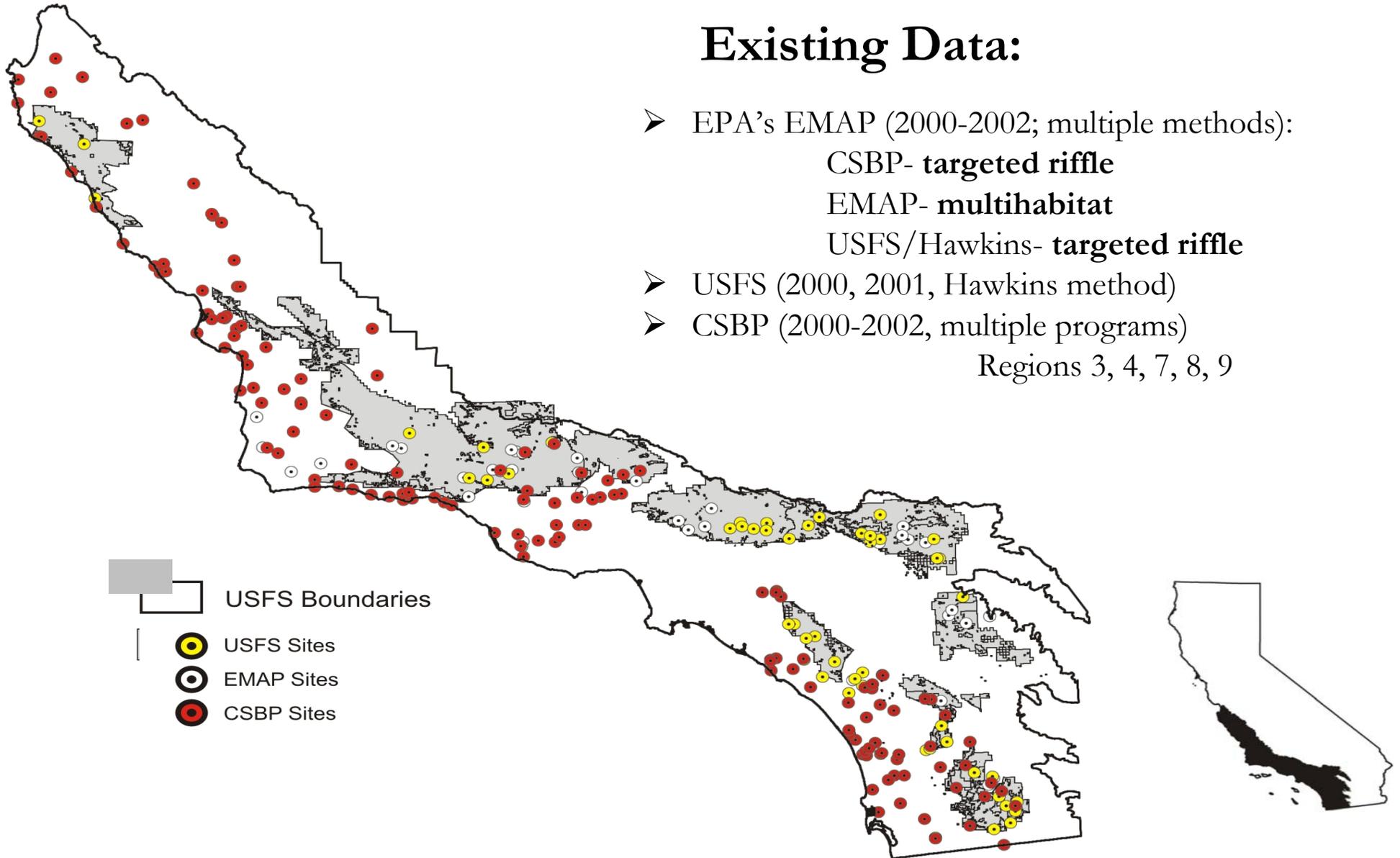
USGS

USFS

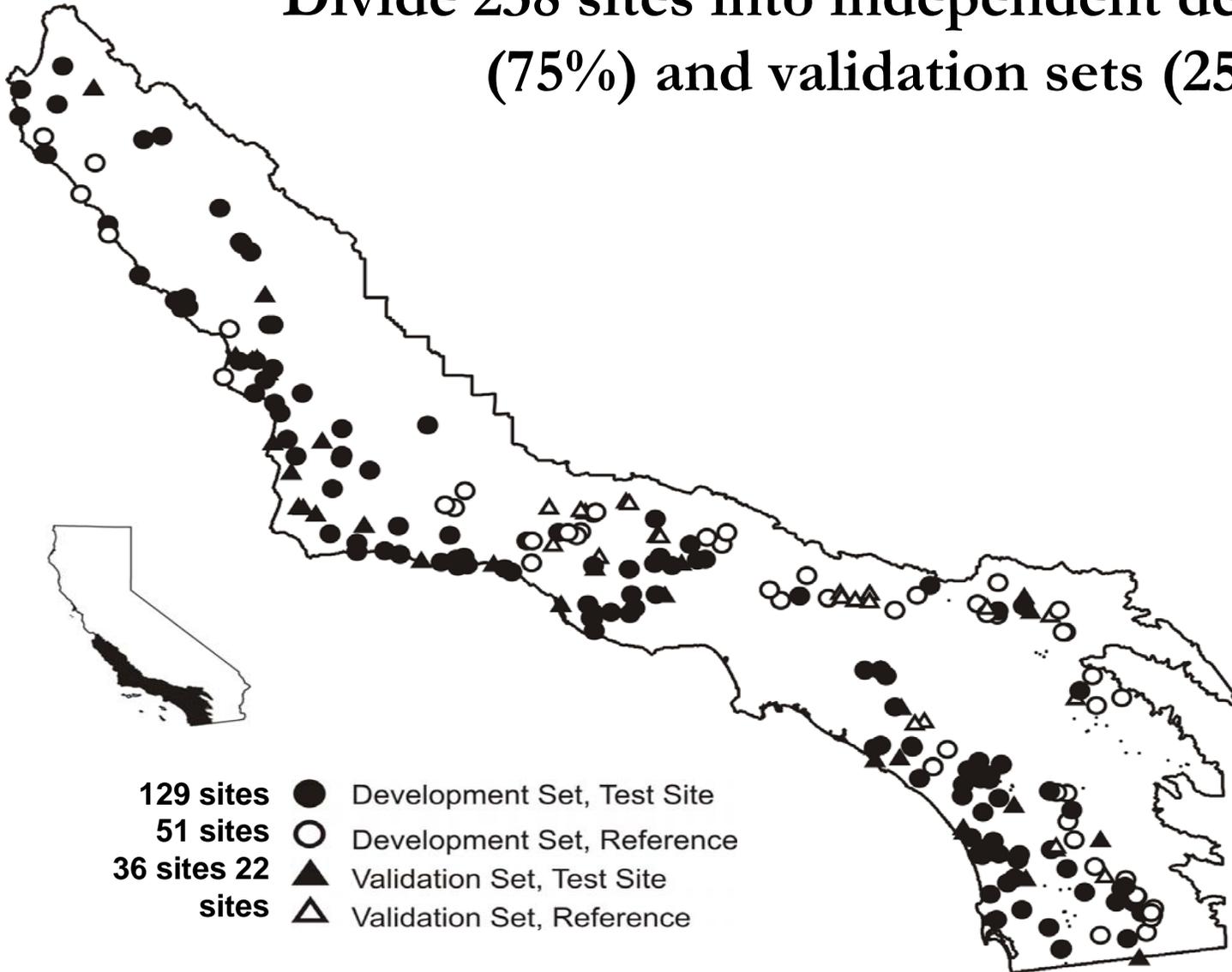
EPA

Existing Data:

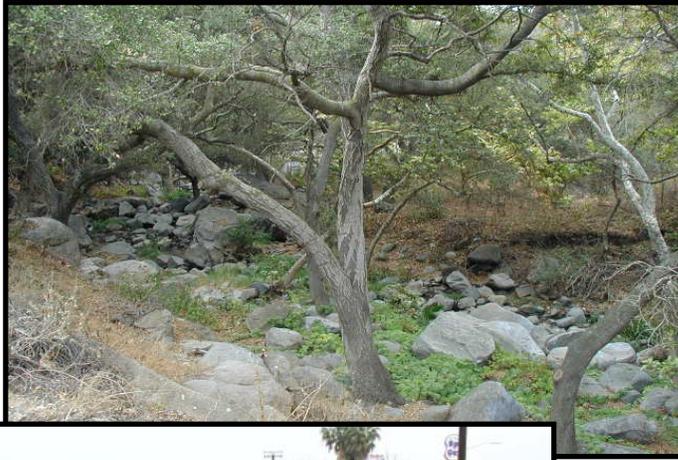
- EPA's EMAP (2000-2002; multiple methods):
 - CSBP- **targeted riffle**
 - EMAP- **multihabitat**
 - USFS/Hawkins- **targeted riffle**
- USFS (2000, 2001, Hawkins method)
- CSBP (2000-2002, multiple programs)
Regions 3, 4, 7, 8, 9



Divide 238 sites into independent development (75%) and validation sets (25%)



Application of a benthic invertebrate IBI to regional 305(b) reporting in southern California



Peter R. Ode, Andrew C. Rehn and Jason T. May

Aquatic Bioassessment Laboratory
Water Pollution Control Laboratory
California Department of Fish and Game
California State University, Chico

Ode, P.R., A.C. Rehn and J.T. May. 2005. A quantitative tool for assessing the integrity of southern coastal California streams. *Environmental Management*. 35:493-504

SoCal IBI Scores

Metric Score	N_Coleop_T	N_EPT_T		N_Pred_T	P_CFCG_I		P_Int_I		P_NonIns_T	P_Tol_T
	All Sites	6	8	All Sites	6	8	6	8	All Sites	All Sites
10	>5	>17	>18	>12	0-59	0-39	25-100	42-100	0-8	0-4
9		16-17	17-18	12	60-63	40-46	23-24	37-41	9-12	5-8
8	5	15	16	11	64-67	47-52	21-22	32-36	13-17	9-12
7	4	13-14	14-15	10	68-71	53-58	19-20	27-31	18-21	13-16
6		11-12	13	9	72-75	59-64	16-18	23-26	22-25	17-19
5	3	9-10	11-12	8	76-80	65-70	13-15	19-22	26-29	20-22
4	2	7-8	10	7	81-84	71-76	10-12	14-18	30-34	23-25
3		5-6	8-9	6	85-88	77-82	7-9	10-13	35-38	26-29
2	1	4	7	5	89-92	83-88	4-6	6-9	39-42	30-33
1		2-3	5-6	4	93-96	89-94	1-3	2-5	43-46	34-37
0	0	0-1	0-4	0-3	97-100	95-100	0	0-1	47-100	38-100

Very Poor 0-14	Poor 15-28	Fair 29-42	Good 43-56	Very Good 57-70
--------------------------	----------------------	----------------------	----------------------	---------------------------

Biological metrics for IBI

Number of coleopteran taxa

Number of EPT taxa

Number of Predator taxa

Percent collector filterers and collector gatherers

Percent Intolerant Individuals

Percent non-insect taxa

Percent tolerant taxa

An Index of Biotic Integrity for the Eastern Sierra



David Herbst
Sierra Nevada Aquatic Research Laboratory, Mammoth
Lakes
University of California, Santa Barbara

CONTRIBUTORS:

Erik Silldorff, Jeff Kane, Tom Suk

Eastern Sierra IBI

1. Total Taxa Richness
2. Ephemeroptera Richness
3. Plecoptera Richness
4. Trichoptera Richness
5. Acari Richness
6. Percent Chronomidae Richness
7. Percent Tolerant Taxa Richness
8. Percent Shredder Abundance
9. Percent Dominance (3 top taxa)
10. Biotic Index (modified HBI)

Eastern Sierra IBI

1. Total Taxa Richness

0 points if ≤ 30

10 points if ≥ 50

$10(\# \text{ taxa} - 30)/(50-30)$

So, Taxa = 45 = $10(15)/20 = 7.5$ points

River Invertebrate Predictive and Classification System (RIVPACS)

Chuck Hawkins

Western Center for Monitoring and Assessment of
Freshwater Ecosystems

Aquatic, Watershed, & Earth Resources

Ecology Center

Utah State University

O/E is a measure of the taxonomic completeness of the biological community observed at a site
(value ranges from 0 to 1.0)



E = 8 taxa



O = 3 taxa

O/E
0.38



excellent to good biological condition (IBI = 100-60)

O/E > 0.8



fair biological condition (IBI = 59-40)

O/E = 0.6



poor biological condition (IBI = 39-20)

O/E = 0.3



very poor biological condition (IBI < 20)

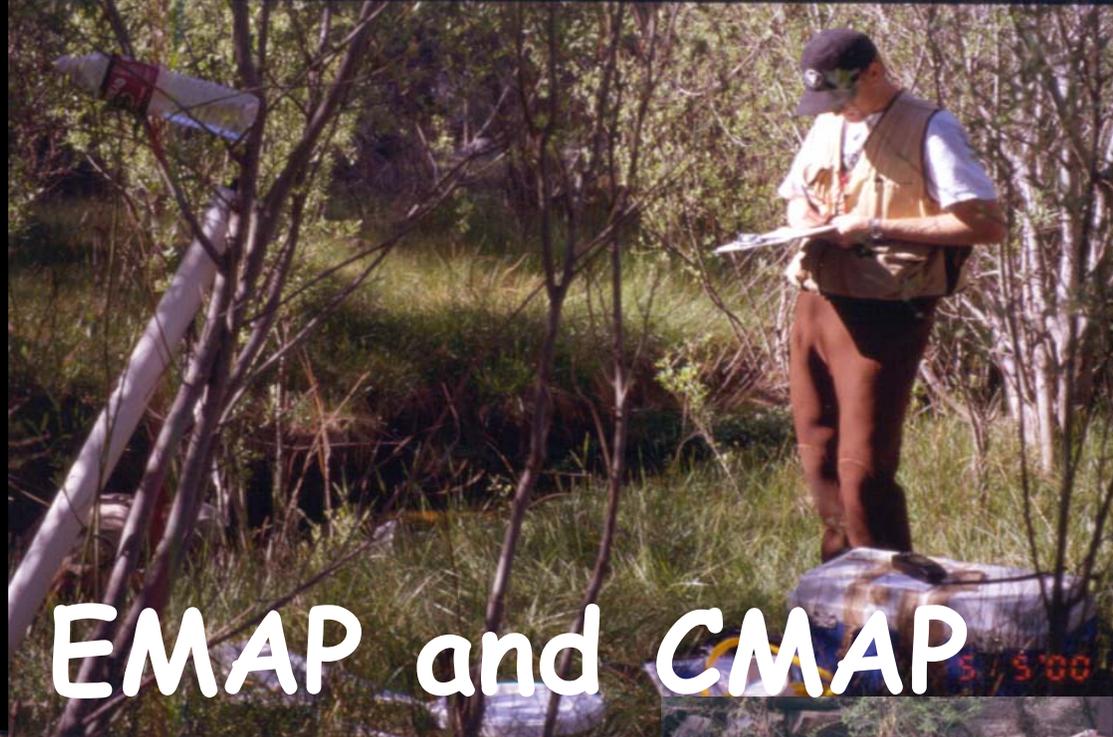
O/E < 0.2



Starting 2000

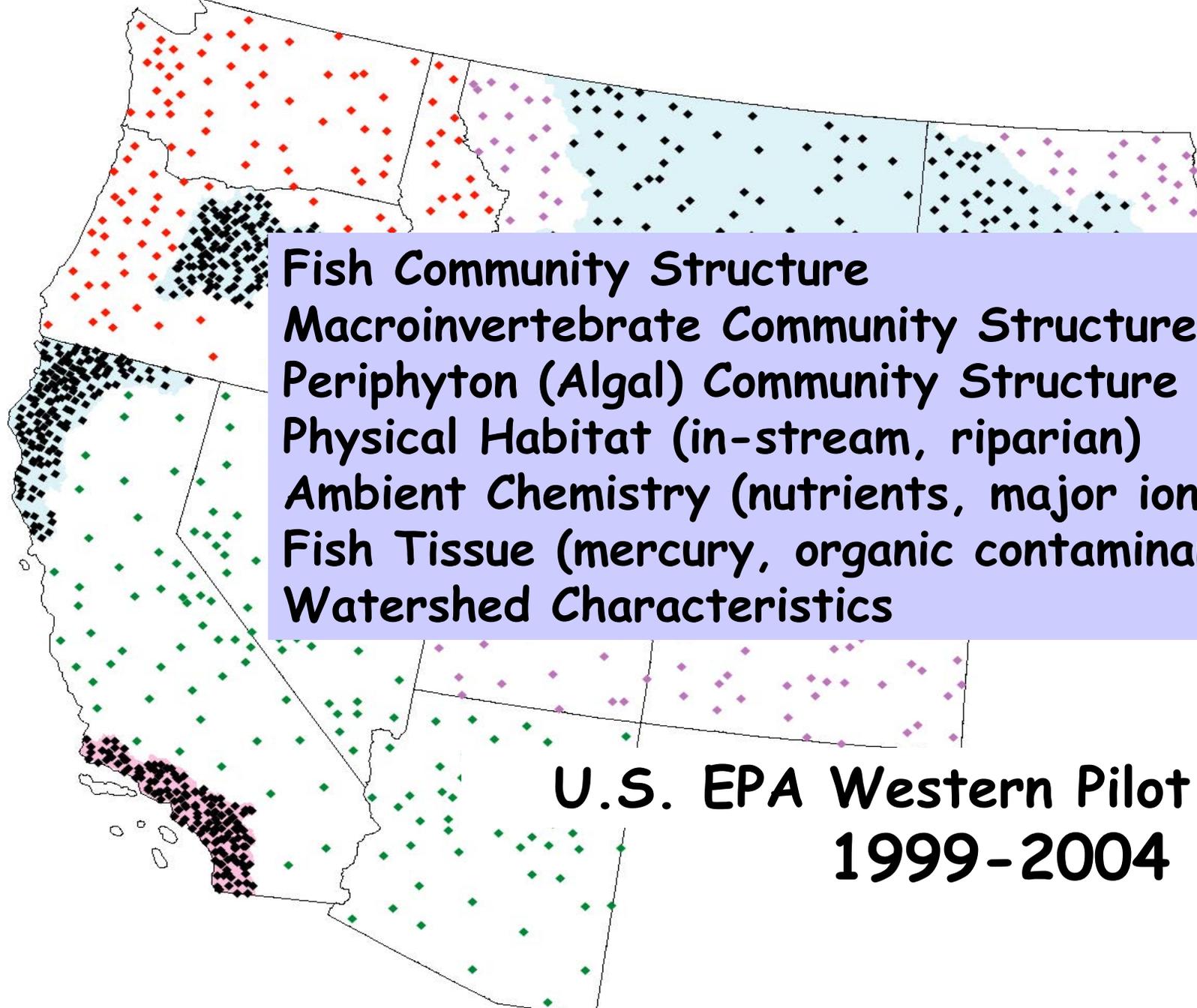
60 sites/year
Probabilistic

Western Pilot EMAP and CMAP



CDFG
U.S. EPA
SWRCB
RWQCB



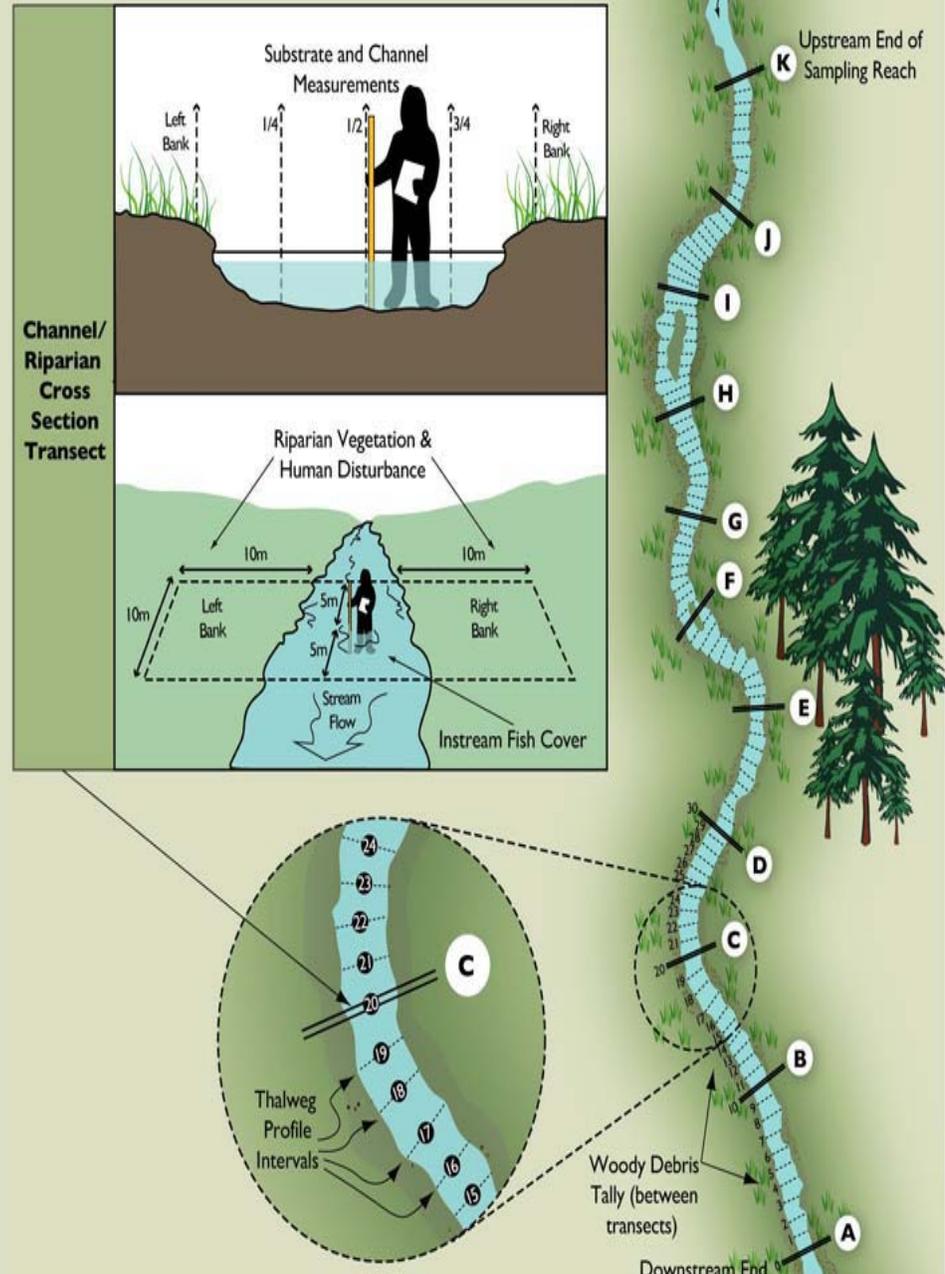


- Fish Community Structure**
- Macroinvertebrate Community Structure**
- Periphyton (Algal) Community Structure**
- Physical Habitat (in-stream, riparian)**
- Ambient Chemistry (nutrients, major ions)**
- Fish Tissue (mercury, organic contaminants)**
- Watershed Characteristics**

**U.S. EPA Western Pilot EMAP
1999-2004**

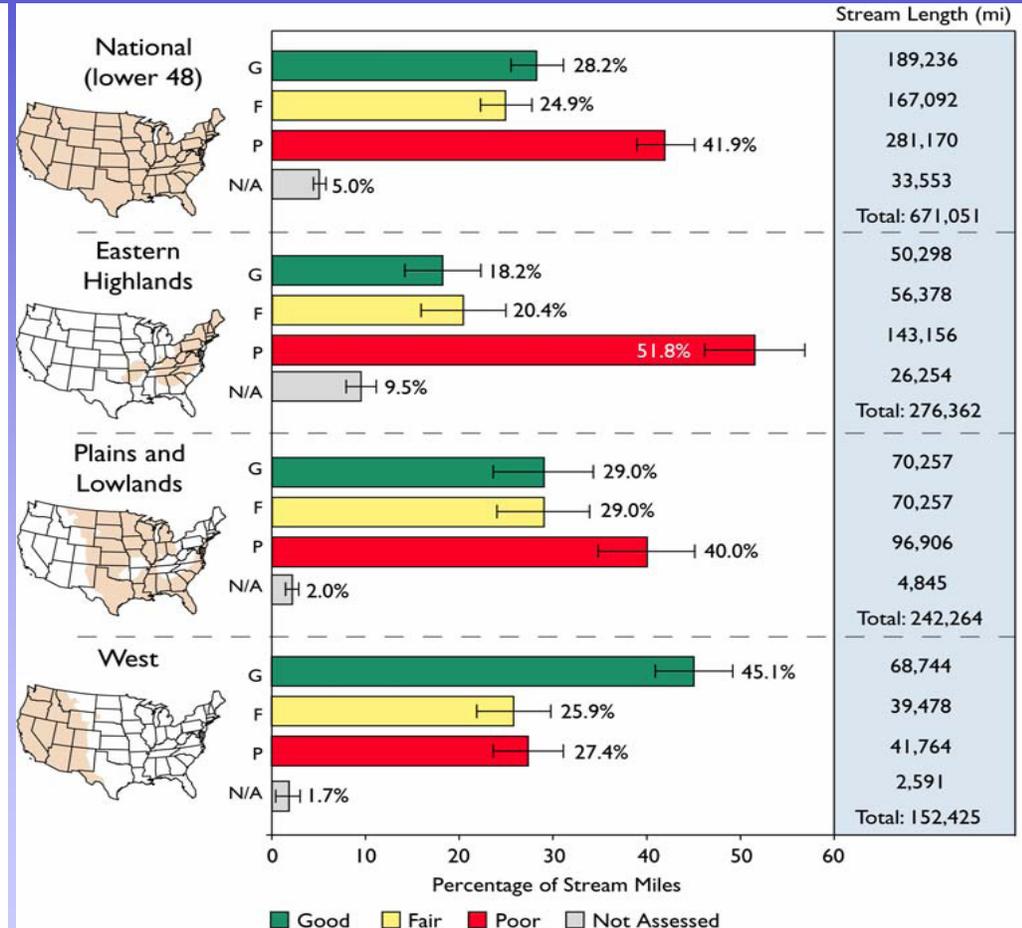
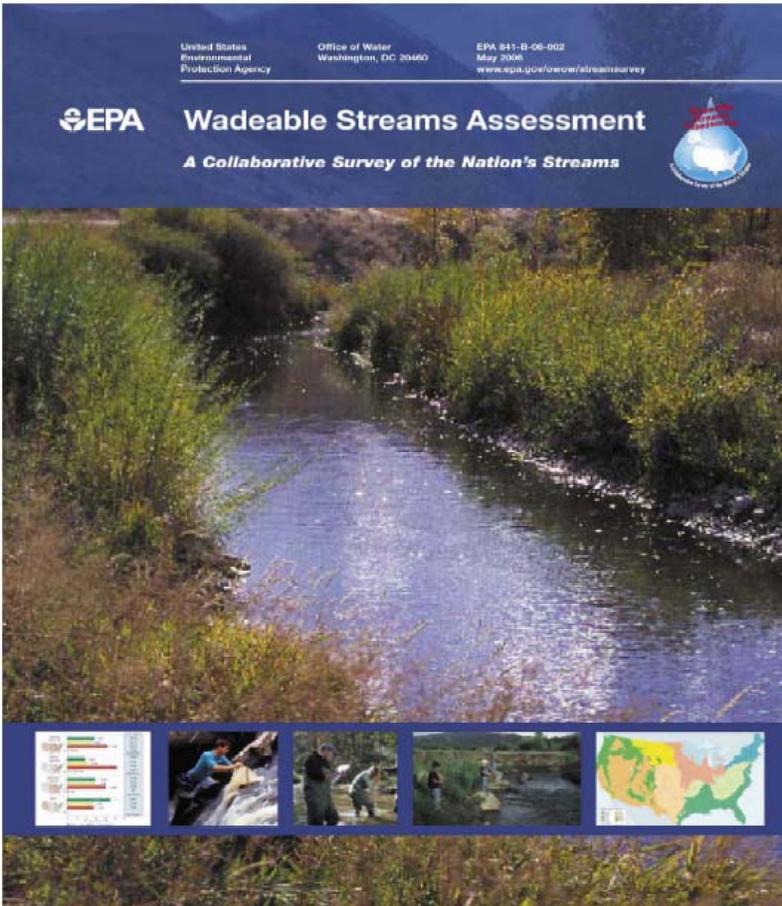
US EPA National Protocol for EMAP

Extensive
Quantitative
Physical/Habitat
Assessment

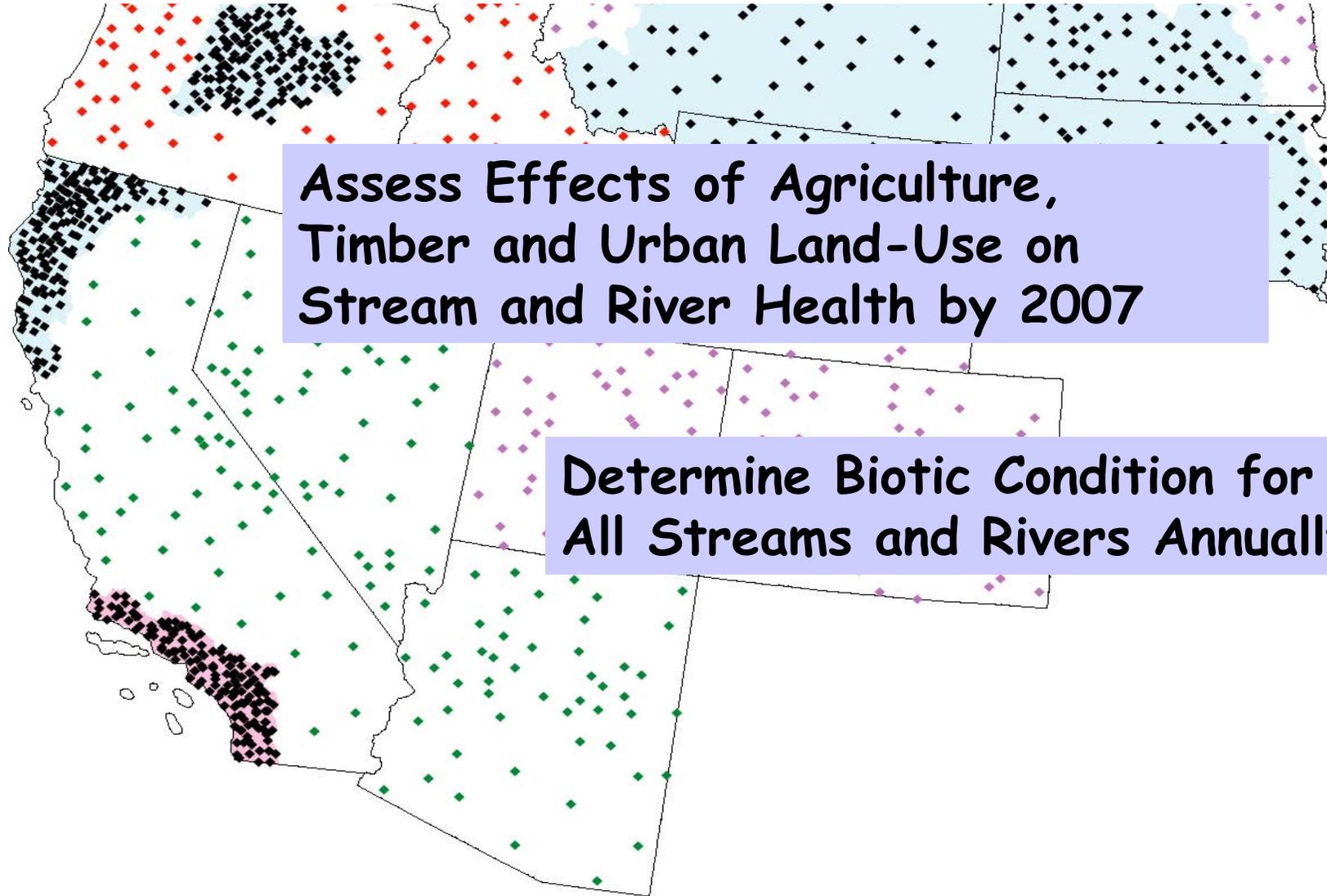


Wadeable Stream Assessment

EPA 841-B-06-002 March 2006



California Monitoring and Assessment Program (CMAP) Starting in 2004 to Forever



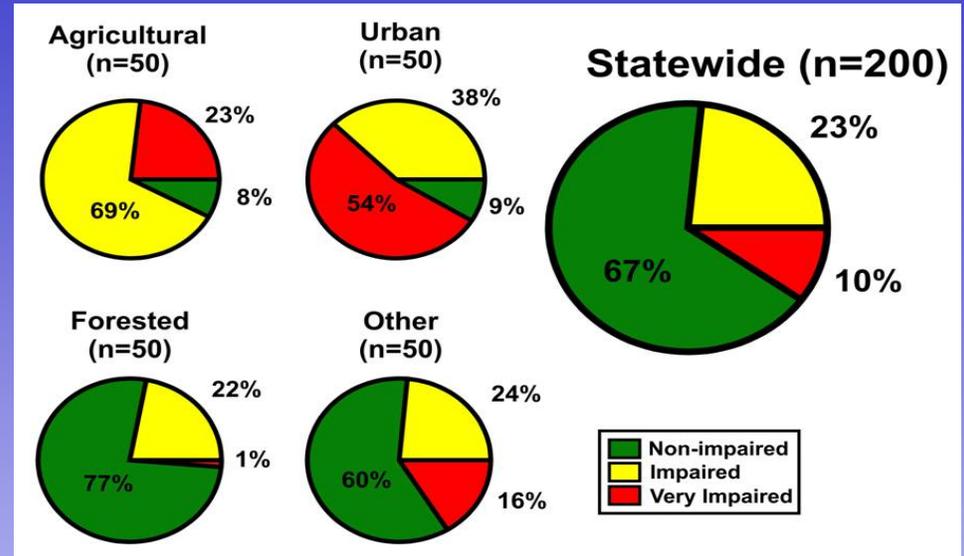
Assess Effects of Agriculture,
Timber and Urban Land-Use on
Stream and River Health by 2007

Determine Biotic Condition for
All Streams and Rivers Annually

Key Products of CMAP

Condition Assessments

(% of stream length in different condition classes)

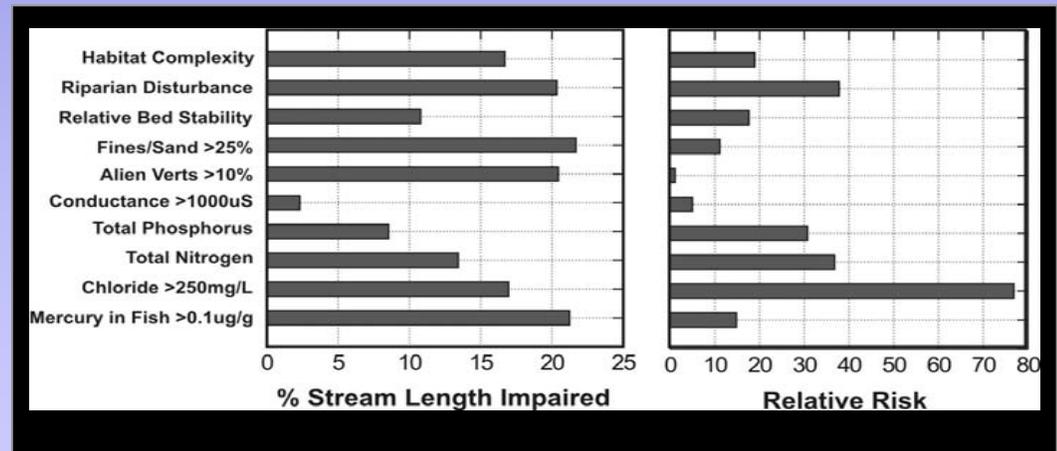


Stressor Extent

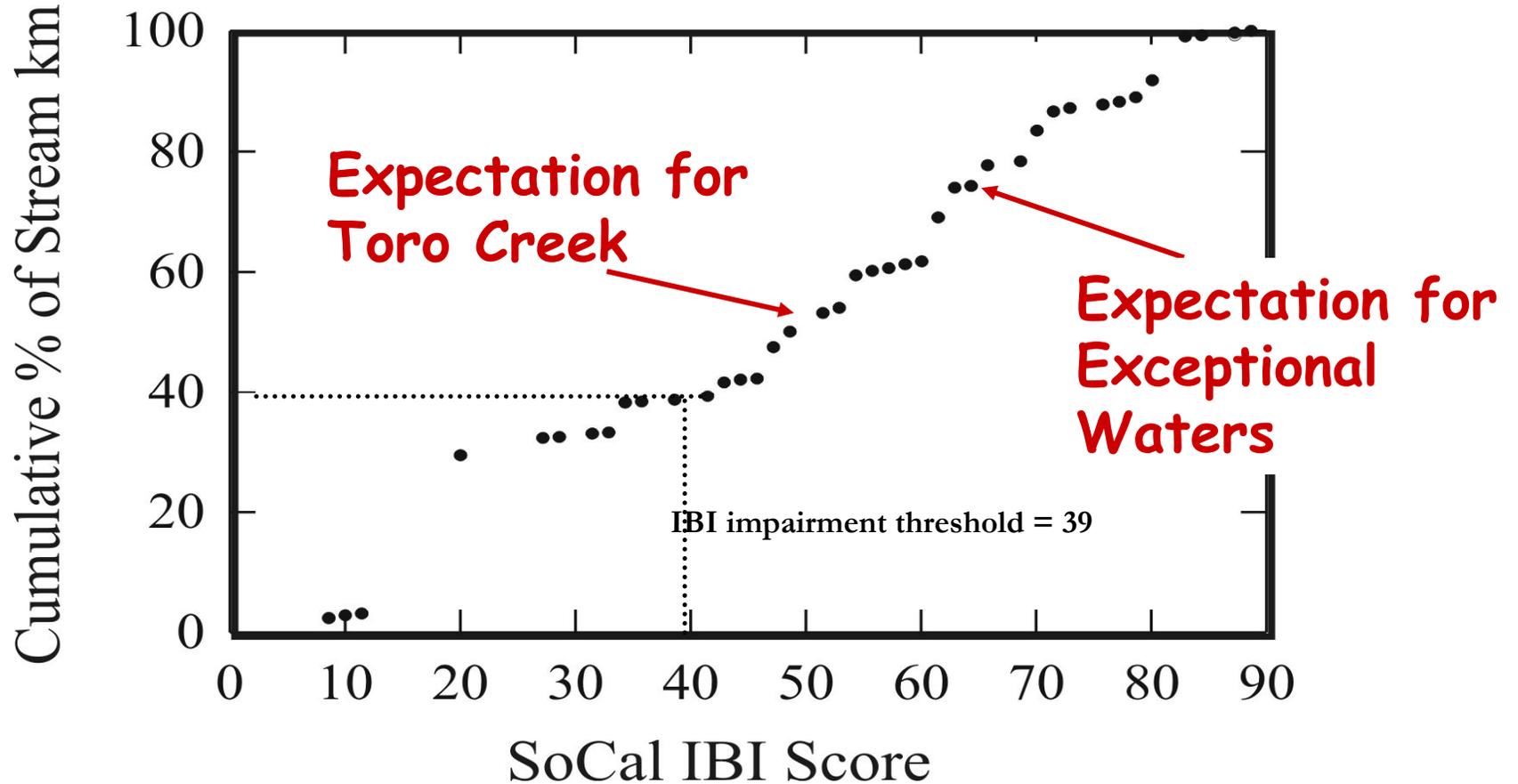
(% of stream length associated with high levels of various stressors)

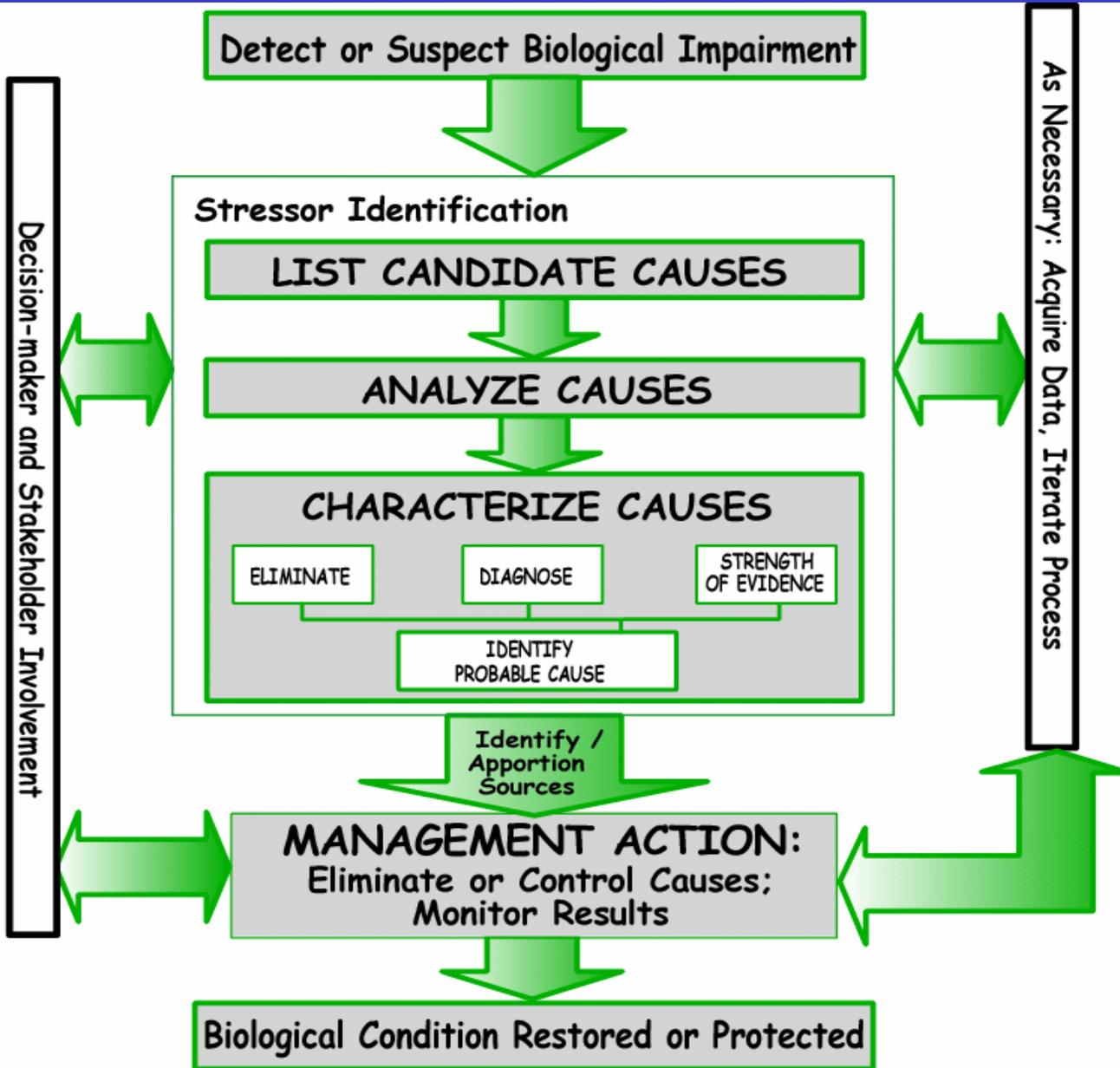
Relative Risk Estimates

(increased risk of biotic impairment associated with various stressors)



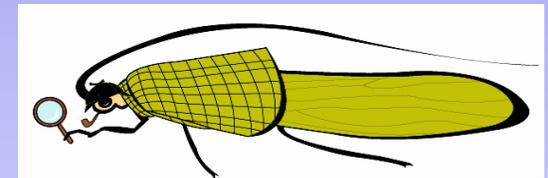
Cumulative Distribution Functions another way to set impairment thresholds





Stressor Identification

Identifying
Unknown
causes of
biological
impairment



Bioassessment in Water Quality Management Activities

Monitoring and Assessment

Assess the quality of current aquatic life resources (305(b))

Identify what resources have been lost or degraded (303(d))

Identify what remains to be protected

Bioassessment in Water Quality Management Activities

Determine Protection Level

Establish uses to protect or restore aquatic life

Improve aquatic life uses by refining, tiering or subcategorizing

Set criteria for aquatic life uses or act as restoration goals-Biocriteria

Bioassessment in Water Quality Management Activities

Problem Management

Prioritize impairments

Set restoration targets or TMDLs

Assess effectiveness of individual permits

Assess effectiveness of restoration actions

Bioassessment in Water Quality Management Activities

Compliance Enforcement

- Prioritize enforcement compliance actions
- Assess penalty damages
- Assess track recovery
- Measure mitigation quality

Bioassessment in Water Quality Management Activities

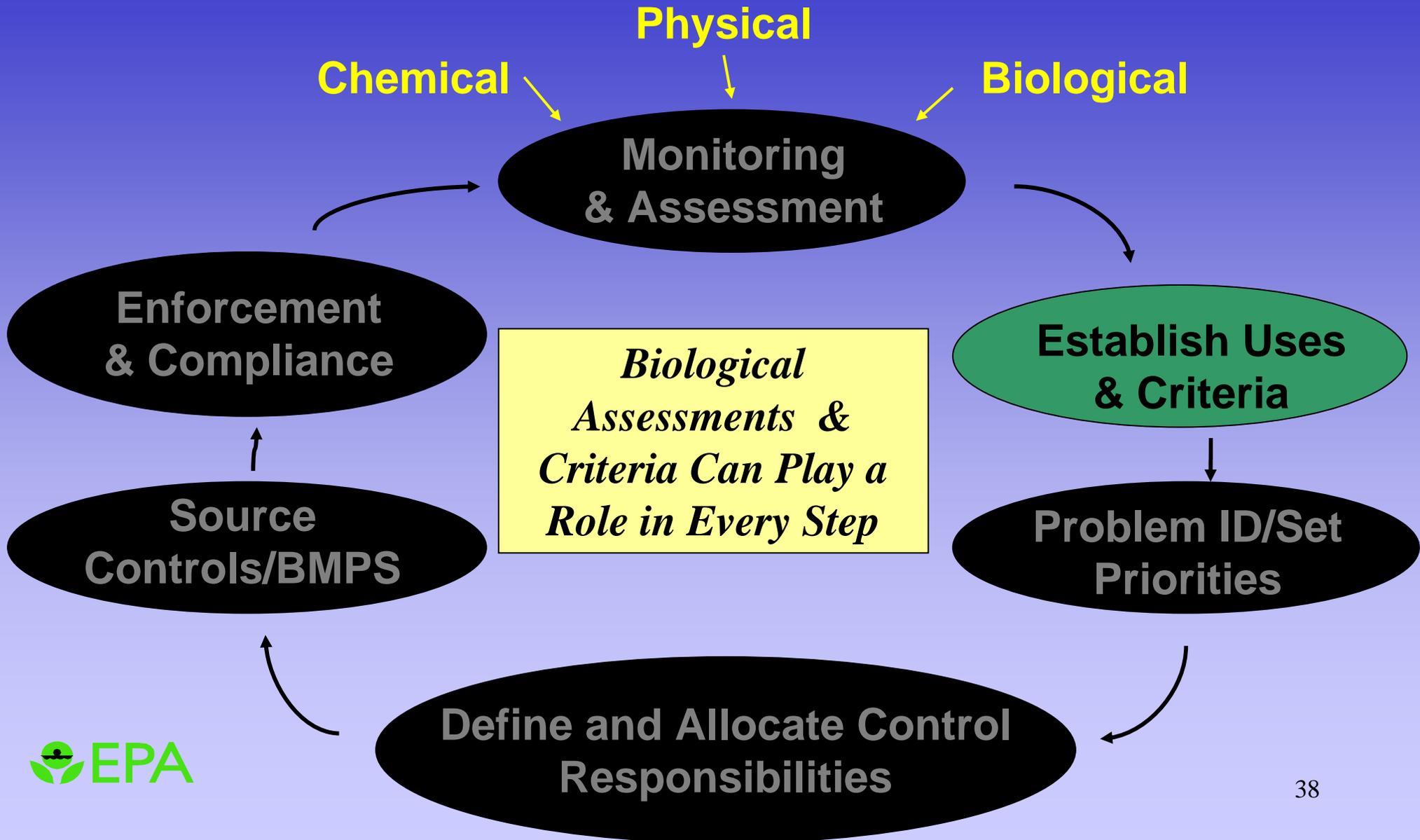
Measure Success

Communicate to stakeholders results of management efforts

Identify progress towards WQS attainment and CWA 101(a) goals

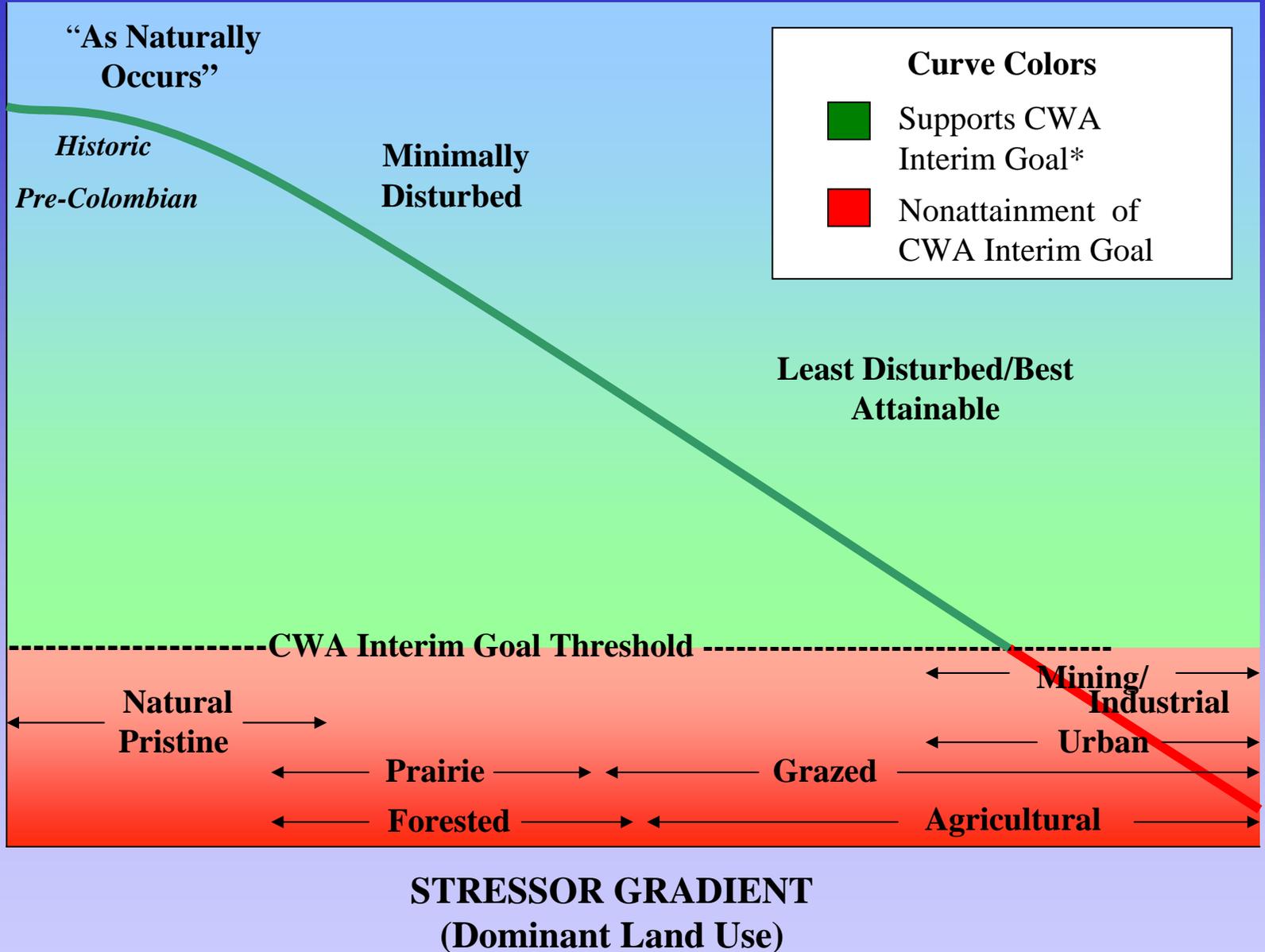
Use as results-oriented indicators

CWA WATER PROGRAM



Biological Integrity

BIOLOGICAL CONDITION



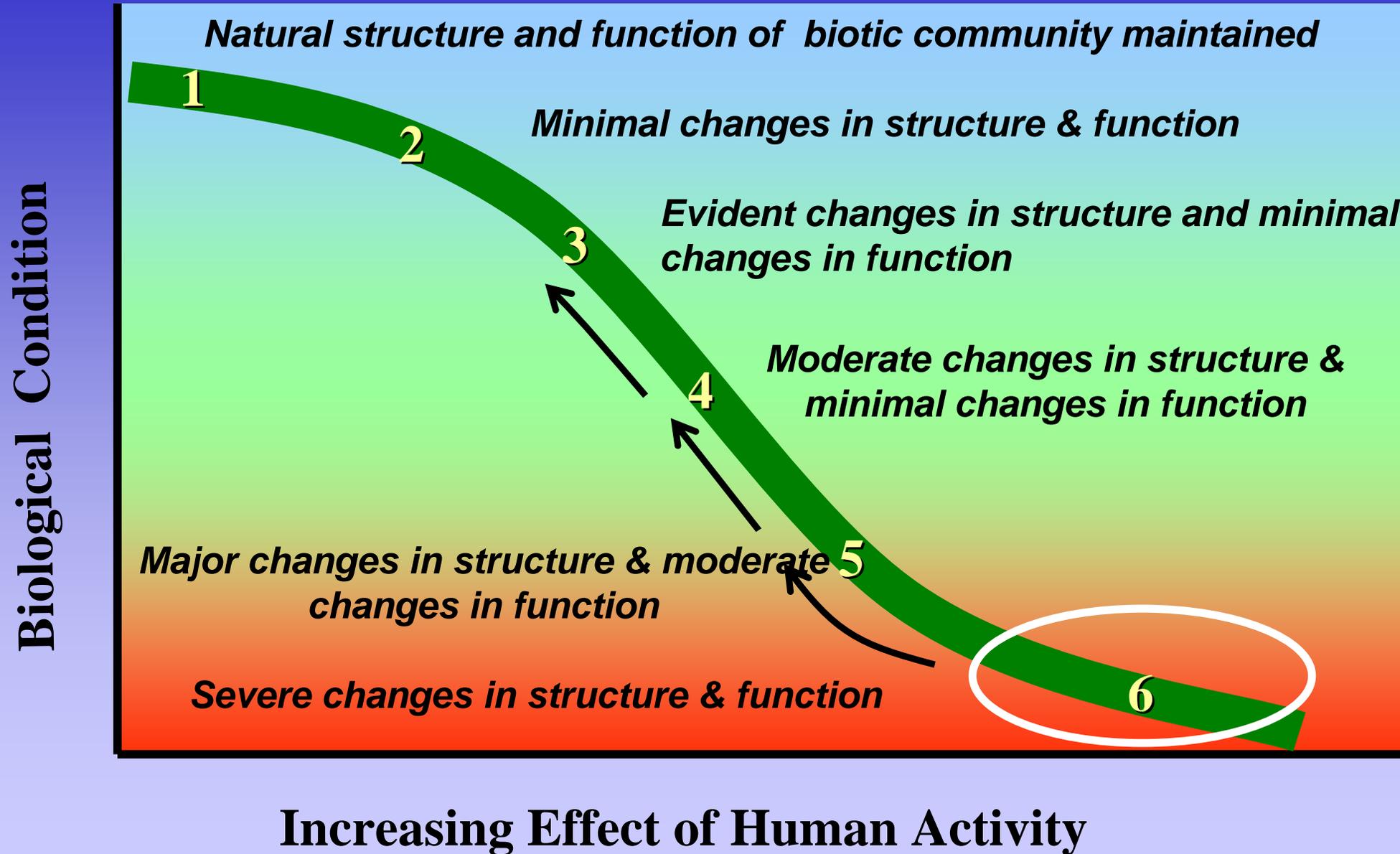
***Protection & Propagation of Fish, Shellfish and Wildlife**



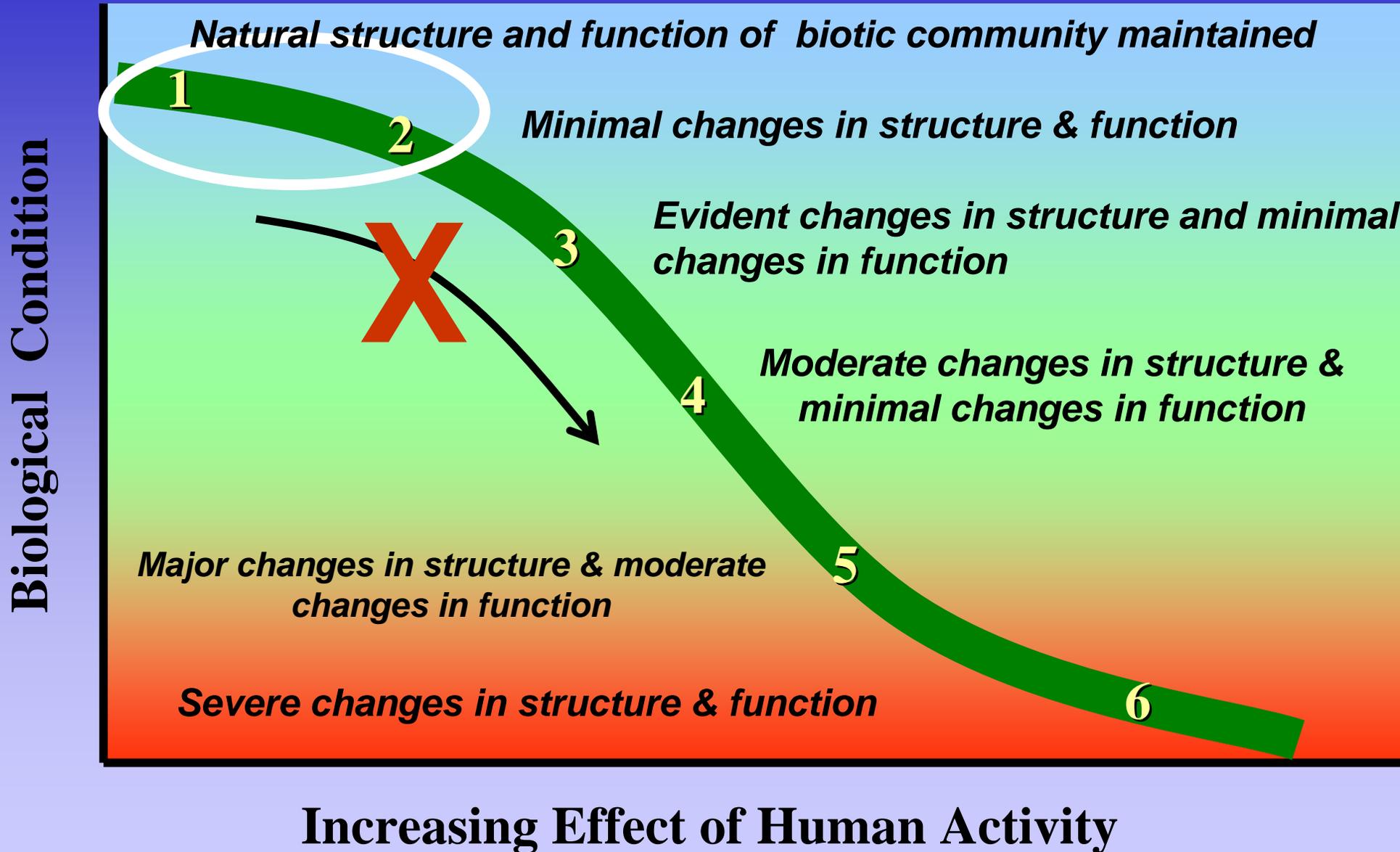
Tiered Aquatic Life Uses (TALU)

September 12, 2005
TAC Meeting, Los Angeles

The Biological Condition Gradient



Biological Condition Gradient



Tier	Report Card	Potential Thresholds for defining boundaries between condition classes	Qualitative Description (5 classes)	Combined Qualitative Description (3 classes)	Compliance with biocriteria (for 305[b])	Compliance with biocriteria (for 303[d])
1	A	Median of reference range above type I / II balance	Very Good	Good	Supporting	Not Impaired
2	B	Balance of Type I and Type II statistical error	Good			
3	C	2 SD below mean of reference streams	Fair	Fair		
4	D	Median of test range below 2 SD reference threshold	Poor	Poor	Partially Supporting	Impaired
5	F	Below median of test sites below 2 SD reference threshold	Very Poor		Not Supporting	

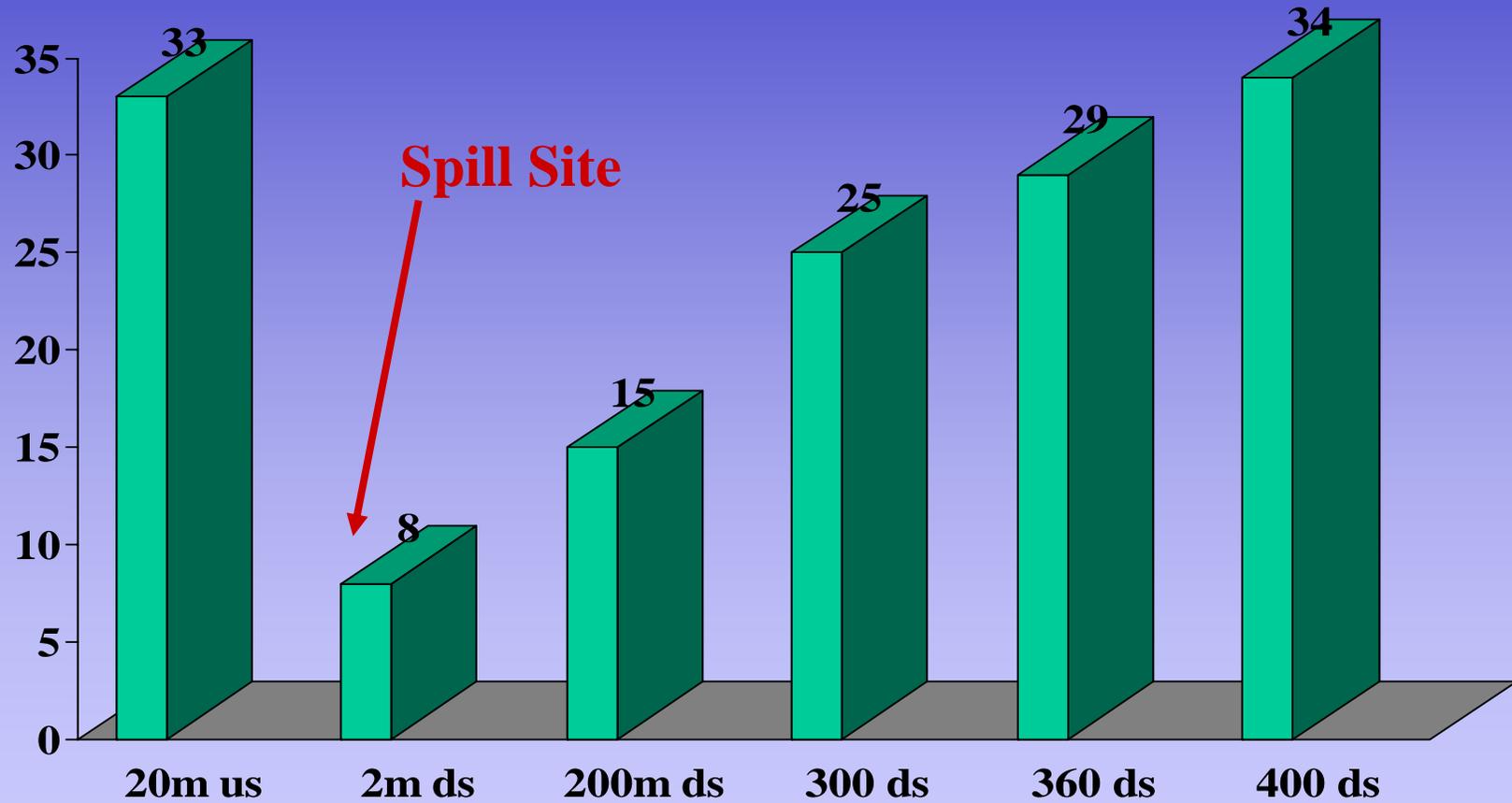
Enforcement of DFG Code 5650

Spill Response



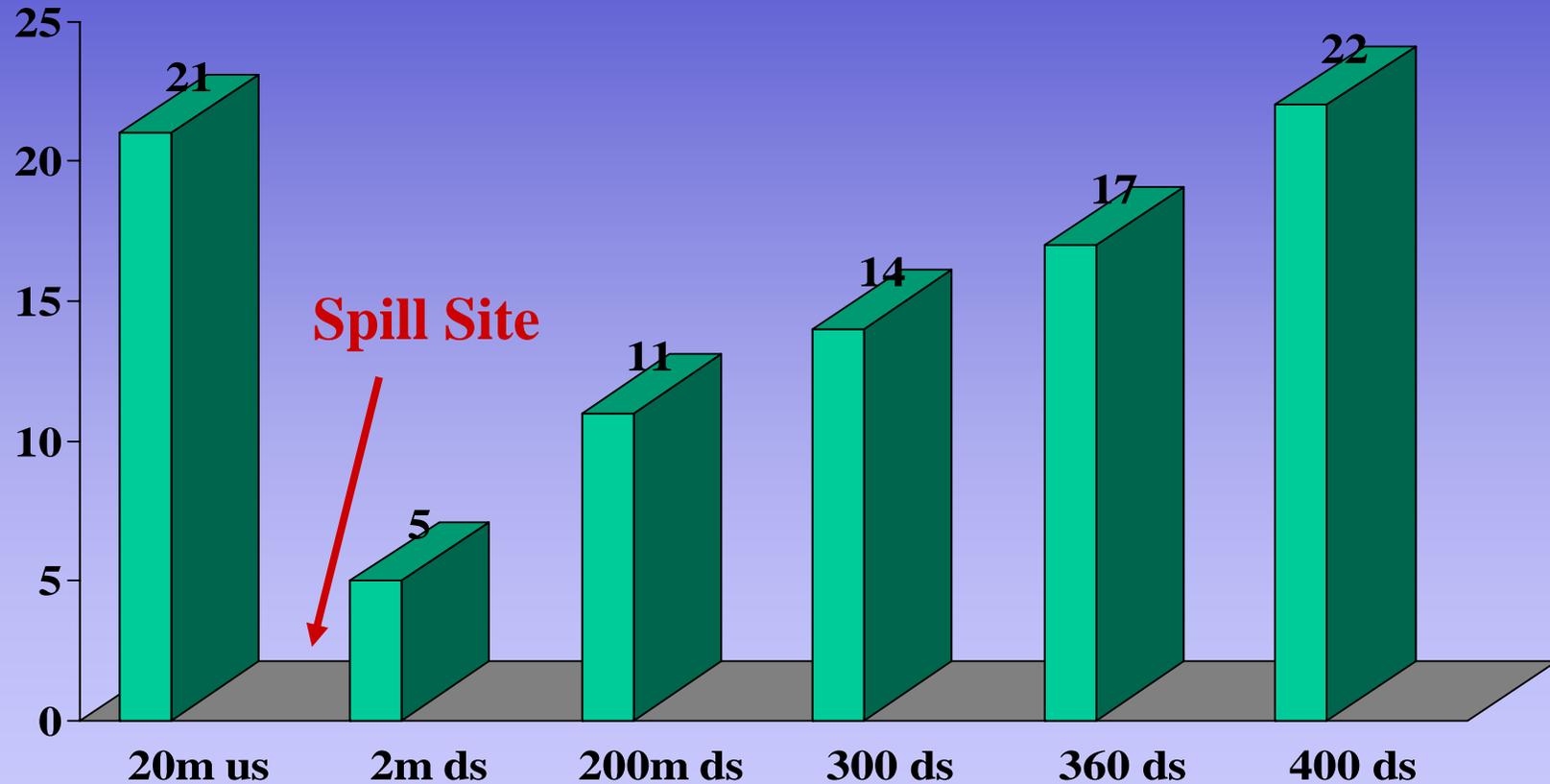
Middle Butte Creek Sediment Spill

Taxa Richness



Middle Butte Creek Sediment Spill

EPT Index (%)

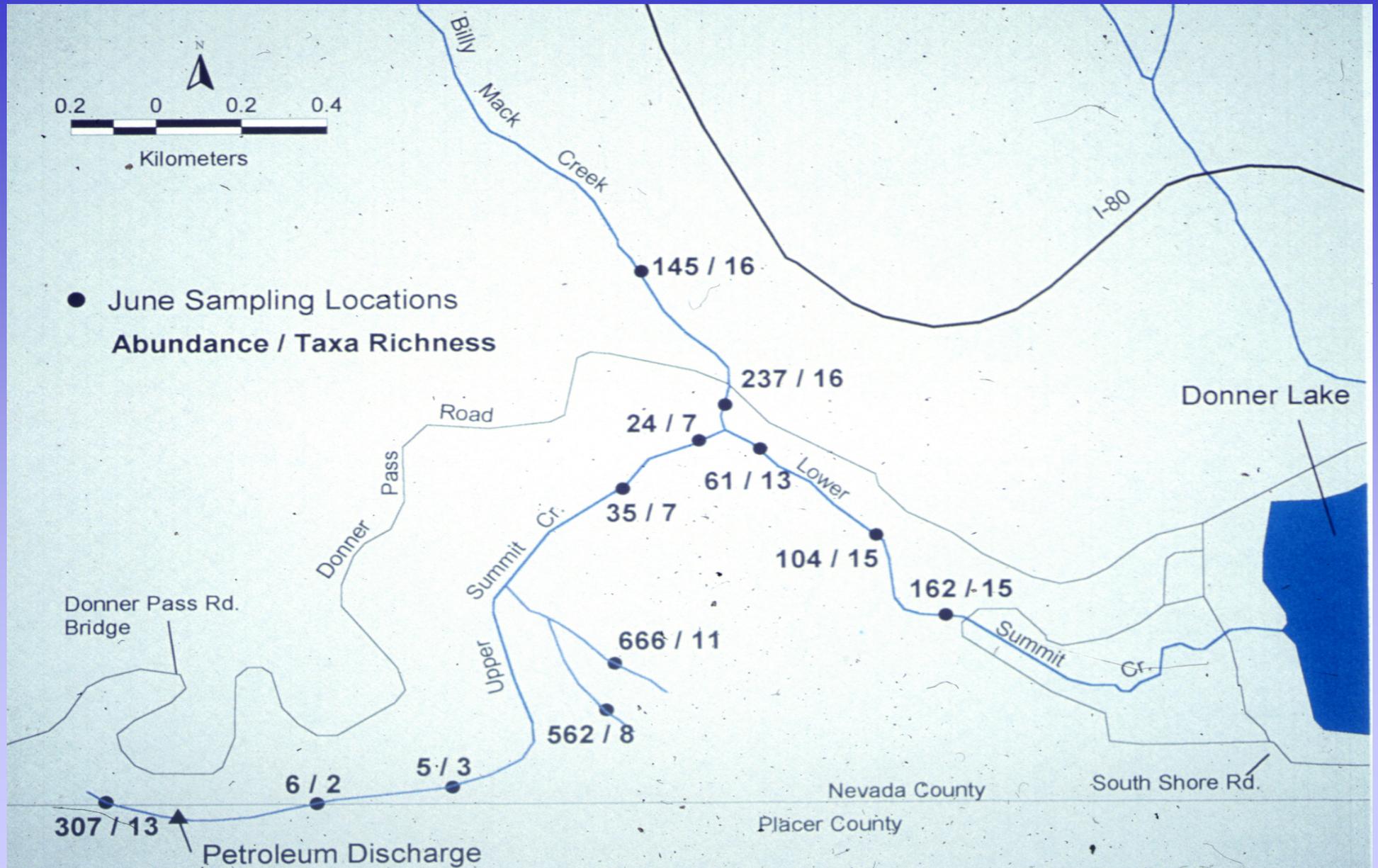


Natural Resource Damage Assessment (NRDA)

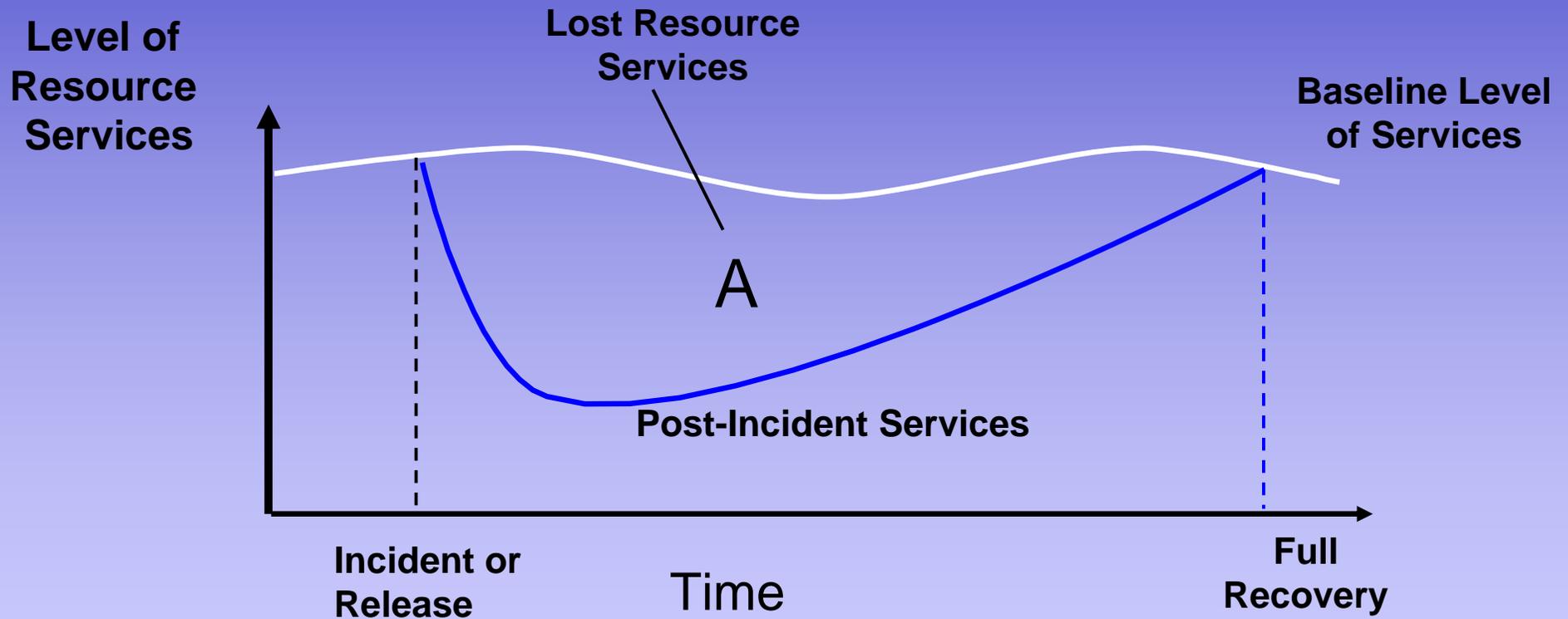


or Bucks for Bugs

Summit Creek Spill - June 1997



Temporary Loss of Services After Release or Spill





Just One More

