

# Benefits Derived in Louisiana from the Long Term Management and Control of Waterhyacinth (*Eichhornia crassipes*)

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US Army Corps of Engineers  
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# Ecosystem Goods and Services

Investigate the utility of and develop practical guidelines for considering and analyzing ecosystem goods and services into Federal Decision Making



# Ecosystems Restoration Goods and Services

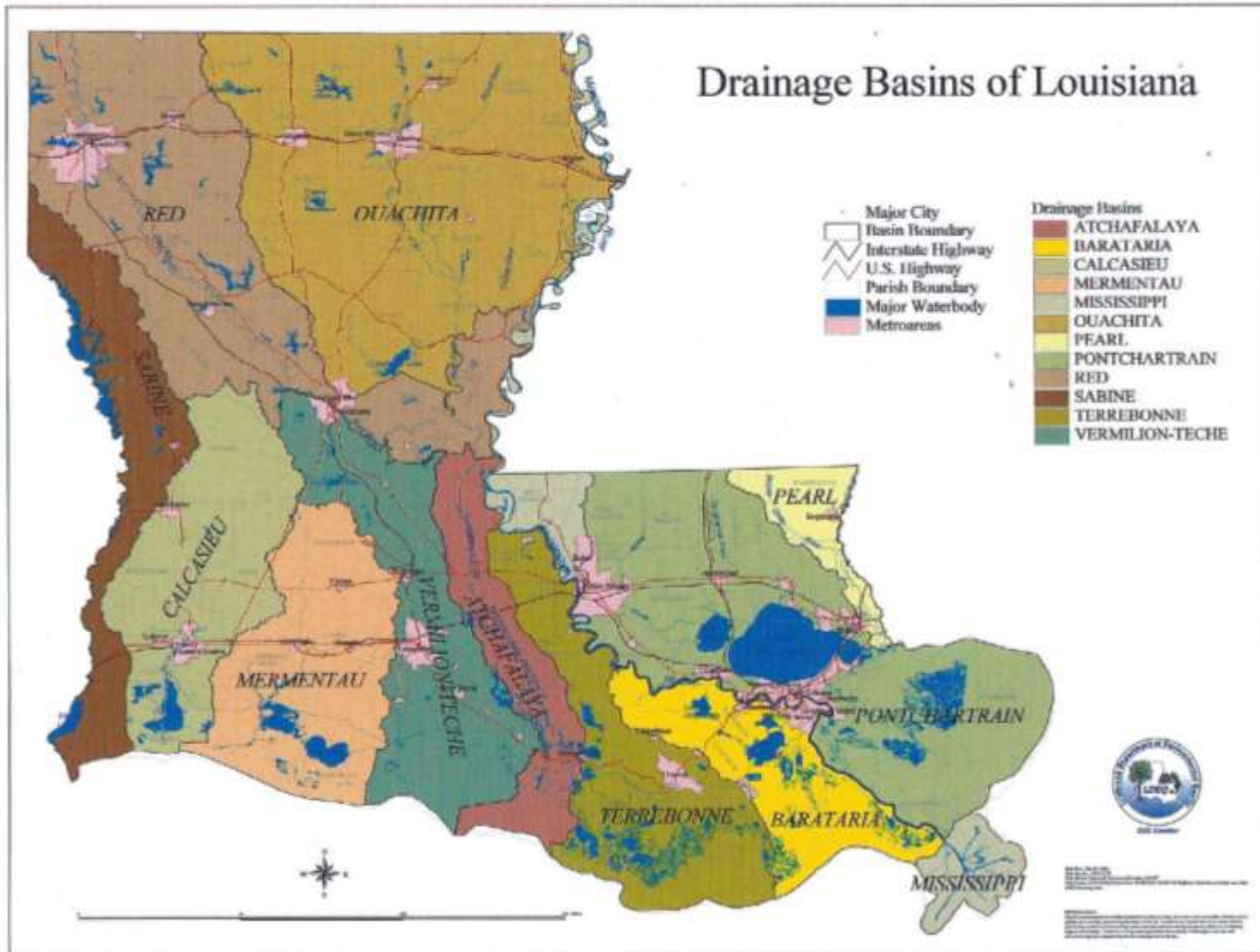
- Problems
  - ▶ Restorations have not been monitored
  - ▶ Metrics hard to monetize
- Needs
  - ▶ Extensive Data – Abiotic & Biotic
  - ▶ Numerous Factors/Interactions



# Eichhornia crassipes (Mart.) Solms (Waterhyacinth)



# Drainage Basins of Louisiana

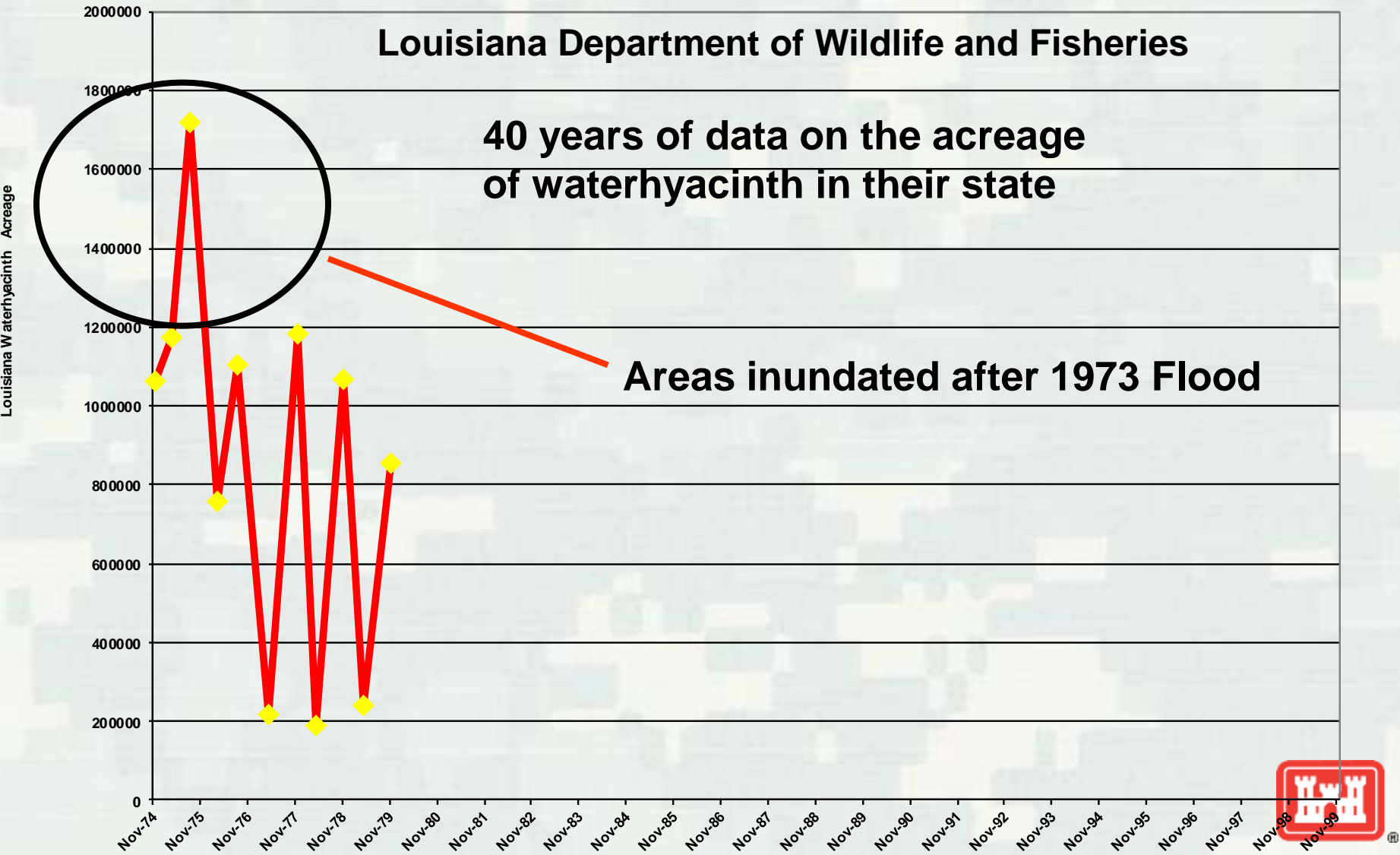


# Waterhyacinth Acreage in Louisiana

Louisiana Department of Wildlife and Fisheries

40 years of data on the acreage of waterhyacinth in their state

Areas inundated after 1973 Flood





## Historical Waterhyacinth Infestations



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# Ecosystem Service Benefits of Waterhyacinth Control

- To develop an example analysis of benefits by quantifying EGS benefits that are impacted by aquatic invasive plant and management
  - ▶ Create a framework applicable to other aquatic invasive plant management
  - ▶ Waterhyacinth in Louisiana as primary test case





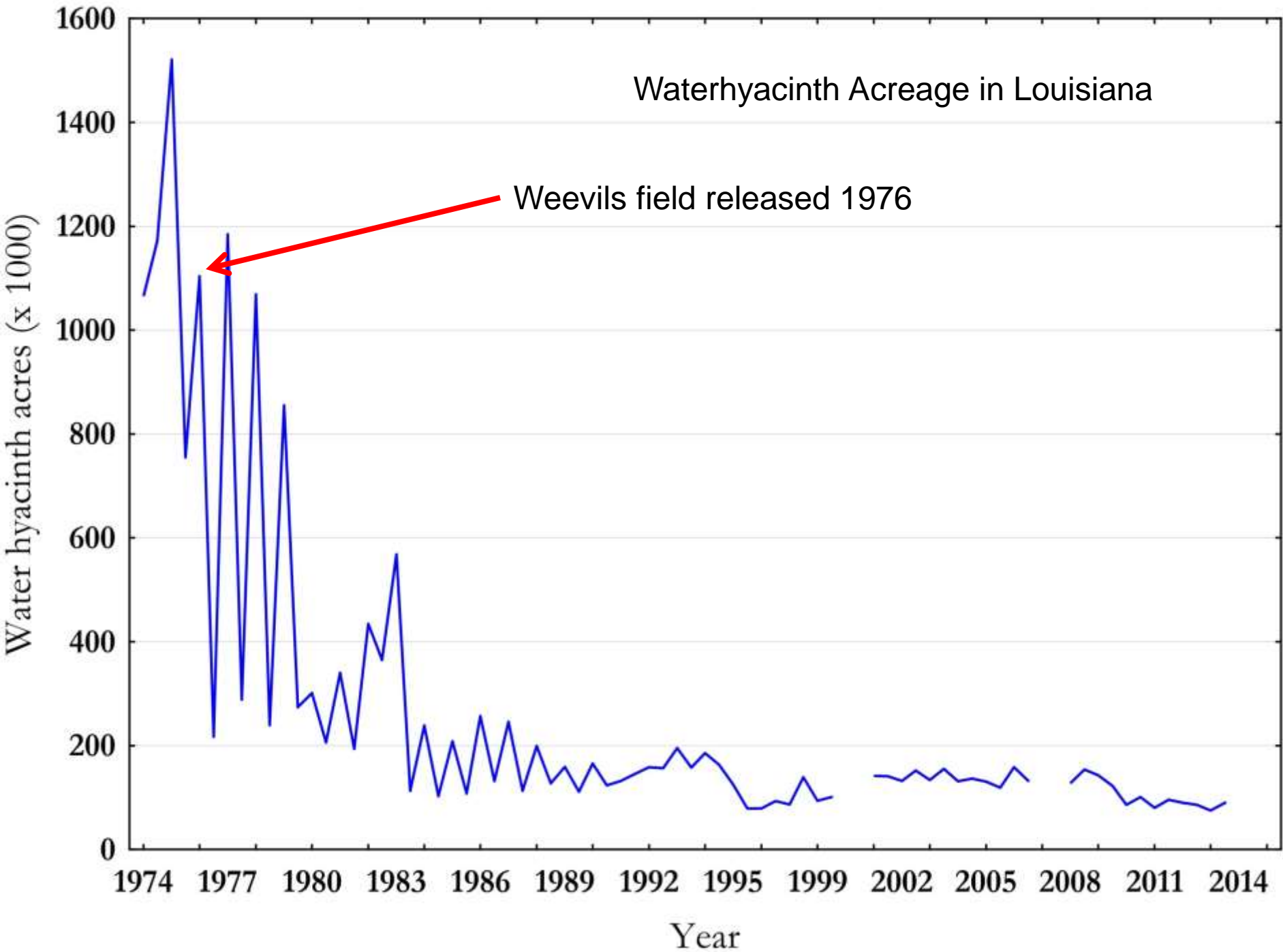
# Economic Assessment of Benefits Associated with Invasive Plant Management

NEEDS TO BE DOCUMENTED,  
STANDARDIZED, AND USED AS A  
MEASURE OF PERFORMANCE

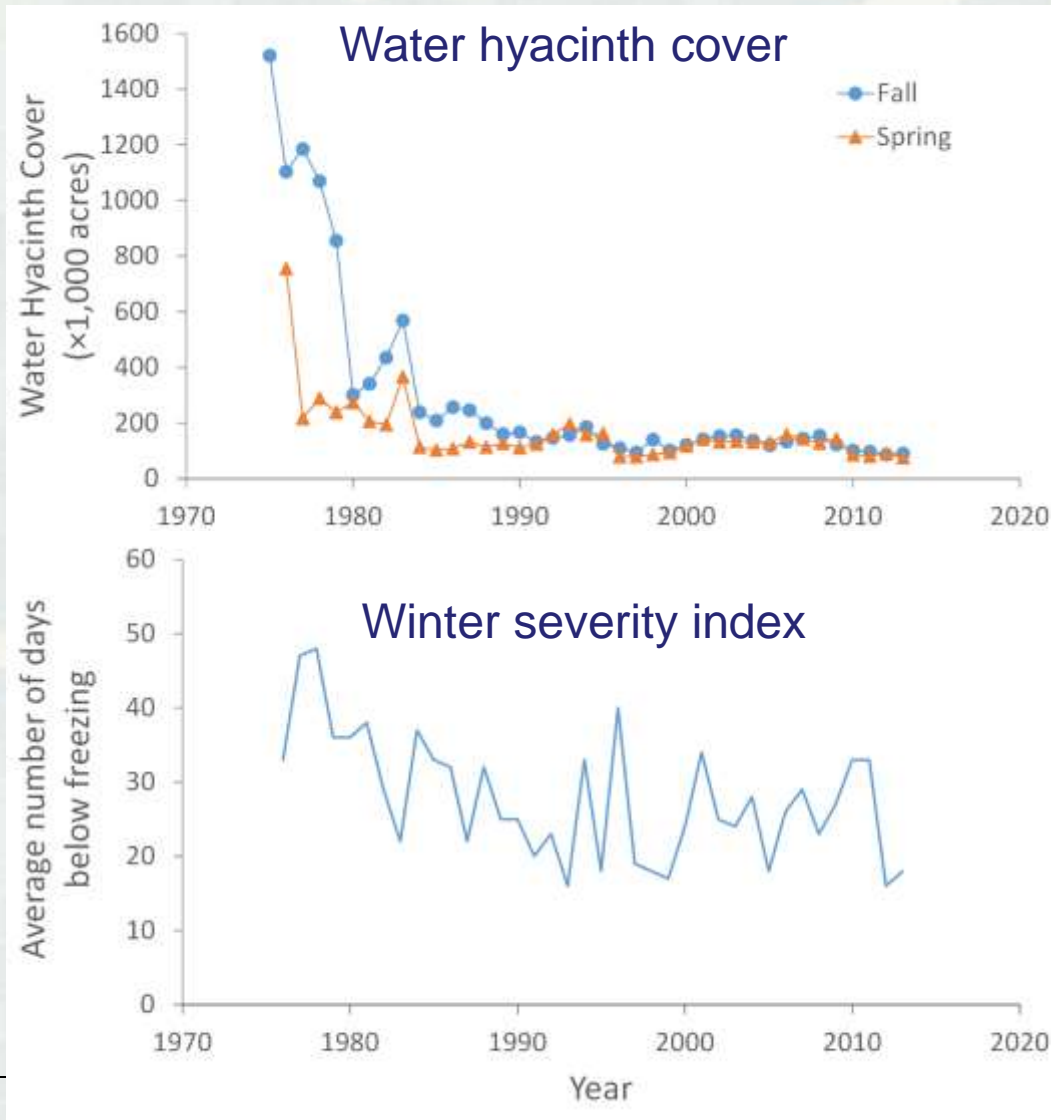


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# Waterhyacinth Acreage in Louisiana

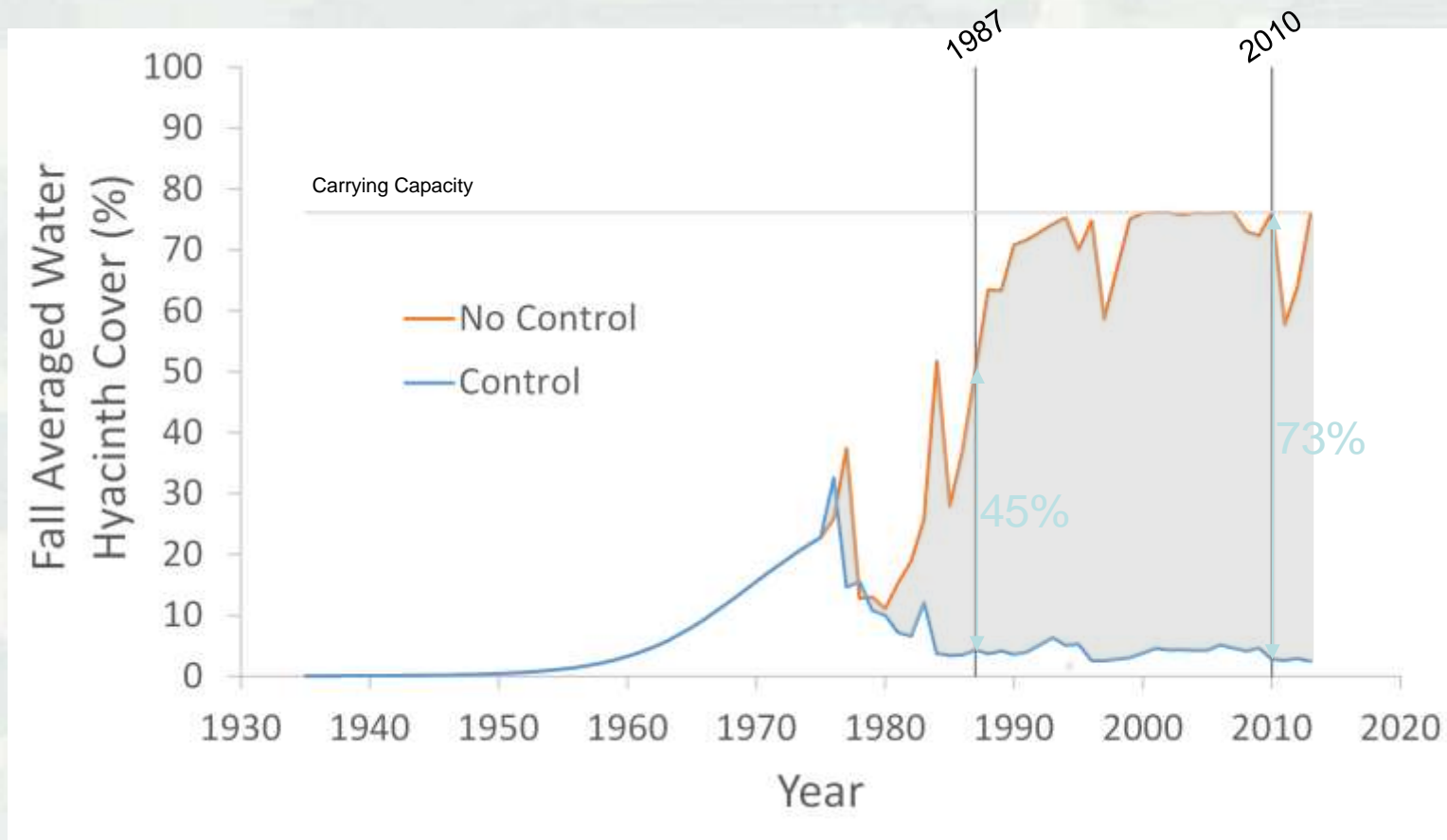


# Modeling the no-control “counterfactual” scenario with historic data



# Benefits are losses avoided

Difference between control and no-control scenarios



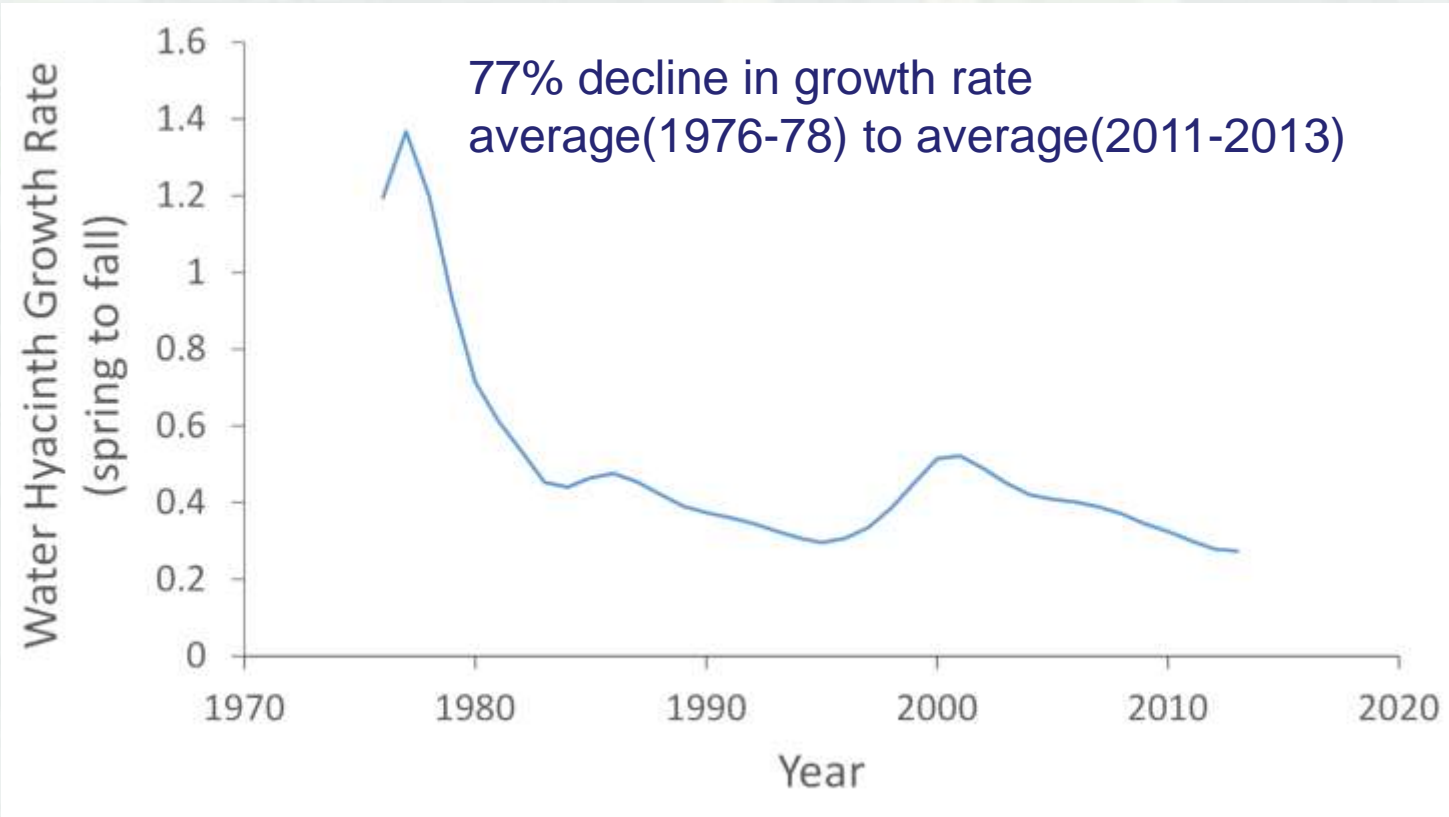
# EGS Evaluated

1. Recreational Fishing
2. Recreational Hunting
3. Boat-dependent tourism & recreation (“swamp tour” companies, marinas)
4. Water Supply
5. Flood risk reduction
6. Commercial navigation
7. Commercial fishing
8. Non-use services (existence values for species and ecosystems)



# Statistical Model Results

Annual water hyacinth growth rate over time



# Economic Calculations

## 1. Benefit transfer using consumer surplus<sup>1</sup>

$$\text{User Value} / \text{day} \times \# \text{ days} / \text{year} = \text{Annual EGS value}$$

## 2. Damage costs (avoided)

$$\text{Costs} / \text{Entity} \times \# \text{ entities} / \text{year} = \text{Annual EGS value}$$

<sup>1</sup>Consumer surplus - the difference between what people would have been willing to pay and what they paid to enjoy a good or service



# Ecosystem Service Benefits estimated for 1987 & 2010

| Impact                                 | Affected Users/Entities            | Annual benefit (Millions \$2010) |                |
|--|------------------------------------|----------------------------------|----------------|
|  |                                    | 1987                             | 2010           |
| <b>Recreational freshwater fishing</b> | 583,480 anglers                    | \$413.9                          | \$675.5        |
| <b>Recreational waterfowl hunting</b>  | 19,400 waterfowl hunters           | \$5.2                            | \$8.3          |
| <b>Boat-related businesses</b>         | 400 marinas (South Louisiana only) | \$4.6 – \$8.0                    | \$5.2 – 9.2    |
| <b>Drinking Water Supply</b>           | 77 drinking water intakes          | \$0.06 - \$0.2                   | \$0.08 - \$0.3 |
| <b>Total</b>                           |                                    | <b>\$424.5</b>                   | <b>\$691.2</b> |





# Costs

| Cost Category                                  | Organization    | Cost (\$2014)         | Costs per year (\$2014)* | Number of years* | Time period |
|--|-----------------|-----------------------|--------------------------|------------------|-------------|
| Herbicide Research (APCRP)                     | USACE-ERDC      | \$1,580,651           | \$112,904                | 14               | 1976-1989   |
| Biological Control Research (APCRP)            | USACE-ERDC      | \$1,162,496           | \$77,500                 | 15               | 1975-2014   |
| Integrated Control Research (APCRP)            | USACE-ERDC, MVN | \$699,516             | \$58,293                 | 12               | 1976-1989   |
| Large Scale Operations Management Test (LSOMT) | USACE-ERDC, MVN | \$2,136,150           | \$356,025                | 6                | 1975-1980   |
| USACE Herbicide Application                    | USACE           | \$84,802,683          | \$2,494,196              | 34               | 1975 -2012  |
| State Herbicide Application                    | LDWF            | \$20,498,629          | \$590,220                | 35               | 1975-2013   |
| <b>Total</b>                                   |                 | <b>\$ 110,880,124</b> |                          |                  |             |

**Over 35 years average annual cost is \$3.1M**



# EGS Evaluated

1. Recreational Fishing
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("swamp tour" companies, marinas)
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8. Non-use services (existence values for species and ecosystems)



1968



2003

St Johns River  
Florida



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# Conclusions

## Treatment effectiveness

- Our statistical analysis showed a 77% decline in water hyacinth growth rate
- Suggested that biocontrol has led to a major reduction in waterhyacinth cover
- Without biocontrol, the total coverage in Louisiana today would be on the order of 45% higher in the spring and about 73% higher in the fall
- Provides an assessment procedure that elucidates the benefits derived over time



# Conclusions

## Benefit Assessment

- The order of magnitude of benefits preserved due to waterhyacinth control in one recent year (2010) could be as high \$691 Million (2010 dollars)
- The vast majority of benefits are from preserving recreational freshwater fishing
- A full benefit estimate over 1975-2013 is likely to reveal a substantially higher value and be much higher than program costs
- Damages for recreational service are likely to be overestimated since freshwater anglers and hunters would find substitute forms of recreation to offset some of these losses (values are being refined)
- However, we were not able to monetize all types of benefits, which would tend to increase total benefits



# Questions



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