A photograph of a creek with a semi-transparent text box overlaid on it. The creek flows through a lush, green forest. The water is a murky, brownish-green color. The text box is centered and contains the title of the document in a bold, black, serif font.

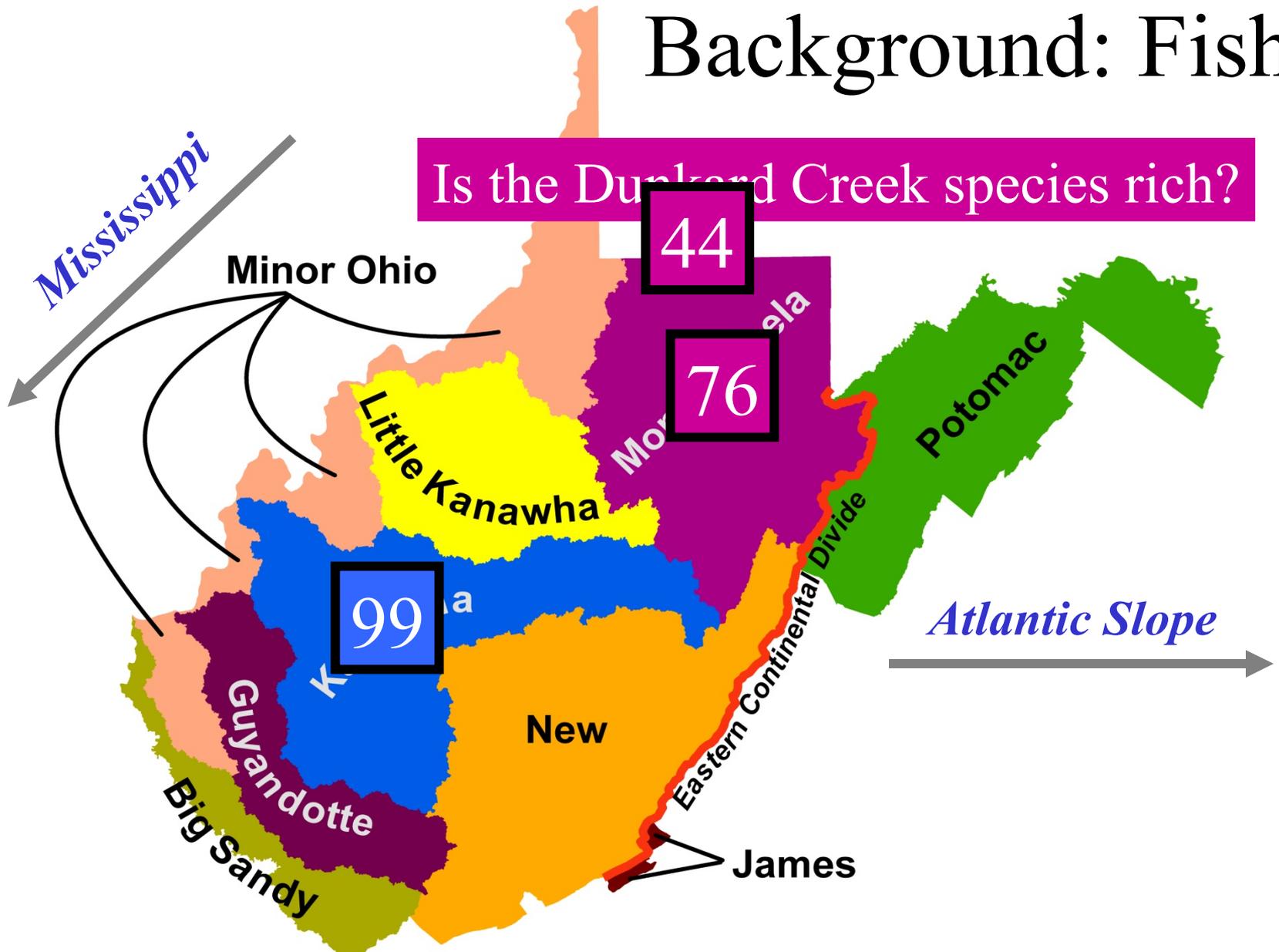
**Dunkard Creek of the Monongahela River:
A Review of Fish Survey Data Before and After
the 2009 Fish Kill**

**Dan Cincotta, Frank Jernejcic, David Wellman (WV Division of
Natural Resources); and, Stuart Welsh (US Geological Survey)**

Drainage and Fishes Background

- Monongahela River (WV = 10,826 km²)
 - Fishes = 76 species (Fishes of WV; Stauffer et al. 1995)
- Dunkard Creek (WV/PA= 611 km²)
 - Fishes = 44 species (Stauffer et al. 1995; DNR data)
- Monongahela River has a unique drainage history, which had a profound influence on the fauna
- Monongahela River / Dunkard Creek historic and/or modern fish database is good due to:
 - strategic location of a growing nation
 - proximity to West Virginia University and Pittsburgh

Background: Fishes



*Note: 133 fishes are native to Ohio River of WV

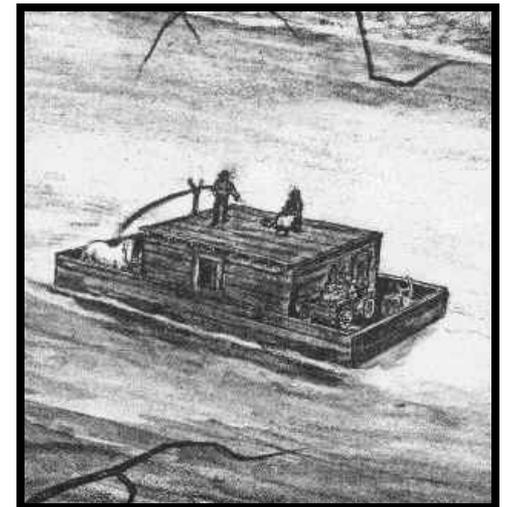
Background: Regional Fishes Data

Constantine Samuel Rafinesque

- Floated down Ohio River from Pittsburgh for Philadelphia Academy of Sciences
- *Ichthyologia Ohioensis* (1820) – described 60+ spp., 29 valid today



1783 – 1840



Background: Mon. WV/PA Fishes Data

- **1886 Evermann and Bollman**
 - WV/PA, Mon. River & tributaries
- **1908 Goldsborough and Clark**
 - WV, mining areas (1899 data)
- **1983 Cooper (Raney 1938)**
 - PA, all drainages (1960-70s data)
- **1995 Stauffer et al.**
 - WV, all drainages (1970-80s data)
- **1899-2010 WVDNR (all drainages)**
 - Welsh and Cincotta museum searches and recent data

KILL BACKGROUND



- August 27th 2009 visit to WV Fork
- WV Fork = 22,000–44,000 $\mu\text{S}/\text{cm}$ below Blacksville # 2 discharge (51,000 $\mu\text{S}/\text{cm}$ from pipe)
- WV Fork = 5,000 $\mu\text{S}/\text{cm}$ above discharge
- Seining survey done immediately above
 - only few fish found below discharge
 - 18 species found above (5,000 $\mu\text{S}/\text{cm}$)
- Two additional sites done above discharge
 - 18-22 species per site (5,000 $\mu\text{S}/\text{cm}$)

PURPOSE

- Review “modern” fish data for Dunkard Creek.
- Summarize certain pre-fish kill data for Dunkard Creek.
- Report Nov. 2009 post-fish kill data
- Discuss July 2010 recovery data



Pentress, WV

Ohio River Basin

Monongahela River

PA/WV = 19,011 km²

WV = 10,826 km²

Dunkard Ck = 611 km²

Dunkard Ck
Watershed

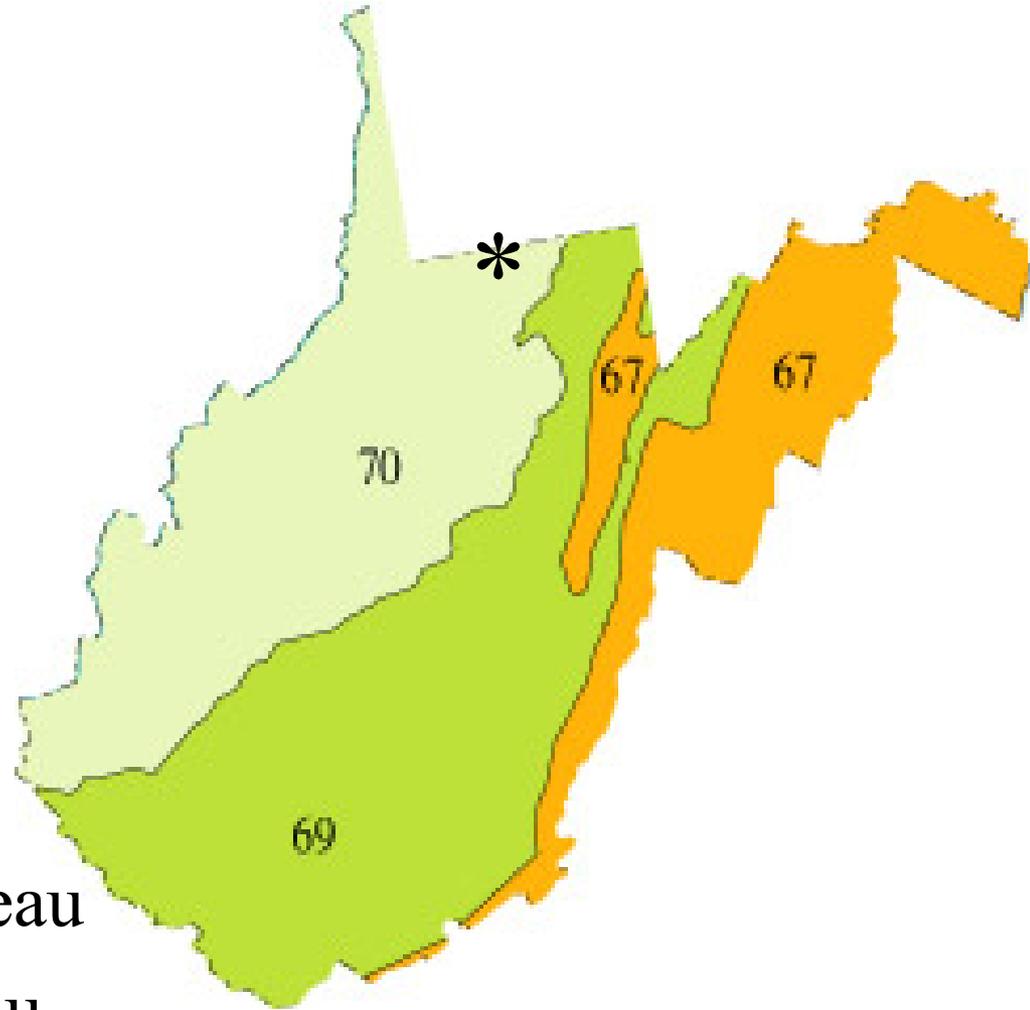
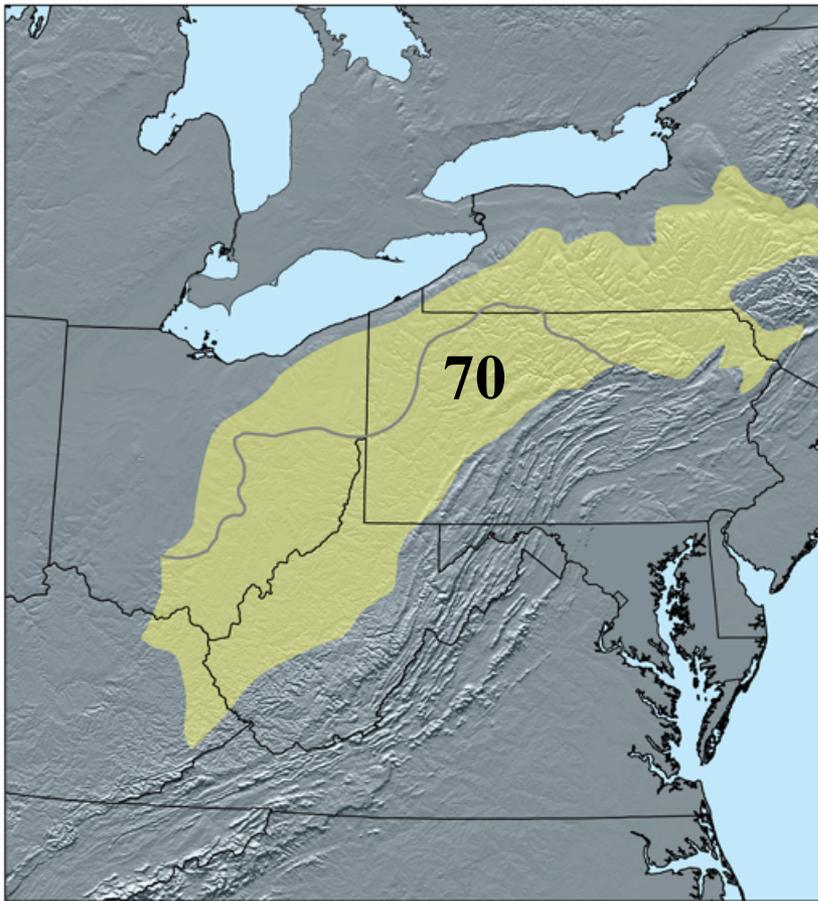
Morgantown



0 15 30 60 Miles



West Virginia Ecoregions

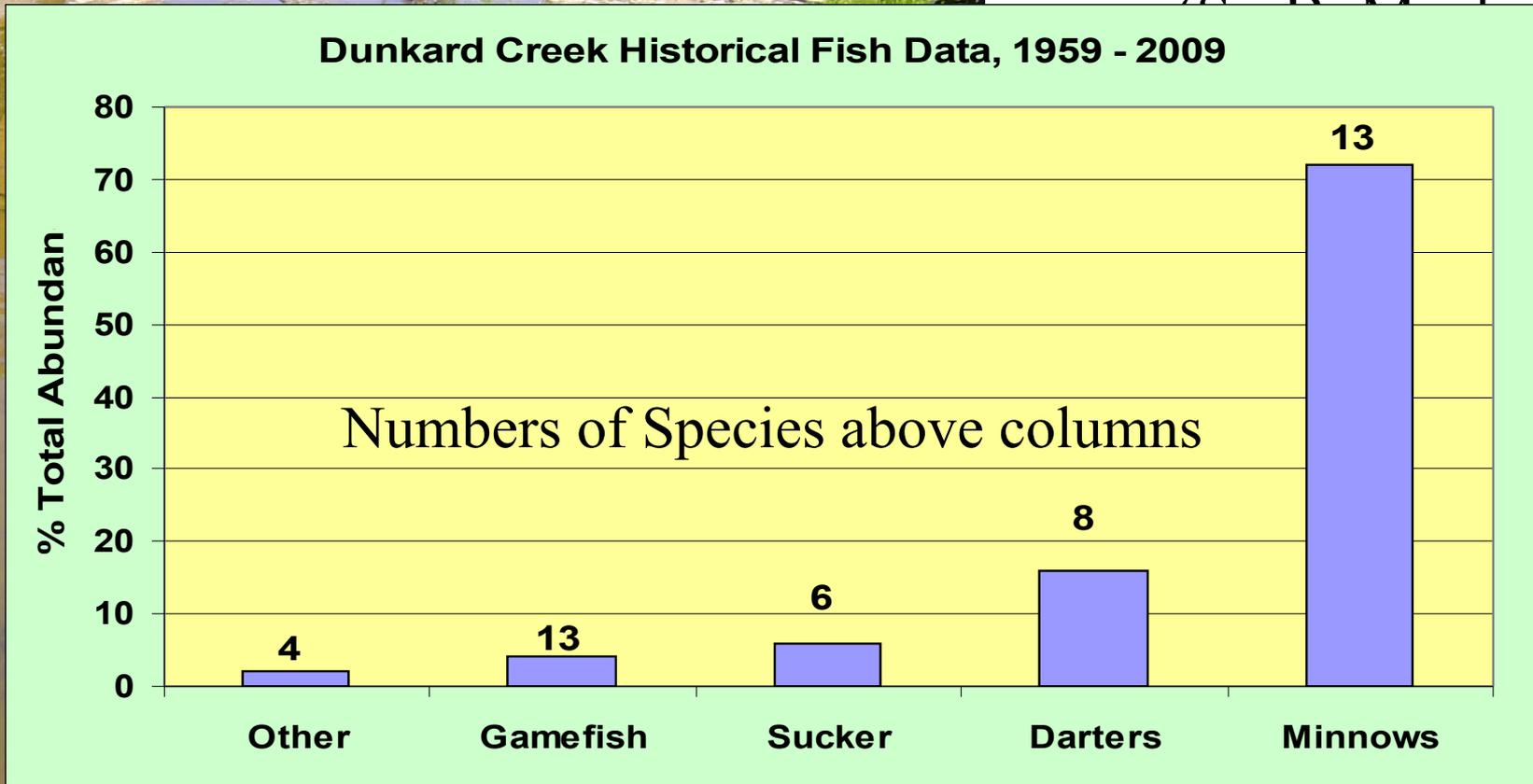


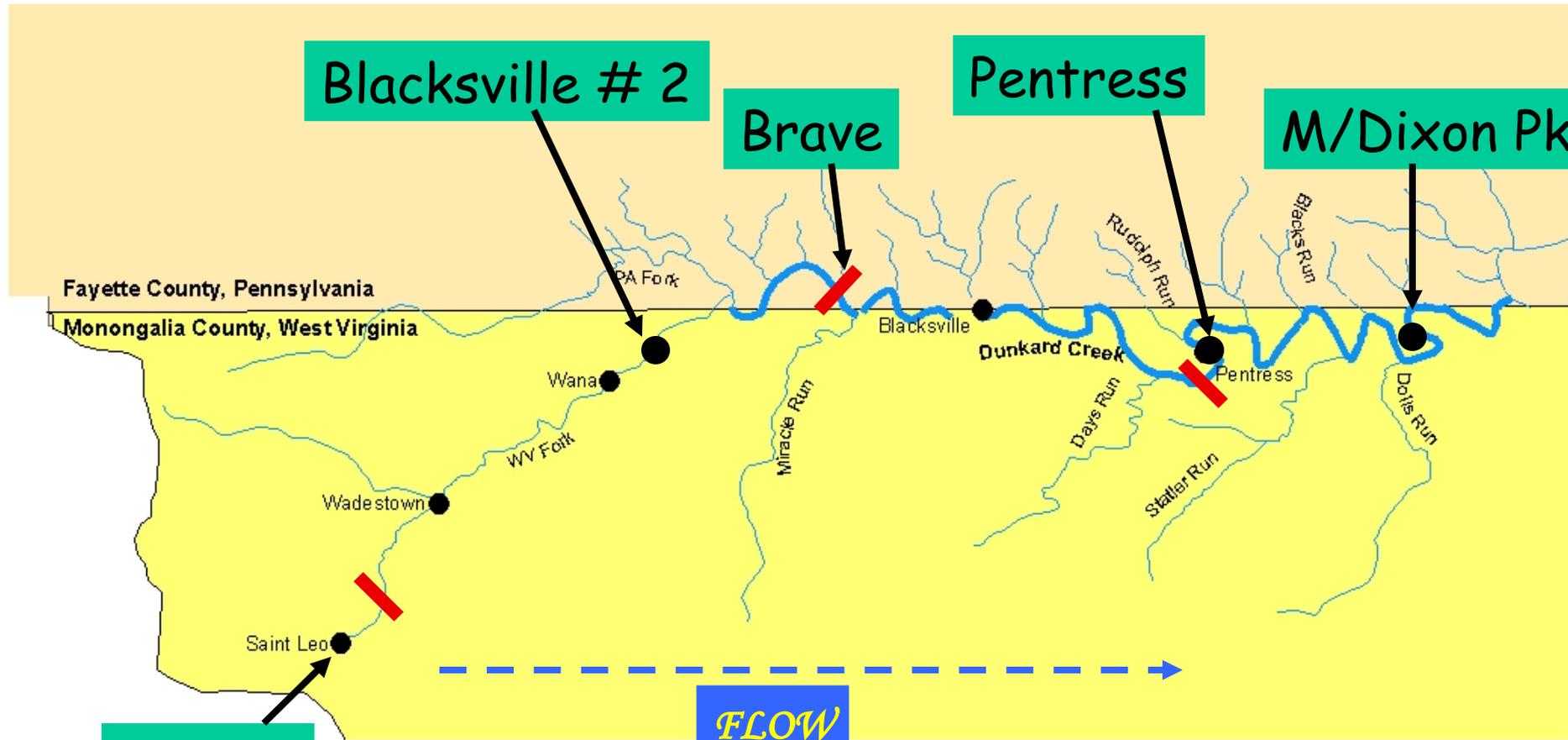
- 70 = W. Allegheny Plateau
- 69 = Appalachian Plateau
- 67 = Ridge and Valley



“Modern” Fish Data

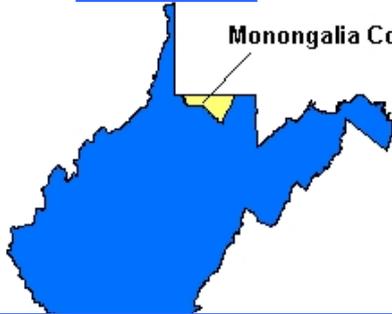
- 18 pre-kill surveys from 1959 - 2009
- 44 fish species
- 13 spp. of gamefish,





St. Leo

FLOW

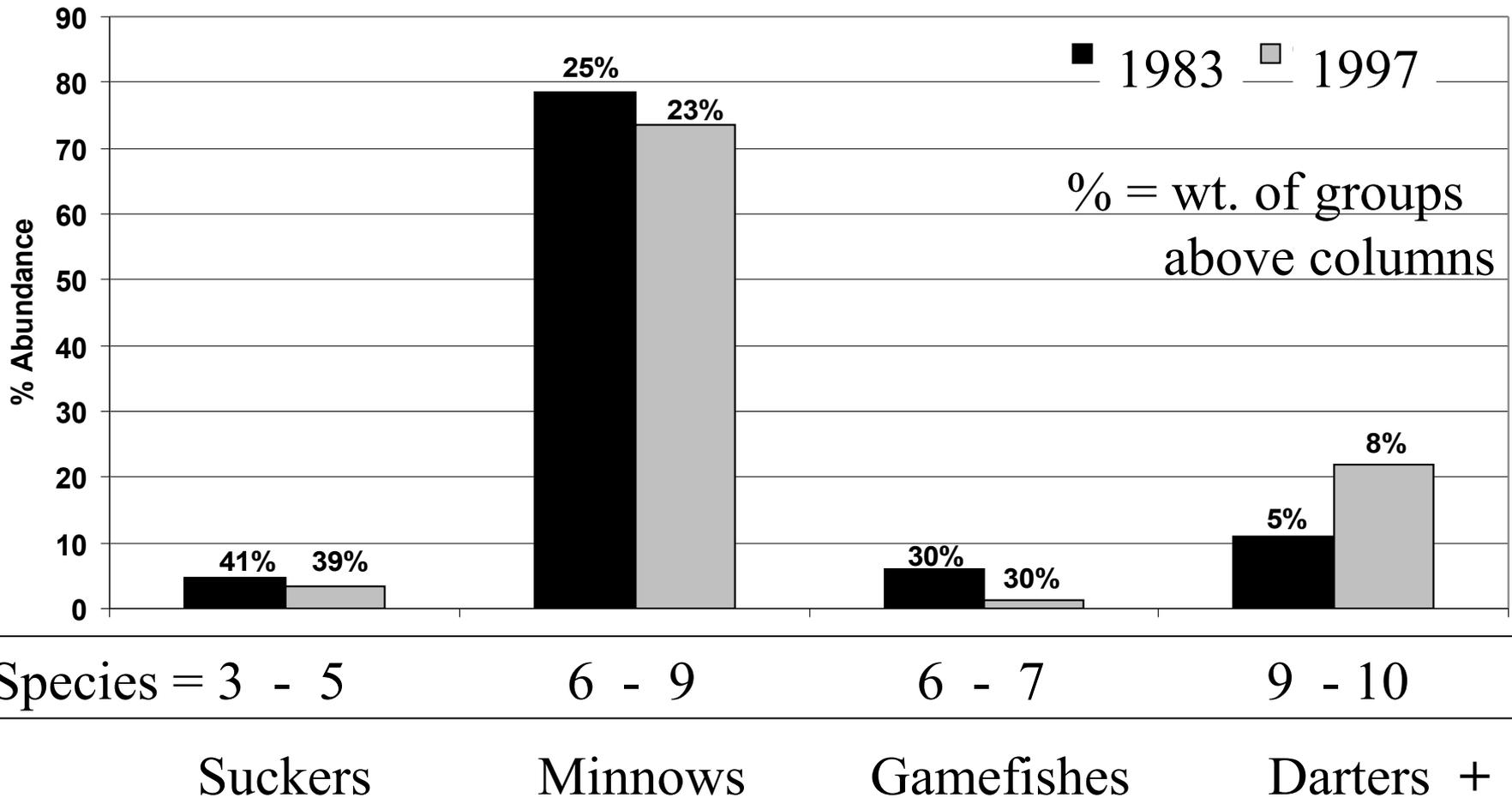


Monongalia County, West Virginia

0 1 2 Miles

Dunkard Creek Fish Kill Summary

Dunkard Creek – Pentress Rotenone Surveys

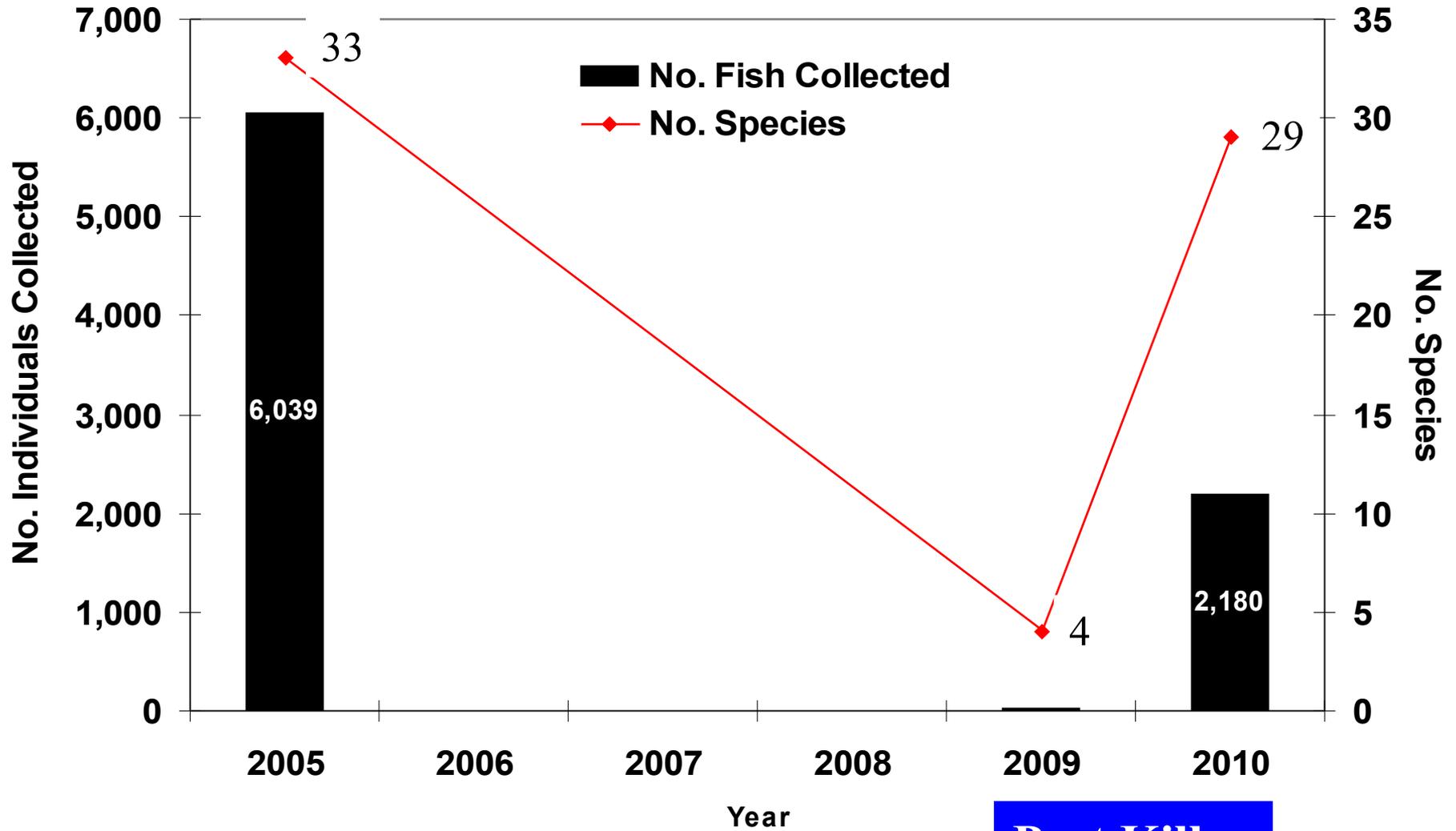


1983 = estimated 8,100 fish/ac and 83 lbs/ac standing crop

1997 = estimated 39,200 fish/ac and 343 lbs/ac standing crop!

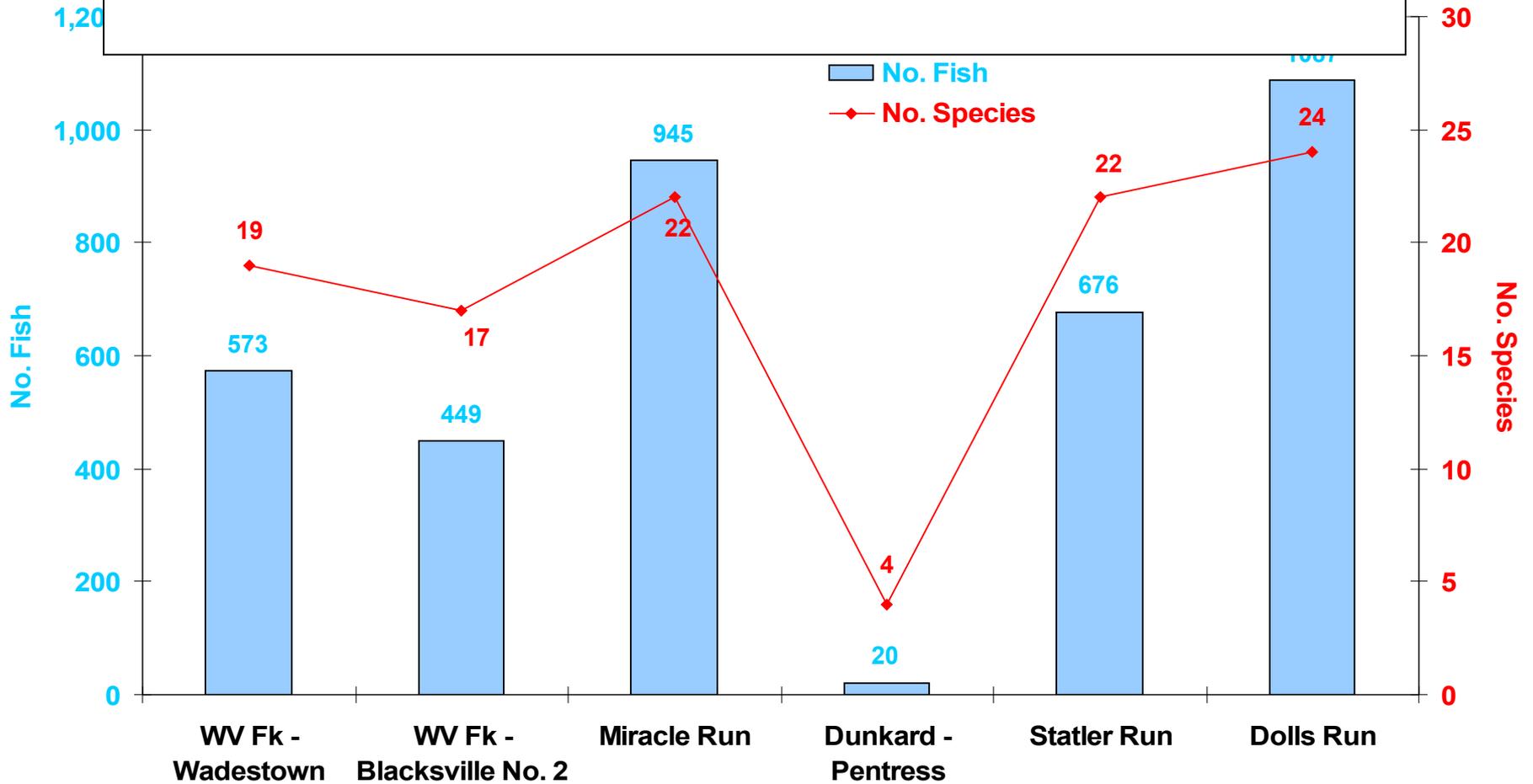
1983-97= species increase 23%

Dunkard Creek Parallel Wire Surveys at Pentress



Post Kill

2009 Tributary Surveys and Pentress - Post Kill



Downstream

Blacksville # 2

Pentress

M/Dixon Pk

Wana

Fayette County, Pennsylvania

Monongalia County, West Virginia

Upstream Fish Kills?

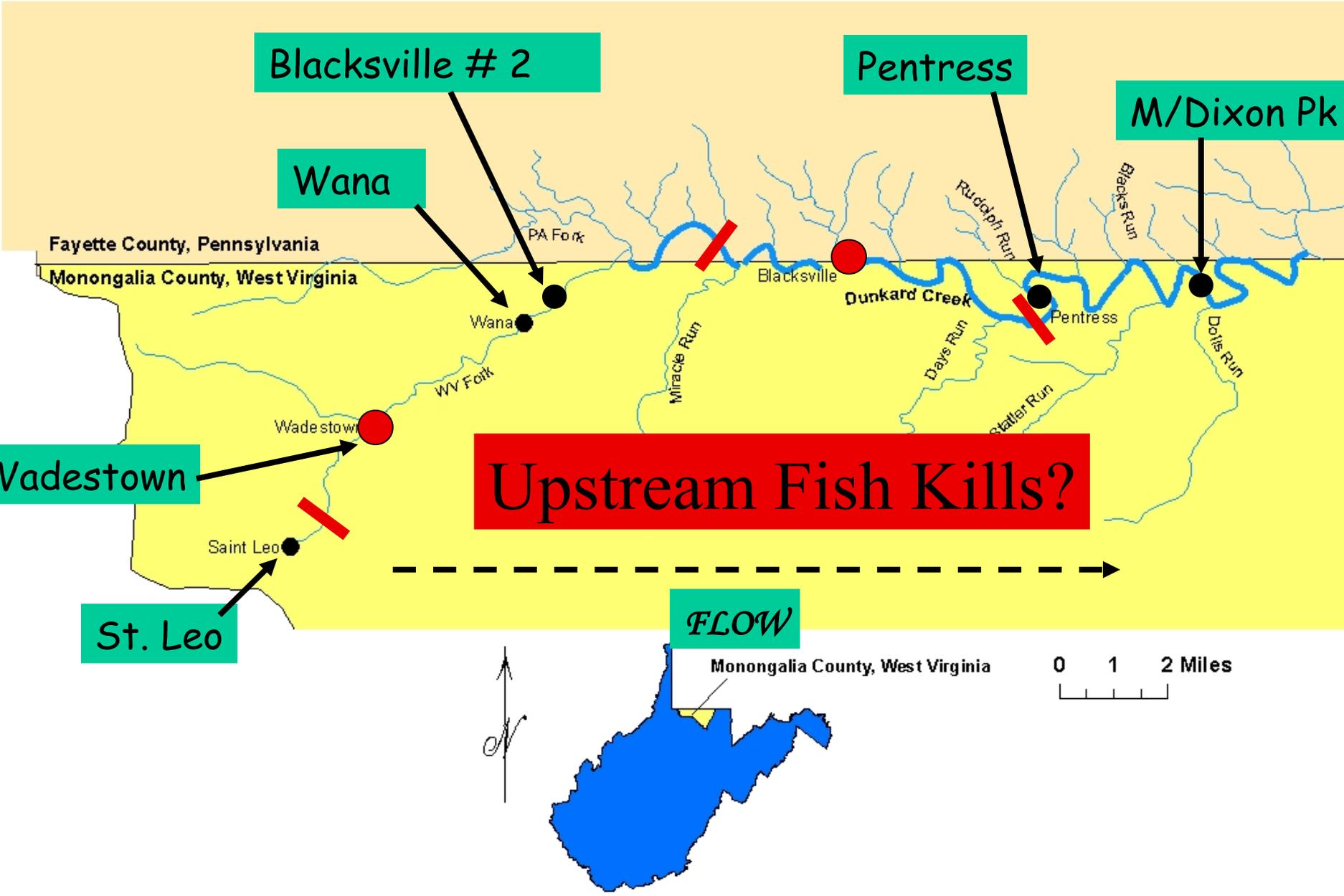
Wadestown

St. Leo

FLOW

Monongalia County, West Virginia

0 1 2 Miles



South Fork WV Fork – Beaver Pond Area

- Above Pond–During Kill
At St. Leo discharge

- 3 suckers
- 1402 minnows
- 95 gamefish
- 110 darters

- Below Pond –After Kill
Below St. Leo discharge

- 1 greenside darter

- Below Breached Pond 2010
Below St. Leo discharge

- 33 suckers
- 606 minnows
- 6 gamefish
- 295 darters



WV Fork

Below Blacksville # 2

Discharge



- Before Kill:
above -
2009

(20 species)

Seining #s

- 17 suckers
- 679 minnows
- 16 gamefish
- 44 darters

- After Kill:
below - 2009
(16 species)

Shocking #s

- 11 suckers
- 431 minnows
- 1 gamefish
- 6 darters

- After Kill:
below - 2010
(24 species)

Shocking #s

- 181 suckers
- 1769 minnows
- 47 gamefish
- 1198 darters

CONCLUSIONS

- Monongahela River and Dunkard Creek have a long history of environmental degradation
- The fish fauna has been recovering slowly since the the 1970s
- A fish kill due to golden algae killed most of the fishes in the main stem below Blacksville No. 2

CONCLUSIONS

- In the So. Fork WV Fork a 3rd kill occurred below a beaver pond; it was essentially a total kill, but fishes did well above the pond.
- Some fishes of the WV Fork above Wana (3rd kill area) survived due to dilution from the North Fork, but in reduced numbers and species.

CONCLUSIONS

- Tributaries in WV/PA contain most of the lost fishes, and a remarkable recovery is taking place species-wise in the main stem.
- However, the standing crop of fishes may take several years to reach the levels attained prior to the kill.

Questions?



Golden Algae

- Found on every continent except for Antarctica
- Mostly associated with estuarine or marine waters
- A mixotroph – nutrients through photosynthesis or can kill other organisms to gain their nutrients
- Toxins (prymnesins) affect gill breathing organisms (fish, mussels, crayfish, gilled amphibians)
- Pecos River, Texas in 1985



Blacksville # 2

Brave

Pentress

M/Dixon Pk

Fayette County, Pennsylvania

Monongalia County, West Virginia

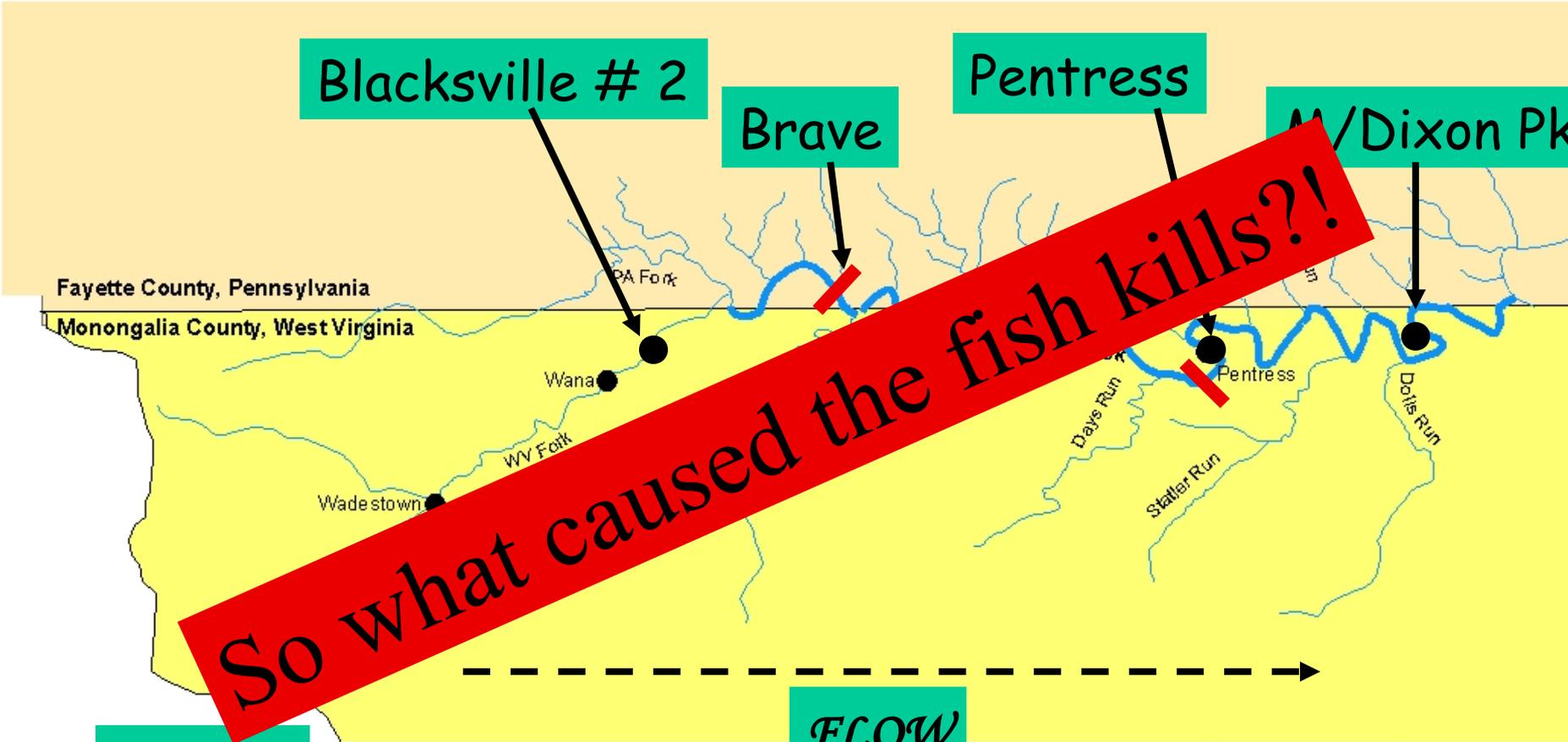
So what caused the fish kills?!

St. Leo

FLOW

Monongalia County, West Virginia

0 1 2 Miles



Would you go left or would you go right!!!???

Allegheny



Monongahela

Background: 44 Fishes Missing?

- Lamprey (3)
- Sturgeon (2)
- Paddlefish (1)
- Gar (1)
- Bowfin (1)
- Goldeye (1)
- Esocids (1)
- Mudminnow (1)



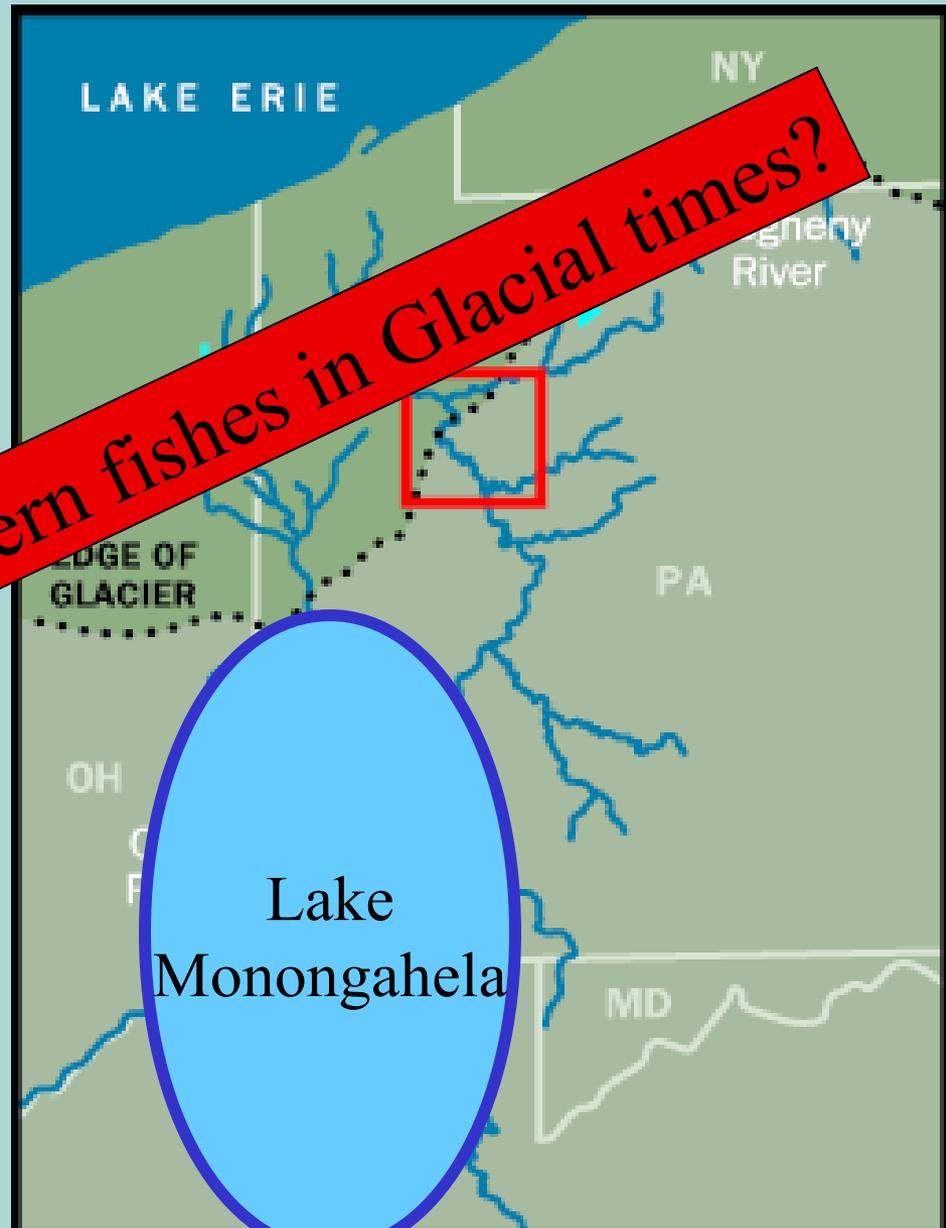
Missing?

- American Eel (1)
- Minnows (14)
- Suckers (7)
- Sunfish (1)
- Catfish (3)
- Darters (7)



Pre-Glacial Mon./Allegheny

Allegheny/Ohio rivers form



So what happened to northern fishes in Glacial times?



St. Lawrence RIVER

Inland Sea

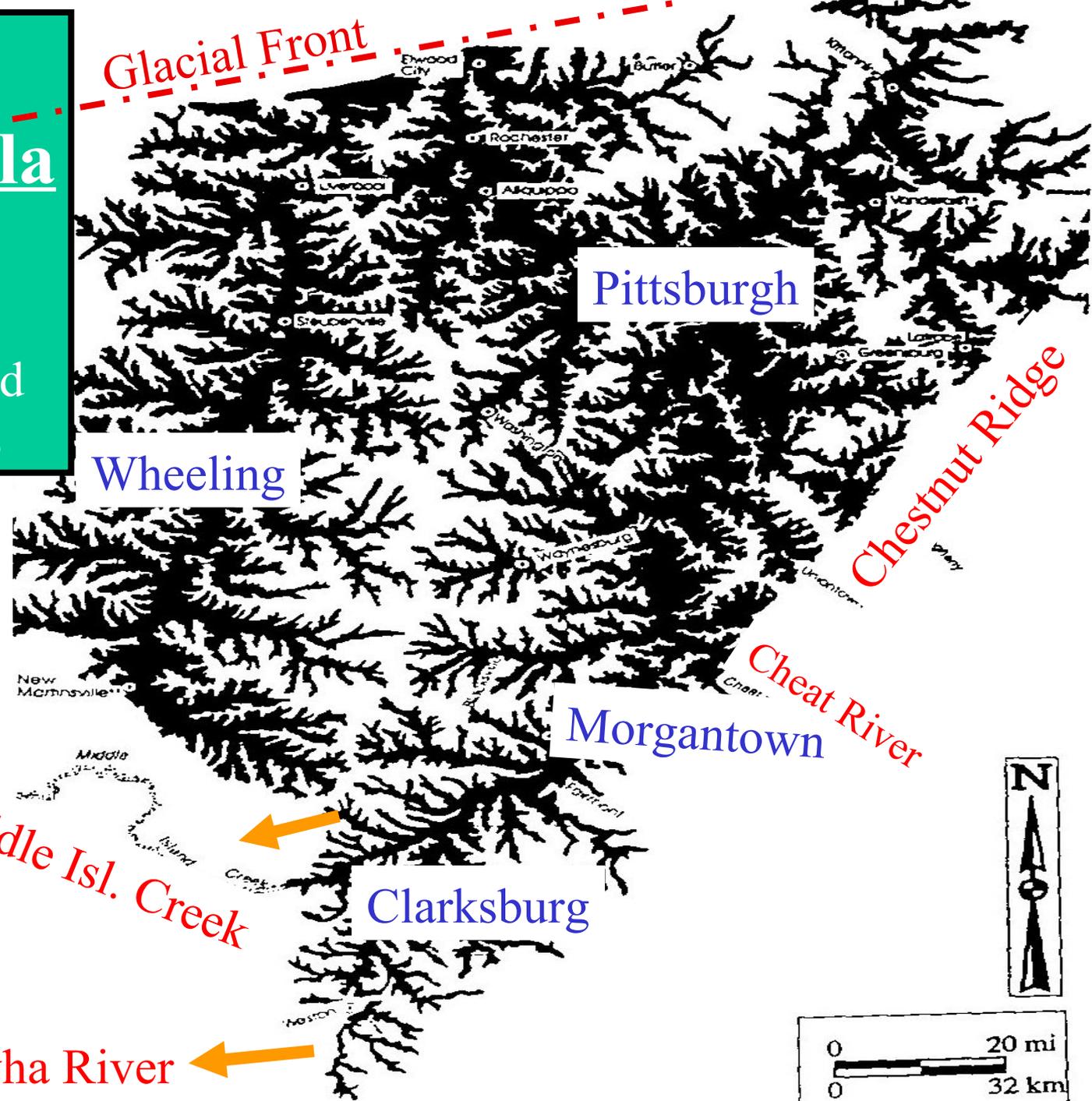
Ozarks

Eastern Highlands

L. Monongahela

Lake Monongahela

Fishes typical to north were harbored in pro-glacial lakes



Wheeling

Pittsburgh

Morgantown

Clarksburg

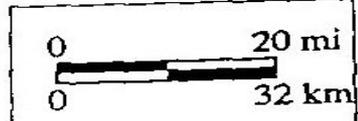
Middle Isl. Creek

Little Kanawha River

Chestnut Ridge

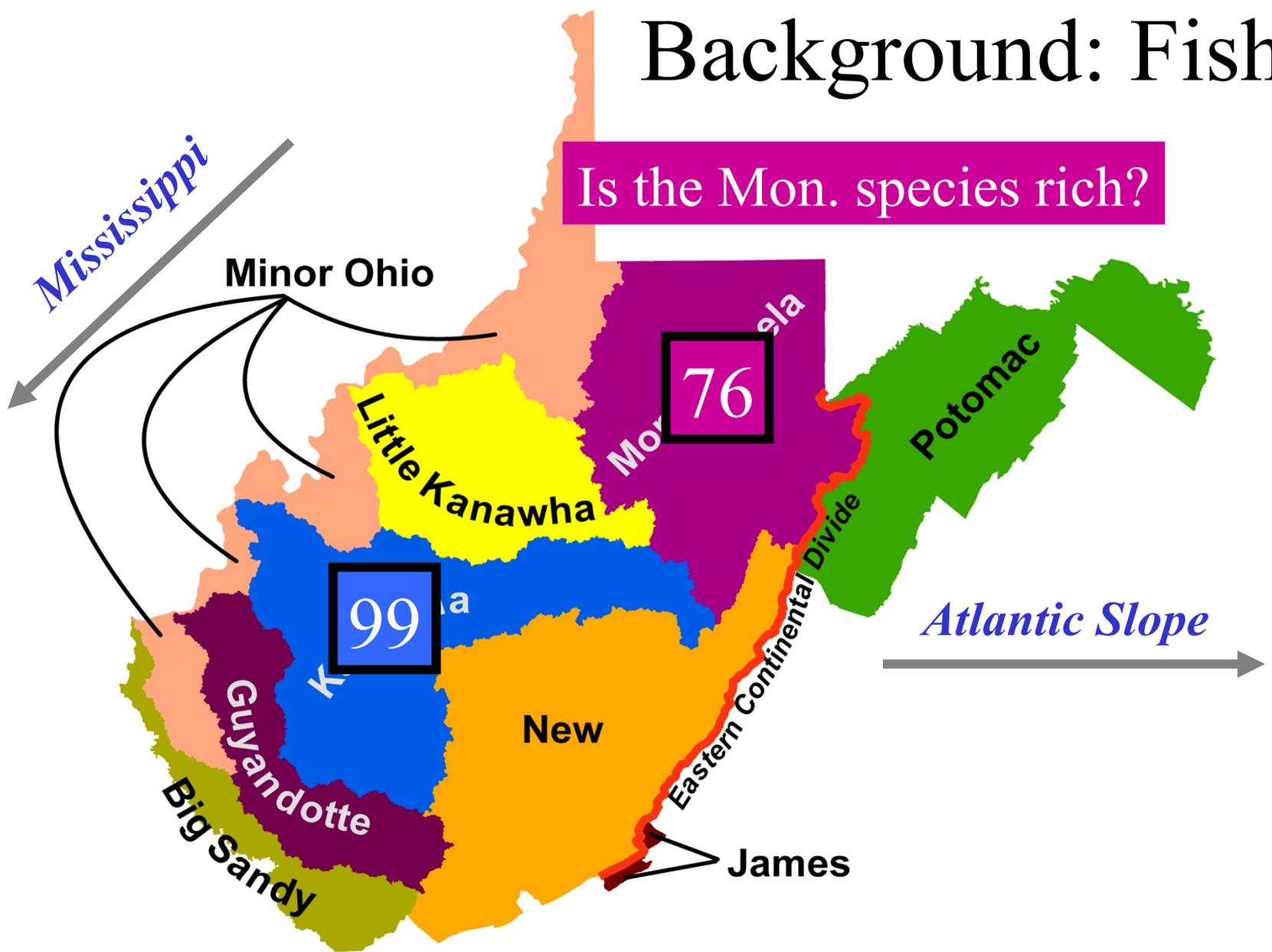
Cheat River

Glacial Front

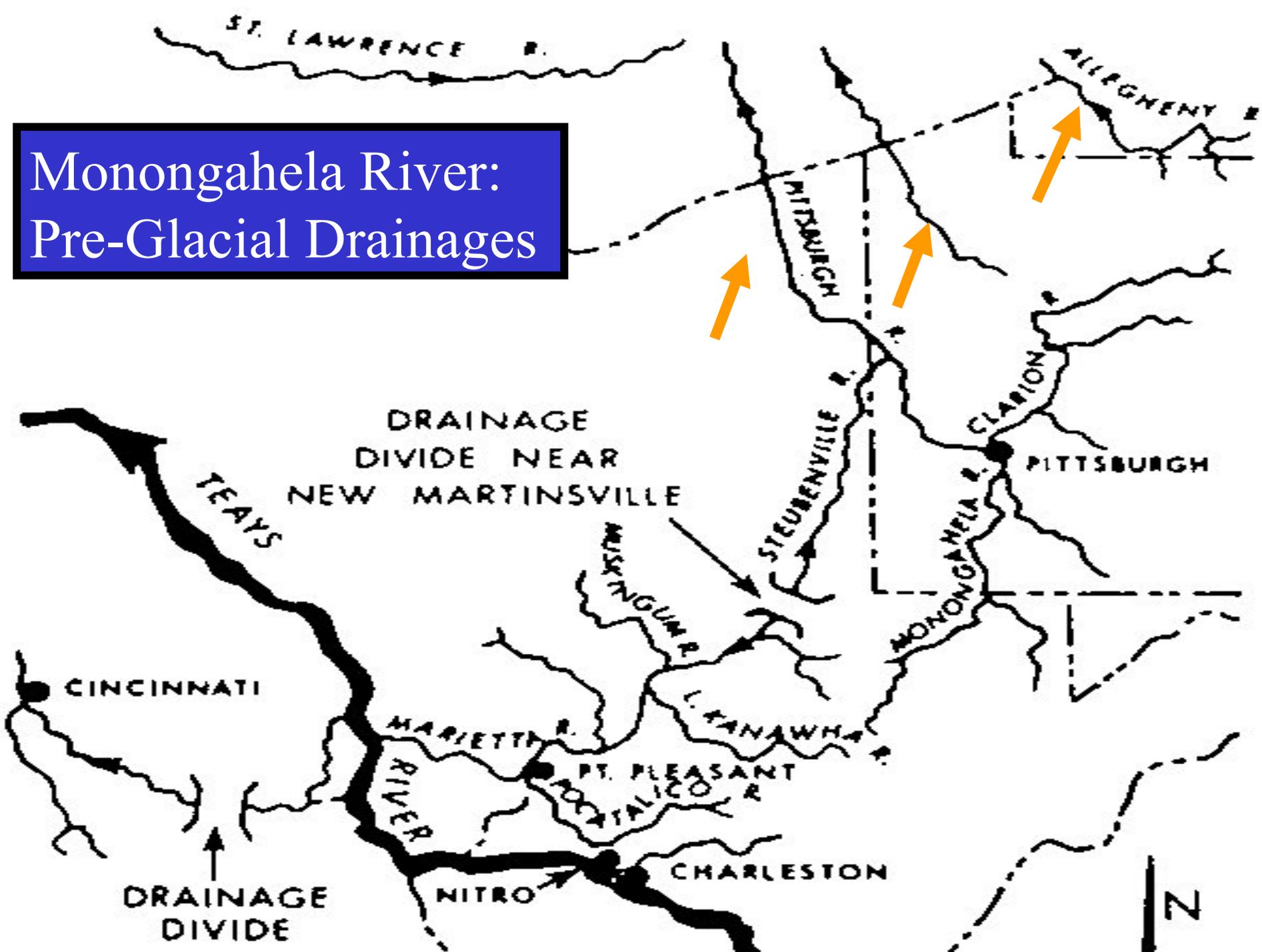


Background: Fishes

Is the Mon. species rich?



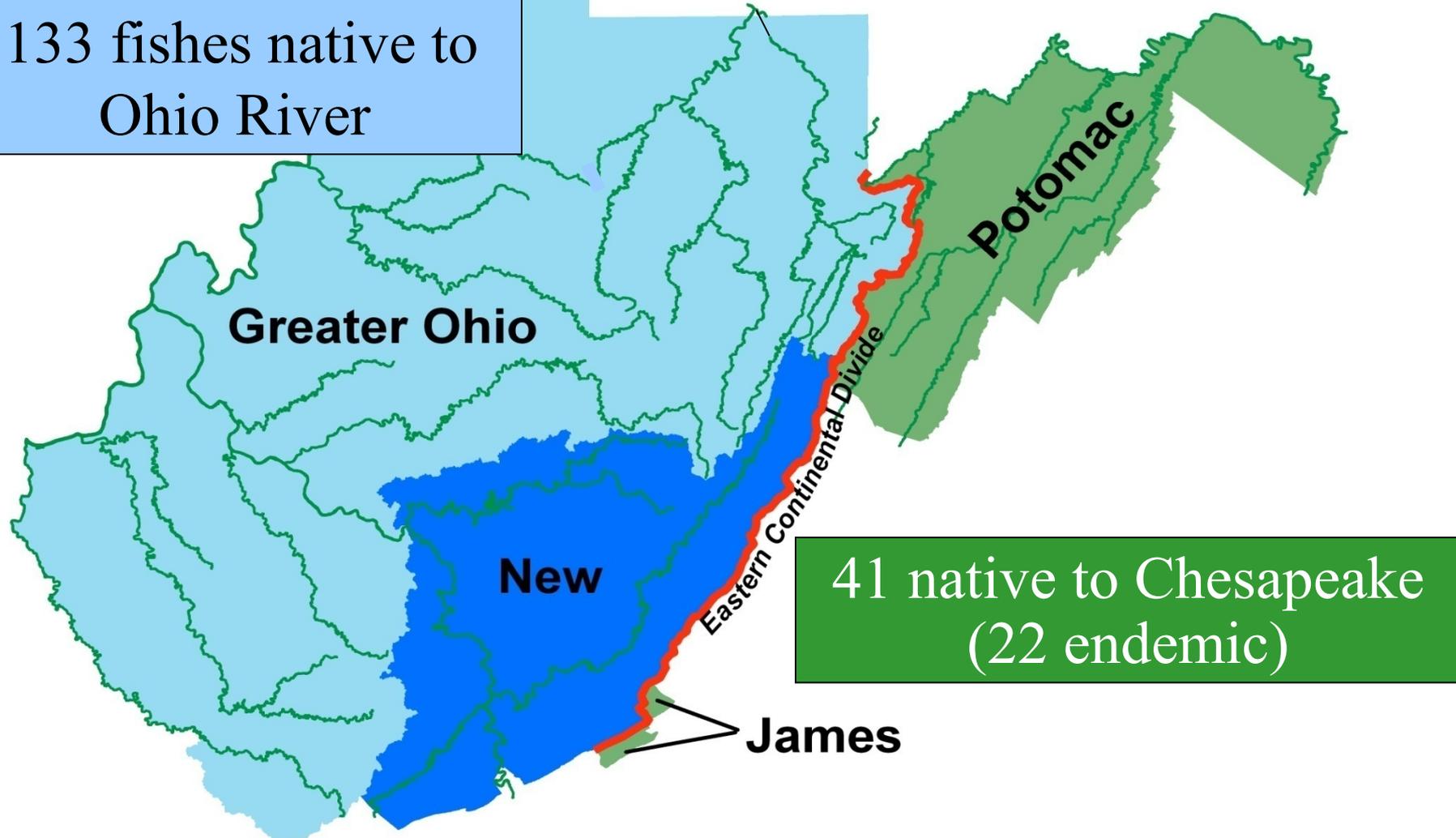
Monongahela River: Pre-Glacial Drainages



Background: Fishes

West Virginia Drainages

133 fishes native to
Ohio River



Greater Ohio

New

Potomac

Eastern Continental Divide

James

41 native to Chesapeake
(22 endemic)

Background: Fishes

- Monongahela/Allegheny Rivers of PA have 44 species not known from WV Mon. waters
- Some are northern glacial relicts
- Many of the 44 have not been seen for decades or persist today as small isolated populations
- Some of the big river species have returned in last 25 years to PA and WV
- WV Monongahela has eight known extirpations (6 minnows, 1 darter, 1 sucker)
- So now ask yourself, if you were a fish and you had 11,000 years to get past Pittsburgh