Agenda for February 27, 2018

- Water in the news
- Guest speakers

Lecture: Hydroelectricity in Ontario:

- Diversions in Lake Superior
- Nipigon River: dam construction
- Grand Canal proposal
- East West Tie Line

- Review of Ontario Electricity Supply

GEOG 4411 COURSE SCHEDULE (*subject to changes*)

Week of	Tuesday	Thursday
Feb 6, 8	Water Supply and Water Quality	Concerns and Threats to Drinking Water
Feb 13,15	Concerns and Threats to Drinking Water (cont.)	Hydroelectricity
Feb 20, 22	Reading Week	Reading Week
Feb 27, Mar 1	Hydroelectricity in Ontario: Diversions, NWO	Conservation Authorities, flood plains, 100-year floods, IDF charts Topic interim reports
Mar 6, 8	Guest Speaker: Tammy Cook Lakehead Regional Conservation Authority	Midterm
Mar 13, 15	TBA Article assessment/summary	Intro: Ring of Fire
Mar 20, 22	Guest Speaker: Doug Murray, Thunder Bay Economic Development Commission "Noront Proposal"	Seminars
Mar 27, 29	Seminars	Seminars
April 3, 5	Debates	Debates and Conclusions

The Nipigon River

The Nipigon Basin

red rock, ontario

nipigon, ontario

thunder bay, ontario

Some History of the Area

1000-1600
Aboriginals are well established in the area.

1650
Europeans arrive and are in awe at the limitless supply of beavers, otters and muskrats. Became huge center for fur trade.

1850
Ojibway sign the Robinson Superior Treaty

Late 1800s
The Nipigon Region begins to be identified as a beautiful area internationally. CPR is built through Nipigon.

1900s
First log drive attempted down the Nipigon river. Full log drives occurred from 1923-73.

1916
World Record Brook Trout Caught (14.5 lbs)

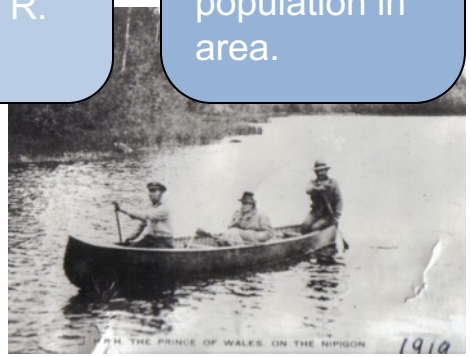
WW1
Commercial fishing begins. Construction of hydro dams on Nipigon R. from 1918 to 1950s.

1940
Long Lake Diversion.

1943
Ogoki river diversion begins. Increased flow of Nipigon R. by 50%

2001
Nipigon places a special focus on sustaining bald eagle population in area.

Theodore Roosevelt



H.R.H. Edward Prince of Wales

History of Dams in the Nipigon Region

- Cameron Falls Dam – 1920

- Alexander Dam – 1930
- Pine Portage Generating Station – 1950

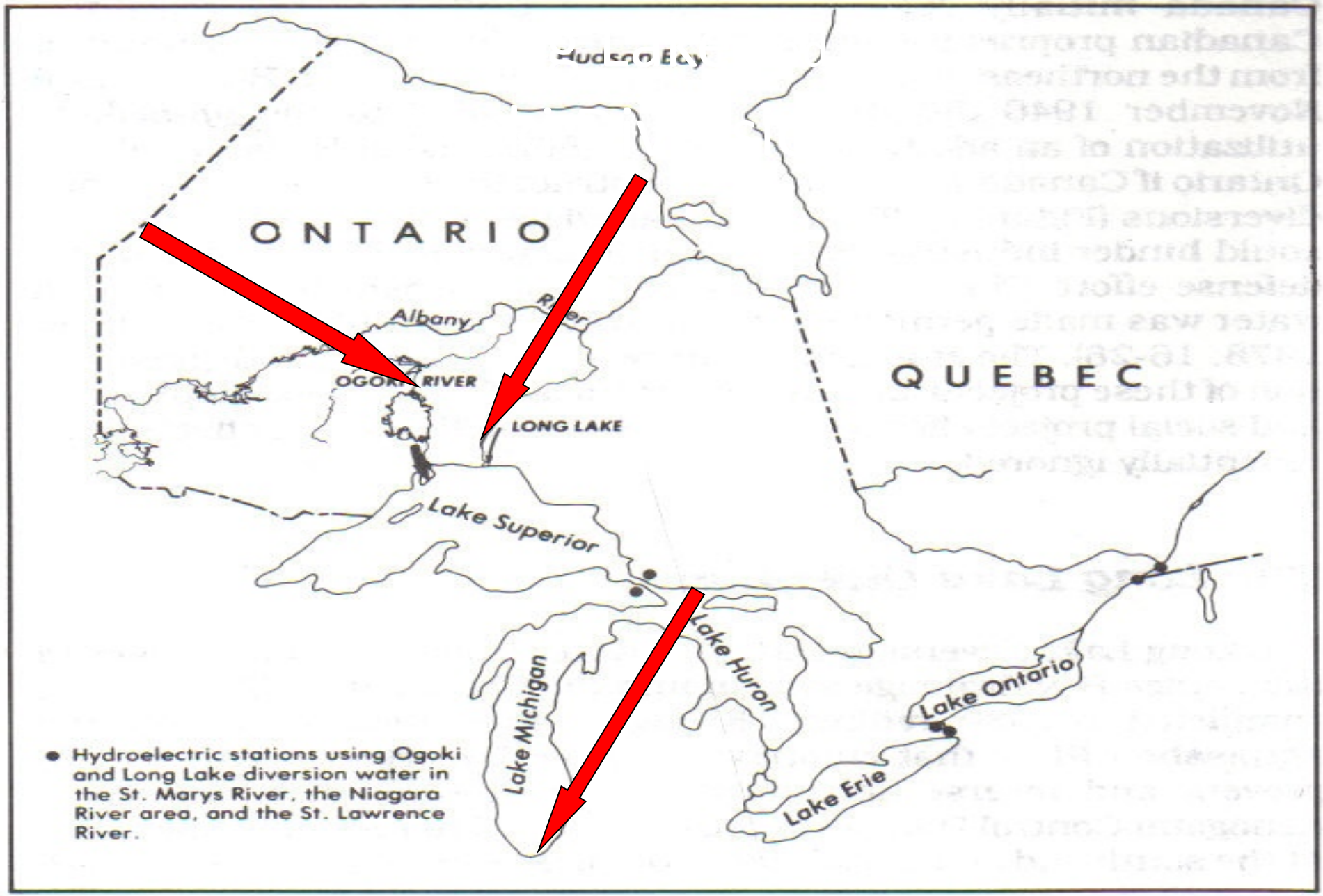


Figure 9: Hydroelectric Stations Using Ogoki and Long Lake Diversion Water

History of the projects

In 1940, the United States agreed to use 143 m^3 /s of water at Niagara Falls in Ontario, if Canada would rapidly construct the Ogoki diversion and continue with the Long Lake diversion.

Purpose of the Projects

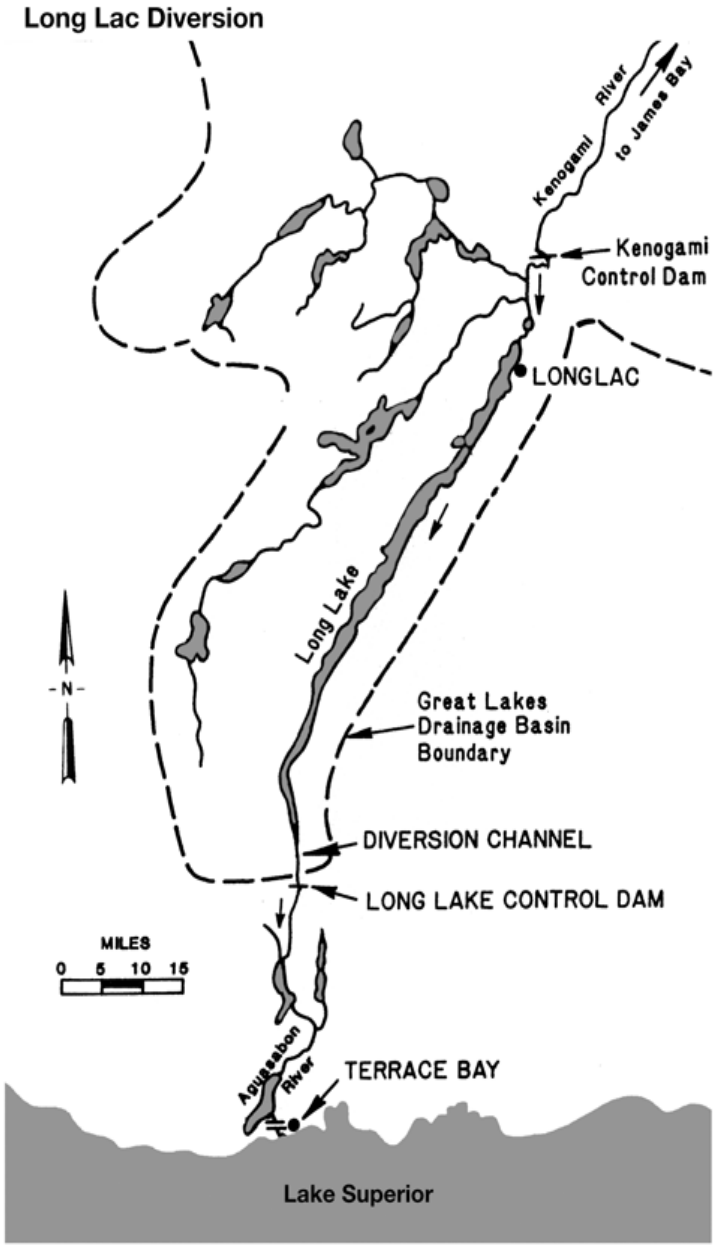
To ease concerns that energy shortages in the United States would hinder for the World War II military production

a) Long Lake Diversion

Move water from the Albany River/ James Bay system into the Great Lakes

Kenogami River now flows south into the Aguasabon River into Lake Superior

Early function was Interbasin pulpwood transportation plus Power generation in the St. Mary's, Niagara and the St. Lawrence Rivers.


Long Lac Diversion
Kenogami River to James Bay
Kenogami Control Dam
LONGLAC
Long Lake
N
Great Lakes Drainage Basin Boundary
DIVERSION CHANNEL
LONG LAKE CONTROL DAM
MILES
0 5 10 15
Aguasabon River
TERRACE BAY
Lake Superior

Purpose of the Projects cont'd

b) Ogoki Diversion

To divert northeastward flowing Ogoki River southward through Lake Nipigon and into the Great Lakes system.

To provide an average 113 m^3 /s flow increment of water for power production at generating stations on the Nipigon,

St. Mary's,

Niagara and

St. Lawrence rivers.

Process of the Ogoki Diversion

Construction of diversion dam at Waboose Rapids

- Ogoki River rises 12 m
- Flooded valley and Mojikit Lake up to height of the land
- A 400 m channel was excavated

The Summit Control Dam regulates southerly flows

- Diverted water enlarges the Little Jackfish River which discharges into Ombabika Bay at the north end of Lake Nipigon
- Trees not cleared from the reservoir prior to inundation.

The project was operational in July 1943.

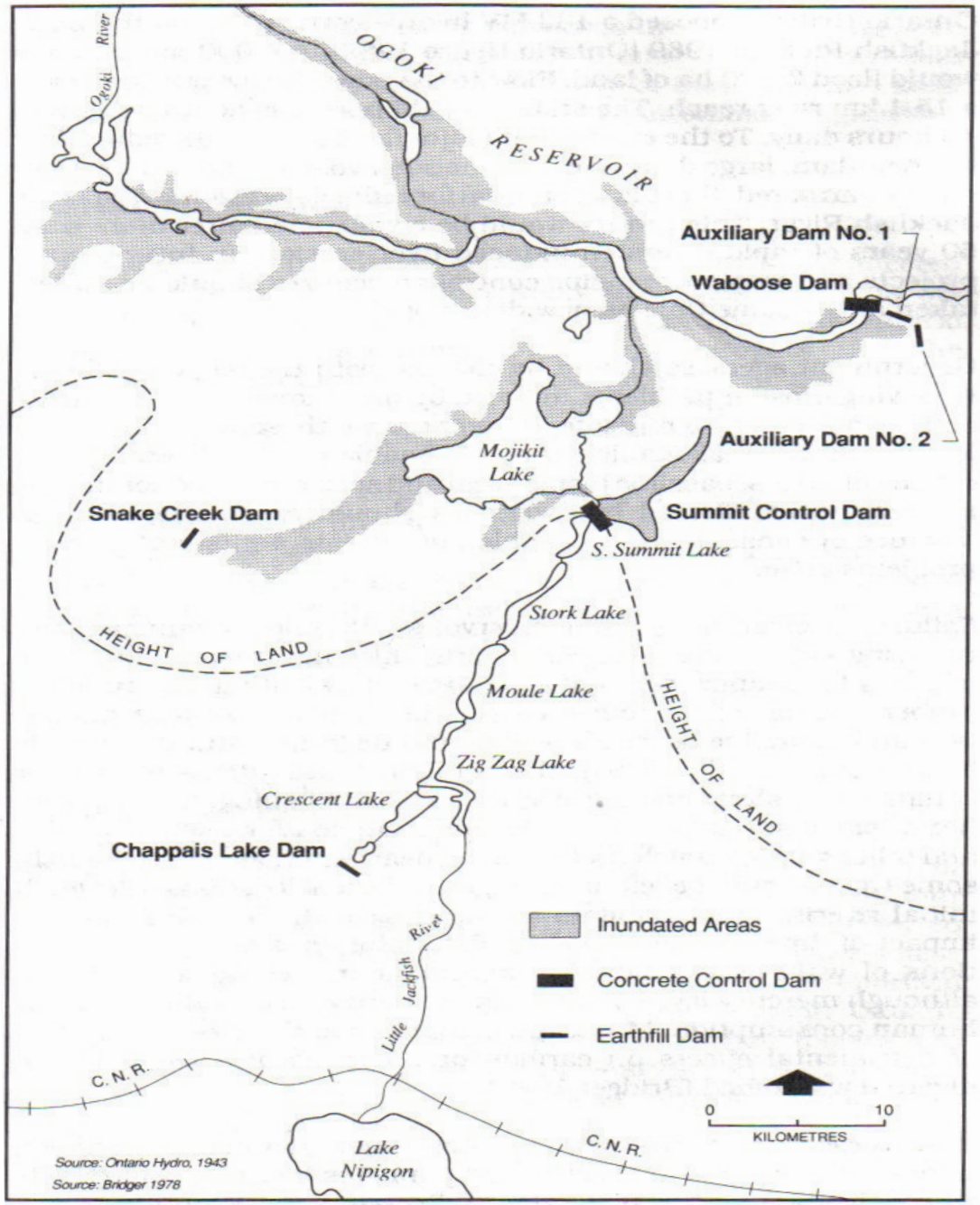


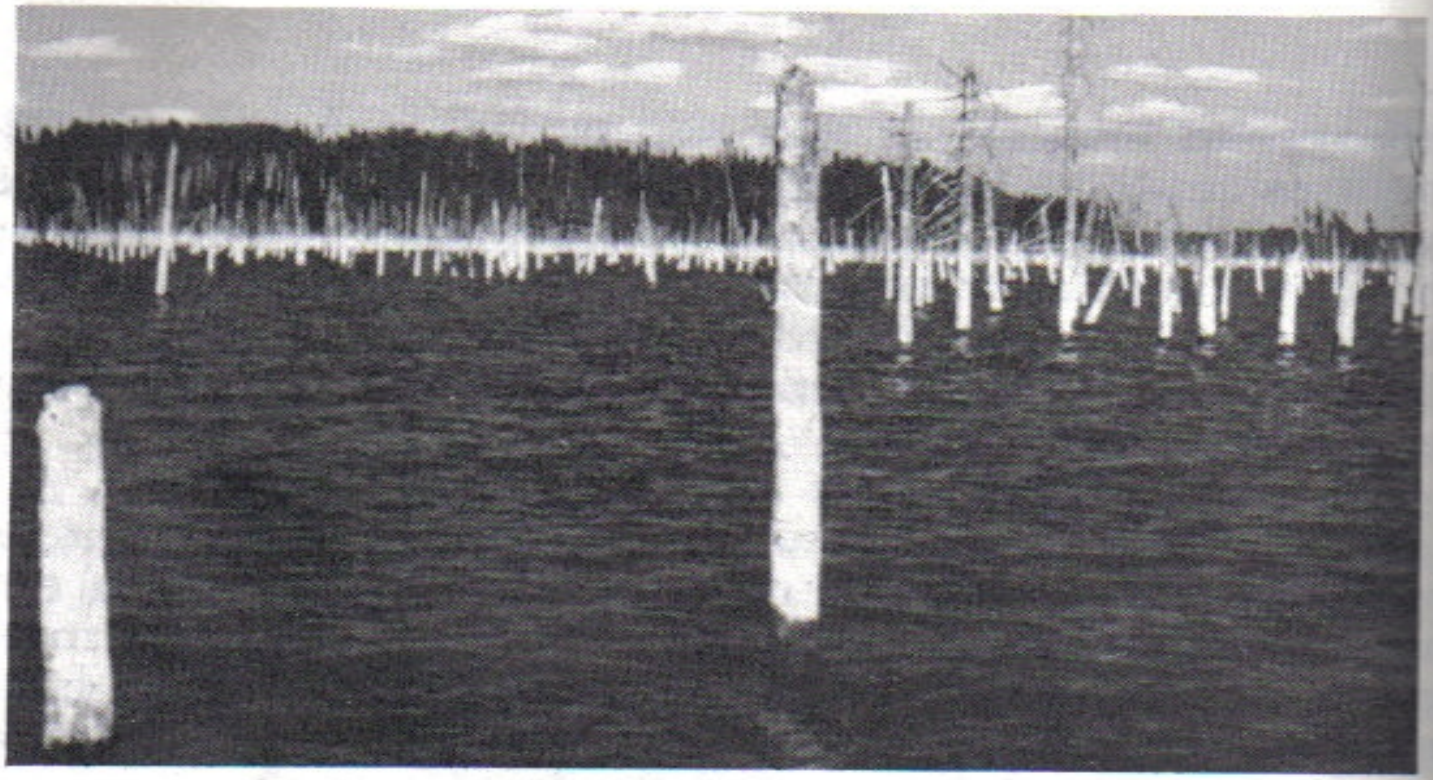
Figure 11: The Ogoki Diversion

Summit Dam

Waboose Dam

Hydro-Electric Dams and Their Effect on Fish Populations

Diversion Effects



Traditionally, forests have not been cleared prior to flooding and interbasin diversion. Vegetation such as this in the Ogoki Reservoir creates valuable fish cover as well as habitat for fish-food organisms. *(Photo: Keith Bridger)*

Biophysical Changes

Erosion in Reservoirs, Diversion Channels and downstream Water Bodies

Erosion has led to . . .

→ Increased turbidity

→ Degraded water quality

→ Damaged private property & cultural artifacts

Impaired habitats for fish

Biophysical Changes (cont)

Trees are in or near reservoirs, diversion channels and Lake Nipigon

Failure to clear trees has led to . . .

- Excess debris

  (Will take 100s of years to disappear by natural oxidation)

- Partially submerged standing trees

  Causes navigation & shoreline access hazards

- Degraded natural aesthetics

Biophysical Changes (cont)

- Drowned vegetation
- Creates a hazard for commercial fishing
- Long term impact on fish habitats is unclear
- Still an abundant population of walleye and pike in Ogoki Reservoir
- Mercury levels in fish flesh are above acceptable levels for consumption
- No evidence of detrimental effects on moose, caribou or other animals living in the watershed.

Socioeconomic Change

Economic Benefits from Hydroelectricity of Long Lake & Ogoki Diversions

- 1943 to 1974

→profits exceeded 220 million dollars.

Socioeconomic Change

- Credit for Diverted Water

- Canada's right to the diverted water was made permanent by the 1950 Niagara River Treaty.

- 1943 to 1972 → diversions averaged 18.7 m^3 /s more than expected.

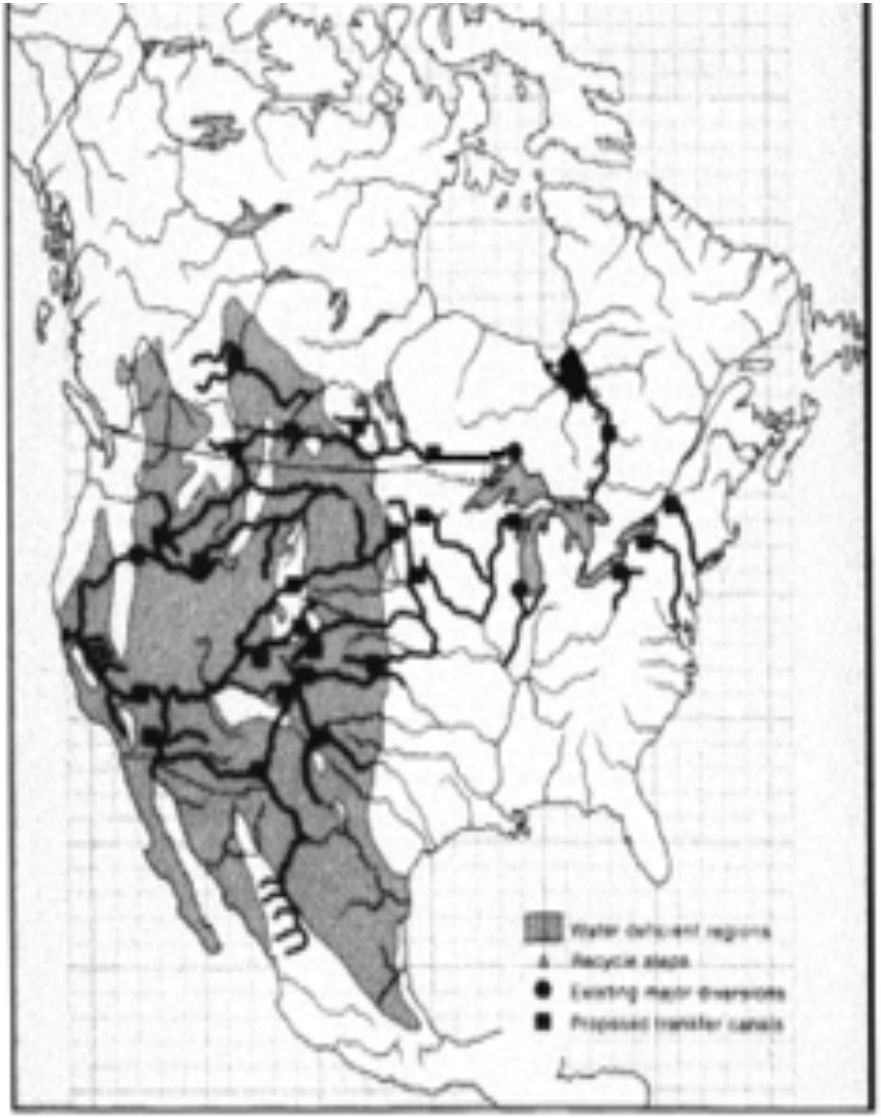
- Under the treaty, Canada can use only half of the surplus (9.3 m3 /s).

- The United States agreed in principal that the rights of water diverted into the Great Lakes should be vested in the country from whose territory it comes.

- This agreement was not approved by the U.S. Senate.

- Canada does not receive credit for about 9.3 m3 /s of water at Niagara and for half of the diverted water in the St. Mary's and St. Lawrence rivers. (The result of failing to create an international Great Lakes Basin water agreement.)

Grand Canal



NAWAPA

Grand Canal proposal

Basic proposal: Recycling of fresh water otherwise be lost to Hudson Bay/Arctic Ocean. New source of fresh water 2.5 X Niagara Falls transferred to American Southwest and Canadian West.

- **Use of existing reservoirs (James Bay, Great Lakes). No flooding to create new reservoirs.**
- **No diverting of water away from where it now flows.**
- **Cost: $100 billion repaid in 2 years. Cost of pumping water offset by peak power sales. As with the St. Lawrence Seaway, each country pays for part of construction on its own soil.**
- **Technology (see Zuider Zee). Construction could start tomorrow.**

North American Water And Power Alliance

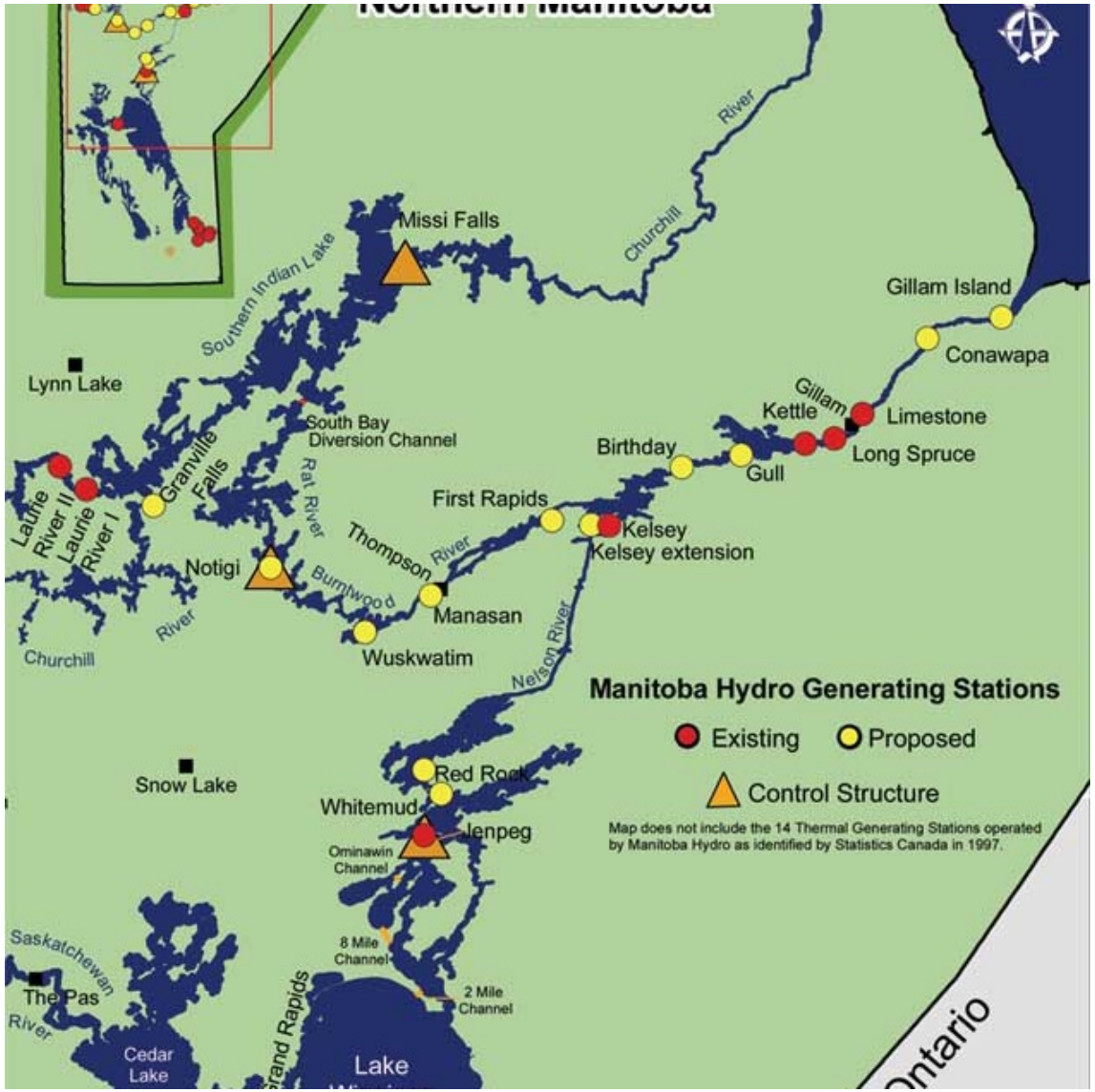
Proposal: Damming and diverting existing rivers from Alaska and Northern Canada to U.S. Southwest. No new water source created.
Massive flooding of mountain valleys to create new reservoirs. Displacement of populations.
Massive rerouting of rivers. Some locations deprived of water.
Cost: Enormous. Impossible to accurately estimate. Complex sharing of cost arrangements between Canada and U.S. necessary.
Technology. The size and complexity makes the project many years away from being realizable. Delay of drought solution costly
International agreement: Most water shipped to the southwestern states. Negotiations could take decades.
No precedent for this type of co-operation where one country suffers environmentally for almost exclusive benefit of the other.

National East-West Power Grid

Manitoba, Quebec and Newfoundland have huge hydroelectric resources.

Ontario?

Northern Manitoba Hydro-electrical



Conawapa Generating Station

- Lower Nelson River, Manitoba
- 1250 mW
- no significant water storage upstream, i.e. limited flooding (about 5 sq. km, almost entirely within the natural banks of the Nelson River)
- Cost of $5 billion, 9 year construction period, approximately 2021.

Fox Lake Cree Nation Sign Agreement

Funding to Fox Lake to facilitate involvement in planning and consultation in project plans, "environmental and regulatory matters, training, employment and business opportunities, and the negotiation of adverse effects arrangements"

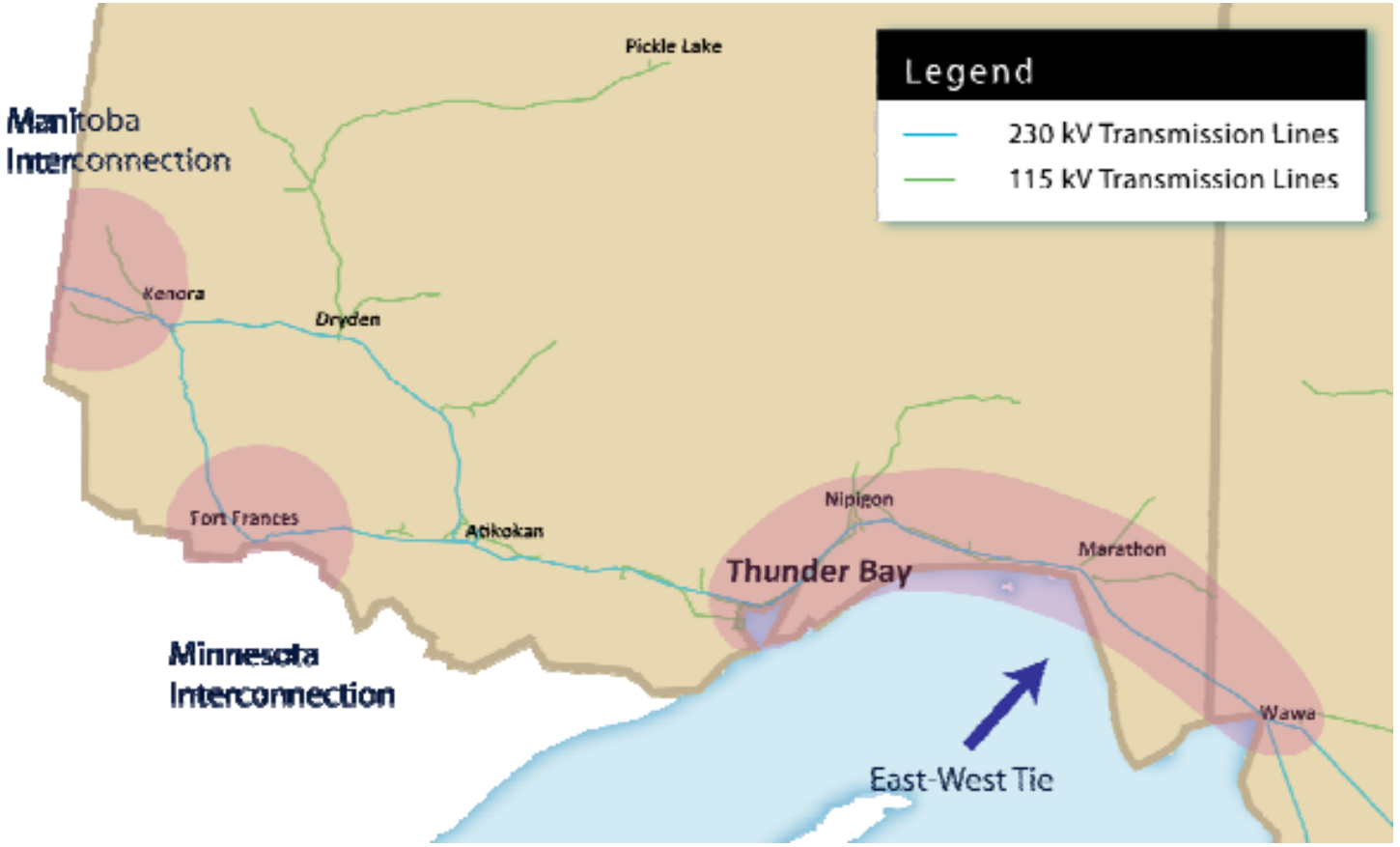
Elders in the community remain cautious and balance economic benefits, community concerns, and previous experience of the Fox Lake Cree Nation (and other First Nations) with Manitoba Hydro.

Clean Energy Transfer Initiative

Details and Routes

- Via Winnipeg and Thunder Bay
- Direct to Thunder Bay
- Direct to Timmins
- Hudson Bay to Timmins

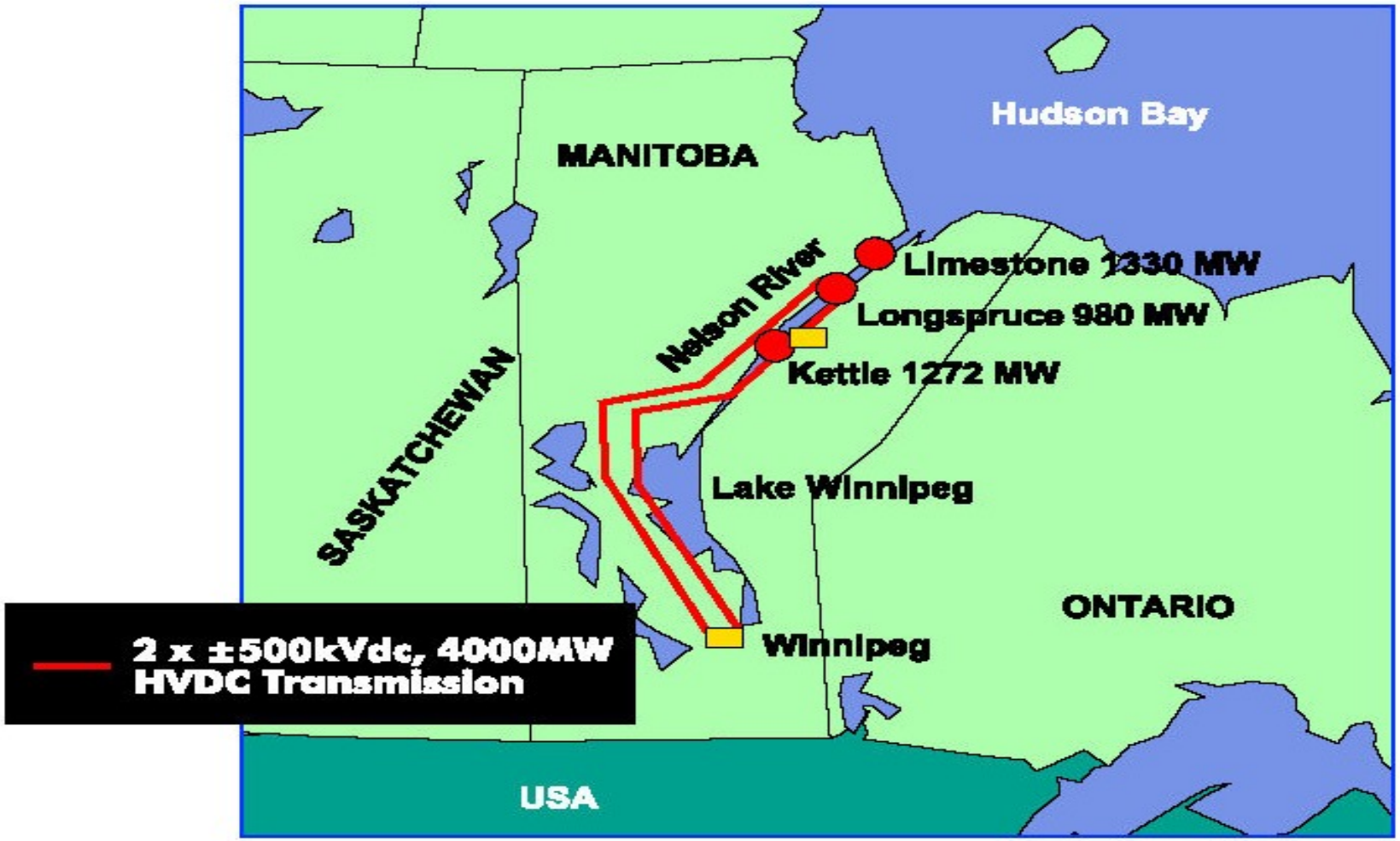
East West Tie Line



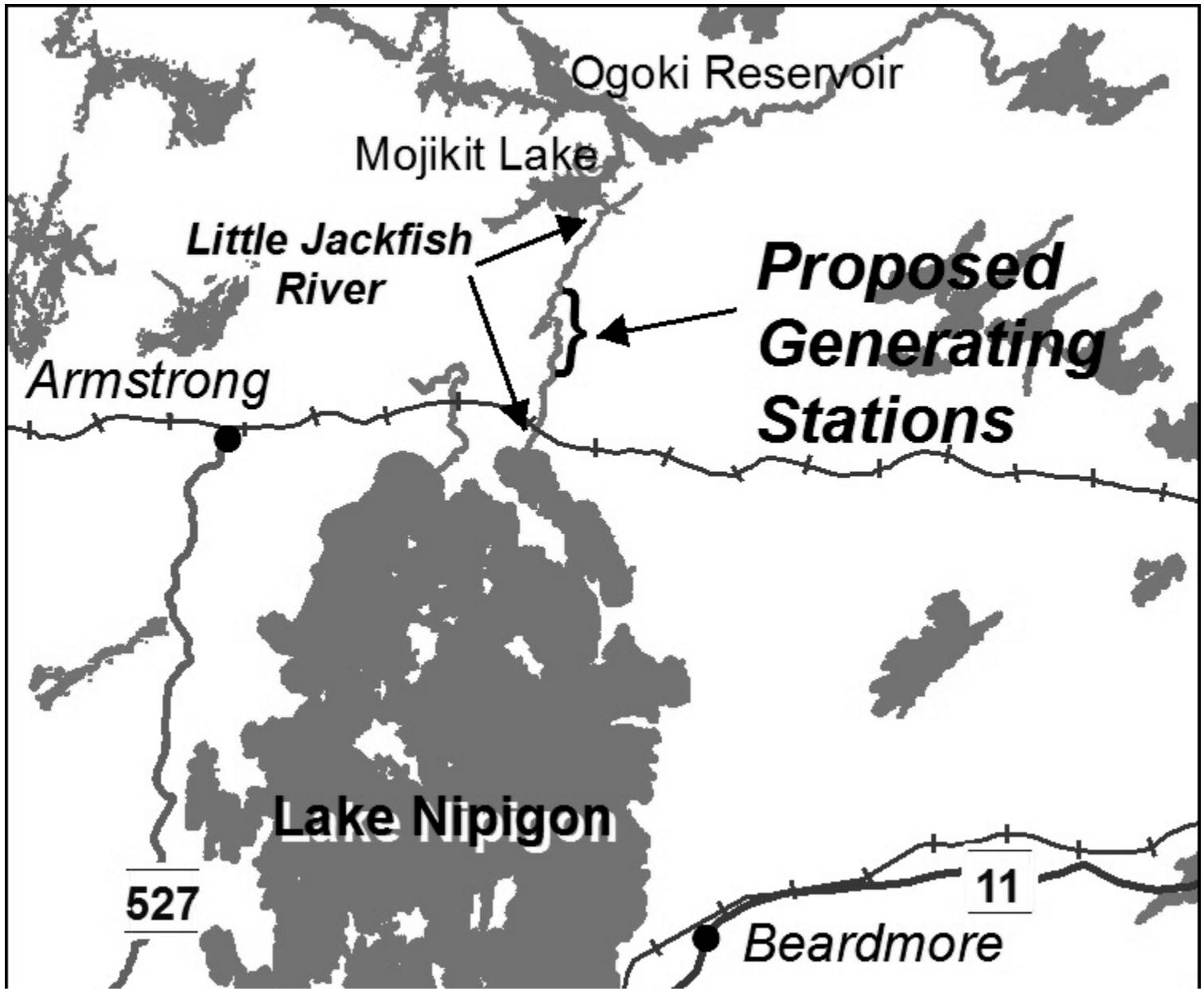
Transmission Lines in the West Grid

Import capacity to 570 MW, export to 490 MW

Nelson River Transmission Lines




KENORA
Red Lake
Kenora
Dryden
THUNDER BAY
Atikokan
Thunder Bay
Fort Frances
Moosonee
COCHRANE
Hearst
Kapuskasing
Marathon
Cochrane
Timmins
Wawa
TEMISKAMING
SUDBURY
ALGOMA
Sault Ste. Marie
U.S.A.


Ogoki Reservoir
Mojikit Lake
Little Jackfish River
Proposed Generating Stations
Armstrong
Lake Nipigon
527
11
Beardmore

Aboriginal Interests

Present Conflict

- Conflict between the Whitesand Indian Band and Ontario Hydro concerning the proposed Little Jackfish Hydroelectric Project.
- Whitesand Indian Band is afraid of the same effect the Ogoki Diversion had on their community.
- The proposed Little Jackfish Hydroelectric Project has the potential of damaging the river system by flooding and destroying the land.

Actions Taken

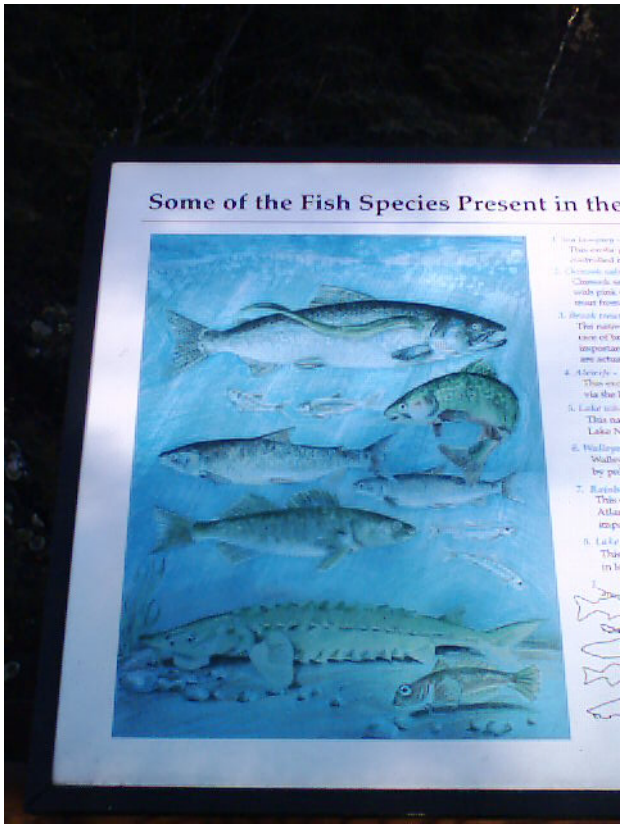
- June 4, 1990, Ontario Hydro and the Chief and Council of the Whitesand Indian band announced a comprehensive land use and harvesting study.
- Highlights from the study included the economic, social, cultural, and spiritual importance of living off the land.
- Conflicts between Whitesand Indian Band and Ontario Hydro dealt with in a fair and effective manner.
- The Little Jackfish River Hydroelectric Project has not started construction.

Problems Associated with Water Level Fluctuations

- Water level fluctuations necessary to regulate flow to dams
- Resulted in flooding of surrounding land and lakes
- Erosion of stream banks and sediment load
- Negatively affected fish populations: migrating and spawning patterns.

Effects of the Dams on Fish

- Construction of dams has reduced migration and affected spawning
- Greatest impact on Brook Trout
- Fluctuating river levels in combination with competition from other introduced fish species, and extensive fishing caused populations to drop significantly
- 1989 rehabilitation program put into effect
- Populations are improving since implementation of program.



- Discussion