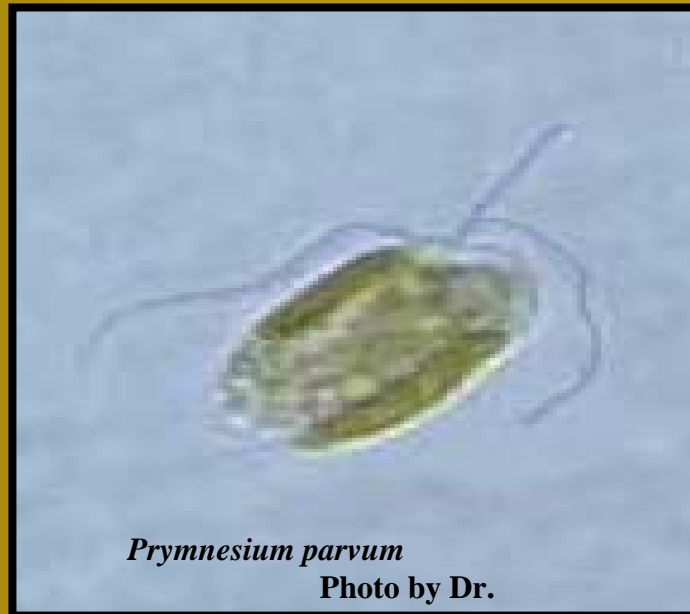


Historical Review of Golden Alga (*Prymnesium parvum*) Problems in Texas

Golden Alga
Workshop
Oct. 24-25,
2003



Prymnesium parvum
Photo by Dr.
Carmelo Tomas

This workshop
was partially
funded by the
federal State
Wildlife Grant
No. T-14-P



Joan Glass
Texas Parks & Wildlife
Department

Prymnesium parvum



Cyst



- Chrysophyte
- Cell size: 8-12 μm
- 2 long flagella - 1 haptonema
- C-shaped chloroplast
- Round to oblong in shape
- Mixotrophic
- Found in brackish water
- Resting cyst stage
- Characteristic swimming motion

Where Has *Prymnesium parvum* Been Found?

- 1st identified 1930's in Holland & Denmark
- Fish kills reported in brackish coastal waters of Israel, China, England, Norway, United States, Australia, Morocco, Scotland, Germany, Spain, Bulgaria, and South Africa
- Inland United States: Confirmed in Texas, New Mexico, Colorado, Wyoming, North Carolina, South Carolina, Georgia, Arkansas & Alabama
- Suspected in Oklahoma and Nebraska

Prymnesium parvum in Texas:

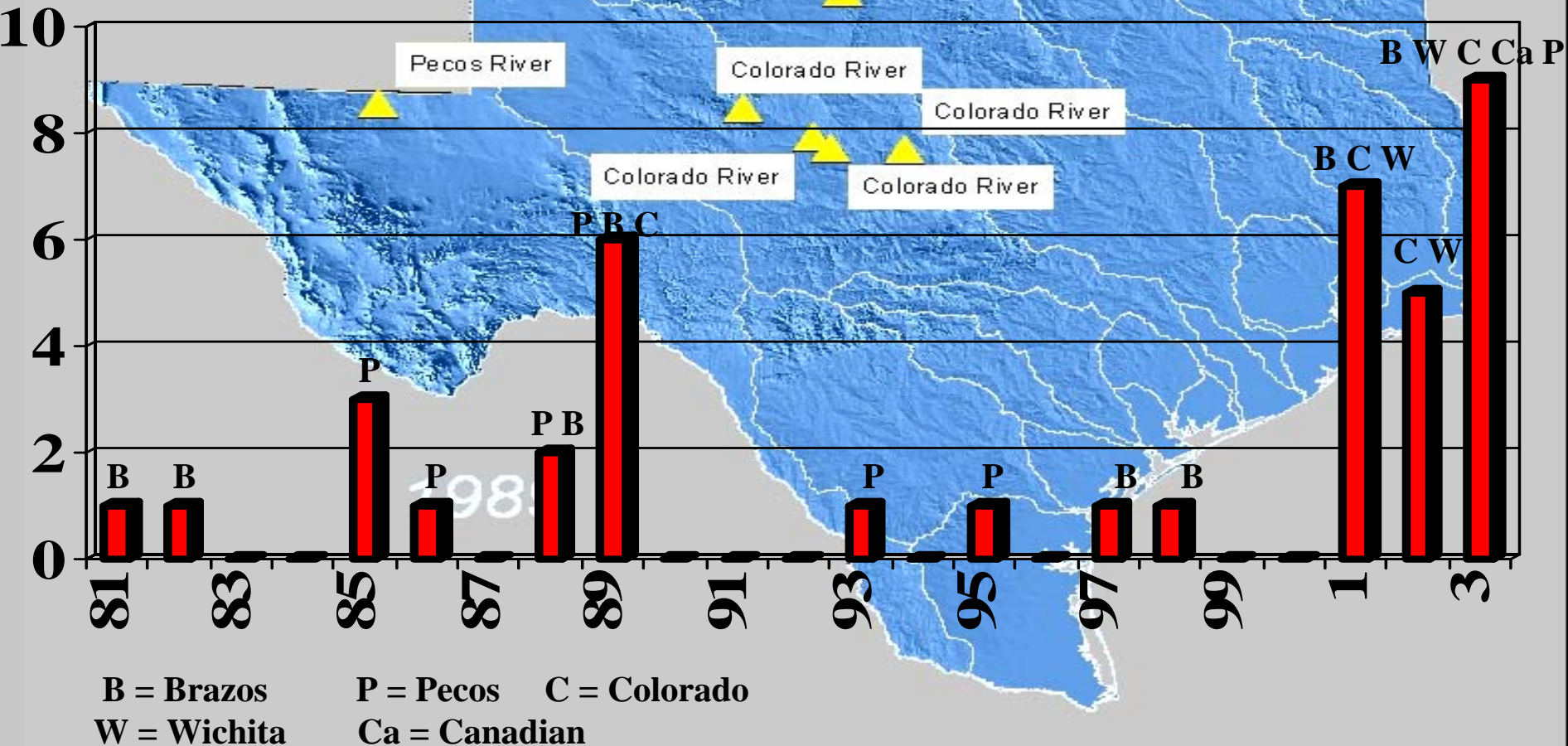
- 28 events - 1981 to 2003
- First documented kill - Pecos River, 1985
- Golden alga first confirmed - Pecos River, 1987-88
- 17.5 million fish killed using conservative estimates
- Value of fish killed over \$7 million



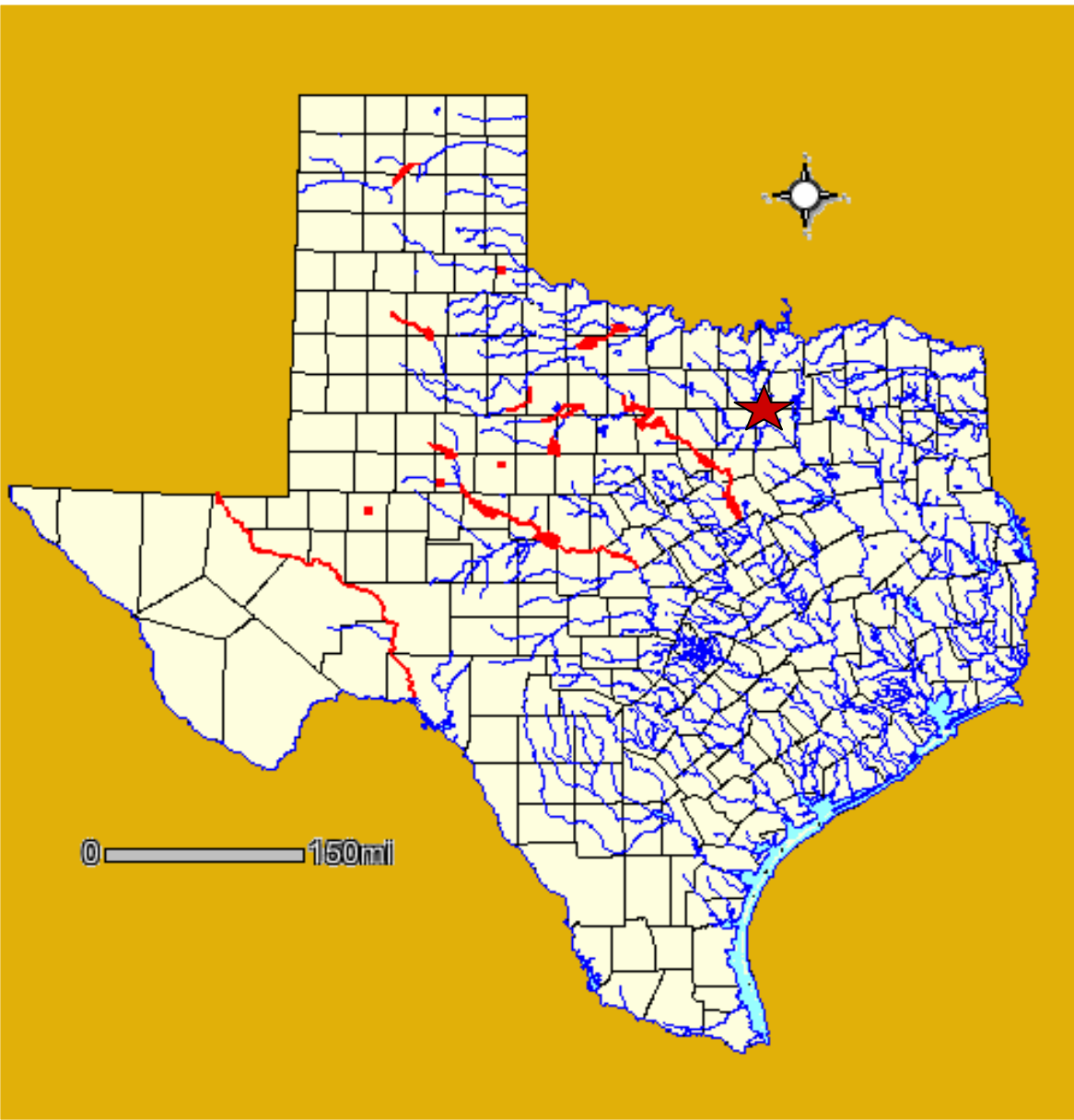
Jackson Bend, Lake Granbury 2003
Photo by Joan Glass

- Unknown indirect losses to local tourism, sport fishing and state revenues
- Reports of fish kills back to 1960's in the Pecos, Brazos and Wichita rivers are suspected to be caused by *P. parvum*

Golden Alga Related Fish Kills 1981 to Present



Five Texas River Basins Impacted



-  Canadian
-  Red (Wichita)
-  Brazos
-  Colorado
-  Rio Grande (Pecos)

Other River Basins:

- ☆ Bloom confirmed in Sulphur Basin (Cooper Lake) - no fish kill
- ☆ Chrysophyte cells also found in Trinity Basin

23 Texas Reservoirs Impacted

Severe

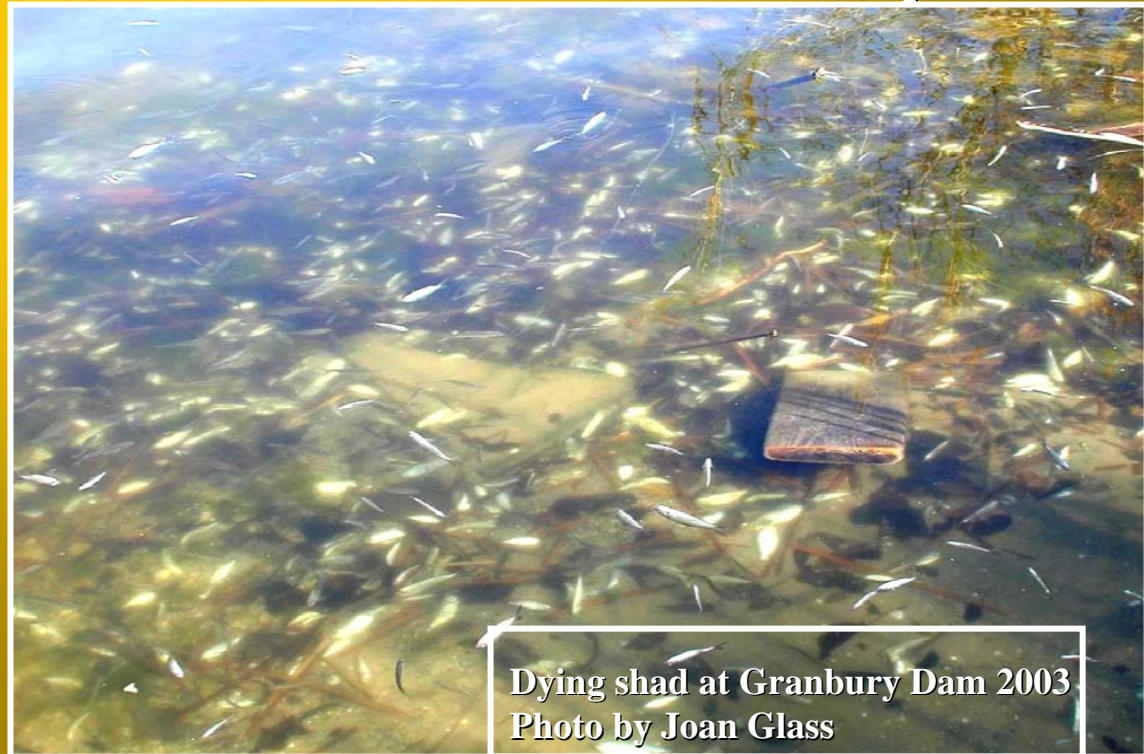
- Stilling Basin of Lake Meredith
- 6 Lubbock City Lakes
- Buffalo Springs
- E.V. Spence
- Colorado City
- Moss Creek
- Possum Kingdom
- Granbury
- Whitney
- Red Bluff

Moderate

- Baylor
- Diversion
- Kemp
- Sweetwater

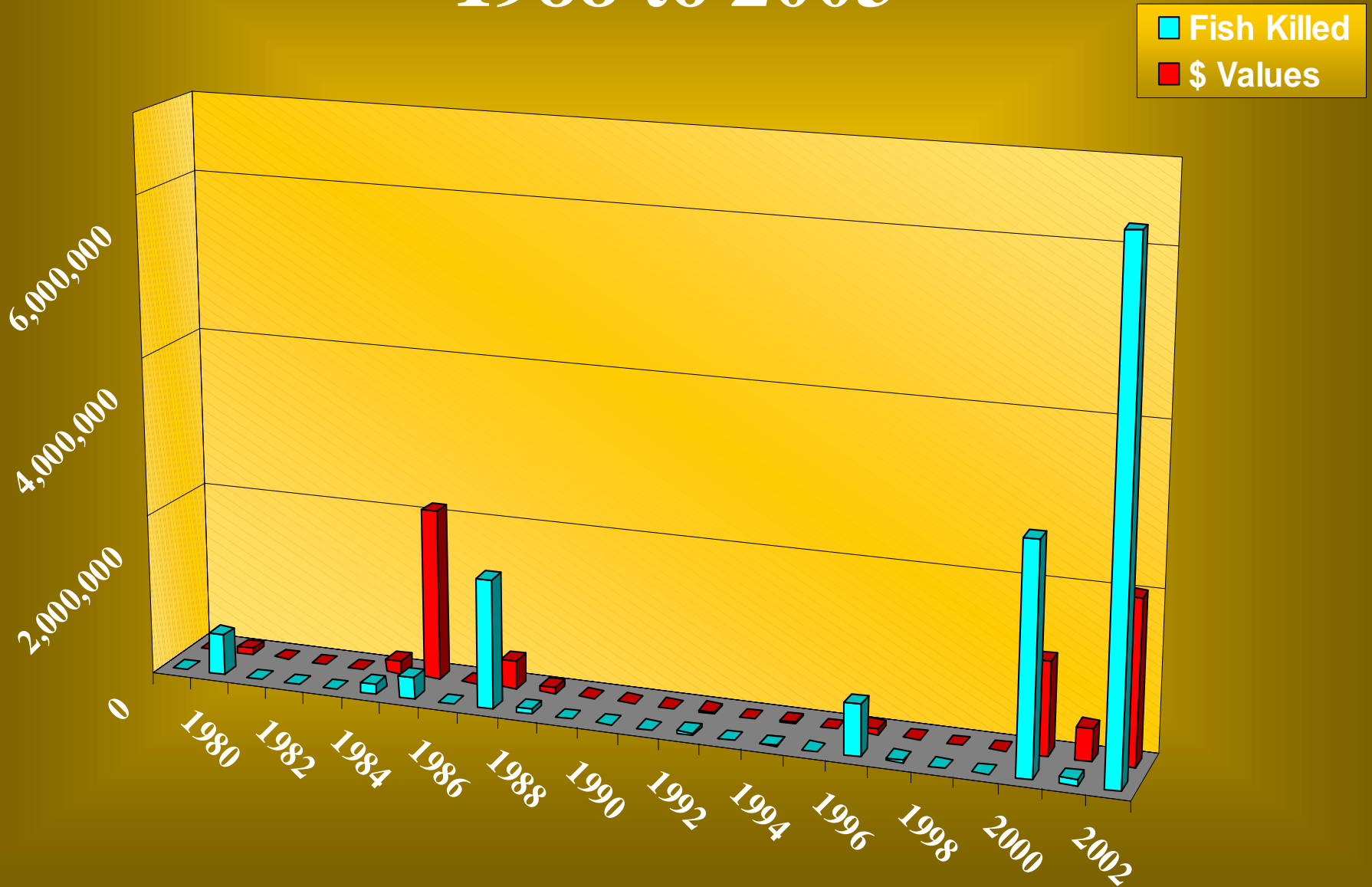
Slight to No

- O.H. Ivie
- Amistad
- Meredith
- Cooper



Dying shad at Granbury Dam 2003
Photo by Joan Glass

Number and Value of Fish Killed 1988 to 2003



Fish Losses by *Prymnesium parvum*

Pecos River

Fish killed: **2,006,500**

Value: **\$2,680,200***

Brazos River

Fish killed: **8,289,600**

Value: **\$2,933,800**

Canadian River

Fish killed: **48**

Value: **\$1,400**

Red River

Fish killed: **9,500**

Value: **\$53,000**

Colorado River

Fish killed: **2,355,900**

Value: **\$863,600**

Dundee 5,000,000

production fish 2001

Value \$430,000

Total Losses of fish

17,661,500

Total Value of fish killed

\$6,962,000*

Freshwater Drum dying in Lake
Diversion Wichita River 2001
Photo by Joan Glass

* Includes values for threatened species -
Rio Grande Darter and Blue Sucker

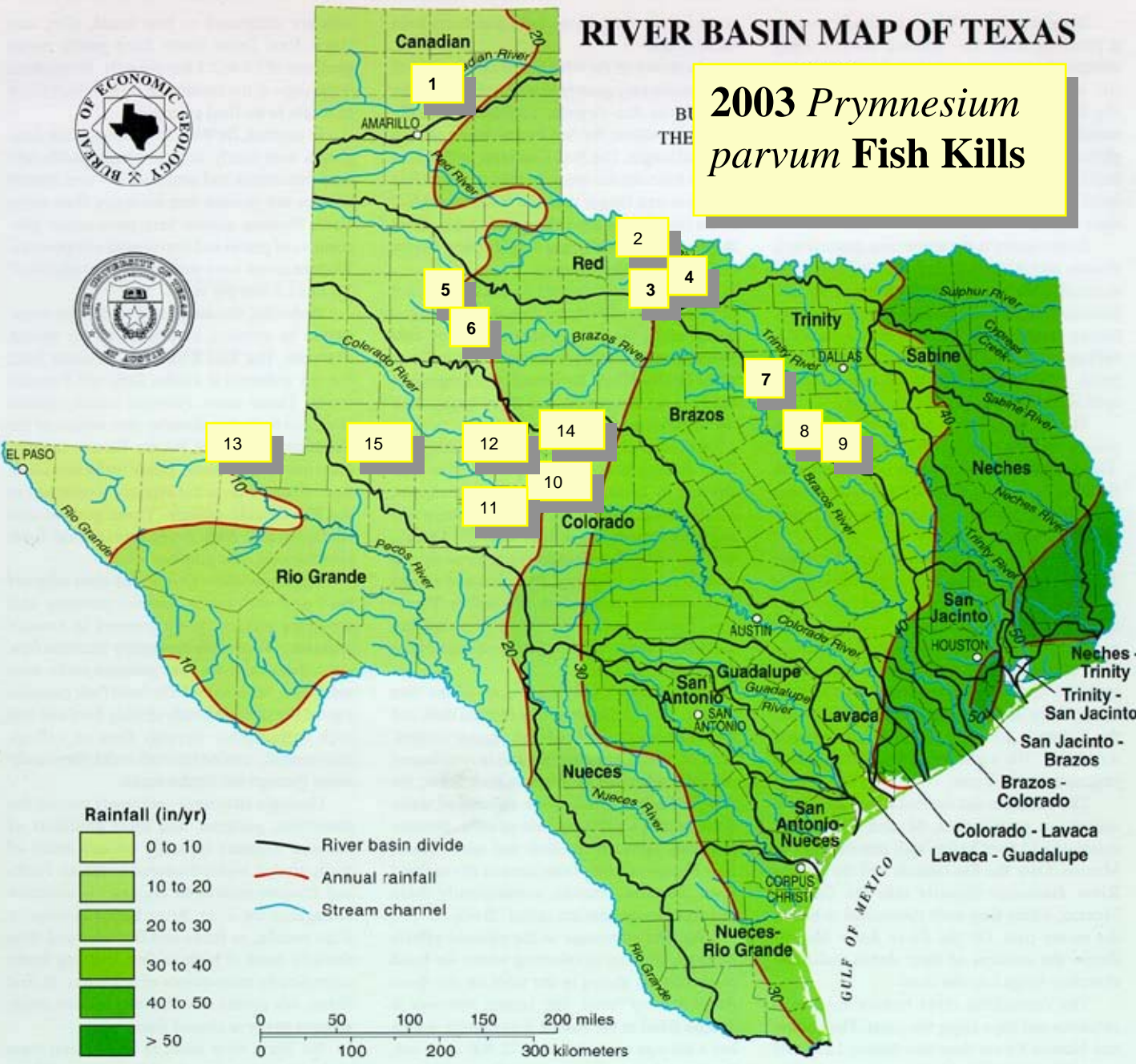
RIVER BASIN MAP OF TEXAS

2003 *Prymnesium parvum* Fish Kills

- Impacted Resv.**
1. Meredith
 2. Baylor
 3. Kemp
 4. Diversion
 5. Lubbock City Lakes 1-6
 6. Buffalo Springs
 7. Possum Kingdom
 8. Granbury
 9. Whitney
 10. Spence
 11. Moss Creek
 12. Colorado City
 13. Red Bluff
 14. Sweetwater
 15. Wadley Barron Pond in Midland

**2003
6.3 million
Fish Killed

Value over
\$2 million**

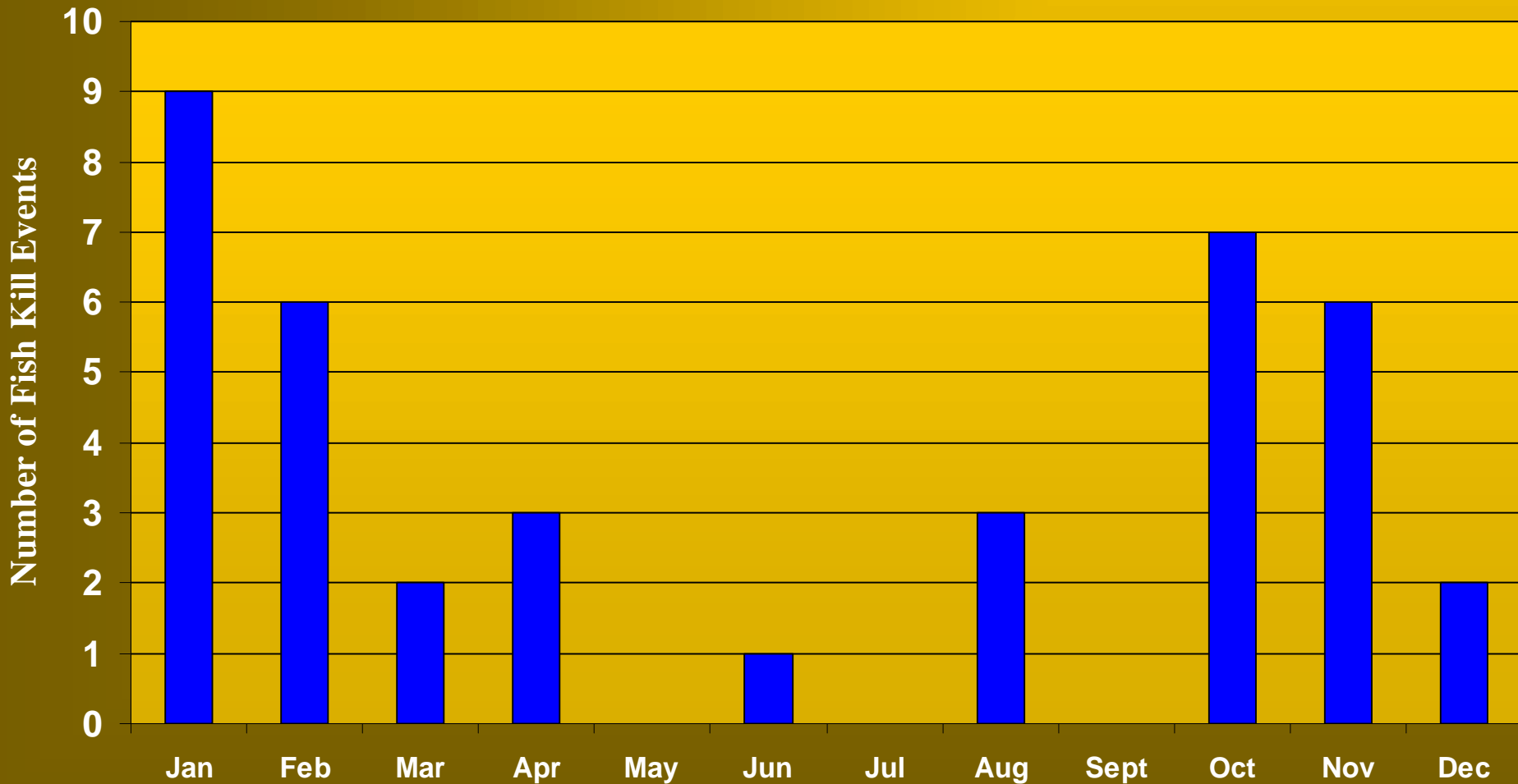


What We Know

- **Majority have occurred in winter**
- **Summer kills occur when water stops flowing**
- **All kills are west of I-35**
- **Frequencies and locations of fish kills are increasing**

David Moduline, TPWD Game Warden
Possum Kingdom Reservoir 2001
Photo by Dave Buzan

Month Golden Alga Fish Kills Began 1981 to 2003



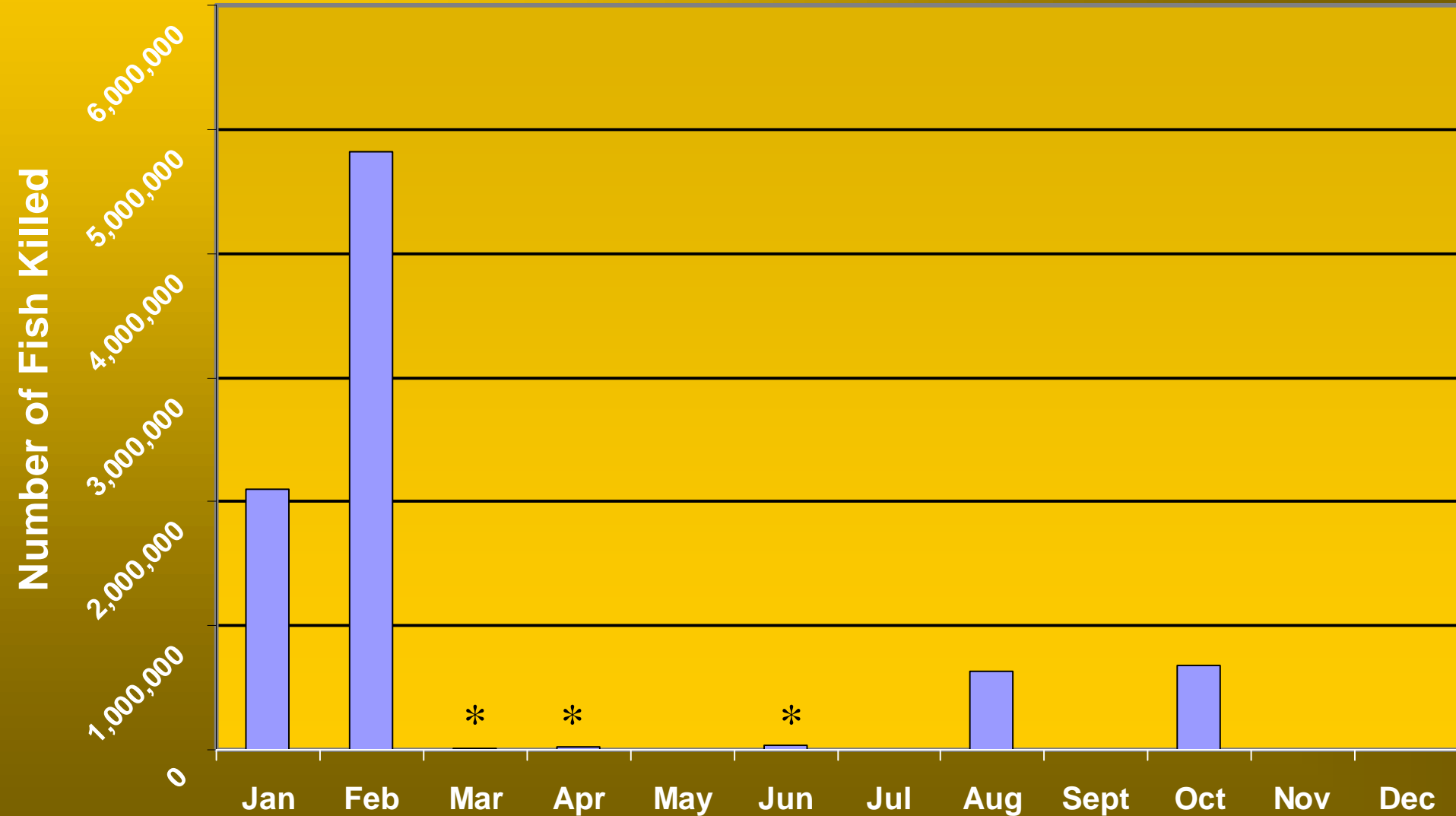
What We Know :

Conditions During Blooms

- Temperature extremes (usually colder)
- Low flows with increased salinity
- pH above 7
- Decreased competition from normal algal community due to environmental conditions

Possum Kingdom Resv.
2003 Foaming at airport
Photo by Joan Glass

Brazos Basin Losses 1981 to 2003 by Beginning Month



We Want to Reduce the Impacts

- 🐟 Prediction and prevention of toxic blooms
- 🐟 Bloom control tactics for natural systems
- 🐟 Prevent release of toxin and control toxins in water when bloom occurs



Possum Kingdom Resv. 2001

Prymnesium parvum

Photo by Dave Buzan

We Want to Solve the Problem

Factors contributing to golden algal blooms:

- 🐟 Factors enhancing source sites and causes of cyst emergence
- 🐟 Fuels for blooms and triggers for toxicity
- 🐟 Causes of senescence and pathogens



Gizzard Shad with hemorrhaging from gills mixed with heavy mucus.

Possum Kingdom
2001 Photo by Dave Buzan



Possum Kingdom 2001
Prymnesium parvum
bloom along shoreline
Photo by Dave Buzan

What We Have Done

- Identified the fish kill cause
- Searched the literature
- Contacted toxic algae researchers
- Provided water from toxic blooms
- TPWD developed acceptable method of golden algae bloom control in hatchery ponds
- Created a library of cell lines at UTEX Algal Collection



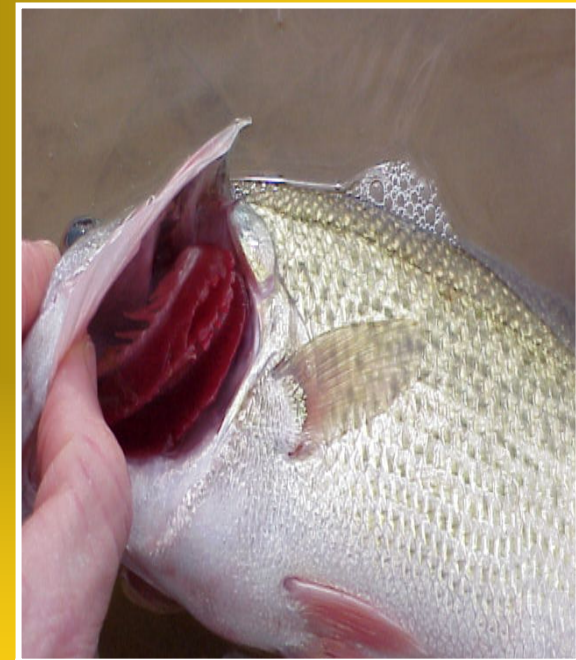
Freshwater drum showing hemorrhaging in fins. PK Resv. 2001
Photo by Joan Glass



Paint Creek 1988
Photo by Joan Glass

What We Have Done - continued

- Reported to Texas Legislature documenting losses
- U.S. Fish & Wildlife Service State Wildlife Grant awarded:
 - ☆ golden alga workshop
 - ☆ assess Texas historical events
 - ☆ website for public access
 - ☆ statewide survey in Texas
 - ☆ genomic study of the Texas golden alga strains



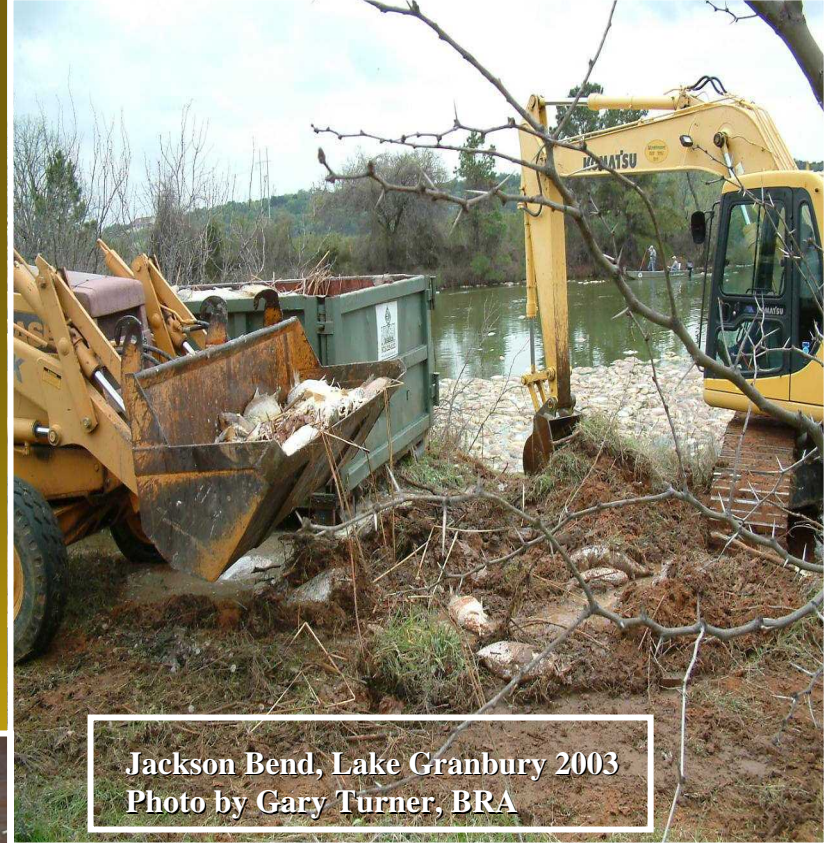
Largemouth bass with hemorrhaging from gills and fins PK Resv. 2001
Photo by Dave Buzan

Problem Summary

- **>17.5 million fish killed in Texas by golden alga since 1981**
- **>6.3 million in 2003 alone**
- **Additional information on golden alga needed**



E.V. Spence 2003
Photo by Kip



Jackson Bend, Lake Granbury 2003
Photo by Gary Turner, BRA

- **Total economic impacts and long term effects are unknown**
- **Texas distribution unknown**

Special Thanks To The Following:

Wendell Barber-UCMWD

Greg Conley-TPWD

John La Claire-U Texas

Kip Portis-TPWD

Carmelo Tomas -UNC

for their devotion to our natural resources

David Buzan-TPWD

Mike Cox - BRA

Larry McKinney-TPWD

Liz Singhurst -TPWD

Gary Turner-BRA



Questions?

Lubbock City Lakes 2003
Yellow water due to
Prymnesium parvum bloom
Photo by Greg Conley

TEXAS
PARKS &
WILDLIFE

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