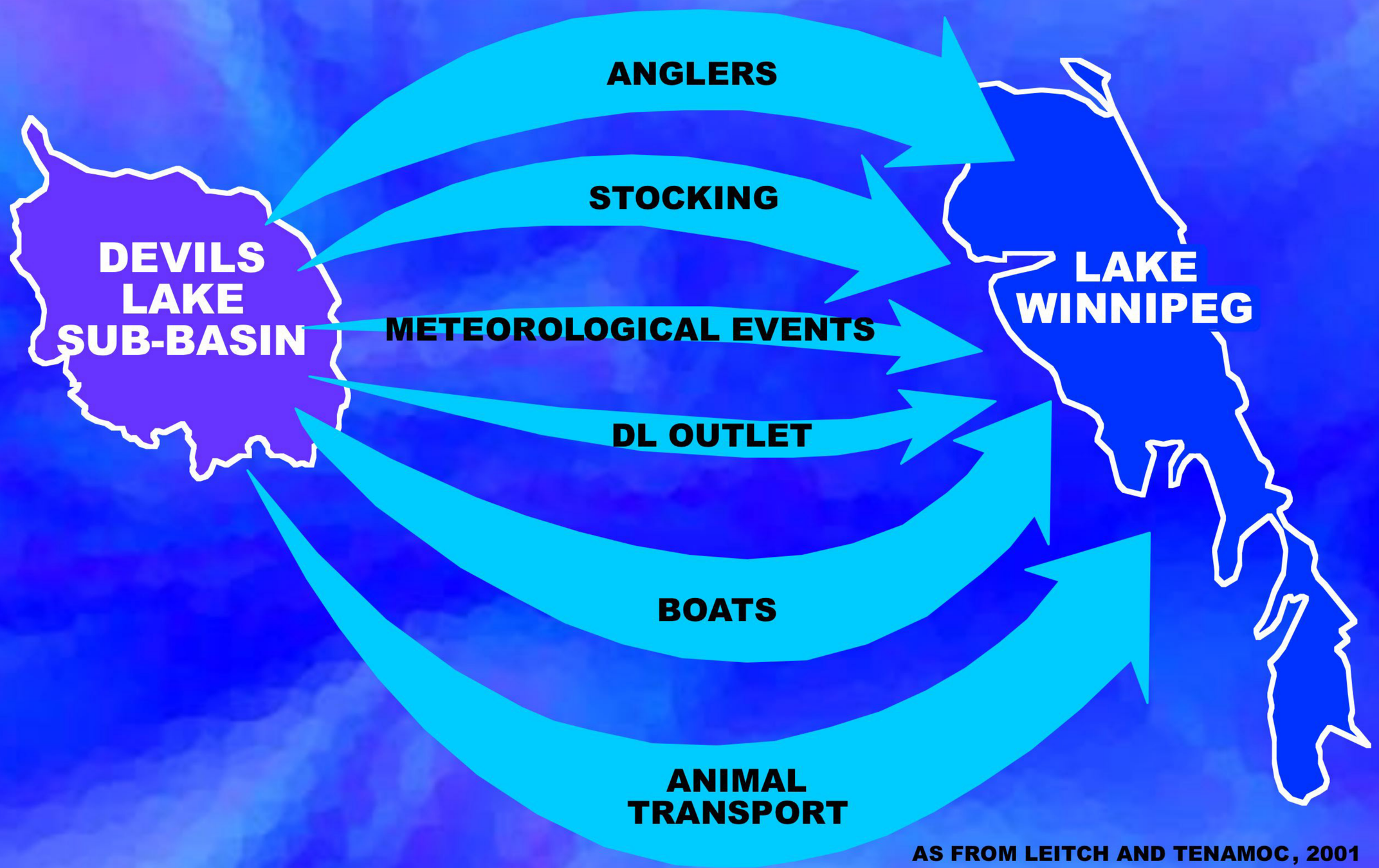
Potential Transfer Pathways for Biota from Devils Lake to Lake Winnipeg

Presented by the NDSWC

The Relative Probability of Biotic & Abiotic Transfer Pathways from Devils Lake



AS FROM LEITCH AND TENAMOC, 2001

Fish Stocking Facts

Manitoba Conservation - Fisheries Branch Website, 2002

MANITOBA:

- 5 species stocked
- 6.8M stocked in 2001
- 57 waterbodies stocked
- 300 lakes, 70 creeks commercially fished
- 80 fish species found

Ontario Conservation - Fisheries Branch Website, 2002

ONTARIO:

- 11 species stocked
- 8.5M stocked every year
- 11,000 lakes & rivers stocked
- 155 fish species found

NORTH DAKOTA:

- 26 species stocked
- 5M stocked in 2001
- 16 major waterbodies stocked
- 350 minor waterbodies stocked
- 96 fish species found

ND Game & Fish Website, 2002; Northern Prairie Wildlife Research Center Website, 2002

MN DNR Website, 2002

MINNESOTA:

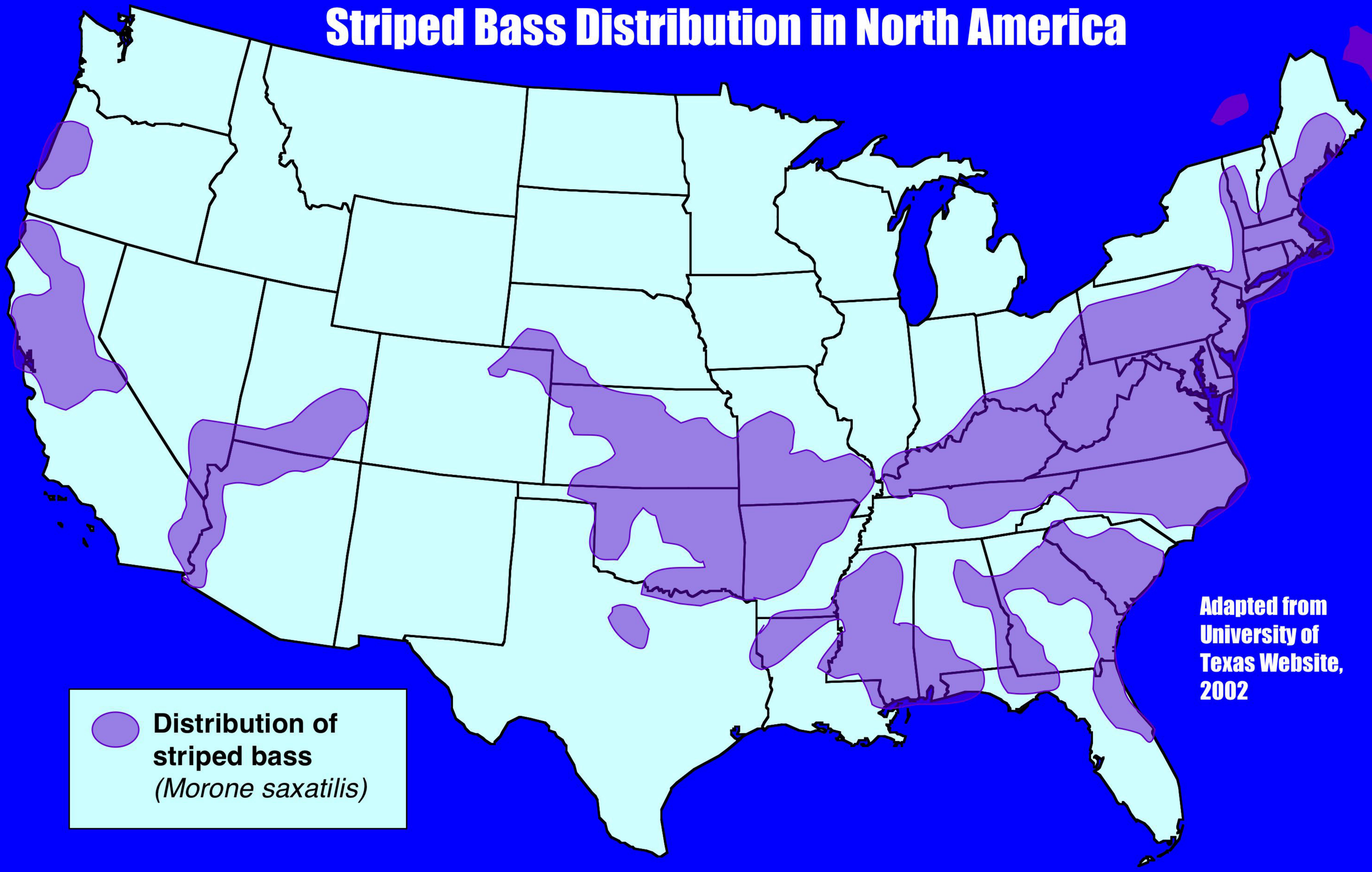
- 17 species stocked
- 17 hatcheries
- 334M stocked Jul 98-Jun 99
- 506 lakes stocked
- 5,493 fishable lakes
- 144 fish species found

ROLE OF AQUACULTURE

Courtenay and Williams, 1992; Leitch and Tenamoc, 2001; OTA, 1993

Aquaculture

Striped Bass Distribution in North America



Adapted from University of Texas Website, 2002

Angler Facts

Manitoba Conservation - Fisheries Branch Website, 2002

MANITOBA:

225,000 Domestic Anglers
38,000 Foreign Anglers in 1995

Ontario Conservation - Fisheries Branch Website, 2002

ONTARIO:

4,200,000 Total Anglers
1,500,000 Resident Anglers in 2001

Personal Communication with Terry Steinwand, 2002

NORTH DAKOTA:

136,000 resident
40,000 non-resident in 2001-02

MN DNR Website, 2002

MINNESOTA:

2,300,000 Anglers in 1999

"BAIT BUCKET" Effect

Leitch and Tenamoc, 2001

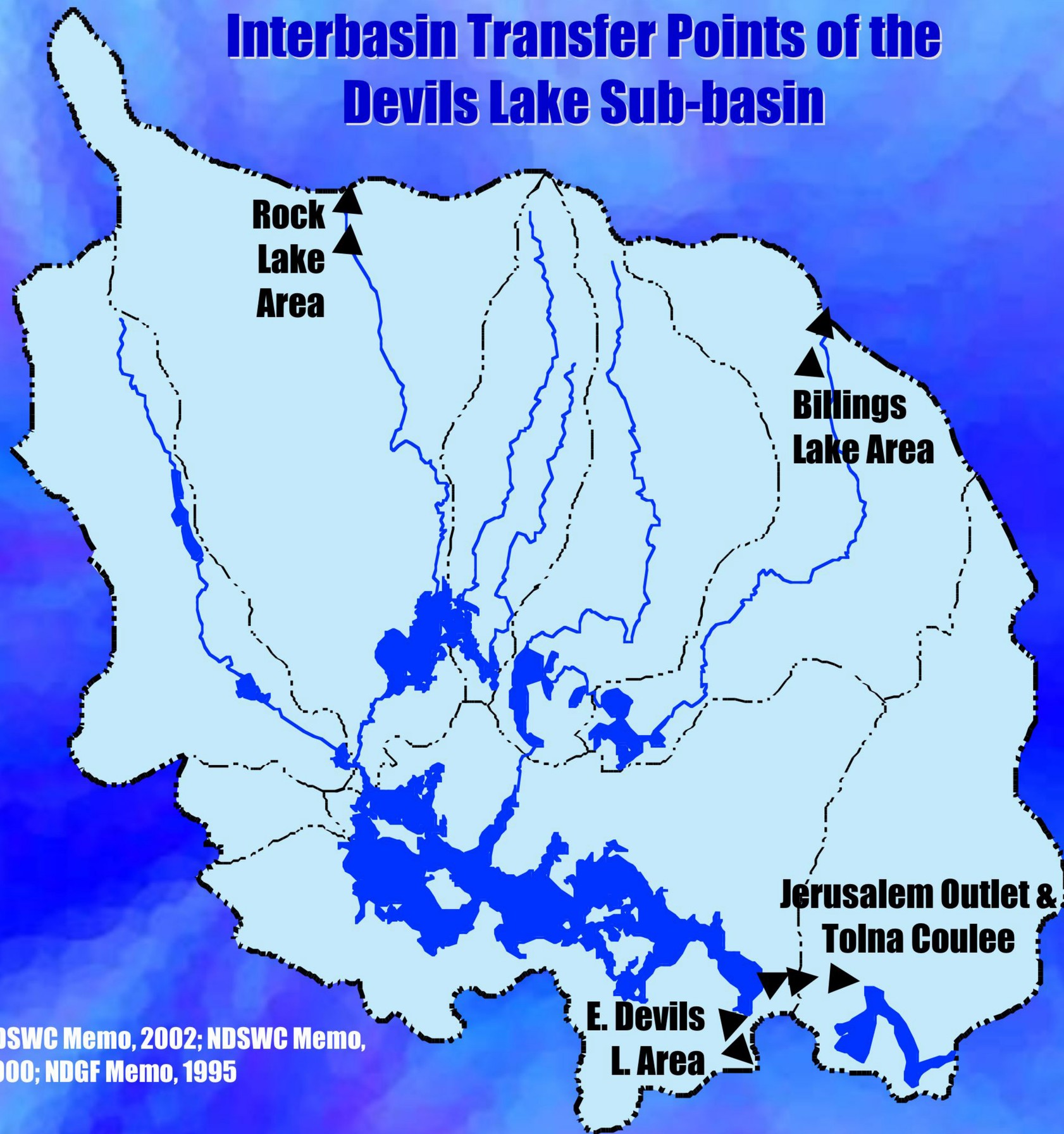
“The EIS is incomplete without a complete baseline assessment of small fish in Devils Lake and downstream. This is the guild that would most likely be introduced to the system via the ‘bait bucket’ vector.”

Kellow, R.L., 2002. RE: Comments on the Devils Lake Integrated Planning Report and Environmental Impact Statement. Transboundary Water Unit, Regina, SK, Canada.

Meteorological Events

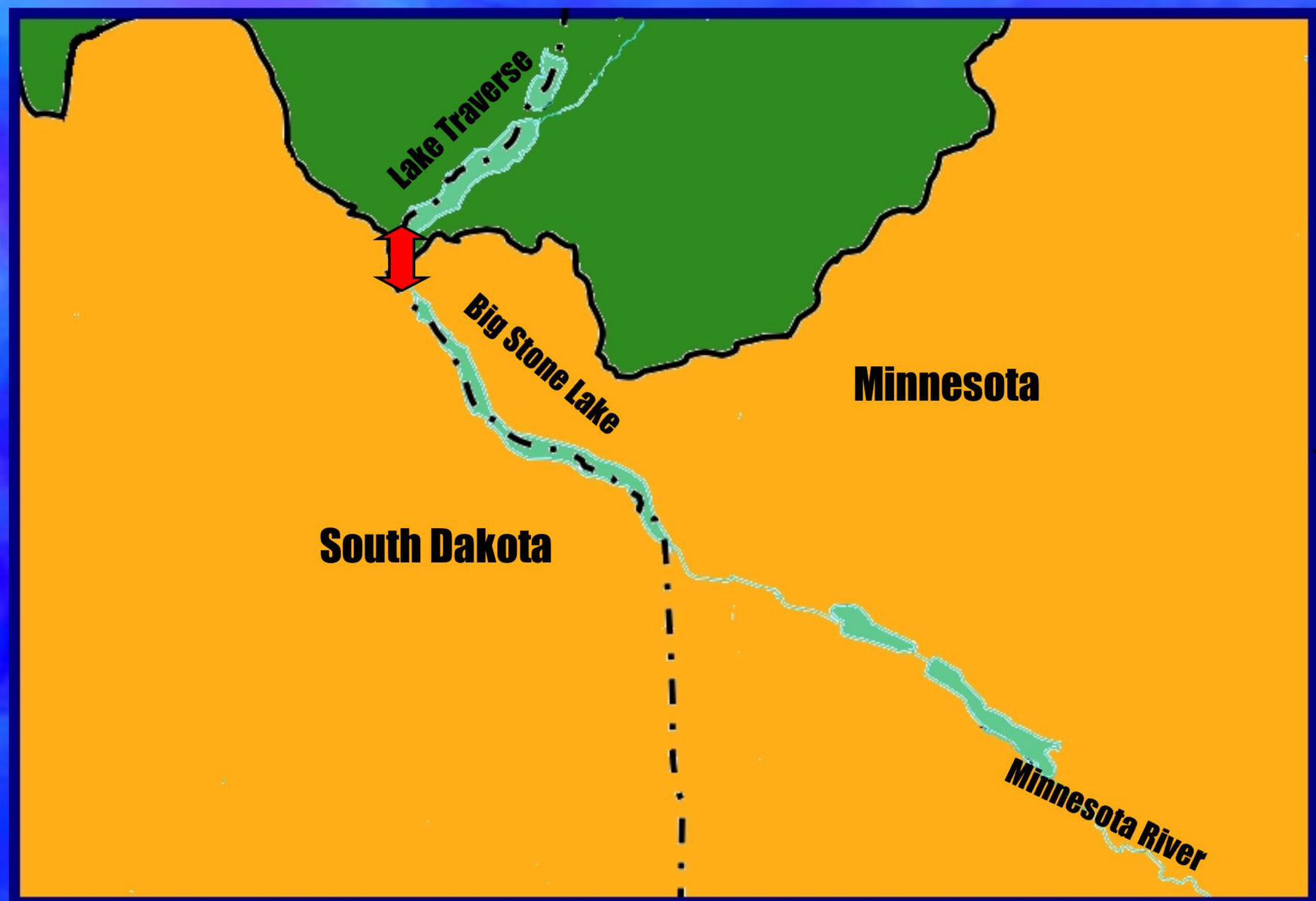
- Water through Stump Lake into Sheyenne R. at least twice in the last 4,000 years. . .
  USGS, 2000
- Anecdotal and observed interbasin water flow in 1995, 1997, and 2002. . .
  SWC, 2002; SWC Memo, 2000; NDGF Memo, 1995
- North Dakota experiences strong pluvial and drought cycles. . .
  NOAA Website, 2002; Oral Communication, Richardson, 2001
- "Freak" weather events DO occur—tornadoes, waterspouts, etc. . .
  Leitch and Tenamoc, 2001
- Extreme precipitation event connected Lake Traverse to Little Minnesota River for several weeks: a clear example of a connection between the Hudson Bay and the Mississippi River basin. . .
  Bertschi, 1994

Interbasin Transfer Points of the Devils Lake Sub-basin



NDSWC Memo, 2002; NDSWC Memo, 2000; NDGF Memo, 1995

Big Stone Lake To Lake Traverse



Hudson Bay Basin

Mississippi River Basin

Little Minnesota River To Lake Traverse Connection

Bertchsi, 1994; USACE, 2000; National Atlas.Gov, 2002; Personal Comm. With Scott Jutila, USACE, 2003

Big Stone Lake To Lake Traverse

- Natural Interbasin Flow Between Little Minnesota River (Mississippi River) And Lake Traverse (Hudson Bay)
- Anecdotal, Observed, And Documented Connections In 1820, 1916, 1930 1943, 1993, 1997, 2001
- People Have Boated Across The Divide Historically
- Flow Now Occurs From The Little Minnesota River Through The Browns Valley Dike To Lake Traverse
- No Biota Transfer Controls Indicated

Hudson Bay Basin

Mississippi River Basin

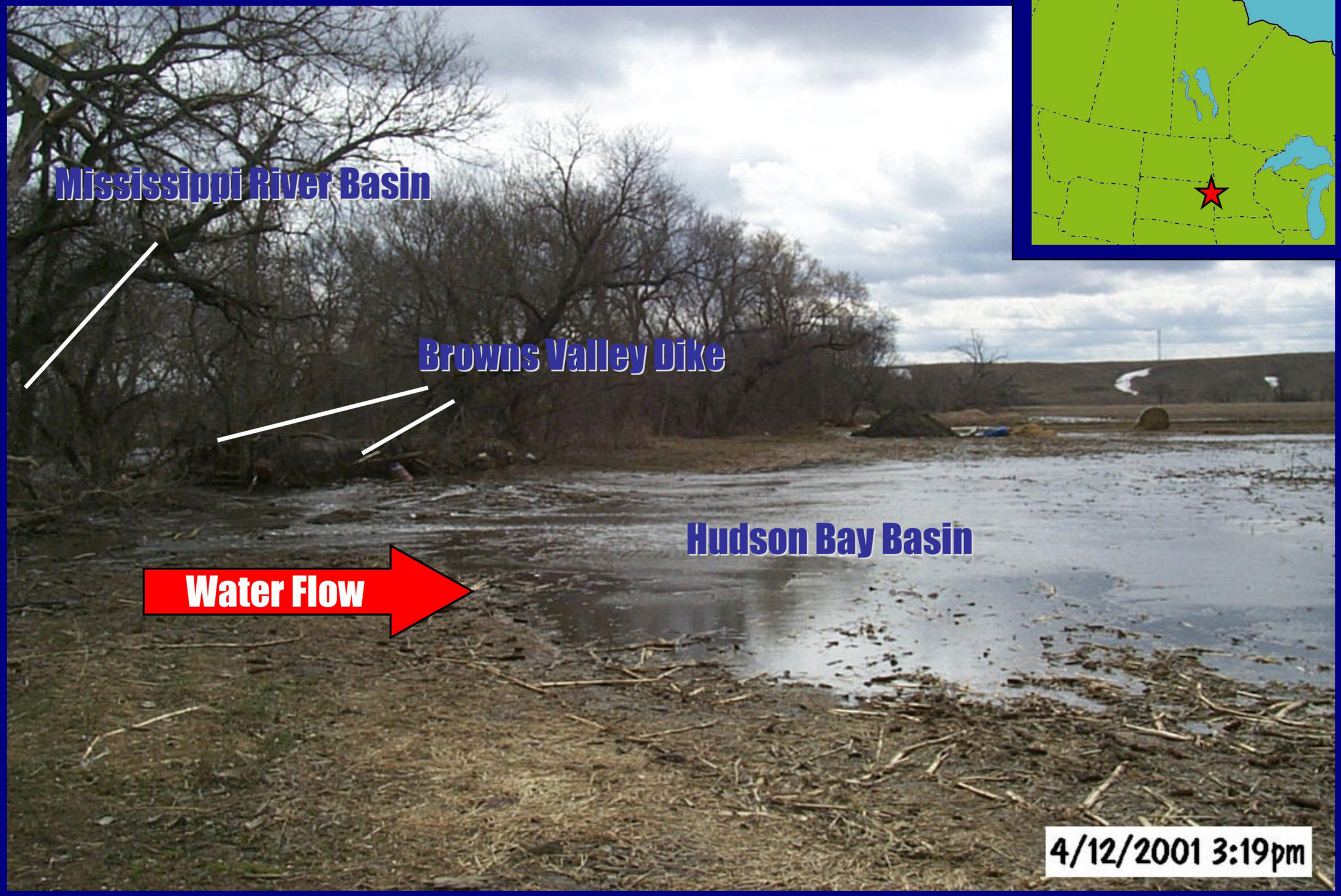
Little Minnesota River To Lake Traverse Connection

Bertchsi, 1994; USACE, 2000; National Atlas.Gov, 2002; Personal Comm. With Scott Jutila, USACE, 2003

Big Stone Lake To Lake Traverse

Memo, USACE, 2000 ;
Personal Comm. With Scott Jutila, USACE, 2003

Big Stone Lake To Lake Traverse



Personal Comm. With Scott Jutila, USACE, 2003

Outlets and Diversions

MANITOBA:
- Churchill River Diversion

Lake of the Woods Control Board Website, 2002; Manitoba Hydro Electical Utility Website, 2002; Lake Manitoba Basin Initiative Website, 2002

ONTARIO:
- Long Lake Diversion
- Ogoki Diversion
- Lake St. Joseph Diversion

State of Michigan, Department of Environmental Quality, Office of the Great Lakes Website, 2002; The National Atlas of Canada, 5th Edition

NORTH DAKOTA:
- 2 proposed Devils Lake Outlets
- NAWS Project (Under Construction)

State Water Commission, 2002; SWC memo, 2000; Personal Communication with Jim Lennington SWC , 2002

MINNESOTA:
- 76 Closed-Basin Lake Outlets

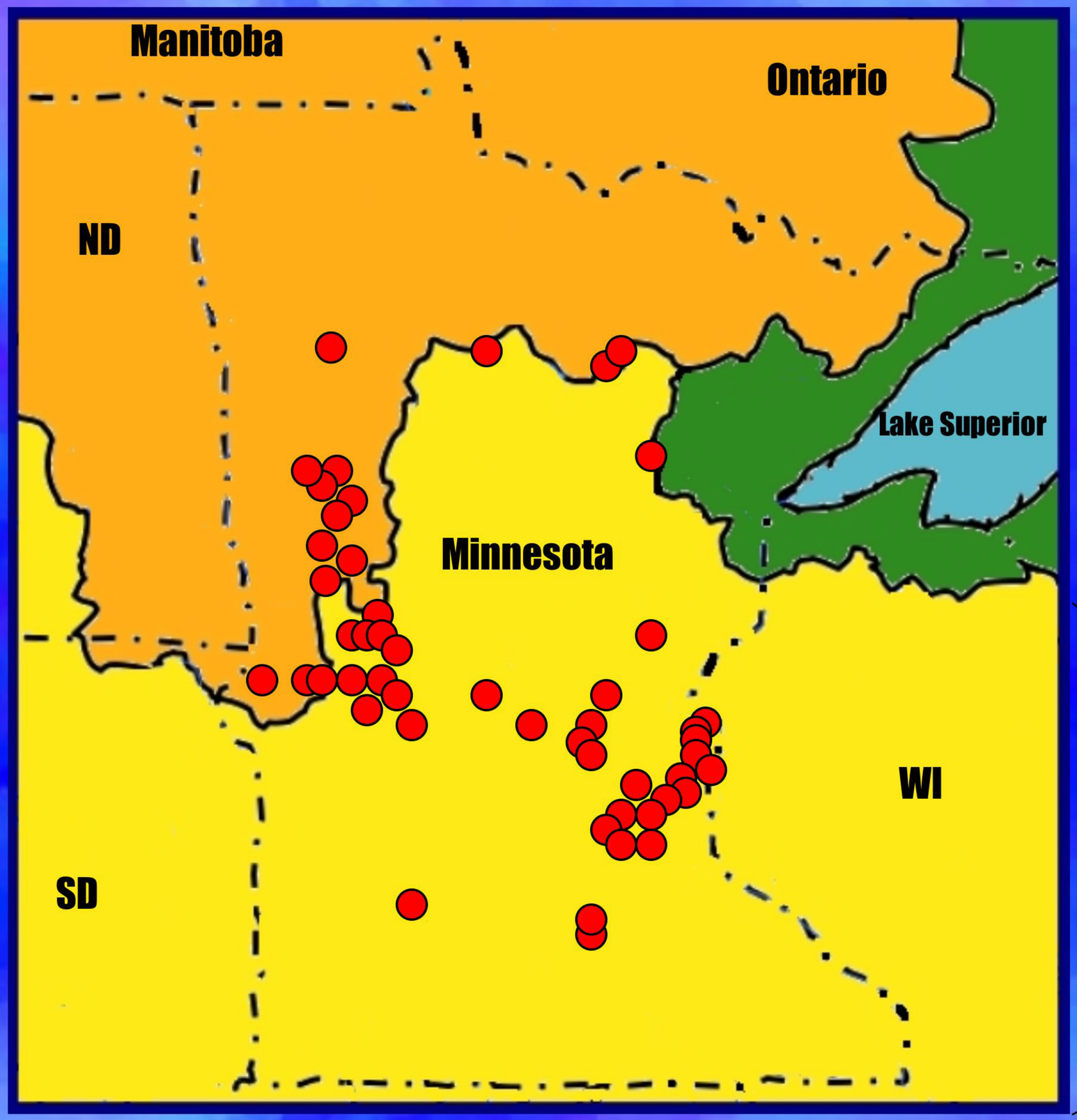
Houston Engineering Website, 2002; Oral Communication, Buffalo Red River Watershed District, 2002; U.S. Army Corps of Engineers, St. Paul District Draft Report, 1985;Personal Communication with Mel Sinn, MNDNR, 2002

Shell Lake Outlet, Wisconsin

- Closed Basin Lake
- Water Quality Concerns
- Water Quantity Concerns
- Biota Transfer Concerns
- Drains Into Mississippi
- 20 cfs Maximum Flow
- Only EA Conducted
- No Objection From Minnesota

WIDNR Shell Lake EA, 2002

Minnesota Closed-Basin Lake Outlets



Hudson Bay Basin

Great Lakes Basin

Mississippi River Basin

Closed-Basin Lakes With Outlet

Minnesota Closed-Basin Lake Outlets

- Purpose: Flood Control
- Constructed By: Various; From MNDNR, To USACE, To Lake Improvement Districts (LID), To Private Citizens
- Constructed: Various; With 76 Outlets, Having Occurred Within The Last Century To Present Time
- Flow: Various; Anywhere From Tiled Up To 25 cfs (0.7 m^3/s)
- Connections: Closed-Basin Lakes To External Drainages
- Biota Transfer Controls: None Indicated, Although Water Quality Monitoring Required On Certain Drained Lakes

Hudson Bay Basin

Great Lakes Basin

Mississippi River Basin

Closed-Basin Lakes With Outlet

St. Mary River And Milk River Diversions

Missouri River Basin

Hudson Bay Basin

Internal Drainage Basin

Pacific Ocean Basin

St. Mary R. Diversion

Milk R. Irrigation

Canada Drainage Basins, 1985 ; National Atlas.Gov, 2002; Personal Comm. With Derrick Jaffray, 2002; SMRID Webpage, 2002

St. Mary River And Milk River Diversions

- Purpose: Irrigation in Montana And Alberta
- Constructed By: USBR And Alberta
- Constructed: Montana Project 1915, Alberta Project 1890's And 1970
- Flow: MT Project 650 cfs, AB Project <25 cfs (19.1 m^3/s)
- Connections: Missouri River Basin And Hudson Bay Basin
- Biota Transfer Controls: None Indicated

Missouri River Basin

Hudson Bay Basin

Internal Drainage Basin

Pacific Ocean Basin

St. Mary R. Diversion

Milk R. Irrigation

Canada Drainage Basins, 1985 ; National Atlas.Gov, 2002; Personal Comm. With Derrick Jaffray, 2002; SMRID Webpage, 2002

The Chicago Sanitary And Shipping Canal

The Chicago Sanitary And Shipping Canal

- Purpose: Sewage Dilution, Navigation, and Hydroelectric Power Generation
- Constructed By: Metropolitan Sanitary District of Greater Chicago
- Constructed: 1900, With Additional Connections in 1910, and 1922 (Now 71 Miles of Canals)
- Flow: 3,213 cfs (221 m^3/s)
- Connections: Great Lakes Basin to Mississippi River Basin (Both Ways)
- Biota Transfer Controls: Electrical Barrier Currently Under Construction, But Other Controls Proposed

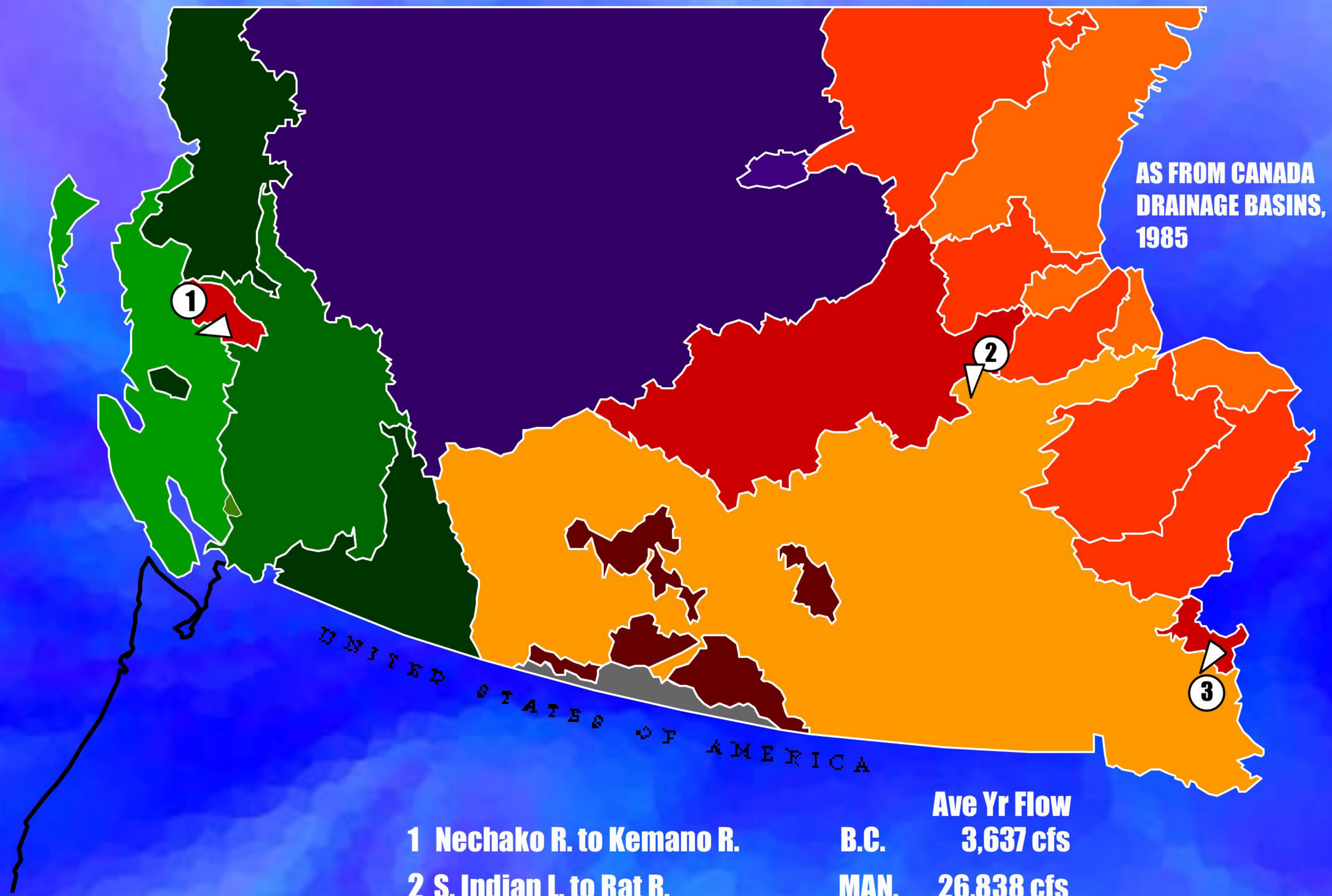
Mississippi River Basin

Great Lakes Basin

Chicago Sanitary & Shipping Canal

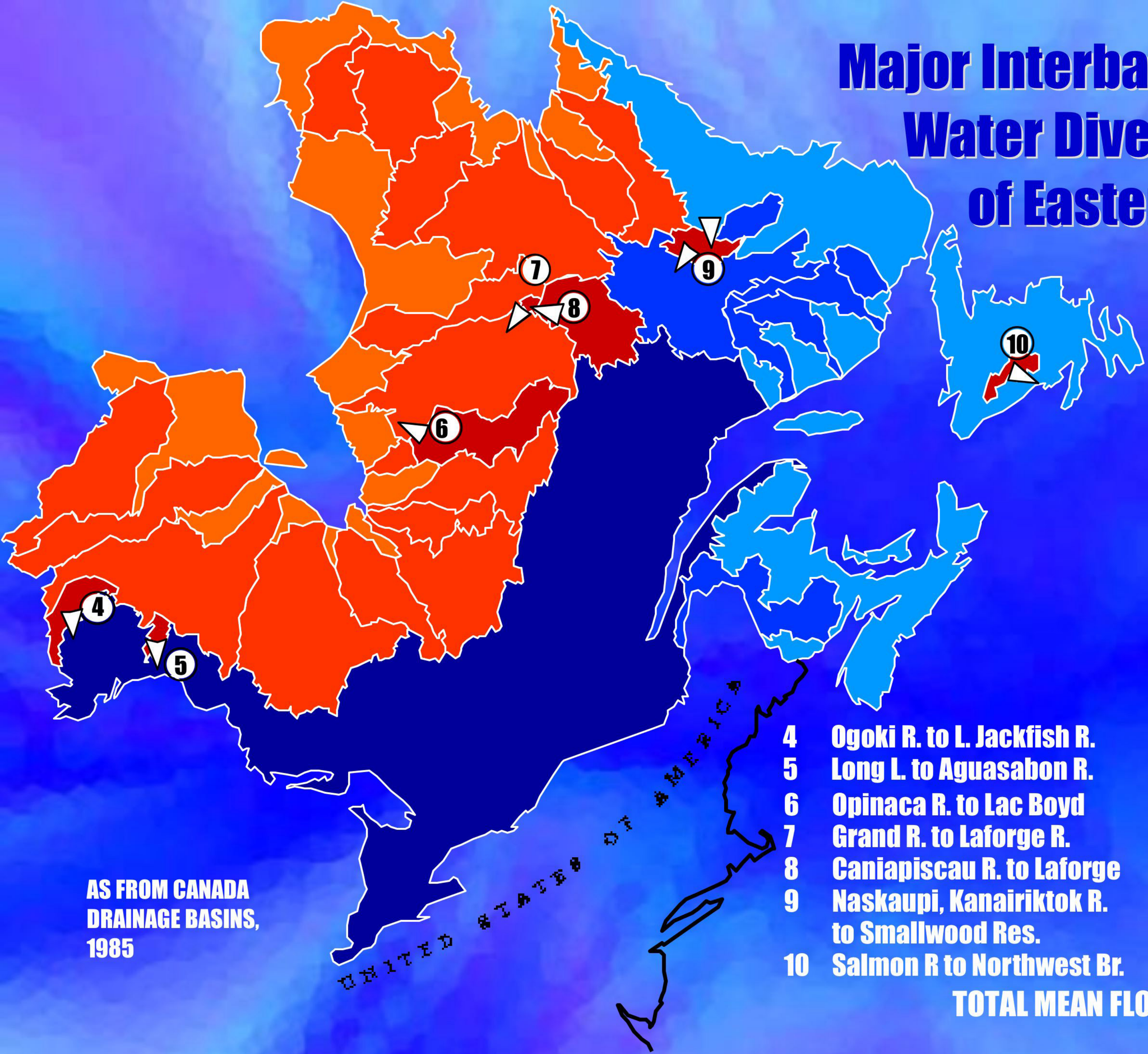
Canadian Interbasin Transfers

Major Interbasin Water Diversions of Western Canada



			Ave Yr Flow
1	Nechako R. to Kemano R.	B.C.	3,637 cfs
2	S. Indian L. to Rat R.	MAN.	26,838 cfs
3	L. St. Joseph to Root R.	ONT.	3,072 cfs

Major Interbasin Water Diversions of Eastern Canada



AS FROM CANADA DRAINAGE BASINS, 1985

			Ave Yr Flow
4	Ogoki R. to L. Jackfish R.	ONT.	4,273 cfs
5	Long L. to Aguasabon R.	ONT.	1,377 cfs
6	Opinaca R. to Lac Boyd	QUE.	30,017 cfs
7	Grand R. to Laforge R.	QUE.	1,024 cfs
8	Caniapiscau R. to Laforge	QUE.	27,898 cfs
9	Naskaupi, Kanairiktok R. to Smallwood Res.	NEW.	11,795 cfs
10	Salmon R to Northwest Br.	NEW.	2,789 cfs

TOTAL MEAN FLOW: 112,720 cfs

MANITOBA:

- 71,000 recreational watercraft in 1994
- 100,000 lakes, varying degrees of recreational fishing access

Industry Canada Website, 2002; Manitoba Conservation, Fisheries Branch Website, 2002

ONTARIO:

- 719,710 recreational watercraft in 1994
- 250,000 lakes, thousands of miles of rivers and streams, varying degrees of recreational fishing access

Industry Canada Website, 2002;
Ontario Conservation, Fisheries Branch, 2002

NORTH DAKOTA:

- 51,483 watercraft registrations in 2001
- 200+ lake and river accesses

Written Communication, Nancy Boldt, 2002;
ND Game & Fish Website, 2002

MINNESOTA:

- 793,107 watercraft registrations in 1999
- 3,000+ public lake accesses in 1999

MN Dept. of Natural Resources Website, 2002

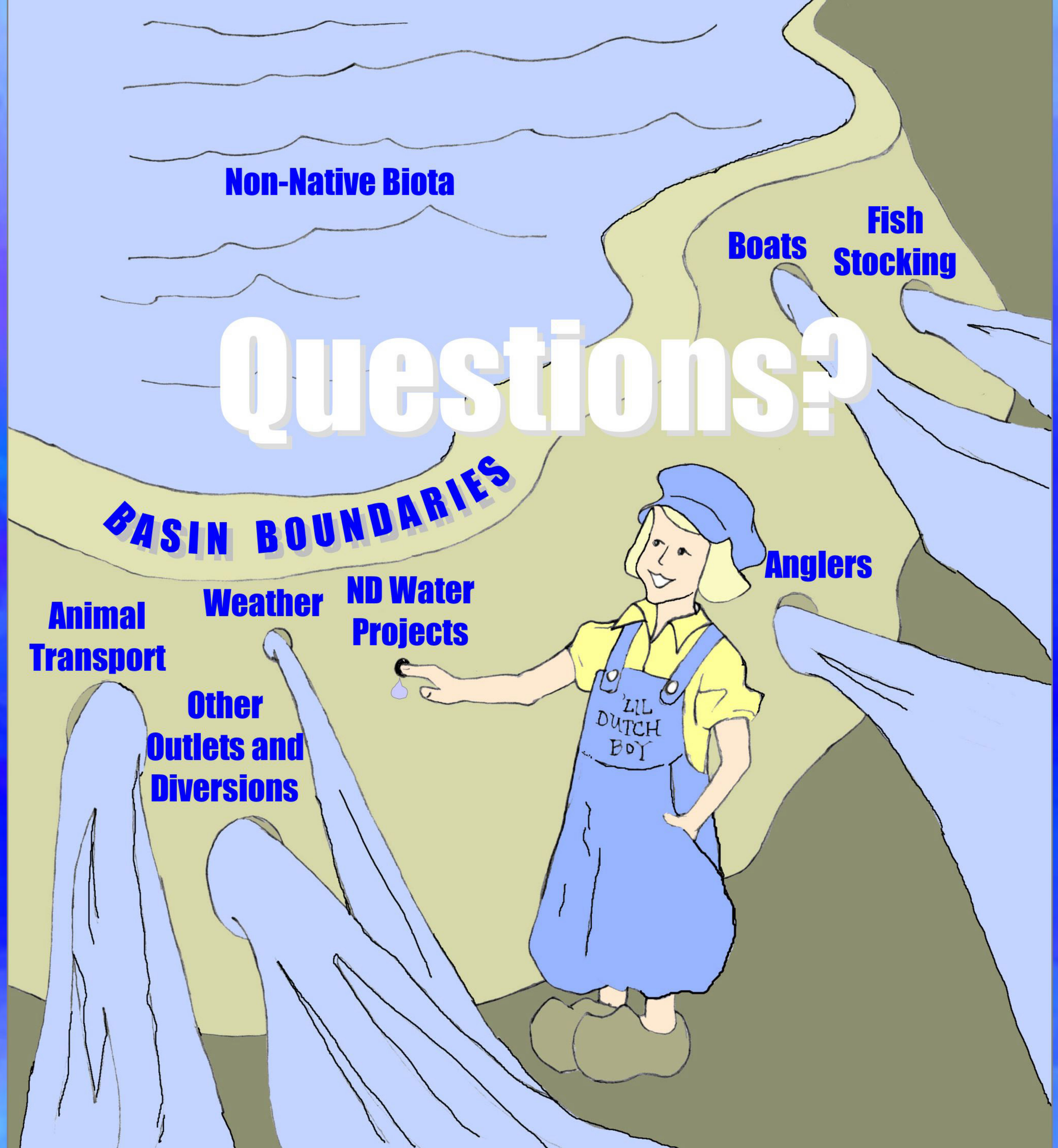
Boats

Many biota are transported attached to boats, in the ballast, or in live wells

Leitch and Tenamoc, 2001

Animal Transport

- Transport of biota is highly likely by various animals. . .
  Oral Communication, Barker, 2001; Clambey et al, 1983
- Possible biotic vectors include: birds, mammals, insects, amphibians, reptiles, invertebrates, fish. . .
  Clambey et al, 1983
- Likely biota to be transported: algae, plants, insects, microbes, invertebrates, fish. . .
  Oral Communication, Barker, 2001; Clambey et al, 1983; Masaki et al, 1994; Smith et al, 1964


Non-Native Biota
Boats
Fish Stocking
Questions?
BASIN BOUNDARIES
Anglers
Animal Transport
Weather
ND Water Projects
Other Outlets and Diversions
LIL DUTCH BOY