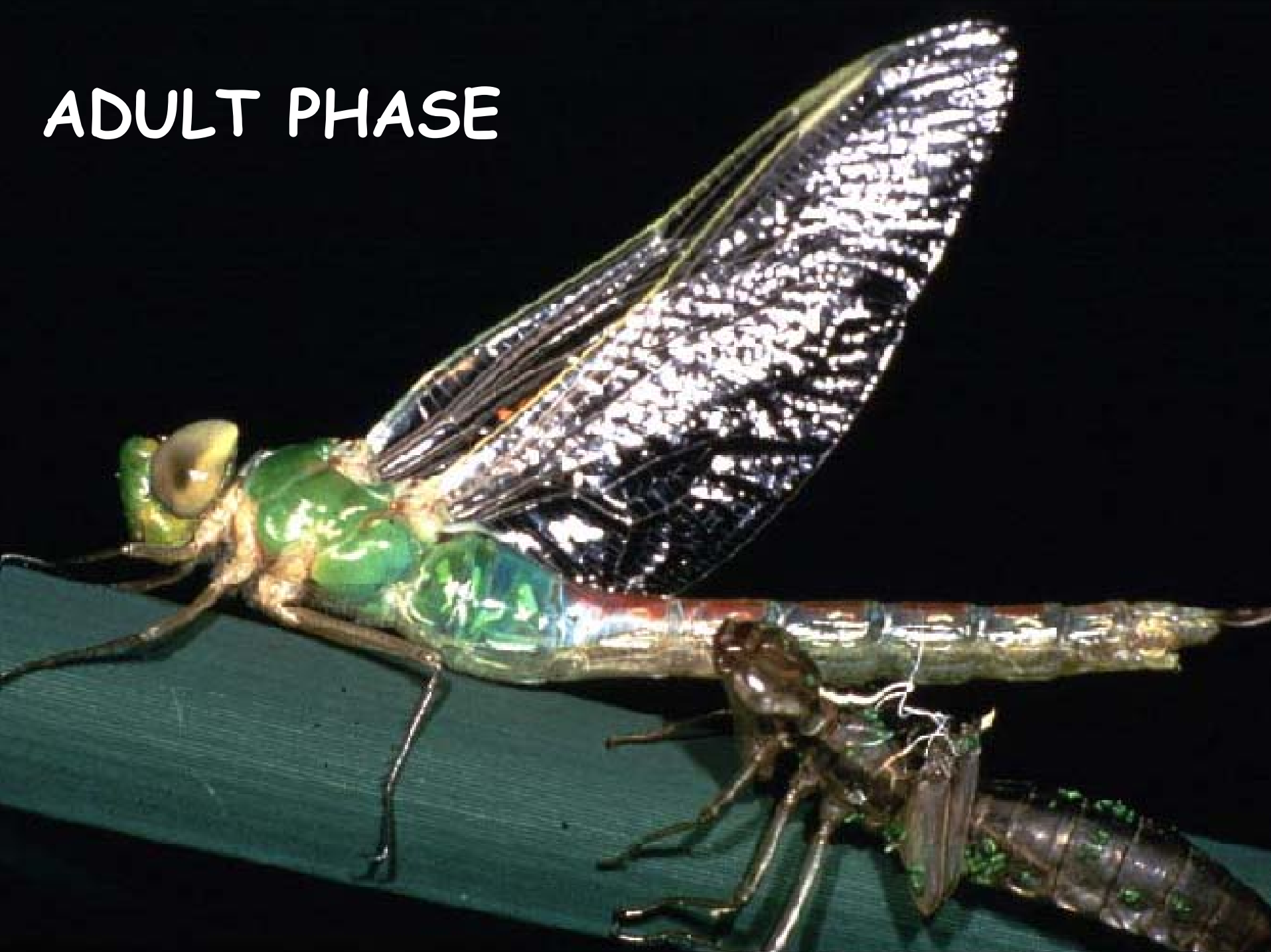
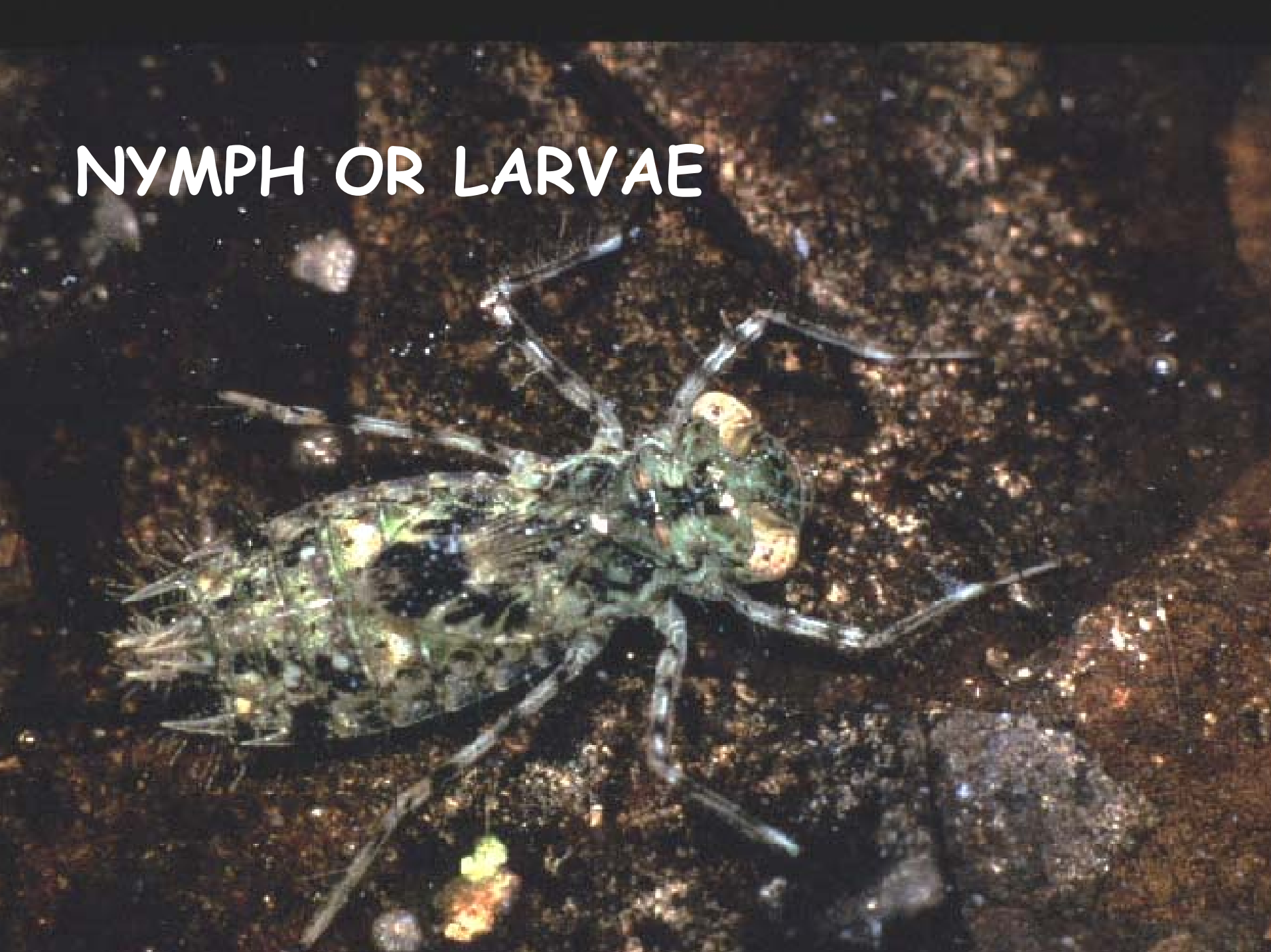
BIOLOGICAL ASSESSMENT

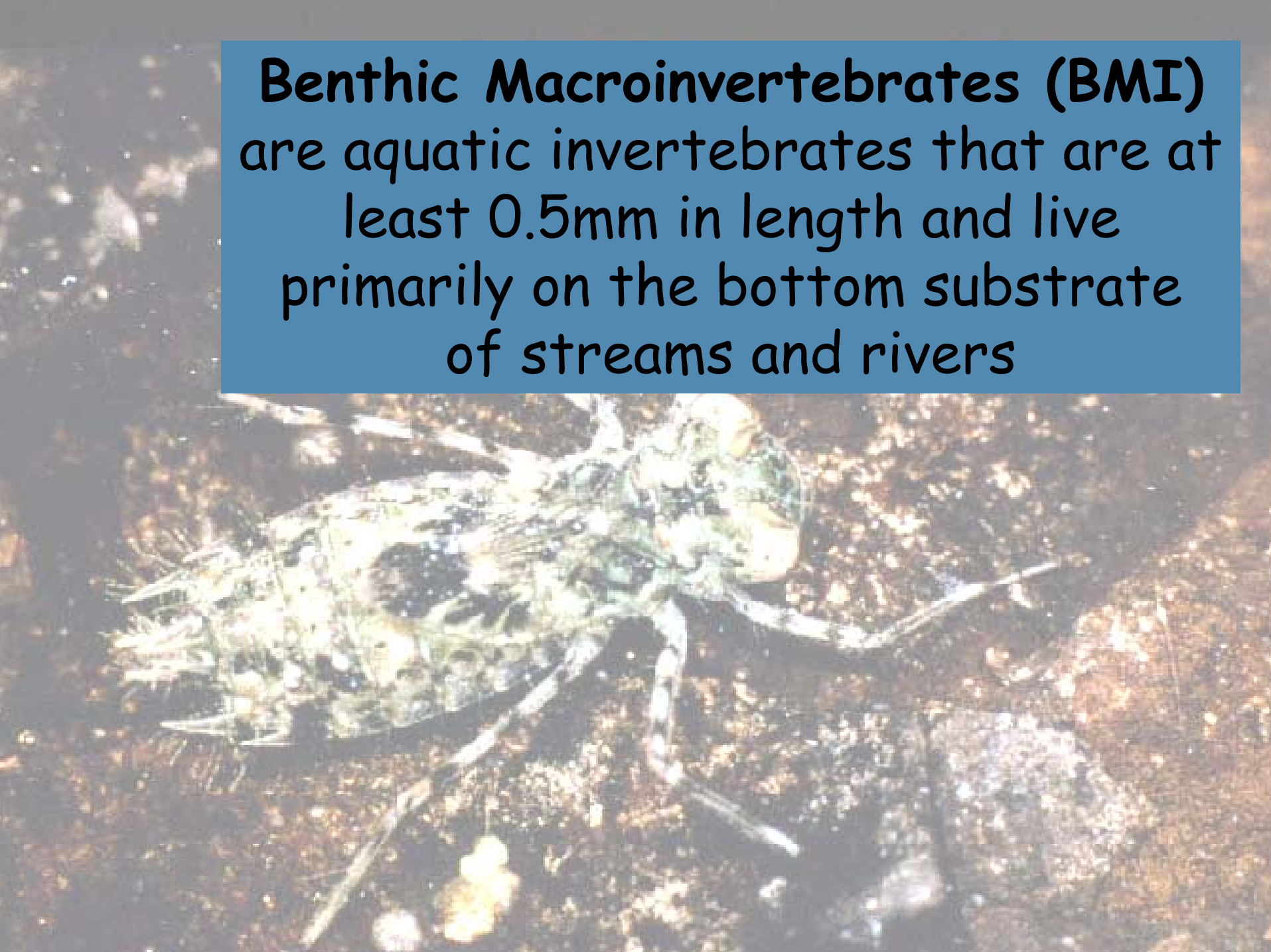
SWAMP Biology

Jim Harrington
California Depart of Fish and Game

ADULT PHASE

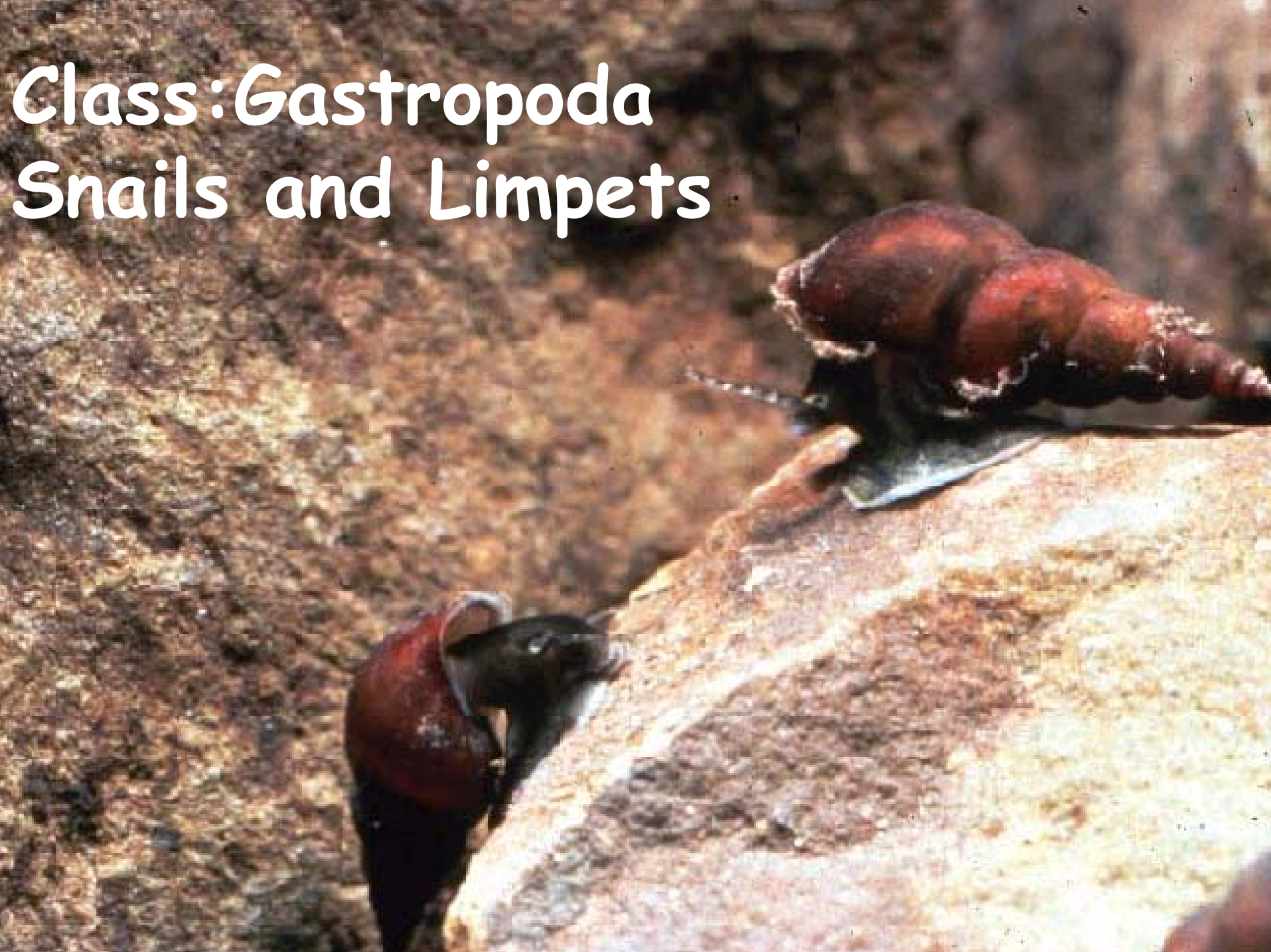



NYMPH OR LARVAE



Benthic Macroinvertebrates (BMI) are aquatic invertebrates that are at least 0.5mm in length and live primarily on the bottom substrate of streams and rivers

Class:Gastropoda
Snails and Limpets




Order:Decapoda
Crayfish

Order:Ephemeroptera
Mayfiles

Baetidae

Ephemerellidae

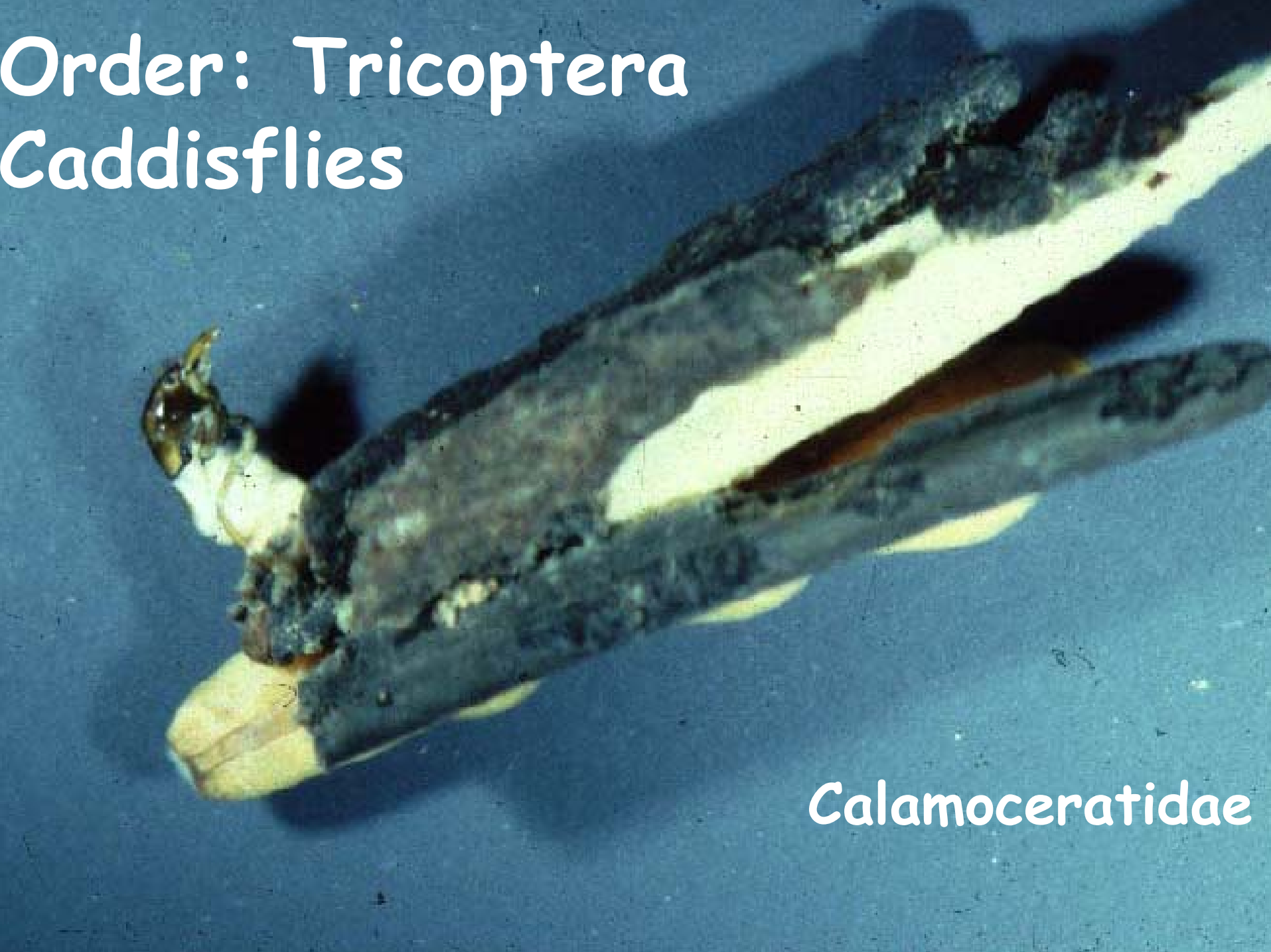
Order: Plecoptera
Stoneflies

Peltoperlidae

Perlidae


Taeniopterygidae

Order: Tricoptera
Caddisflies



Calamoceratidae

Glossosomatidae

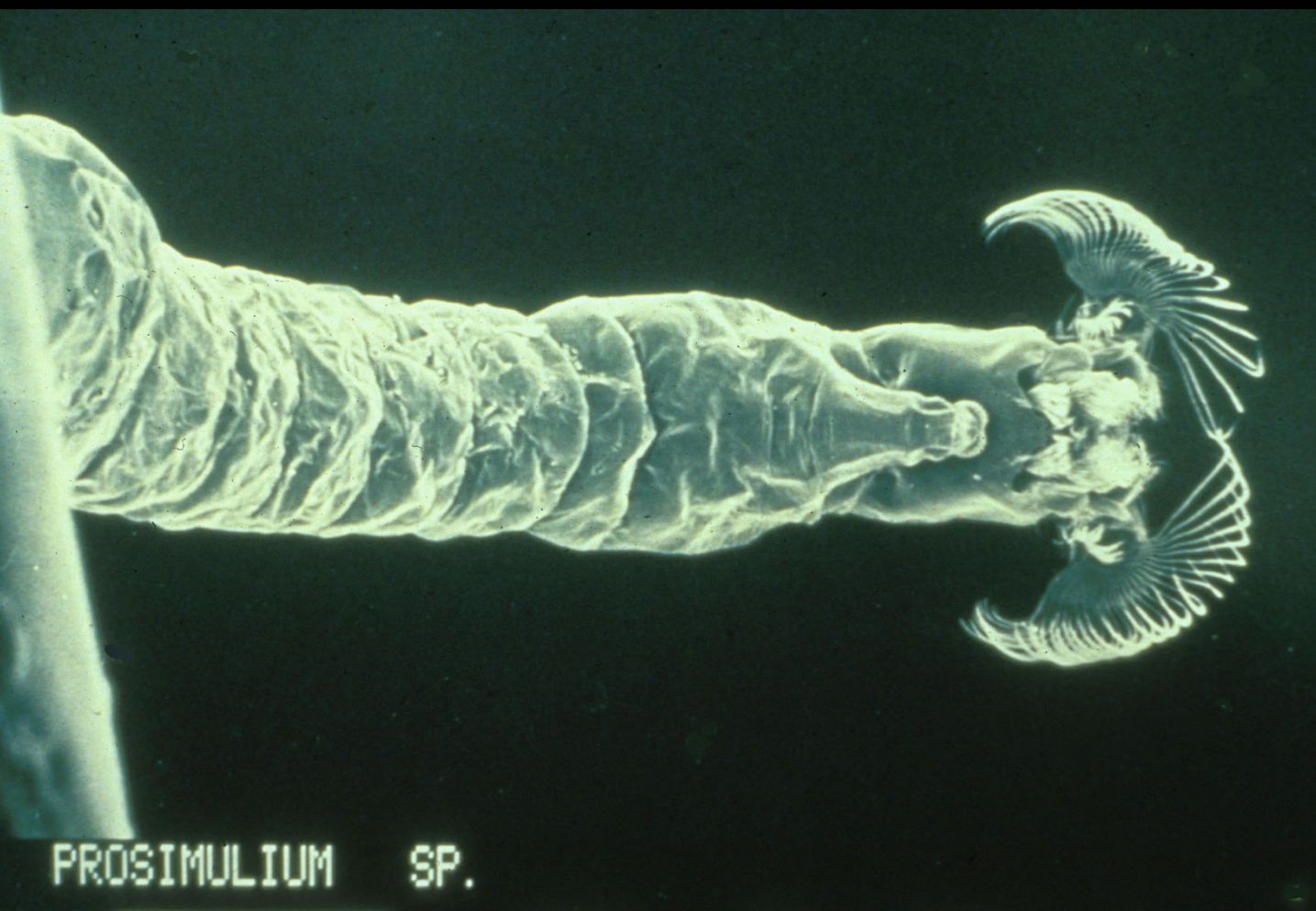

Limnephilidae

Order: Coleoptera
Aquatic Beetles

Order: Diptera
Aquatic Flies

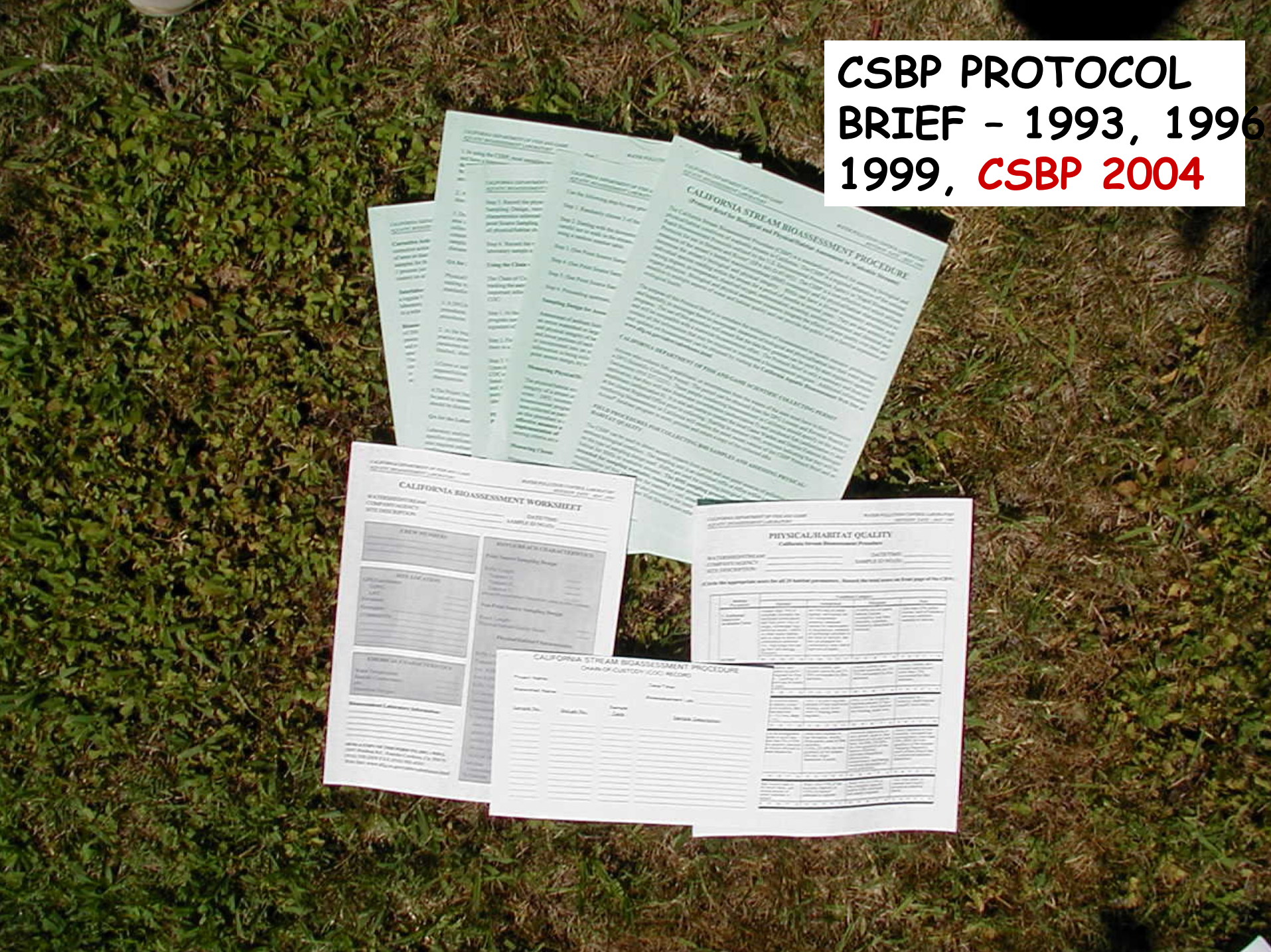
Chironomidae


Simuliidae

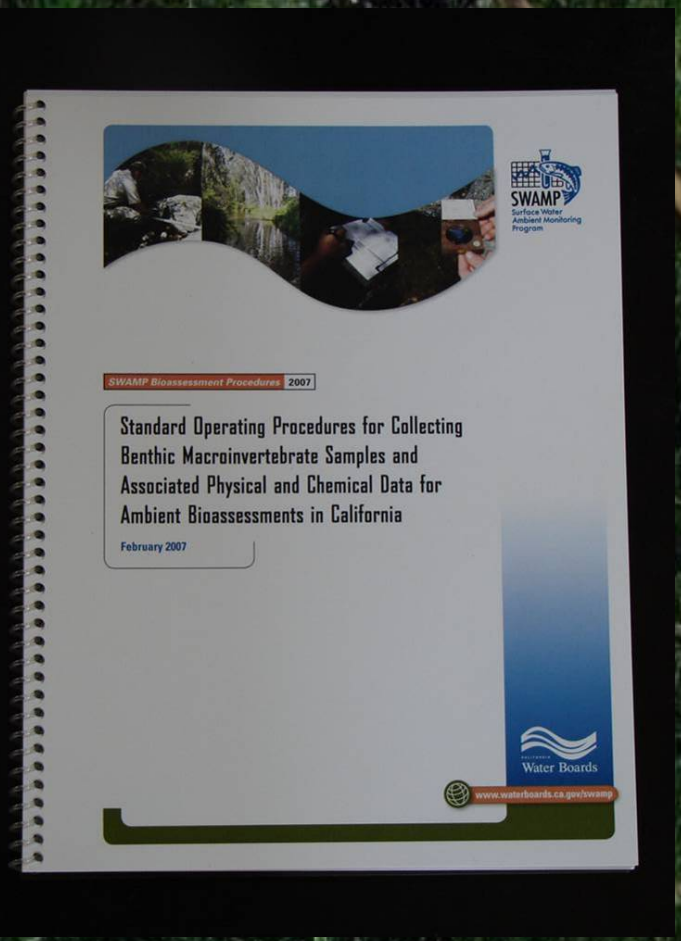

PROSIMULIUM SP.


Order: Hemiptera
True Bugs
Belostomatidae

Gerridae
(not a benthic invertebrate)


CSBP PROTOCOL
BRIEF – 1993, 1996
1999, CSBP 2004
CALIFORNIA STREAM BIOASSESSMENT PROCEDURE
CALIFORNIA BIOASSESSMENT WORKSHEET
PHYSICAL/HABITAT QUALITY
CALIFORNIA STREAM BIOASSESSMENT PROCEDURE

Rapid Biological Assessment
2007 SWAMP Procedures



Collect BMIs

Measure Phab

Measure Basic Chemistry

SWAMP PROCEDURE
BIOLOGICAL SAMPLE

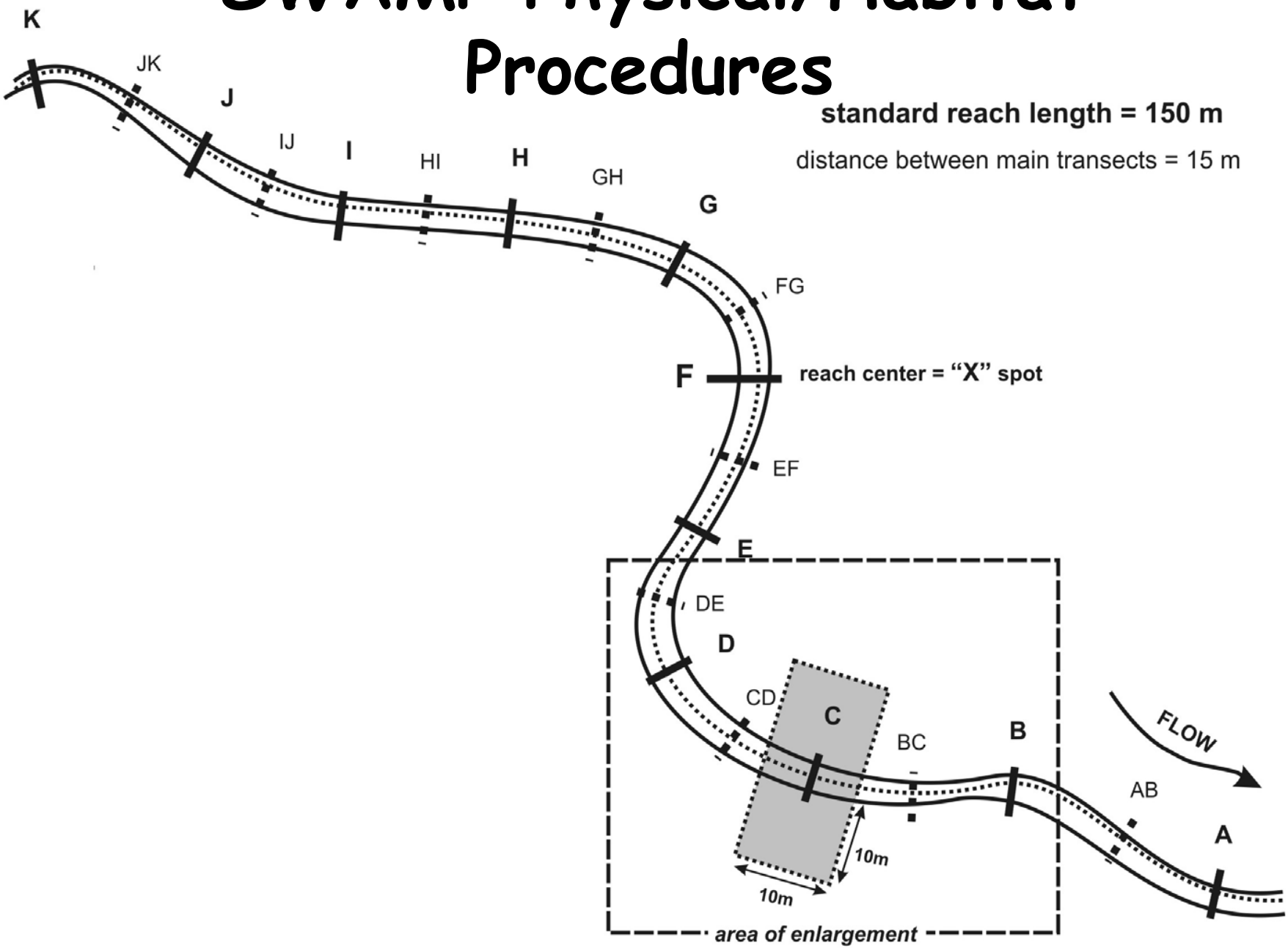
Reach-Wide Benthos (RWB)

1 Composite/Reach

Duplicates at 10% of the Sites

Benthic
Macroinvertebraes

SWAMP Physical/Habitat Procedures

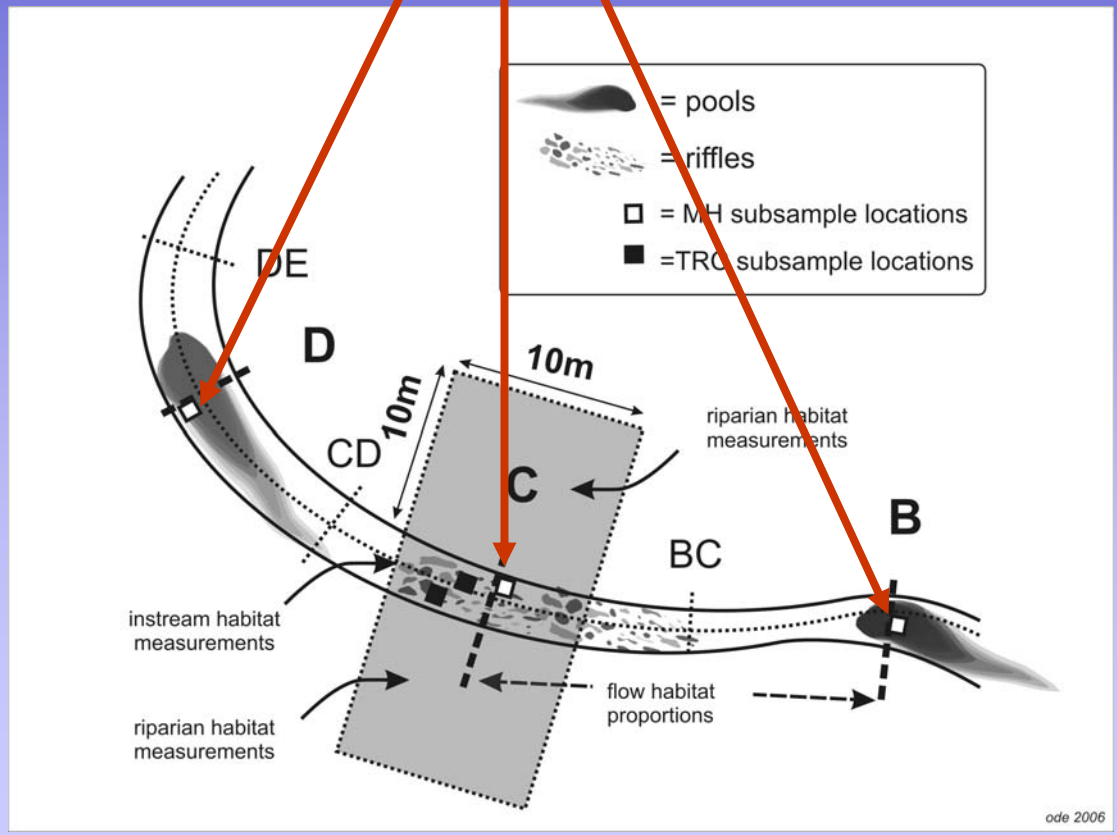


standard reach length = 150 m

distance between main transects = 15 m

SWAMP PROCEDURE for BIOLOGICAL SAMPLES

REACH-WIDE BENTHOS (RWB)




KIS


HARVEY'S.


HARVEY'S


DO NOT USE FUME HOOD
WHEN INDICATOR IS
BELOW RED ARROW


LEICA
DIPSEA

Sensitive Organisms in Streams

Dragonflies and Damselflies

Mayflies

Stoneflies

Caddisflies

Expected Response to Stress: ⬇ **abundance & proportion**

Tolerant Organisms in Streams

Scuds

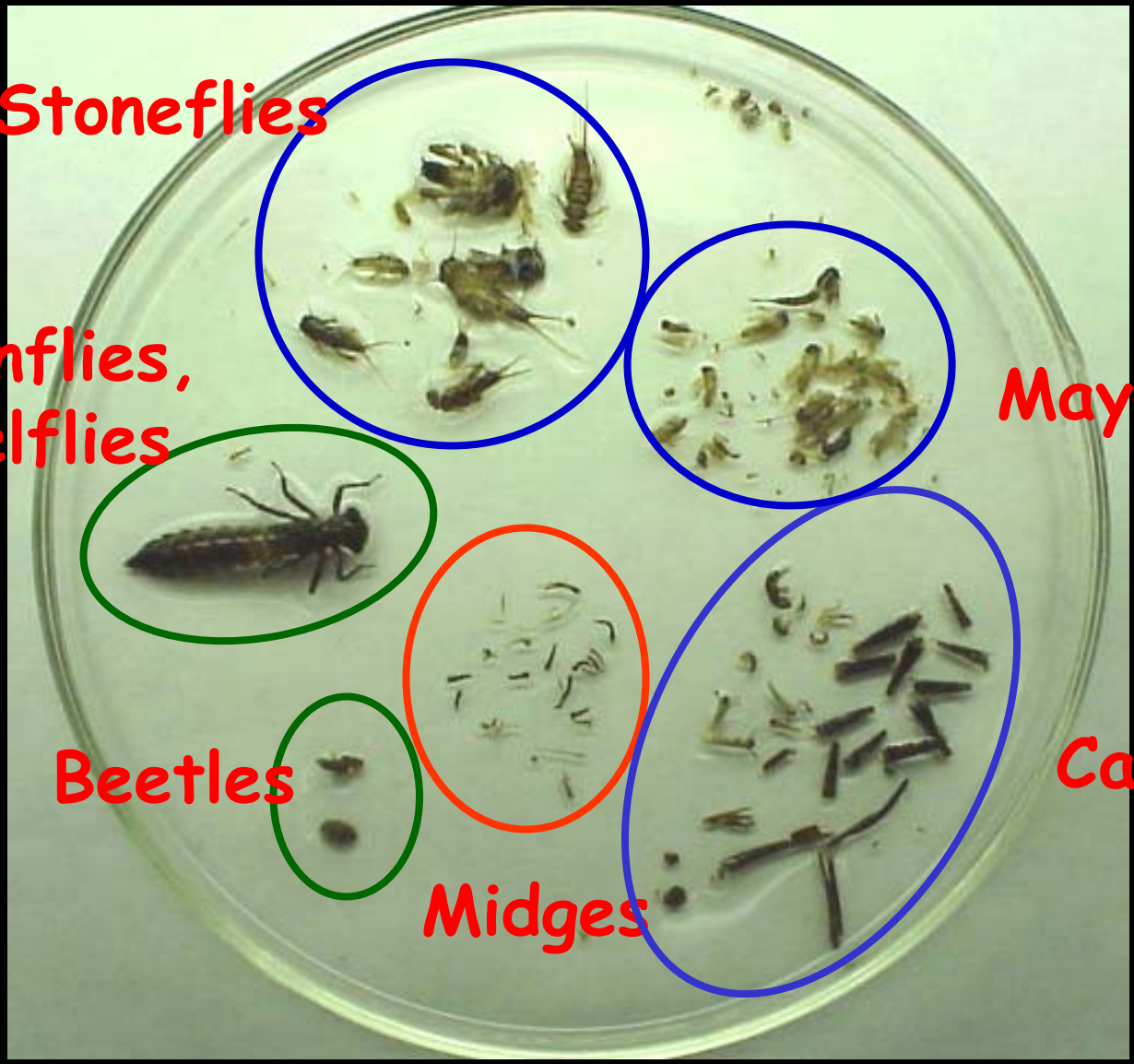
Snails

Leeches

Midges

Expected Response to Stress: ↑ **abundance & proportion**

BMI Metrics


Stoneflies
Dragonflies,
Damselflies
Mayflies
Beetles
Midges
Caddisflies

Types of BMI Metrics

Richness Measures

EPT Taxa

Composition Measures

Percent EPT Individuals

Tolerance/Intolerance Measures

Percent Sensitive EPA Taxa

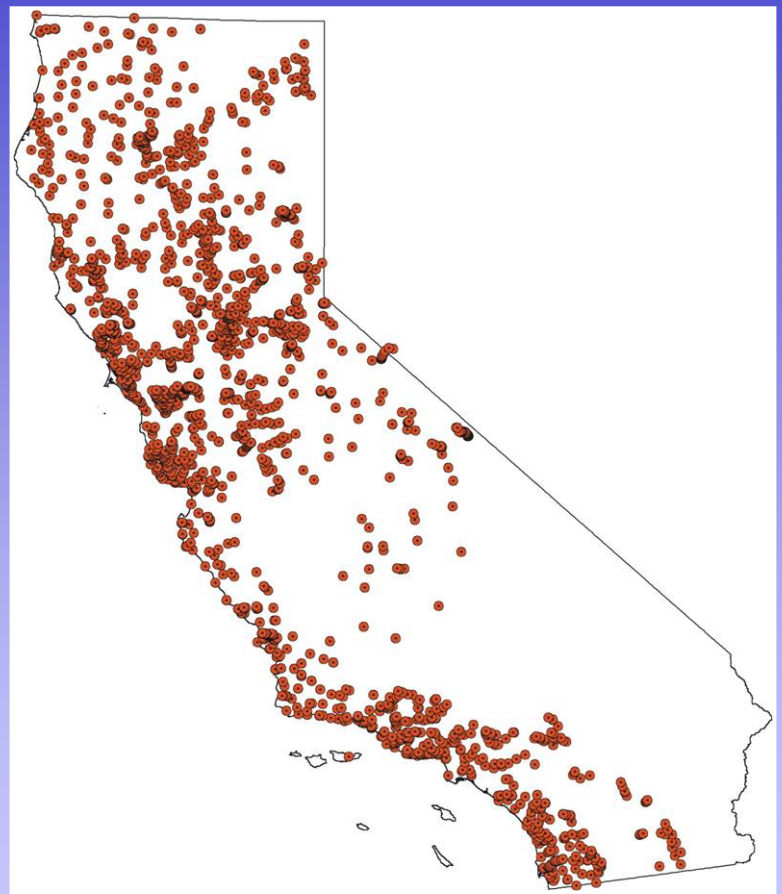
Functional Feeding Groups

Percent Shredder Taxa

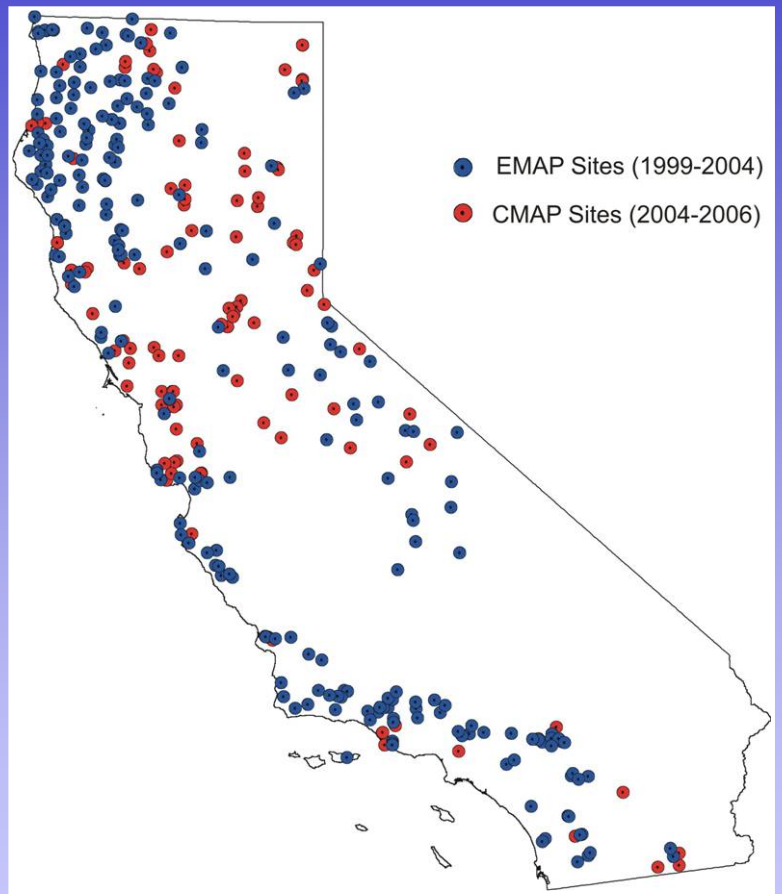
Total of 134

SAFIT StandardTaxonomic Effort I & II

All ABL processed sites (1993-2006)



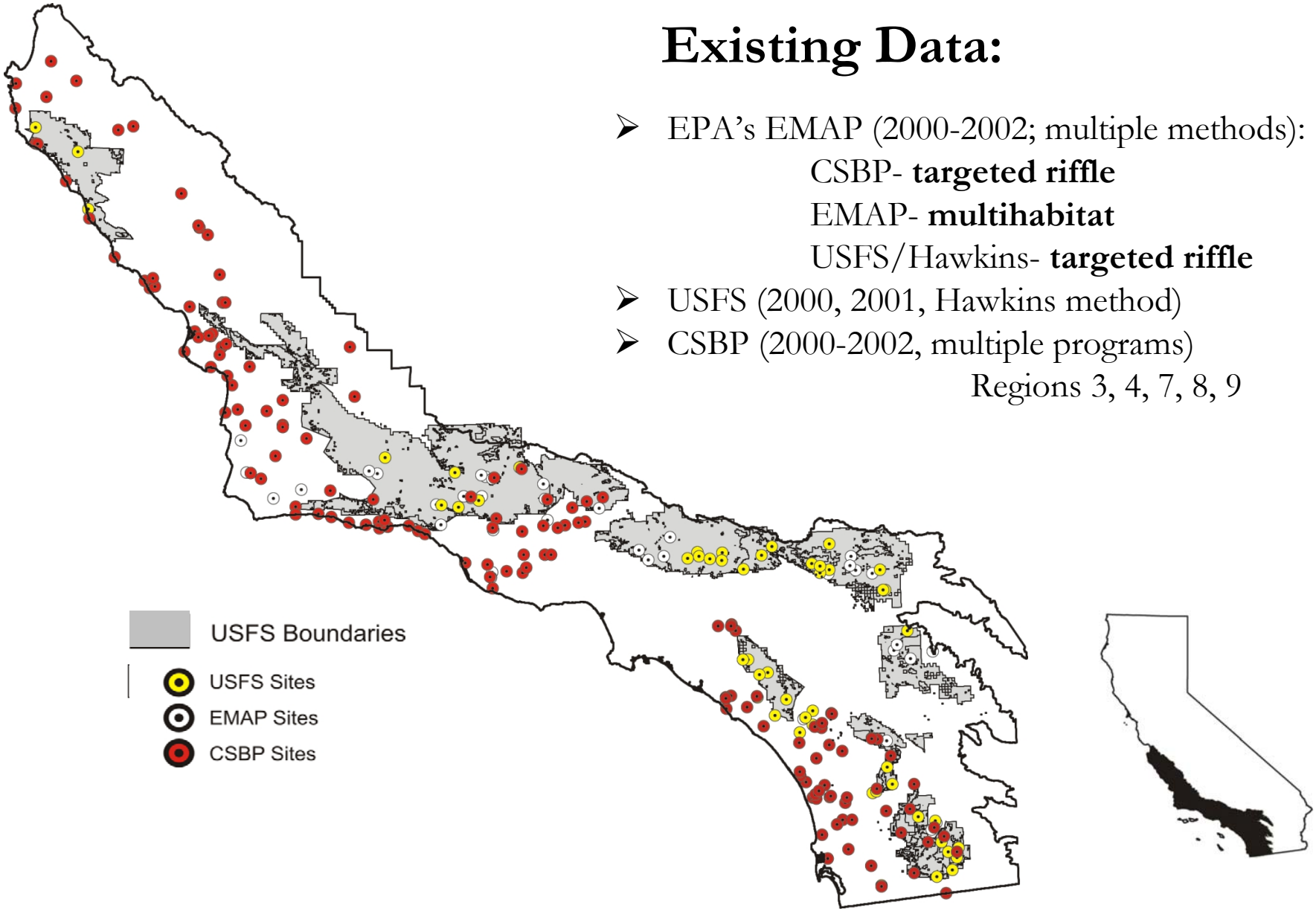
Probability survey sites (2000-2006)

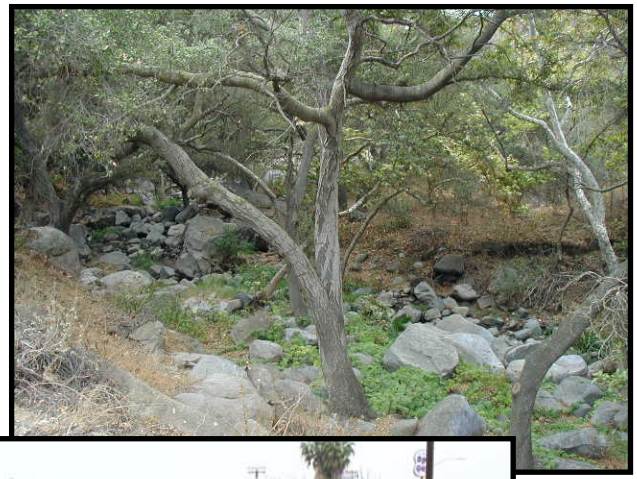


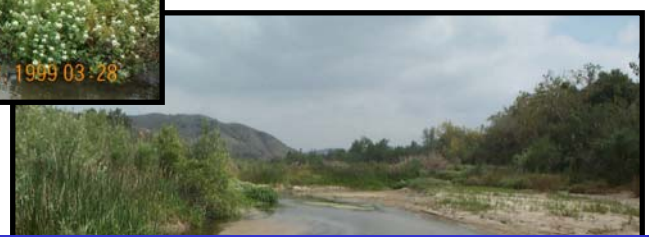
More than 17,000 sites as of 2010

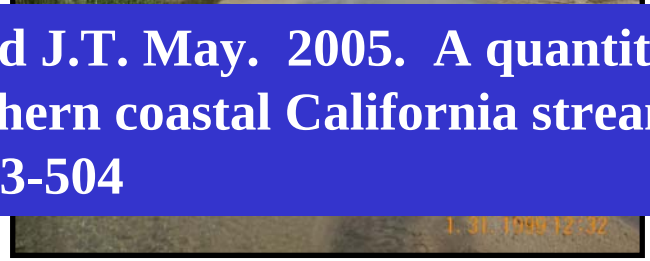
Existing Data:

- 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









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

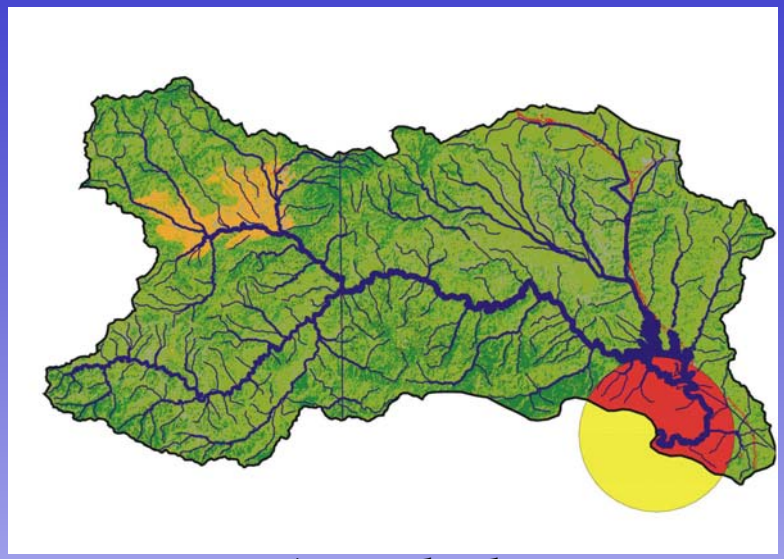
Peter R. Ode, Andrew C. Rehn and Jason T. May

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

Laboratory

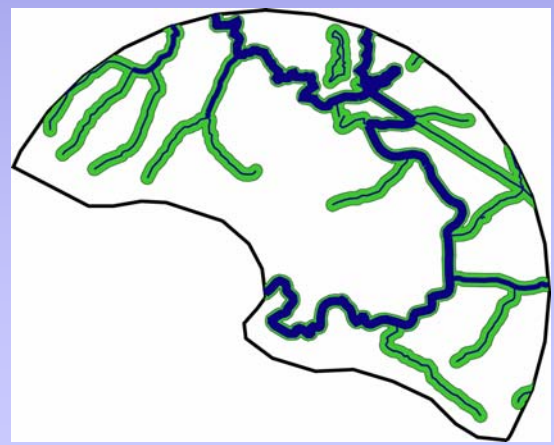
GIS Landuse Analysis at 4 Spatial Scales



Watershed

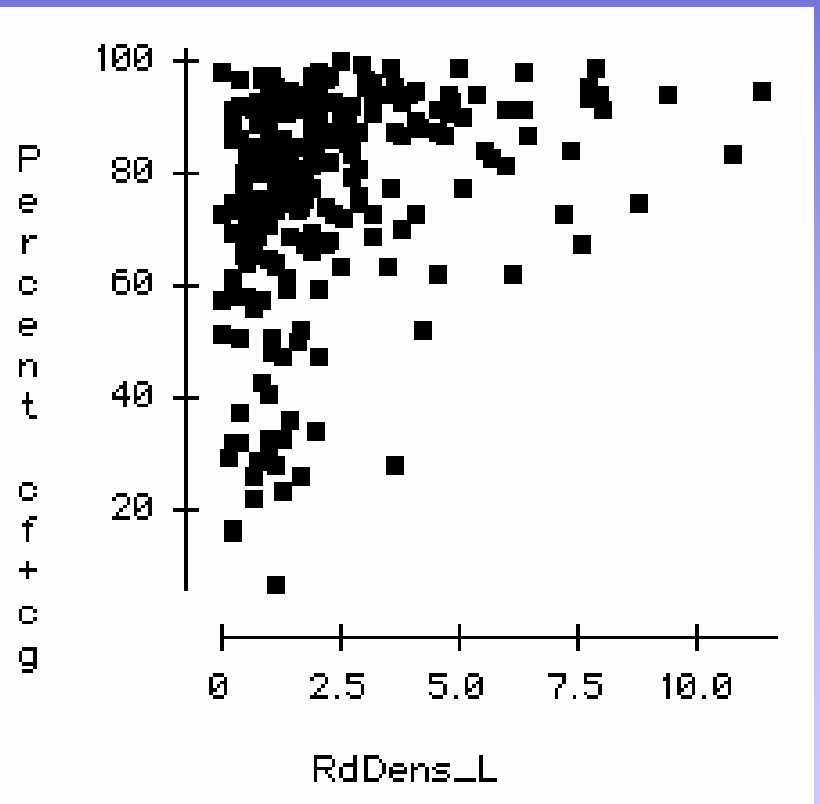
Watershed Stream Buffer (120m)

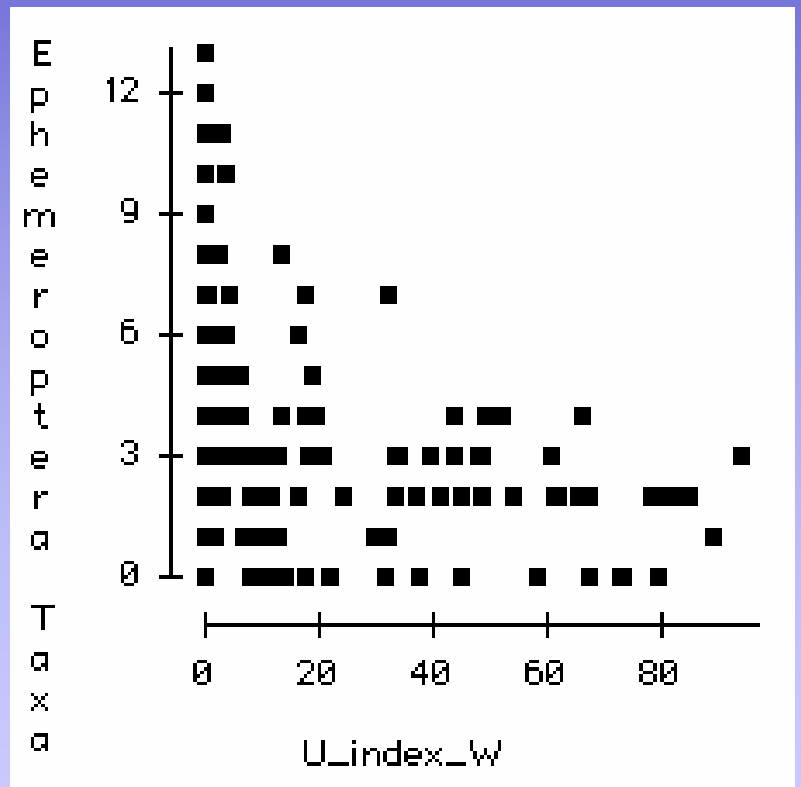
5 km Buffer



5 km Stream Buffer

100+ BMI Metrics Tested for Response to Human Disturbance Base on Land-use





Select responsive biotic metrics that are uncorrelated with each other:

1. Percent collector filterer + collector gatherer individuals
2. Percent non-insect taxa
3. Percent tolerant taxa
4. Percent intolerant individuals
5. EPT richness
6. Coleoptera richness
7. Predator richness

SoCal IBI Scores

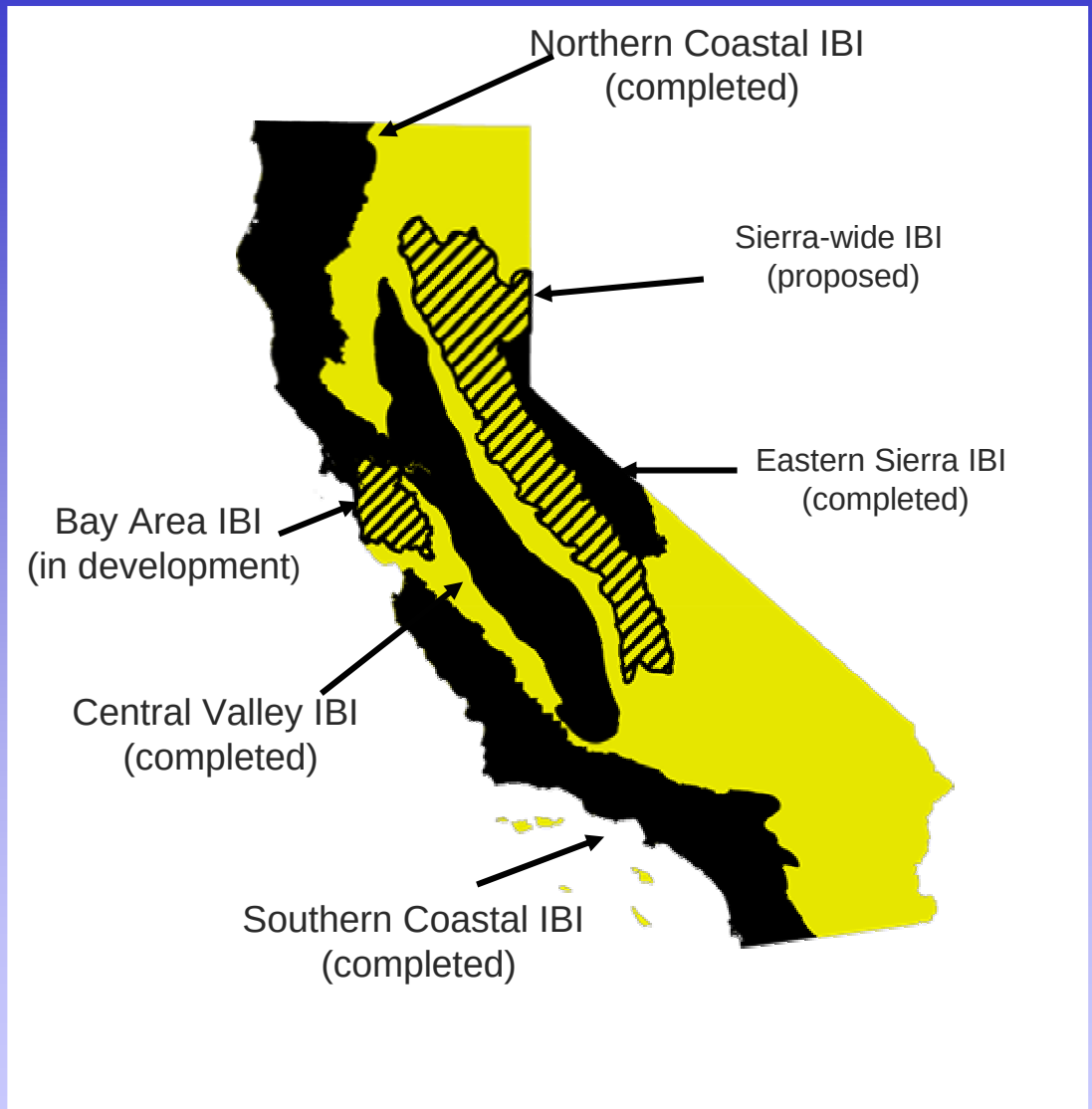
Metric Score	N_Coleop_T	N_EPT_T		N_Pred_T	P_CFCG_I		P_Int_I		P_NonIns_T	P_Tol_T
	All Sites	6	8	All Sites	6	8	6	8	All Sites	All Sites
10	>5	>17	>18	>12	0-59	0-39	25-100	42-100	0-8	0-4
9		16-17	17-18	12	60-63	40-46	23-24	37-41	9-12	5-8
8	5	15	16	11	64-67	47-52	21-22	32-36	13-17	9-12
7	4	13-14	14-15	10	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	Poor	Fair	Good	Very Good
0-14	15-28	29-42	43-56	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

IBI Availability



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

$$\frac{O}{E} = 0.38$$

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


Get to Know
Your Mayflies

And your Beetles