

3%

Of all water on Earth is
Freshwater

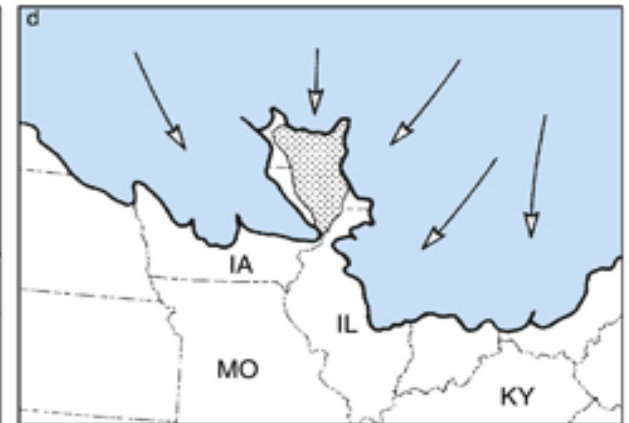
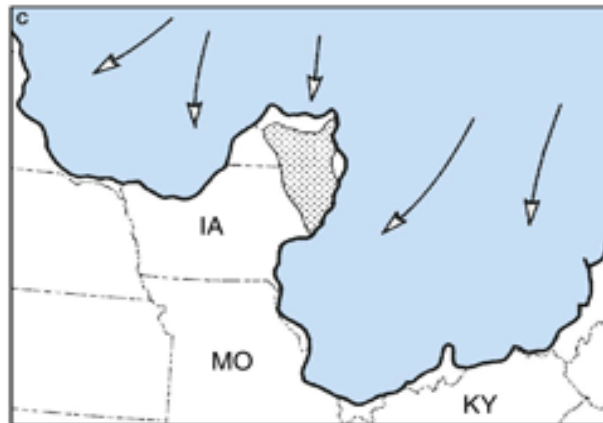
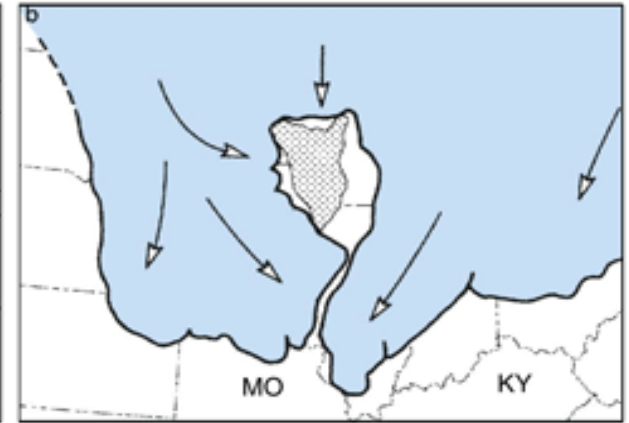
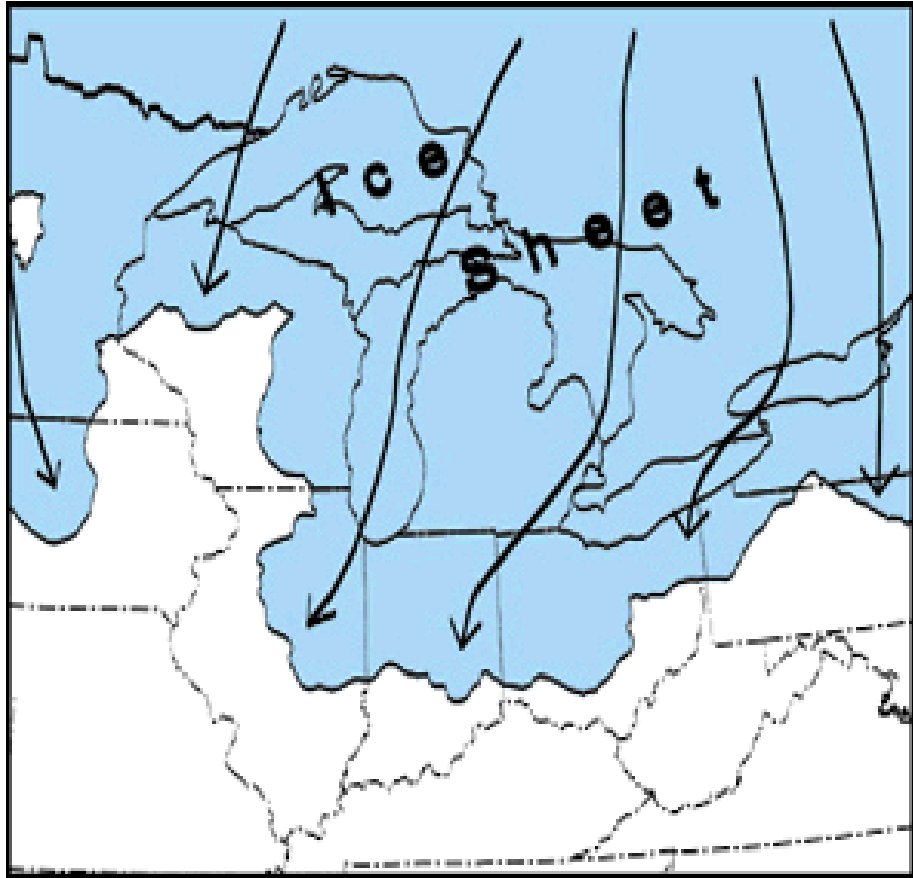
1%

Of water is available for
**Human
Consumption**

Approximately **20%**
of the World's Available

Fresh Water Lies Within the
Great Lakes





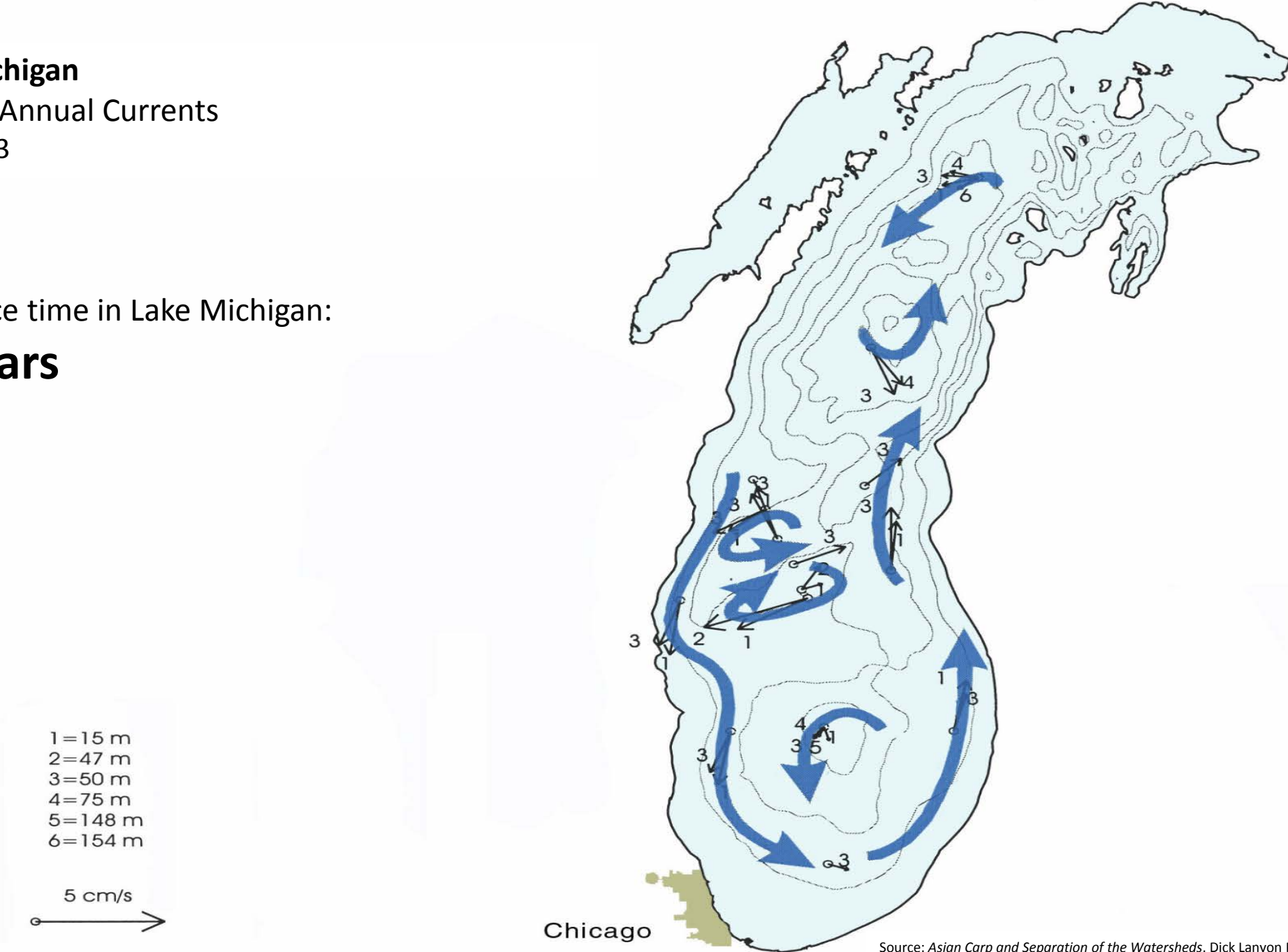


From: Bobby Garro Sutton. *Chicago WILDERNESS*.

Lake Michigan

Average Annual Currents
1982-1983

Residence time in Lake Michigan:
99 Years

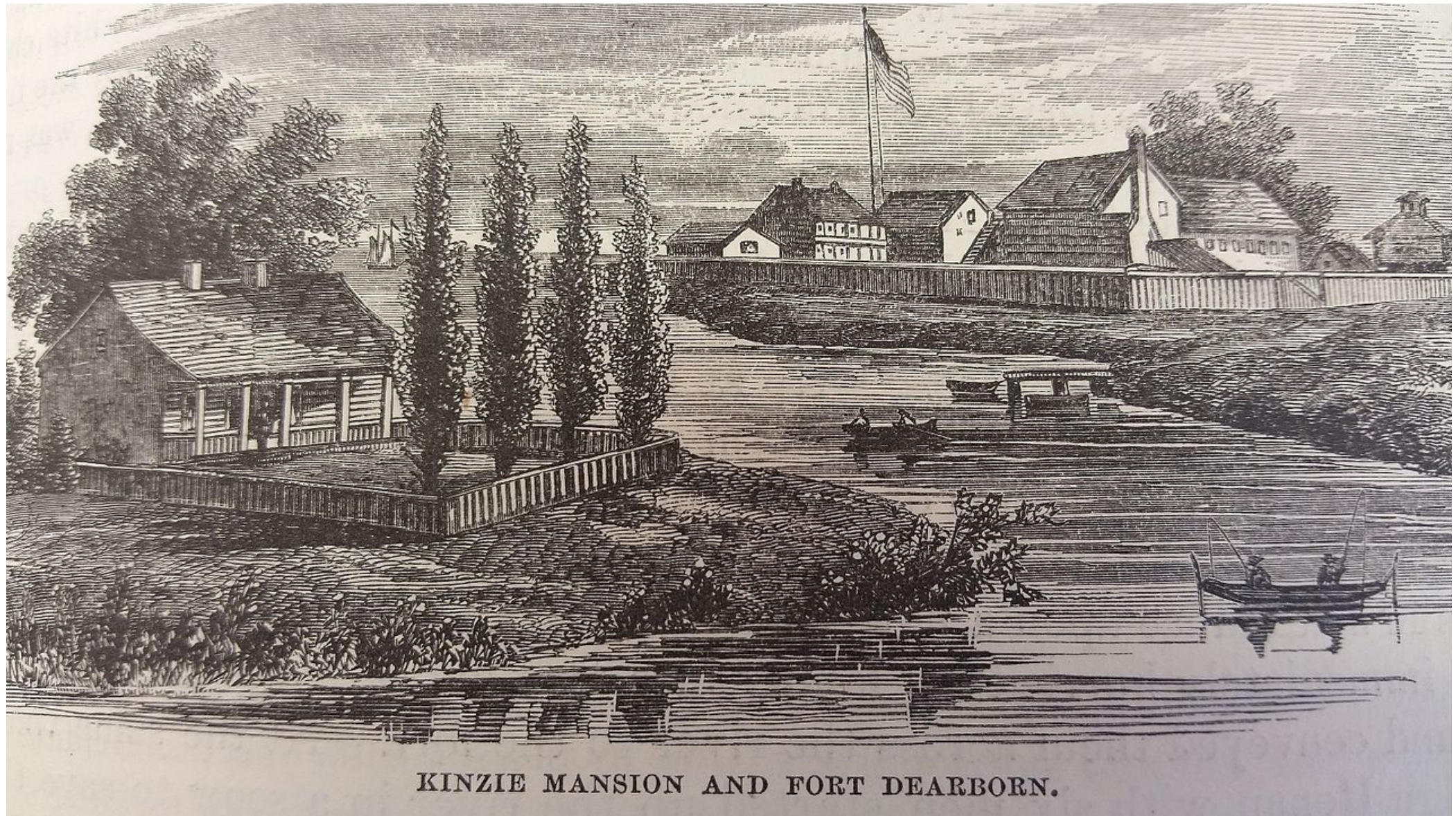


Source: Asian Carp and Separation of the Watersheds, Dick Lanyon Presenter
Original Source: Mean Circulation in the Great Lakes, Dmitry Beletsky, et al.



Fort Dearborn Near the mouth of the Chicago River 1831

https://en.wikipedia.org/wiki/Chicago_River#/media/File:Fort_Dearborn_1831_Kinzie.jpg



KINZIE MANSION AND FORT DEARBORN.

Kinzie Mansion (foreground) and Fort Dearborn (background).

From: *The Pictorial Fieldbook of the War of 1812*
https://en.wikipedia.org/wiki/Fort_Dearborn#/media/File:Fort_Dearbon.jpg



Chicago and Fort Dearborn in 1820

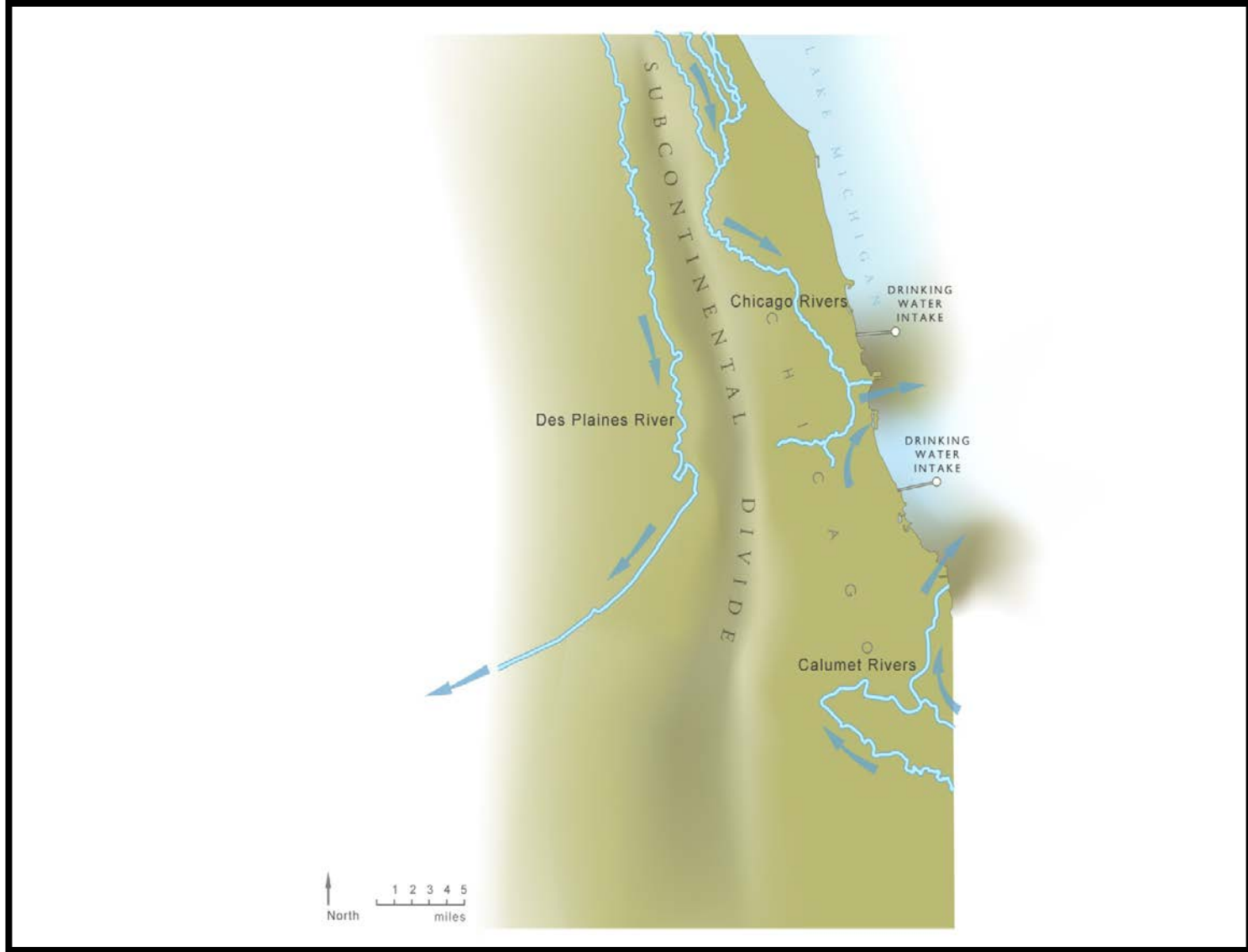
https://en.wikipedia.org/wiki/History_of_Chicago#/media/File:Chicago_in_1820.jpg

Lake Michigan Supply Replaces
Polluted River Supply



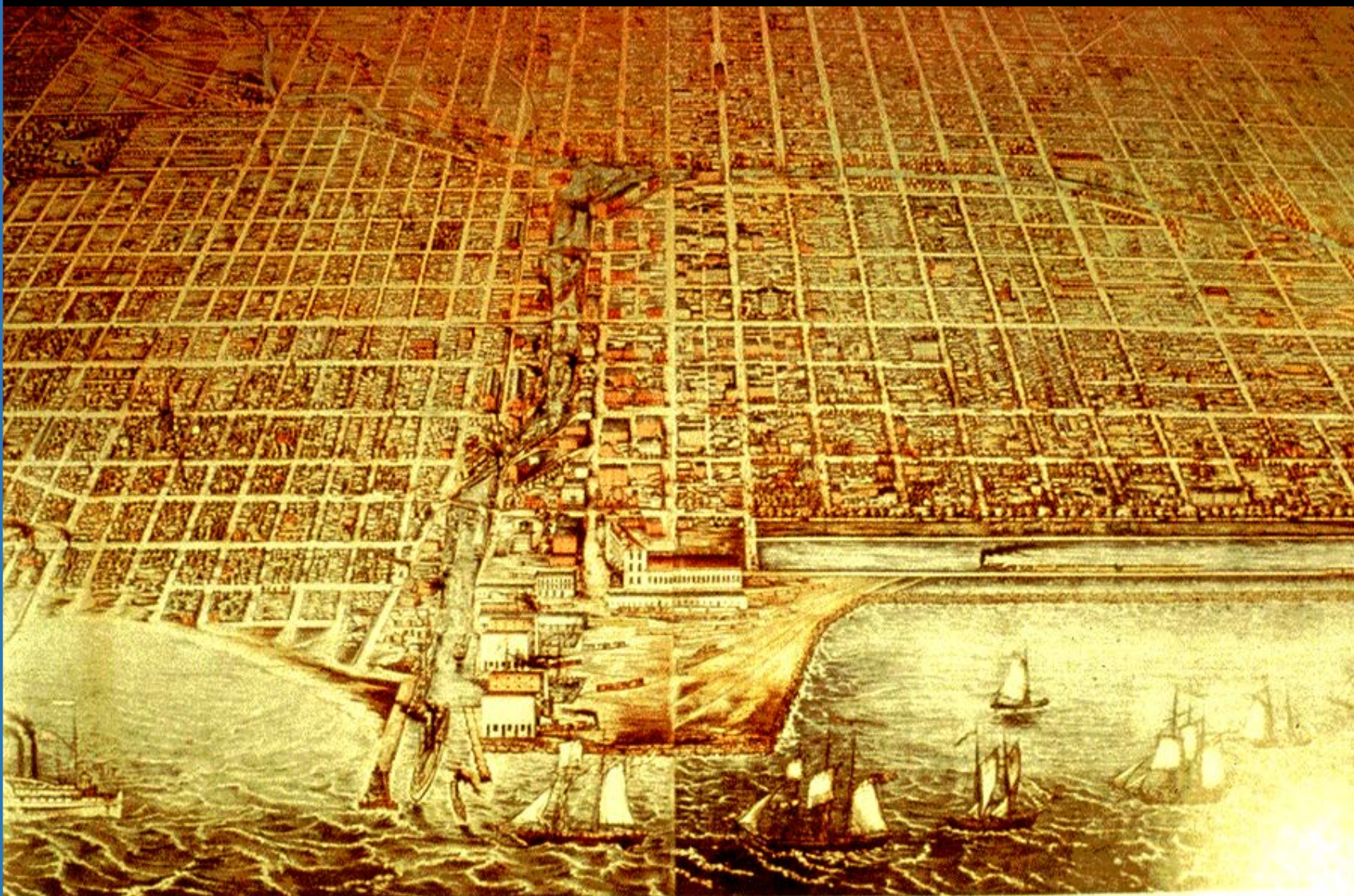
Y.E.S. Trowbridge
'95

Water supply of early Chicago.



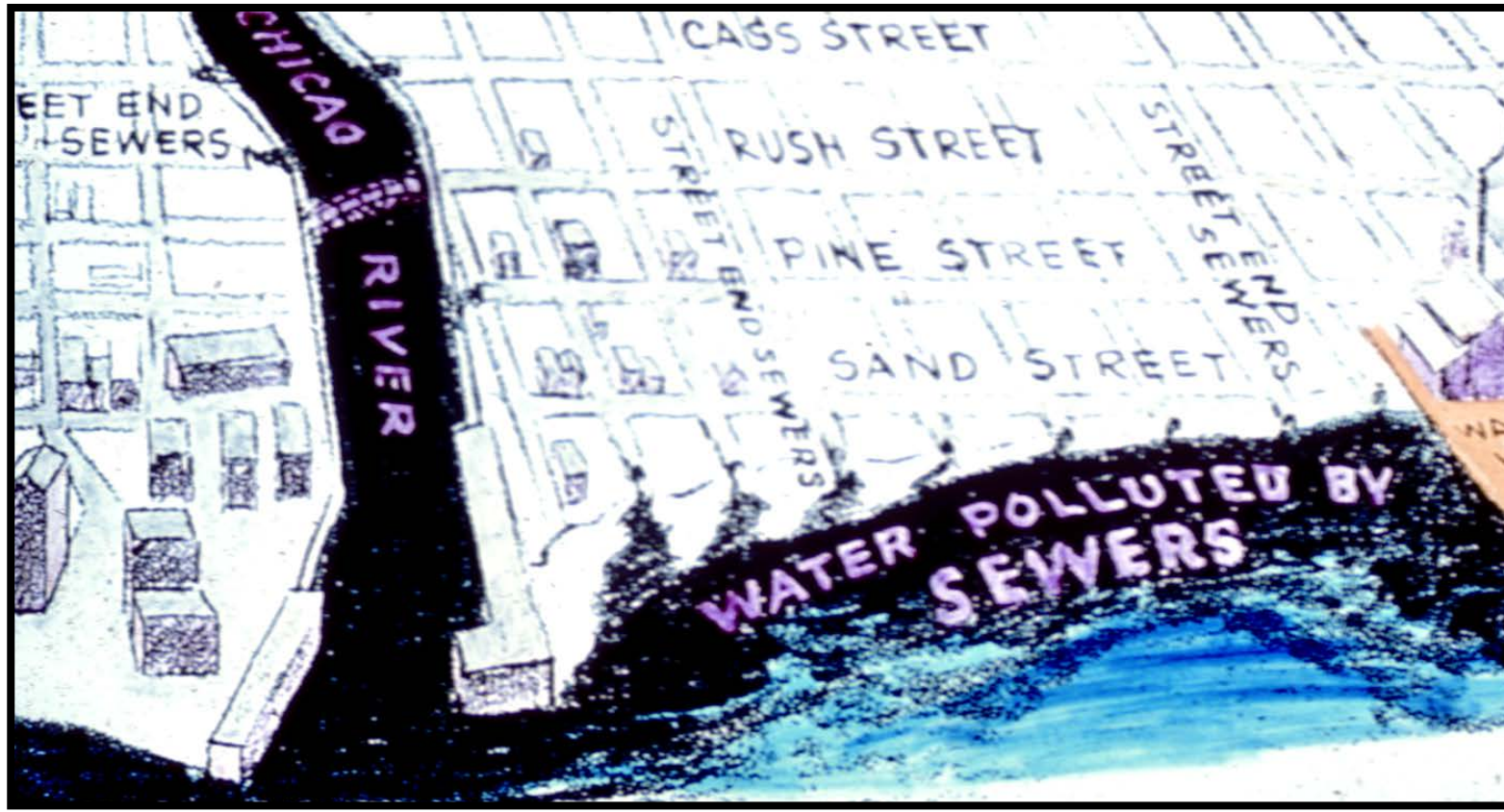
Chicago Area Waterways before 1900

Rapidly Growing City



Courtesy of Chicago Historical Society

Inherent Conflict



Need a Solution



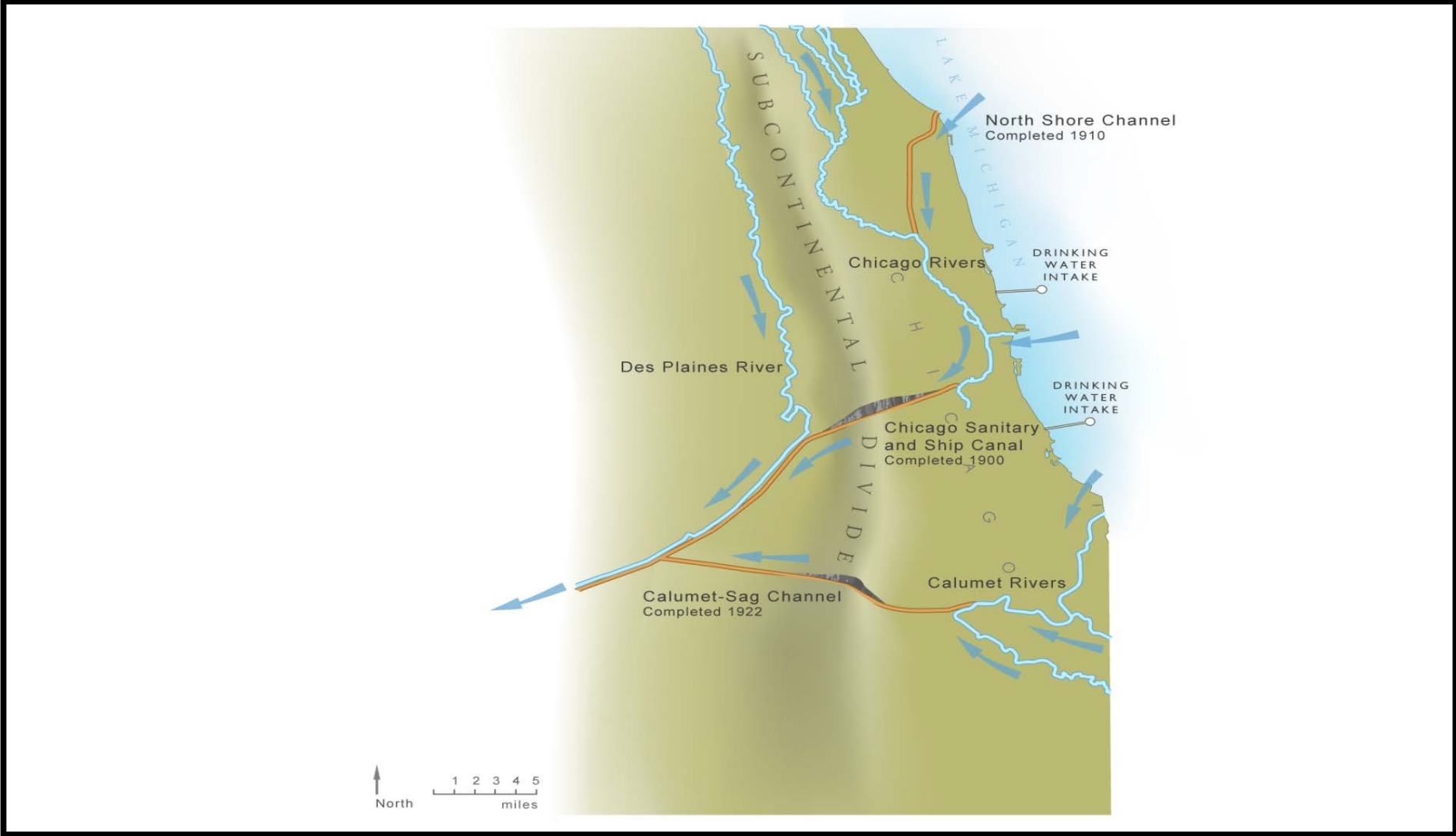


9.28.1899

Courtesy of the Metropolitan Water Reclamation District

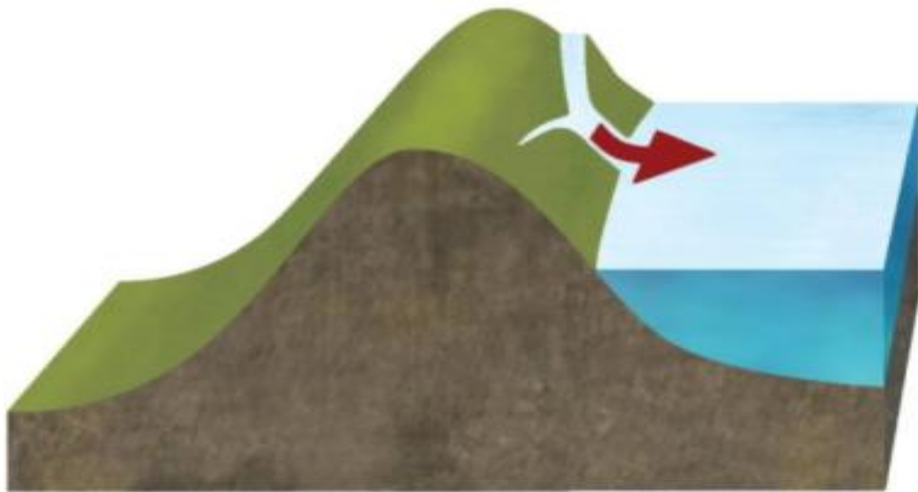


1.2.1900 - SDC trustees preparing to symbolically dig a channel to connect the Collateral Channel to the excavated CSSC to start the filling process.

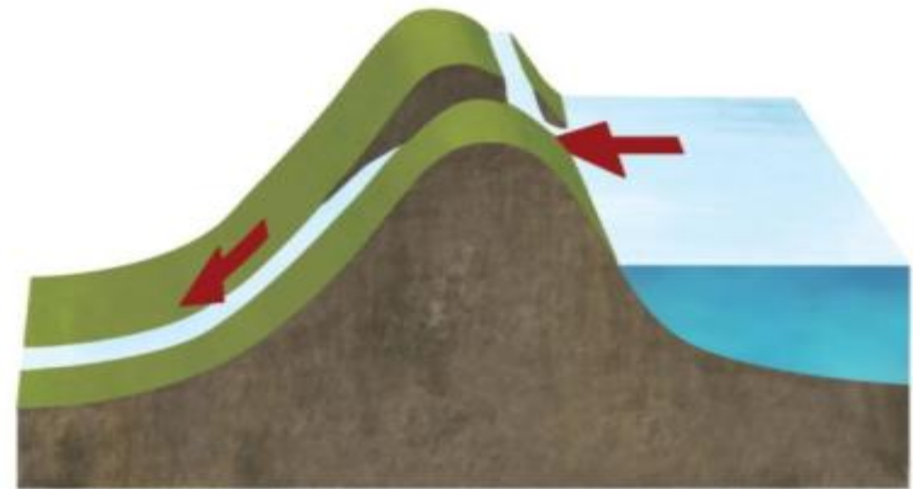


Chicago Area Waterways after 1922

Before Canal Excavation



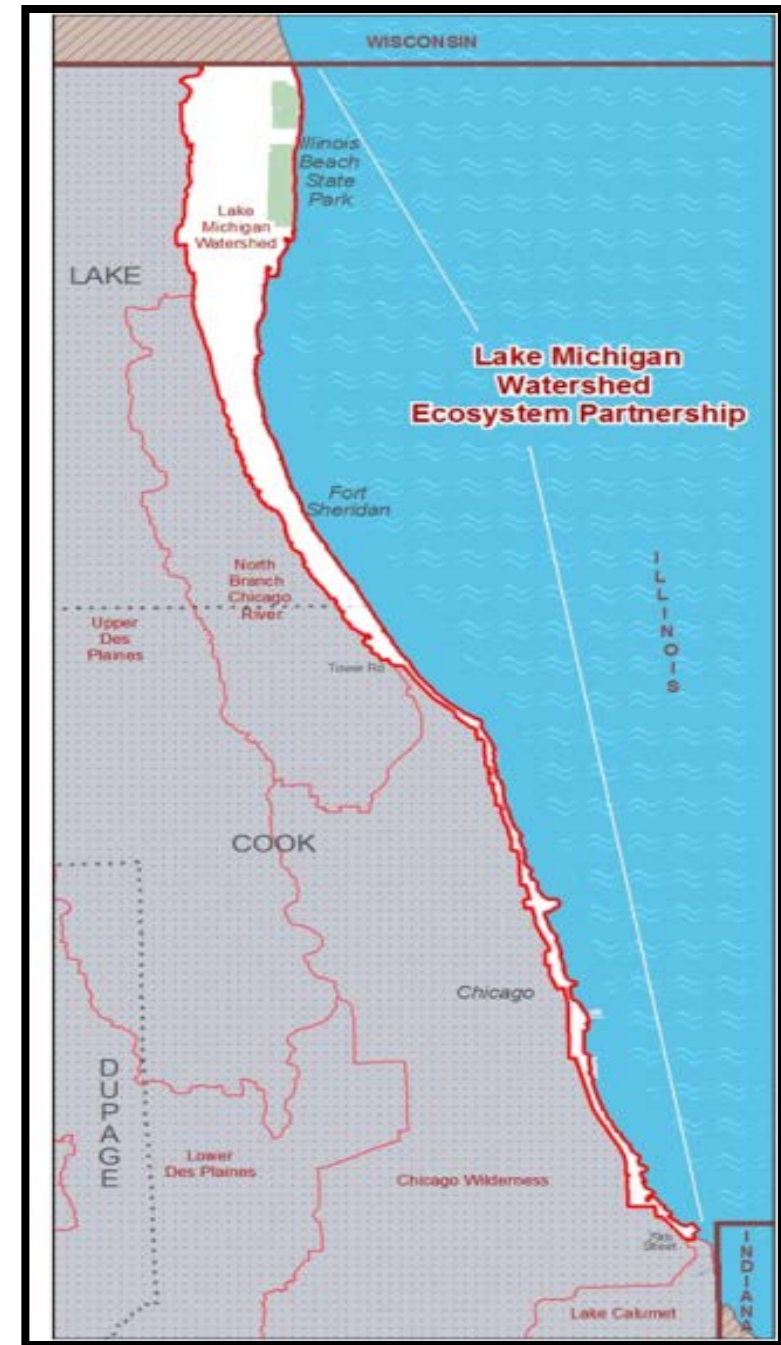
After Canal Excavation



Chicago River Reversal

30 Trillion Gallons

Of water have been diverted from Lake Michigan since 1967

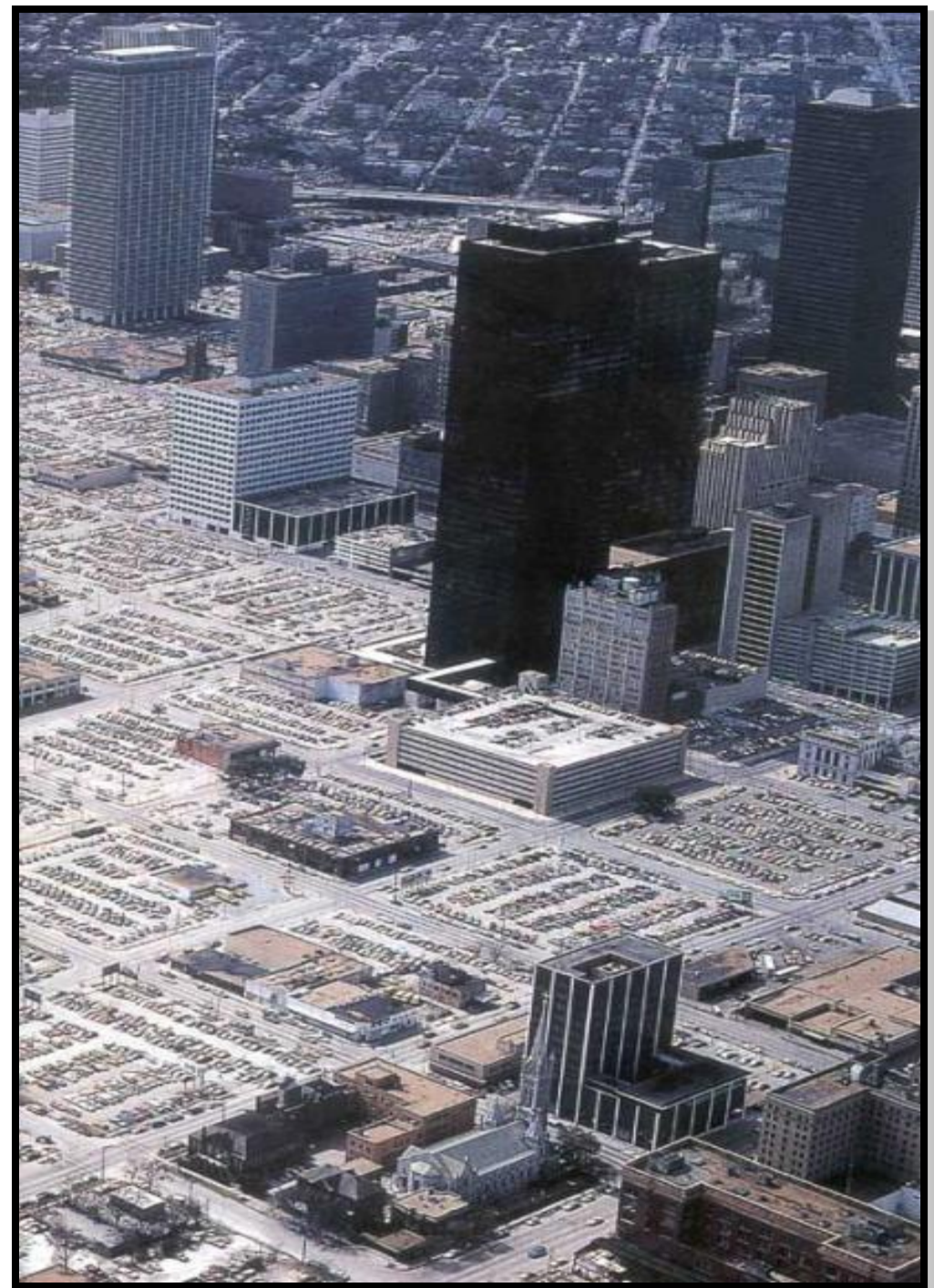


30 Trillion Gallons

Of water have been diverted from Lake
Michigan since 1967

42%

Of Cook County is impervious

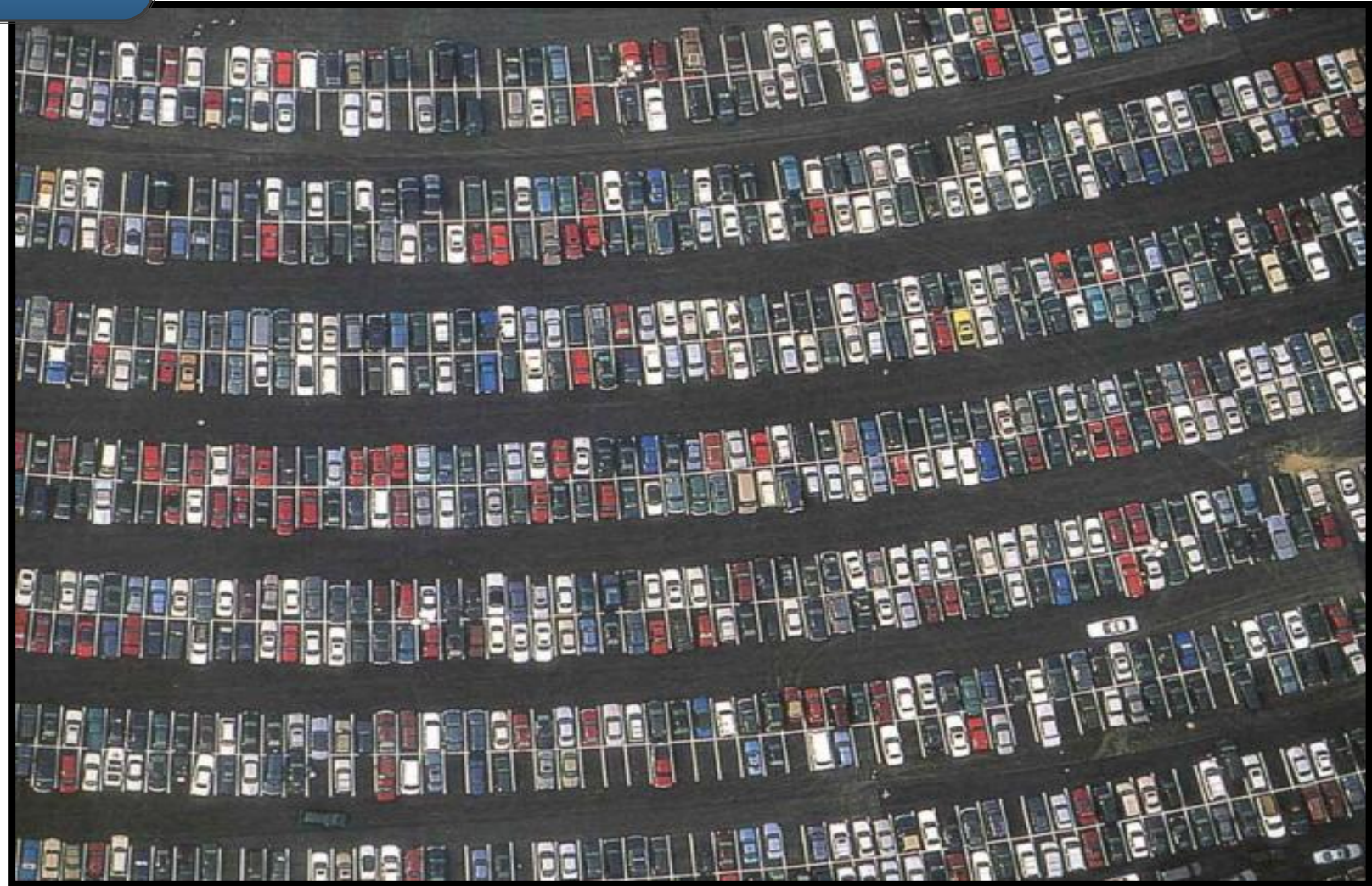


30 Trillion Gallons

Of water have been diverted from Lake Michigan since 1967

42%

Of Cook County is impervious



30 Trillion Gallons

Of water have been diverted from Lake Michigan since 1967

42%

Of Cook County is impervious

60%

Of rainfall is under ½" episodes

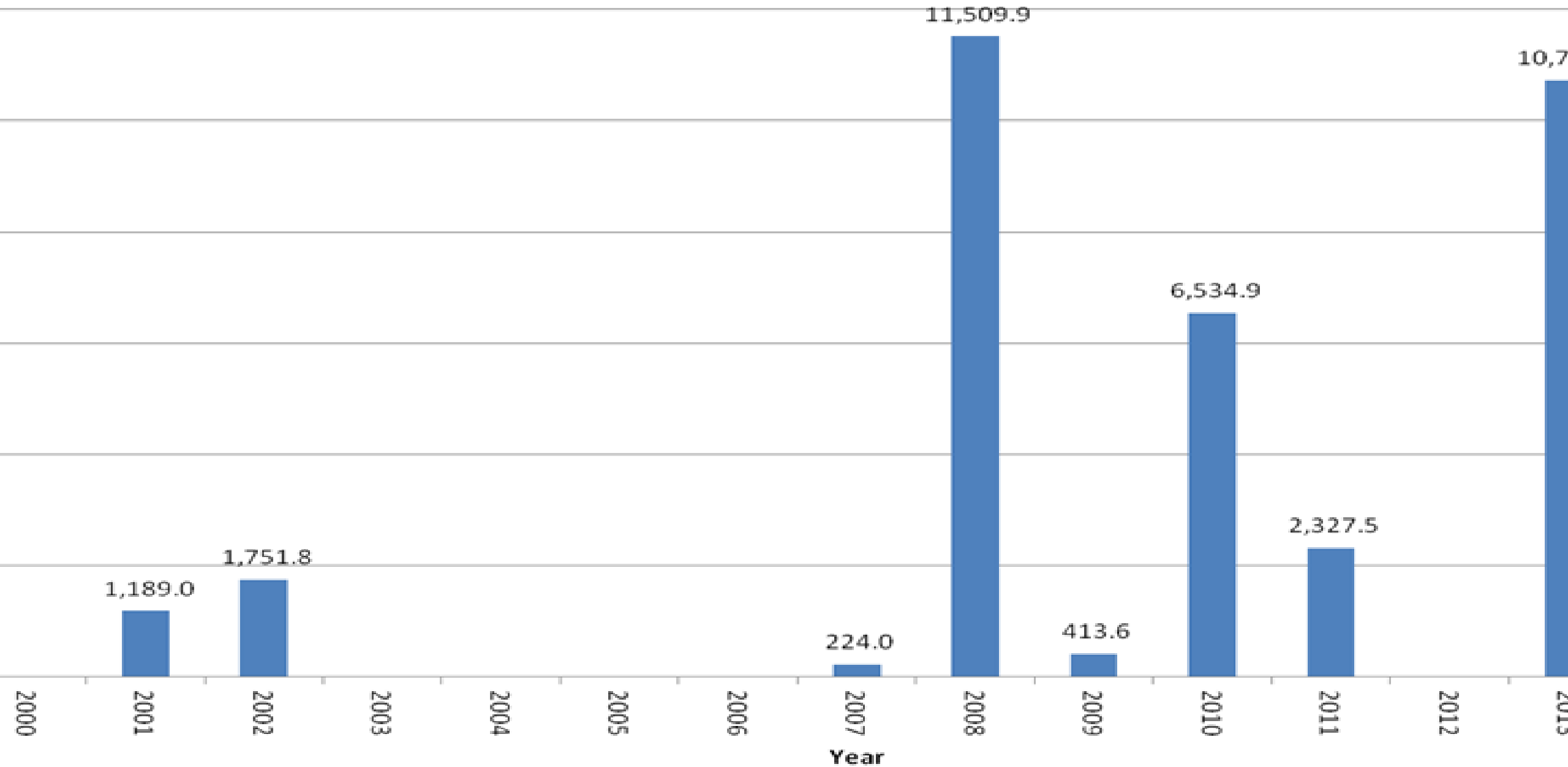




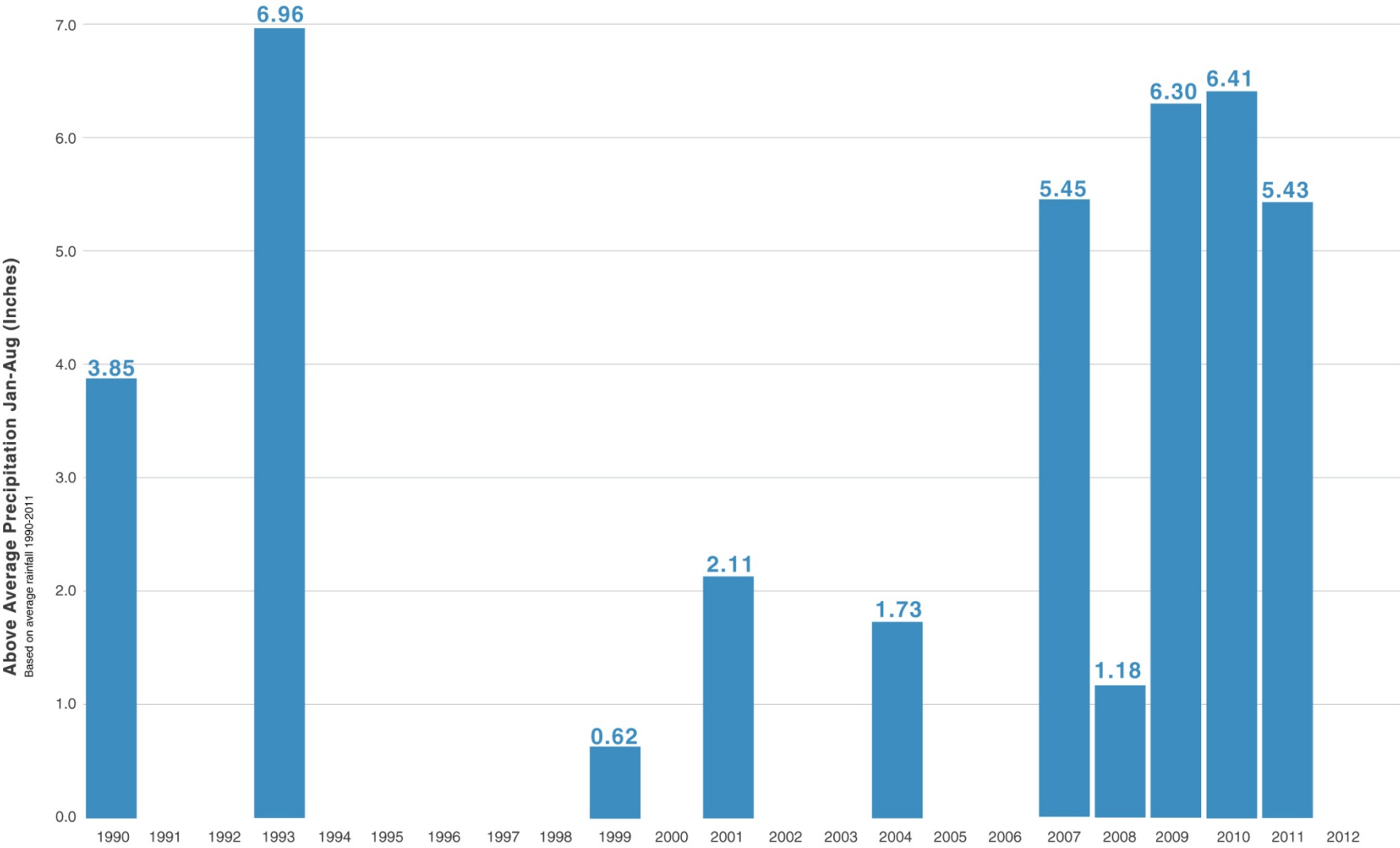
Photo: John Trilik, Courtesy of the National Weather Service



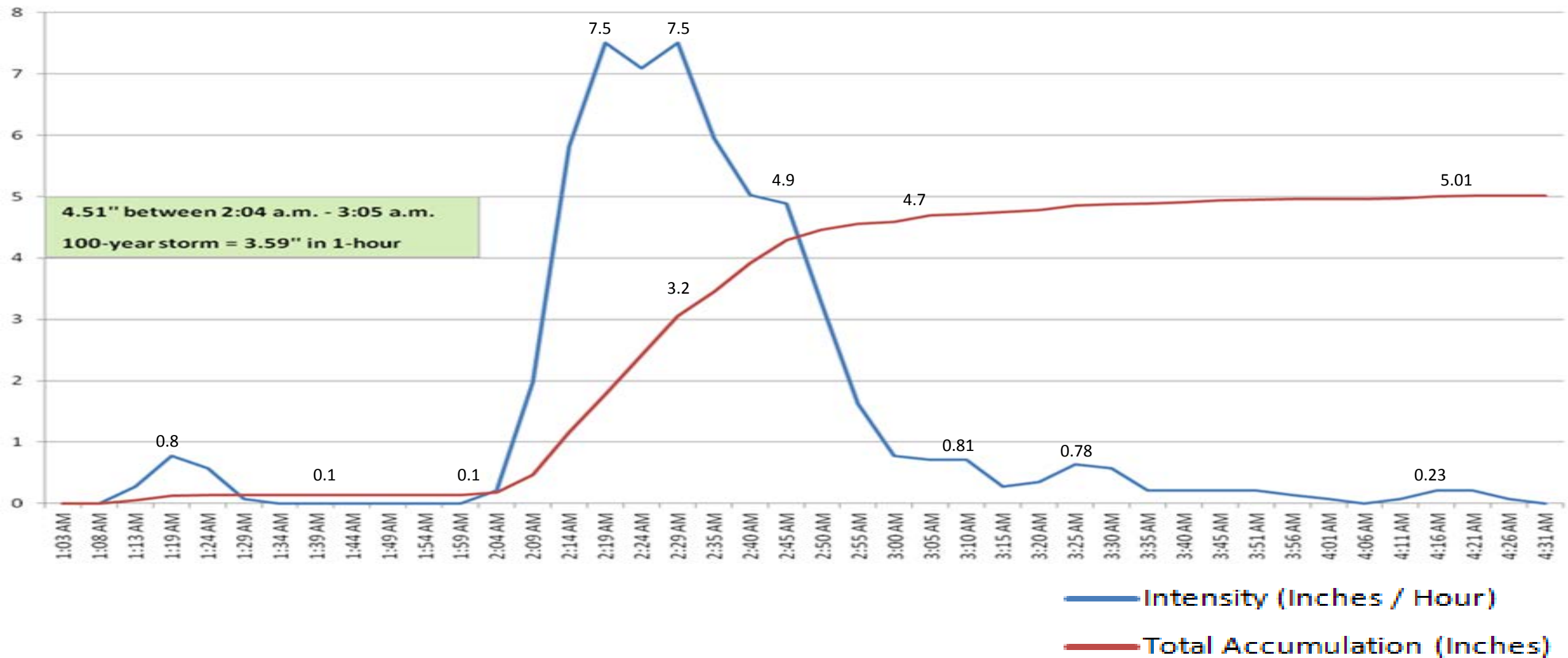
Reversals to Lake Michigan (2000 - 2014)



Above Average Precipitation in Cook County, 1990-2012



Oak Lawn/Burbank, 8.22.2014, 1:03 a.m. – 4:31 a.m.



Teardowns increase

& reduce

Runoff

Permeability

1998 Home:

3,560 sqft

Impervious Area

2008 Home:

5,650 sqft

Impervious Area



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Impervious Area

Increase in Annual Runoff

	Bldg Size (ft ²)	Total Impervious Area (ft ²)	Lot Percent Impervious	Increase in Runoff from 1954 (gal)
1954 original	1,600	3,160	23%	--
1998 remodel	2,000	3,560	26%	9,000
2008 rebuild	3,650	5,650	41%	50,000 gallons





Rain Barrels



Rain Gardens

Permeable Pavement



Native Prairie Landscaping



Stormwater Trees



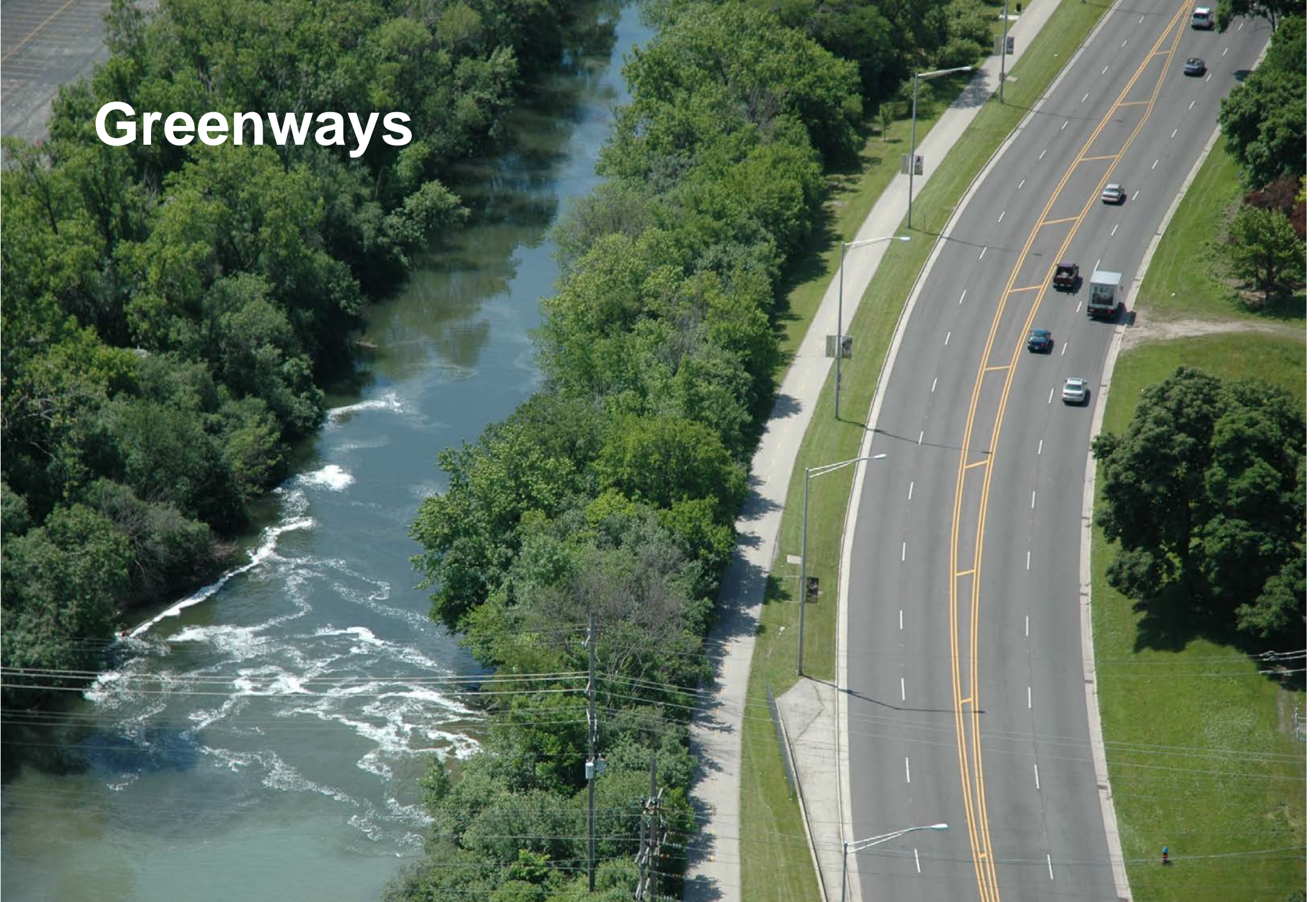
Bioswales



Green Roofs



Greenways





Green Alleys and Walkways

Wetlands

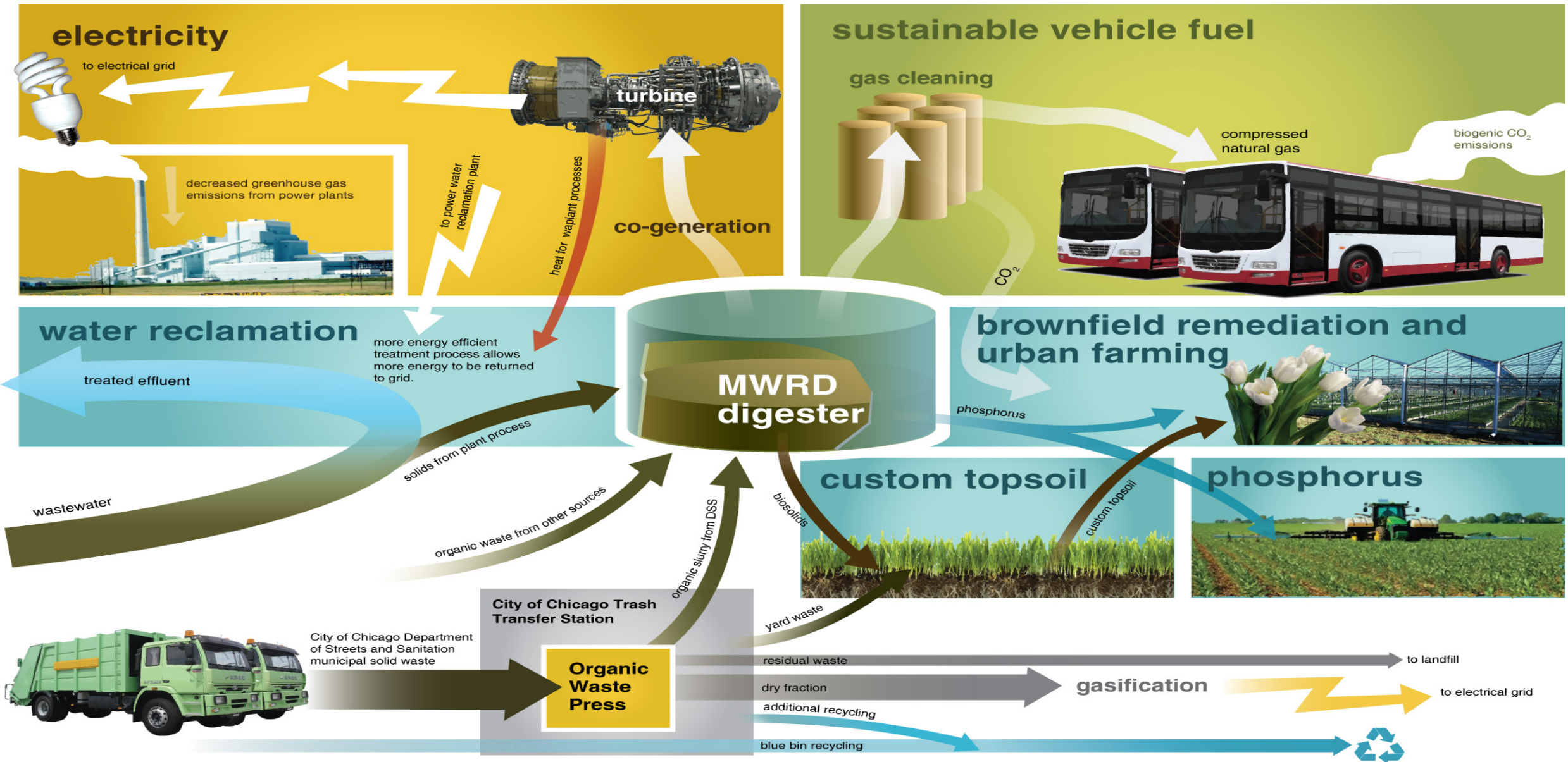








Sustainability: A New Paradigm





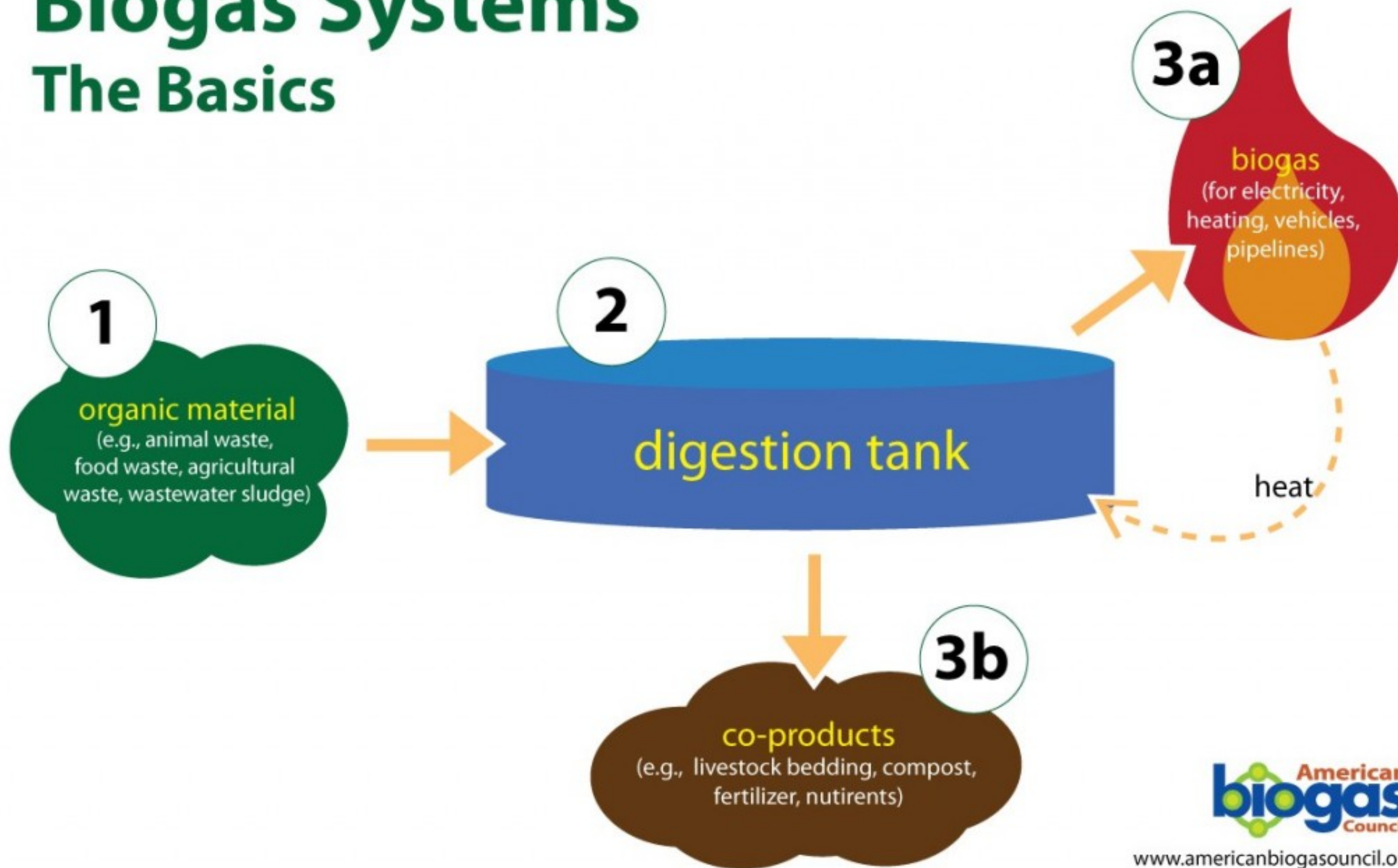
Sustainable Landscape

Dramatically Reducing Landfilling of Wastes

- 30% of 1,000,000 tons are organic
- 30% Syngas Fuel
- 20% Recycle Product

Biogas Systems

The Basics



www.americanbiogasouncil.org



Sustainable Fleet

CTA, City of Chicago, Parks, MWRD

- Compressed Natural Gas



Sustainable Energy

Creating Electricity from Sewage Solids and Organic Waste Materials

- MWRD Footprint 13 MW
- Minor Modifications 22 MW
- Waste to Energy Potential 80 MW



Sustainable Reduction

- Deammonification / Denitritation
- 40% Energy Reduction – WERF 60% - 80%



Sustainable Recovery Closing the Phosphorus Cycle

- Non-renewable resource
- High Quality Environmentally Friendly Phosphorus
- 10,000 Tons Annual Yield Potential

“Life can multiply until all phosphorus has gone, and then there is an inexorable halt which nothing can prevent.”

— Isaac Asimov



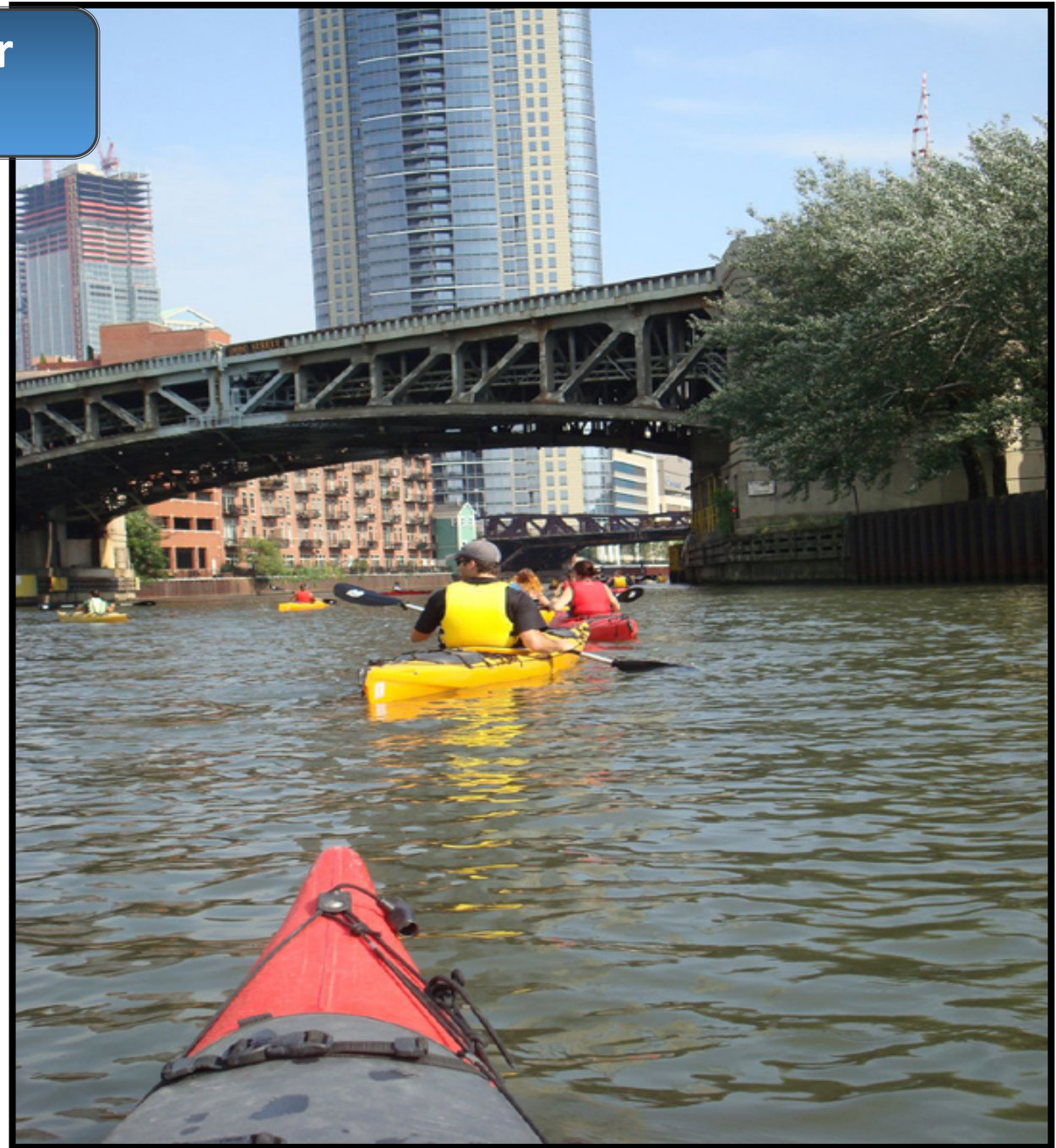


Sustainable Soils

- Class A Biosolids: 140,000 tons/year
- City of Chicago Yard Waste Blend
- Reduction in maintenance costs – better results



Recreation on an urban working river



Recreation on an urban working river

