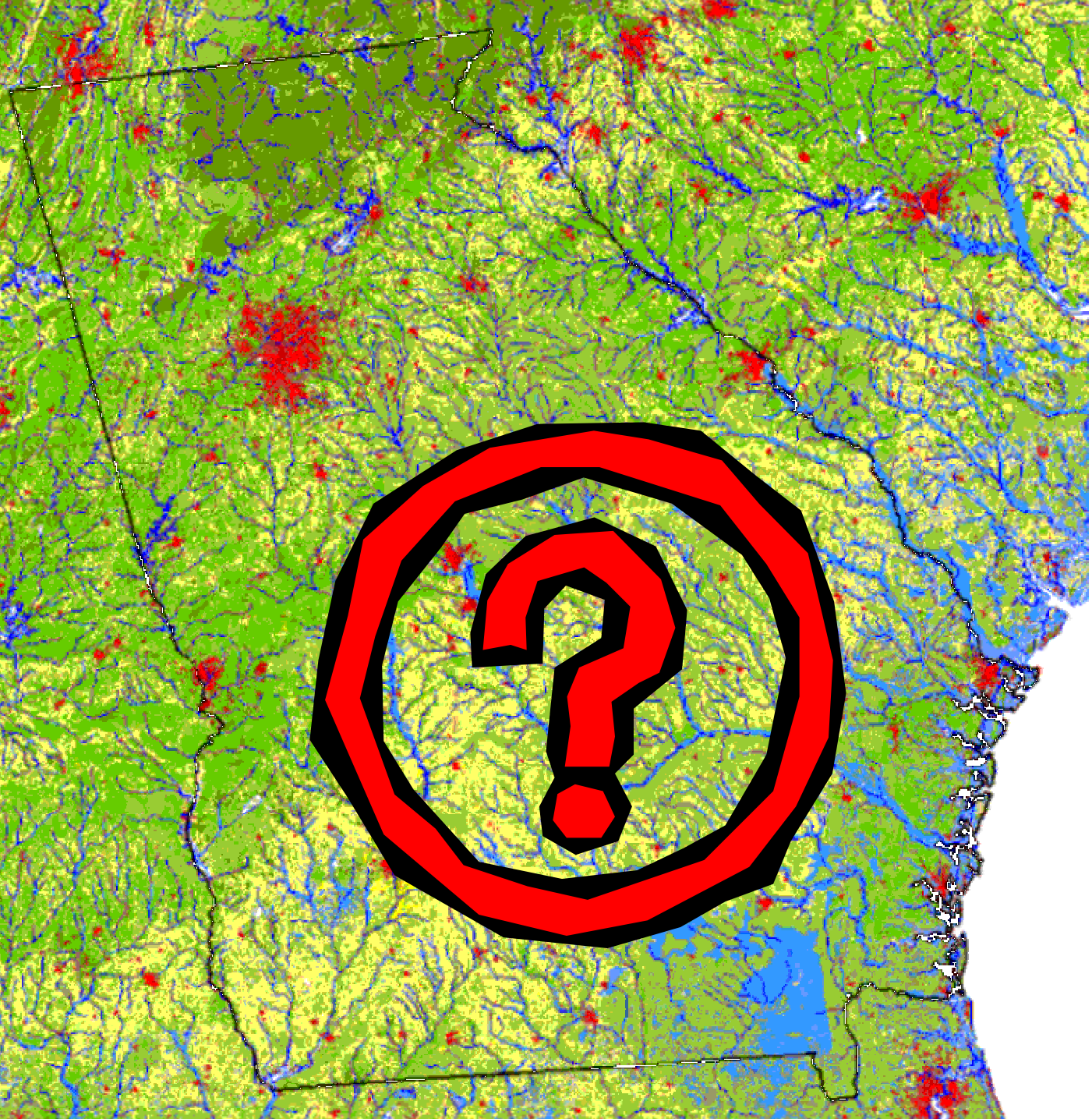
Managing Water Resources: The Role of Science & Education

USDA-CSREES
National Water Conference
Savannah, GA
January 30, 2007

Jim Kundell
Vinson Institute of Government
Institute of Ecology
University of Georgia

Public Service & Outreach



Georgia

Humid Southeast

Georgia is a Changing State

Focus

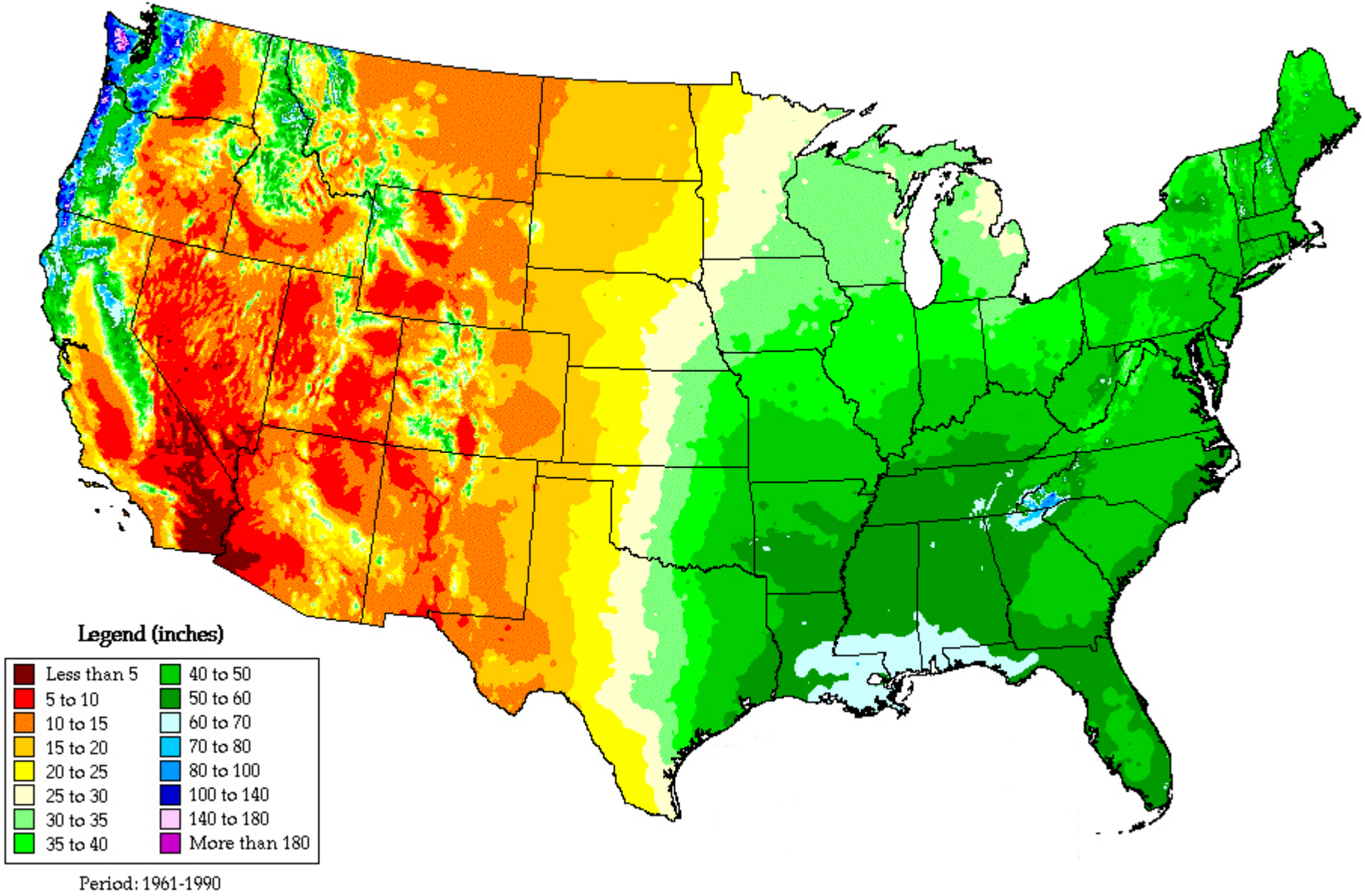
- ✓ Water Resources
- ✓ Challenges & Efforts to Resolve Them
- ✓ Role of Science & Education in Addressing Water Challenges

Natural Availability of Water:

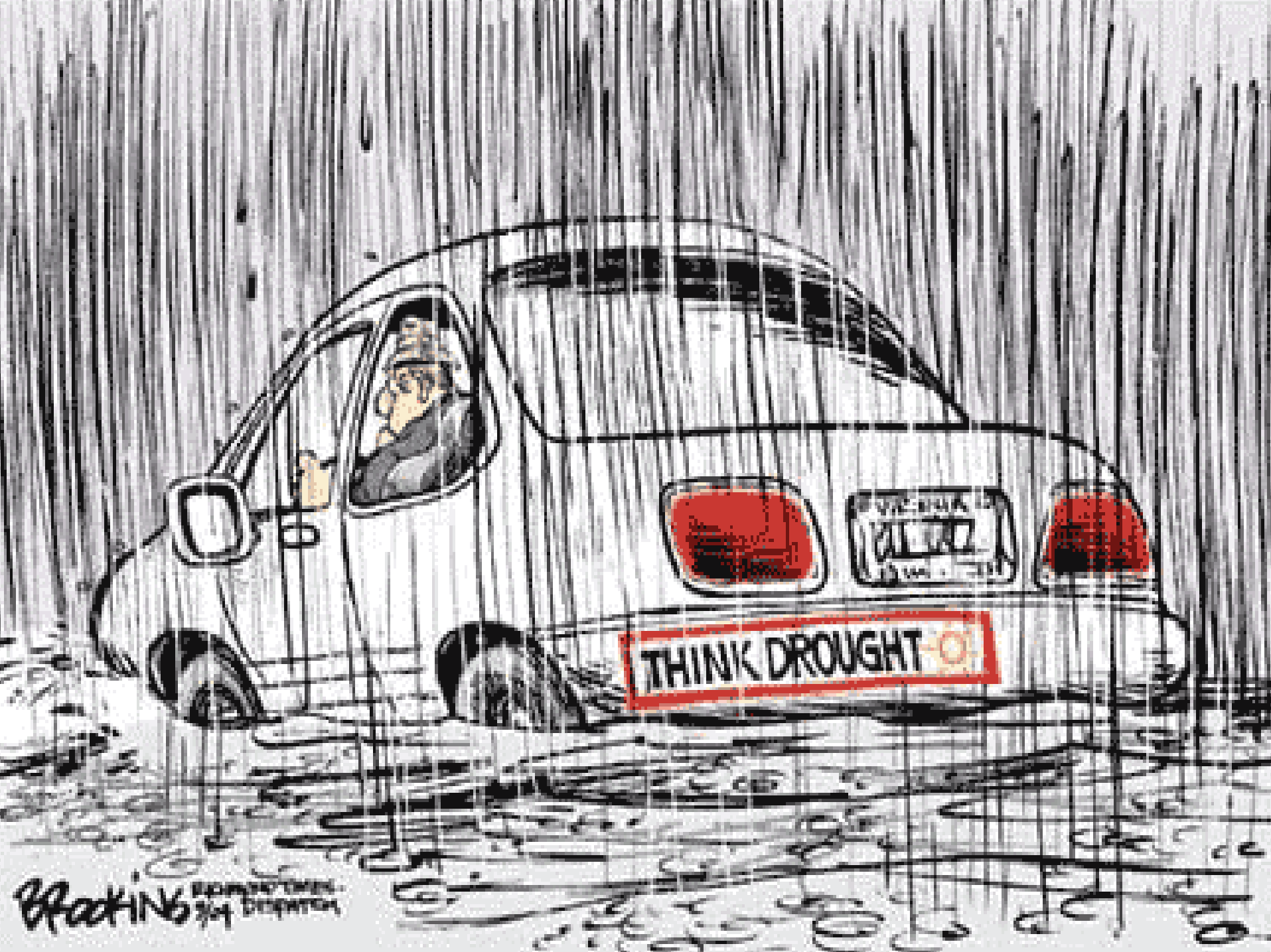
- ✓ Climate
- ✓ Geology

Annual Average Precipitation

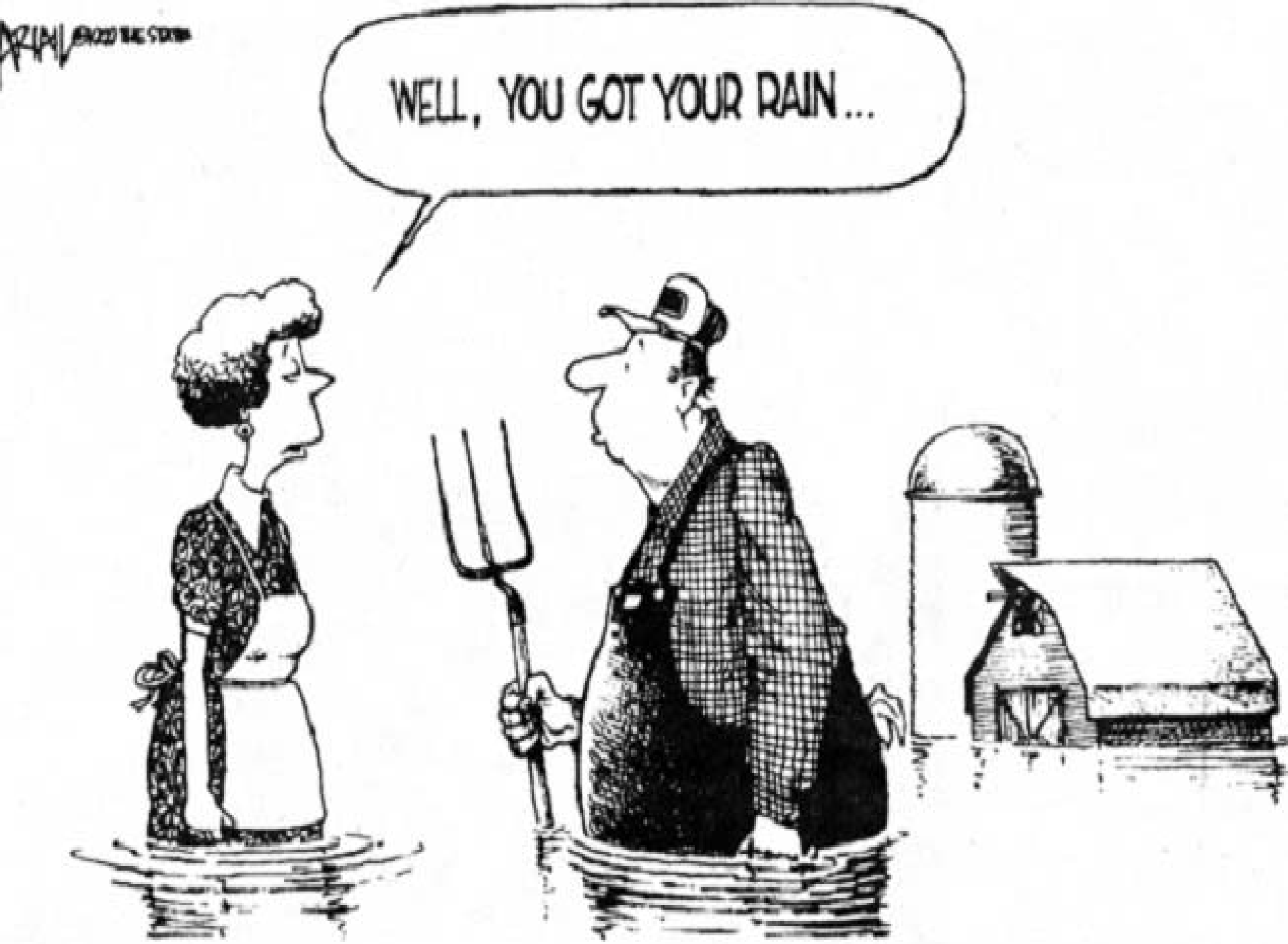
United States of America



Period: 1961-1990


THINK DROUGHT
Bloking

✓ Mid-1950s
✓ Late 1980s
✓ 1998-2002
Drought


WELL, YOU GOT YOUR RAIN...

Floods

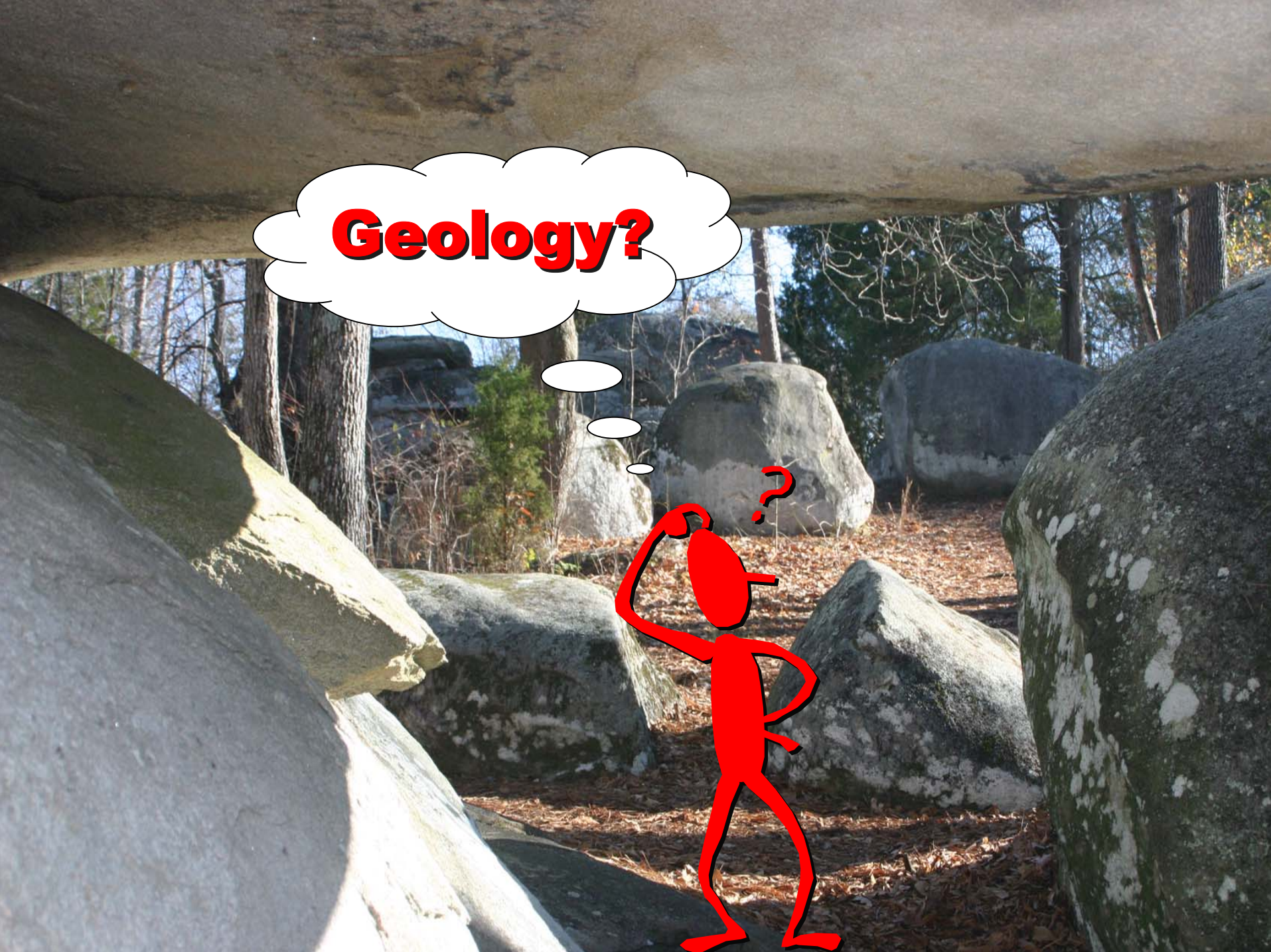
- ✓ 1994: 500 Year Flood
- ✓ 1998: 100 Year Flood

2004-2005 Hurricanes
New Orleans

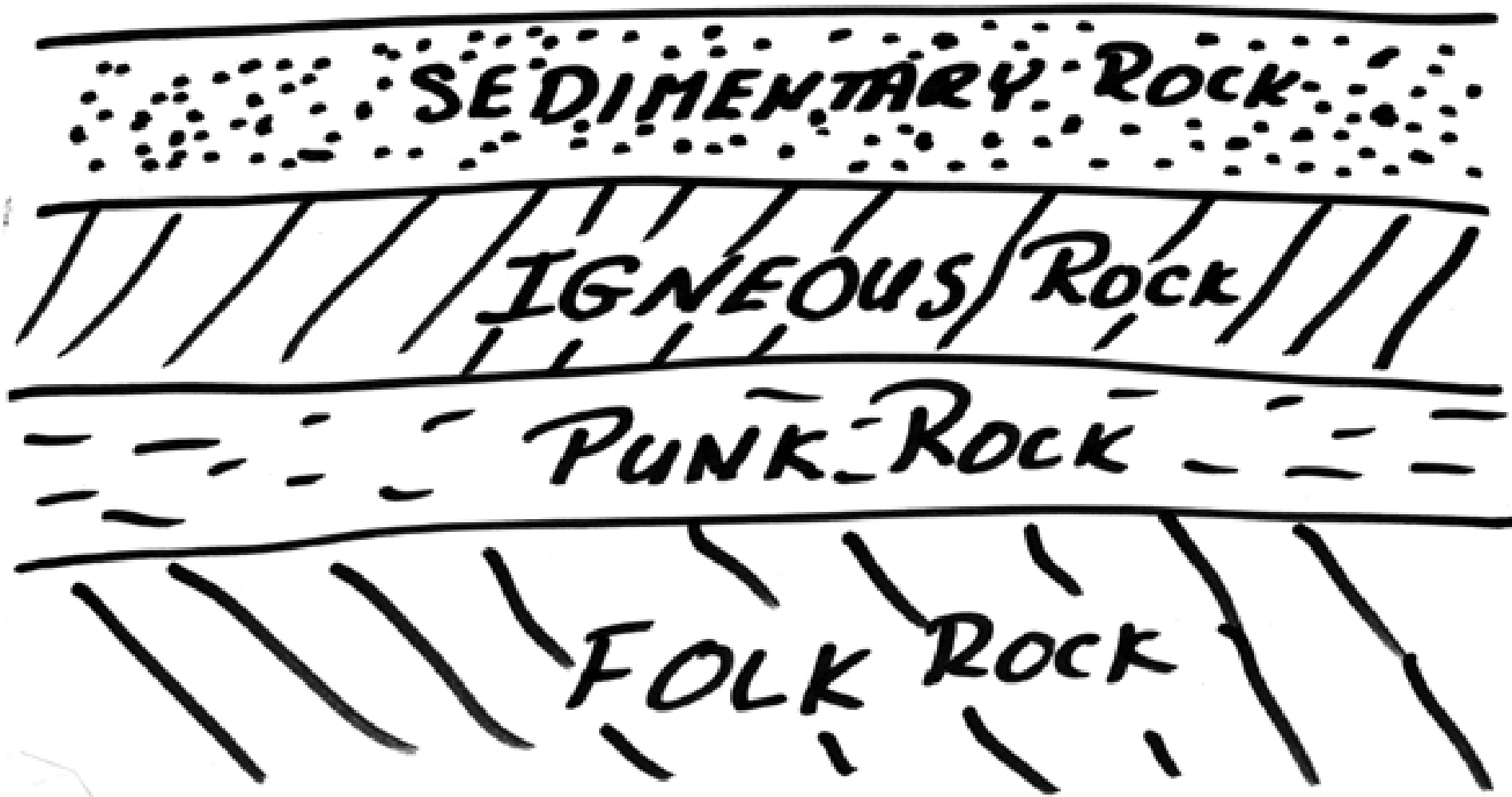
The Future?

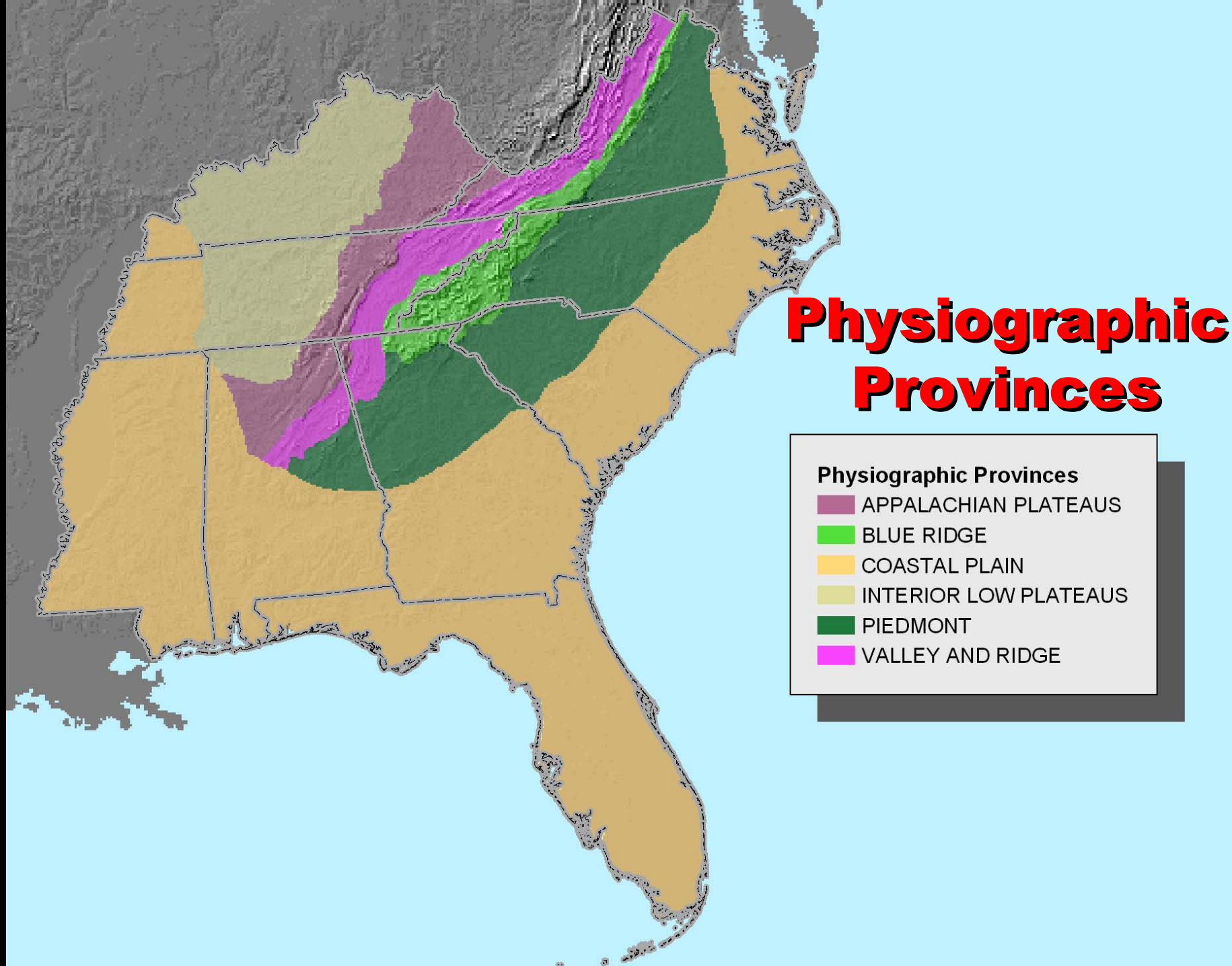
BROOKINS RICHMOND TIMES-DISPATCH 9/05
GULF COAST
MOTHER NATURE

Average U.S. Precipitation

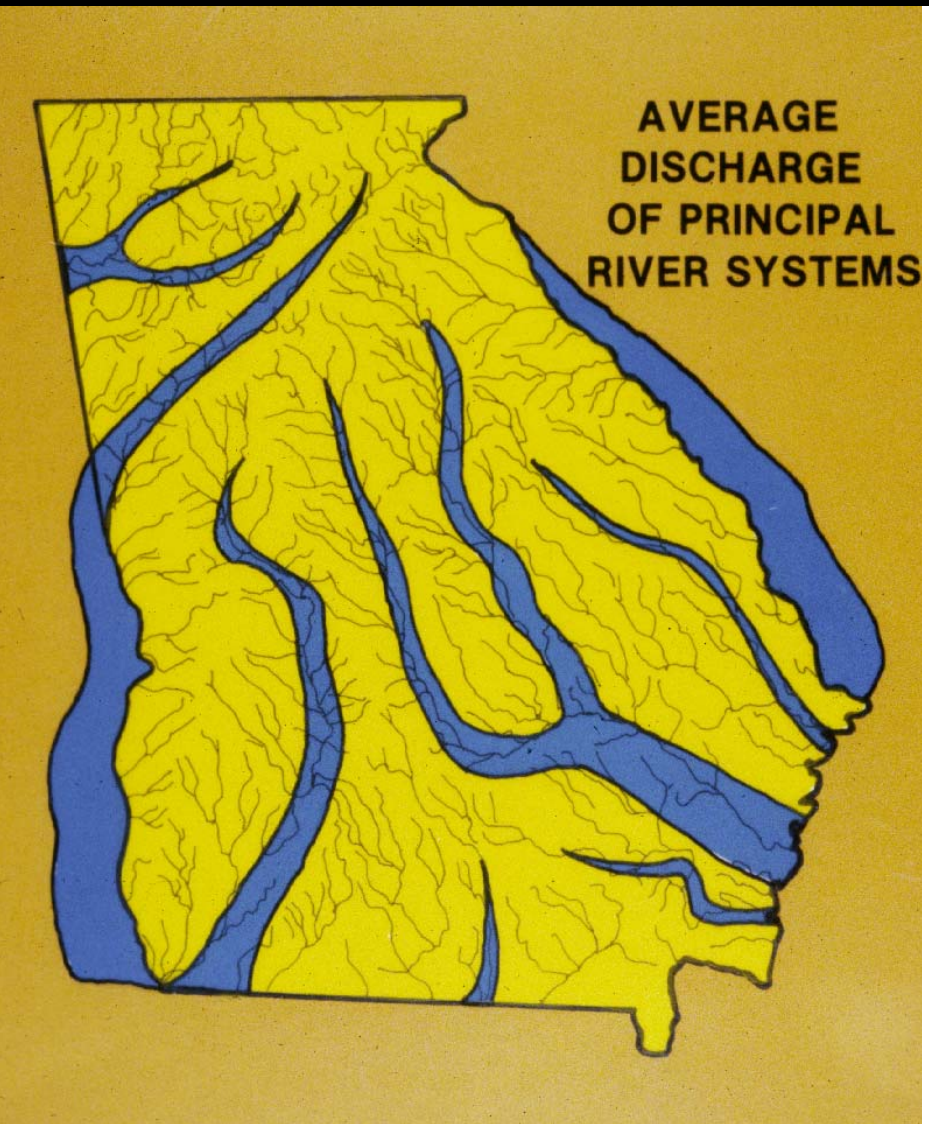

Geology?

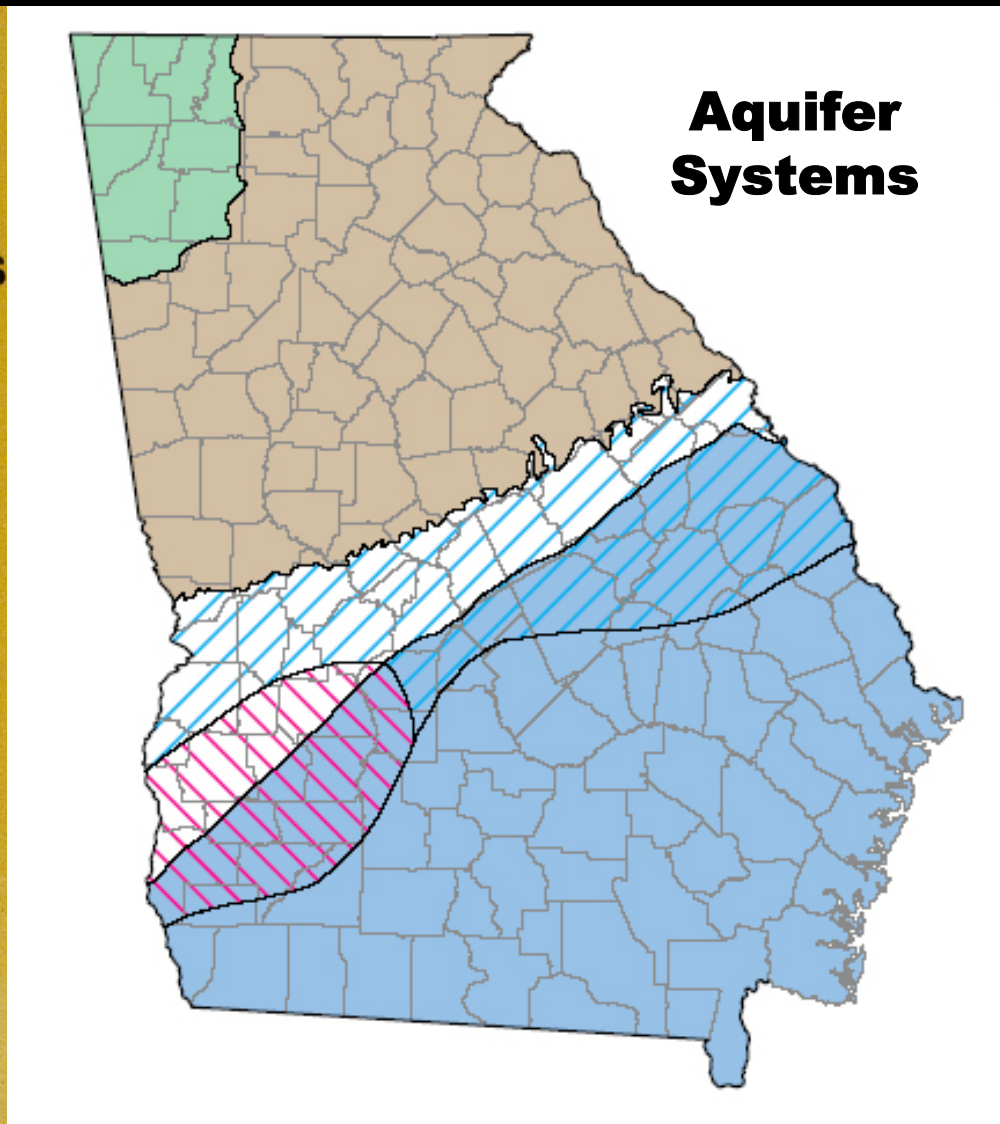
GEOLOGY




Physiographic Provinces
Physiographic Provinces
APPALACHIAN PLATEAUS
BLUE RIDGE
COASTAL PLAIN
INTERIOR LOW PLATEAUS
PIEDMONT
VALLEY AND RIDGE

Uneven Distribution of Georgia's Surface & Ground Water





Water Trends

- ✓ Water Quality
- ✓ Water Quantity
- ✓ Water Management

Water Quality

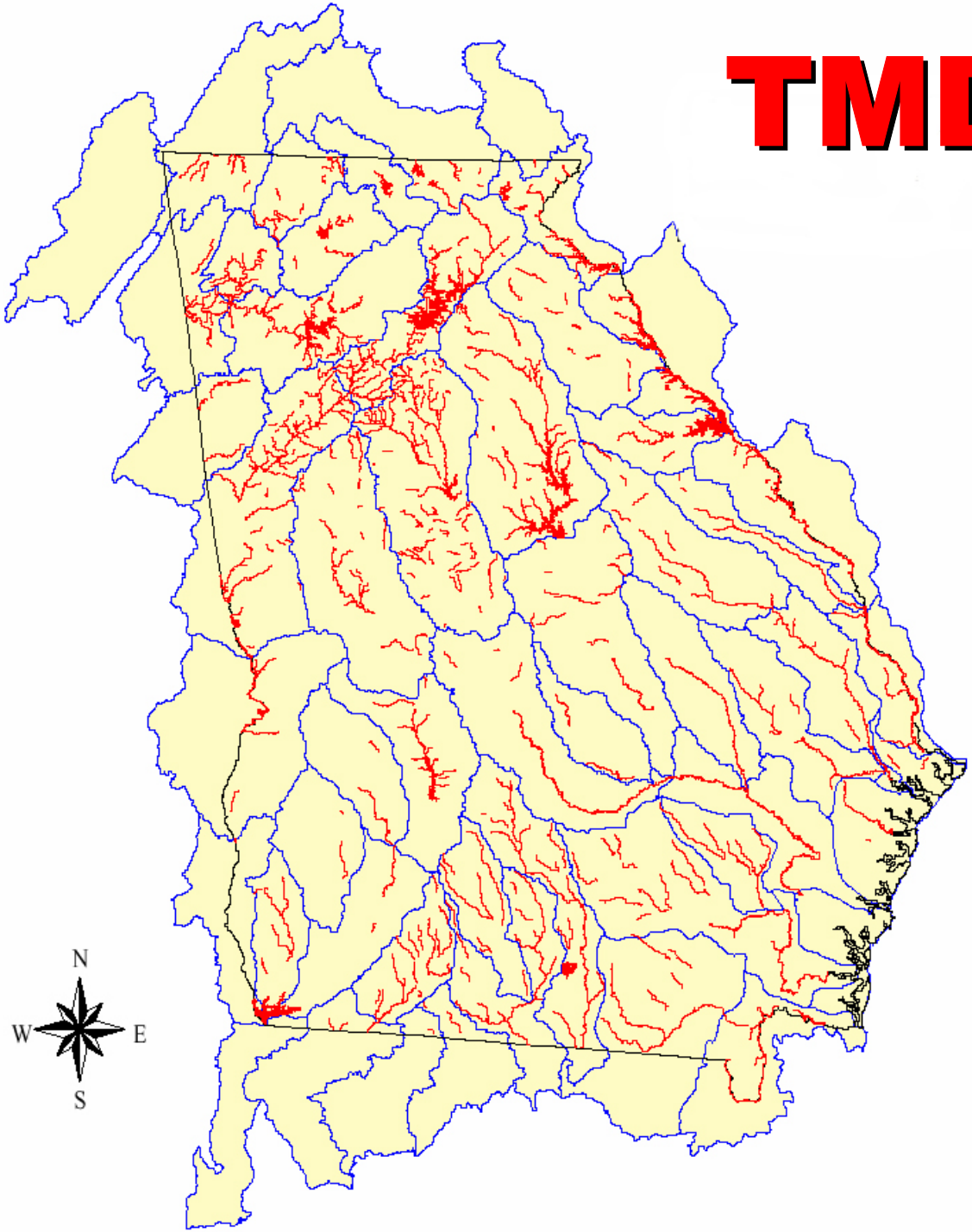
Clean Water Act

SHOOTIN' THE 'HOOCH'

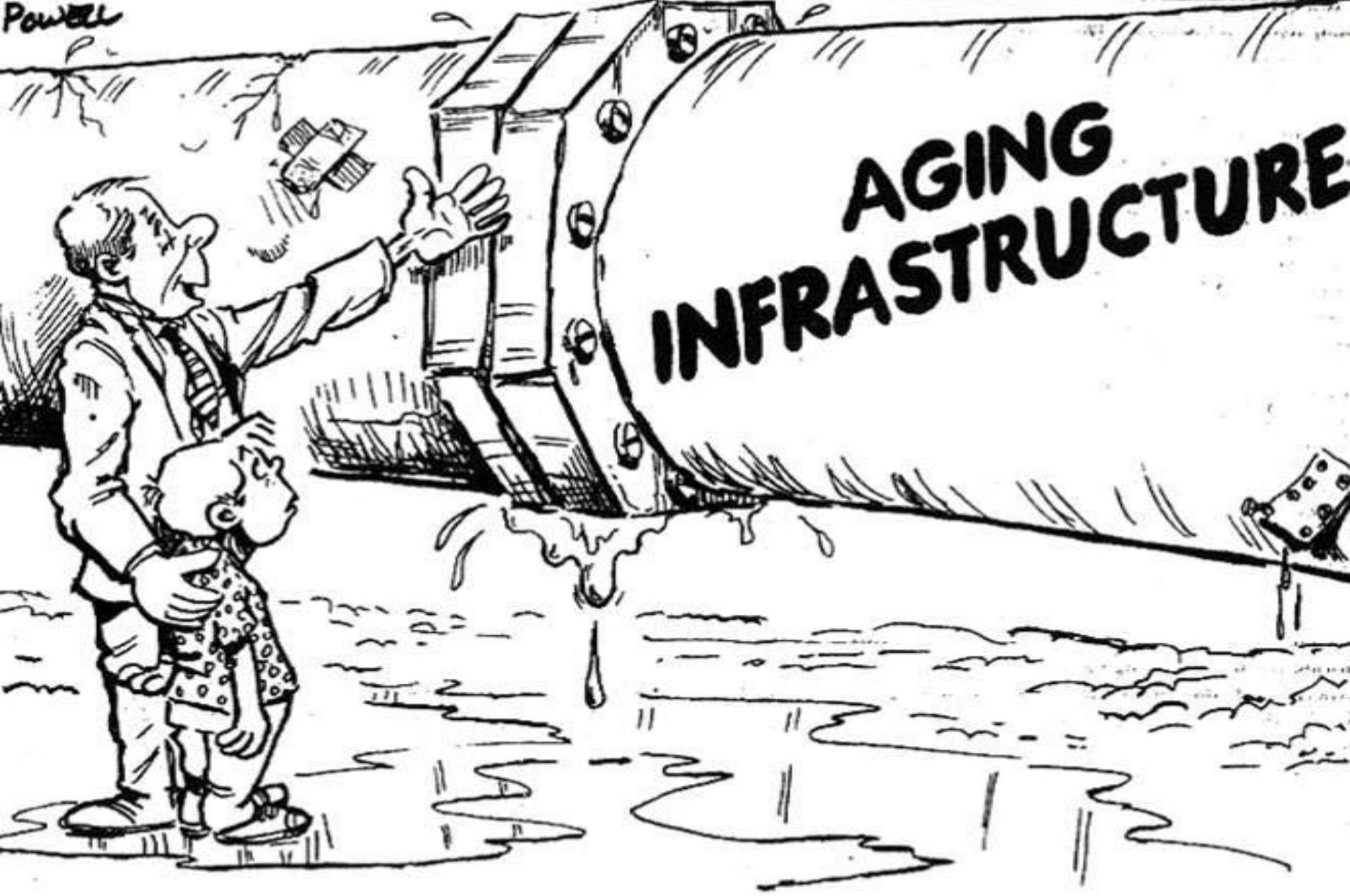
Water Quality Has Improved

1970-1995
Water Bodies Not Meeting Fishable & Swimmable Standards Decreased 38%

TMDLs



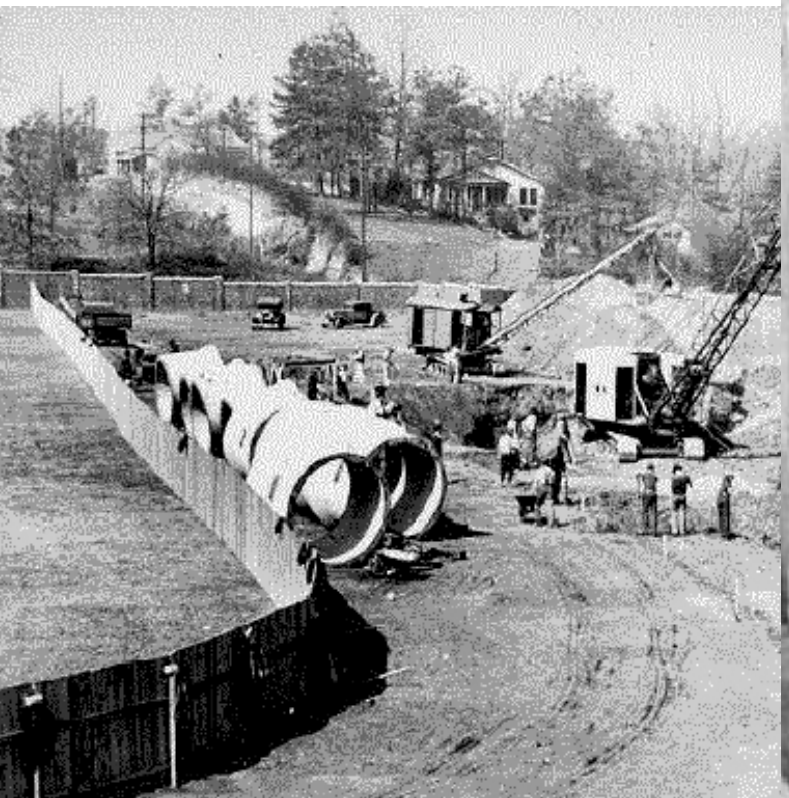
6,000+ Miles of Assessed Streams Are Impaired



"Someday, son, all this will be yours!"

Combined Sewer Overflows (CSOs)

Built Prior to 1920

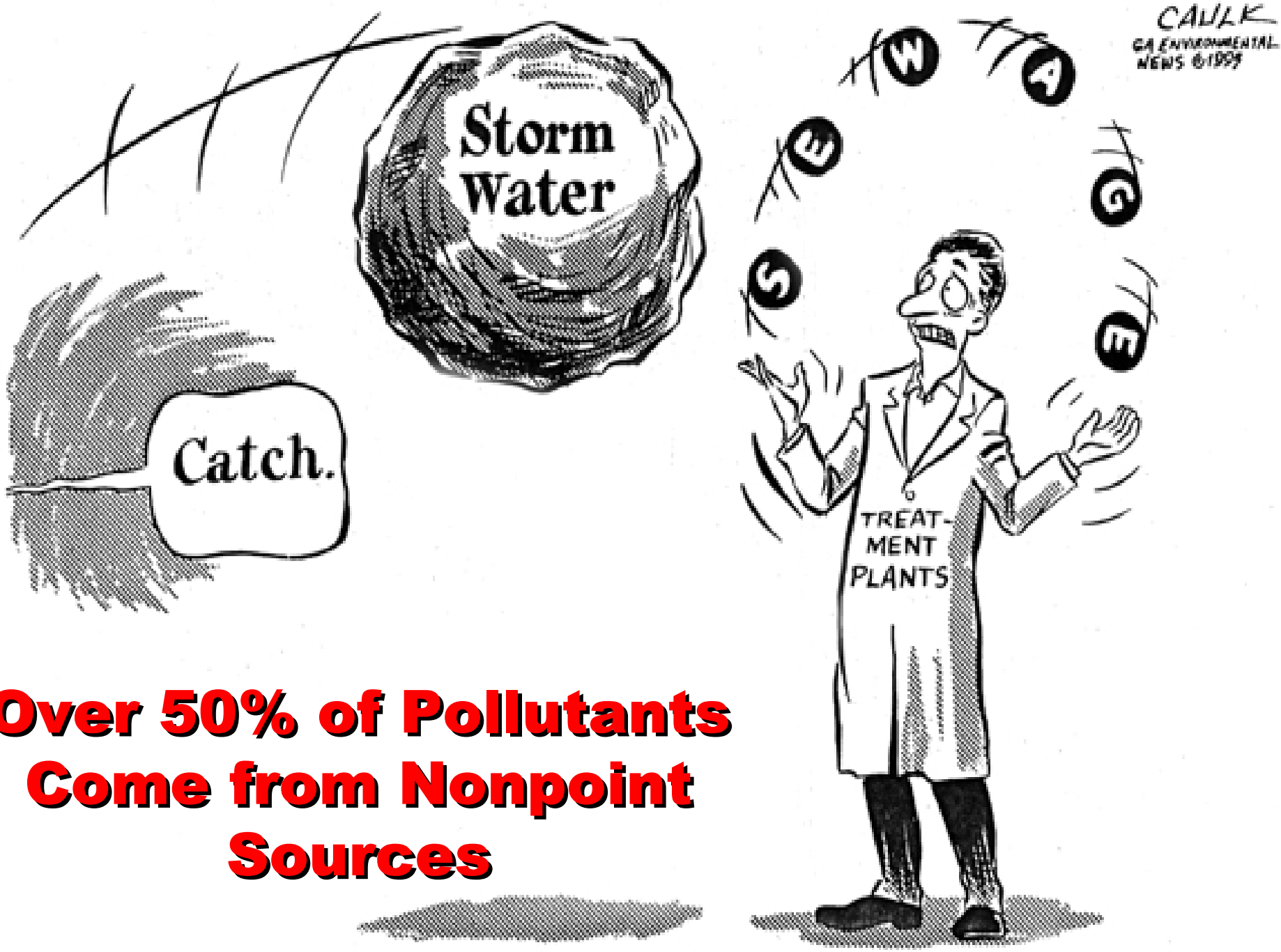


"Confound it–doesn't anybody want to taste it?"

Lake Lanier

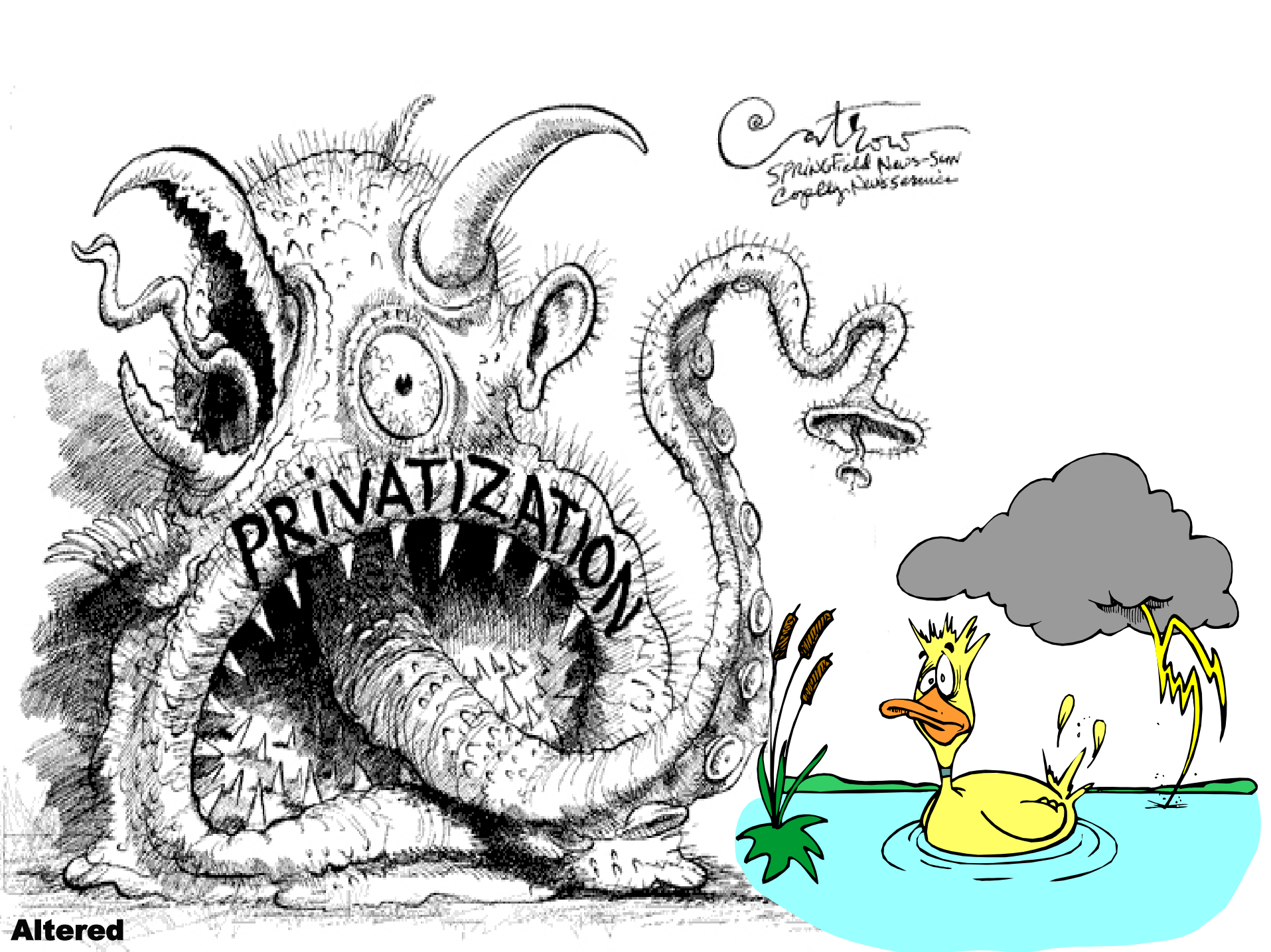
Relationship Between Land & Water

Forest



Over 50% of Pollutants Come from Nonpoint Sources

Water Quantity



Altered

Water Demands

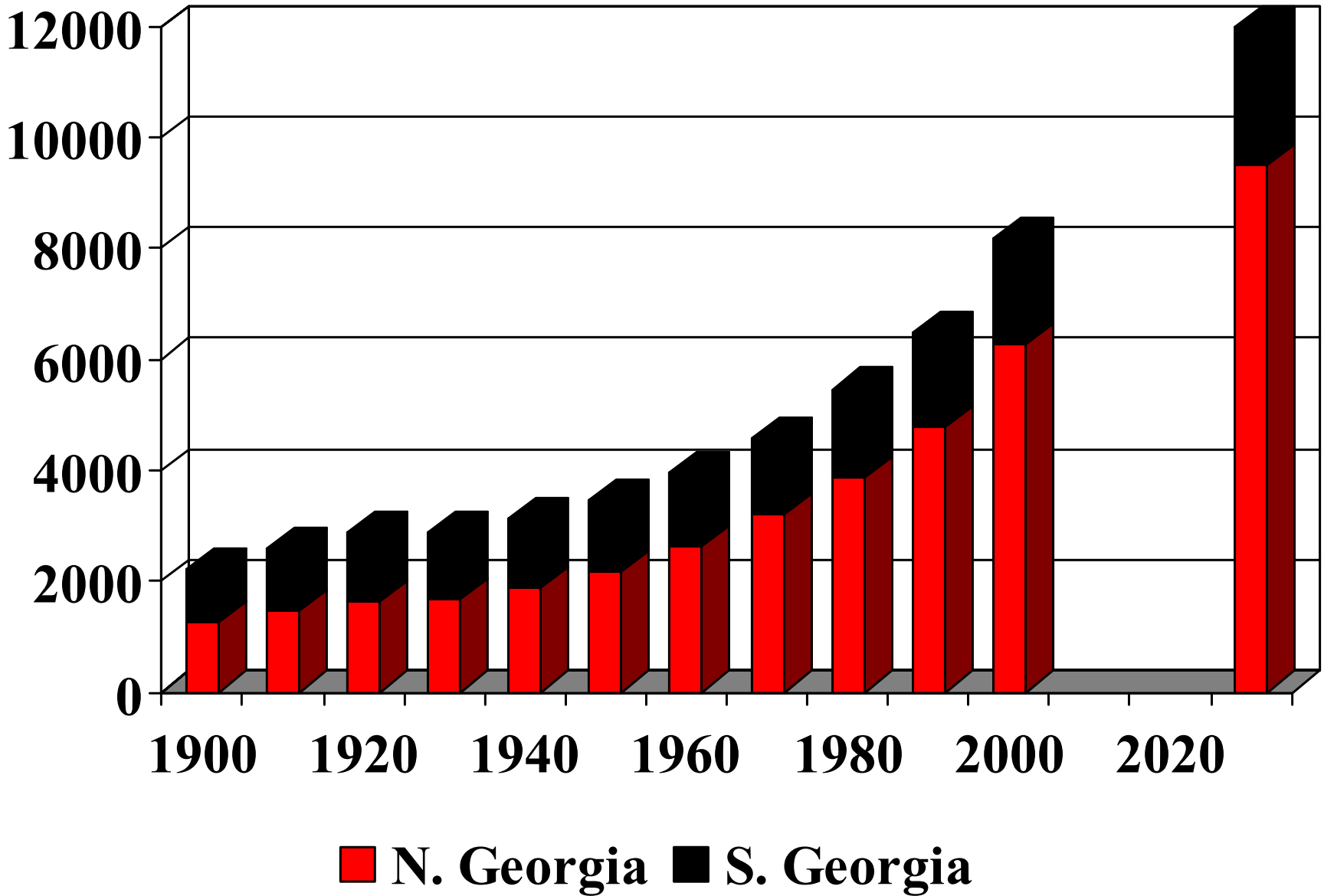
World War II

Malaria

Air Conditioning

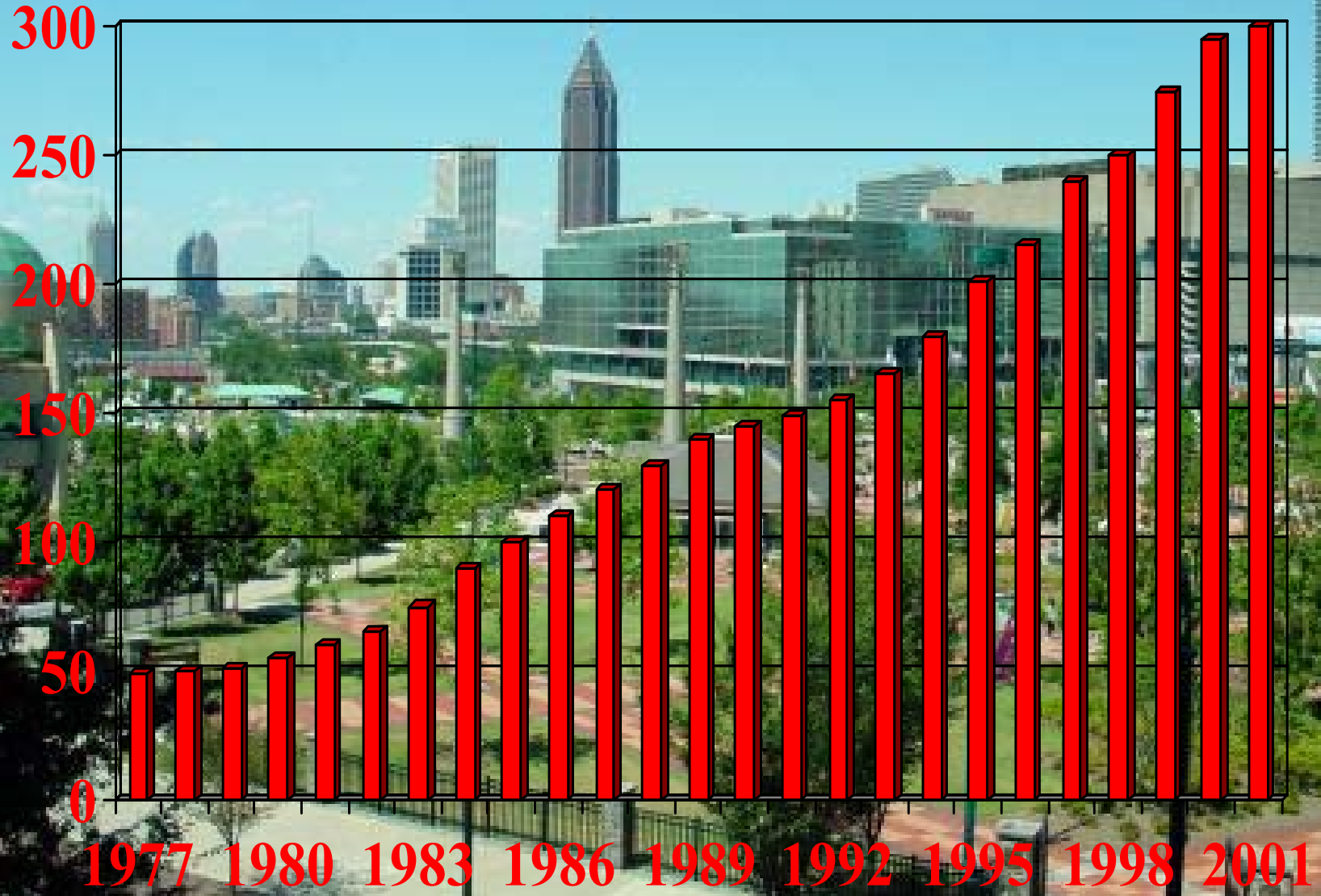
Georgia Population Growth 1900-2030

(1000s)

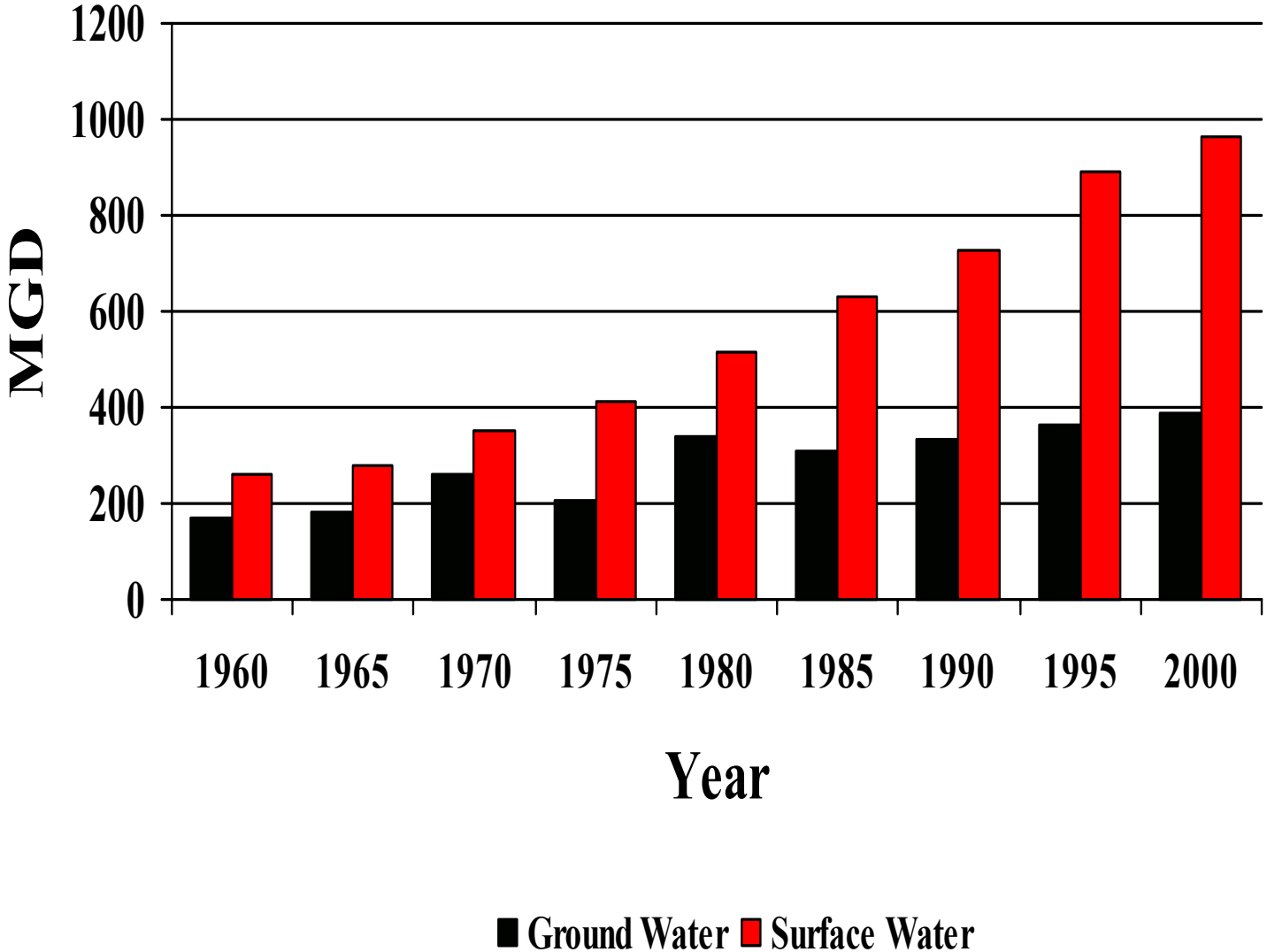


Economic Growth In Georgia

(Gross State Product in Billion $)



Public Water Supply Withdrawals



Increasing Demands!

Same Amount of Water!

What Should We Do?

KEEP
RIGHT

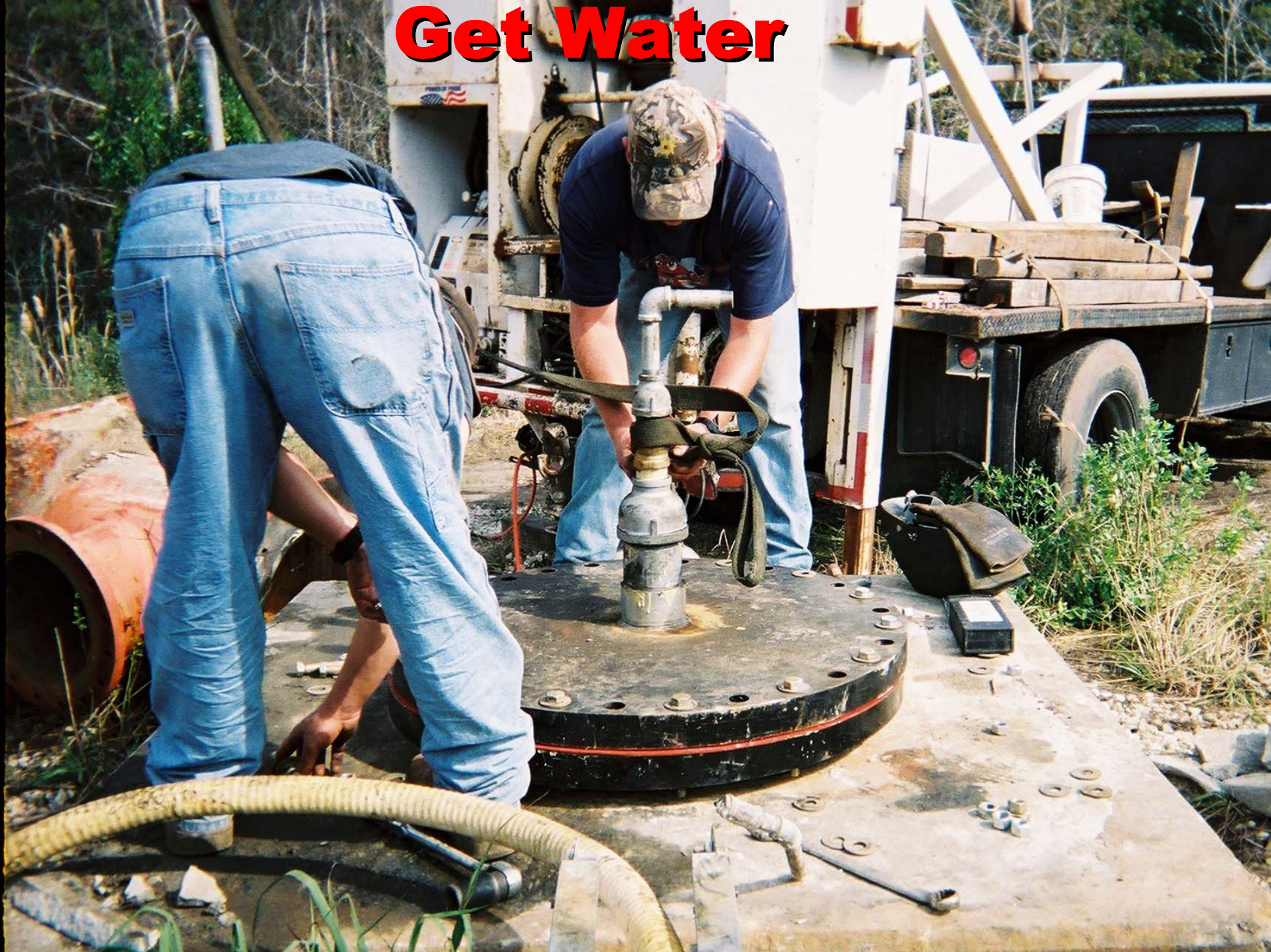
Water Management

Permit System

Technology

Technology

Get Water



Move Water

Measure Water Use

Treat Water

Maintain Water Infrastructure

Conserve Water

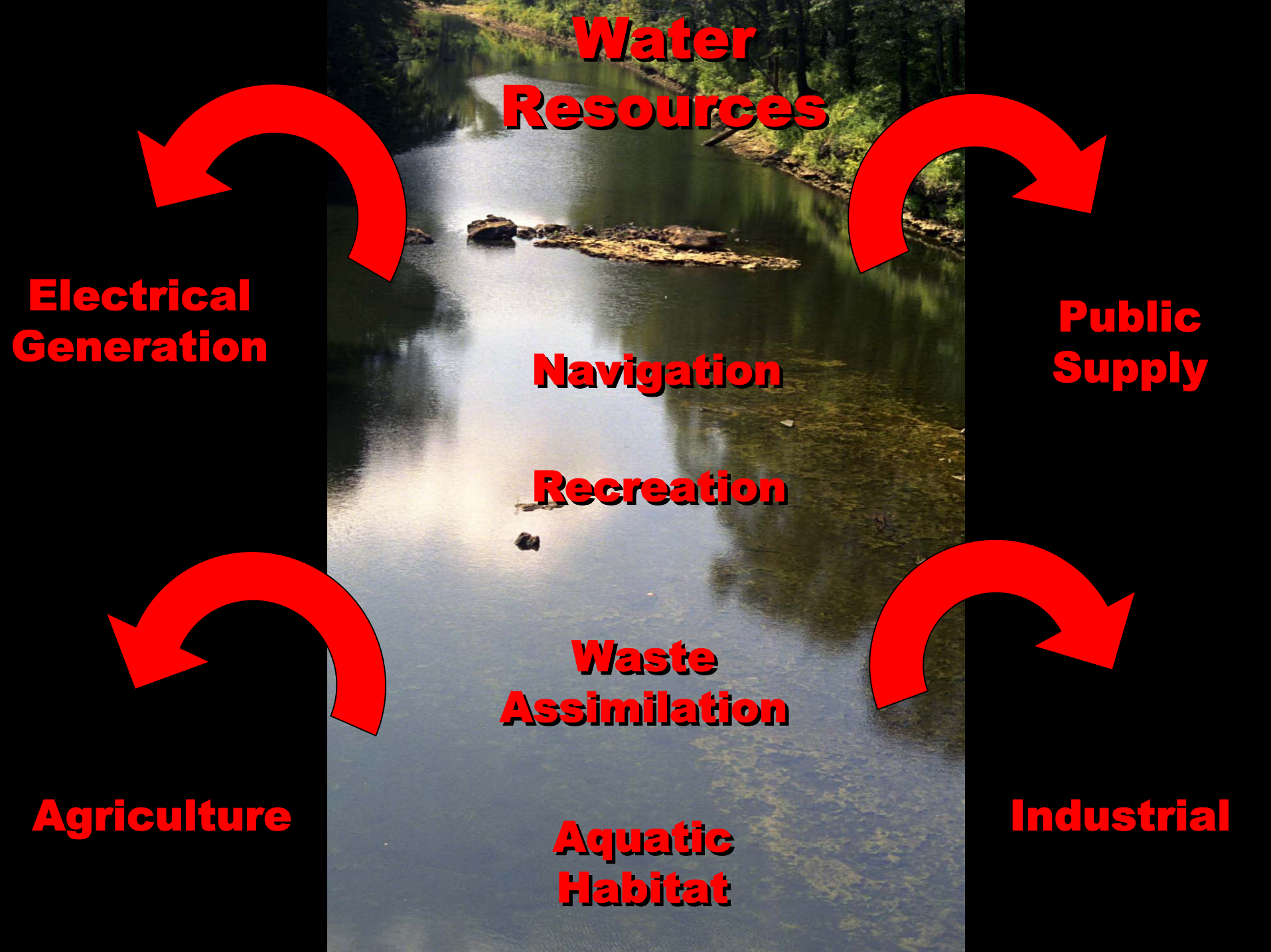
Test Water

Treat Wastewater

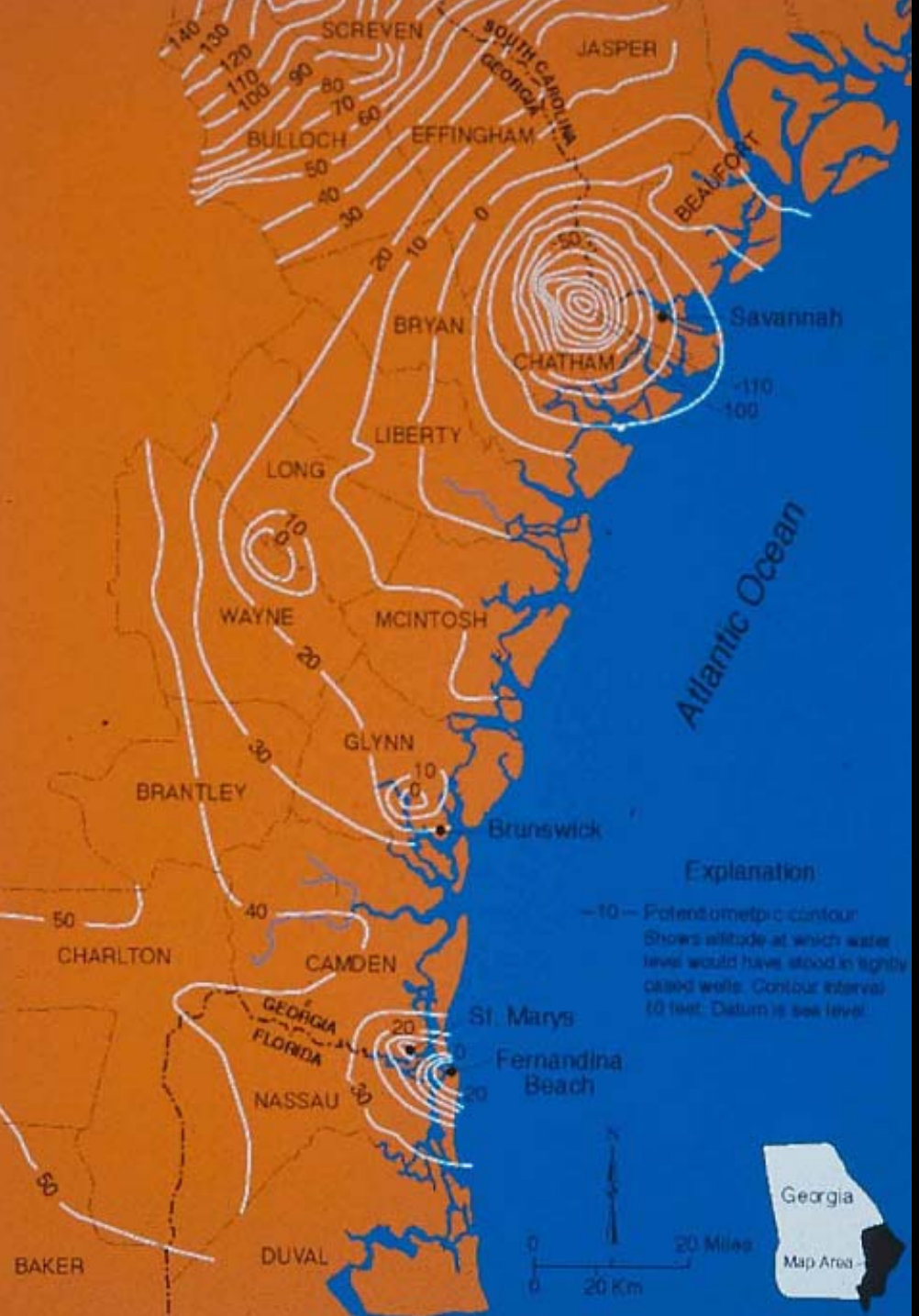
Improve Water Use

Increase Stress

Instream/Offstream Conflicts


Water Resources
Electrical Generation
Public Supply
Navigation
Recreation
Waste Assimilation
Agriculture
Industrial
Aquatic Habitat

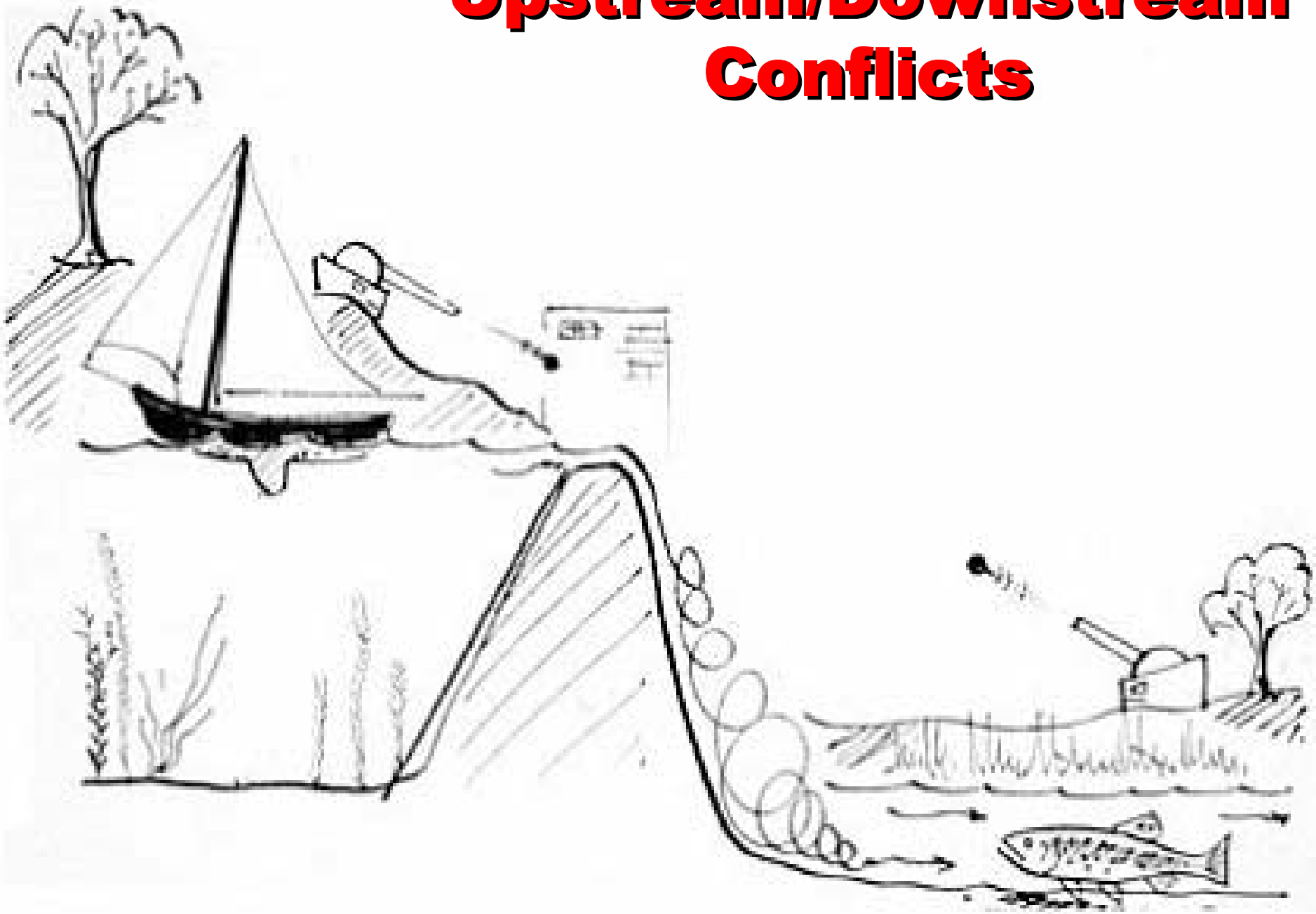
Instream Flows



Over Draft Of The Upper Floridan Aquifer

ISCO
STREAM GAGING STATION
U.S. GEOLOGICAL SURVEY

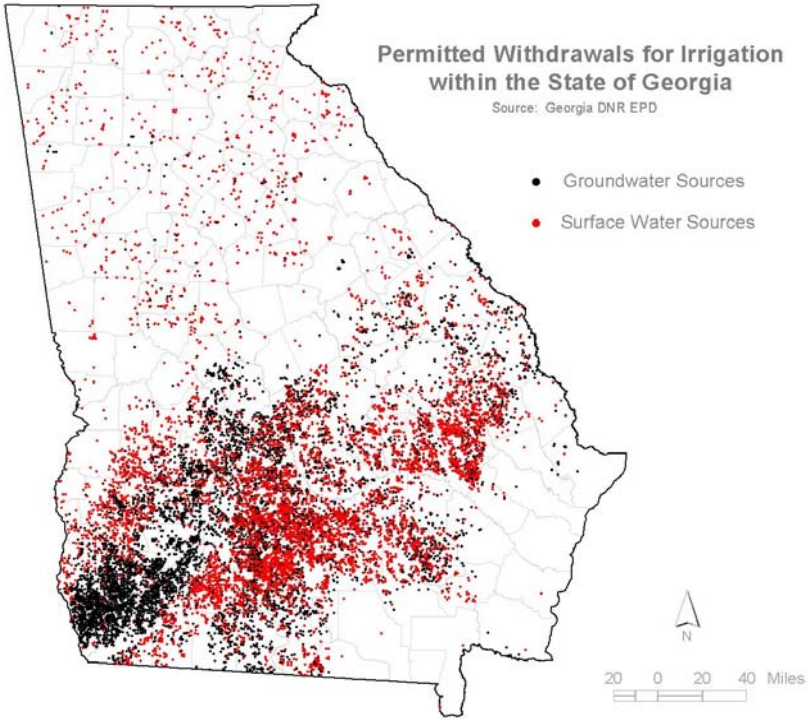
Upstream/Downstream Conflicts

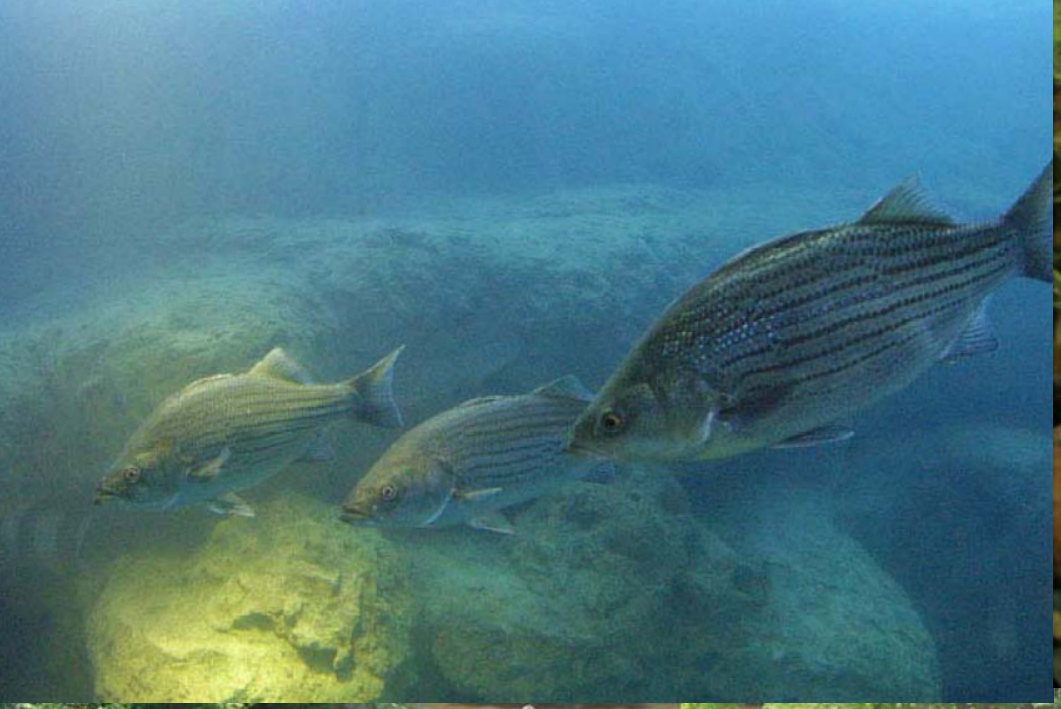


ACT/ACF RIVER BASINS

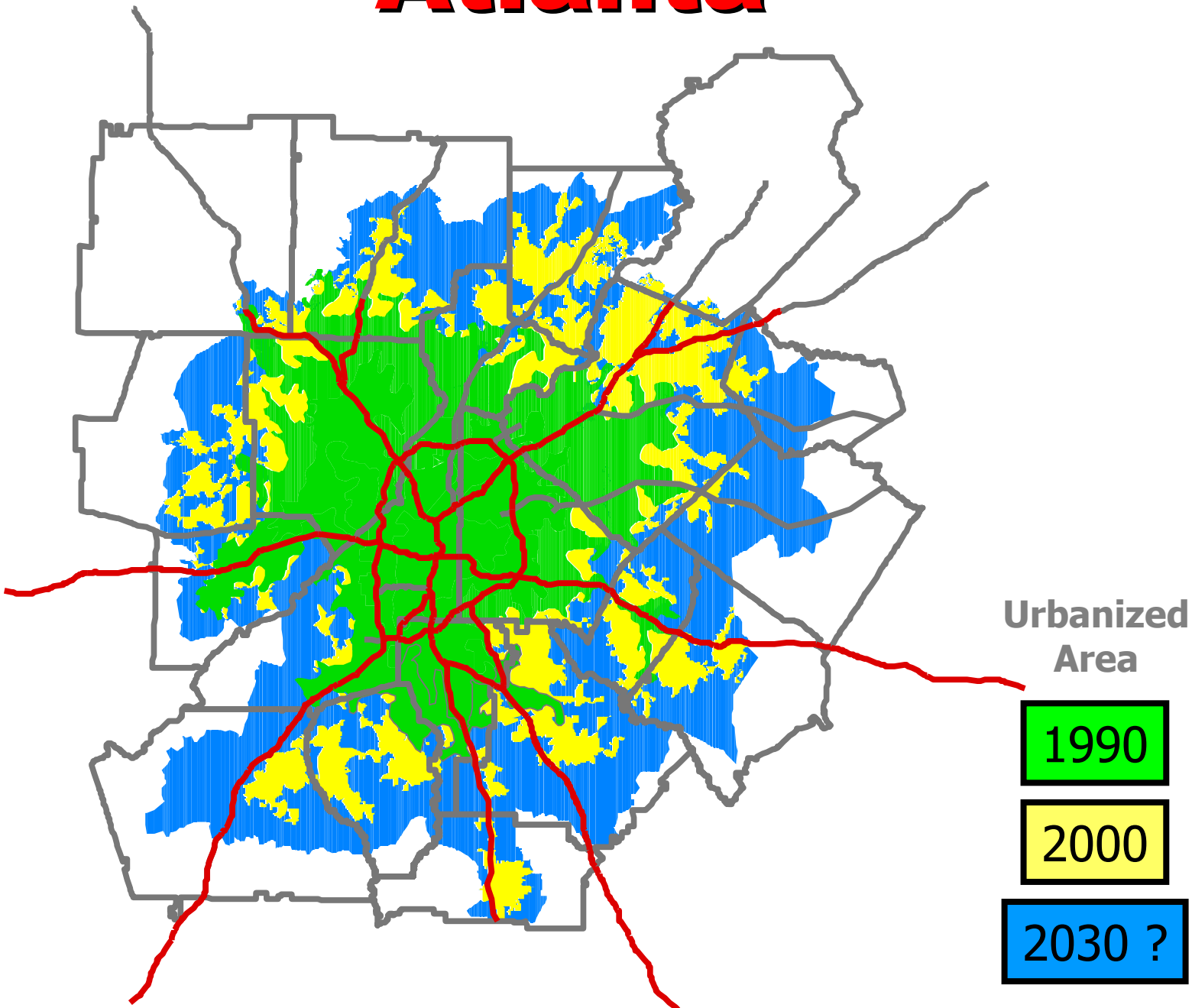
The Water Wars

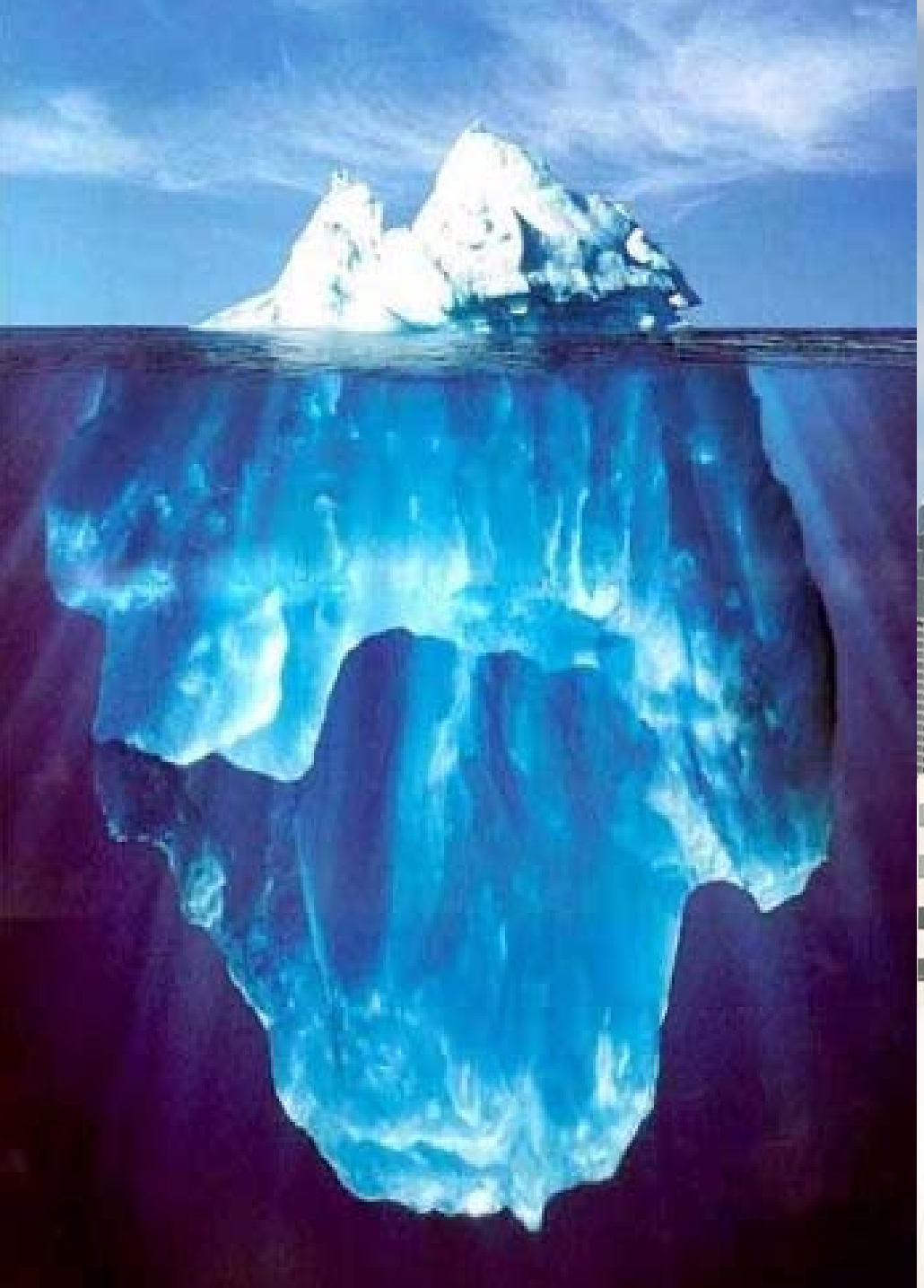
Lower Flint River Basin





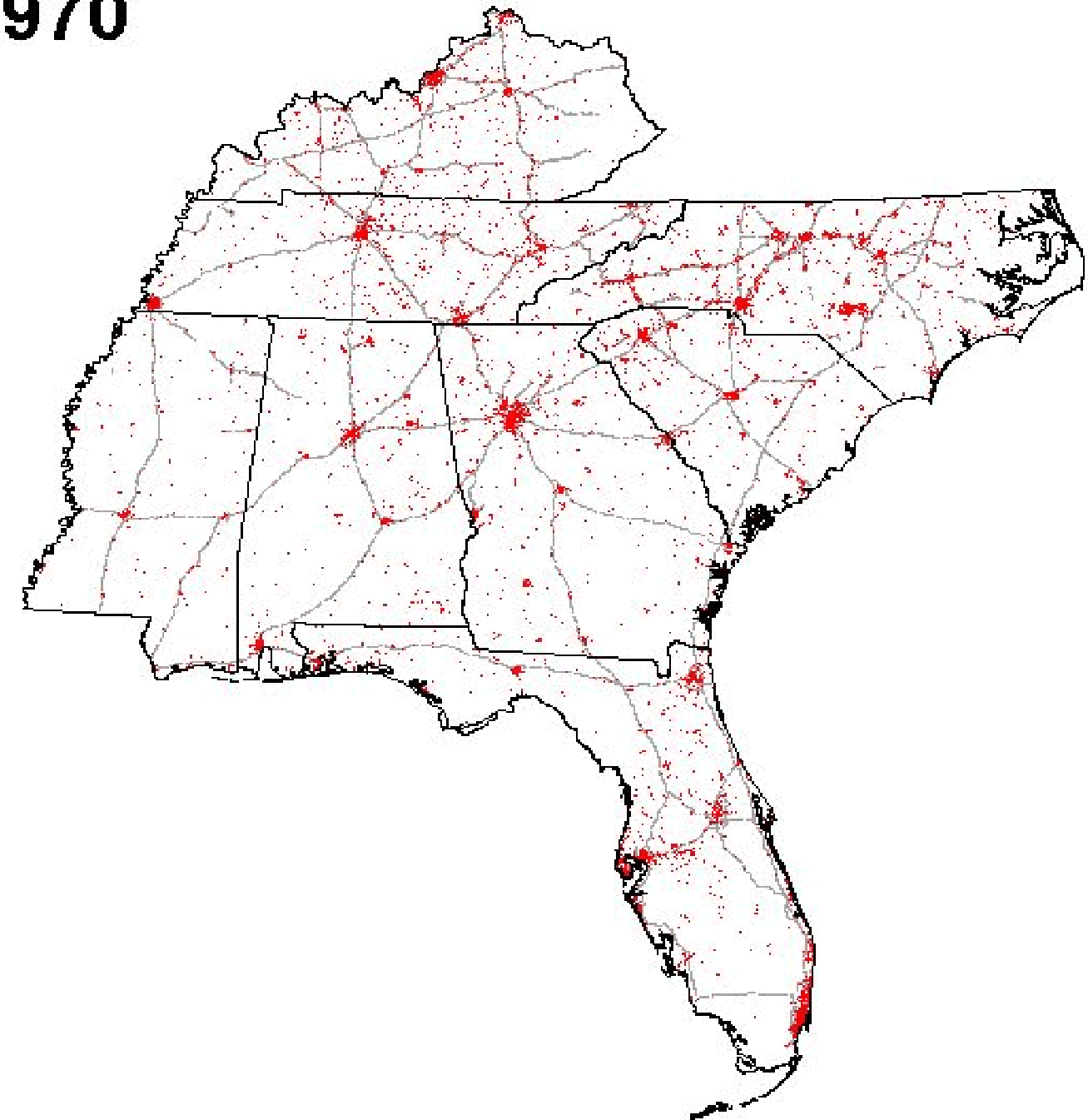
Atlanta

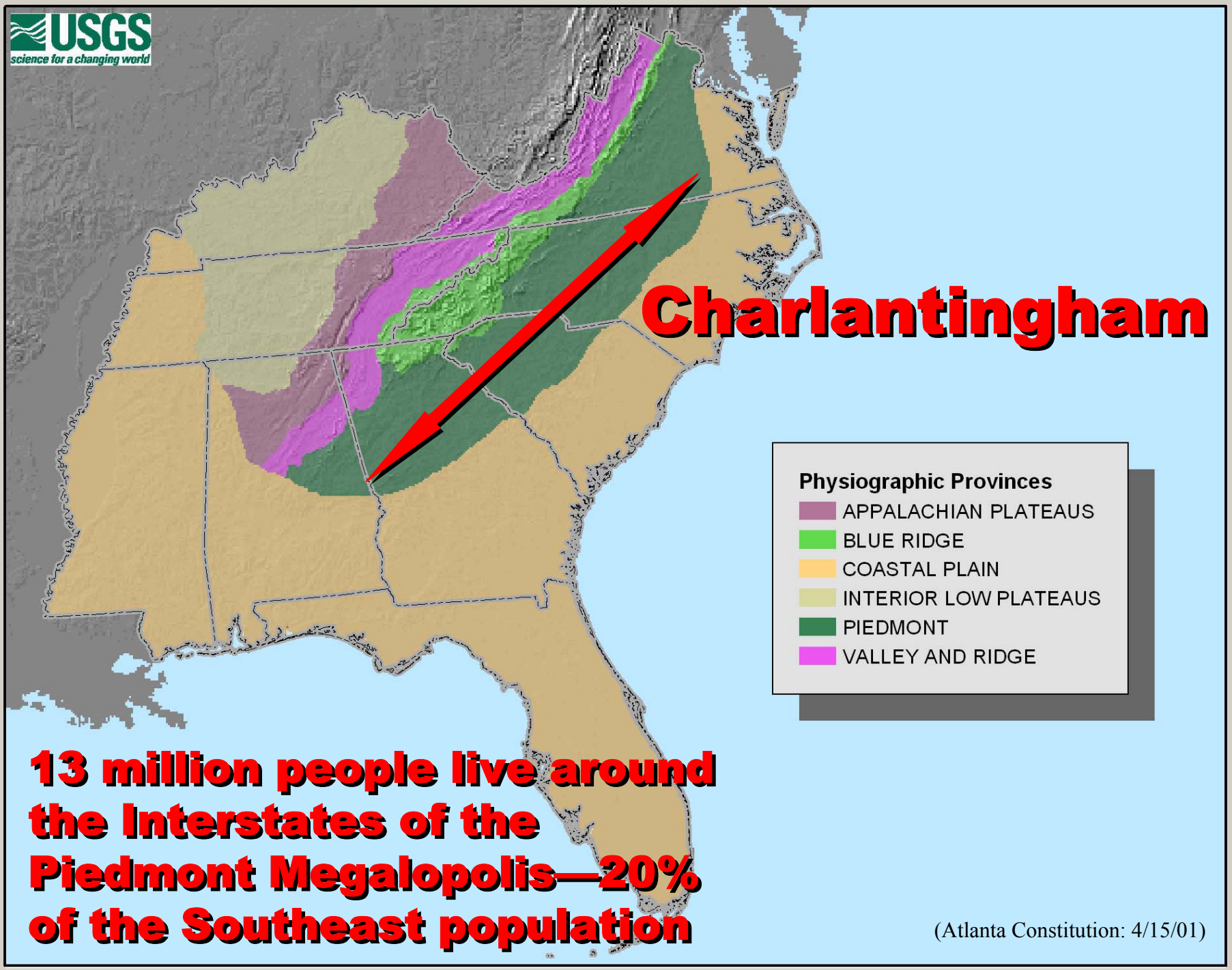


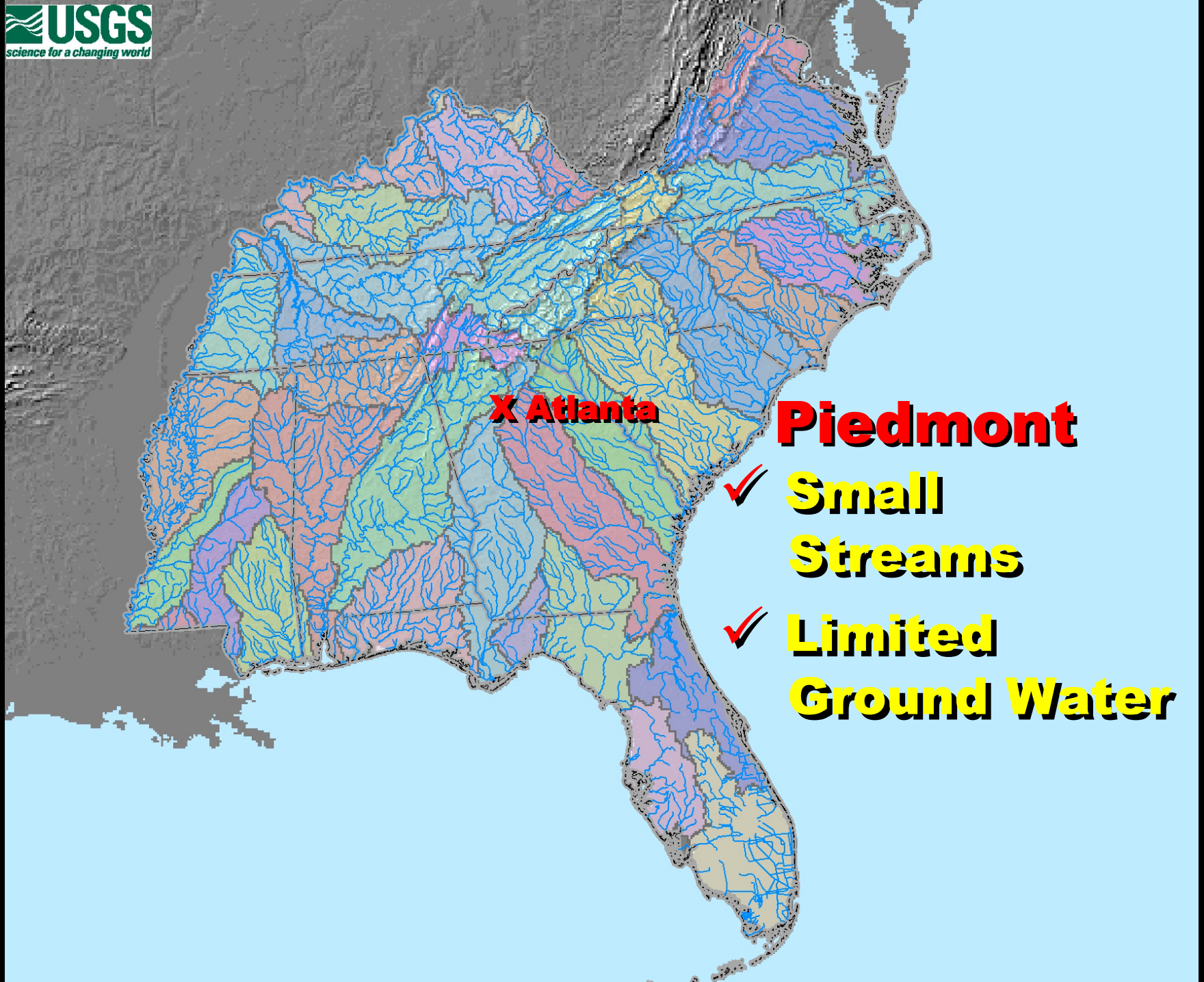


Atlanta
GP

1970



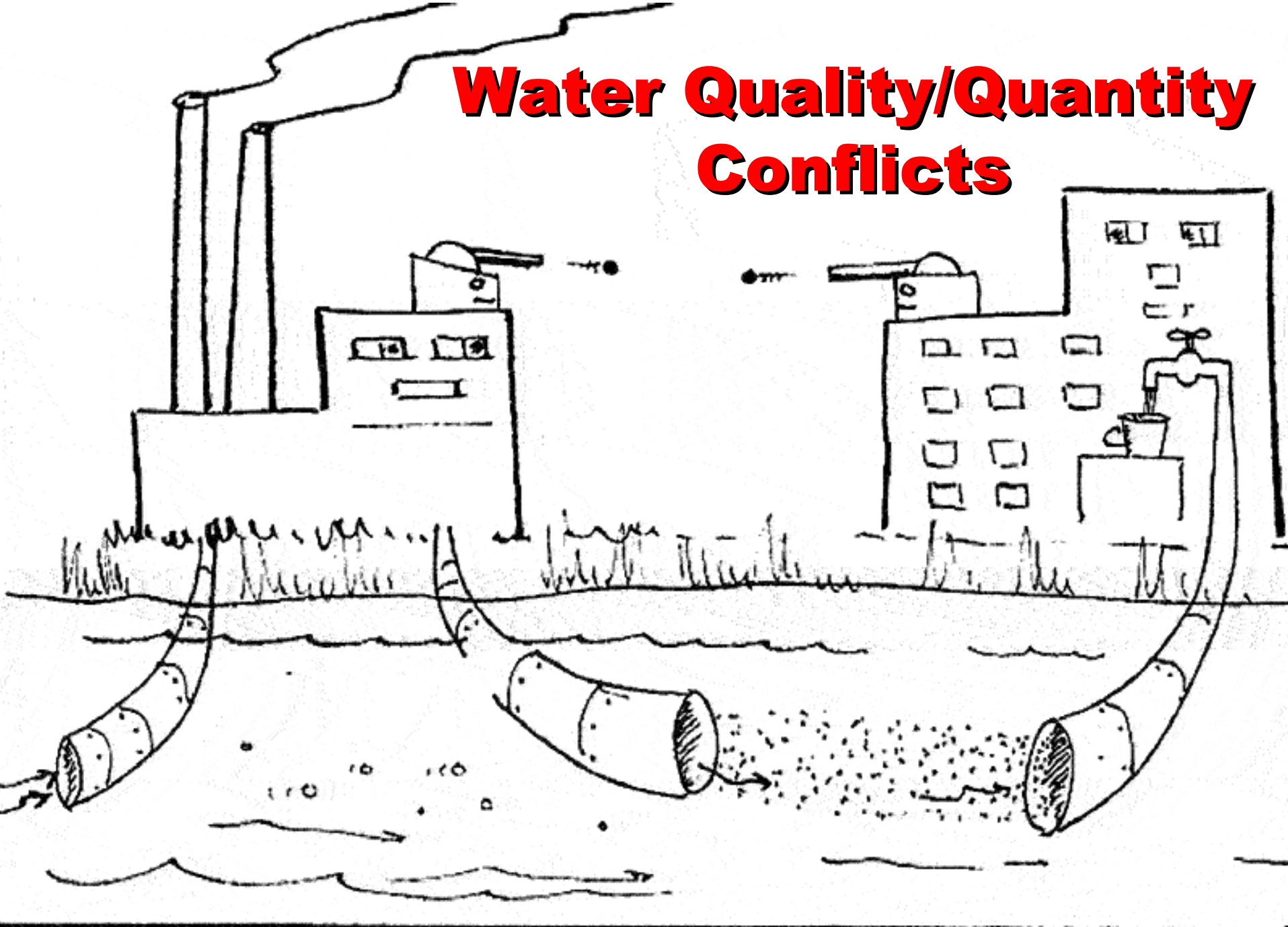

USGS
science for a changing world
Charlantingham
Physiographic Provinces
APPALACHIAN PLATEAUS
BLUE RIDGE
COASTAL PLAIN
INTERIOR LOW PLATEAUS
PIEDMONT
VALLEY AND RIDGE
13 million people live around the Interstates of the Piedmont Megalopolis—20% of the Southeast population
(Atlanta Constitution: 4/15/01)


USGS
science for a changing world
X Atlanta
Piedmont
✓ Small Streams
✓ Limited Ground Water

Interstate Water Conflicts

POWER
KEEP BUSY
N.C.
LAKE GASTO
CORPS OF ENGINEERS
VIRGINIA

Water Quality/Quantity Conflicts

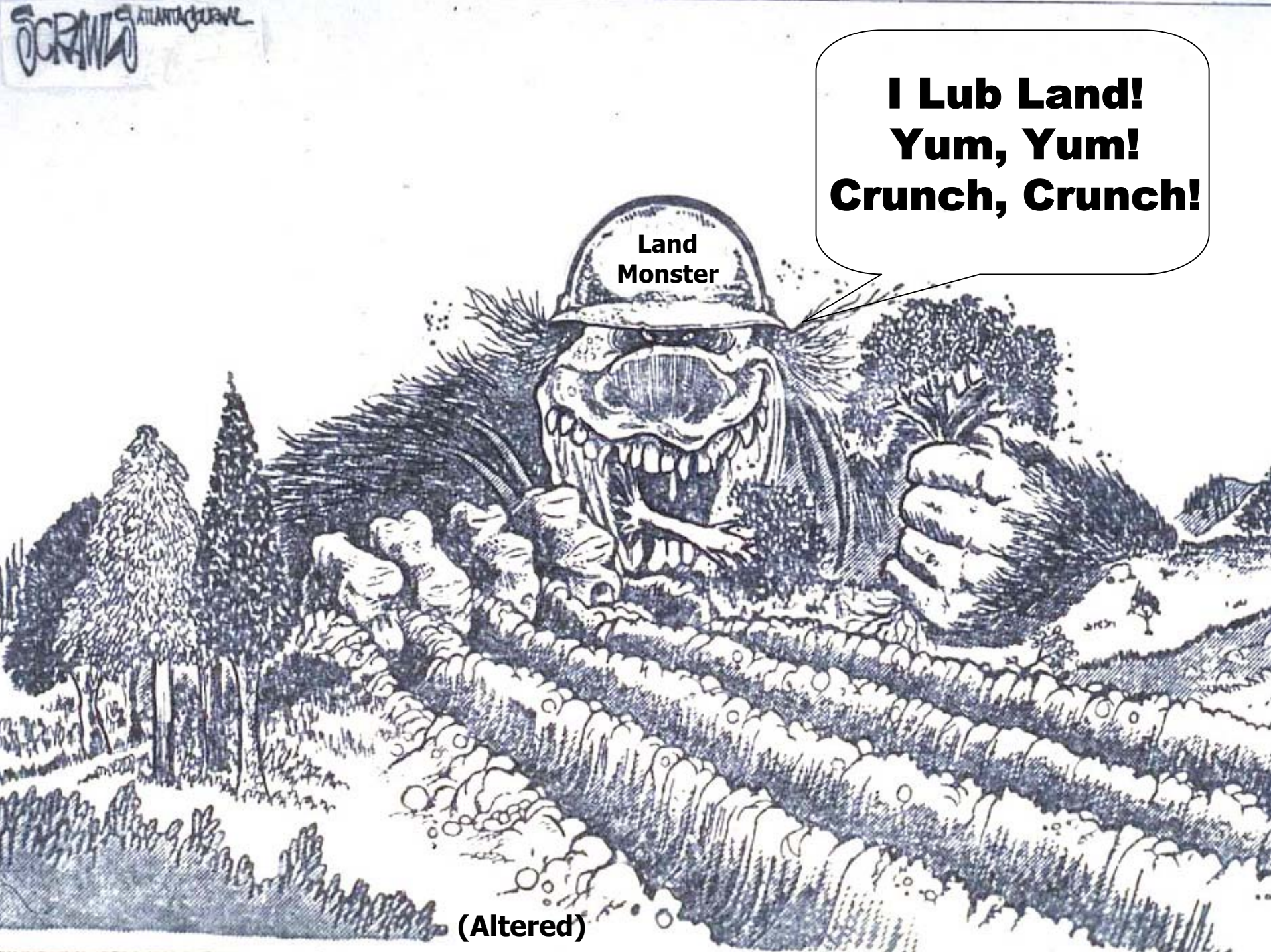


Savannah River Basin

South Carolina

Georgia

Assimilative Capacity


SCRAWL
ATLANTA JOURNAL
I Lub Land!
Yum, Yum!
Crunch, Crunch!
Land
Monster

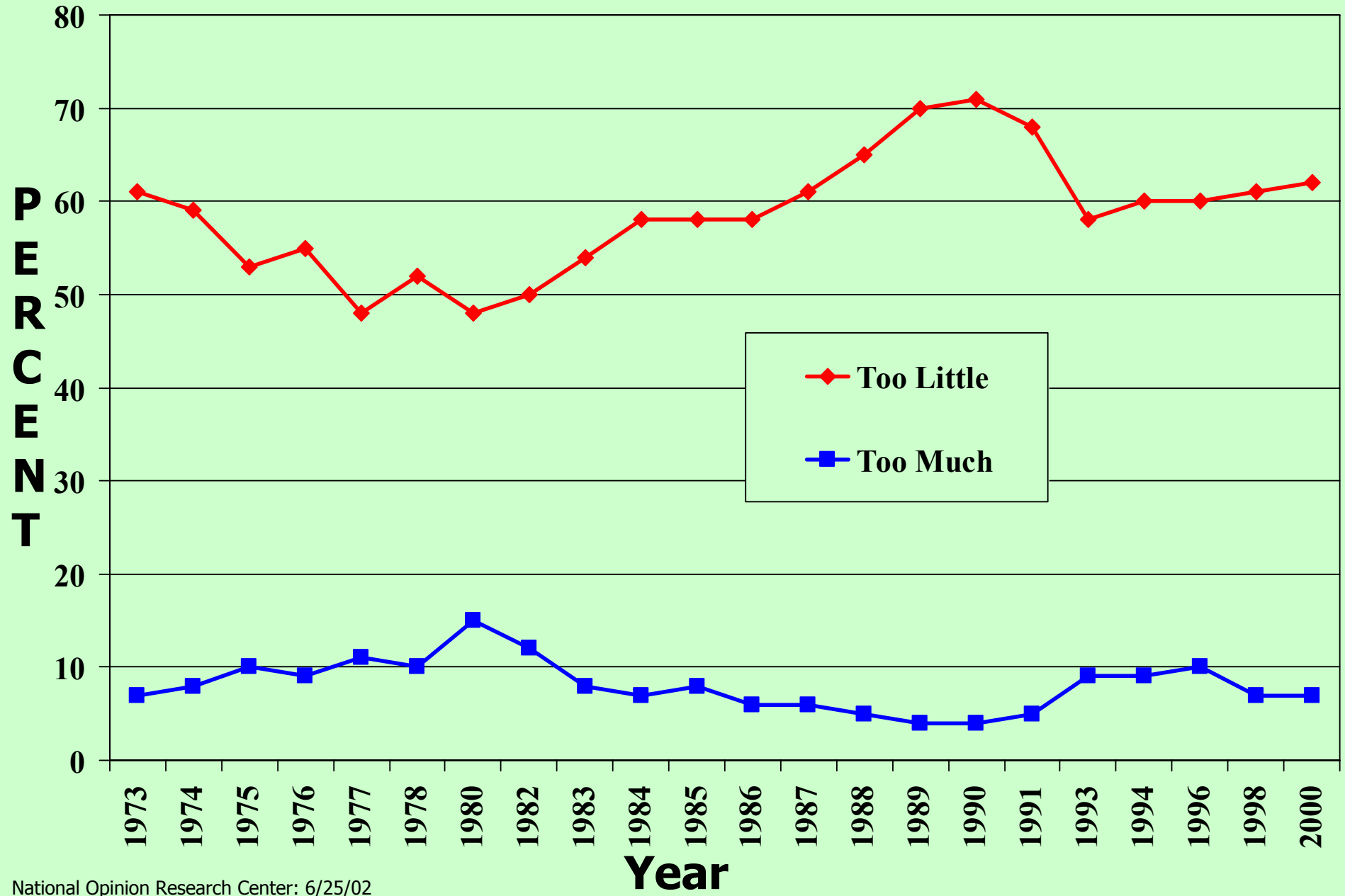
(Altered)

"LORETTA! DO YOU KNOW WHAT YOUR MEATLOAF IS DOING TO THE OZONE LAYER?"

Technology
Human Behavior

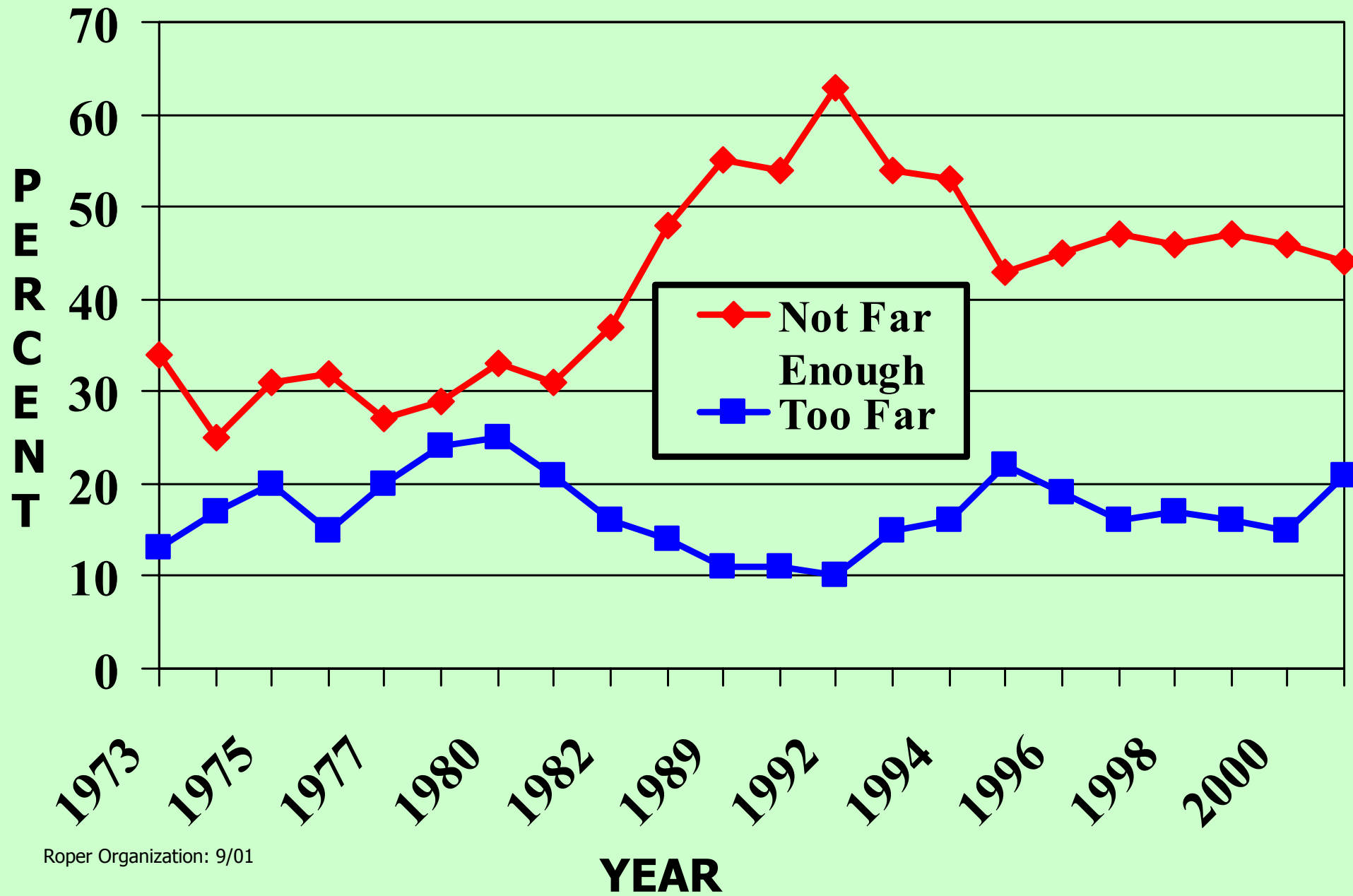
What Does the Public Say?

Spending on the Environment is...



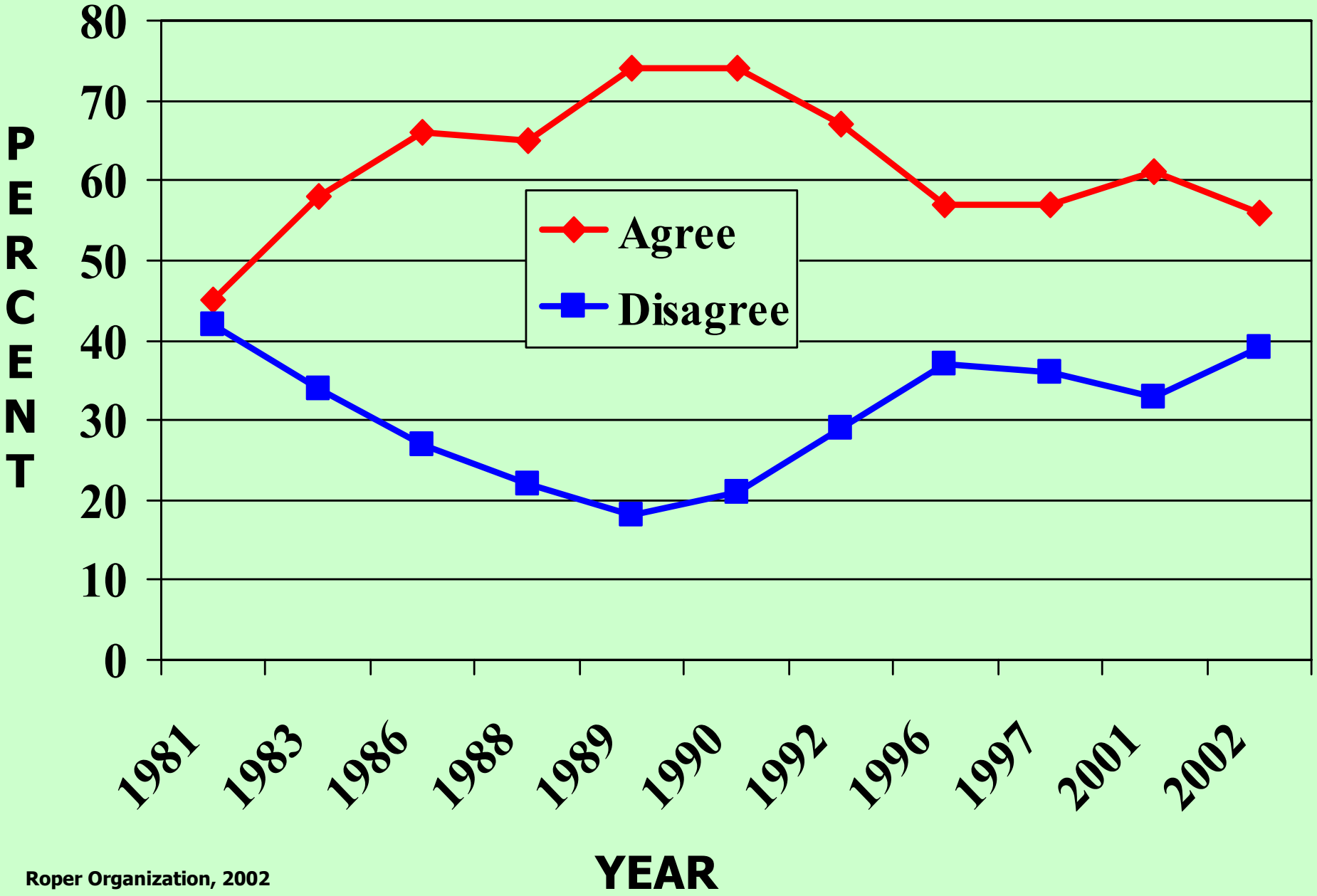
National Opinion Research Center: 6/25/02

Environmental Controls have gone...



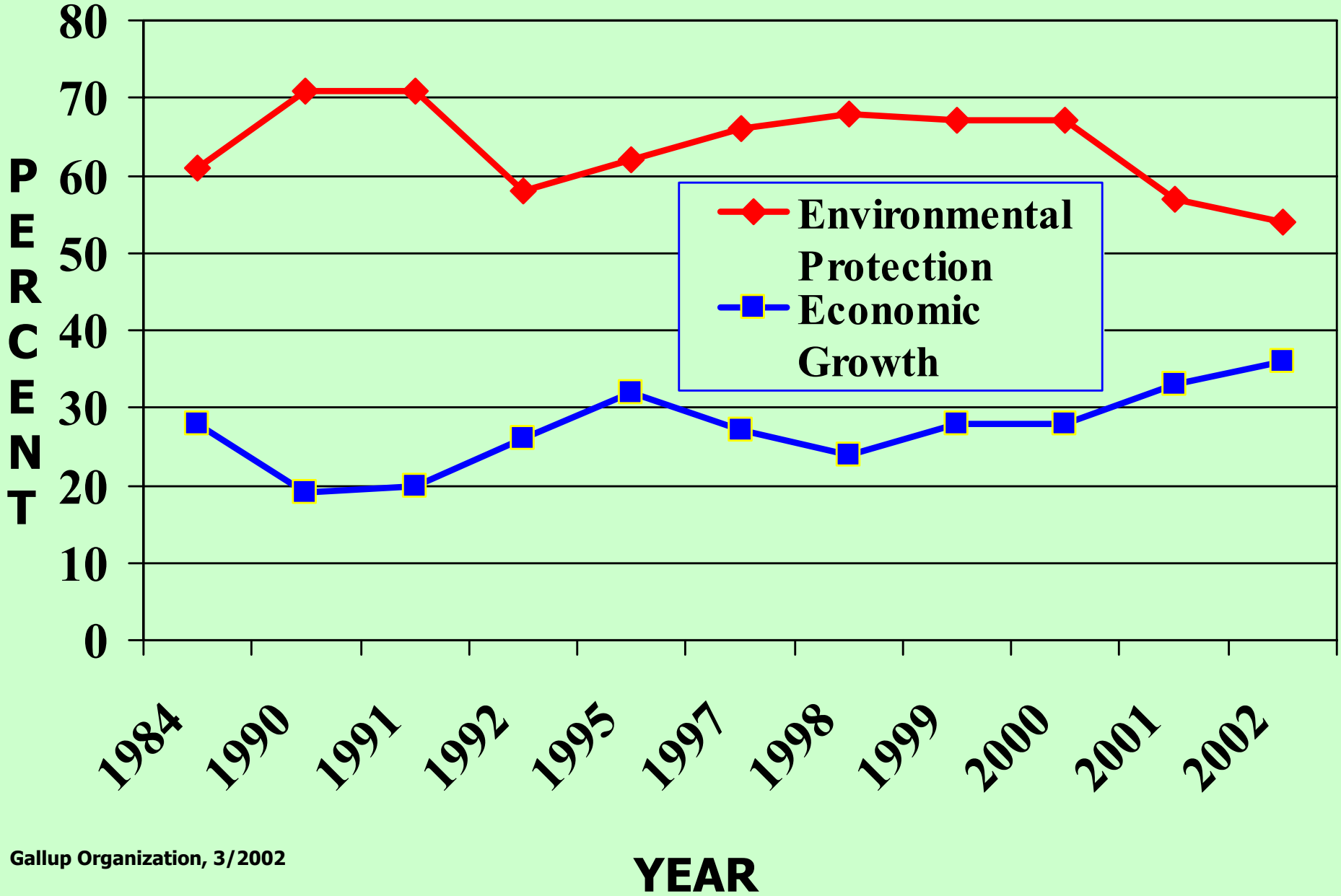
Roper Organization: 9/01

Protect Environment Regardless of Cost



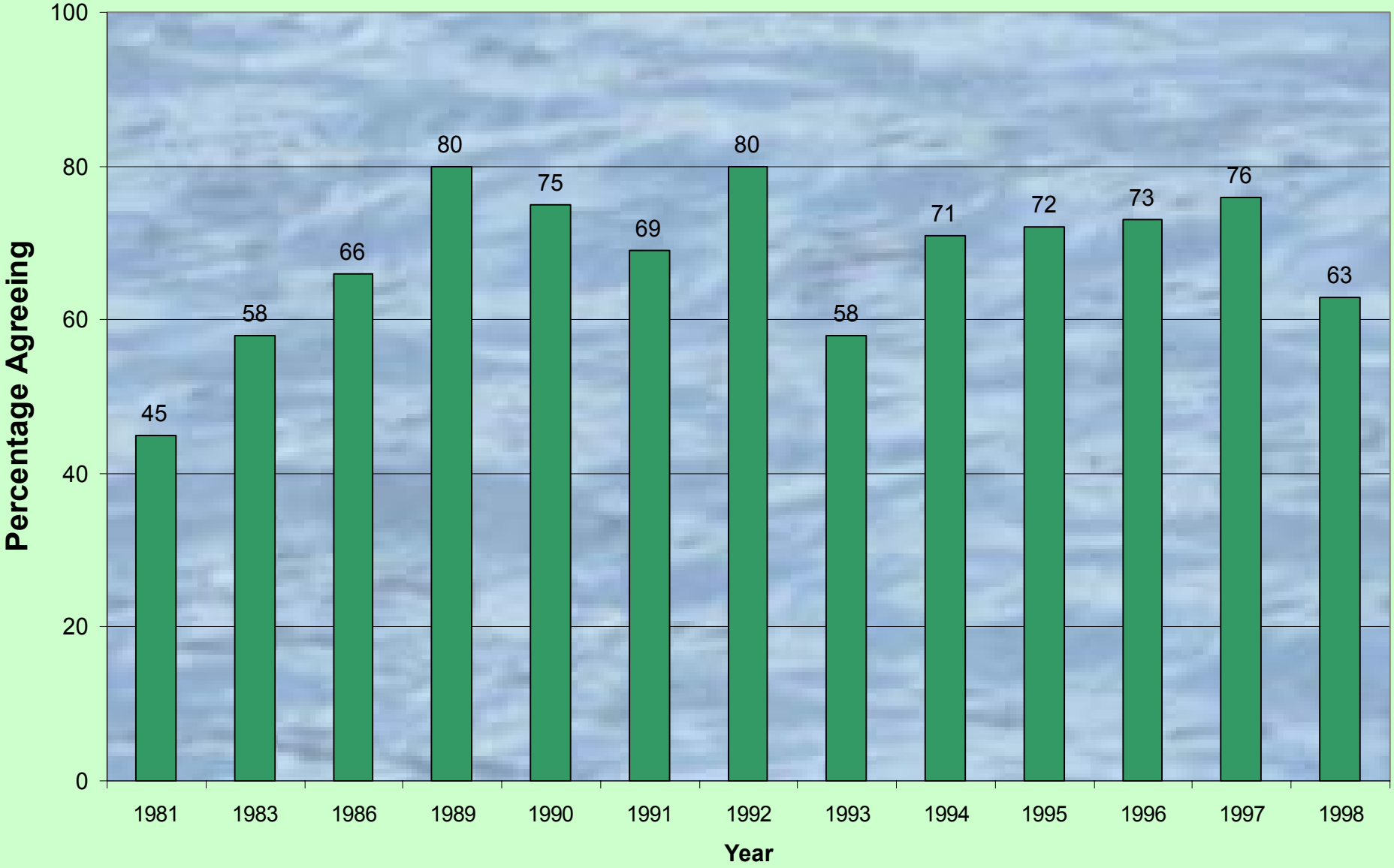
Roper Organization, 2002

Which Should Be Given Priority?



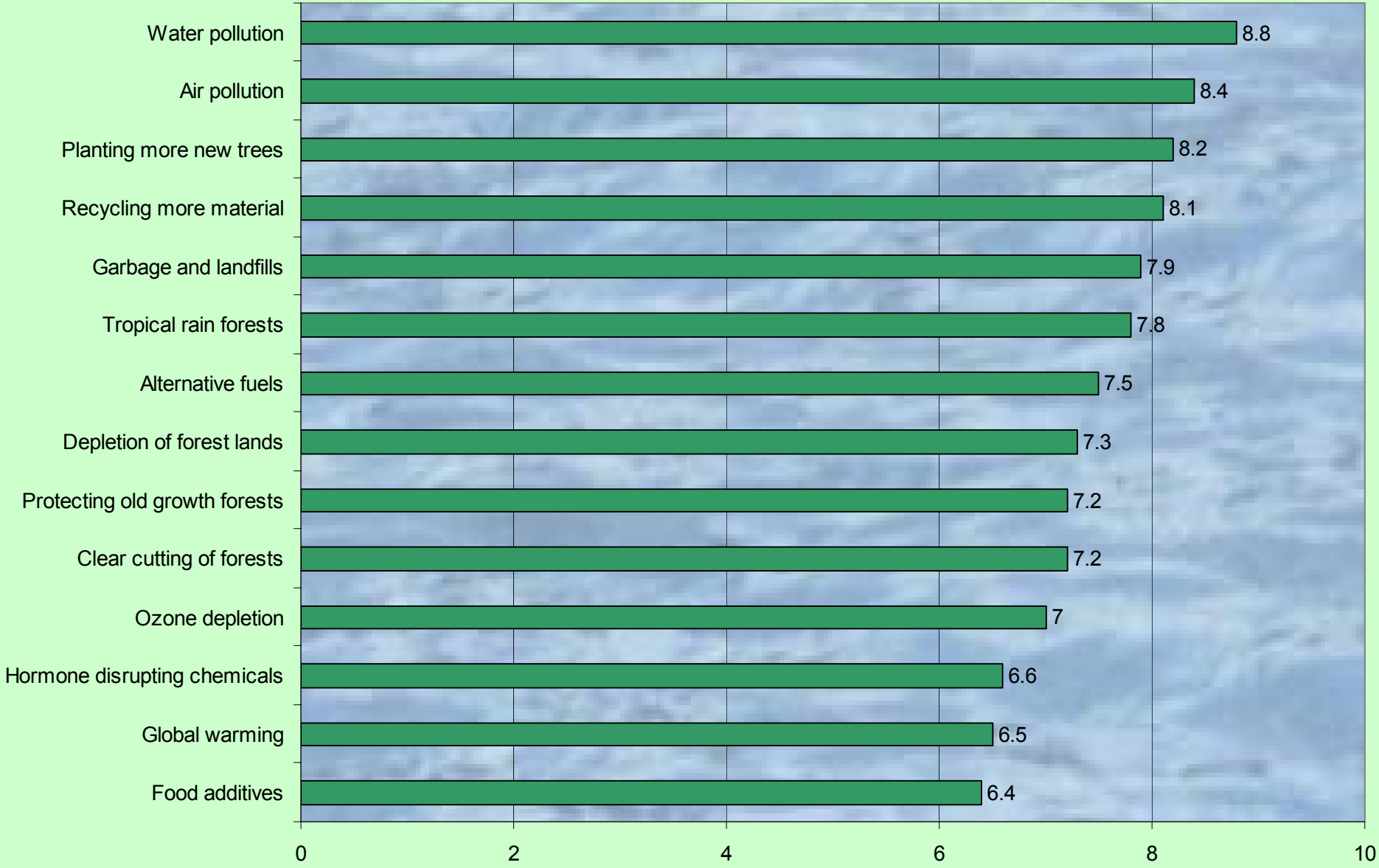
Gallup Organization, 3/2002

Environmental Standards Cannot be Too High, and Continuing Improvments Must be Made, Regardless of Cost



Source: The Wirthlin Report: Current Trends in Public Opinion from Wirthlin's Worldwide. Vol. 8, No. 9. September 1998. Accessed from http://www.wirthlin.com on

How high of a priority is each problem, where 1 is low and 10 is high?



Source: The Wirthlin Report: Current Trends in Public Opinion for Wirthlin's Worldwide. Vol. 9, No. 9. September 1998. Accessed from http://www.wirthlin.com on May

What Does The Public Do?

PIG NATION

Mass Consumption is EVERYBODY'S DUTY!

WELD
RACING
4x4

GLOBAL
WARMER
EXPEDITION
I'M CHANGING
THE CLIMATE!

GRIPSHIFT

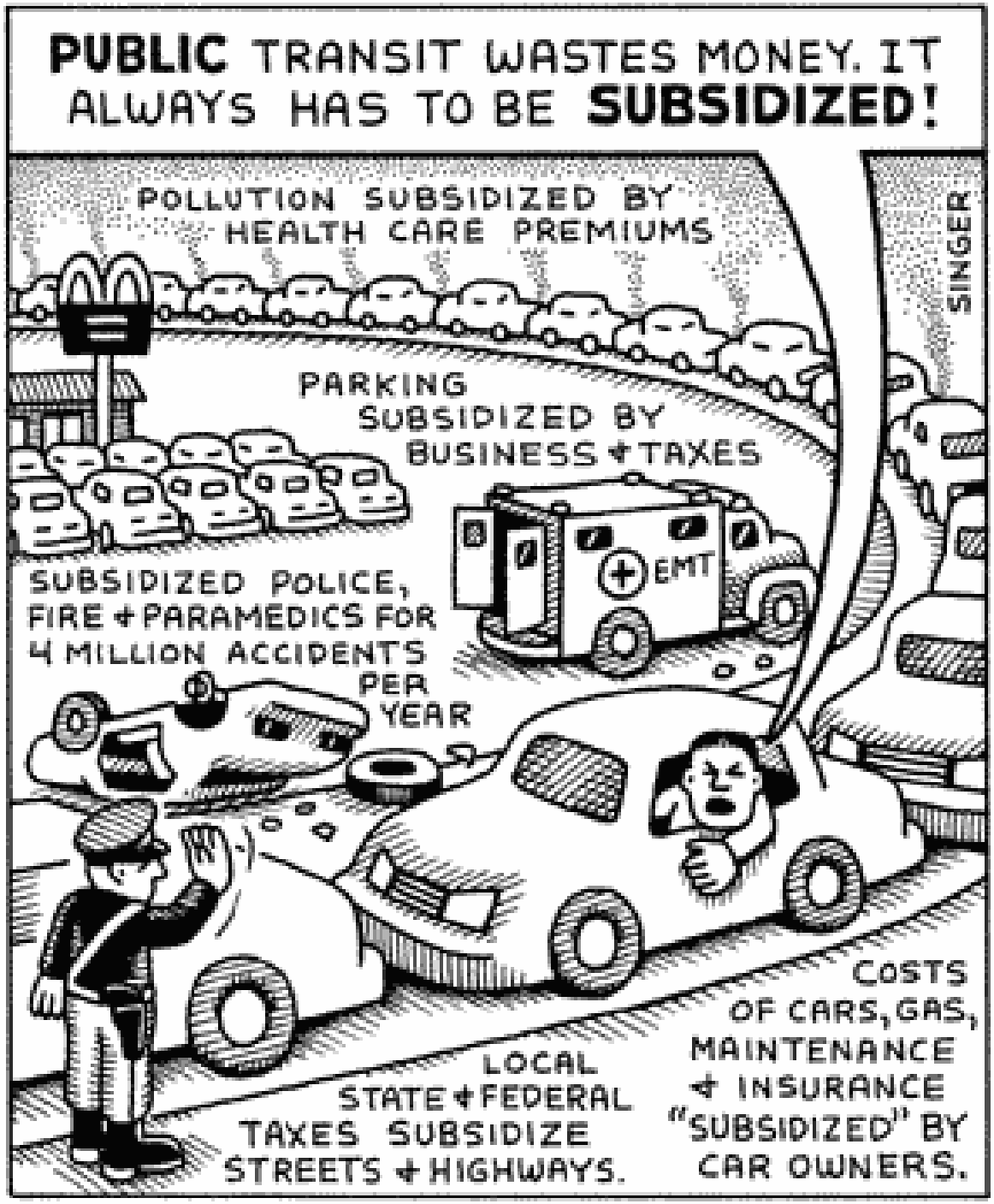

PUBLIC TRANSIT WASTES MONEY. IT ALWAYS HAS TO BE SUBSIDIZED!
POLLUTION SUBSIDIZED BY HEALTH CARE PREMIUMS
SINGER
PARKING SUBSIDIZED BY BUSINESS + TAXES
EMT
SUBSIDIZED POLICE, FIRE + PARAMEDICS FOR 4 MILLION ACCIDENTS PER YEAR
LOCAL STATE + FEDERAL TAXES SUBSIDIZE STREETS + HIGHWAYS.
COSTS OF CARS, GAS, MAINTENANCE + INSURANCE "SUBSIDIZED" BY CAR OWNERS.

Photo Courtesy of
The Fastest News on the Net!

LOT 9

90

TIME TO
BUY
STUFF
(SEASON'S GREETINGS!)
YOU KNOW, THIS YEAR... IS IT JUST ME, OR-
ARKANSAS DEMOCRAT-GAZETTE
DRAKE
© 2004 CREATORS SYNDICATE, INC.

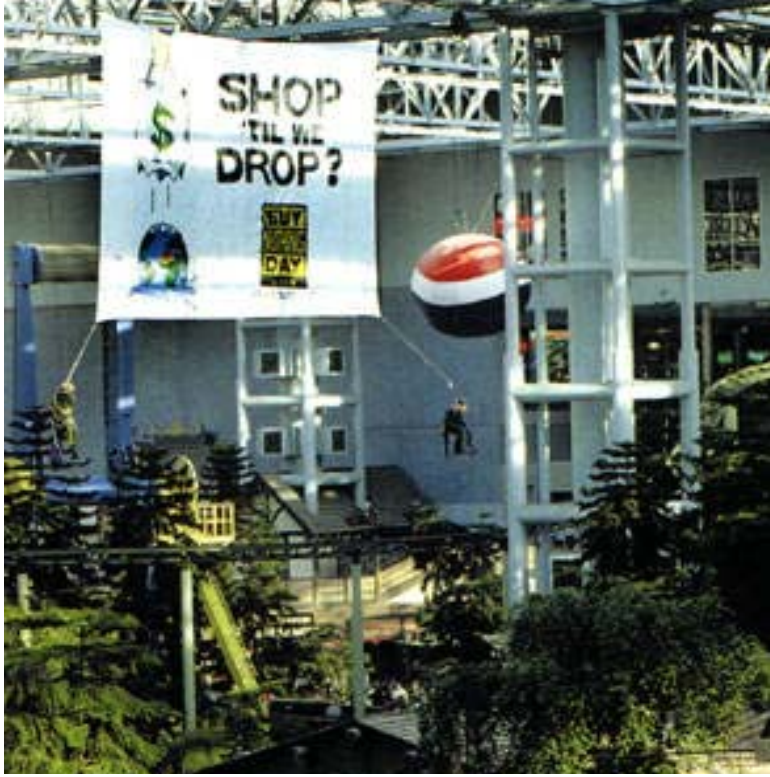
FARMALL

BALLYS

Golden Goose
WORLD CLASS
TOPLESS GIRLS
SENSATIONAL
MEN'S CLUB
GLITTER
GULCH
LET US
ENTERTAIN
YOU!

NO
LITTERING

Sidewalk Bubblegum ©1993 Clay Butler



WARNING!
EXPLICIT
CONSUMERISM

Kawasaki

ESPINET
330
Kamikaze JET
Sun Jet
JEFCO

Lake Wellbrook

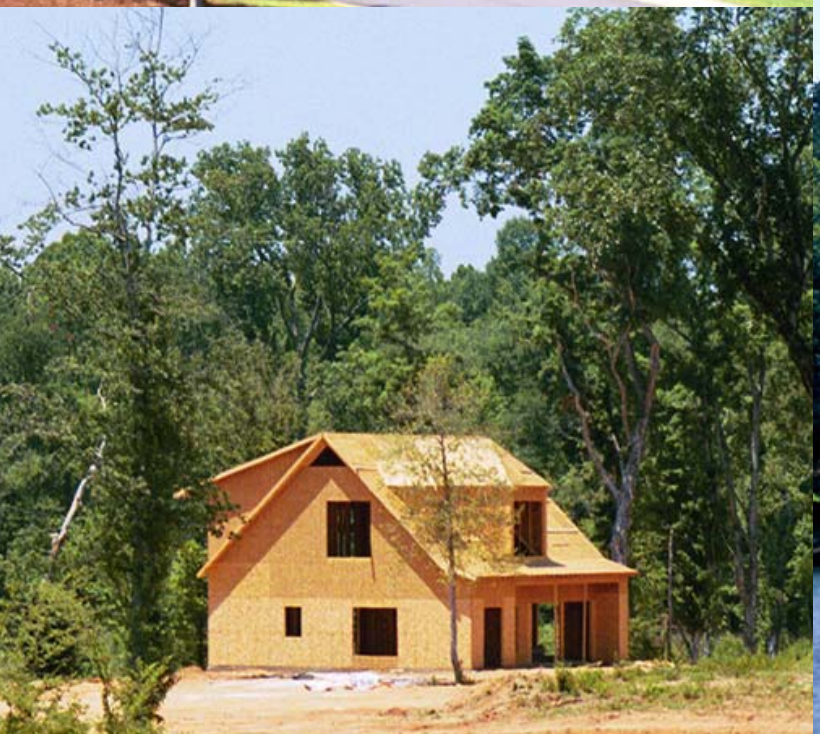
Chateau
Sport
Chateau
Sport

DayBreak
DayBreak

THANKS
FOR PROTECTING
OUR
FORESTS

SWEENEY & SON LOGGING & EXCAVATING
Maple Lane Nursery
ski-doo

STOP



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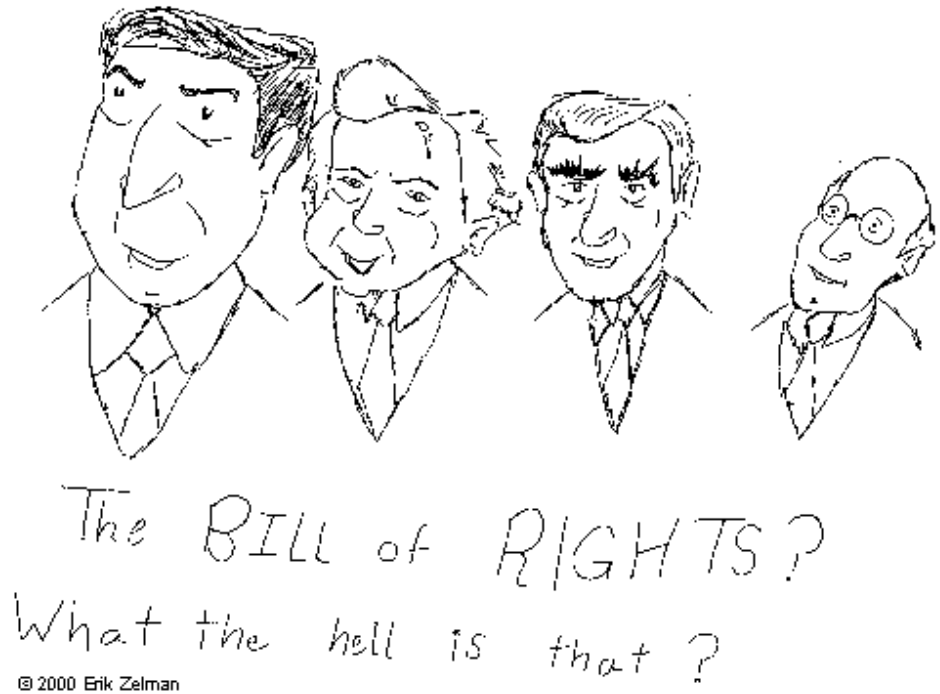
TO WILD FOREST
COMING SOON!
MEGA VERTIGO MALL
VERTIGOLIAT
Consume!
THIS SPAC AVAILAB
BUY
PRIVATE PROPERT
GAS
WADDA BOIGA

We Support Our
Local Community!
Amend the E.S.A.
CAT


The BILL of RIGHTS?
What the hell is that?
© 2000 Erik Zelman

THE
LORD
GIVETH
THE LORD
TAKETH...
NOT OUR
GOVERNMENT

NO TAX!!!
NO INCOME TA
STOP SPEND
MONEY THAT W

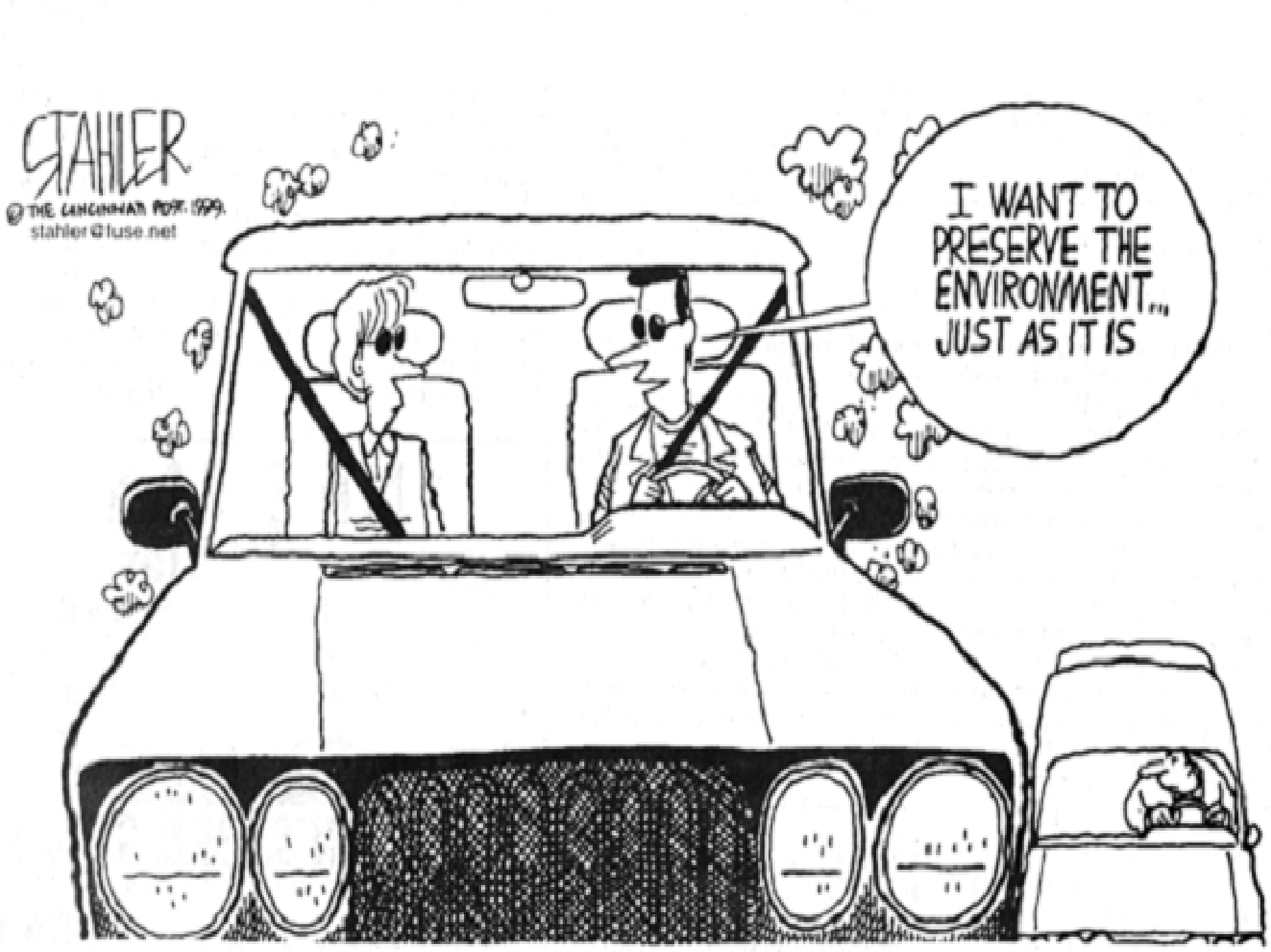
HOAX
FOR
NO NEW TAXES!

LESS
TAX
MORE
THRIFT

GO AHEAD...
RAISE OUR TAXES.
PEOPLE POWER
TAR

AX THE TAX
NO INCOME TAX!
NO NEW TAX
AX THE
TAX

" NO, I'M NOT VIOLATING WATERING REGULATIONS—I'M A MIRAGE!"


STAHLER
© THE CINCINNATI POST 1999.
stahler@fuse.net
I WANT TO PRESERVE THE ENVIRONMENT... JUST AS IT IS

ENCORE
HORSEY
BUT HOW WILL YOU MITIGATE THE IMPACT ON WATER RESOURCES? FOREST LANDS? INDIGENOUS SPECIES? WASTE MANAGEMENT?...
SORRY, CHIEF, BUT WE CAME HERE FOR LIBERTY, NOT LAND USE PLANNING!
Plymouth Subdivision

©2005 FLORIDA TODAY
PARKER
caglecartoons.com
OY!... I DON'T THINK I CAN SUPPORT MUCH MORE, FOLKS...
jparker@flatoday.net

"...LOOK, THEY'VE OVERPOPULATED THEIR HABITAT, THEY EAT TOO MUCH FOR THEIR OWN GOOD AND THEY'RE A MENACE TO THEIR ENVIRONMENT! I'M TELLIN'YA, THIS IS THE MOST HUMANE WAY!"

DAMN
THE
DAMS
SARDAR
SARDAR
INDIRA
SAGAR
TAVA
NARMADA SAGAR
ALSO THE TEHRI

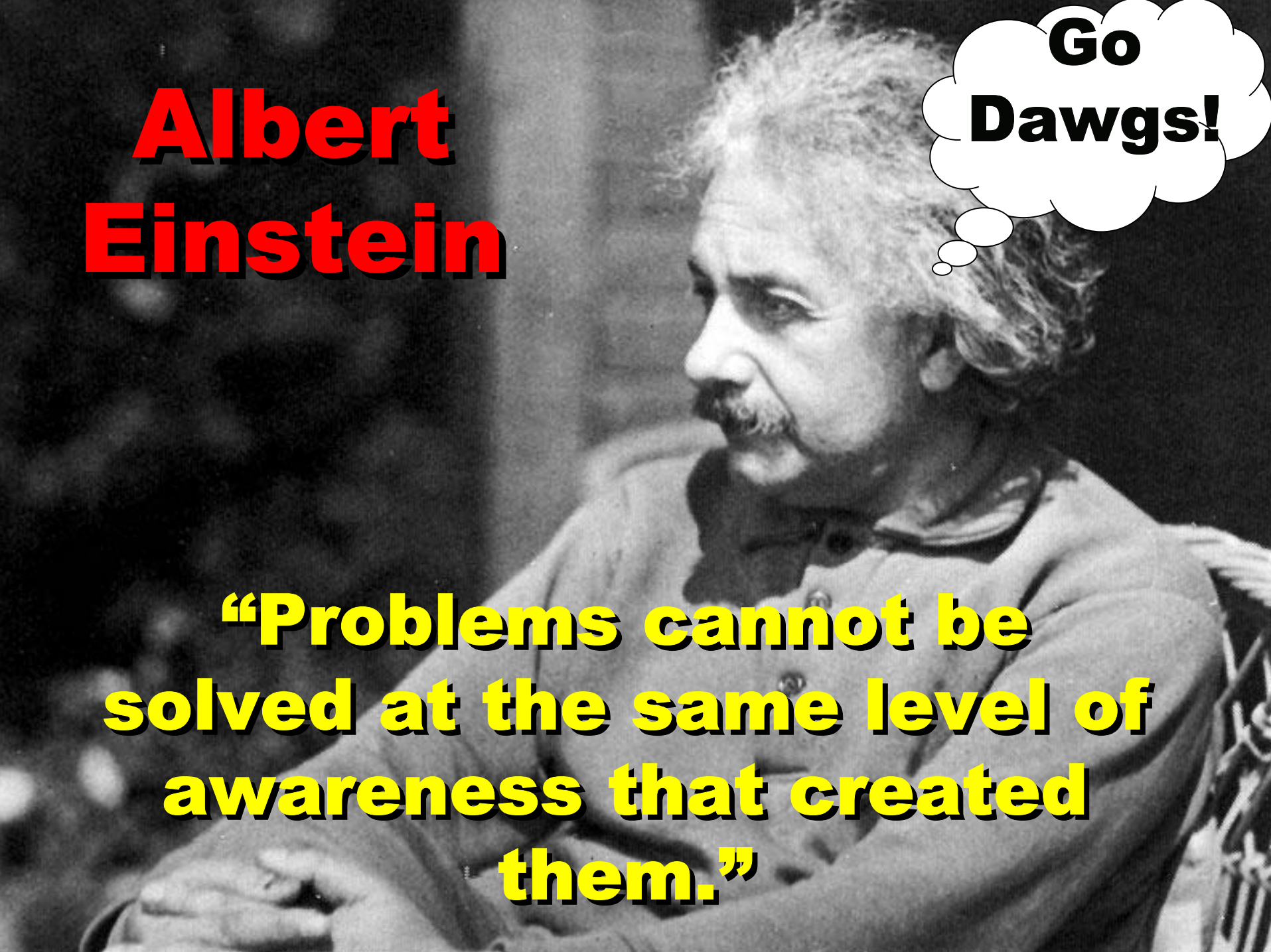
EVIL

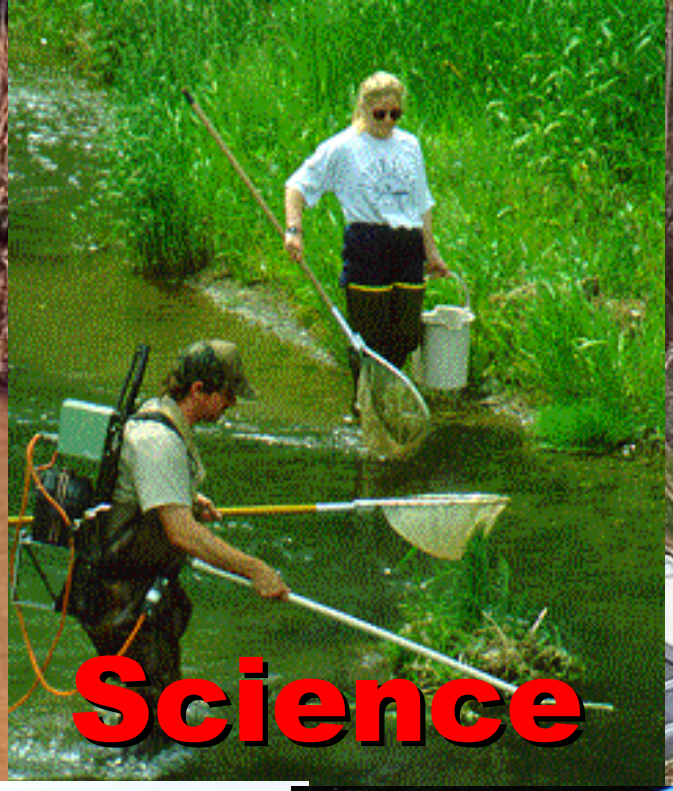
NO WAR ON IRAQ
aman

DISARM BUSH

STOP THE PROMISES
VOTE DEMOCRATIC

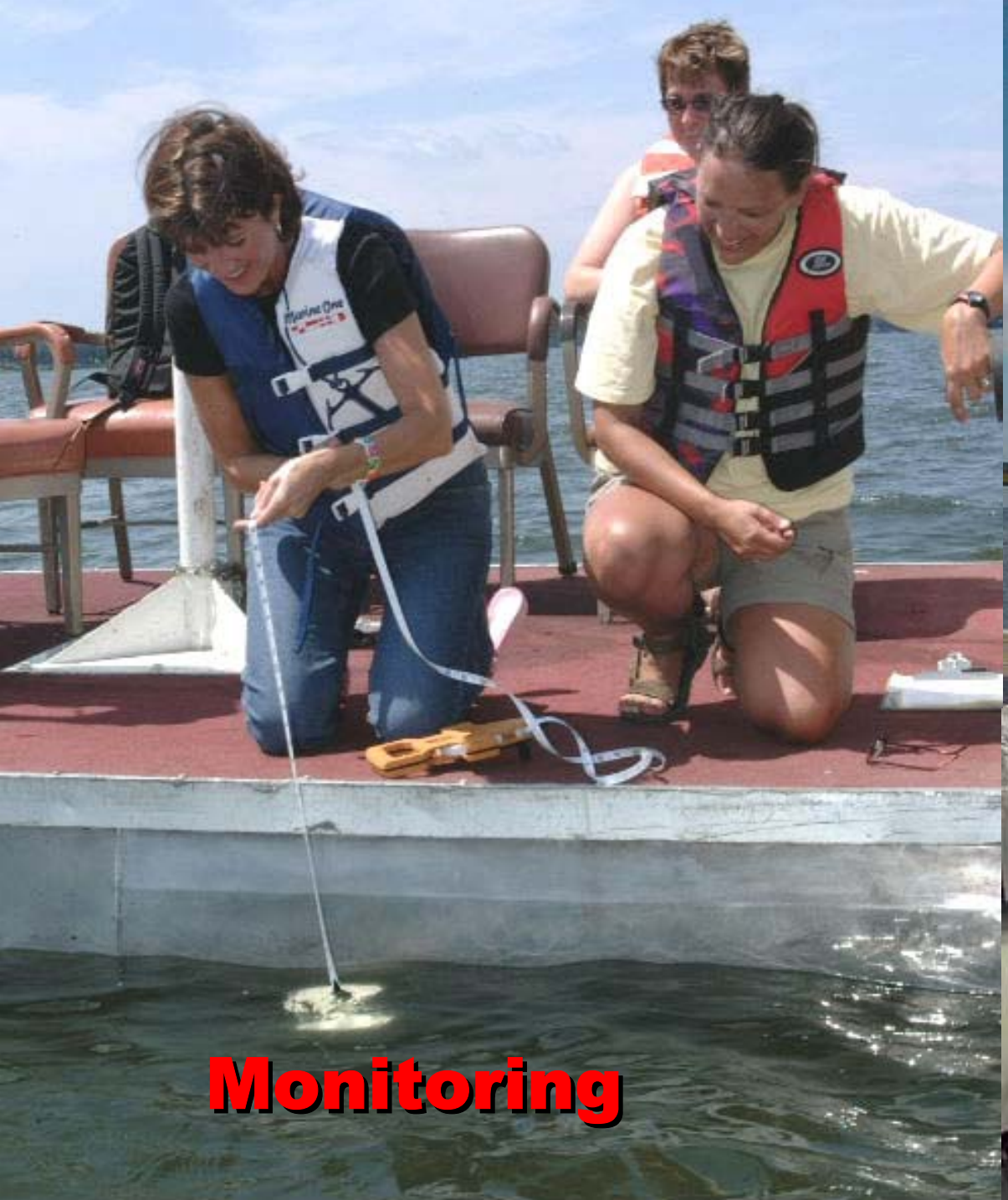
Reactive & Negative
Proactive & Positive


Albert Einstein
Go Dawgs!
“Problems cannot be solved at the same level of awareness that created them.”



Science

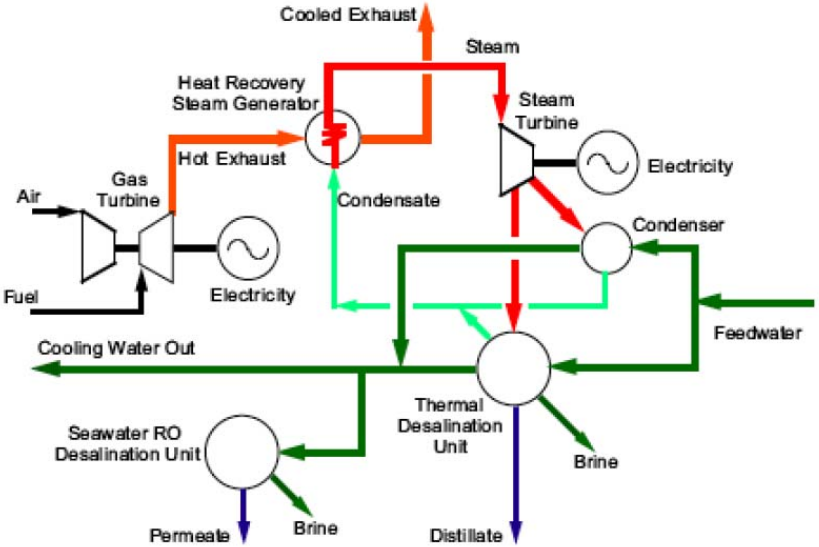
Education



Monitoring

The University of Georgia
C. M. Stripling
Irrigation Research Park
College of Agricultural and Environmental Sciences

Research



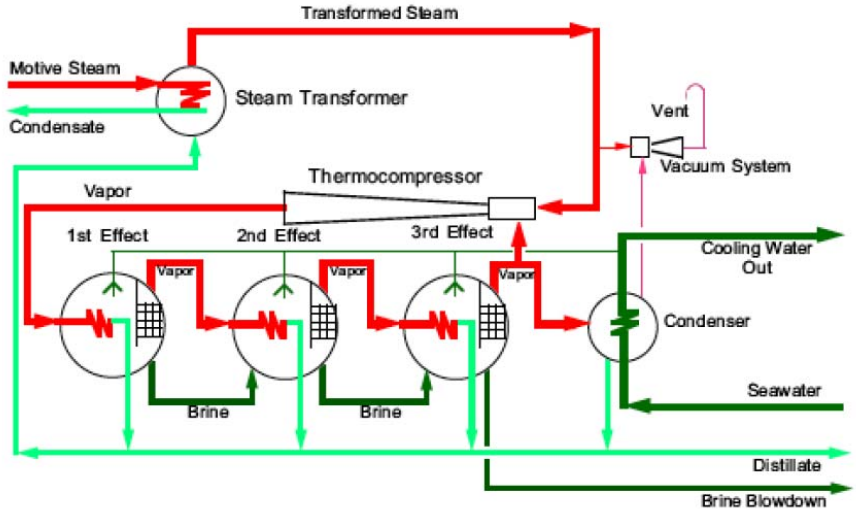


Figure 3 Diagram of multiple effect evaporation with thermal vapor compression

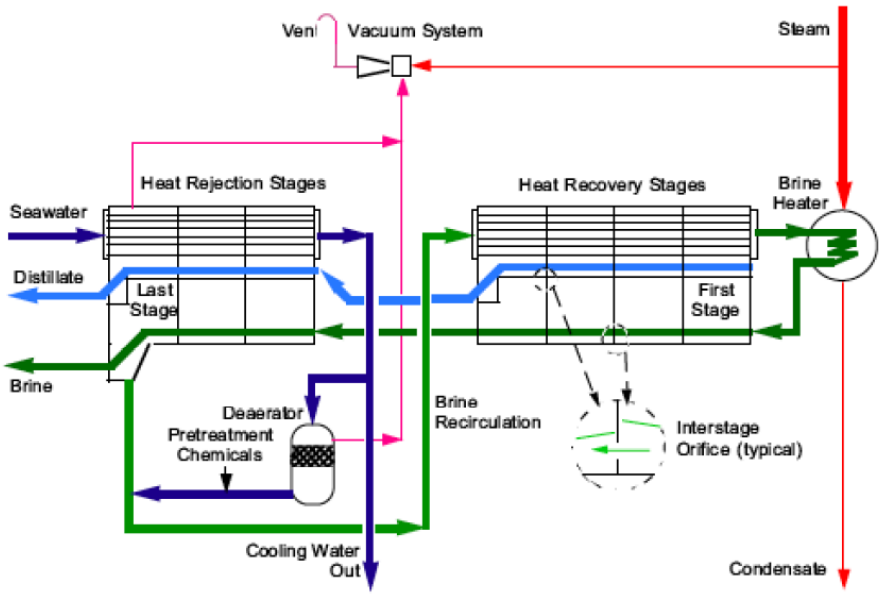


Figure 1 Multistage flash with brine recirculation

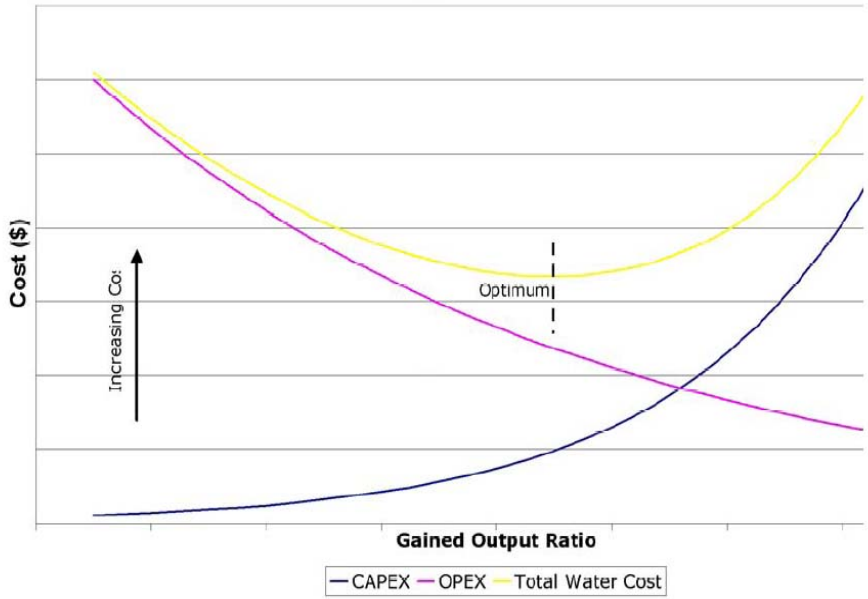
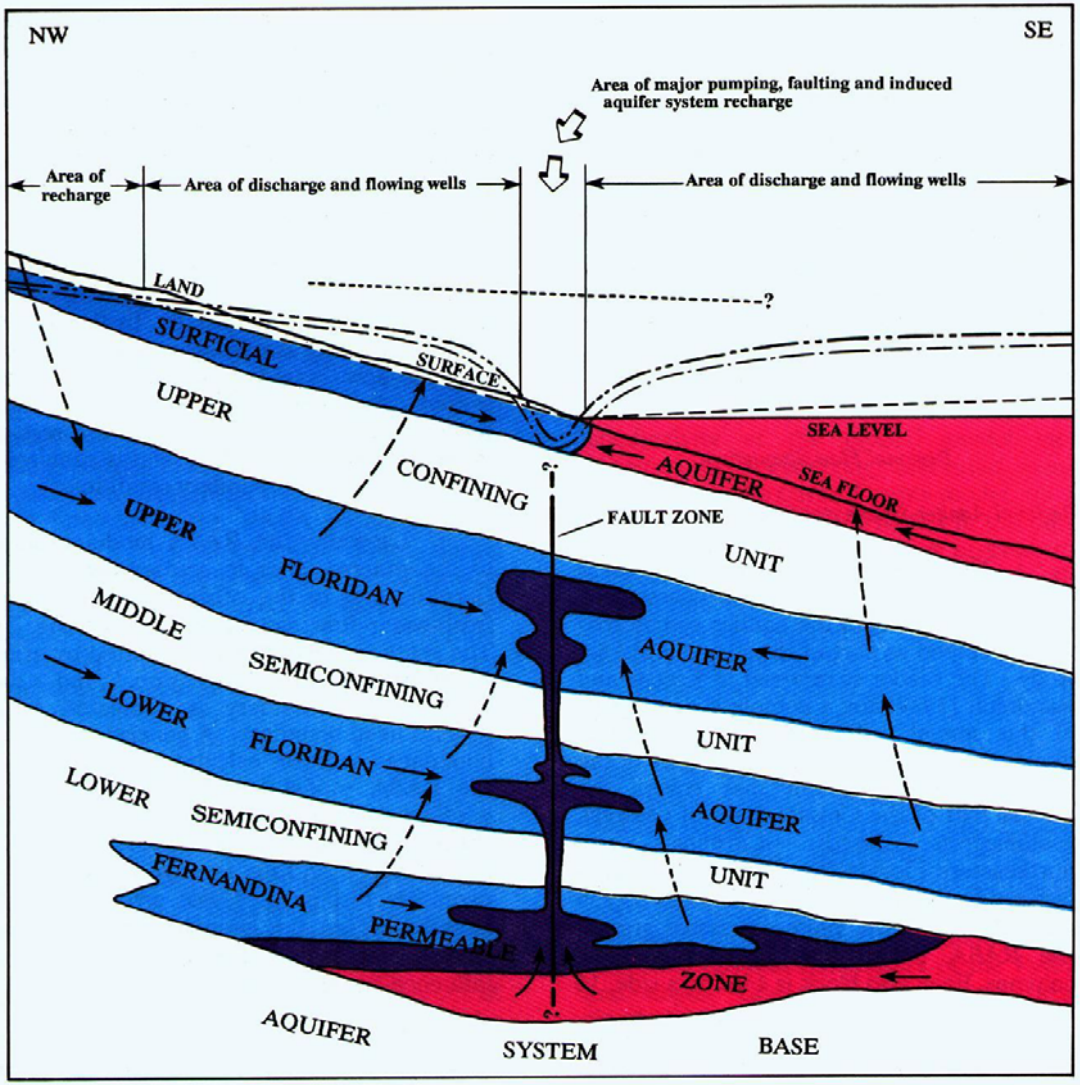


Figure 5 Capital, operational, and total water costs



EXPLANATION

FRESHWATER

SALTWATER

BRACKISH WATER

DIRECTION OF GROUND-WATER FLOW

EQUIVALENT FRESHWATER HEAD

WATER TABLE

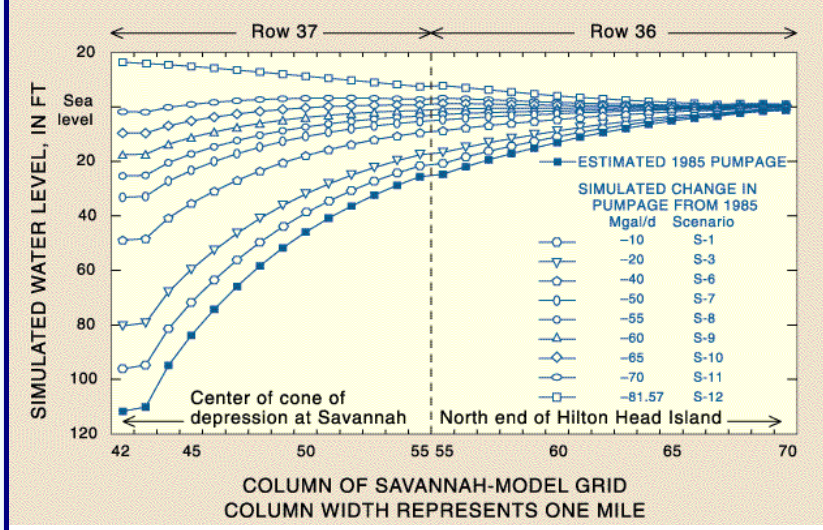
POTENTIOMETRIC SURFACES

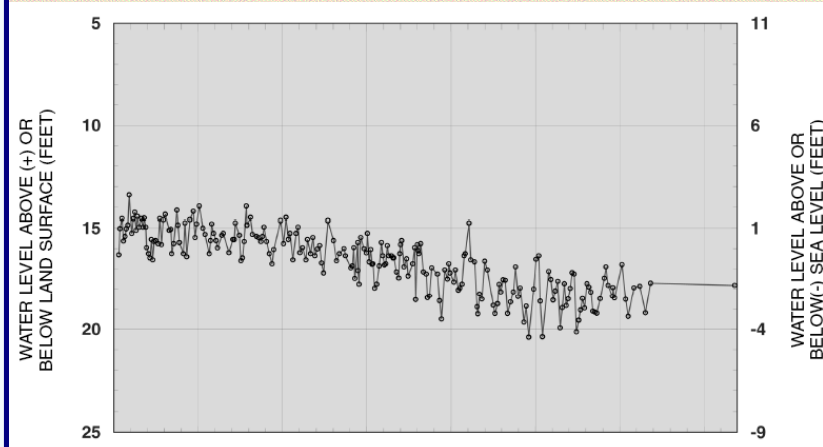
UPPER FLORIDAN AQUIFER

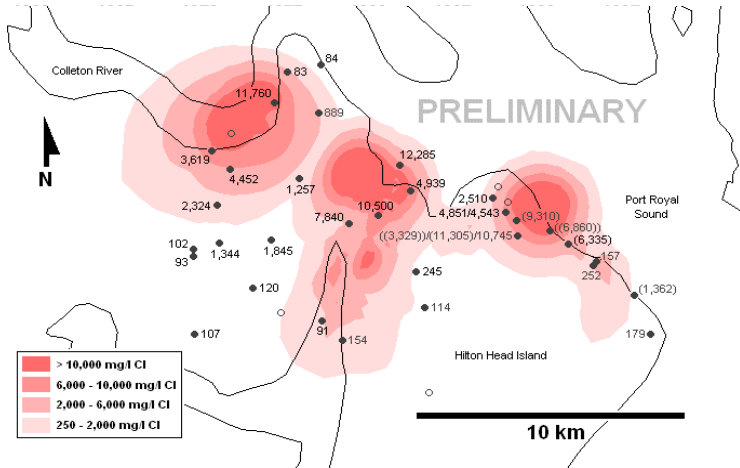
LOWER FLORIDAN AQUIFER

FERNANDINA PERMEABLE ZONE

Figure 10.--Idealized section of the Floridan aquifer system under 1985 conditions showing the effects of faulting on the ground-water-flow system. Modified from Krause and Randolph (1989).







Effective Communication

Translators

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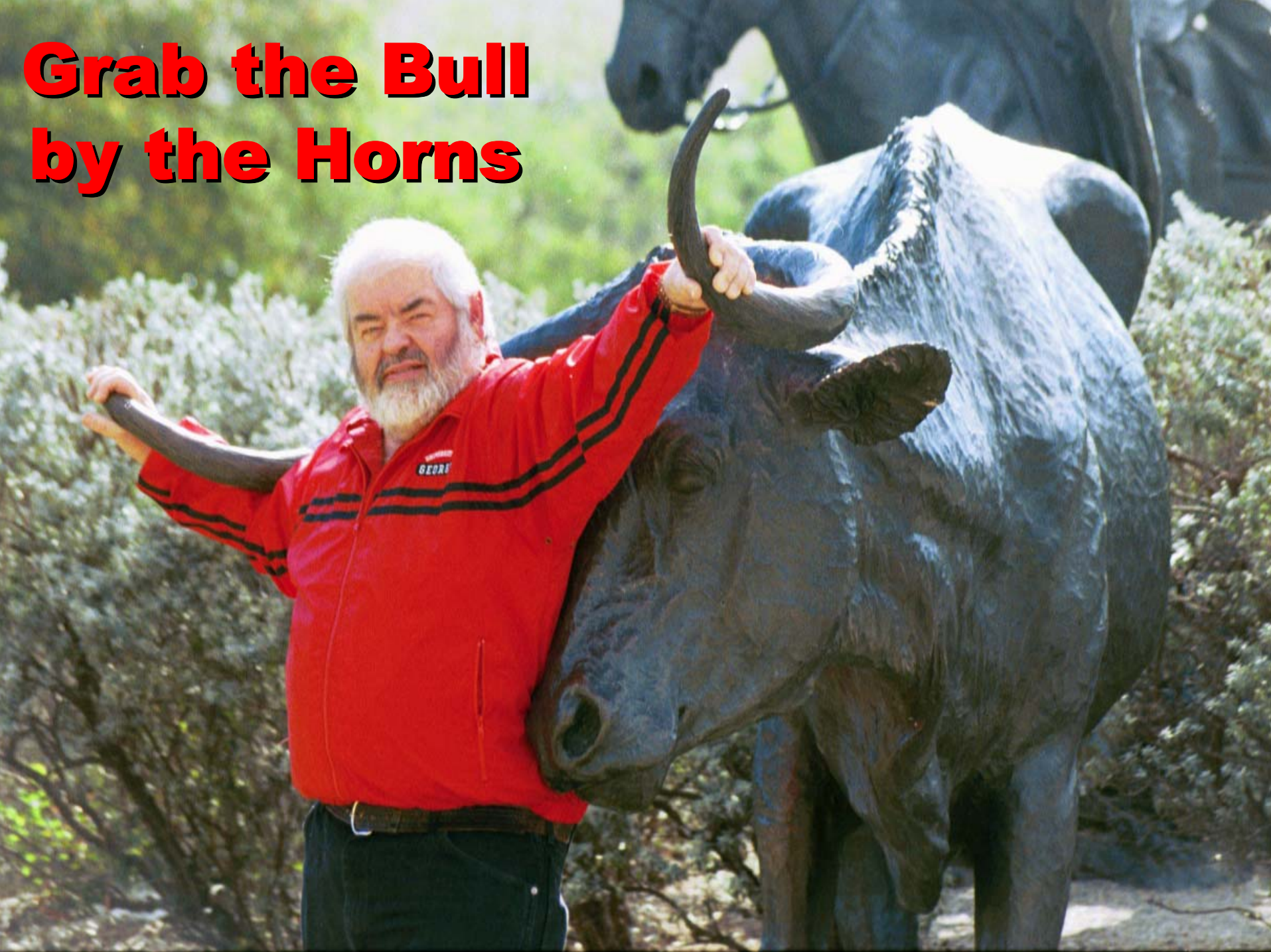
Who We Are
Gateway
Internet

Education

Grab the Bull by the Horns



WATCH
FOR
WATER

The End

Jim Kundell
Vinson Institute of Government
Institute of Ecology
University of Georgia

Public Service & Outreach