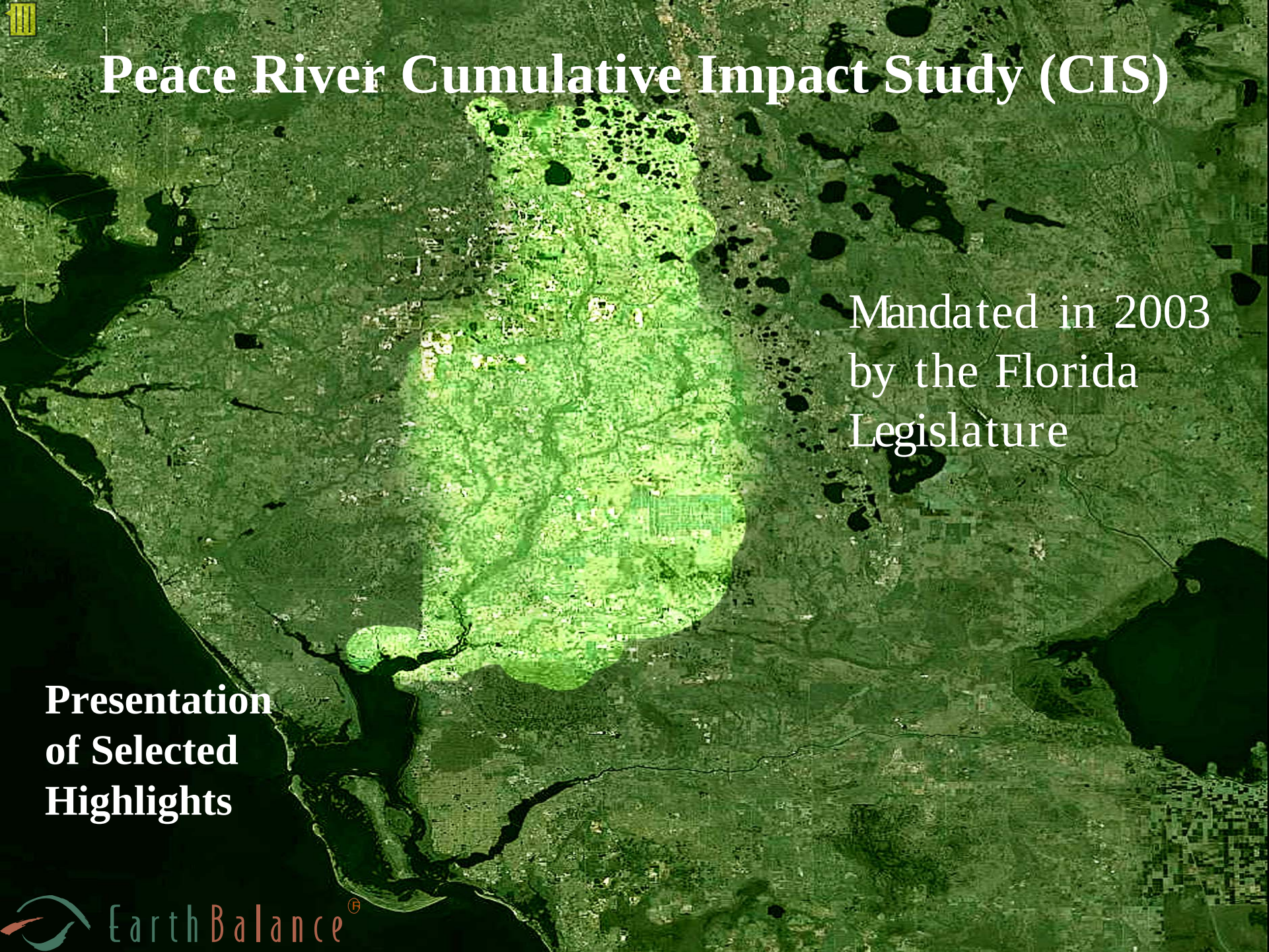
Peace River Cumulative Impact Study (CIS)



Mandated in 2003 by the Florida Legislature

Presentation of Selected Highlights

EarthBalance®

What did the Legislature ask for?

- Assess the cumulative impacts of *changes in landform and hydrology* in the Peace River watershed
- Form the technical foundation for the DEP Peace River Resource Management Plan
- Identify regulatory and non-regulatory actions to address cumulative impacts
- Recommend statutory changes to regulatory programs

  (Rule-making authority has already been granted for regulatory recommendations)

What is Unique about the Cumulative Impact Study?

- The study evaluates the effectiveness of regulations for first time on watershed scale
  - Environmental regulation began in the 1970's
  - Cumulative impacts are evident 30 years later
  - Central Question: Have regulations been effective in addressing cumulative impacts?
- The source information was obtained by methods independent of regulatory records
- The study is the work product of independent consultants, with review by DEP and SWFWMD staff

Preconceptions: True or False?

- Coastal populations demand water and this demand threatens the Charlotte Harbor estuary
- Phosphate mining threatens the river
- The watershed is mostly agricultural and, therefore, "undeveloped"
- So far, the "Heartland" has been spared the problems of development

Why study *past* (cumulative) impacts?

- Population *projections* for the "Heartland" show very large increases.
- The Peace River is a regional water supply for Charlotte, DeSoto, Manatee, and Sarasota counties, and supplies freshwater critical to the Charlotte Harbor estuary.
- Public agencies are programming significant money to fix cumulative impacts.
- The Peace River watershed is only 4% of Florida, and the study may have future implications for the rest of the State.



Future Land Use Scenarios for the Southwest Florida Region

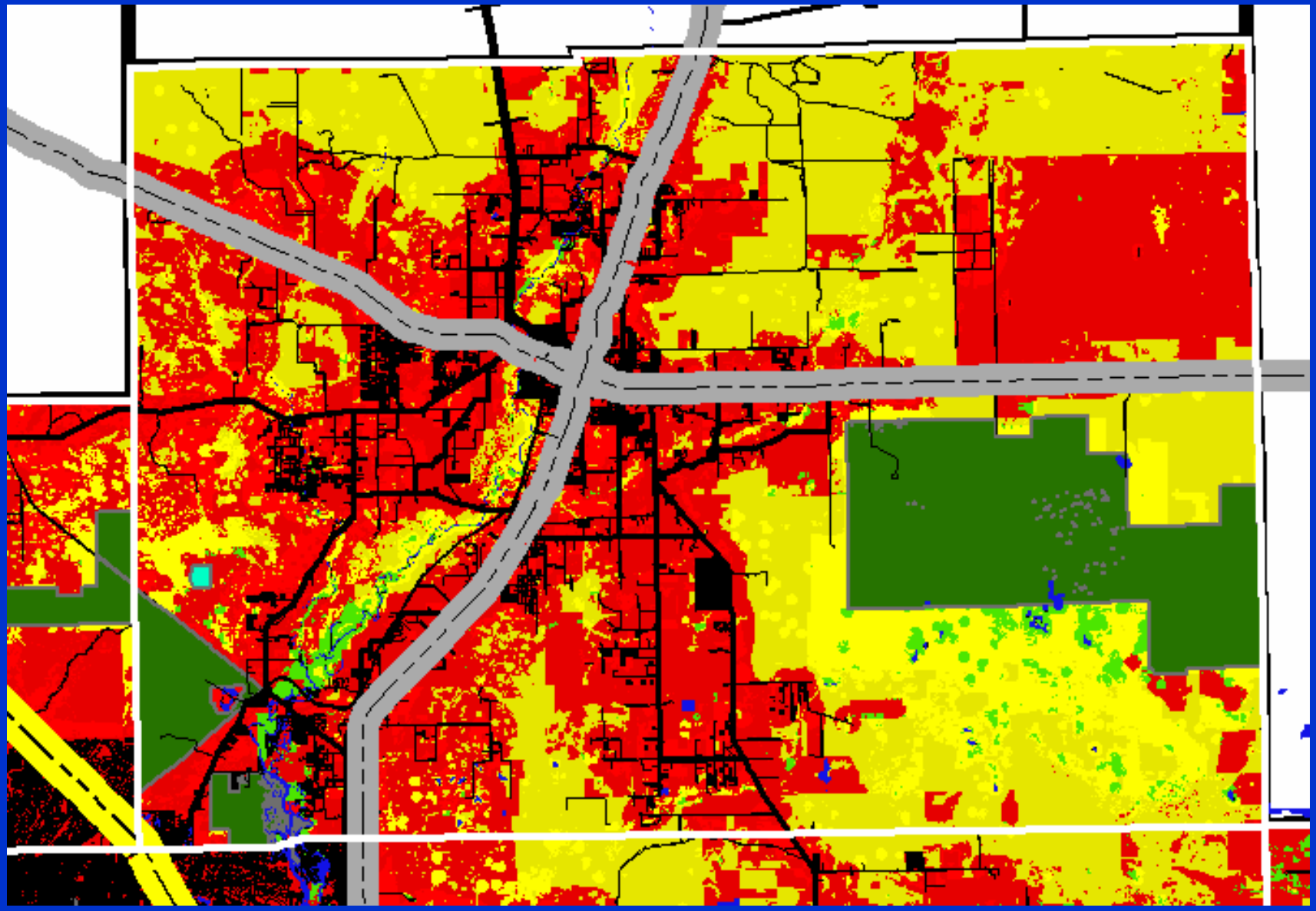
Sarasota, Desoto, Glades, Hendry, Charlotte, Lee and Collier

Geoplan Center
College of Design, Construction and Planning

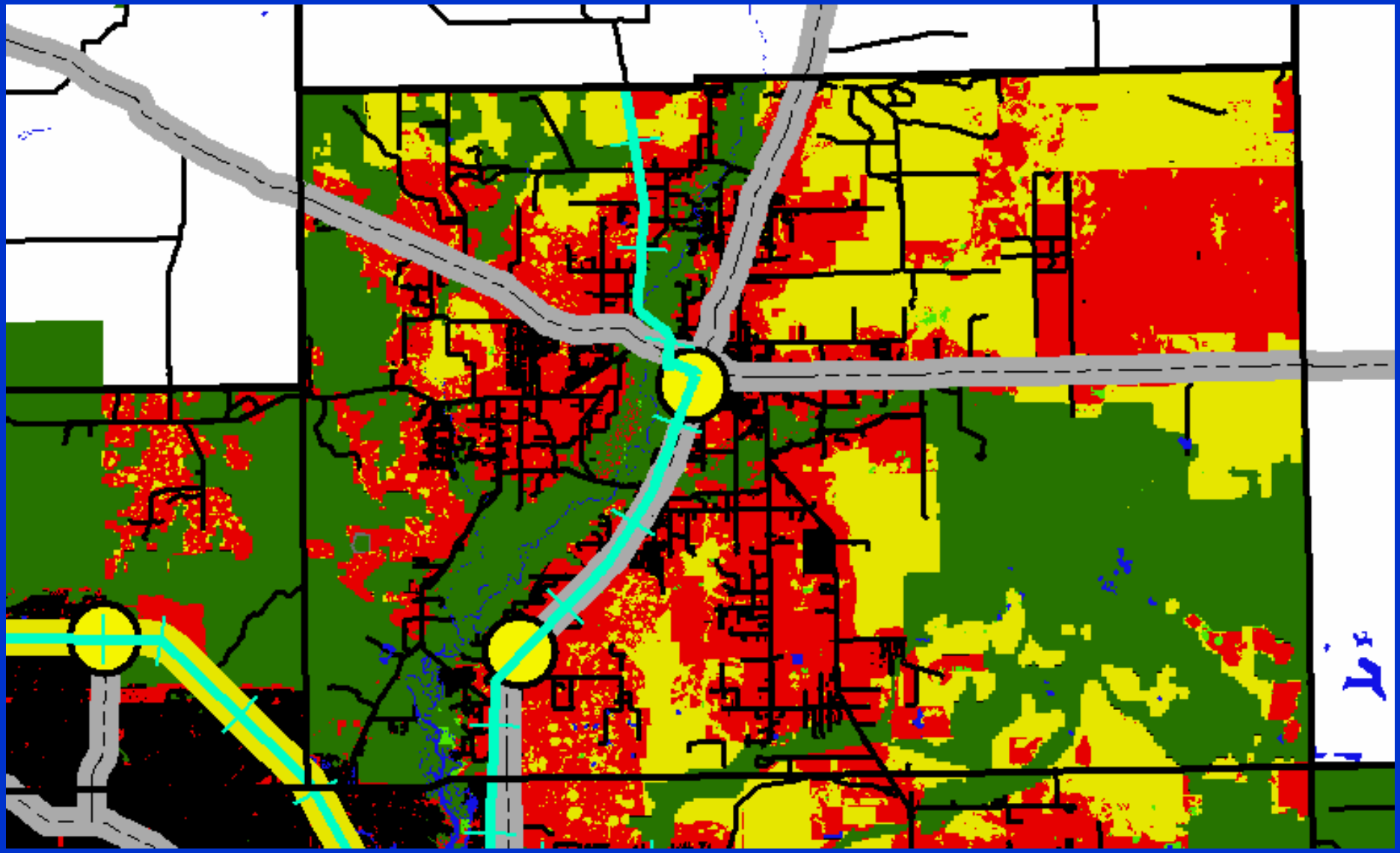
UF UNIVERSITY of FLORIDA

December 13, 2006

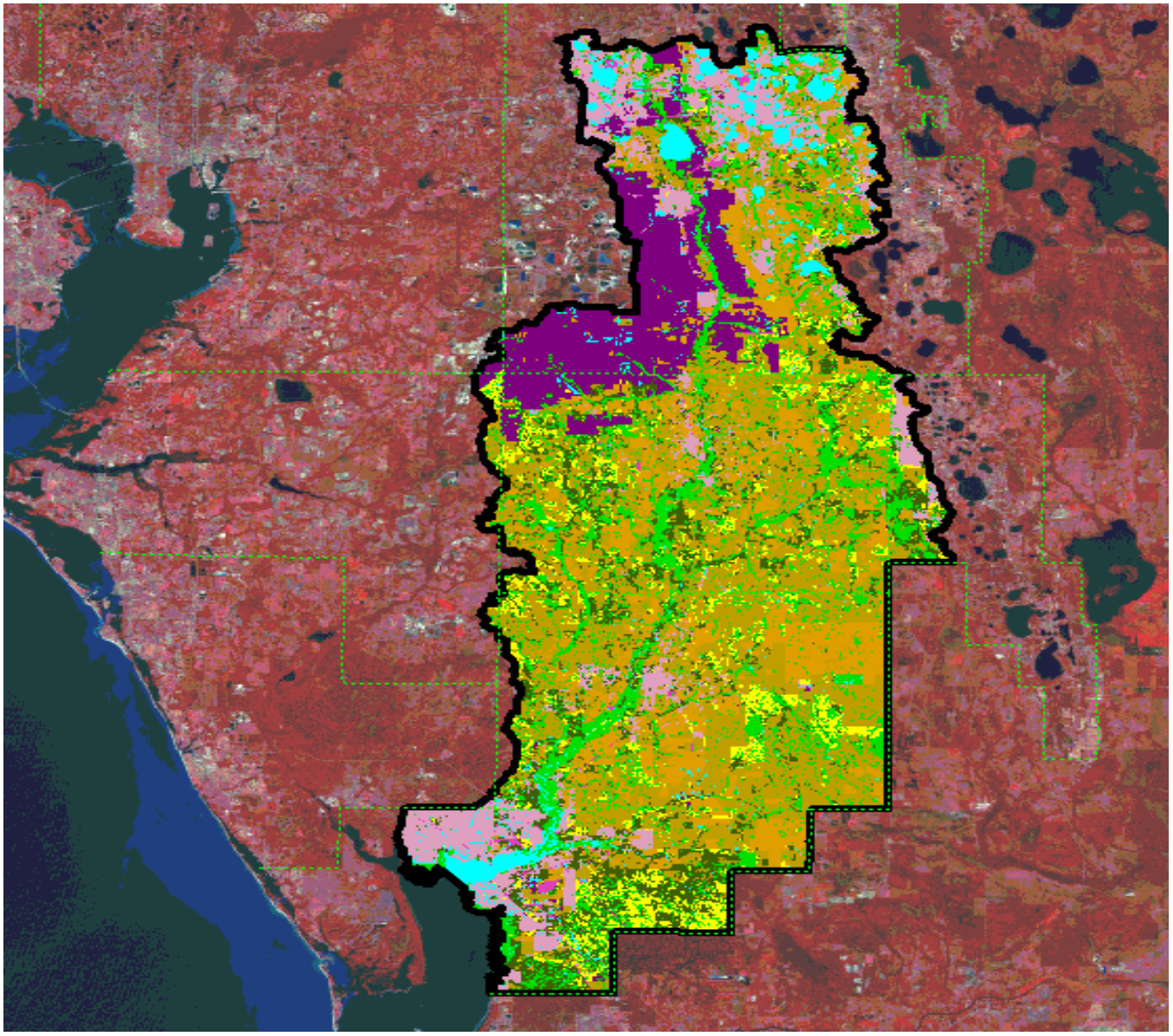
Desoto Results for Baseline Scenario



Composite Results - Desoto



Peace River Basin in 1999



Peace River

1999 Land Use

- Urban
- Agriculture
- Rangeland
- Upland Forest
- Water
- Wetlands
- Mining
- Transportation
- Citrus

What did the CIS address?

- River flow from the 1930s
- Water quality from the 1960s
- Land use from the 1940s
- Regulatory effectiveness since 1970s

River Flow

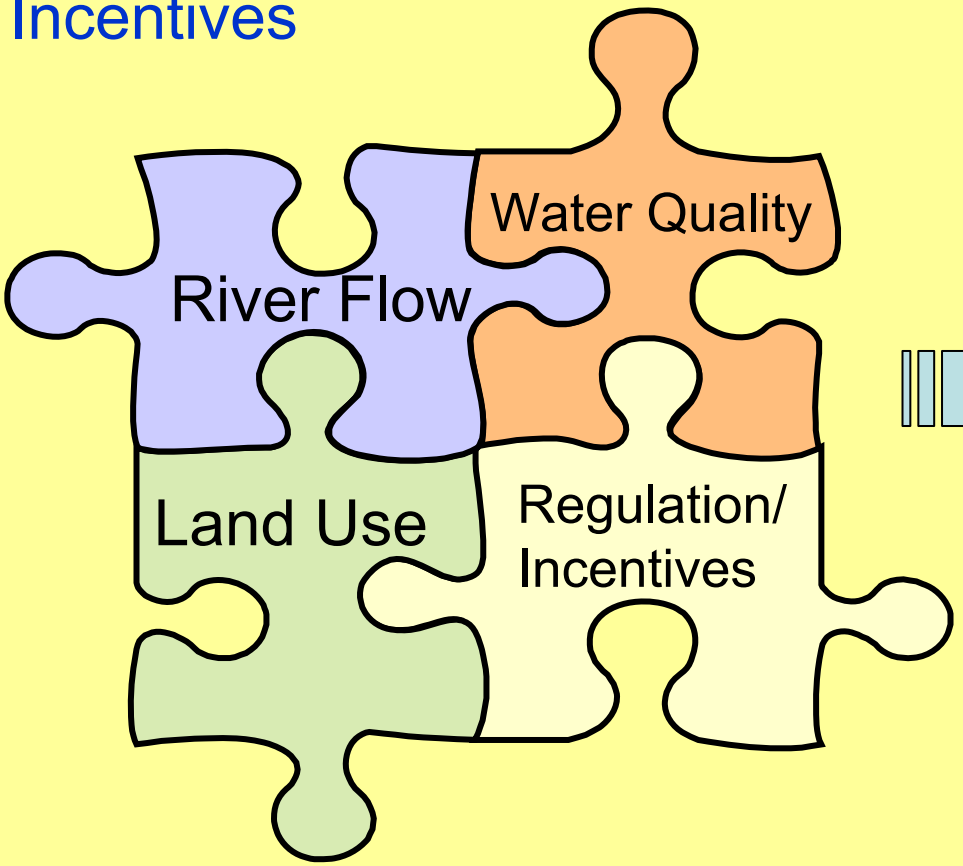
Water Quality

Land Use

Regulation & Incentives

Affect

Current and future demands on:
Water Supply
Aquatic Resources
Future Land Use and Economics
Recreational Opportunities



Goal

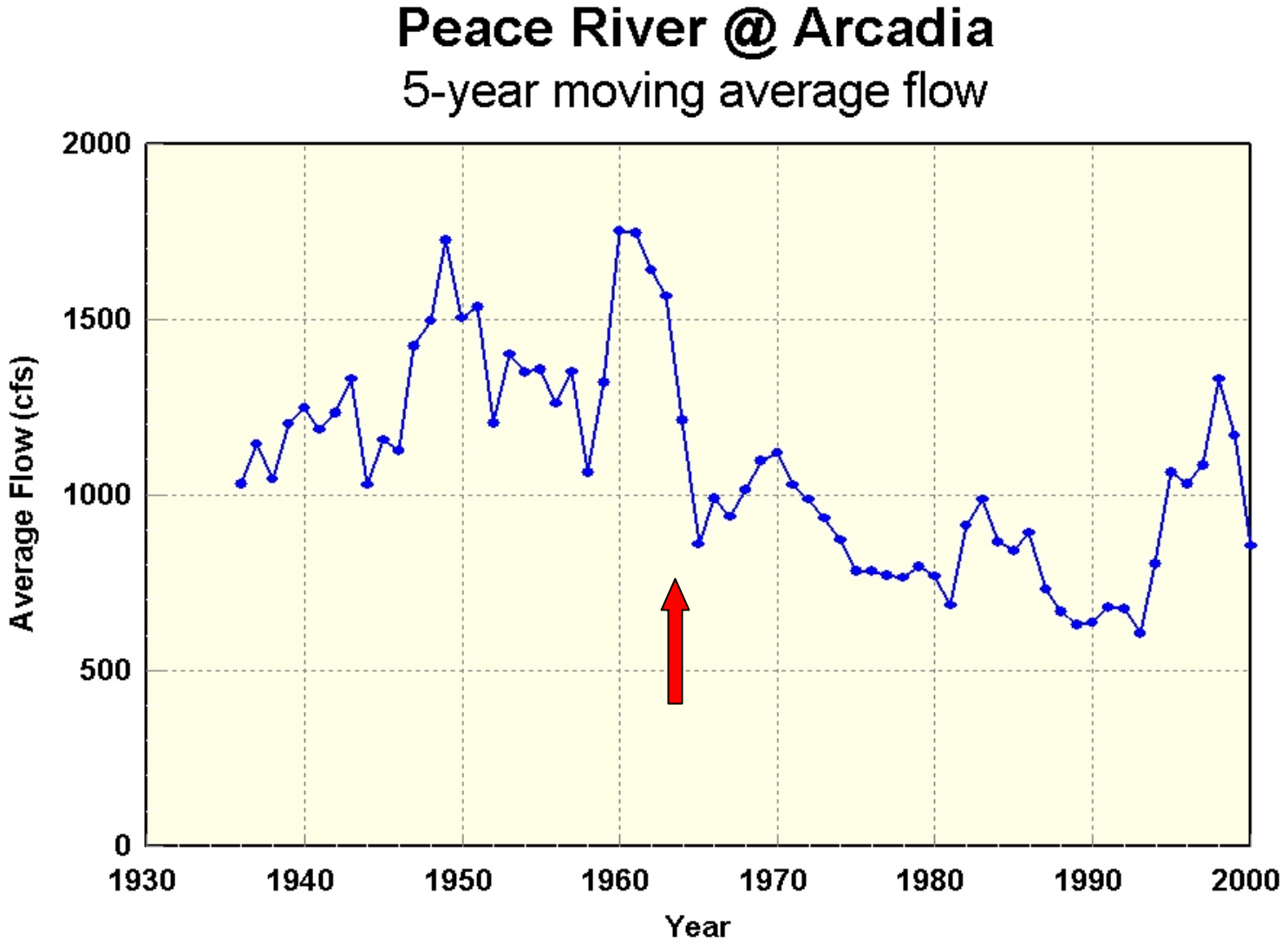
Stop on-going cumulative degradation

Protect water sources

Develop sustainable solutions for anticipated growth

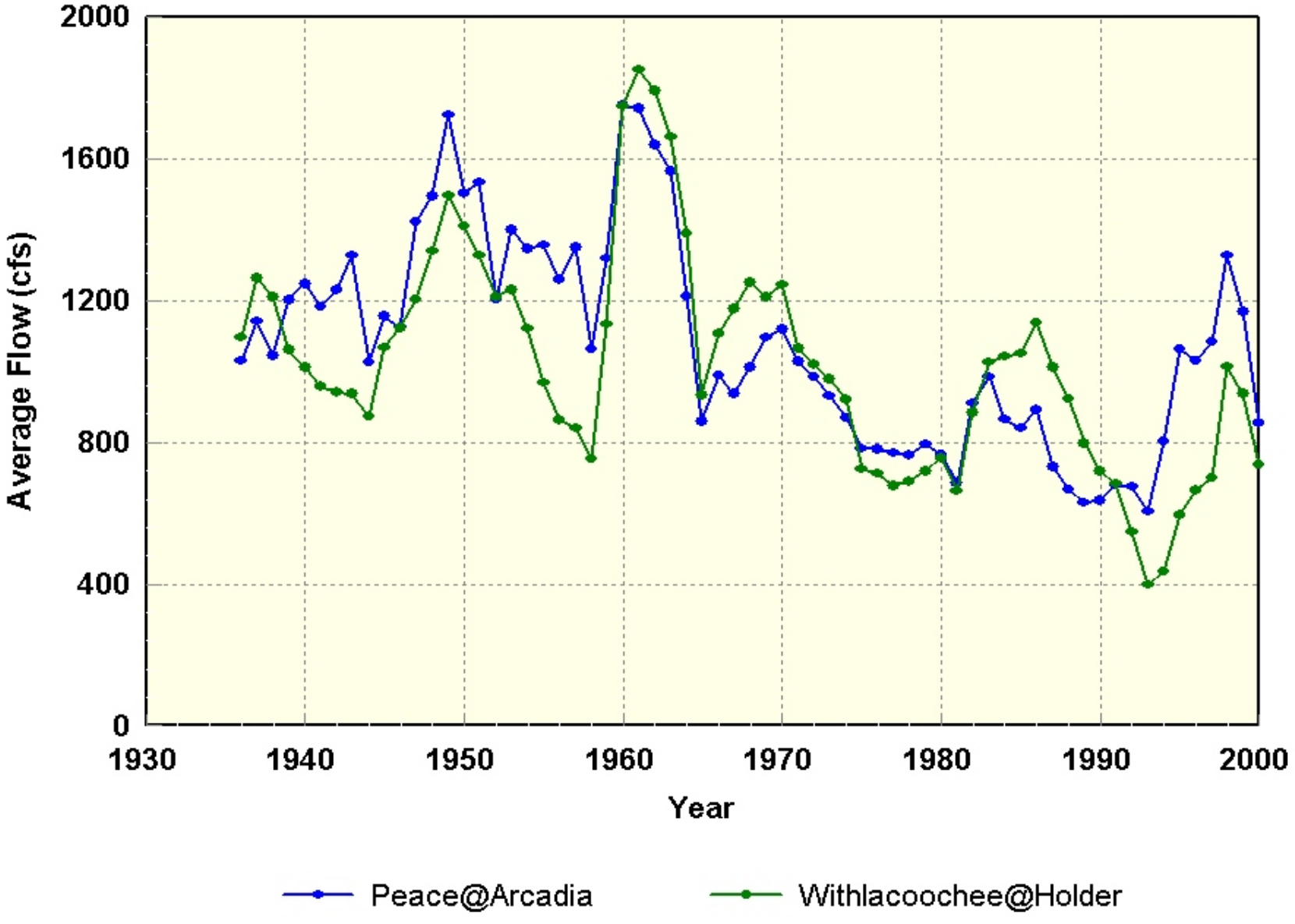
Questions about River Flow

- Why have Peace River flows declined?
- Why did Kissengen Springs (and others) stop flowing in the upper river?
- How are base flows (i.e., not directly related to rainfall) important to water supply?
- How is groundwater depletion in the SWUCA related to river flows and water supplies?


Peace River @ Arcadia
5-year moving average flow
Average Flow (cfs)
2000
1500
1000
500
0
1930
1940
1950
1960
1970
1980
1990
2000
Year

Peace & Withlacoochee Rivers

5-year moving average flow



Did less rainfall account for all the decreases in river flow?

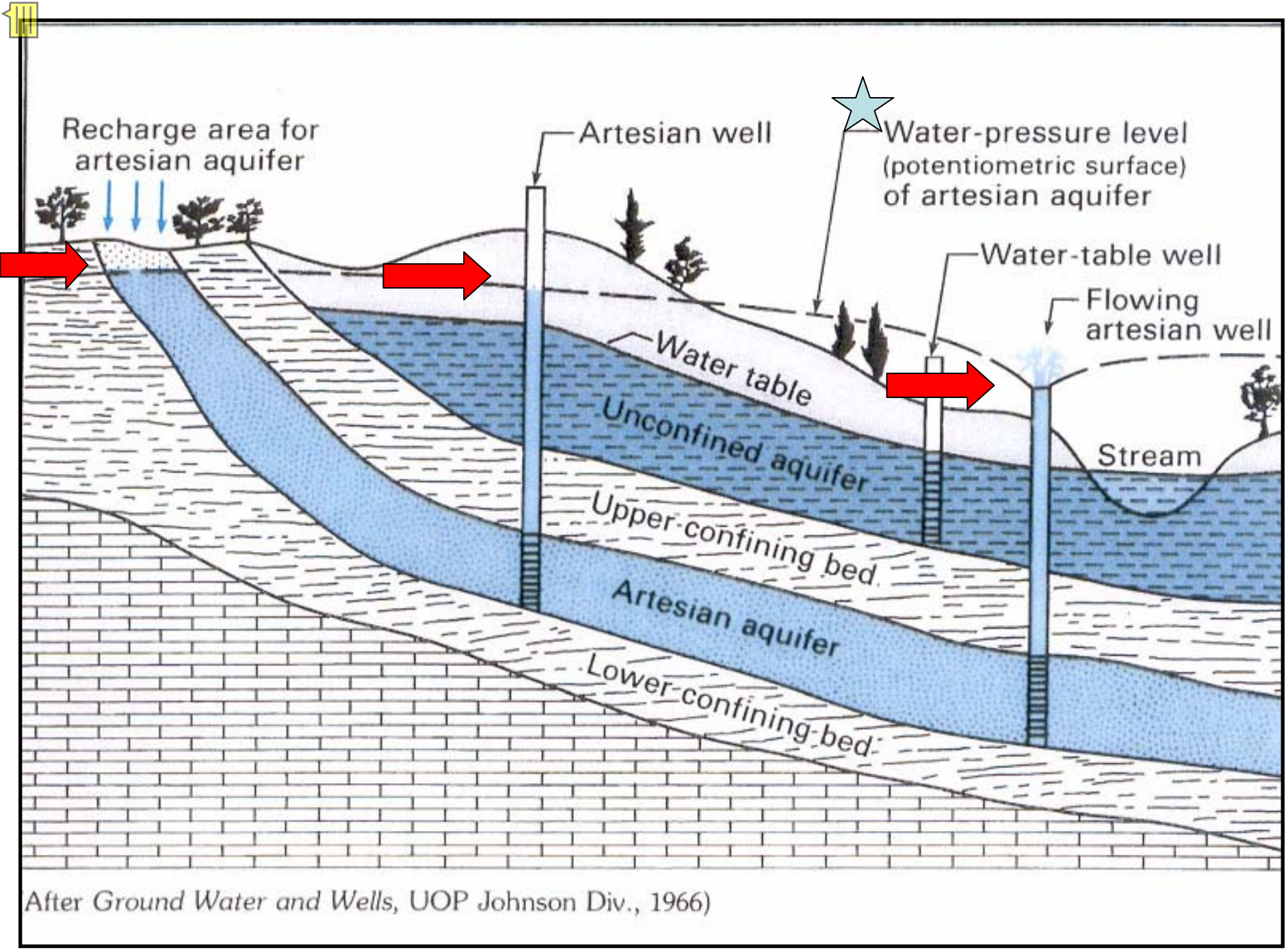
- No, rainfall was only a partial cause.
- River flow has decreased more than changes in rainfall would indicate, especially during the dry season.
- Even with increased flow from irrigation runoff, low flows are down more than expected.
- Low flow is also called base flow. Base flow occurs from the slow release of stored water during periods of no rainfall. (Base flow sustains natural systems and water supplies during droughts.)

Where does base flow come from?

- Water table (unconfined aquifer) as indicated by wetlands on flat terrain
- Artesian aquifers when connected to the surface by sinkholes or subsidence features

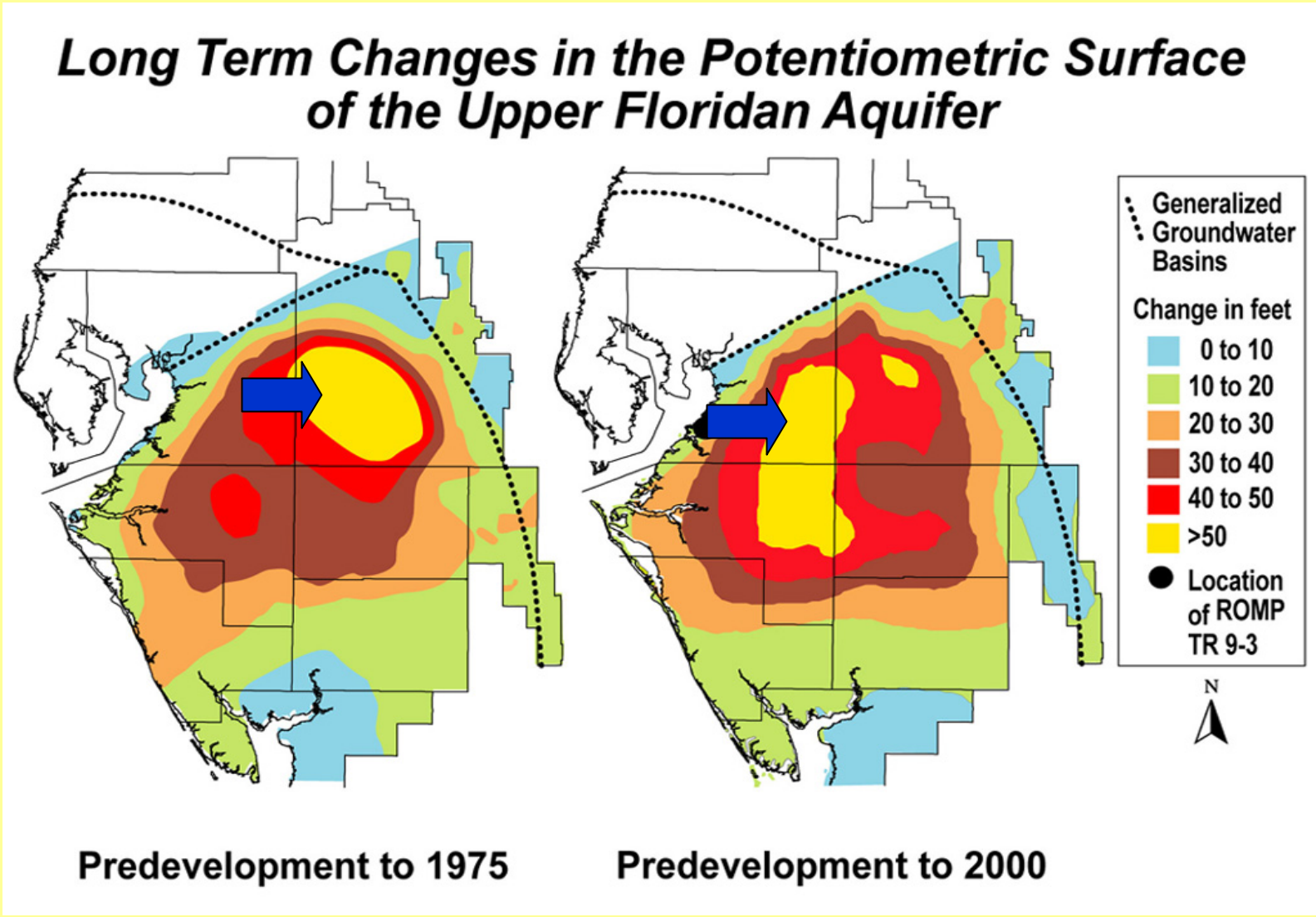
Wetlands are important storage features that we will look at later in the presentation

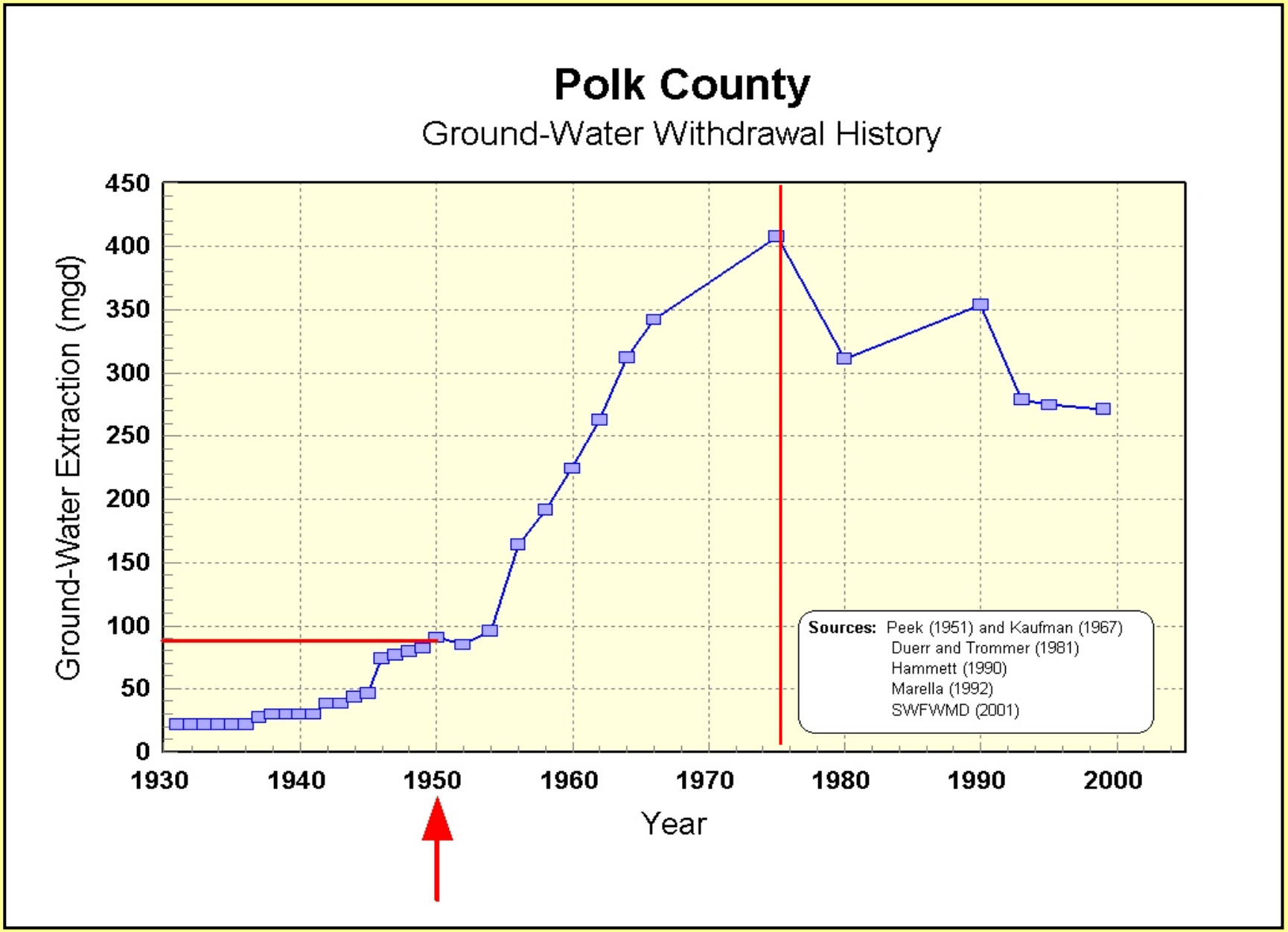
Now, let's look at the role of artesian aquifers …



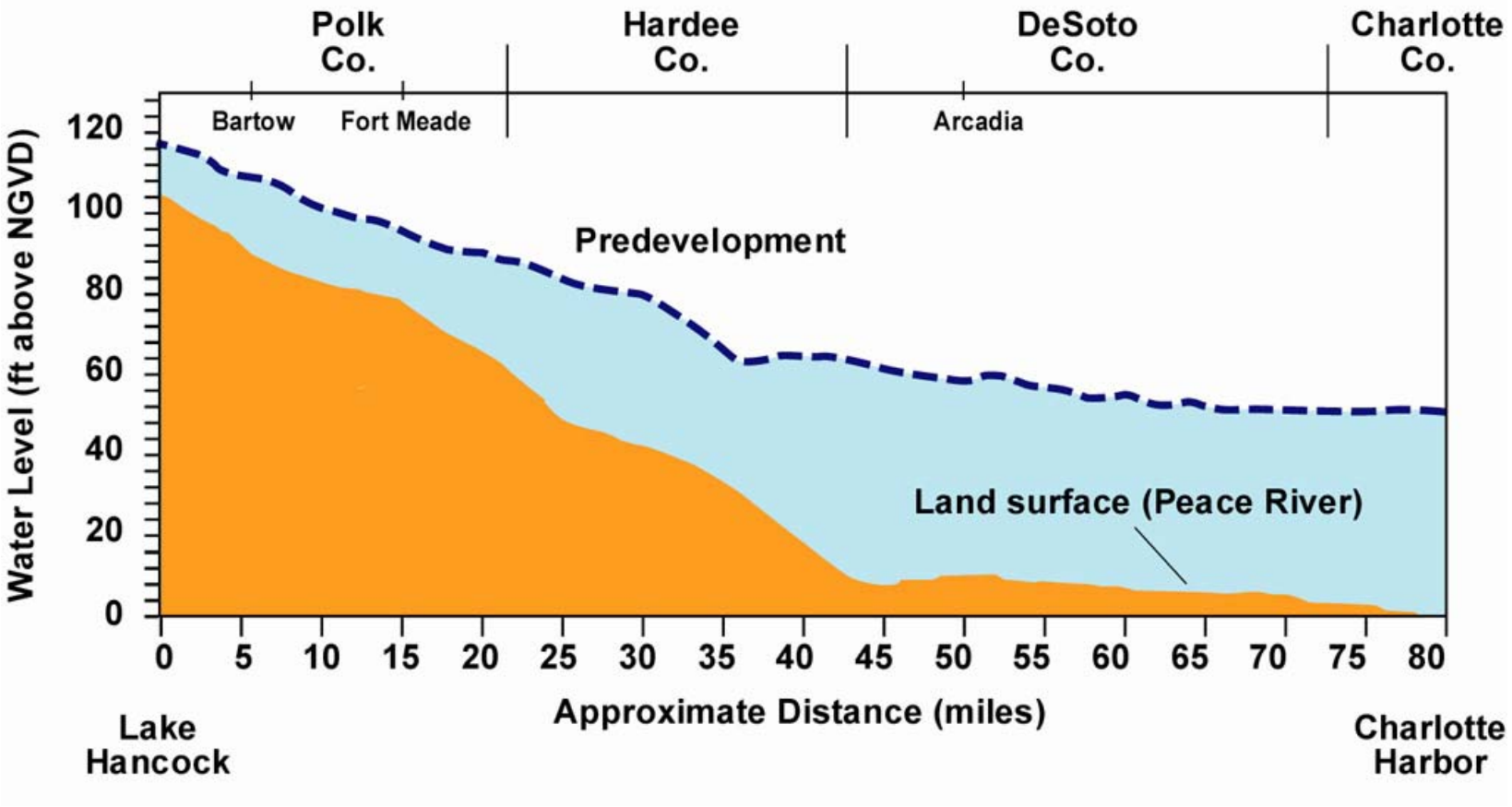
After *Ground Water and Wells*, UOP Johnson Div., 1966)

Groundwater Declines




Polk County
Ground-Water Withdrawal History
Ground-Water Extraction (mgd)
450
400
350
300
250
200
150
100
50
0
1930
1940
1950
1960
1970
1980
1990
2000
Year
Sources: Peek (1951) and Kaufman (1967)
Duerr and Trommer (1981)
Hammett (1990)
Marella (1992)
SWFWMD (2001)

Generalized Potentiometric Surface of the Upper Floridan Aquifer along the Peace River



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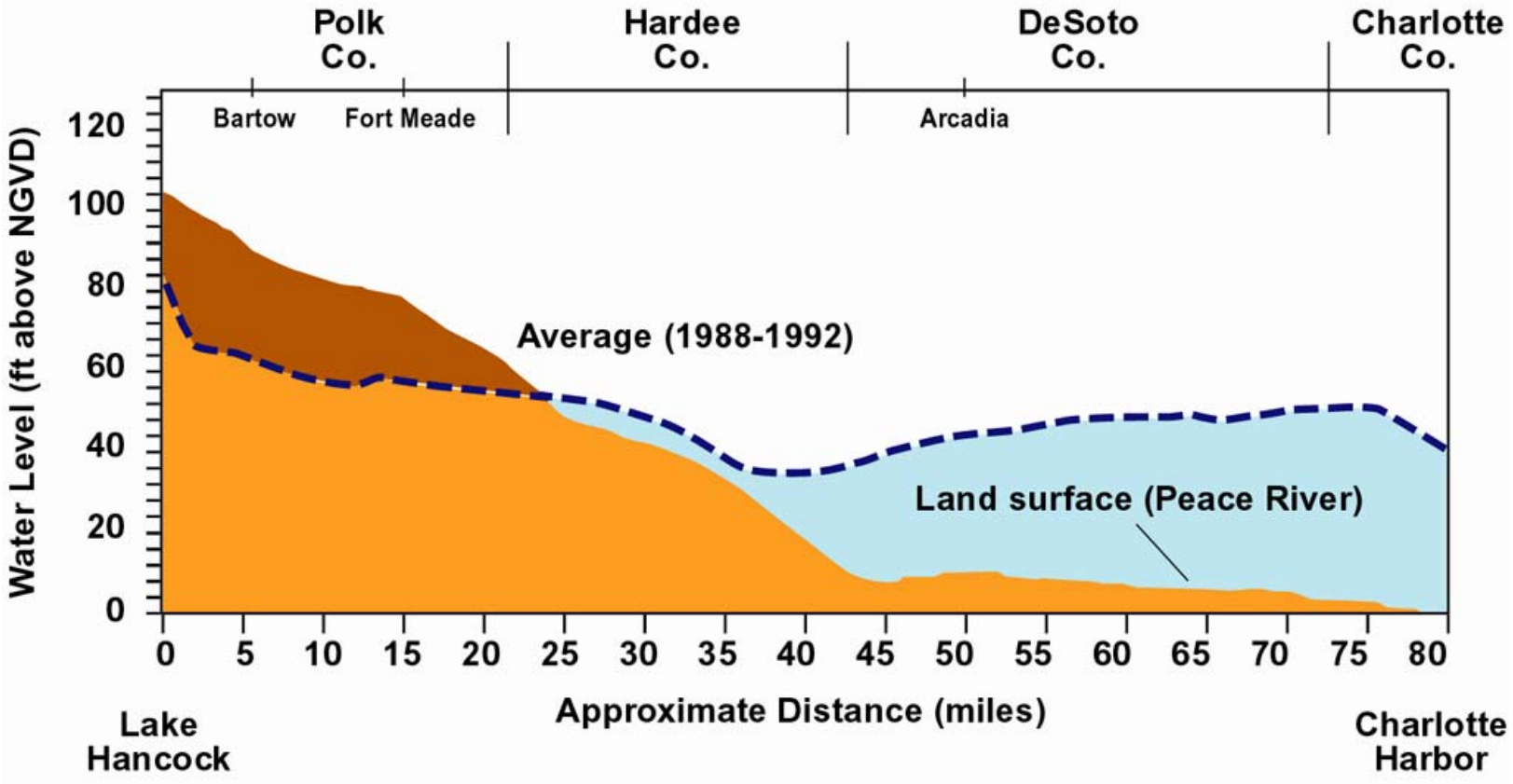
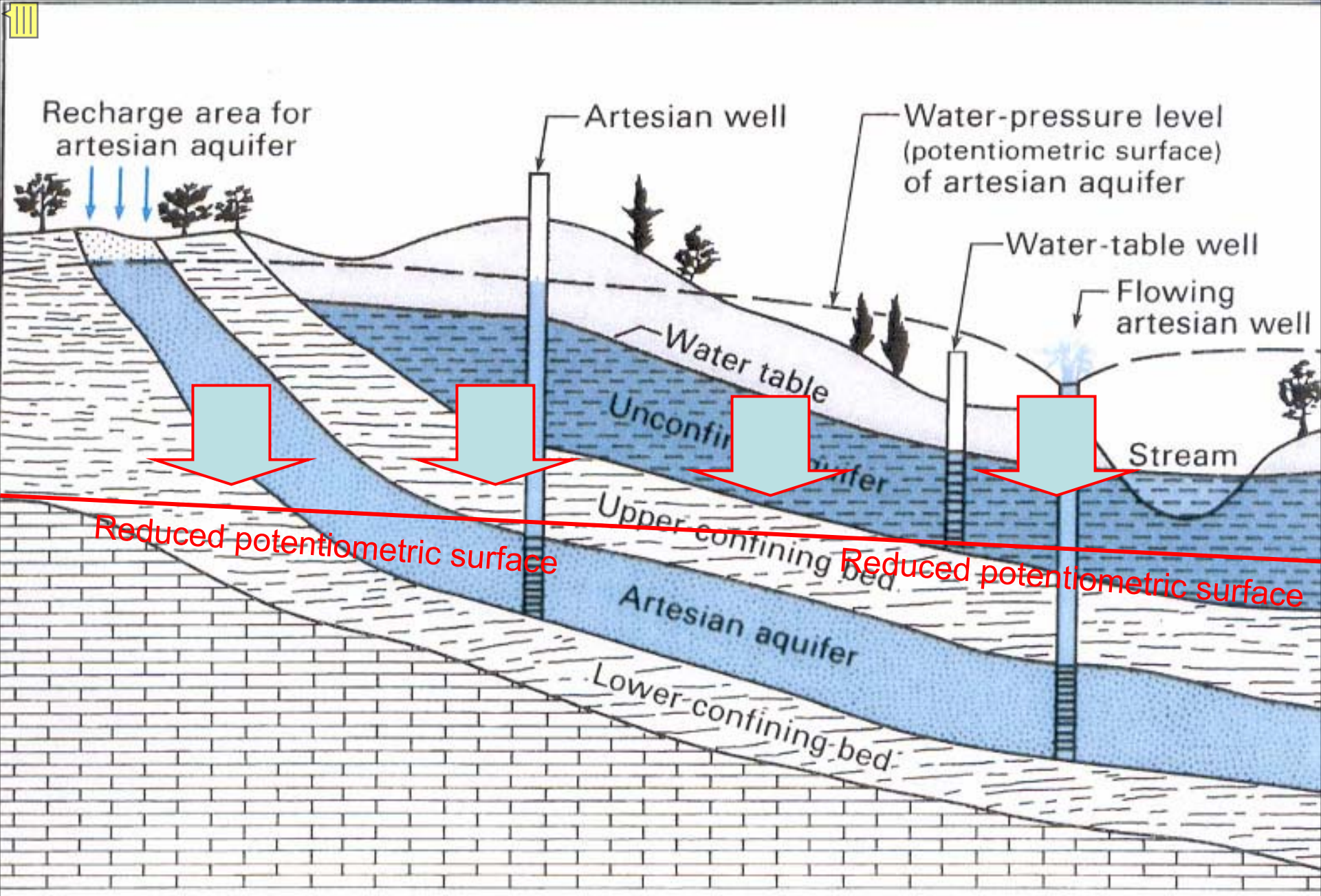
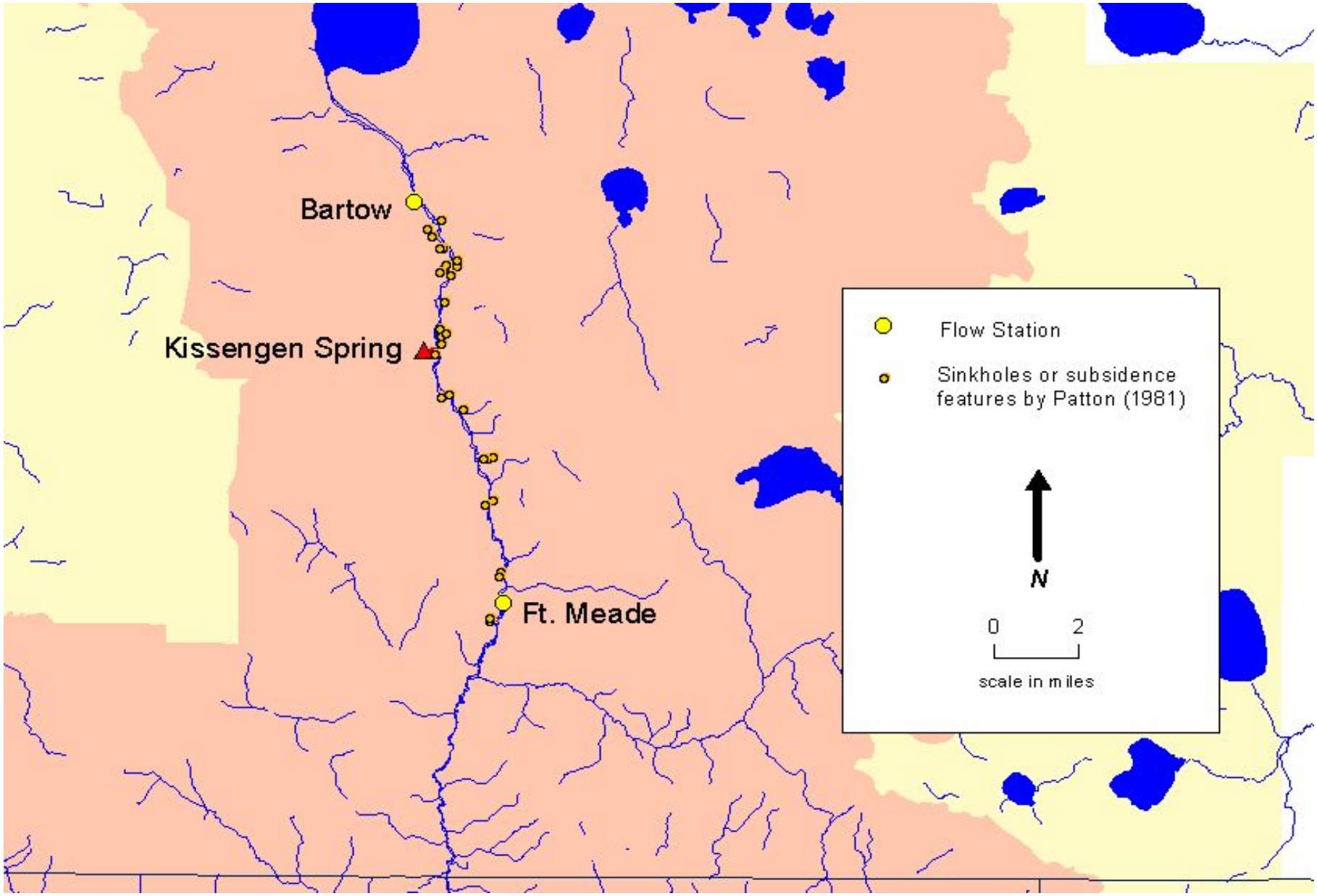
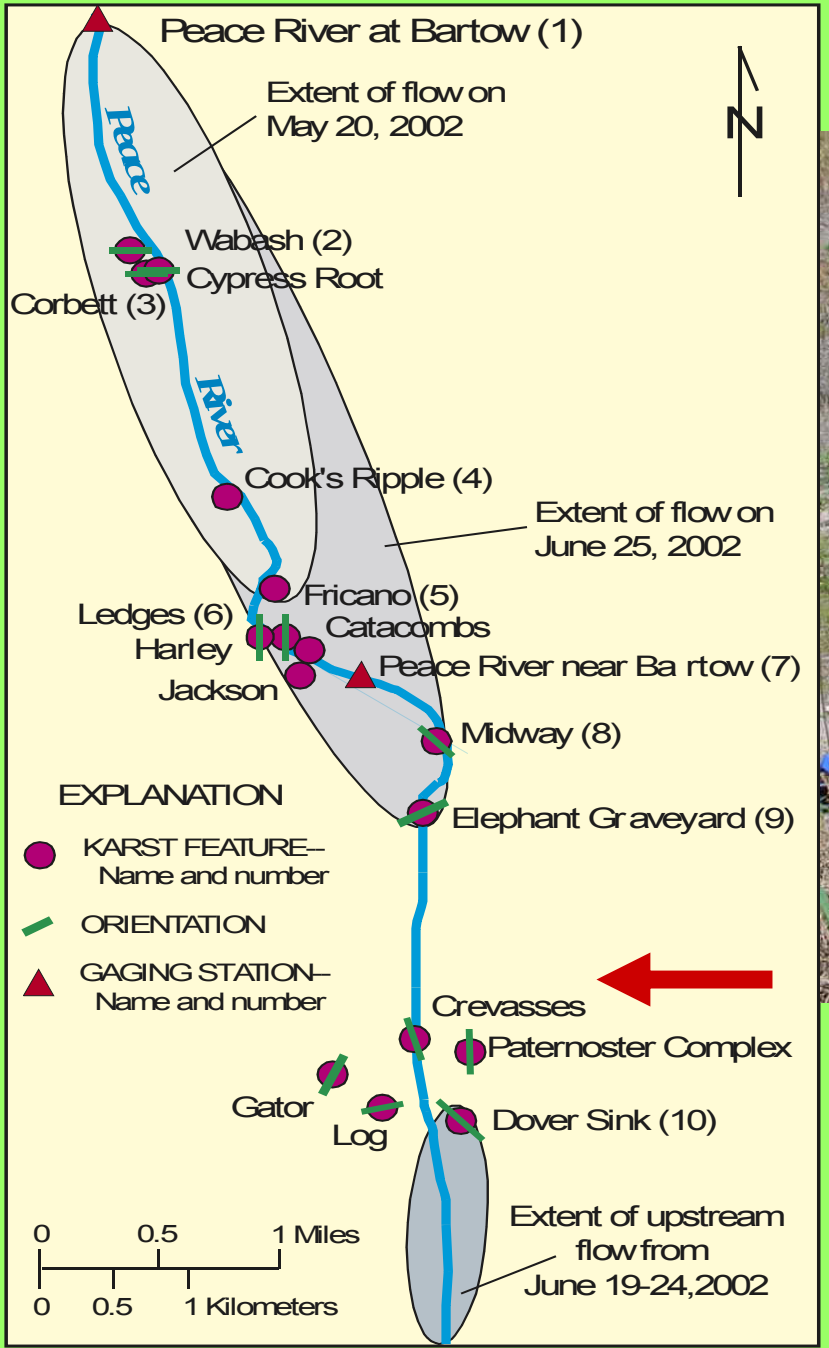




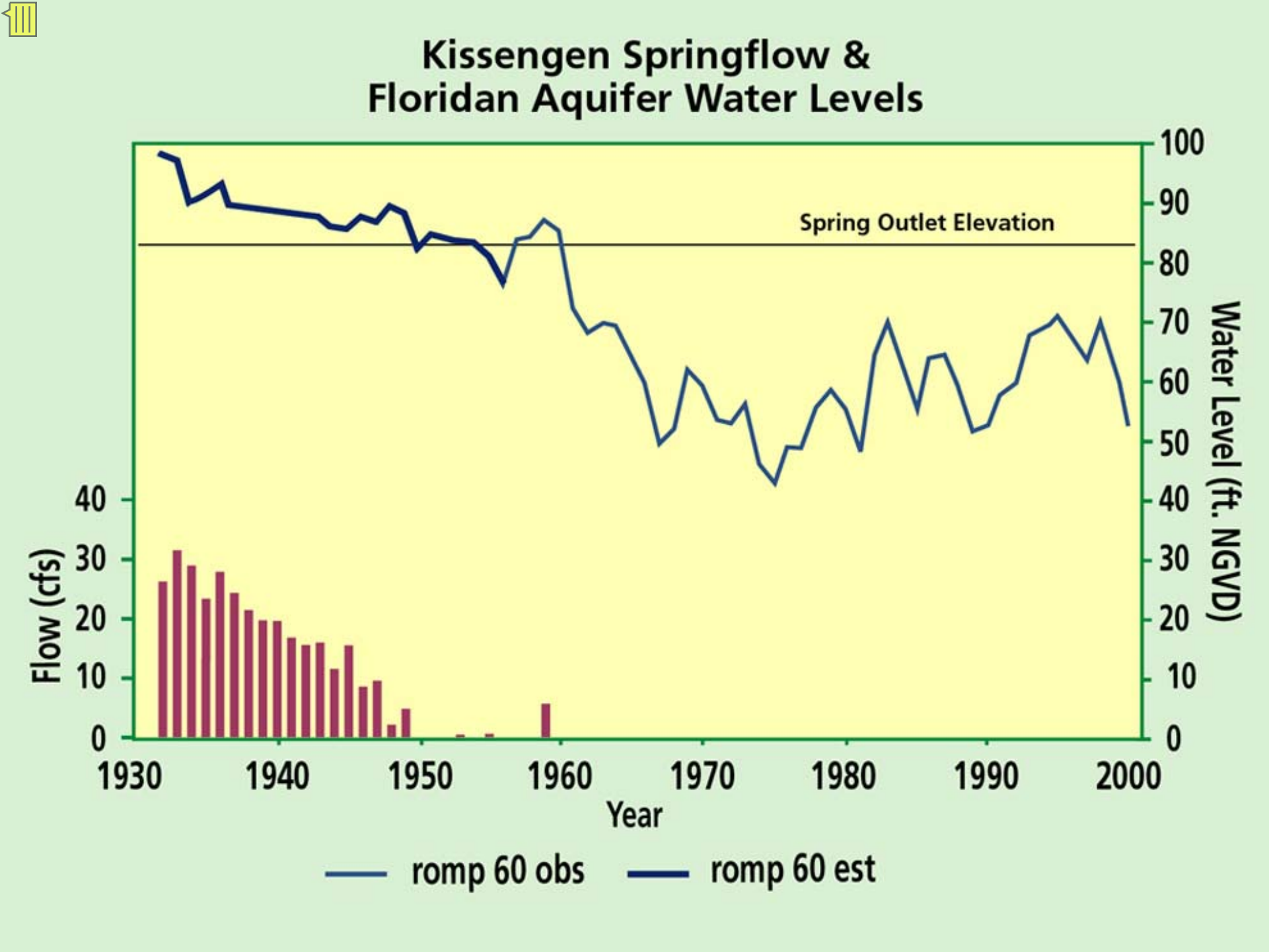
(After *Ground Water and Wells*, UOP Johnson Div., 1966)


Bartow
Kissengen Spring
Ft. Meade
Flow Station
Sinkholes or subsidence features by Patton (1981)
N
0
2
scale in miles


Peace River at Bartow (1)
Extent of flow on May 20, 2002
N
Peace
River
Wabash (2)
Cypress Root
Corbett (3)
Cook's Ripple (4)
Extent of flow on June 25, 2002
Fricano (5)
Ledges (6)
Catacombs
Harley
Jackson
Peace River near Ba rtow (7)
Midway (8)
EXPLANATION
KARST FEATURE– Name and number
ORIENTATION
GAGING STATION– Name and number
Elephant Gr aveyard (9)
Crevasses
Paternoster Complex
Gator
Log
Dover Sink (10)
Extent of upstream flow from June 19-24,2002
0 0.5 1 Miles
0 0.5 1 Kilometers


2002 5 15

Crevasses


Kissengen Springflow &
Floridan Aquifer Water Levels
Spring Outlet Elevation
Flow (cfs)
0
10
20
30
40
Water Level (ft. NGVD)
0
10
20
30
40
50
60
70
80
90
100
1930
1940
1950
1960
1970
1980
1990
2000
Year
romp 60 obs
romp 60 est

Summary of Flow Changes

- Before 1970's there was an overall *decline in flows* beyond that related to rainfall patterns
  - Associated with declines in aquifer levels and loss of spring flows in the upper watershed that occurred before 1960's
  - Associated with significant loss of wetland storage throughout the watershed from 1940's

- Starting in 1950's, the lower watershed (Horse, Joshua, Shell and Prairie Creeks) flows have actually *increased* from agricultural irrigation
  - Associated with land clearing, wetland losses and agricultural development
  - Flows from irrigation wells have a groundwater "signature"

Good News: Upper Peace River Water Quality Improving

- Upper Peace River water quality poor, but improving since 1960s with elimination of direct pollutant discharges
    - Lake Hancock will be used for storage and its discharge will be treated by a man-made wetland
    - Total Maximum Daily Loads are being established by DEP on impaired waters in upper Peace River watershed

Lower Peace River Water Quality Getting Worse

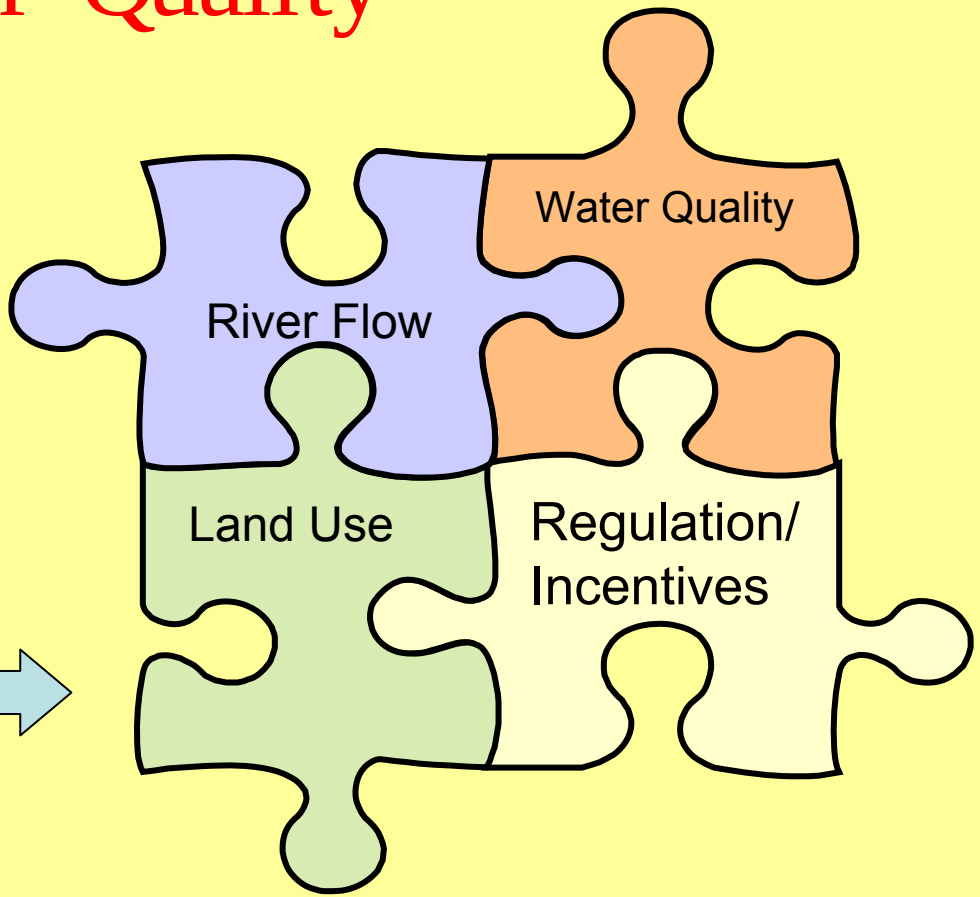
- Lower Peace River -- tributaries are becoming highly mineralized
  - Floridan aquifer is relatively salty in the lower basins
  - Agricultural irrigation brings these salts to the surface where they enter streams
  - Some streams have been “impaired” by well water
  - The City of Punta Gorda’s water supply was degraded in the 2001 drought – bringing the problem into sharp focus
- Even where water supplies are not threatened, the study found evidence of impacts to fish communities from increased mineralization.
- DEP is reviewing mineralization standards and may recommend more stringent standards in the future.

Resolving the Conflict with Punta Gorda's Water Supply

- SWFWMD and DEP have worked together to help agricultural irrigation users meet acceptable levels by 2014.
- The challenge is to resolve the conflict between agricultural users, who depend on irrigation water, and the City of Punta Gorda customers, who depend on Shell Creek for their water supply.
- The CIS identified a need to
  - More directly address the water quality impacts in streams during the issuance of SWFWMD irrigation permits
  - Provide gradually tighter regulatory controls for reducing impacts to Shell Creek water supply reservoir

We have looked at River Flow and Water Quality

Now let's look at Land Use



Land Use Study Compared Historic Aerial Photographs

- 1940s – earliest available aerial coverage
- 1979 – after major regulations adopted
- 1999 – recently available aerial coverage
- Standard techniques to compare disparate photographic record
  - Digital technology applied to historical aerial photos
  - Standardized classifications used
  - Same photo-interpreters used

Warning!

Viewer discretion advised!

The following slides contain disturbing material that may not be appropriate for those who care about natural Florida.

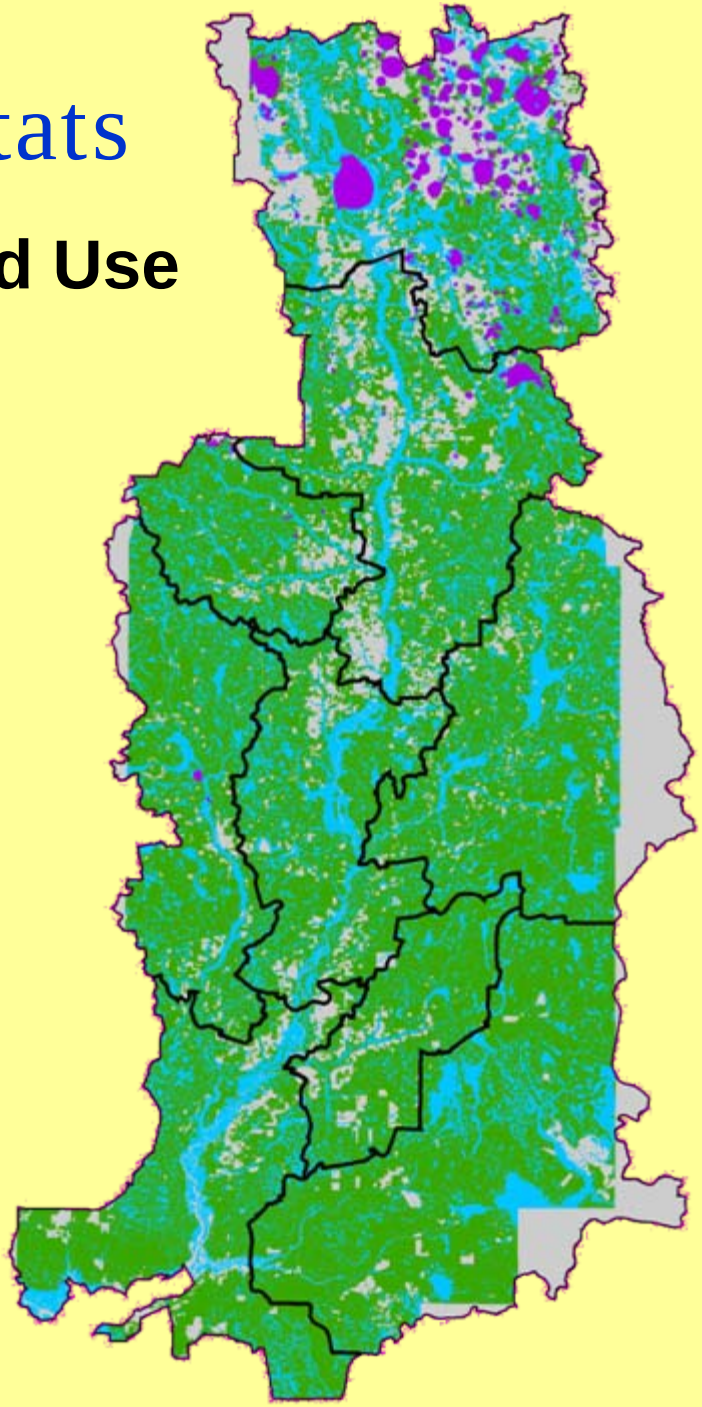
Changes in Native Habitats

1940s Undeveloped Land Use

Native Upland Habitat

Wetland

Lake



- **Upland Habitats = 60%**
- **Wetlands = 25%**
- **All Native Lands = 85%**

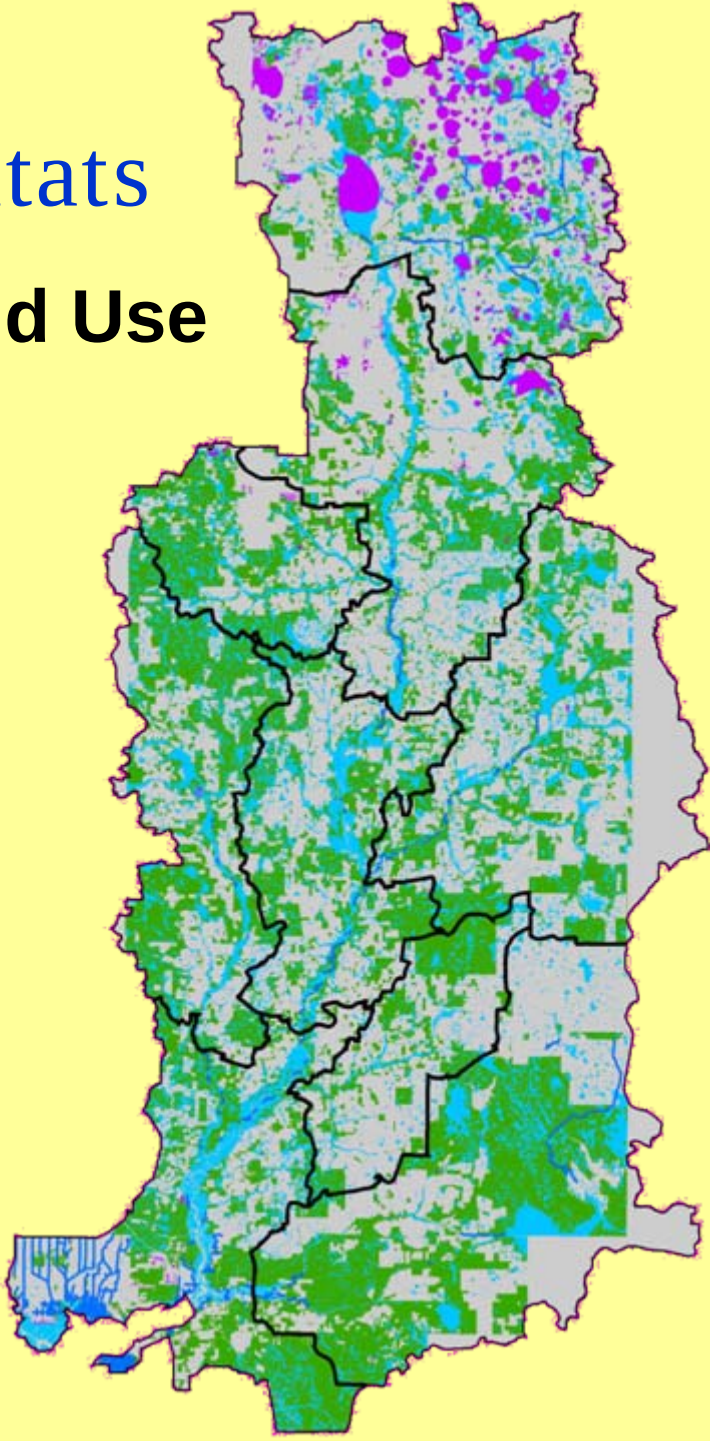
Changes in Native Habitats

1979 Undeveloped Land Use

Native Upland Habitat

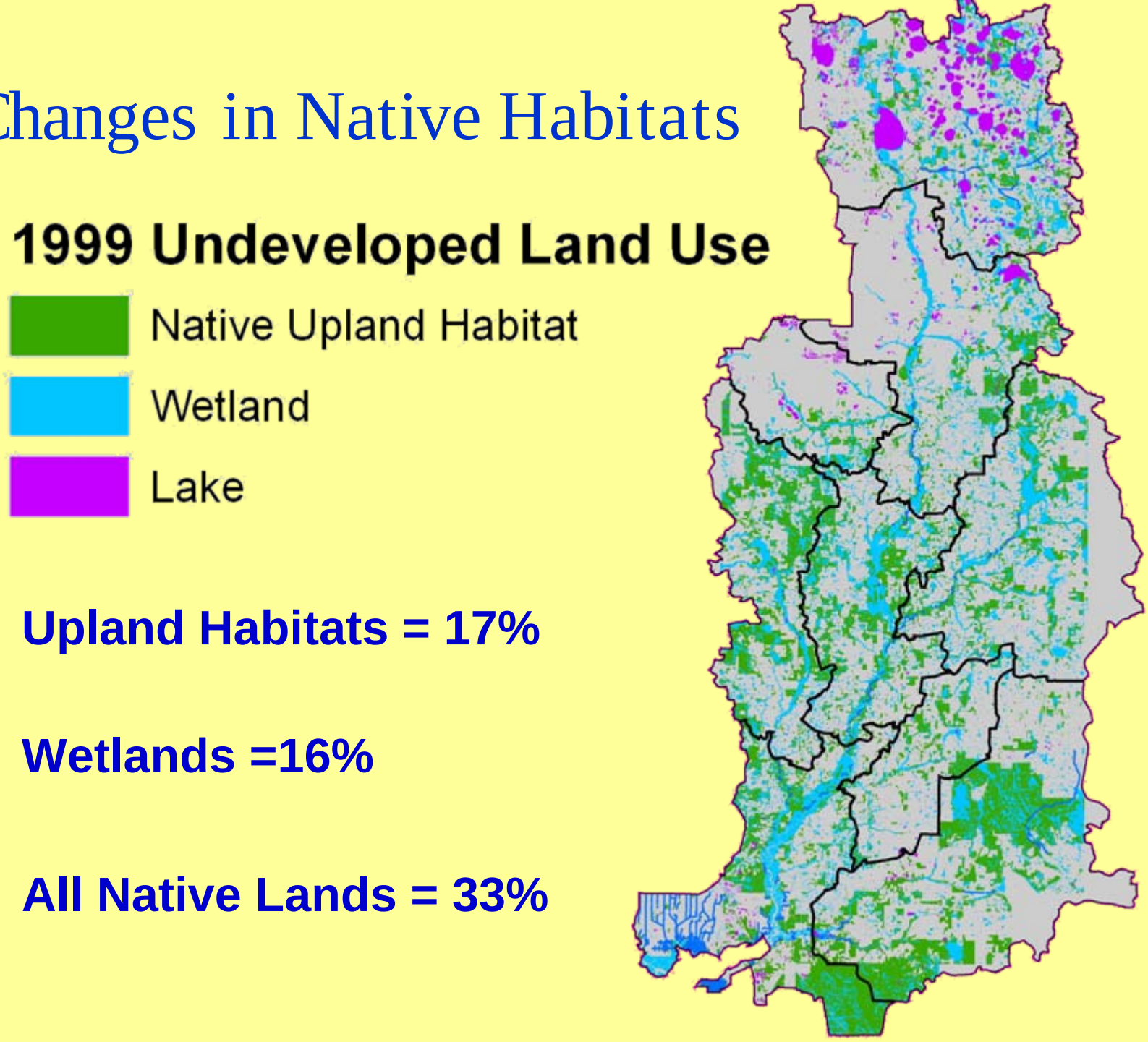
Wetland

Lake



- **Upland Habitats = 30%**
- **Wetlands = 18%**
- **All Native Lands = 48%**

Changes in Native Habitats



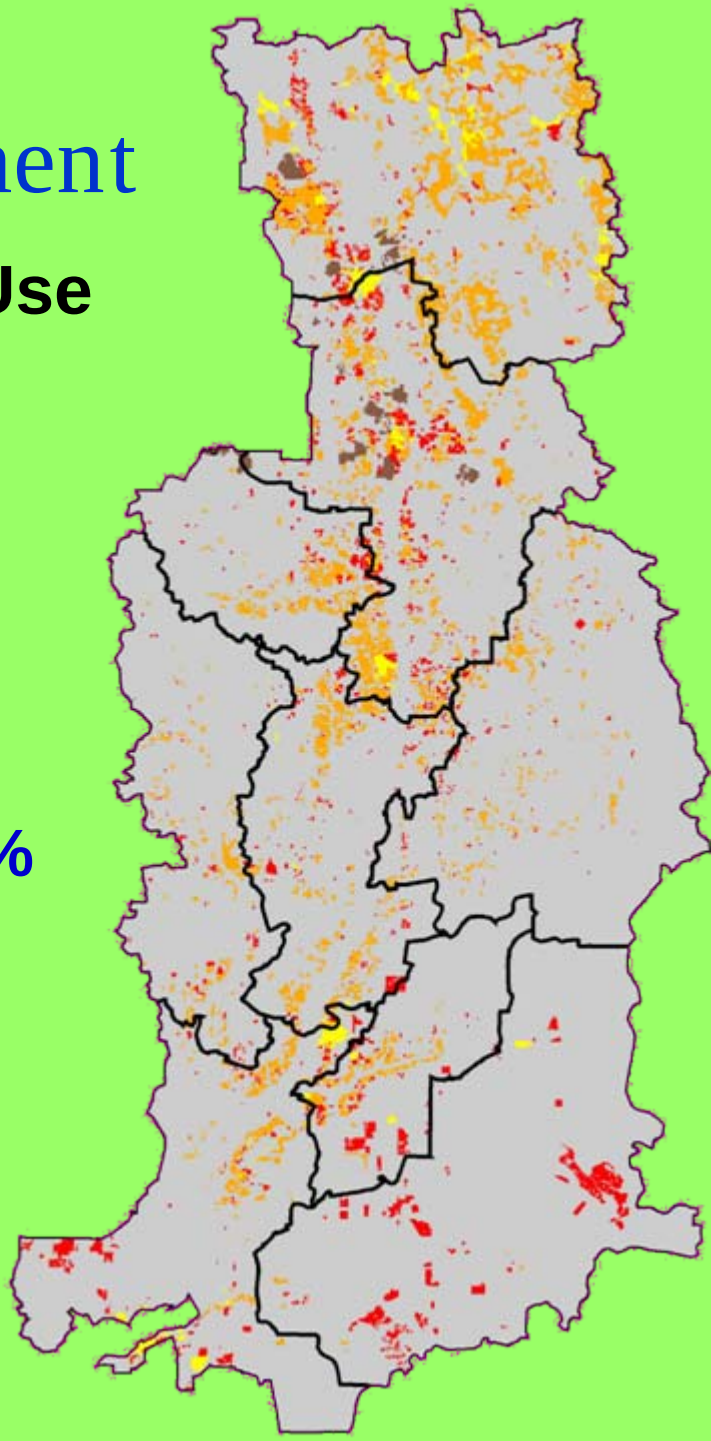
- **Upland Habitats = 17%**
- **Wetlands =16%**
- **All Native Lands = 33%**

Changes from Development

1940s Developed Land Use

- Improved Pasture
- Intensive Agriculture
- Urban Land Use
- Mining

- **Intense Agriculture = 8%**
- **Improved Pasture = 3%**
- **Urban Land Use = 1%**
- **Mining = 0.5%**
- **Total = 12.5%**

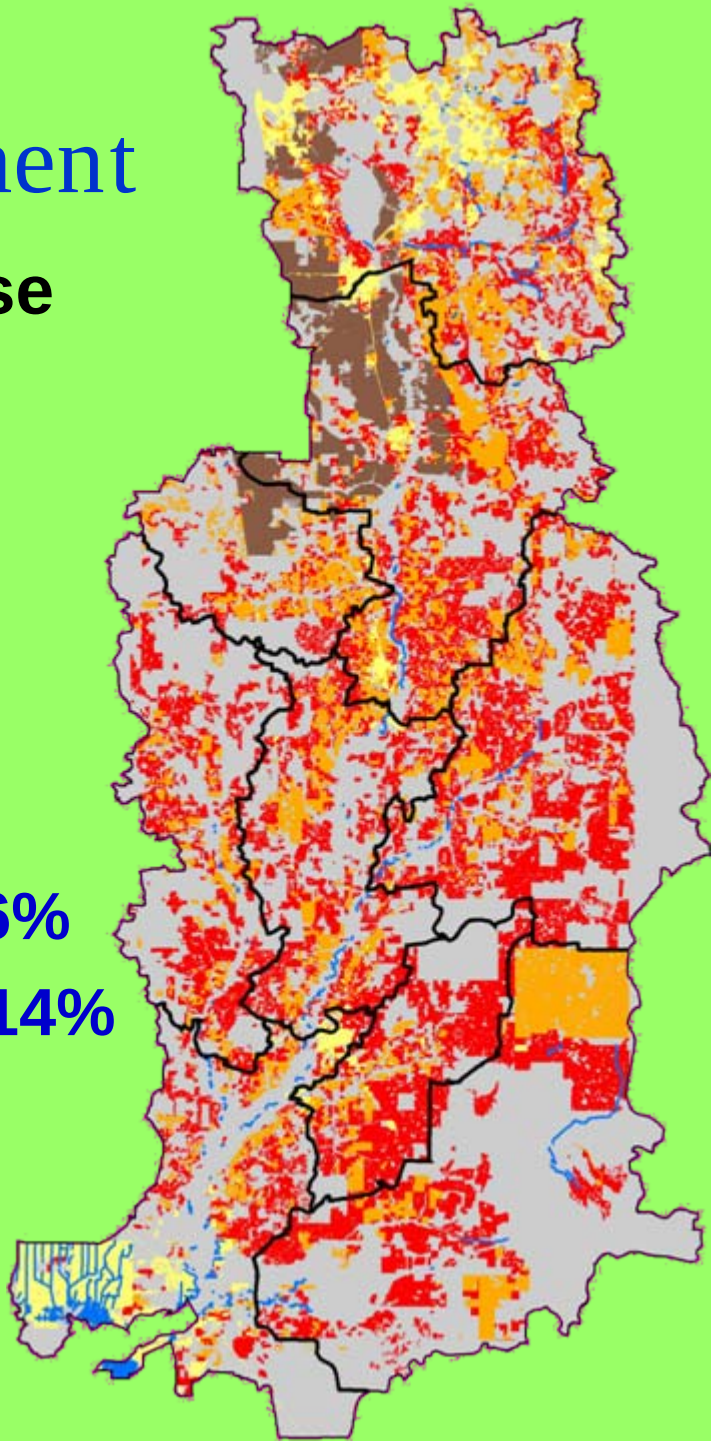


Changes from Development

1979 Developed Land Use

- Improved Pasture
- Intensive Agriculture
- Urban Land Use
- Mining

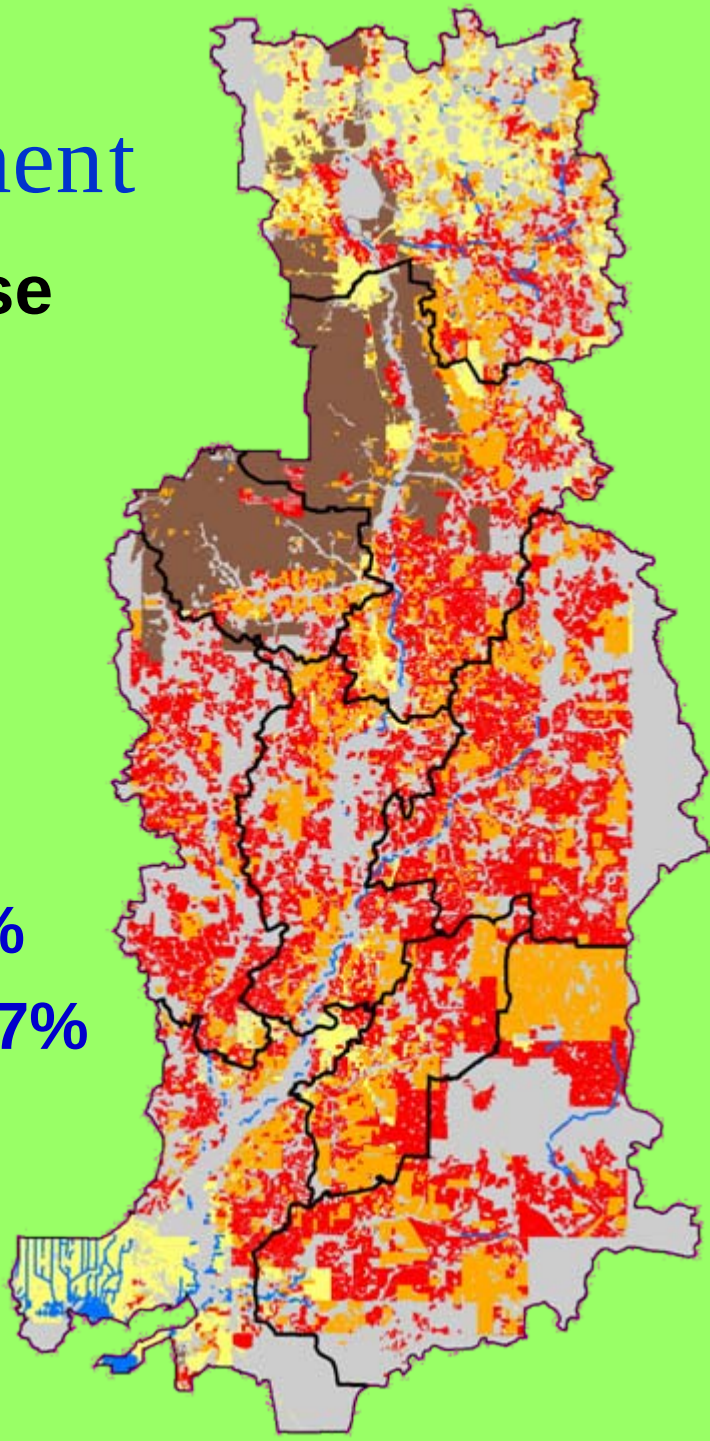
- **Improved Pasture = 26%**
- **Intense Agriculture = 14%**
- **Mining = 5%**
- **Urban Land Use = 5%**
- **Total = 50%**



Changes from Development

1999 Developed Land Use

- Improved Pasture
- Intensive Agriculture
- Urban Land Use
- Mining

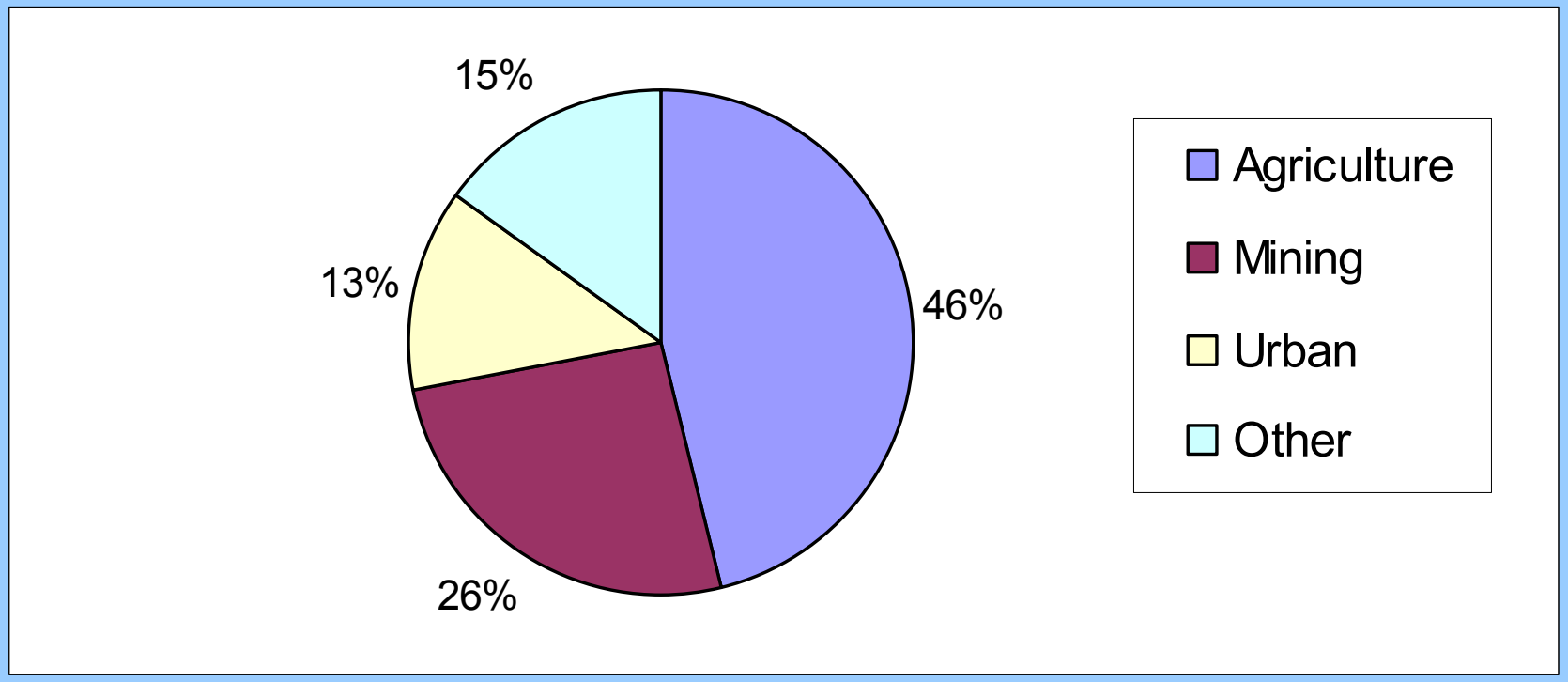


- **Improved Pasture = 27%**
- **Intense Agriculture = 17%**
- **Mining = 10%**
- **Urban Land Use = 10%**
- **Total = 64%**

Summary of Changes Since 1940s

- 591,462 acres (924 sq. mi.) of native uplands converted to other uses
- 136,442 acres (213 sq. mi.) of wetlands lost
- 343 miles of streams lost (about the distance from Tallahassee to Port Charlotte)

Where did 136,000 acres of wetlands go?



Wetlands declined during period of increasing protection: 1979 to 1999

More than 31,000 acres have disappeared since 1979

- 13,397 to phosphate mining
- 12,707 to agriculture
- 4,086 to urban

How did this happen in the era of wetland regulation?

Phosphate Mining (13,397 acres)

- No permitting requirements for isolated wetlands until 1995
- From 1987, reclamation required acre-for-acre, type-for-type replacement
- Industry has received sign-offs from DEP after one year of restoration success
- The study only used aerial photographs and ground-truths may reveal more reclaimed wetlands not recognizable on the aerial photographs

- *The CIS recommends reconciling phosphate restoration records with wetland losses*

Agriculture (12,707 acres)

- Agriculture is exempt from surface water permitting, but this is not supposed to be used to drain wetlands
- The agricultural exemption is vague and somewhat dependent on the intent of the user – hard to enforce
- The loss of wetlands is a result of drainage to lower water tables and remove flood waters. Current agricultural economics may support drainage reversals to store water.
- *The CIS recommends reviewing use of the agricultural exemption and looking for opportunities to engage agricultural land owners to store water in wetlands*

Urban Land Uses (4,086 acres)

- Scale of wetland losses, while smaller than for mining and agriculture, still is not consistent with SWFWMD permitting records – about 5 times greater
- Most losses occur in Polk and Charlotte counties
- Agricultural exemption may have been improperly applied in developing areas to prepare land for conversion to urban between 1979 and 1999
- *The CIS recommends reconciling permitting records with wetland losses and updating change analysis to 2005 to better determine the current rate of loss.*

Summary of Cumulative Impacts

- Loss of spring flows
- Loss of wetlands for storage, filtration and slow release to surface streams
- Loss of stream channels conveying water to the river
- Augmentation with groundwater from industrial and irrigation wells
- Mineralization of streams from irrigation

What does this mean for water supply?

- The Peace River loses flow to ground water during dry periods
- Surface storage volume has been reduced
- Conveyances (streams) have been lost, reducing connection to the Peace River
- Flow declines actually worse than indicated by records because they are offset by agricultural irrigation runoff to streams
- Water quality is generally diminished by irrigation runoff

What does this mean for the environment?

- Peace River flows are more “flashy,” making faster and less moderated changes to estuarine salinity
- Water suppliers and the environment compete more for critical low flows. Guess who loses?
- Habitat is lost with degraded water quality, converted wetlands and streams lost.

What does this mean to the taxpayer?

Curing cumulative impacts is costly

- Example – Restoring minimum flows to the upper Peace
  - Wetlands store water needed to extend base flows during dry periods
  - Wetland losses in the upper Peace River basin between 1979 and 1999 totaled over 10,000 acres
  - These wetlands contributed to base flow of the upper river
  - SWFWMD is spending $115 million to create 9300 acre-ft of storage in Lake Hancock to meet about *half* the minimum flow requirement of the upper Peace River

- *Bottom Line: Losses of water storage in wetlands require replacement storage to meet minimum flow requirements and protect public water supplies.*

Questions raised by the study

Are we still losing wetlands? If so, at what rate?

Are irrigation well permits still being issued that degrade water supplies?

What regulatory gaps allowed the apparent loss of >31,000 acres of wetlands over a 20-year period?

What has allowed the loss of 343 miles of streams?

Is the agricultural exemption in 373, F.S., being properly applied?

How would continued wetland loss, stream loss, flow augmentation with mineralized water (or the cutoff of irrigation augmentation) affect water supplies?

Would it be possible to restore wetlands and streams to increase base flow for water supply?

Selected Recommendations

- Update change analysis to 2005 to measure effectiveness of current regulations since 1999
- Address water quality impacts of irrigation permits
- Audit wetland losses since 1979, wetland mitigation, and mine reclamation of wetlands to understand 31,000-acre loss
- Audit stream channel losses to understand 343 mile loss
- Review proper use of agricultural exemption and opportunities for landowners to store water on land
- Develop plan to restore wetlands and streams for base flow benefits to water supply and the environment.
- Develop plan to manage the Peace River watershed to protect water supplies and natural resources.