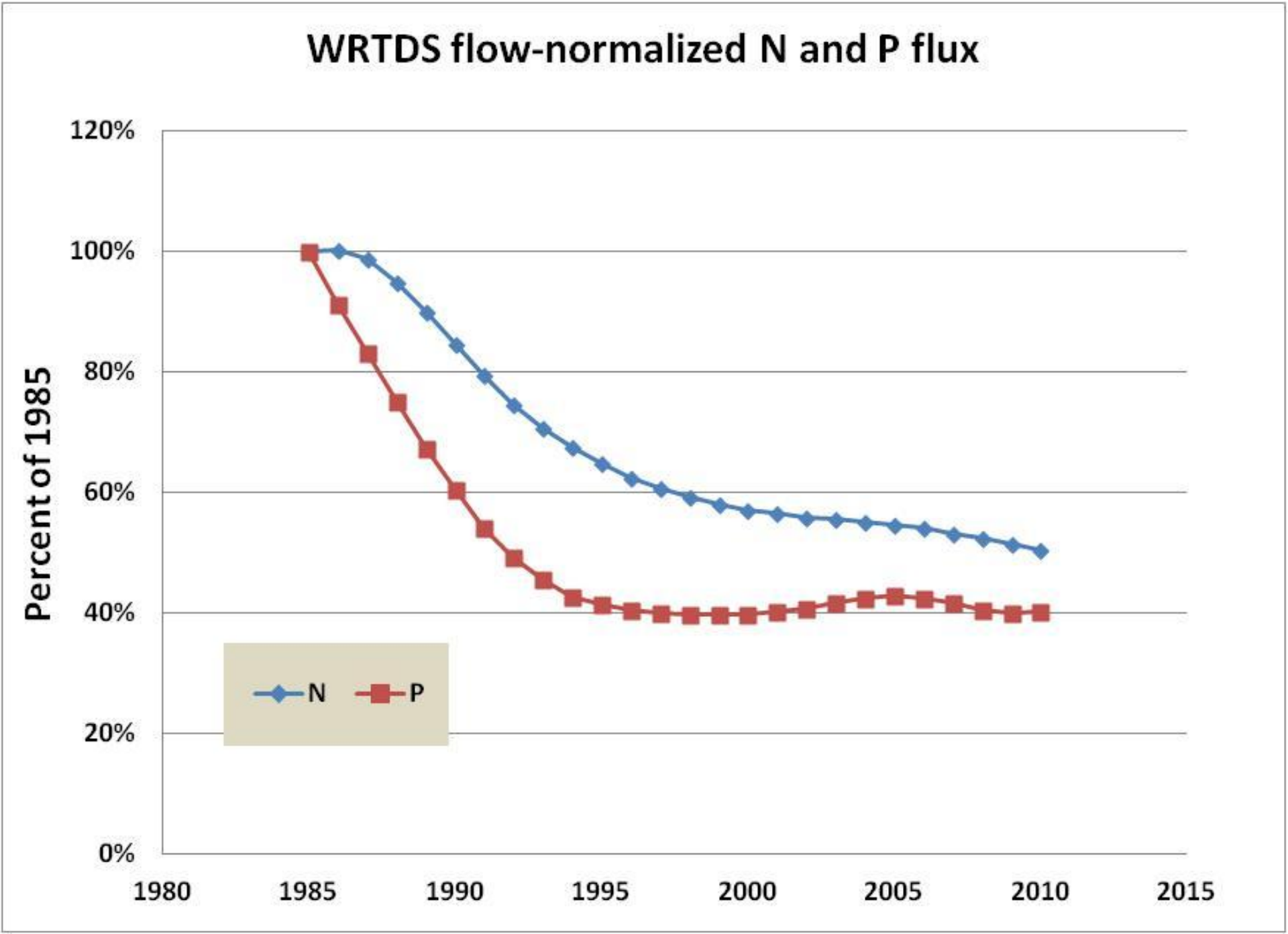
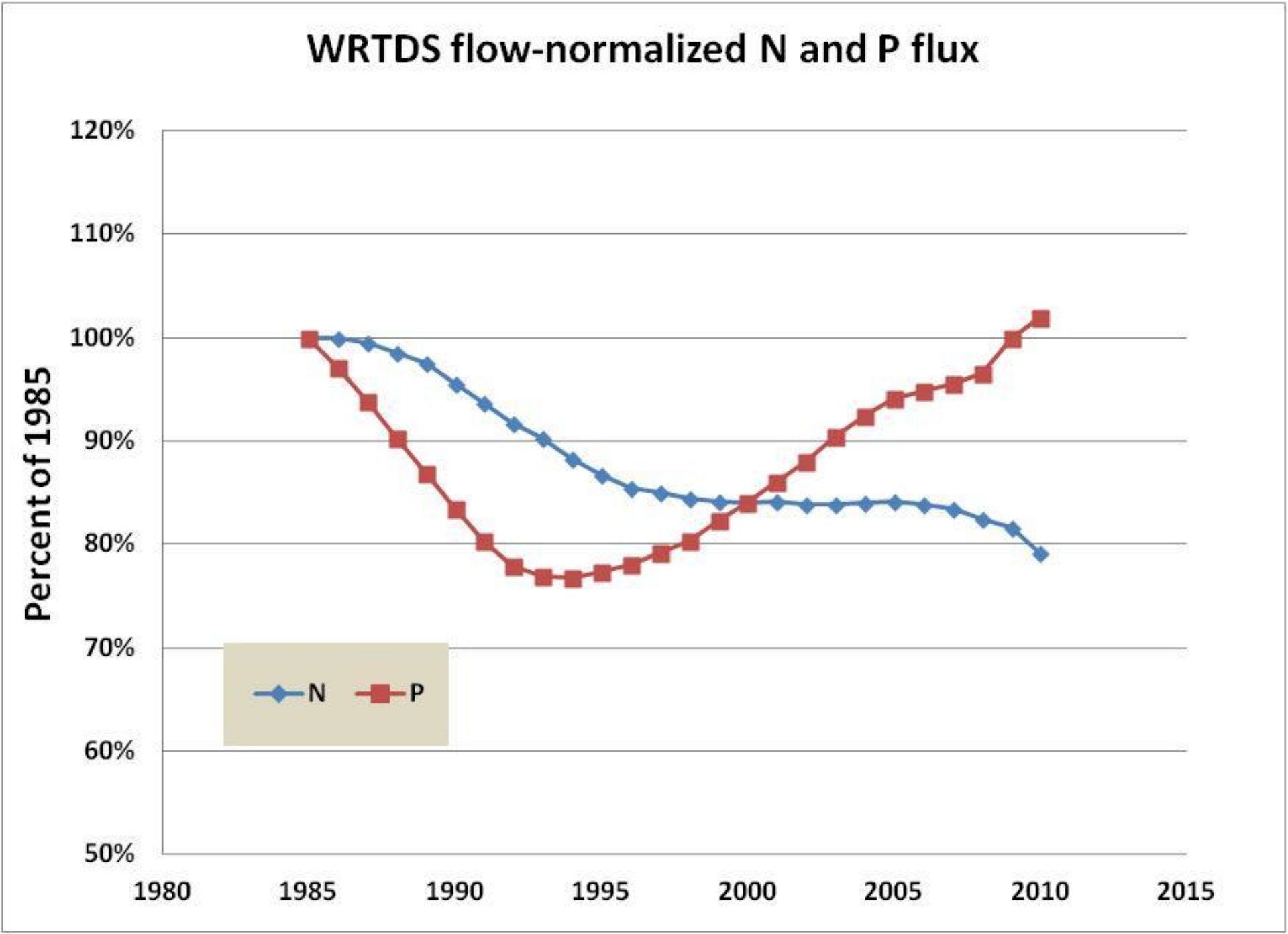
Using Models and BMP and Source information to explain WQ trends

Gary Shenk

3/27/13

NTWG/TMAW Joint Meeting


WRTDS flow-normalized N and P flux
120%
100%
80%
60%
40%
20%
0%
Percent of 1985
1980
1985
1990
1995
2000
2005
2010
2015
N
P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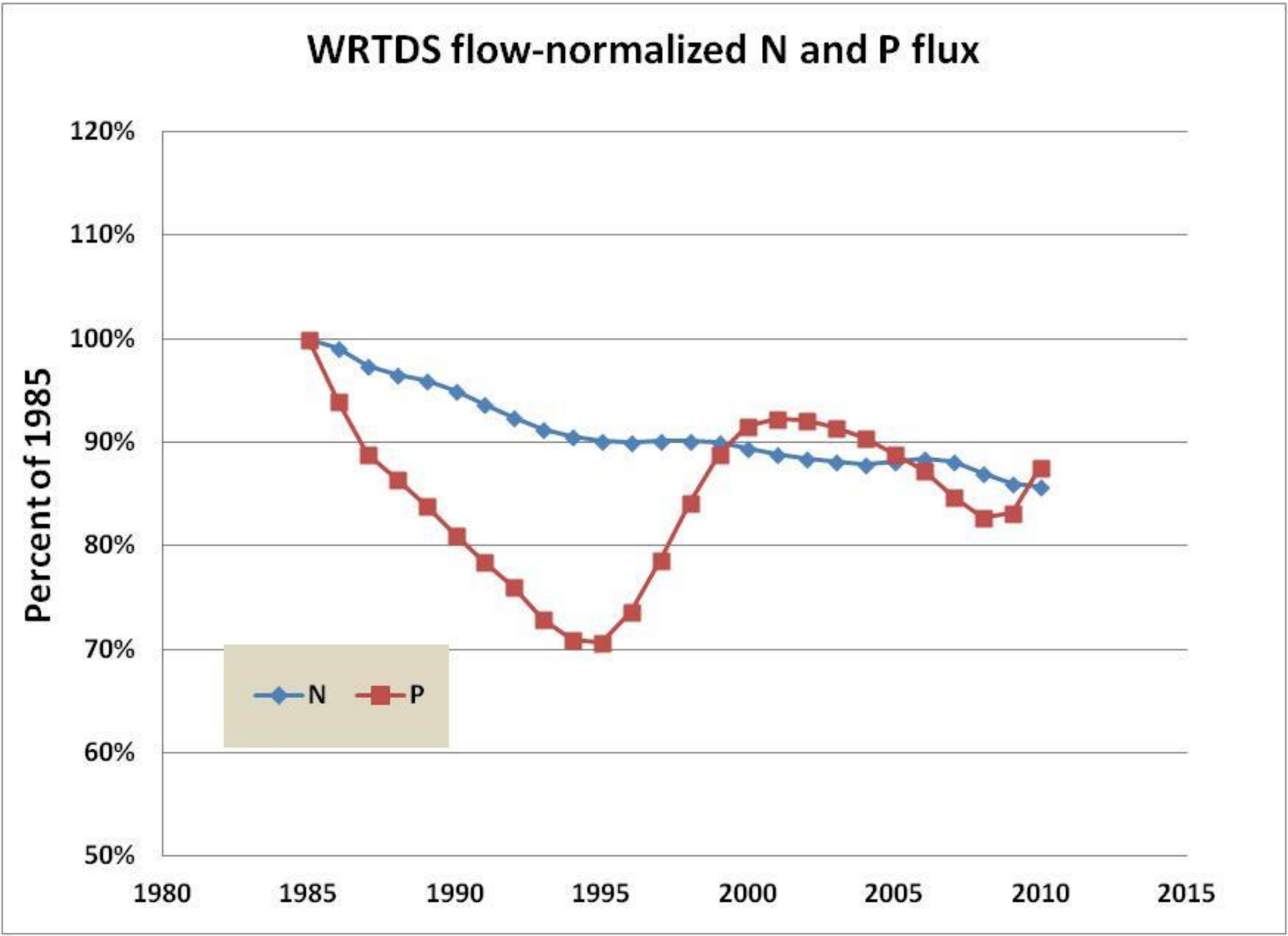
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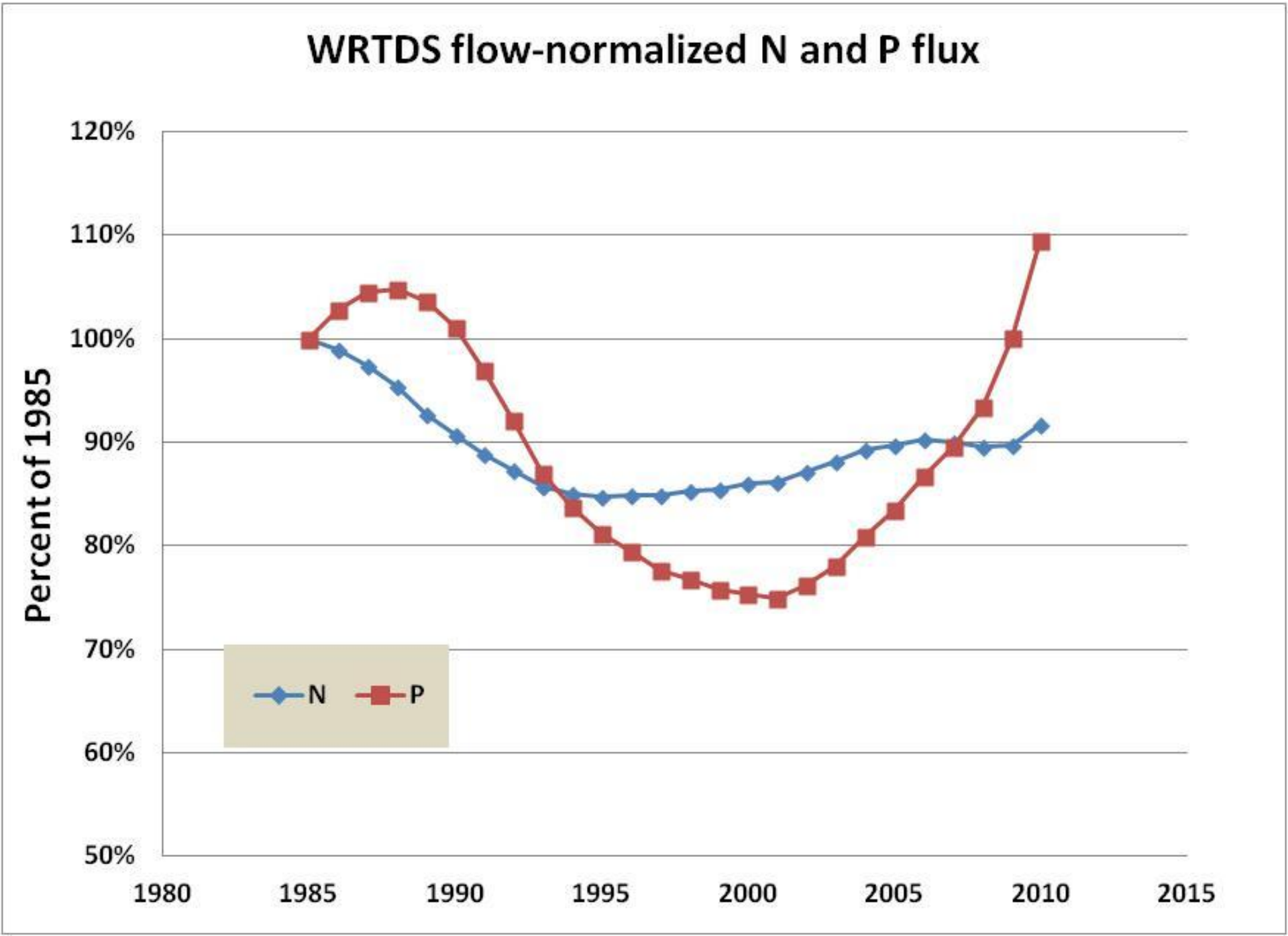
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2010
2015
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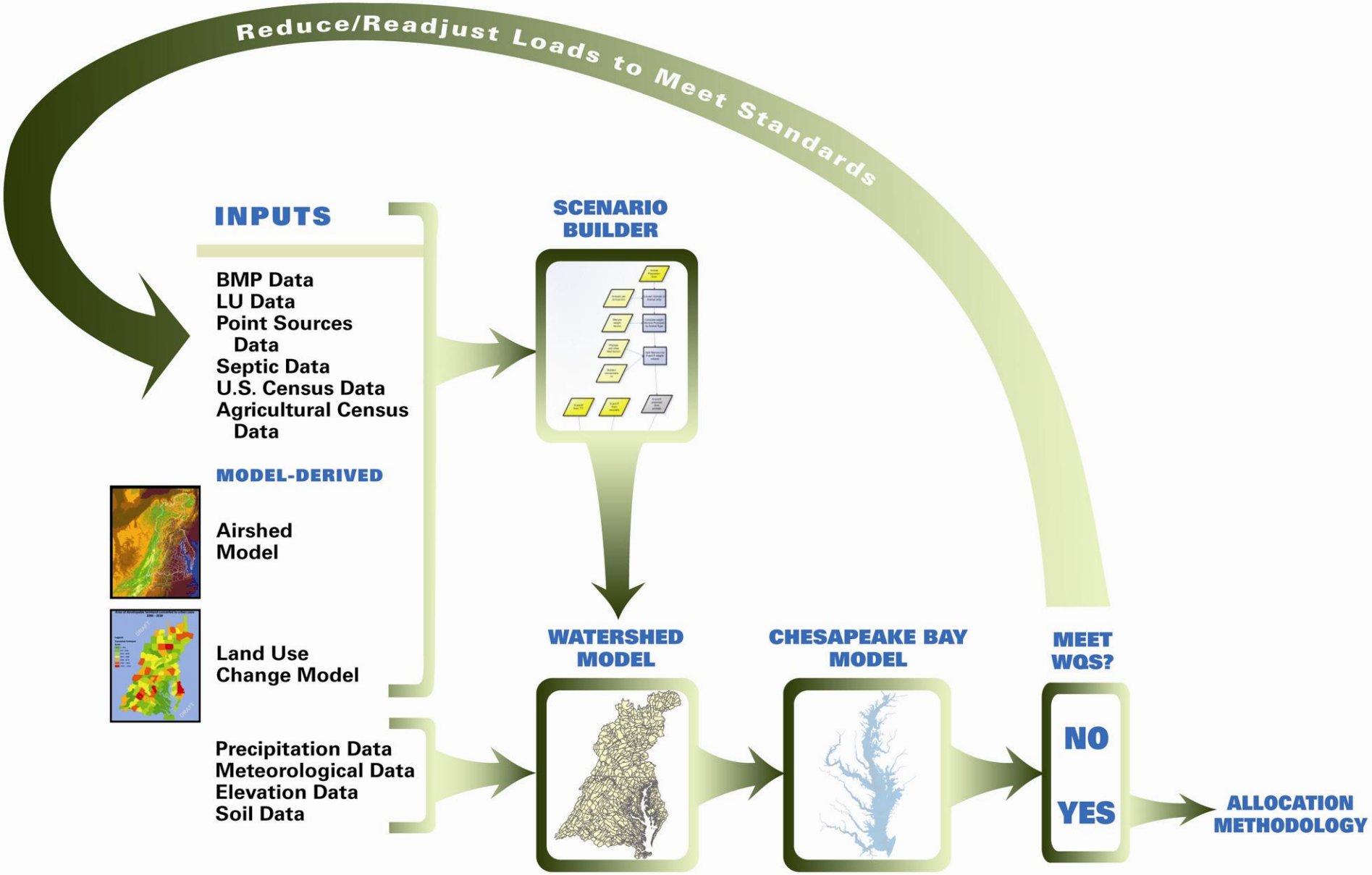
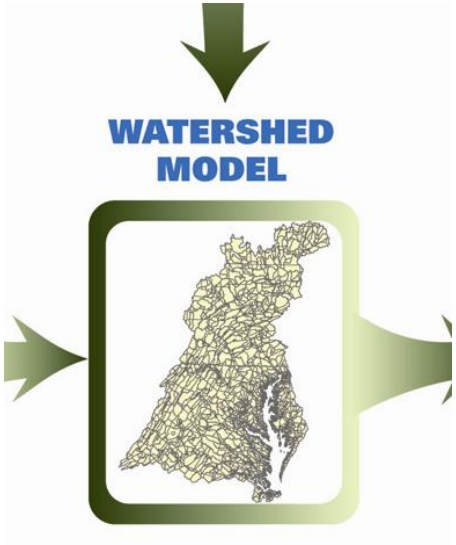
P

Chesapeake Bay Partnership Models

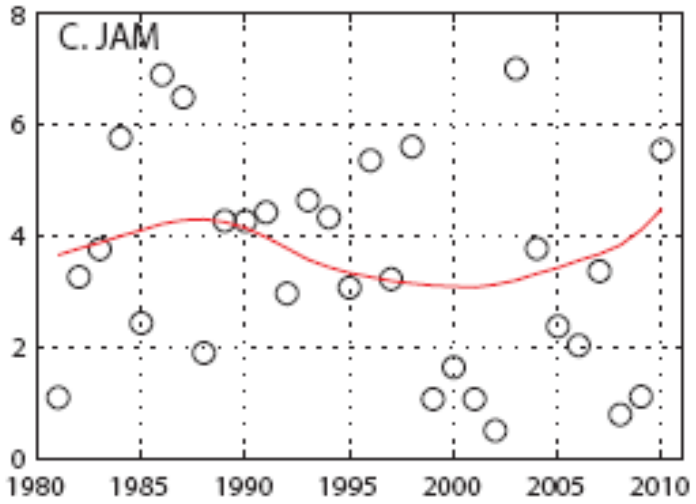


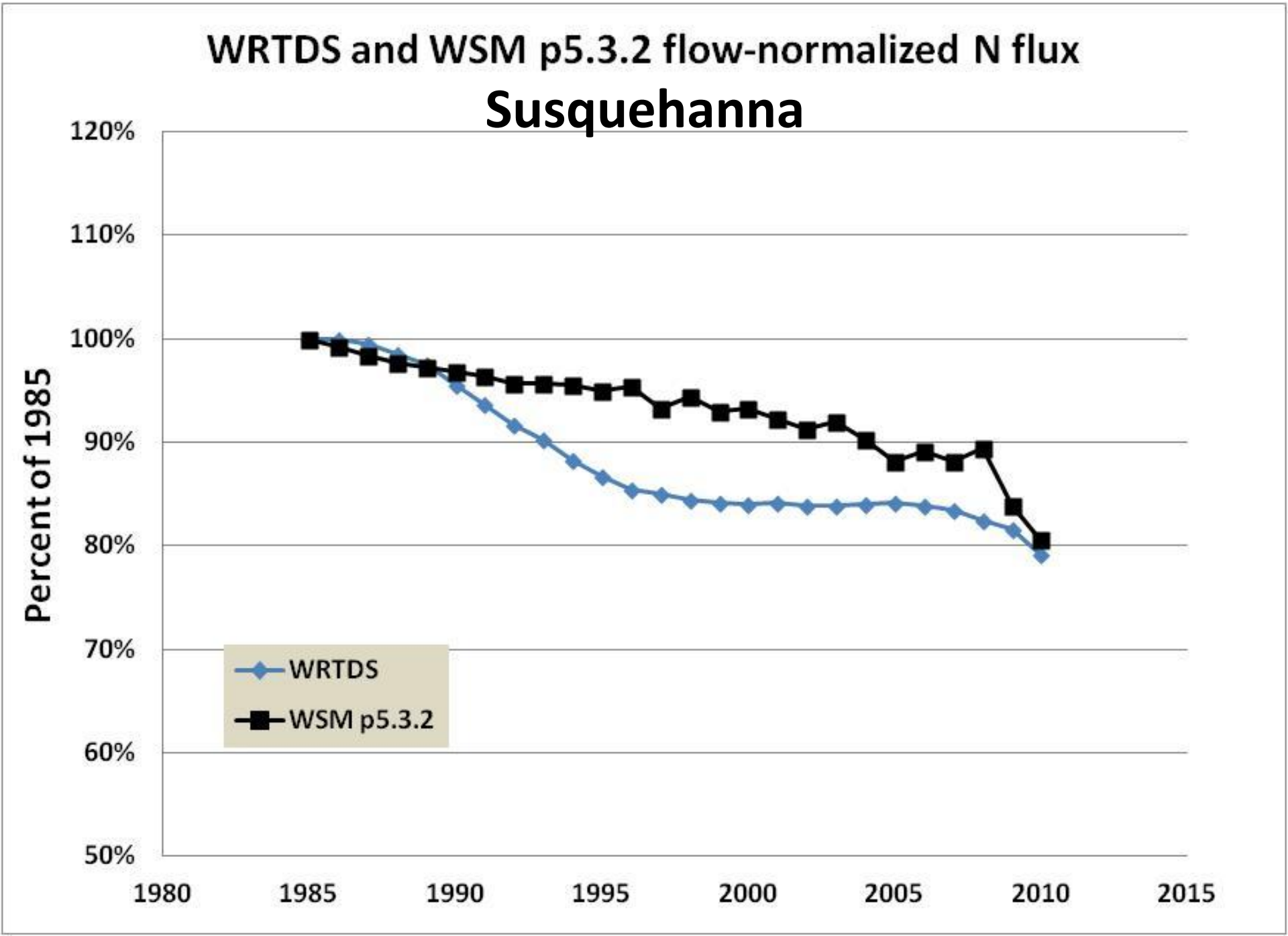
See the Similarity?

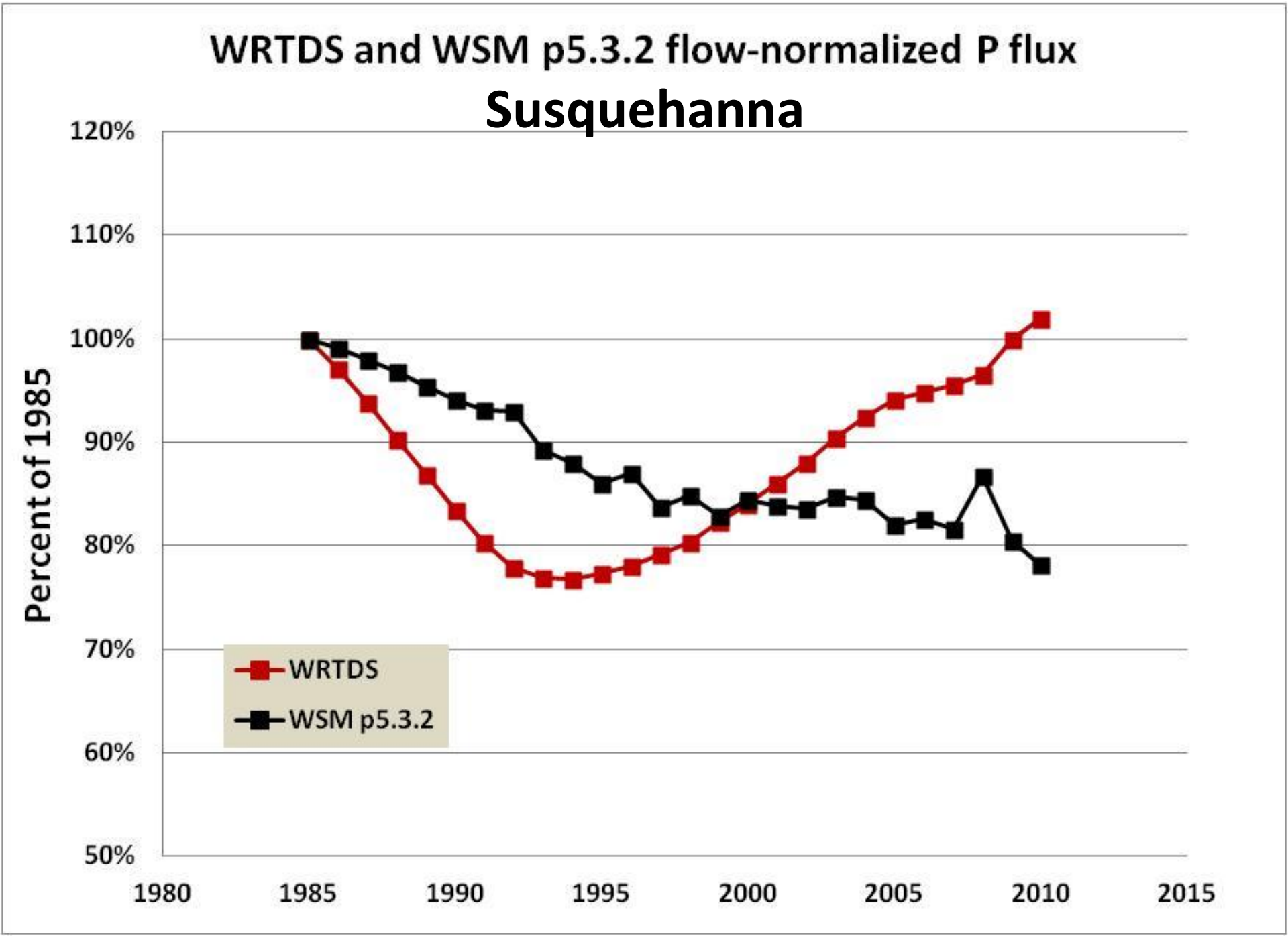
CBP Watershed Model
Tool for estimating flow-normalized change in load



WRTDS
Tool for estimating flow-normalized change in load




WRTDS and WSM p5.3.2 flow-normalized N flux
Susquehanna
120%
110%
100%
90%
80%
70%
60%
50%
Percent of 1985
1980
1985
1990
1995
2000
2005
2010
2015
WRTDS
WSM p5.3.2


WRTDS and WSM p5.3.2 flow-normalized P flux
Susquehanna
120%
110%
100%
90%
80%
70%
60%
50%
Percent of 1985
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1990
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2010
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WRTDS
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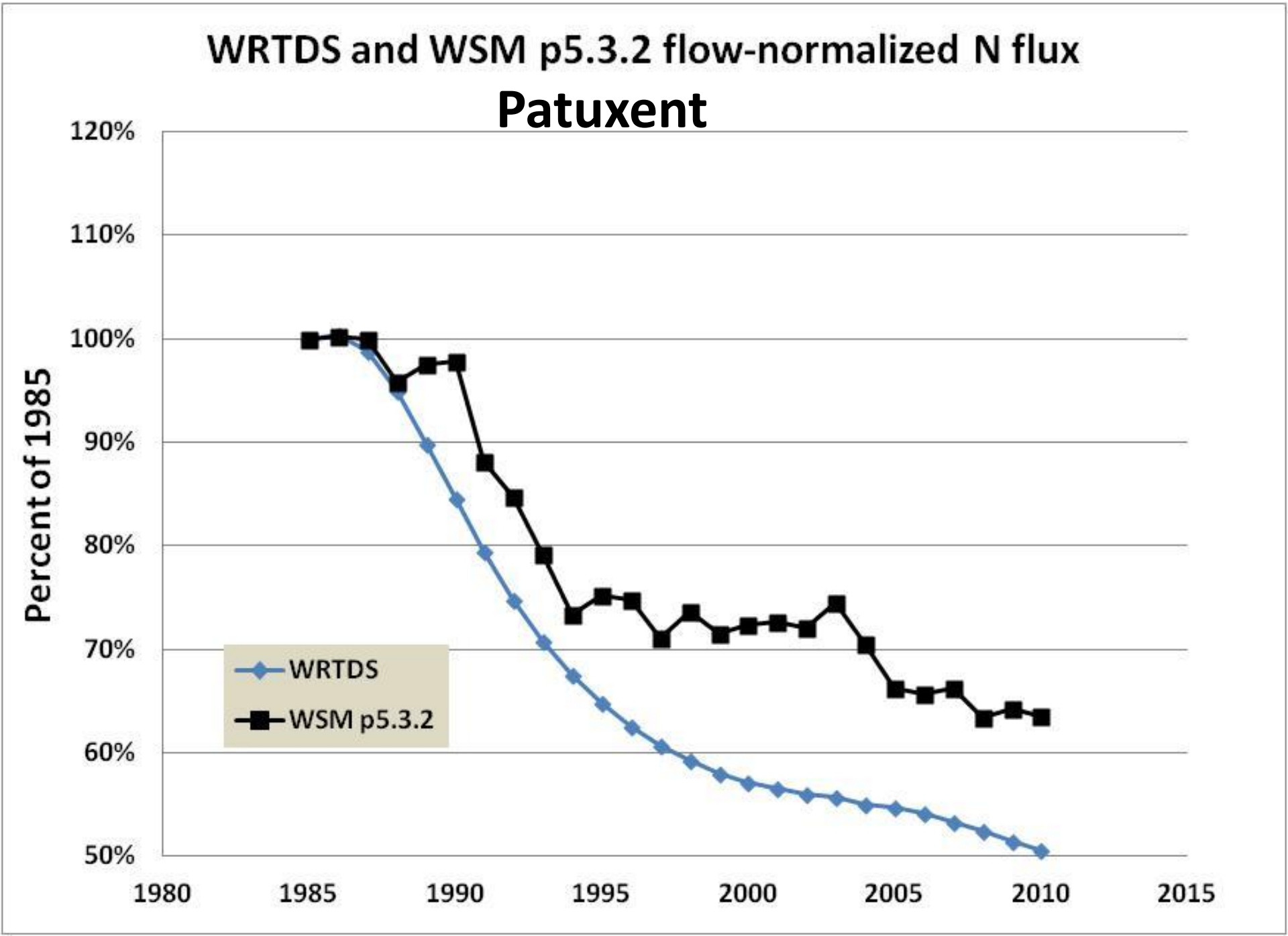
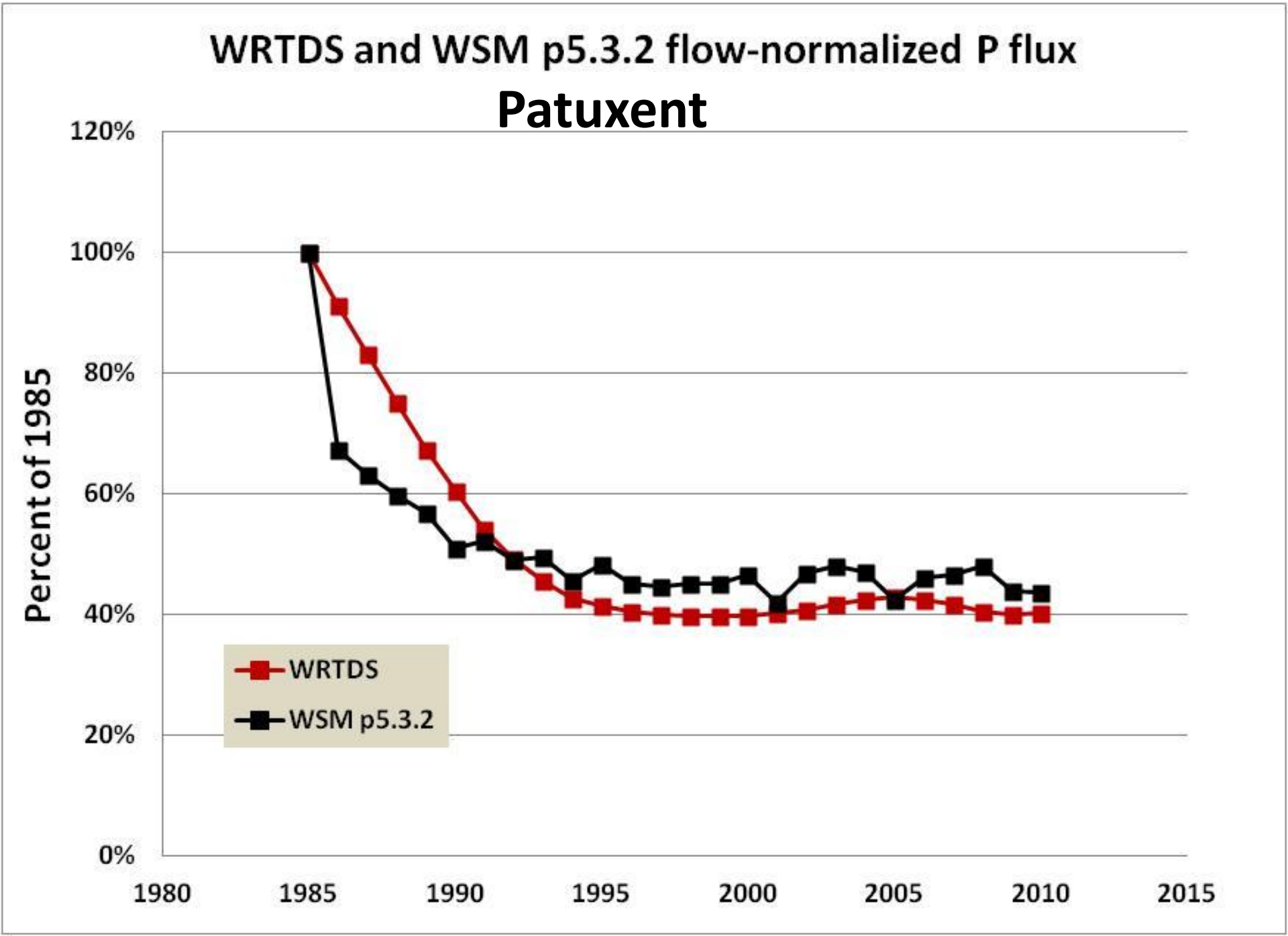

WRTDS and WSM p5.3.2 flow-normalized N flux
Patuxent
120%
110%
100%
90%
80%
70%
60%
50%
Percent of 1985
1980
1985
1990
1995
2000
2005
2010
2015
WRTDS
WSM p5.3.2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80%
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Percent of 1985
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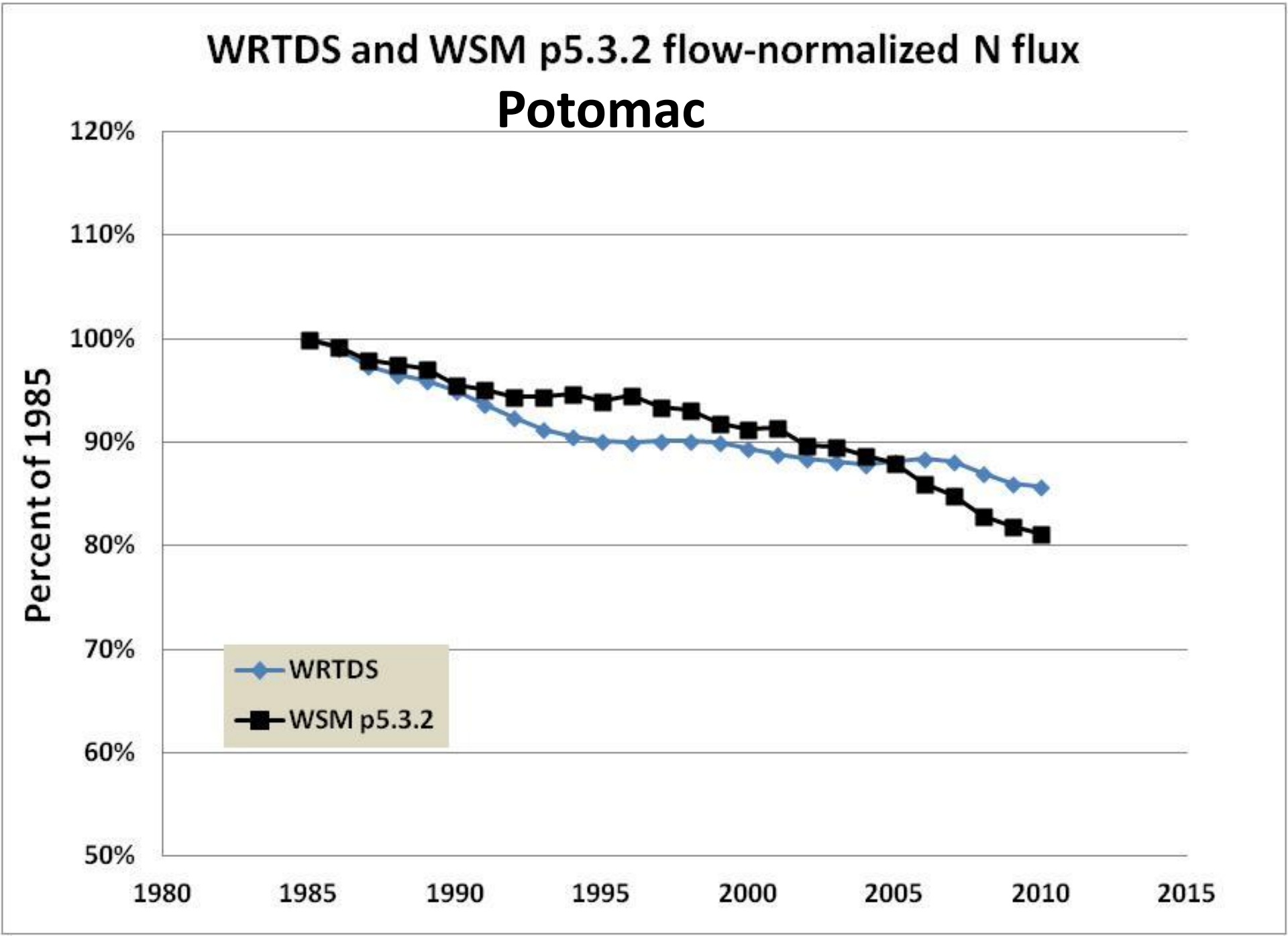
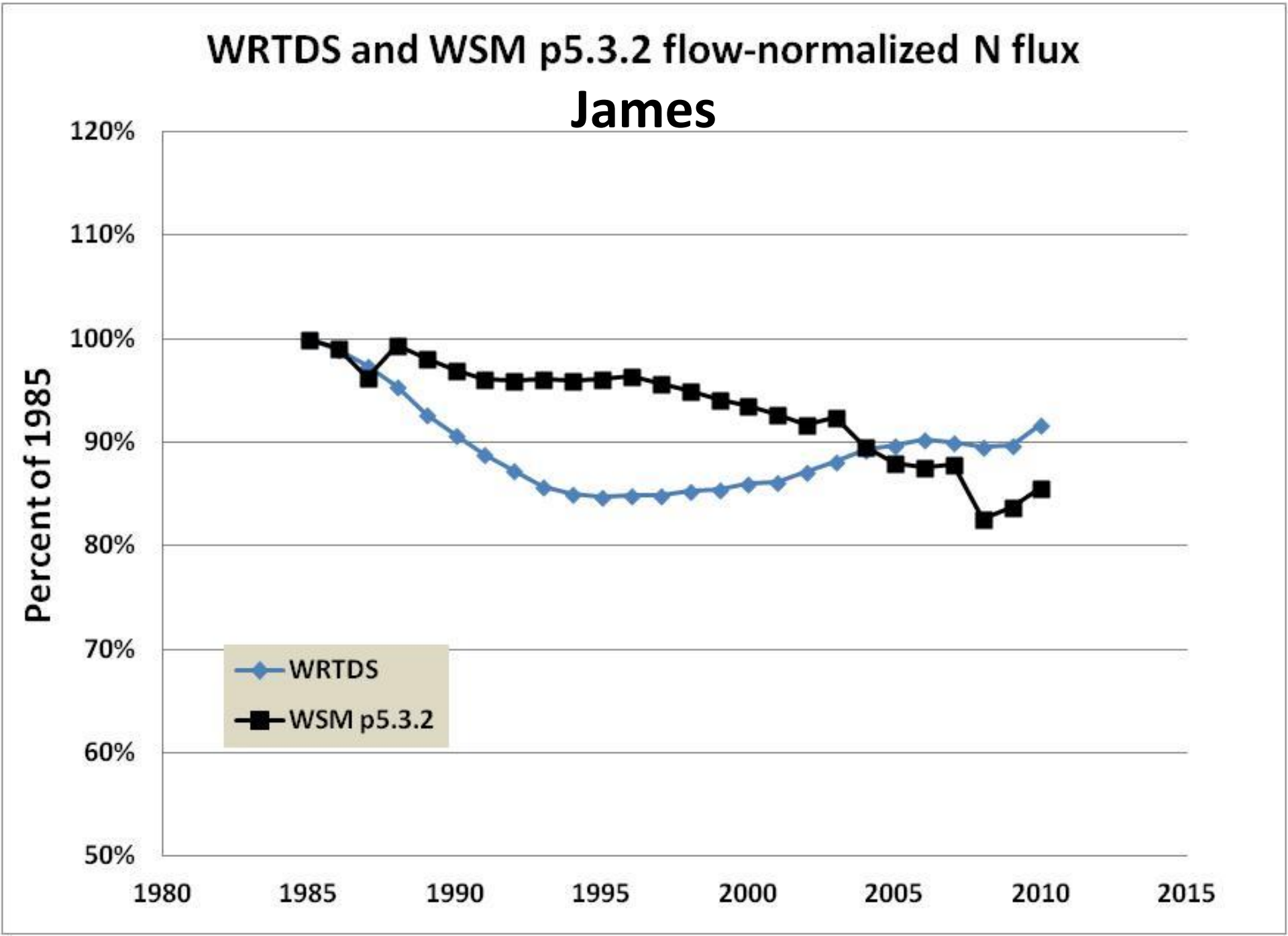
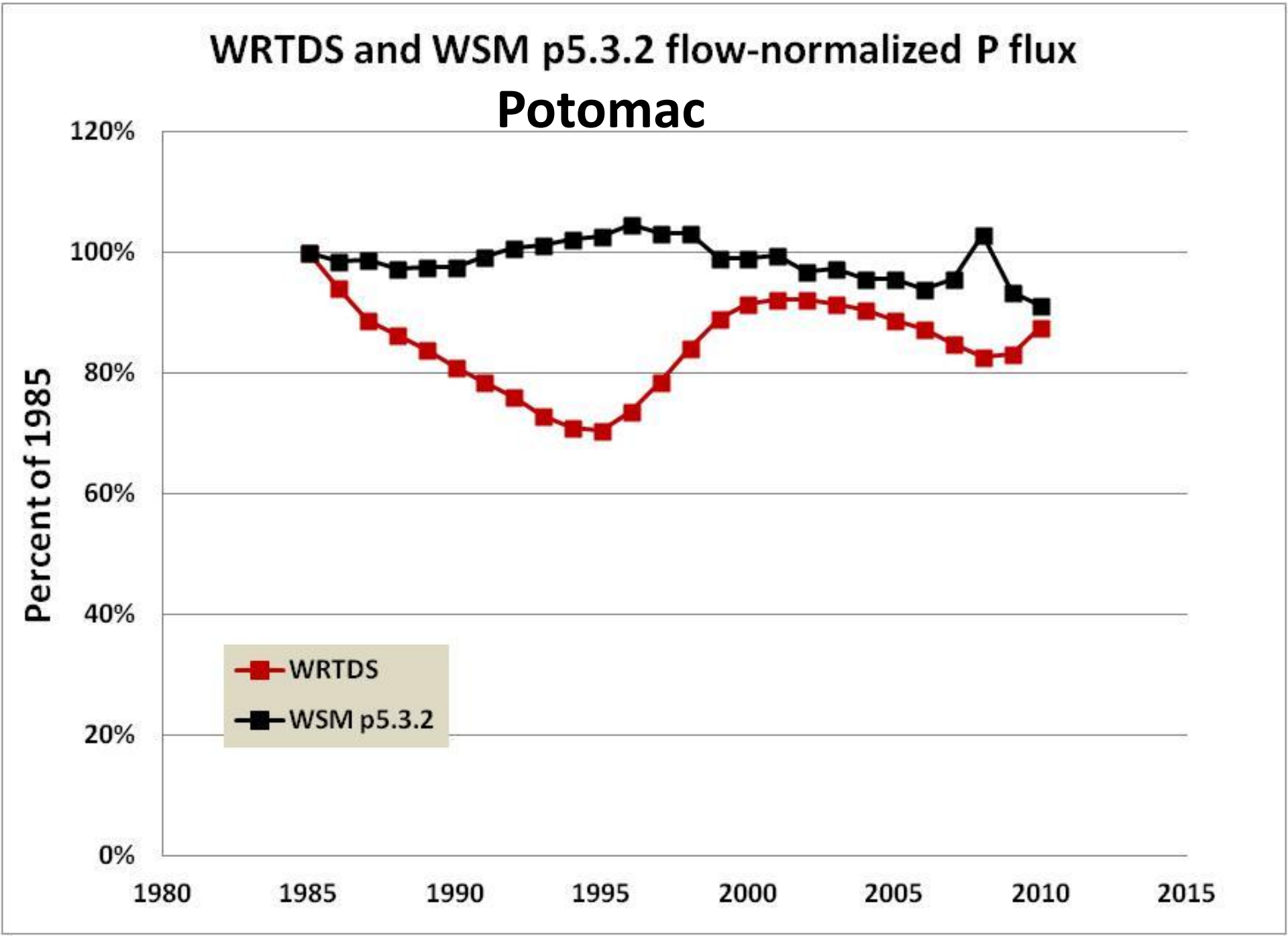

WRTDS and WSM p5.3.2 flow-normalized N flux
Potomac
120%
110%
100%
90%
80%
70%
60%
50%
Percent of 1985
1980
1985
1990
1995
2000
2005
2010
2015
WRTDS
WSM p5.3.2


WRTDS and WSM p5.3.2 flow-normalized N flux
James
120%
110%
100%
90%
80%
70%
60%
50%
Percent of 1985
1980
1985
1990
1995
2000
2005
2010
2015
WRTDS
WSM p5.3.2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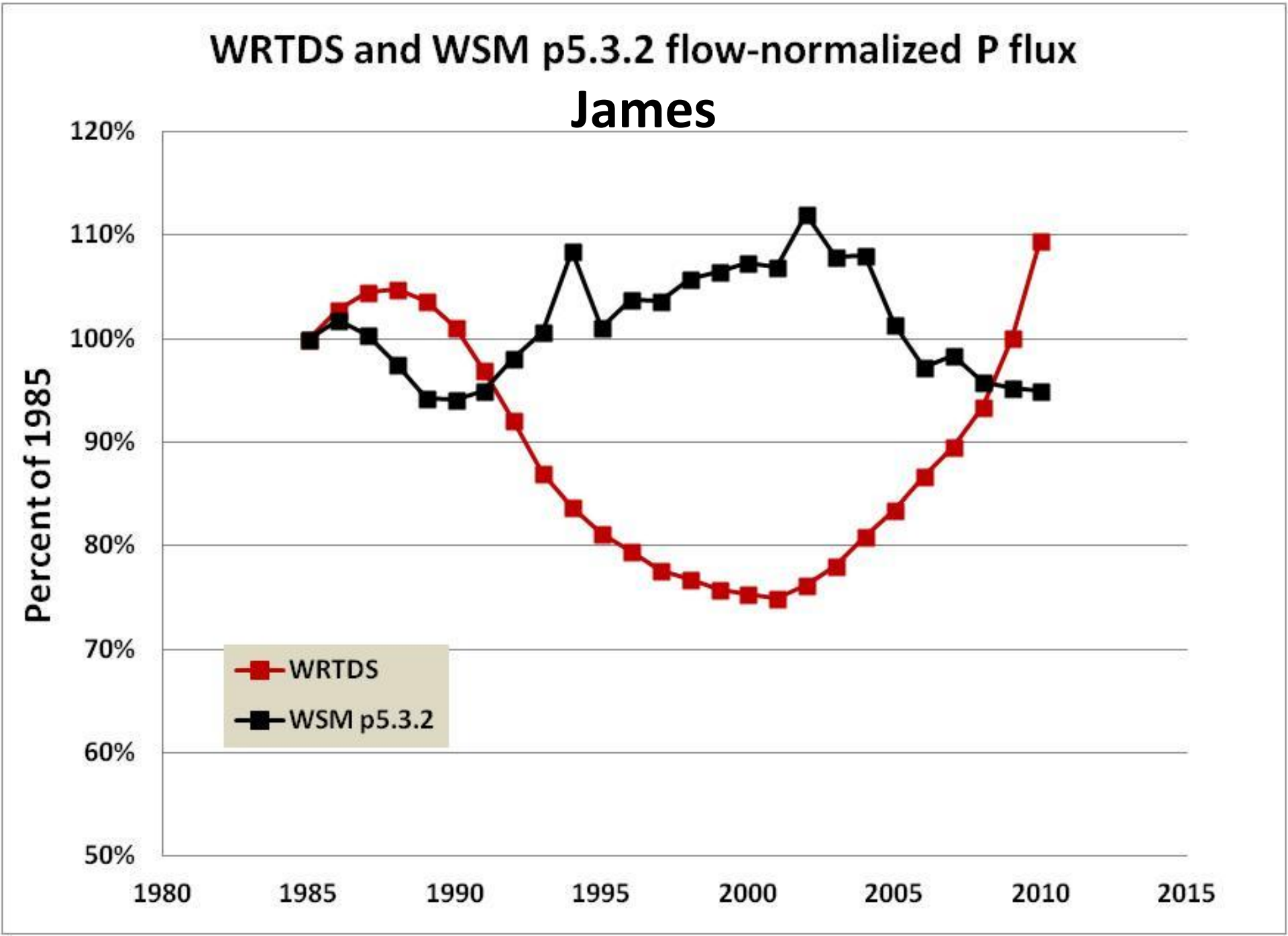
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James
120%
110%
100%
90%
80%
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Percent of 1985
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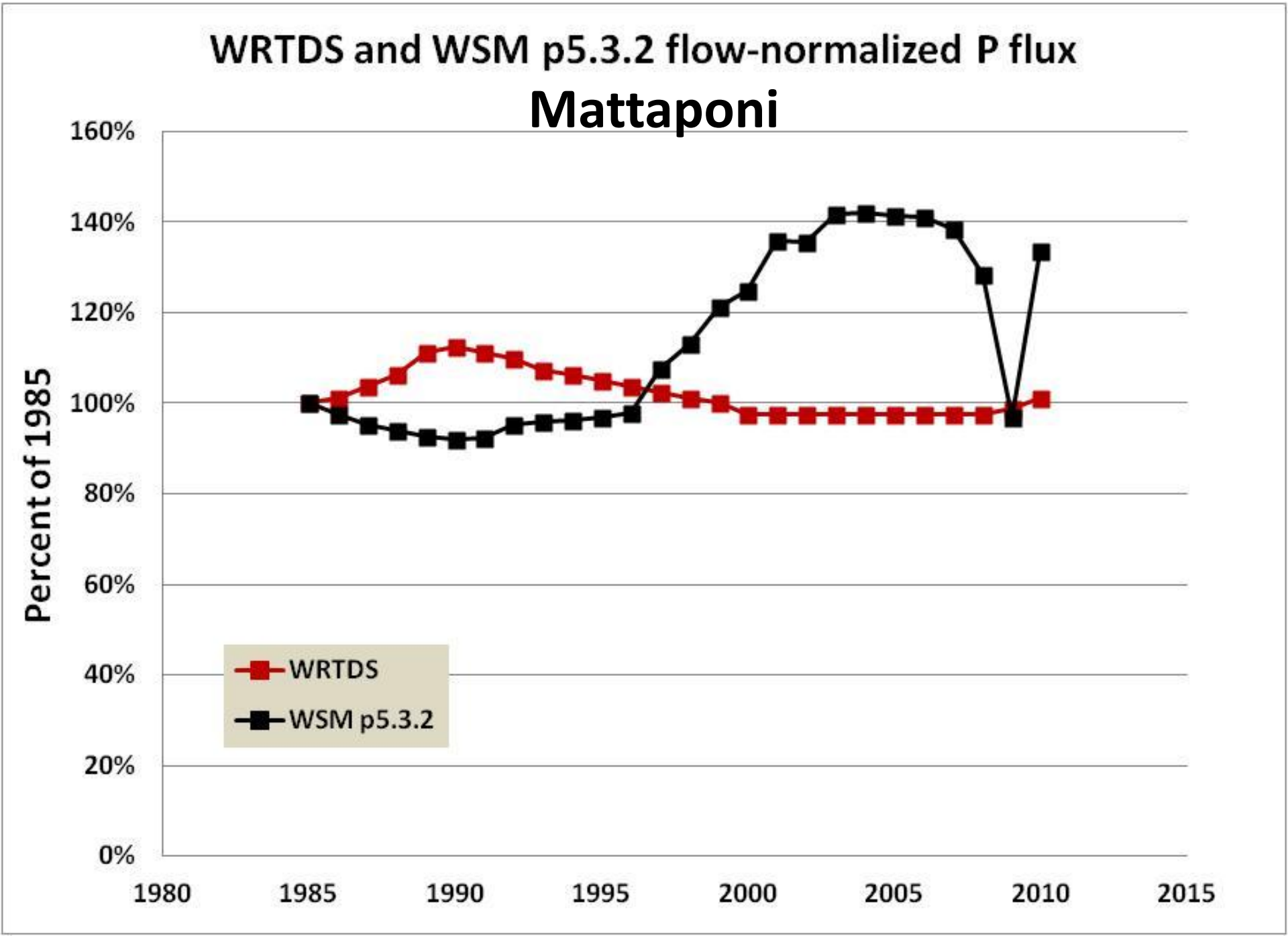
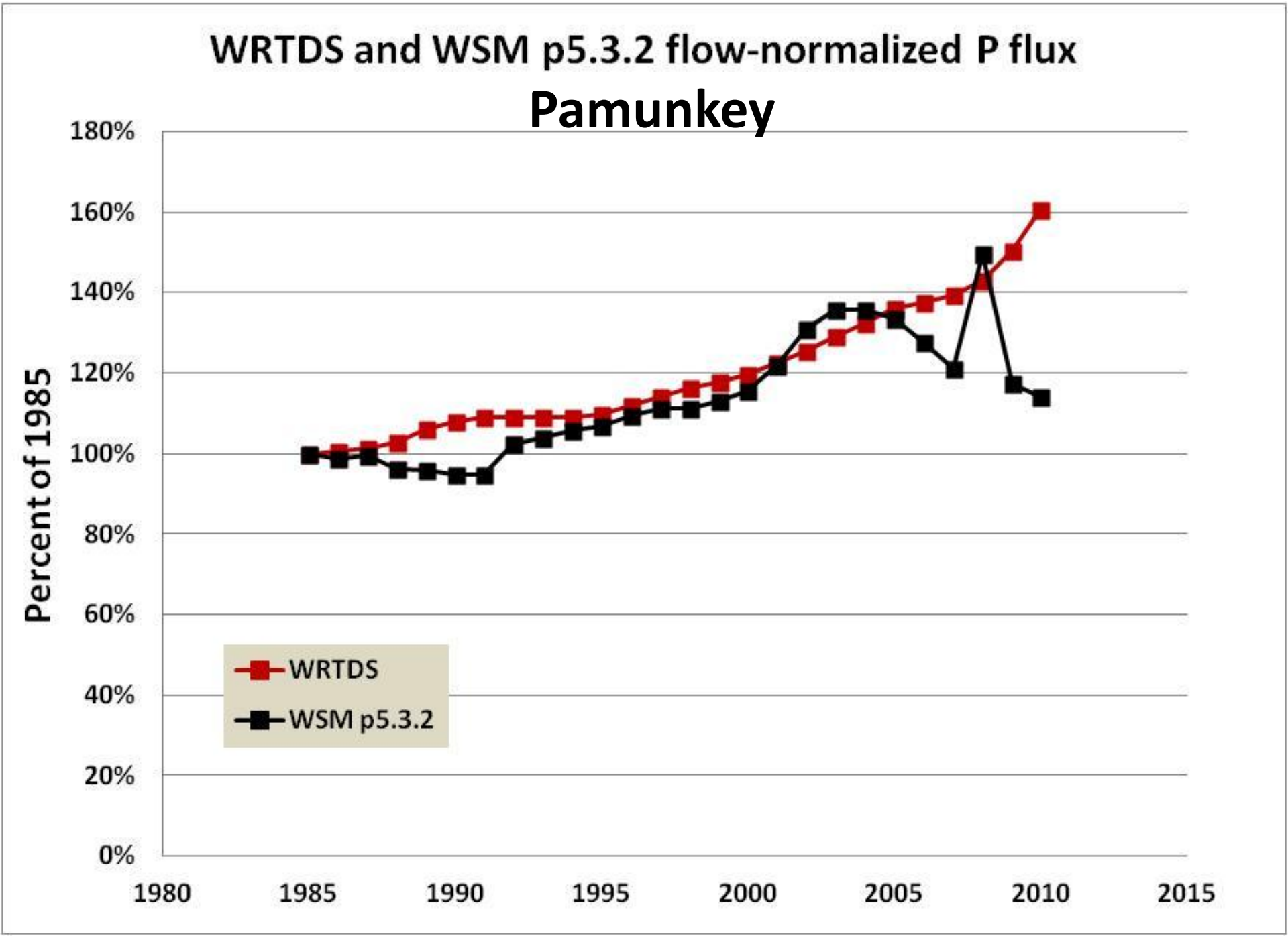

WRTDS and WSM p5.3.2 flow-normalized P flux
Mattaponi
160%
140%
120%
100%
80%
60%
40%
20%
0%
Percent of 1985
1980
1985
1990
1995
2000
2005
2010
2015
WRTDS
WSM p5.3.2

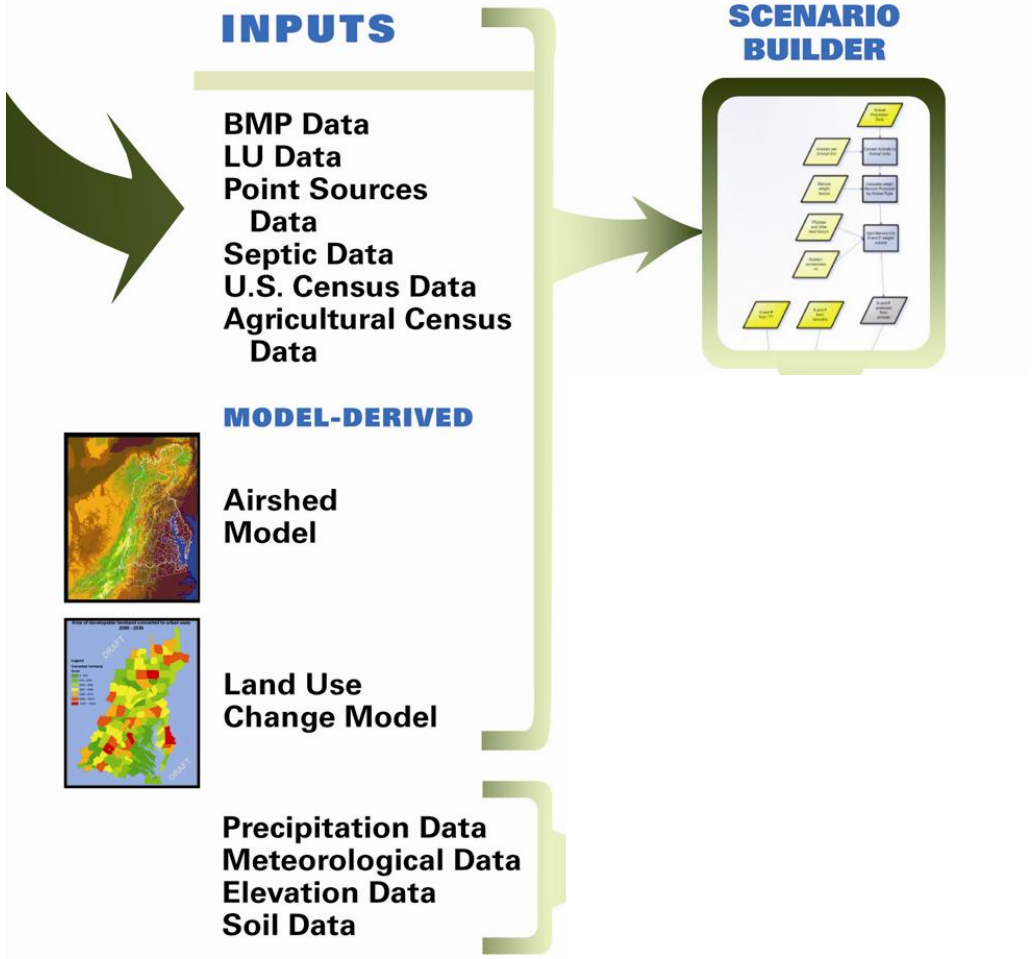

WRTDS and WSM p5.3.2 flow-normalized P flux
Pamunkey
180%
160%
140%
120%
100%
80%
60%
40%
20%
0%
Percent of 1985
1980
1985
1990
1995
2000
2005
2010
2015
WRTDS
WSM p5.3.2

?????

- Why are we better able to predict load changes in some areas than others?
  - Better at some land uses?
  - Better at some BMP types?
  - Better in some physical region?
- Are we better at a certain time?
  - Did we do better in the earlier/later time period
- Are there physical factors?

CBP Scenario Builder, land use modeling and other data systems –

Tool for estimating changes to the watershed



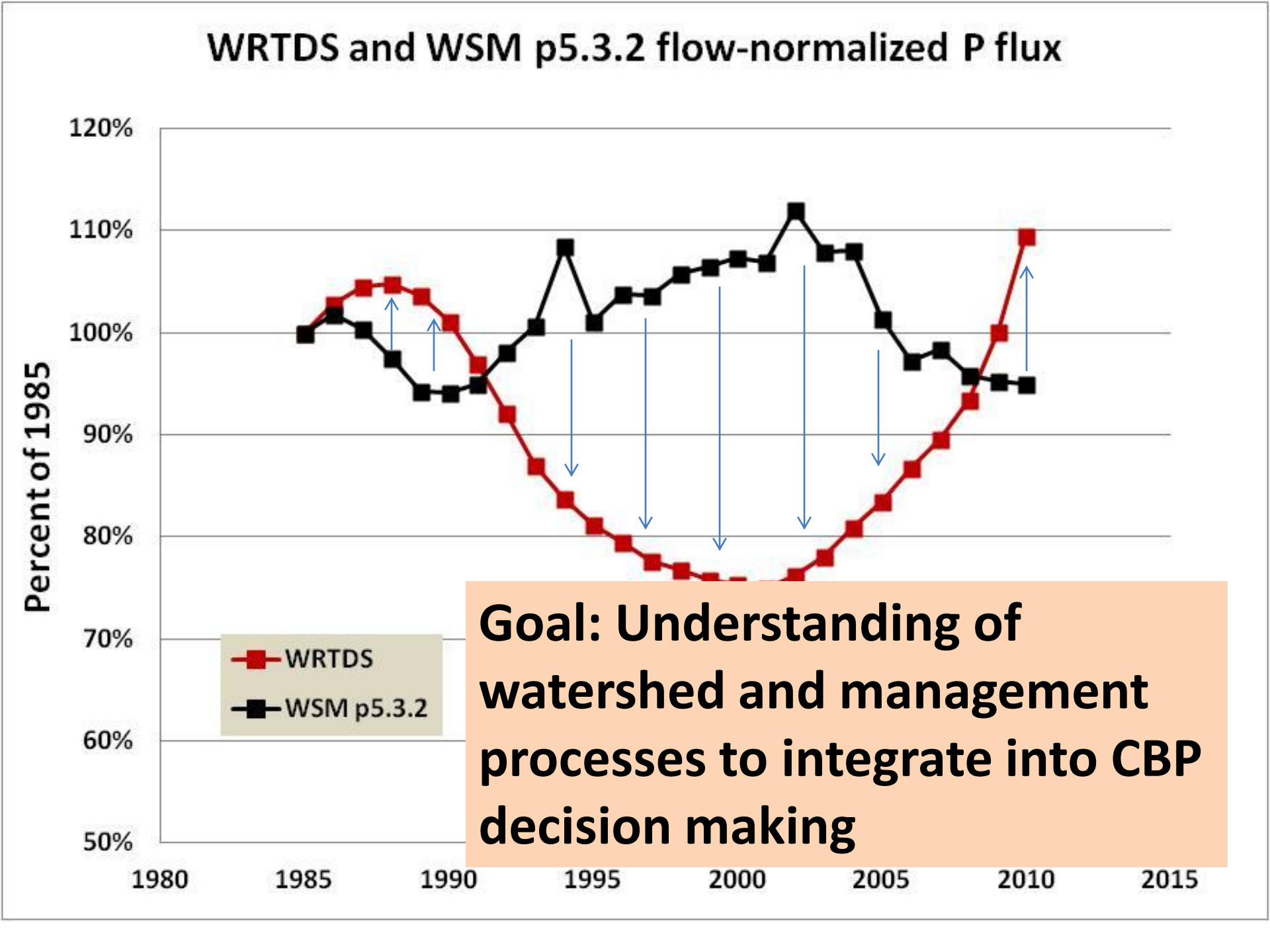
Land Use
Point Sources
Septic Loads
Human Population
Animal Population
Atmospheric Deposition
Fertilizer application
Manure application
Legume fixation
Crop uptake
Vegetative cover
Plowing disturbance
BMP implementation
Physical setting information

Sparrow

Tool for estimating the effect of watershed characteristics on downstream measurements

$$\text{Load}_i = \left\{ \sum_{j \in J(i)} \left[\sum_{n=1}^{N} S_{n,j} \beta_n \exp(-\alpha' Z_j) \right] \exp(-\delta' T_{i,j}) \right\} \exp(\epsilon_i)$$

- We have watershed characteristics and downstream measurements, find innovative ways to relate them
- Innovative uses of sparrow now in development
  - Time variable sparrow
  - BMPs as a land-to-water factor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Goal: Understanding of watershed and management processes to integrate into CBP decision making