

Decade-scale changes in the riverine flux of carbon, nitrogen and phosphorus to coastal waters of the conterminous United States

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NAWQA Project Cycle III Surface Water Trends

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Geographic analysis – James Falcone

Model and code support – Laura DeCicco

NAWQA Project Cycle III Surface Water Trends

Scope

- Stream and river trends in nutrients, pesticides, sediment, carbon, salinity, and aquatic ecology
- Four time periods: (1) 2002-2012, (2) 1992-2012, (3) 1982-2012, and (4) 1972-2012
- Flux (load) and concentration

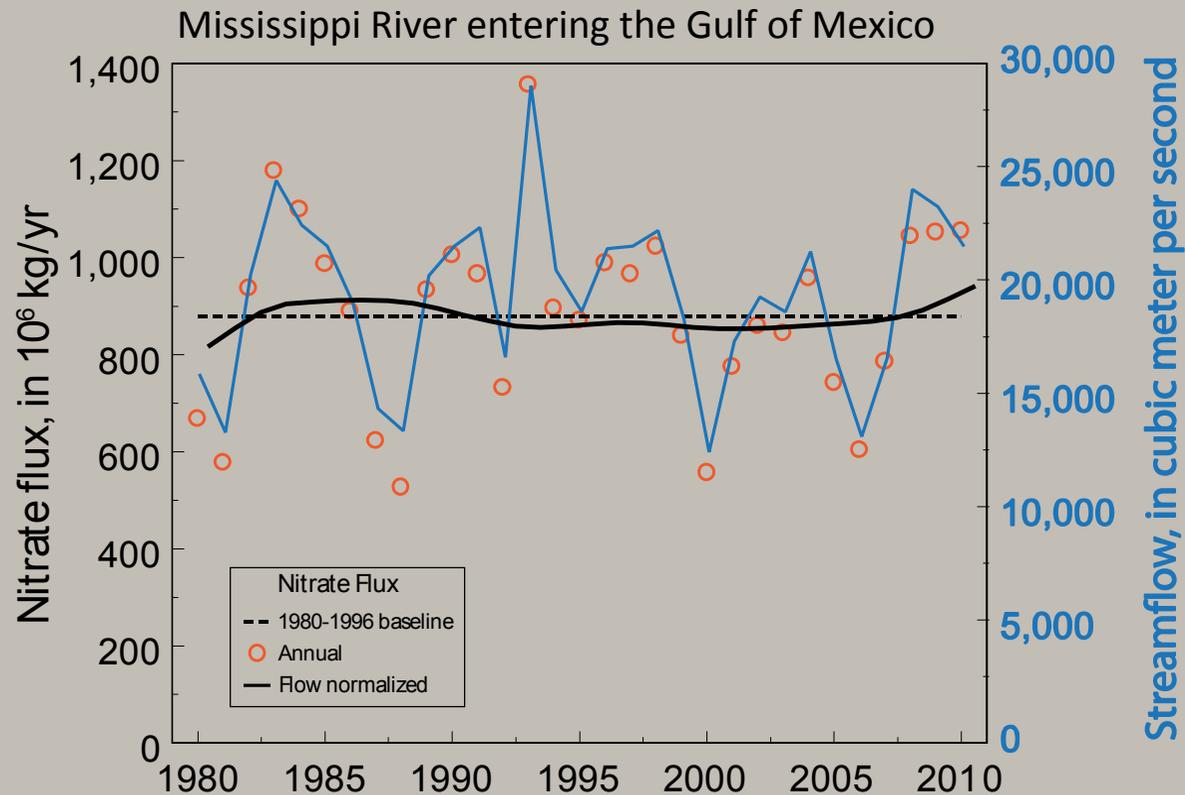
Data source

- Collated data from multiple sources to increase overall spatial coverage
- NWIS, STORET, and other Federal, State, and local databases
- 147 million water-quality records from 468,000 sites and 518 agencies

NAWQA Project Cycle III Surface Water Trends

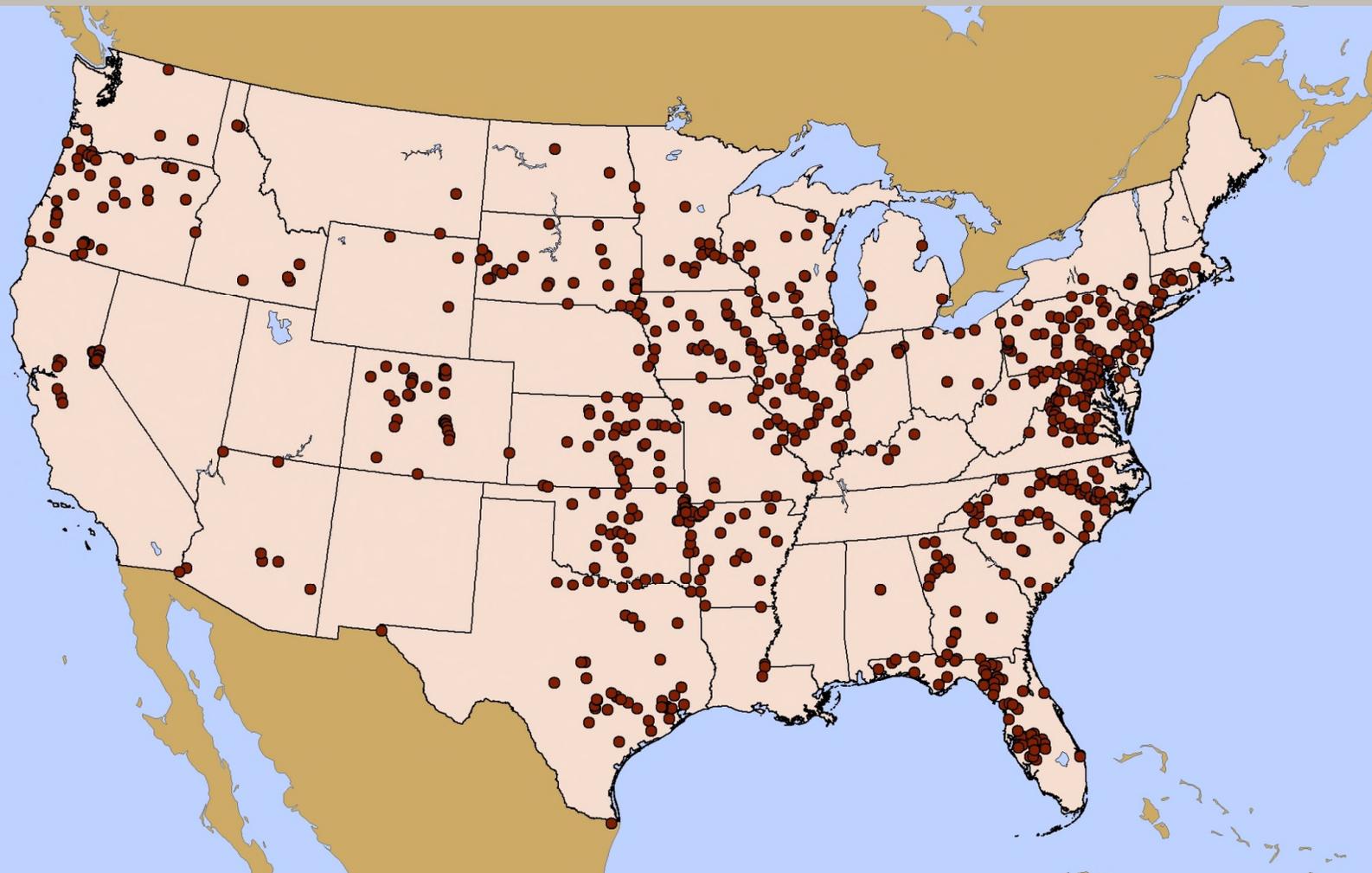
Methods

- Concentrations and fluxes calculated in Weighted Regressions on Time, Discharge, and Season (WRTDS).
- Used flow-normalized concentration / flux.
- “Coastal” sites defined as most downstream monitoring station in a river network.
- Flow-normalized fluxes were summed to estimate total fluxes nationally and regionally.



Preliminary information – Subject to revision. Not for citation or distribution.

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Trend sites

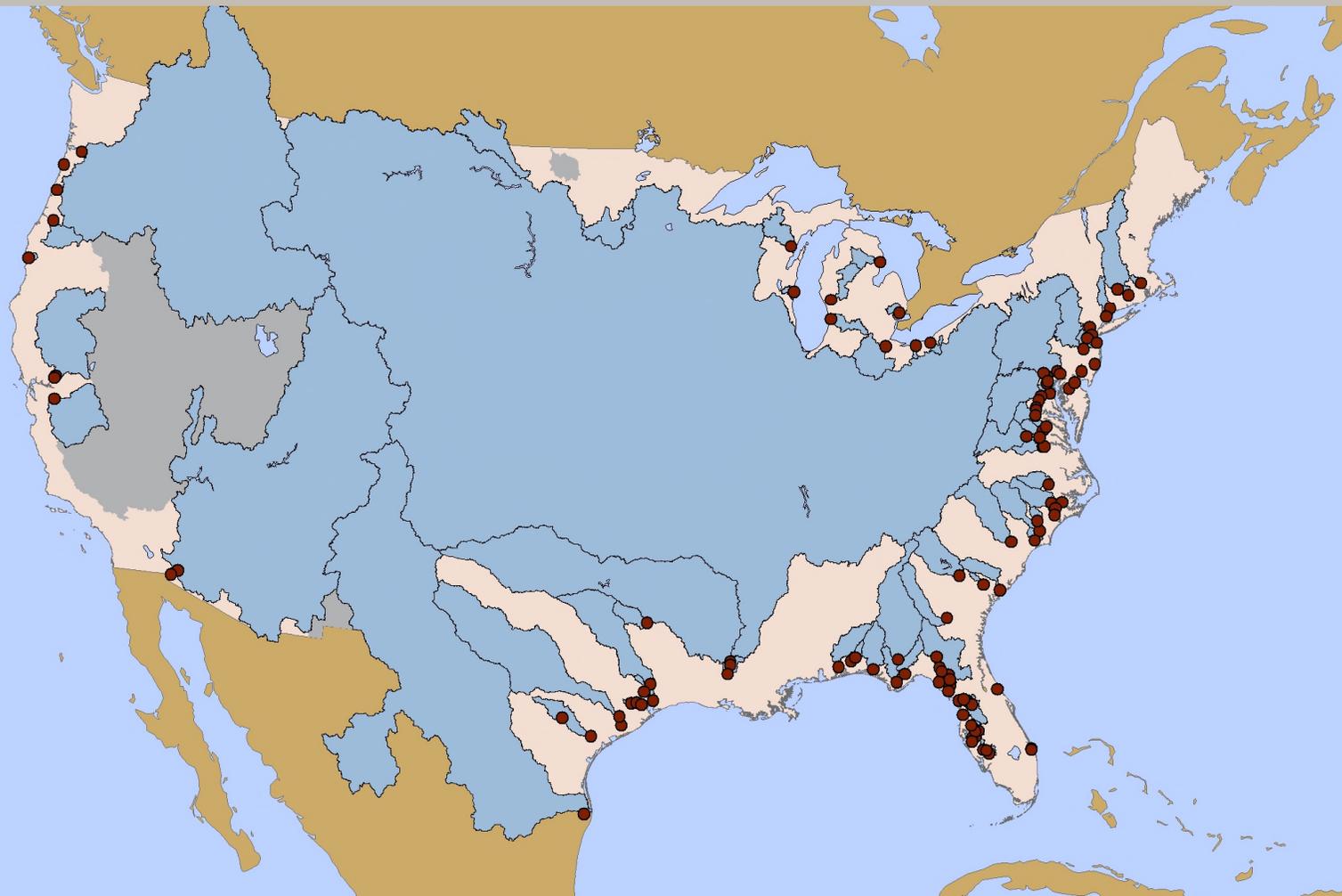
Total nitrogen, total phosphorus, or alkalinity.

(2002-2012)

$n = 483$

Preliminary information – Subject to revision. Not for citation or distribution.

NAWQA Project Cycle III Surface Water Trends



Coastal trend sites

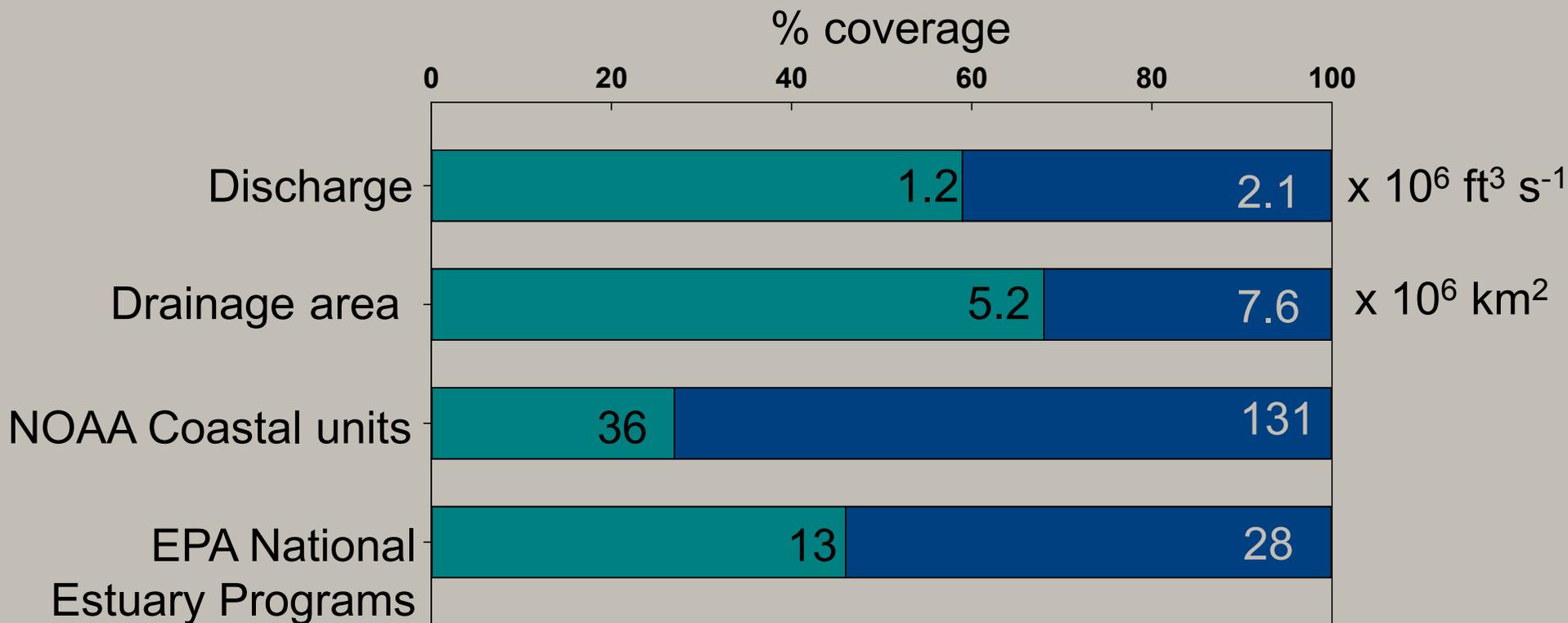
Total nitrogen, total phosphorus, or alkalinity.

(2002-2012)

$n = 133$

Preliminary information – Subject to revision. Not for citation or distribution.

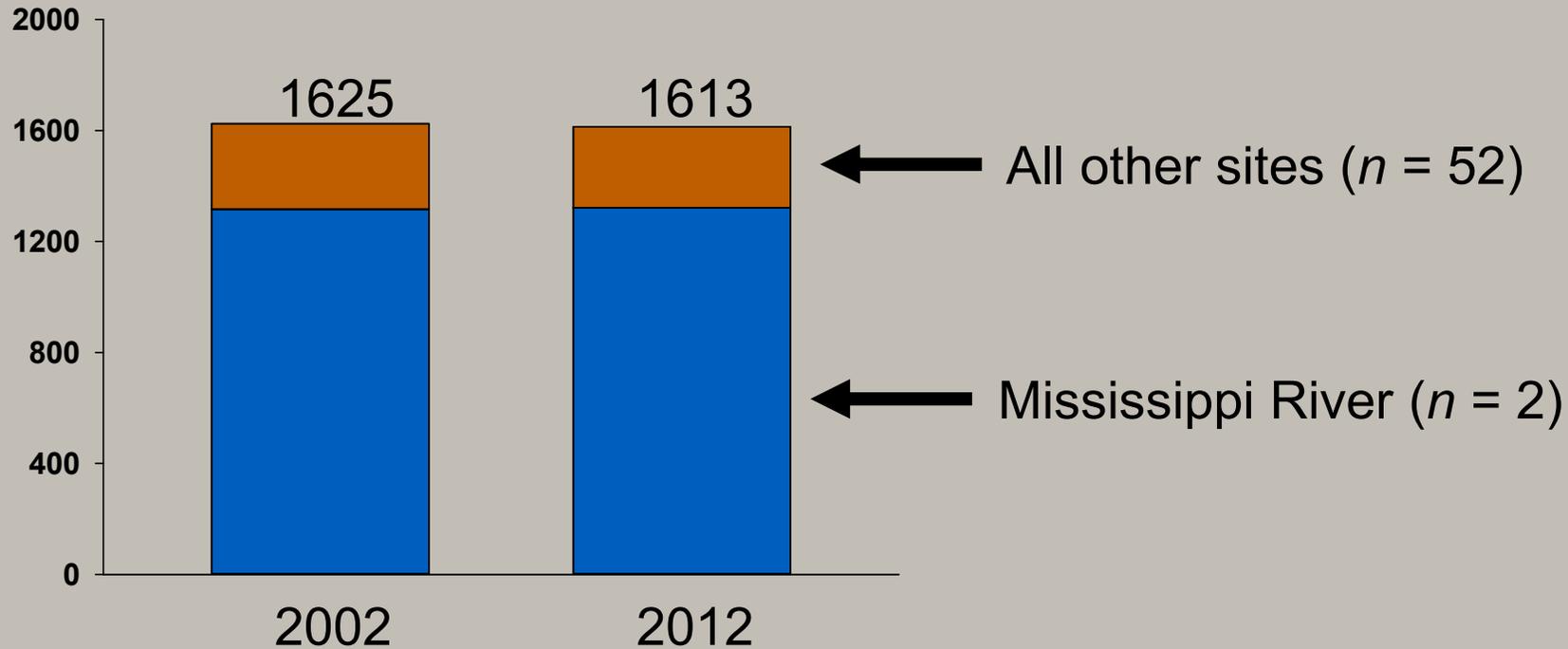
Coastal site coverage (2002-2012)



Preliminary information – Subject to revision. Not for citation or distribution.

TOTAL NITROGEN 2002-2012

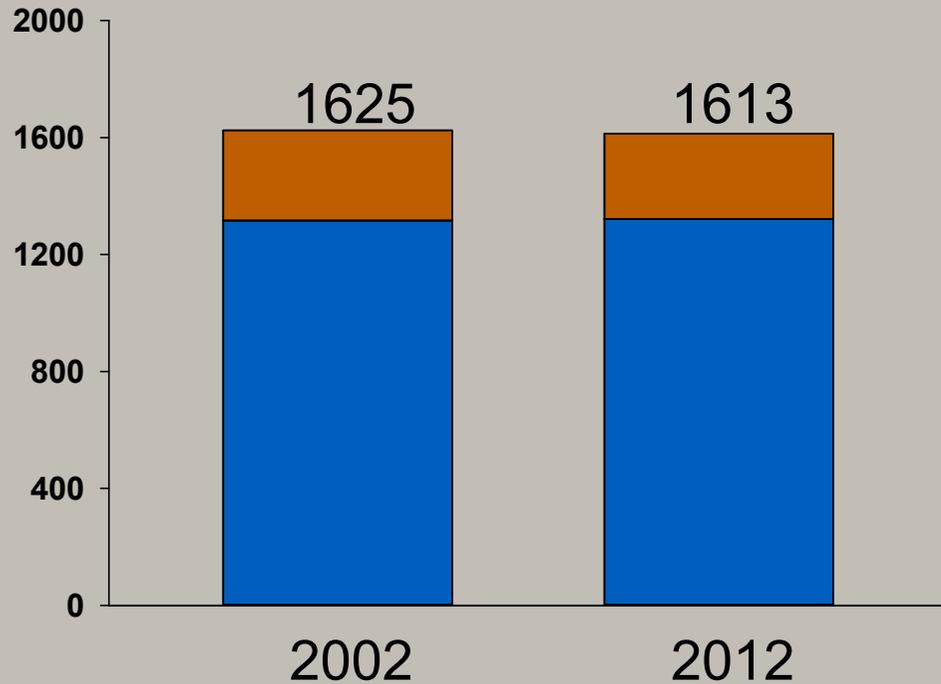
Flow-normalized total nitrogen flux
($\times 10^9$ g N yr⁻¹)



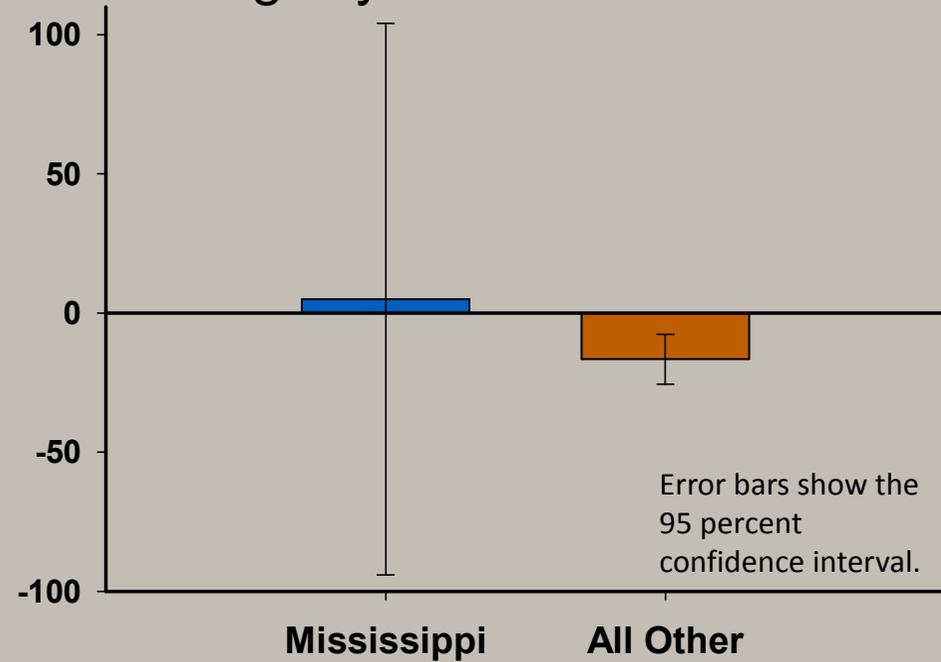
Preliminary information – Subject to revision. Not for citation or distribution.

TOTAL NITROGEN 2002-2012

Flow-normalized total nitrogen flux
($\times 10^9$ g N yr⁻¹)



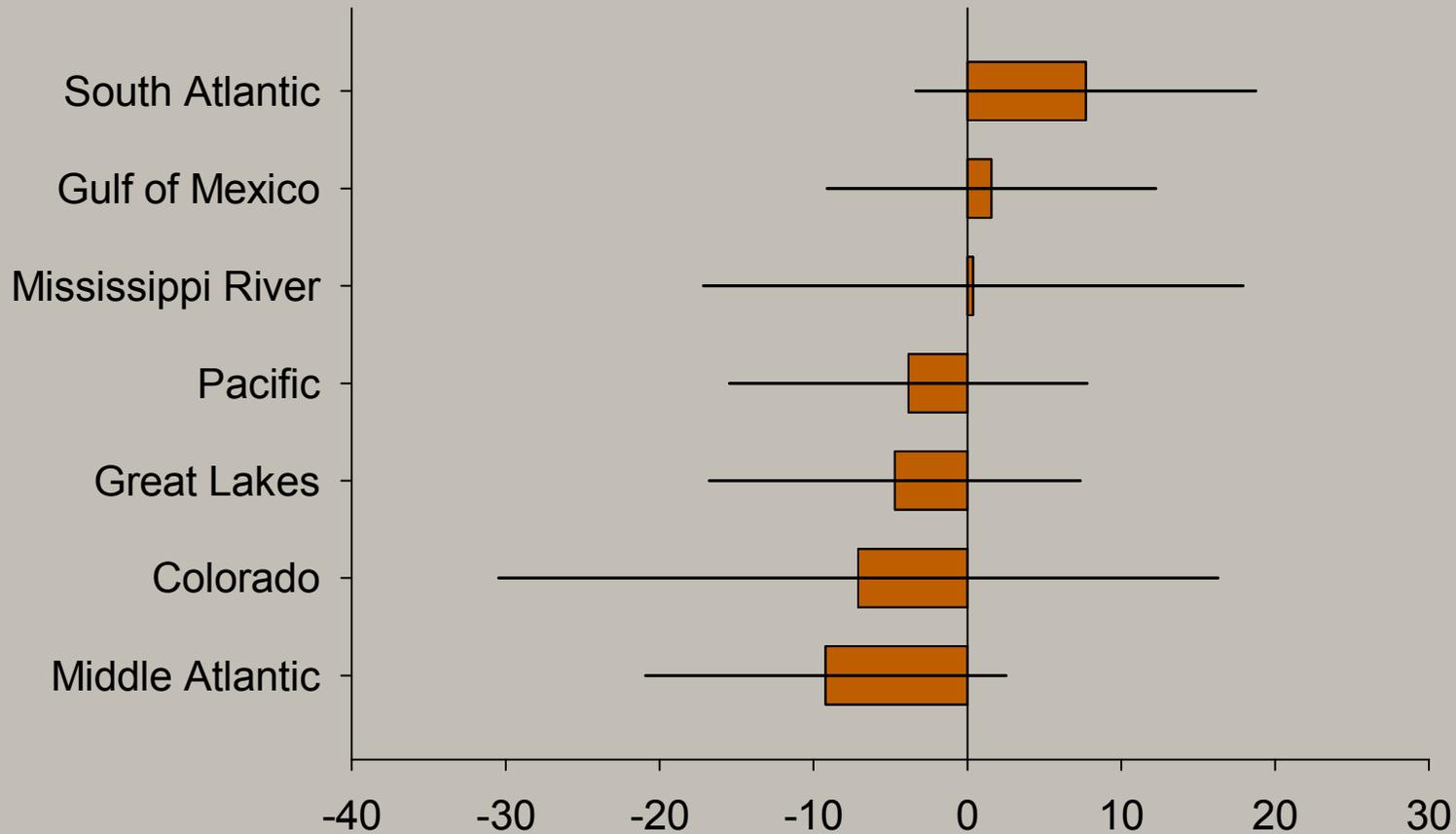
Change in flux 2002-2012
 $\times 10^9$ g N yr⁻¹



Preliminary information – Subject to revision. Not for citation or distribution.

TOTAL NITROGEN 2002-2012

Percent change in total nitrogen
flow-normalized flux 2002-2012

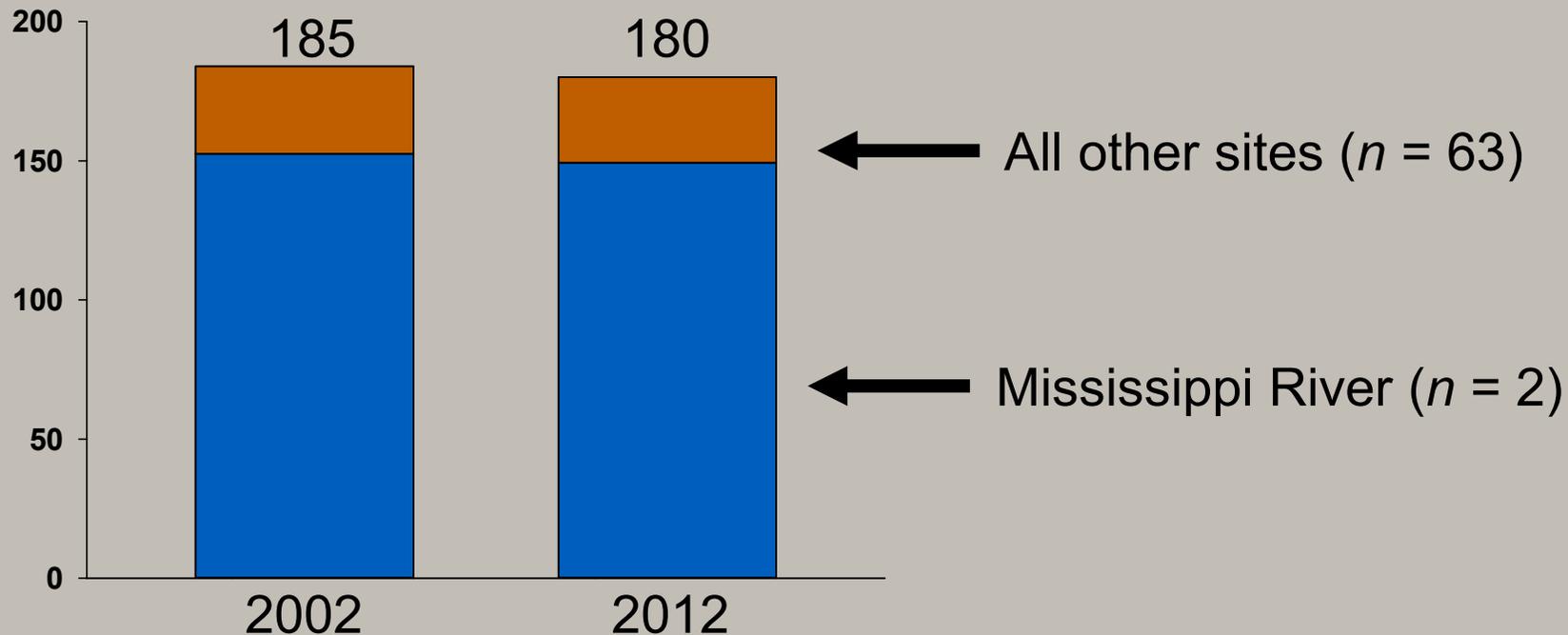


Error bars show
the 95 percent
confidence
interval.

Preliminary information – Subject to
revision. Not for citation or distribution.

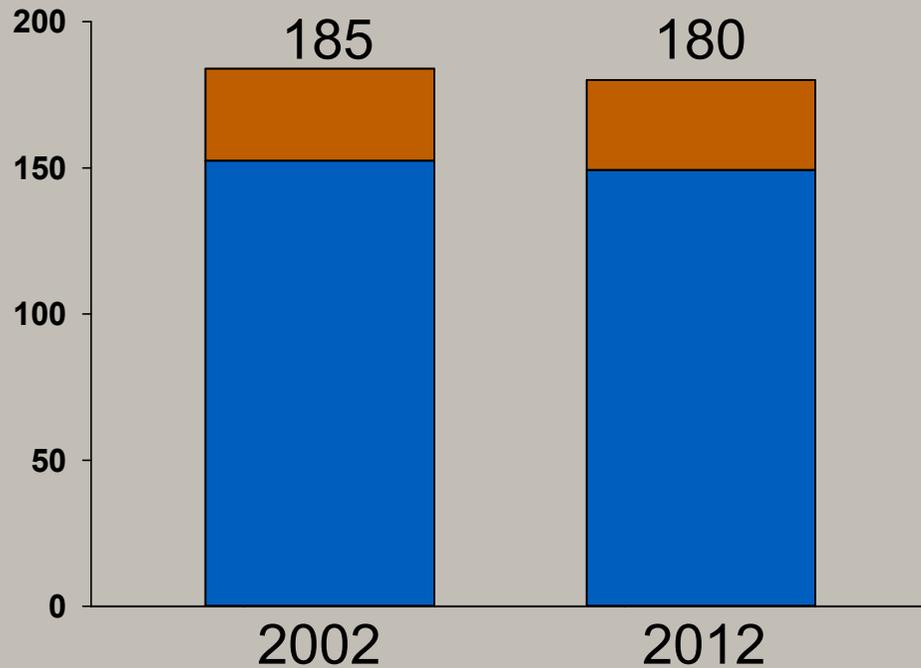
TOTAL PHOSPHORUS 2002-2012

Flow-normalized total phosphorus flux
($\times 10^9$ g P yr⁻¹)

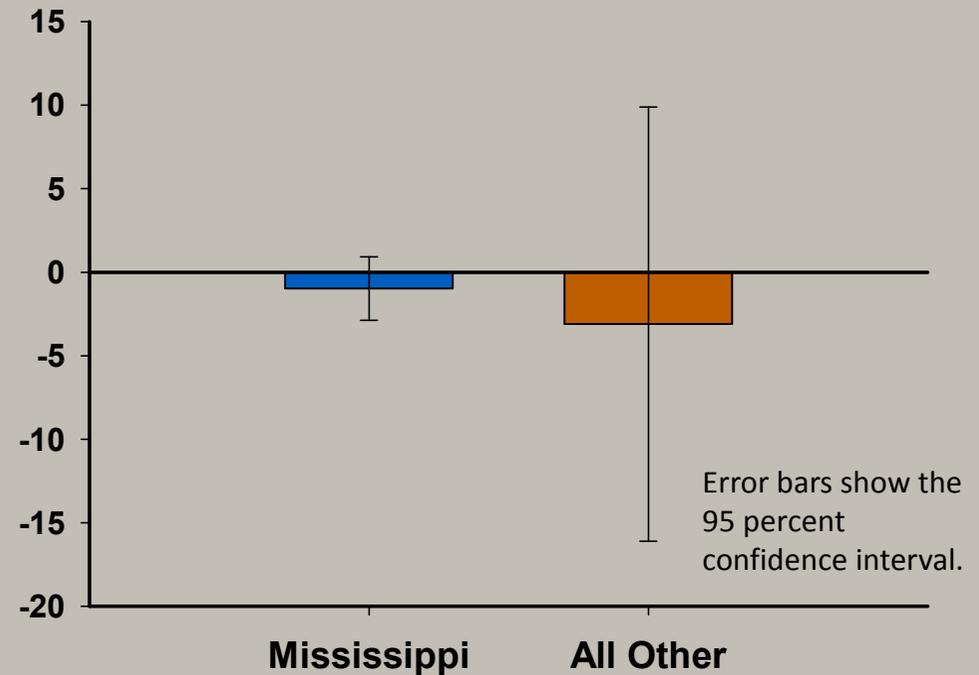


TOTAL PHOSPHORUS 2002-2012

Flow-normalized total phosphorus flux
($\times 10^9$ g P yr⁻¹)

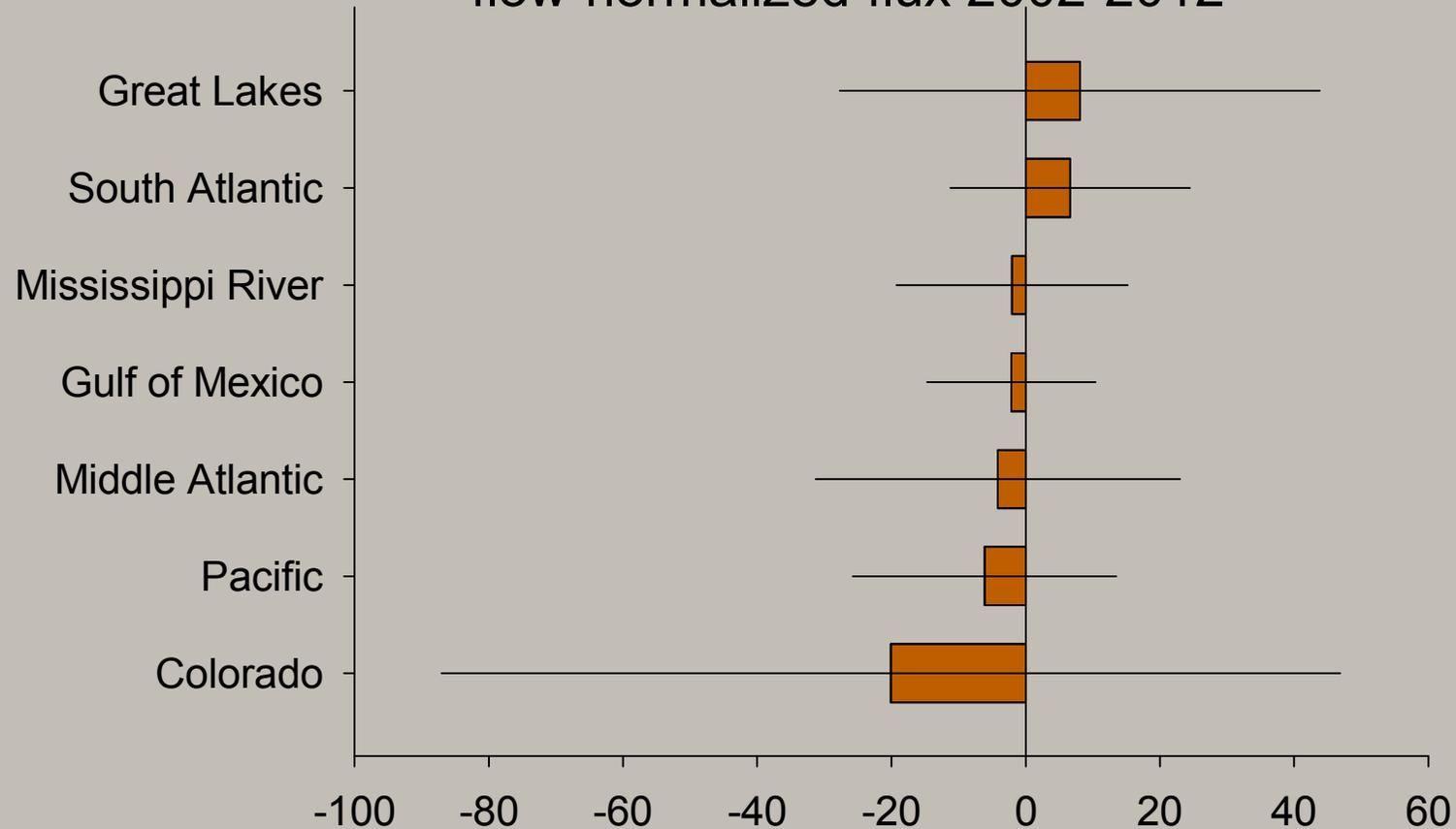


Change in flux 2002-2012
 $\times 10^9$ g P yr⁻¹



TOTAL PHOSPHORUS 2002-2012

Percent change in total phosphorus flow-normalized flux 2002-2012

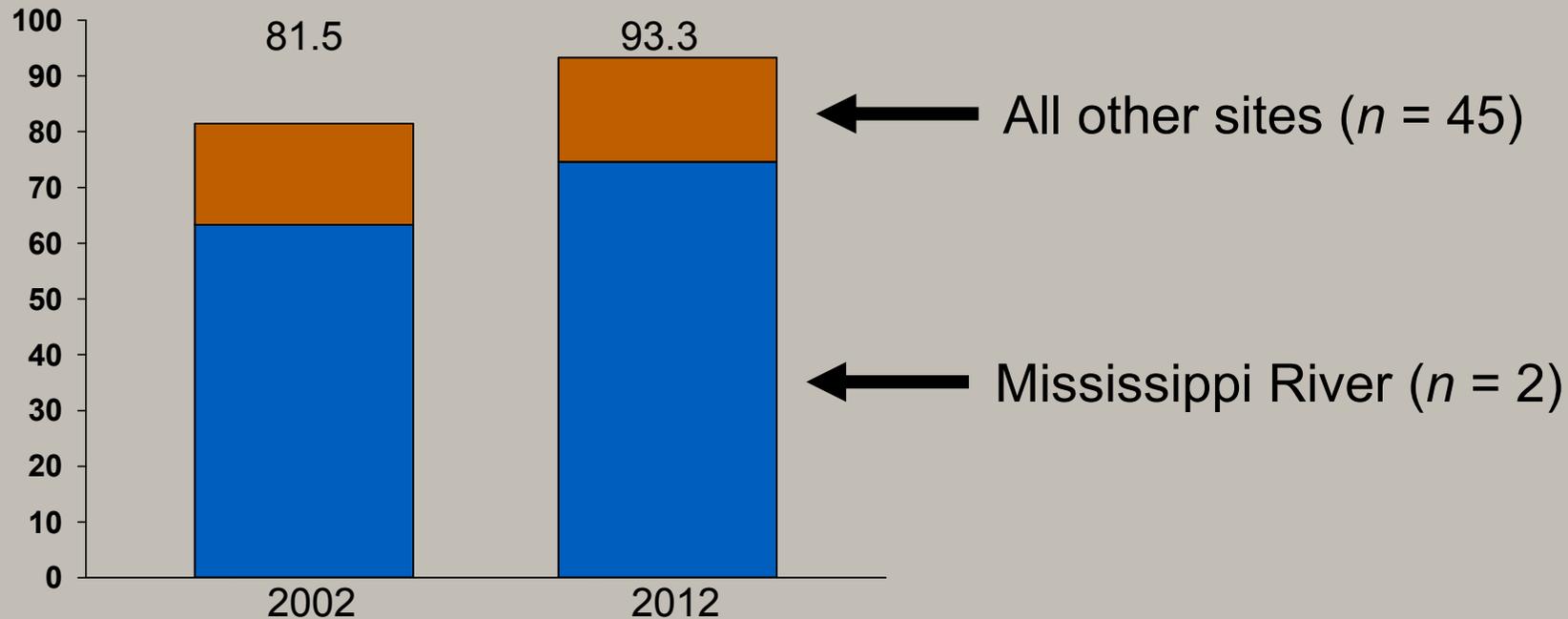


Error bars show the 95 percent confidence interval.

Preliminary information – Subject to revision. Not for citation or distribution.

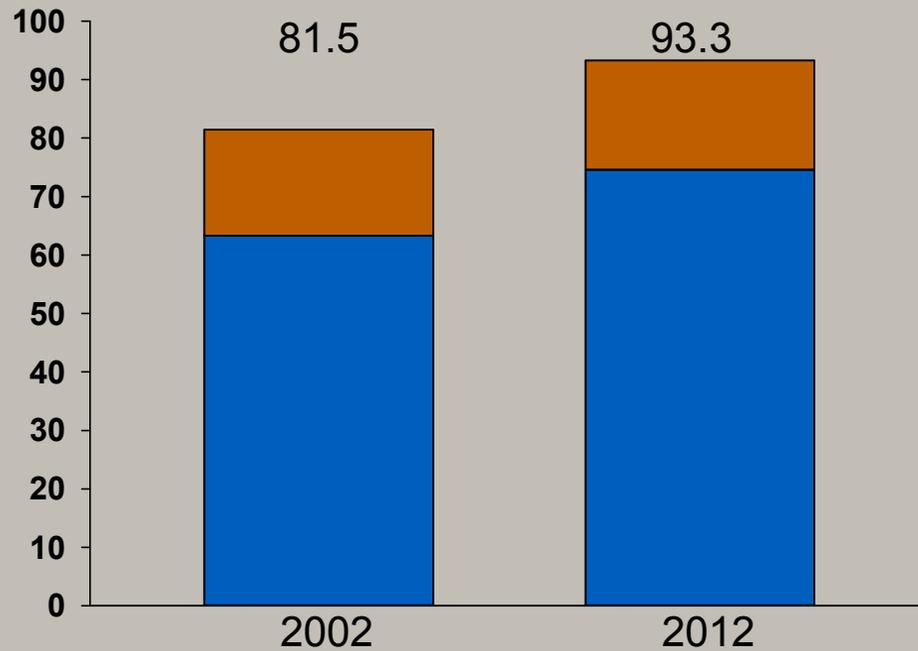
TOTAL ALKALINITY 2002-2012

Flow-normalized alkalinity flux
($\times 10^{12}$ g CaCO_3 yr^{-1})

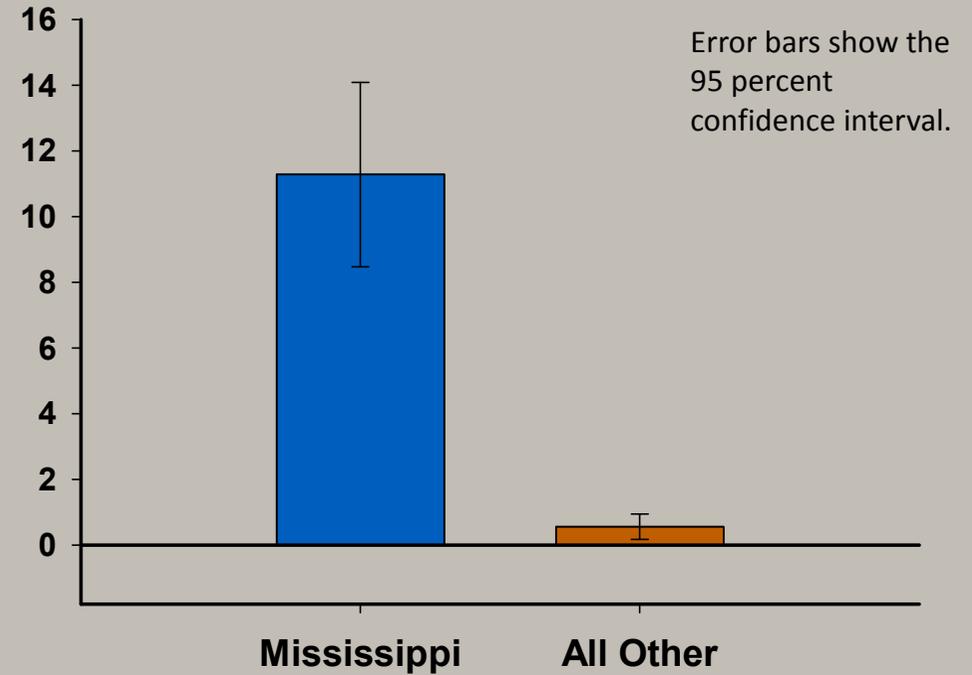


TOTAL ALKALINITY 2002-2012

Flow-normalized alkalinity flux
($\times 10^{12}$ g CaCO_3 yr $^{-1}$)

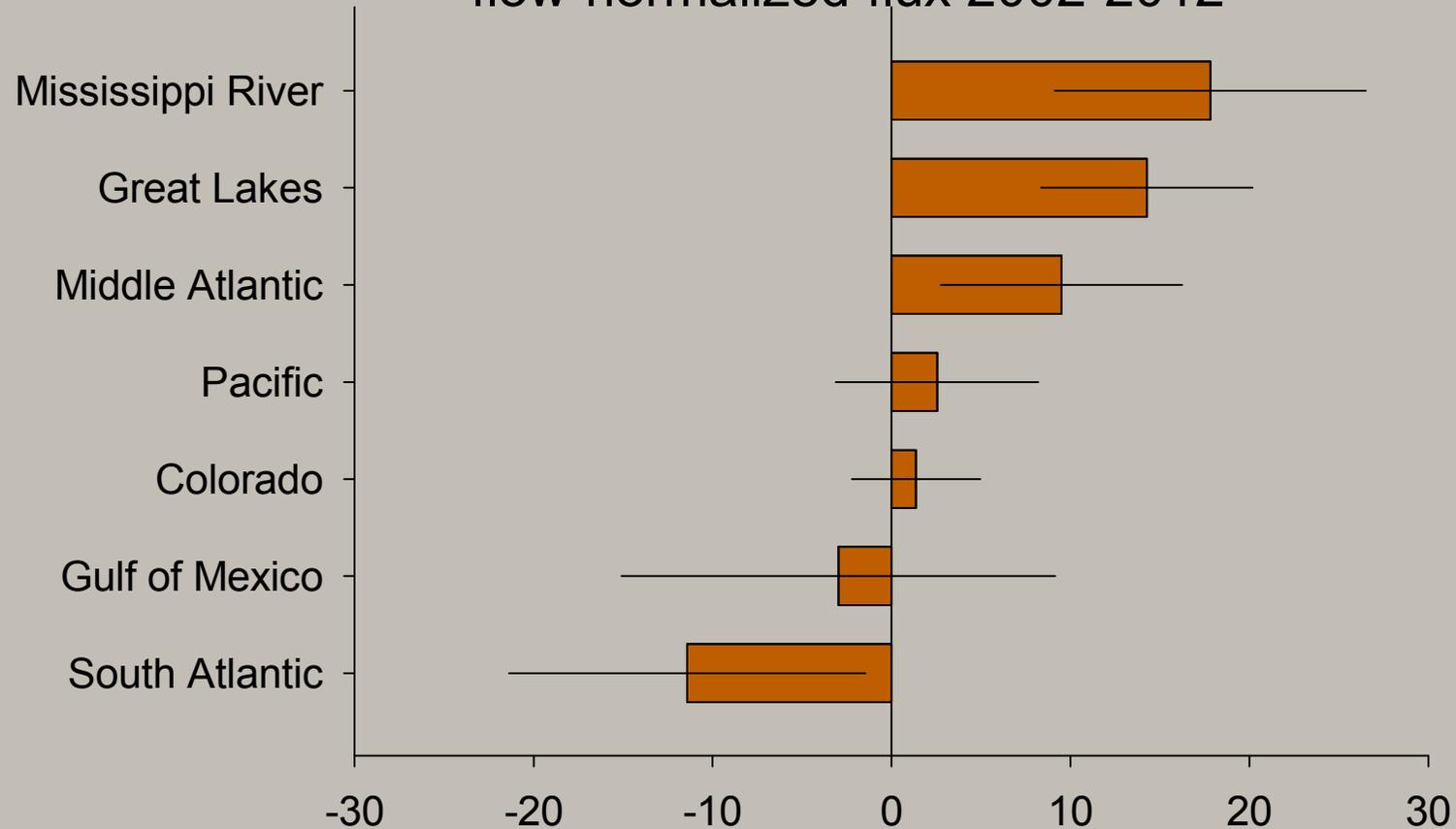


Change in flux 2002-2012
 $\times 10^{12}$ g CaCO_3 yr $^{-1}$



TOTAL ALKALINITY 2002-2012

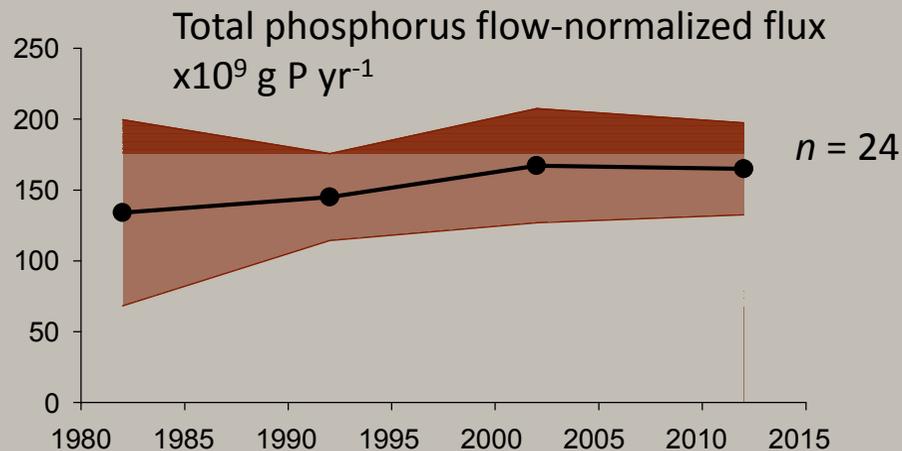
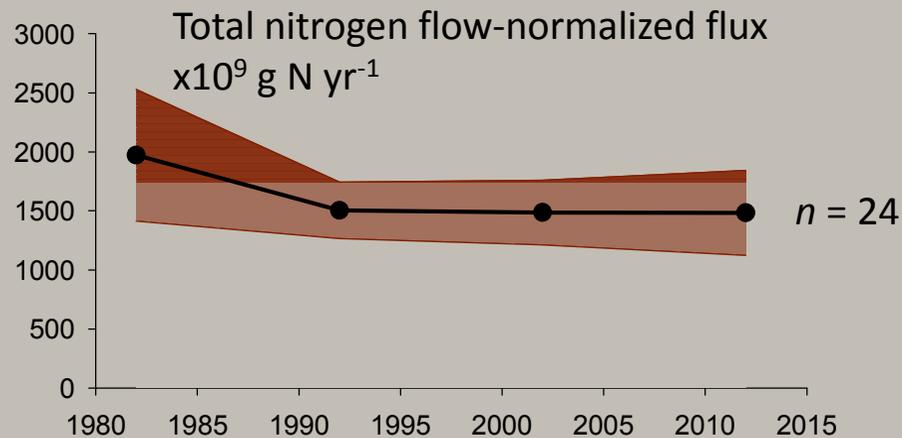
Percent change in total alkalinity
flow-normalized flux 2002-2012



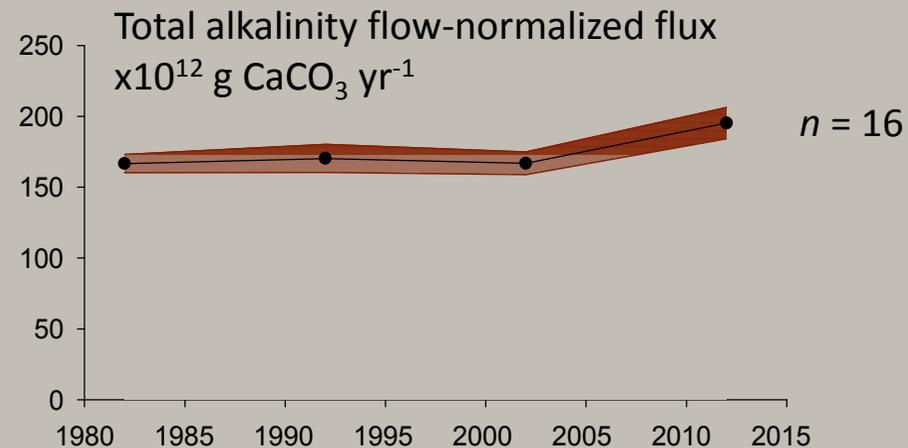
Error bars show
the 95 percent
confidence
interval.

Preliminary information – Subject to
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LONG-TERM TRENDS 1982-2012



- Long-term trends at all sites with required data for trend analysis.
- Fewer sites represented in the long-term analysis than in the 2002-2012 time period.



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CONCLUSIONS

Data coverage

- 70 % of watershed area and 60 % of coastal discharge were represented in 2002-2012 analysis.
- Missing parts of Eastern Coastal Plain, Pacific, and Gulf Coast.

Nitrogen trends

- Small changes in coastal nitrogen flux 2002-2012.
- Potential regional differences in nitrogen flux, especially between South and Mid-Atlantic.
- Long-term trends suggest little change in nitrogen flux for several decades.

CONCLUSIONS

Phosphorus trends

- Small changes in phosphorus flux 2002-2012 nationally and at regional scales.
- Little change in phosphorus flux since 1982.

Alkalinity trends

- Increasing alkalinity export to coastal ocean.
- Largest increases in Mississippi, Great Lakes, Mid-Atlantic.
- Increased alkalinity export is especially noticeable during 2002-2012.

