

**National Biological Assessment
and Criteria Workshop**

Advancing State and Tribal Programs



Coeur d'Alene, Idaho
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TALU 101

***Response of Stream
Biological Communities to
Agricultural Disturbances
in Kansas***

Presented by

**Bob Angelo,
Kansas Department of Health and Environment**

**GREAT PLAINS
ECOREGION
OF
NORTH
AMERICA**



BIOLOGICAL INTEGRITY CATEGORIES

SHALLOW, SANDY BOTTOMED PLAINS STREAMS

Class A: Historical (natural) reference condition

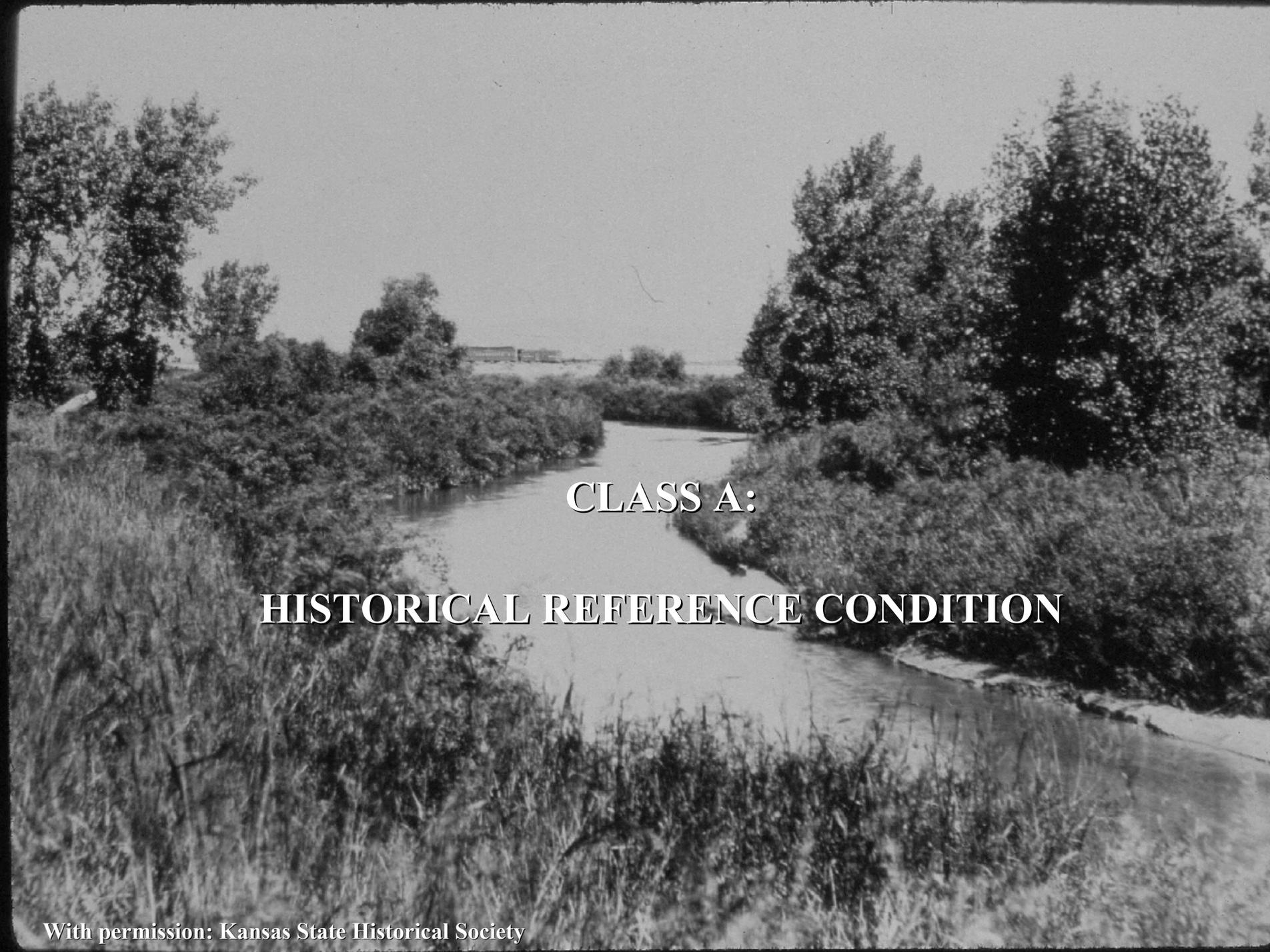
Class B: Contemporary (best remaining) reference condition

Class C: Fully supportive of designated aquatic life use

Class D: Partially supportive of designated aquatic life use

Class E: Non-supportive of designated aquatic life use

Class F: Grossly non-supportive of designated aquatic life use



CLASS A:
HISTORICAL REFERENCE CONDITION



With permission: Kansas State Historical Society



With permission: Kansas State Historical Society

Anderson at Great Bend 1892



SUMMARY OF EXPECTED BIOLOGICAL CONDITIONS IN CLASS A STREAMS

- Biological community lacks exotic plant and animal species.
- Many peripheral fish species (e.g., American eel, chestnut lamprey) and invertebrate species (e.g., hickorynut mussel, sharp hornsnail) are represented in biological community.
- Regionally endemic or quasi-endemic fish species (e.g., Arkansas River shiner, plains killifish) and invertebrate species (e.g., ringed crayfish, “sand dwelling” mayfly) rank among dominant taxa.



CLASS B:

CONTEMPORARY REFERENCE CONDITION

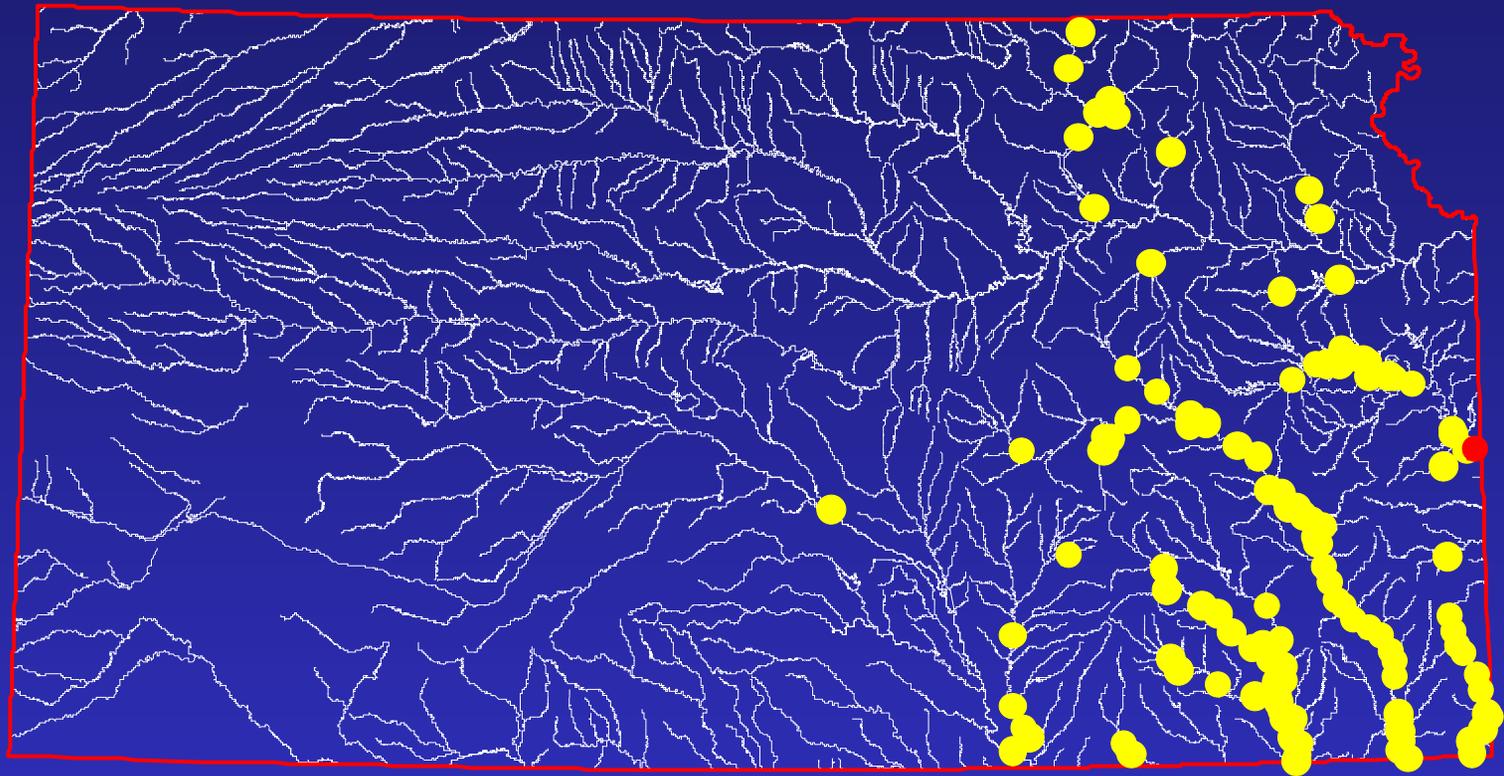








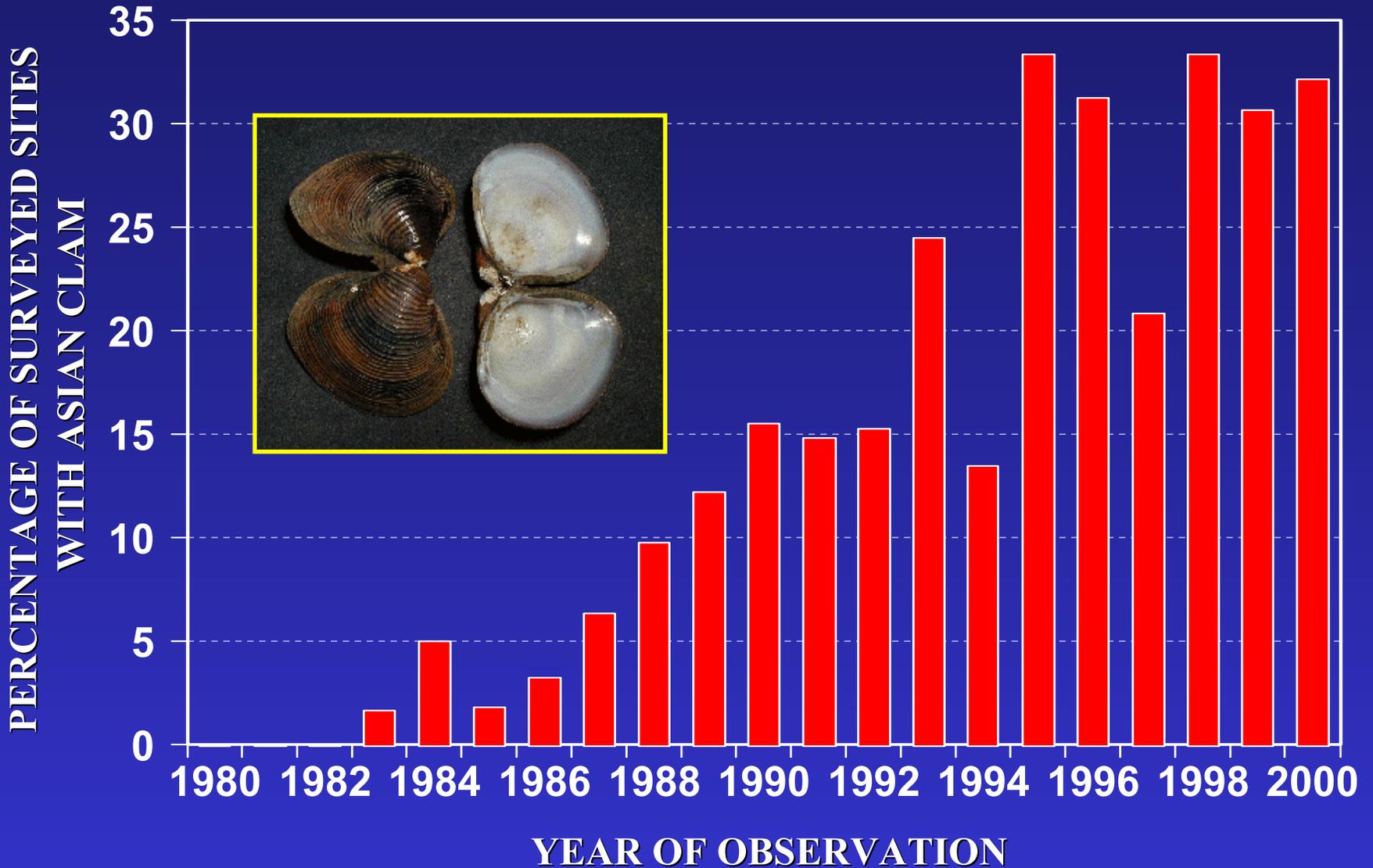
DECLINE IN GEOGRAPHICAL DISTRIBUTION OF THE BLACK SANDSHELL IN KANSAS



● HISTORICAL POPULATIONS

● KNOWN EXTANT POPULATION

DOCUMENTED OCCURRENCE OF ASIAN CLAM AT KDHE STREAM BIOLOGICAL MONITORING SITES



SUMMARY OF EXPECTED BIOLOGICAL CONDITIONS IN CLASS B STREAMS

- Biological community may include populations of a few widely occurring exotic plants and animals (e.g., watercress, carp, Asian clam).
- Some peripheral species (e.g., black sandshell mussel) and regionally endemic species (e.g., Arkansas River shiner) are no longer present.
- Dominant taxa, major trophic pathways, and nutrient cycling (spiraling) relationships are little changed from historical reference condition.



CLASS C:

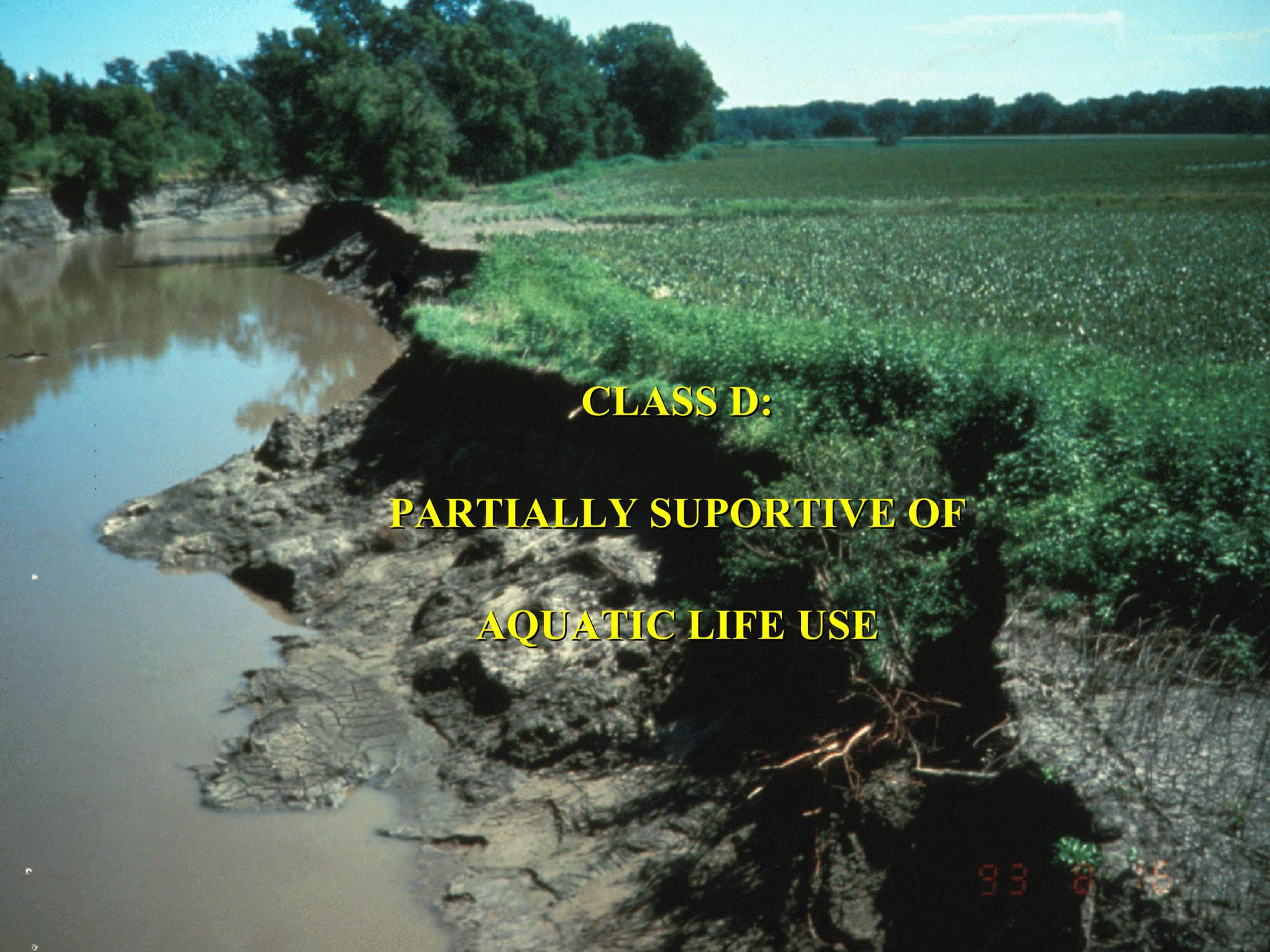
FULLY SUPORTIVE OF

AQUATIC LIFE USE



SUMMARY OF EXPECTED BIOLOGICAL CONDITIONS IN CLASS C STREAMS

- Exotic plant and/or animal species constitute a significant component of biological community.
- Most regionally endemic taxa and many peripheral species are missing from community.
- Stonefly taxa are few in number or entirely absent, but EPT percent count approaches or exceeds 50%. Pennate diatoms dominate epilithic and episammic algal communities.
- Natural trophic structure/function and nutrient cycling relationships are largely maintained.



CLASS D:
PARTIALLY SUPORTIVE OF
AQUATIC LIFE USE

93 8 15





Asian Clam (*Corbicula fluminea* Müller, 1774)
Walnut River, Butler County, September 19, 2000

SUMMARY OF EXPECTED BIOLOGICAL CONDITIONS IN CLASS D STREAMS

- Exotic species may dominate stream biological community in terms of biomass and number of individuals.
- Few if any regionally endemic taxa and peripheral species are represented in community.
- EPT percent count ranges from 30-50%. Midge larvae, oligochaete worms, and other tolerant forms rank among dominant invertebrate taxa. Pennate diatoms absent or nearly so.
- Nutrient cycling interactions and major trophic pathways differ from those of class C streams.

An aerial photograph showing a river or stream flowing through a rural landscape. The river is the central focus, winding through a patchwork of agricultural fields. A road or path crosses the river. The surrounding land is mostly flat and appears to be used for farming. The sky is clear and blue.

**CLASSES E AND F:
(GROSSLY) NON-SUPPORTIVE OF
AQUATIC LIFE USE**



SUMMARY OF EXPECTED BIOLOGICAL CONDITIONS IN CLASS E STREAMS

- Virtually all peripheral and regionally endemic species are absent from biological community.
- Macrofauna are often limited to a few hardy exotic species (e.g., carp) and highly tolerant native taxa (e.g., Chironomus larvae, physid snails). Nuisance algal growths may develop seasonally unless precluded by high turbidity.
- EPT percent count does not exceed 30%.
- Biological nutrient cycling interactions and trophic relationships are less complex than those occurring in higher quality streams.



SUMMARY OF EXPECTED BIOLOGICAL CONDITIONS IN CLASS F STREAMS

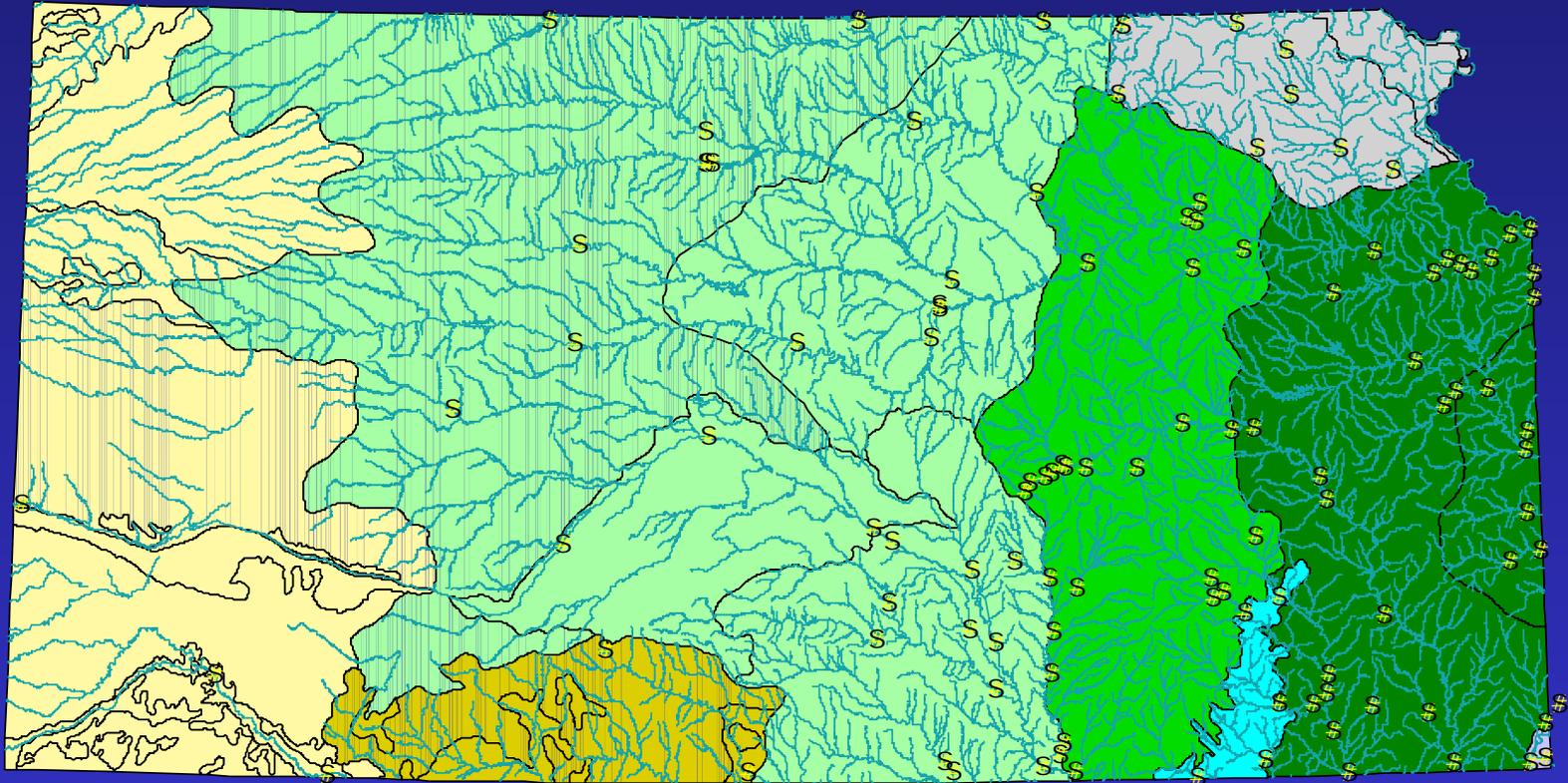
- Fish no longer comprise permanent component of biological community.
- Surviving invertebrate life (e.g., mosquito larvae) may attain very high population densities.
- Nuisance algal growths will occur seasonally unless precluded by high turbidity.
- Nutrient cycling interactions and trophic relationships within biological community are highly simplified and generally inefficient.

An aerial photograph of a wide, winding river flowing through a flat, grassy landscape. The river is light blue and has several meanders. There are patches of green vegetation and small islands in the water. The sky is clear and blue.

**UTILITY OF MACROINVERTEBRATE DATA IN
DELINEATION OF AGRICULTURAL
IMPACTS AND BIOLOGICAL
INTEGRITY CATEGORIES**

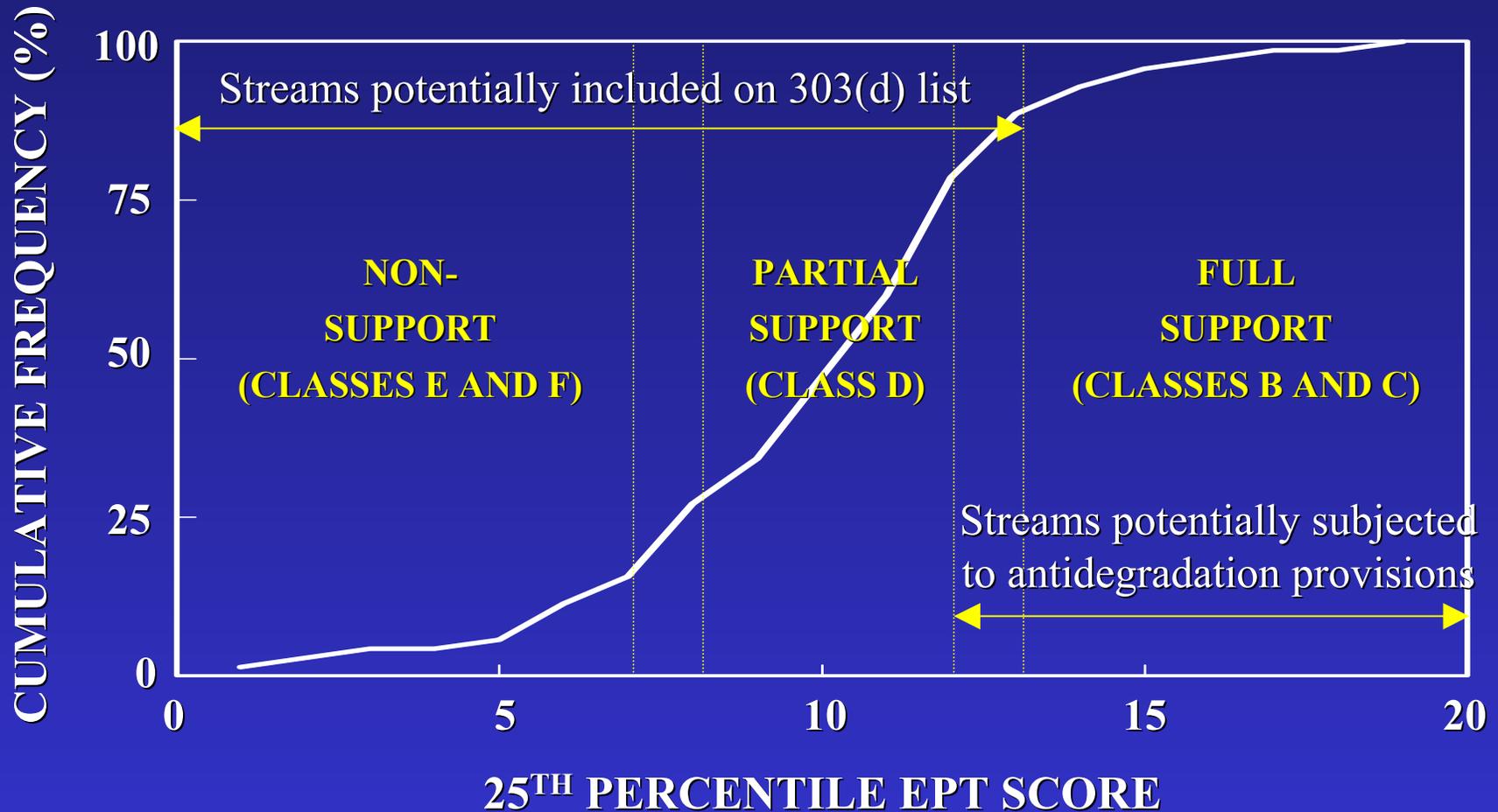
KDHE STREAM BIOLOGICAL MONITORING NETWORK

MONITORING SITE DISTRIBUTION AMONG LEVEL III ECOREGIONS



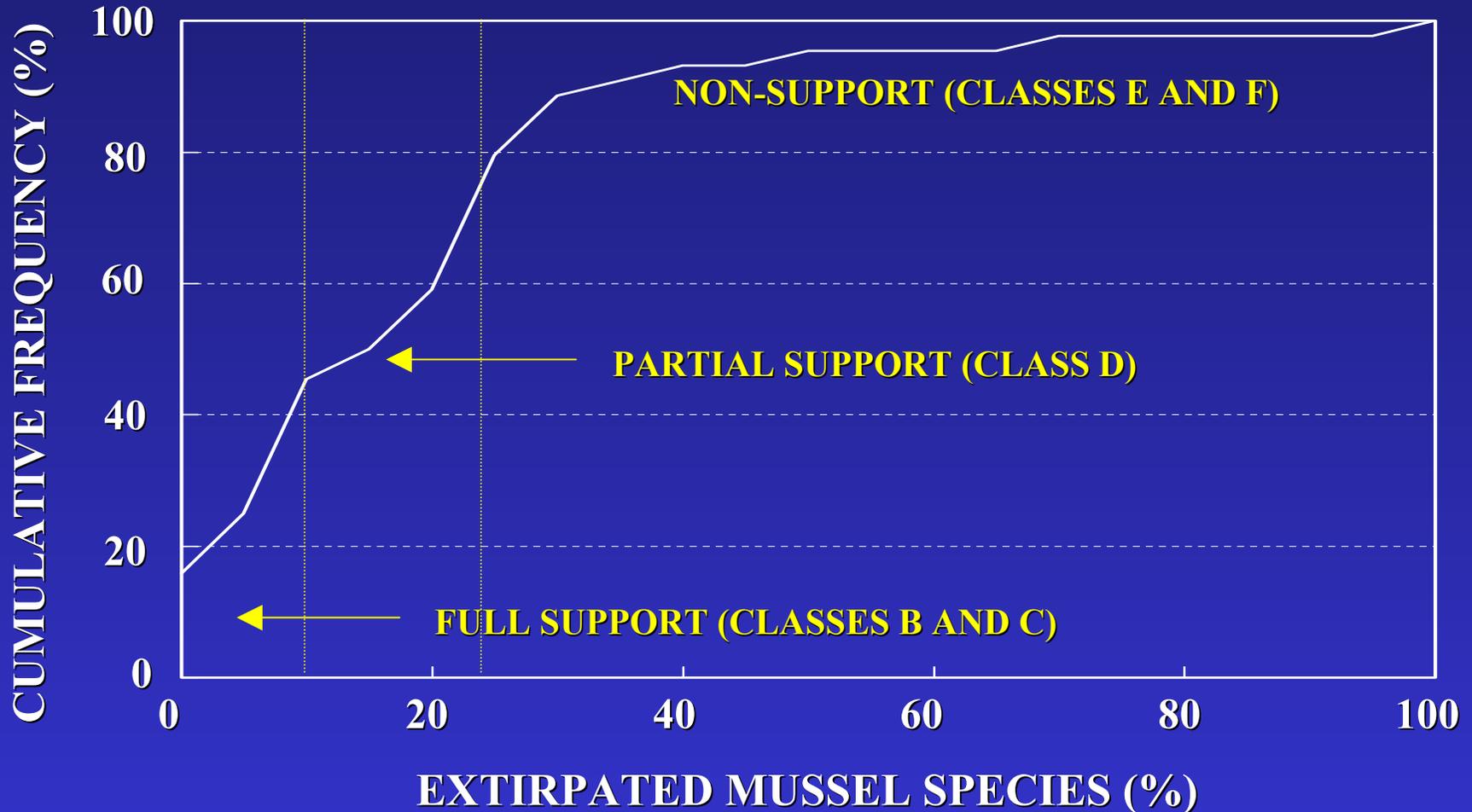
EPHEMEROPTERA-PLECOPTERA-TRICHOPTERA INDEX

CUMULATIVE FREQUENCY DISTRIBUTION FOR SITES WITH MINIMUM FIVE-YEAR PERIOD-OF-RECORD



DECLINE IN NATIVE MUSSEL ASSEMBLAGES

CUMULATIVE FREQUENCY DISTRIBUTION FOR SITES WITH MINIMUM THREE-YEAR PERIOD-OF-RECORD AND FIVE OR MORE SPECIES HISTORICALLY



CLOSING COMMENTS AND CONSIDERATIONS

- Generalizations made during this presentation may not apply well to all areas of the Great Plains.
- Biological monitoring efforts in this ecoregion must account for natural temporal fluctuations in community-based metrics (i.e., weather and stream flow effects).
- Non-agricultural factors also contribute to stream biological use impairments in many watersheds in this ecoregion.

CLOSING COMMENTS AND CONSIDERATIONS

(continued)

- Historical accounts and photographs, early biological survey records, and ongoing archeological studies afford an interesting and potentially useful perspective on the original condition of many streams in the Great Plains.
- MBI, EPT and other classical biological indices may not be sensitive enough, by themselves, to reliably identify ecoregional reference streams. Surviving populations of historically occurring key species and indicator taxa may be useful in verifying the reference condition under such circumstances.

CLOSING COMMENTS AND CONSIDERATIONS

(continued)

- Although reference streams should retain historically dominant taxa and species deemed integral to function and identity of community as a whole, absence of a few historically occurring peripheral species does not necessarily preclude a reference designation.
- Non-indigenous species in low numbers and densities may be acceptable for reference purposes provided other measured attributes of biological community are representative of wider body of reference systems.
- Large areas within Great Plains probably no longer retain true reference streams.

A person wearing a red and black plaid shirt, dark waders, and a yellow cap is standing in a shallow stream. They are using a long-handled net to catch something in the water. The stream is surrounded by large logs and branches, and the water is clear. The text "THE END" is overlaid in yellow on the image.

THE END