
TRIBAL LANDS
SPIRIT LAKE
RED LAKE
BOIS FORTE
MINNESOTA CHIPPEWA
GRAND PORTAGE
LEECH LAKE
WHITE EARTH
OJIBWE
RED CLIFF
ONTONAGON
KEWEENAW BAY
MINNESOTA CHIPPEWA
FOND DU LAC
BAD RIVER
LAC VIEUX DESERT
BAY MILLS
SAULT SAINTE MARIE
SAULT SAINTE MARIE
LAC DU FLAMBEAU
LAKE TRAVERSE
MILLE LACS
LAC COURTE OREILLES
FOREST COUNTY POTAWATOMI
HANNAHVILLE
LITTLE TRAVERSE BAY
ST. CROIX
SOKAOGON MOLE LAKE
OJIBWE
GRAND TRAVERSE
STOCKBRIDGE MUNSEE
MENOMINEE
UPPER SIOUX
SHAKOPEE MDEWAKANTON SIOUX
PRAIRIE ISLAND
HO-CHUNK
MENOMINEE
ONEIDA
GRAND TRAVERSE
OJIBWE
LOWER SIOUX
LITTLE RIVER
OTTAWA OJIBWE
FLANDREAU
DAKOTA
ISABELLA
HO-CHUNK
BROTHERTOWN
YANKTON
SANTEE
HO-CHUNK
FOREST COUNTY POTAWATOMI
MATCH-E-BE-NASH-SHE-WISH BAND OF POTTAWATOMI
OJIBWE/POTAWATOMI
SAUK, FOX, DAKOTA
PONCA
WINNEBAGO
SAUK & MESKWAKI
HURON POTAWATOMI
OTTAWA, OJIBWE, POTAWATOMI
POKAGON
OMAHA
OMAHA
SAC & FOX/MESKWAKI
TheWays.org/map

“When can we eat the fish?”

university-community research in Lake Superior’s Keweenaw Bay

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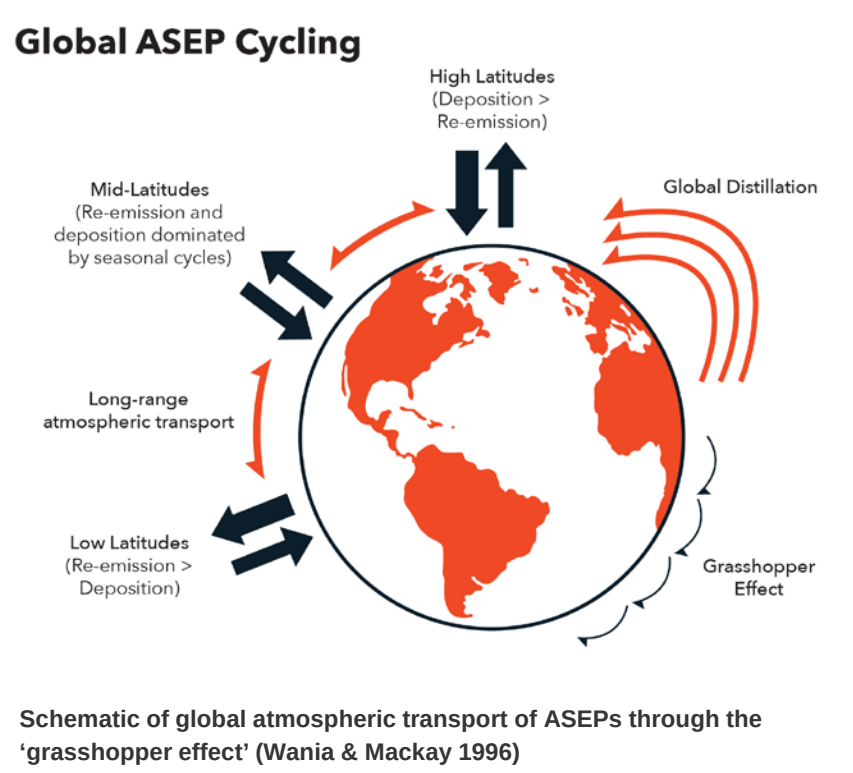
Panel on Contaminants, Tribal Exposure Pathways, Environmental Human Health, & Trust Resources

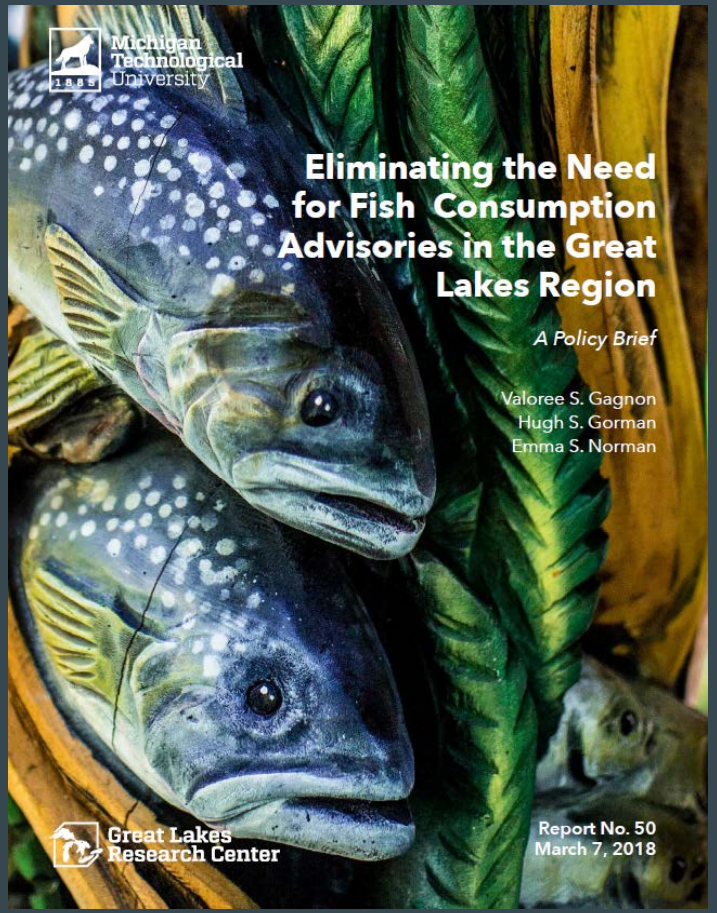
2018 BIA Partners in Action Conference

Valoree S. Gagnon
Director, University-Indigenous Community Partnerships
Great Lakes Research Center, Michigan Tech
<asep.mtu.edu>

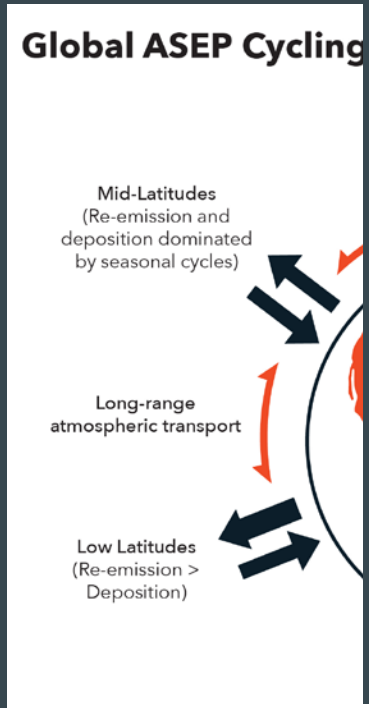
Well, it depends…



Schematic of global atmospheric transport of ASEPs through the 'grasshopper effect' (Wania & Mackay 1996)



Well, it depends…



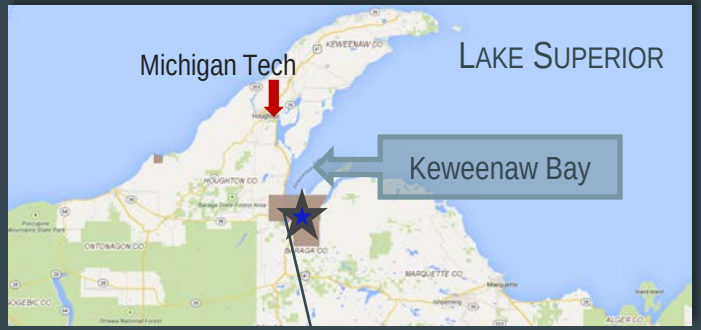
Schematic of global atmospheric transport of ASEPs through the ‘grasshopper effect’ (Wania & Mackay 1996)

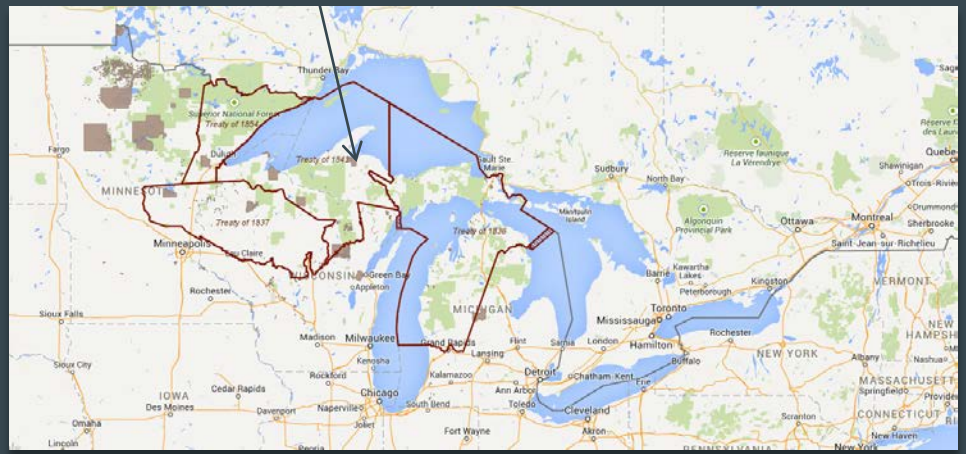
Advisories are not and should not be viewed as a permanent policy to address the problems associated with widespread fish [and wildlife and plants] contamination.

(O’Neill 2004; National Environmental Justice Advisory Council 2002; Gagnon et al. 2018)

Managing Impacts of Global Transport of Atmosphere-Surface Exchangeable Pollutants (ASEPs) in the Context of Global Change 2013-2018

- Michigan Technological University
- Keweenaw Bay Indian Community
- Massachusetts Institute of Technology
- Desert Research Institute
- University of Massachusetts, Boston
- Keweenaw Bay Ojibwa Community College
- Great Lakes Indian Fish & Wildlife Commission
- Lake Superior Binational Forum
- Environmental Protection Agency
- National Park Service
- International Joint Commission
- Arctic Monitoring & Assessment Programme





Created from http://maps.glifwc.org/ 2015

(NSF # ICER-1313755)

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Community-based question (from an initial project-launch workshop)

"When can we eat the fish?"

Scientific inquiry (definitions & metrics from a 2nd workshop)

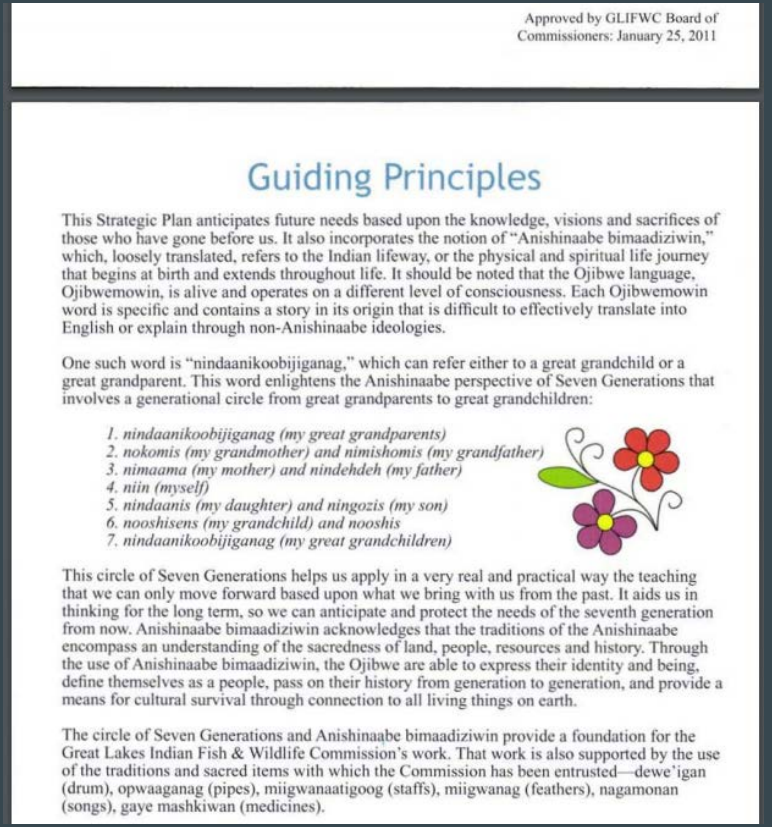
How many years will it take before the most sensitive populations in Keweenaw Bay are able to safely consume the amount of fish that they desire?

Ogaa ("walleye") spearfishing spring harvest
Pike's Bay, Houghton County MI 2010

"Years" defined in terms of "generations."

The "Seven Generations" philosophy—
long-term thinking , long-term planning

("Seven generations" ~ 150 years)



Approved by GLIFWC Board of Commissioners: January 25, 2011

Guiding Principles

This Strategic Plan anticipates future needs based upon the knowledge, visions and sacrifices of those who have gone before us. It also incorporates the notion of "Anishinaabe bimaadiziwin," which, loosely translated, refers to the Indian lifeway, or the physical and spiritual life journey that begins at birth and extends throughout life. It should be noted that the Ojibwe language, Ojibwemowin, is alive and operates on a different level of consciousness. Each Ojibwemowin word is specific and contains a story in its origin that is difficult to effectively translate into English or explain through non-Anishinaabe ideologies.

One such word is "nindaanikoobijiganag," which can refer either to a great grandchild or a great grandparent. This word enlightens the Anishinaabe perspective of Seven Generations that involves a generational circle from great grandparents to great grandchildren:

1. *nindaanikoobijiganag (my great grandparents)*
2. *nokomis (my grandmother) and nimishomis (my grandfather)*
3. *nimaama (my mother) and nindehdeh (my father)*
4. *niin (myself)*
5. *nindaanis (my daughter) and ningozis (my son)*
6. *nooshisens (my grandchild) and nooshis*
7. *nindaanikoobijiganag (my great grandchildren)*

This circle of Seven Generations helps us apply in a very real and practical way the teaching that we can only move forward based upon what we bring with us from the past. It aids us in thinking for the long term, so we can anticipate and protect the needs of the seventh generation from now. Anishinaabe bimaadiziwin acknowledges that the traditions of the Anishinaabe encompass an understanding of the sacredness of land, people, resources and history. Through the use of Anishinaabe bimaadiziwin, the Ojibwe are able to express their identity and being, define themselves as a people, pass on their history from generation to generation, and provide a means for cultural survival through connection to all living things on earth.

The circle of Seven Generations and Anishinaabe bimaadiziwin provide a foundation for the Great Lakes Indian Fish & Wildlife Commission's work. That work is also supported by the use of the traditions and sacred items with which the Commission has been entrusted—dewe'igan (drum), opwaaganag (pipes), miigwanaatigoog (staffs), miigwanag (feathers), nagamonan (songs), gaye mashkiwan (medicines).

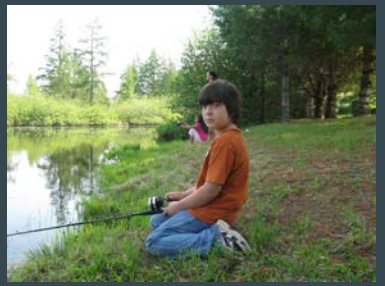
Great Lakes Indian Fish and Wildlife Commission (GLIFWC) STRATEGIC PLAN, 2010

"Sensitive populations" defined as: women of child-bearing age, developing children, and those who depend heavily on marine diets.

Methyl-mercury via Fish Consumption

(O'Neill 2007)

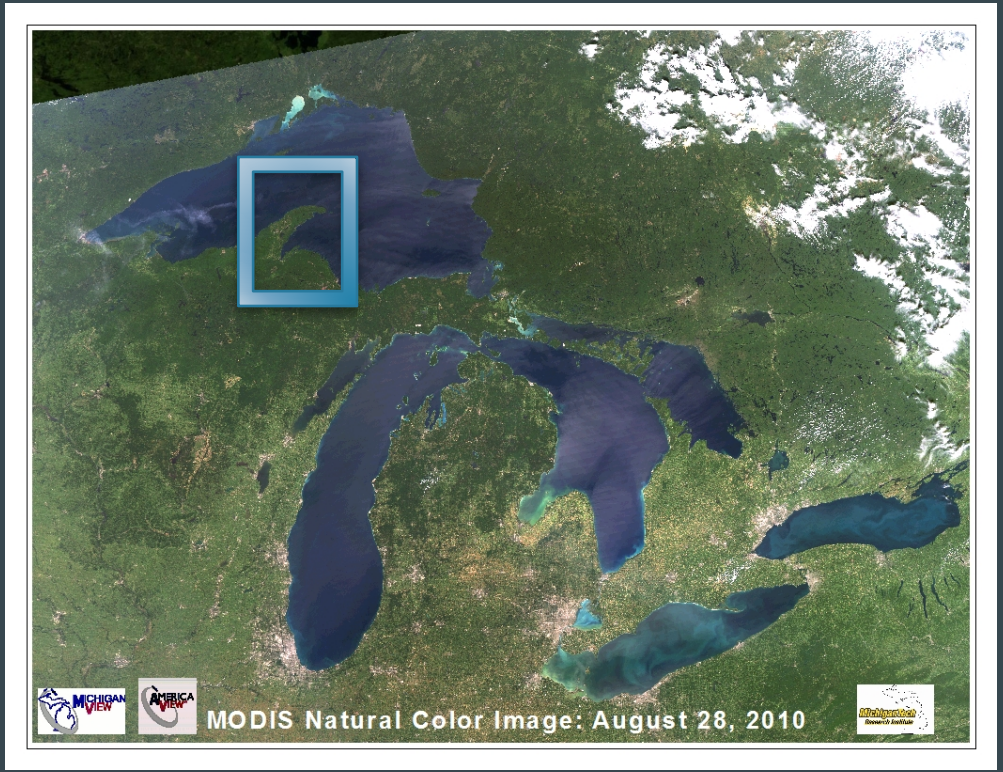
Population	Fish Consumption Rate (g/day)	Current Methylmercury Exposure: Average Woman (microgram/kg bodyweight/day)	Methylmercury Exposure if Mercury Deposition Reduced 60%: Average Woman (microgram/kg bodyweight/day)	Difference (microgram /kg bodyweight/day)
United States General Population	17.5	0.1050	0.042	0.063
Great Lakes Fish Consumers	42	0.2520	0.1008	0.1512
GLIFWC Tribal Fish Consumers	189.6	1.1376	0.45504	0.68256



“Keweenaw Bay” as the focal region.

For modeling purposes—

- Great Lakes Basin
- Inland water bodies



"Safely consume" defined by using the most-stringent human health standards, not exceeding EPA's "reference dose."

"Reference dose" (RfD) in micrograms of MeHg per kilogram of body weight per day (µg/ kg/day)

Agency	RfD	Source
U.S. EPA	**0.1**	USEPA 2013
Michigan Department of Community Health	**0.1**	MDCH 2013
Health Canada	**0.2**	Health Canada 2007
Great Lakes Indian Fish & Wildlife Commission (GLIFWC)	**0.3**	GLIFWC 2013
Agency for Toxic Substances and Disease Registry (ATSDR)	**0.3**	ATSDR 2008
Alaska Division of Public Health (ADPH)	**0.4**	Hamade 2014
US Federal Department of Agriculture (FDA)	**0.5**	Cunningham et al. 1994
World Health Organization (WHO)	**0.5**	WHO 2006

“Desired” versus “current”

(Donatuto and Harper 2008; Donatuto et al. 2011)

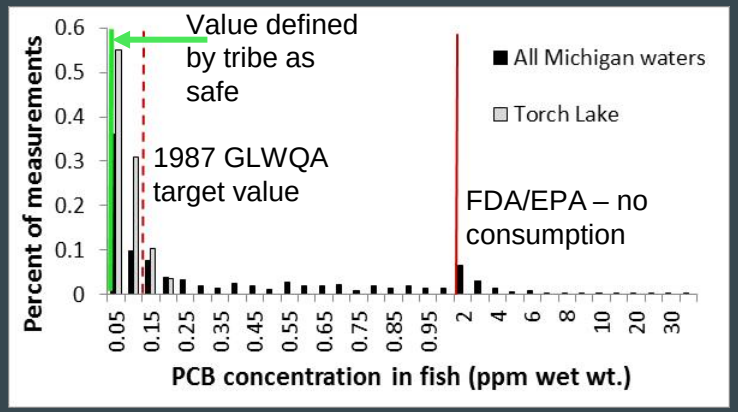
Desired fish consumption =

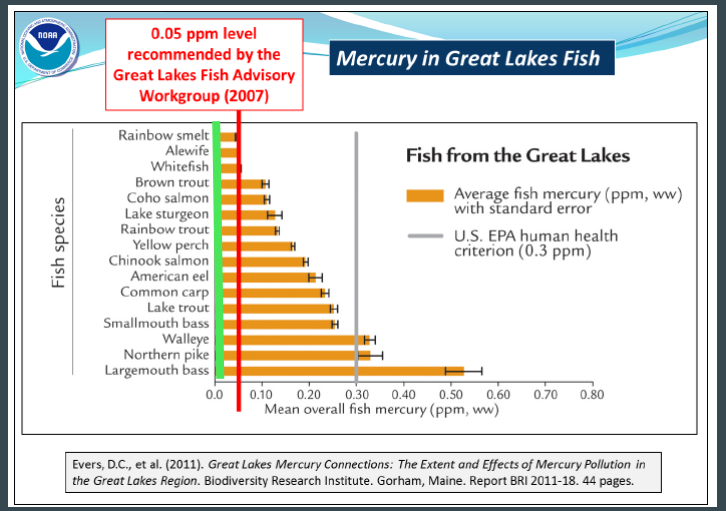
two 8 oz. meals per day

(height of Great Lakes fishing season, *ogaa* spring spearfishing)

Live-fish release, KBIC Hatchery, Menge Creek, Baraga County MI 2010

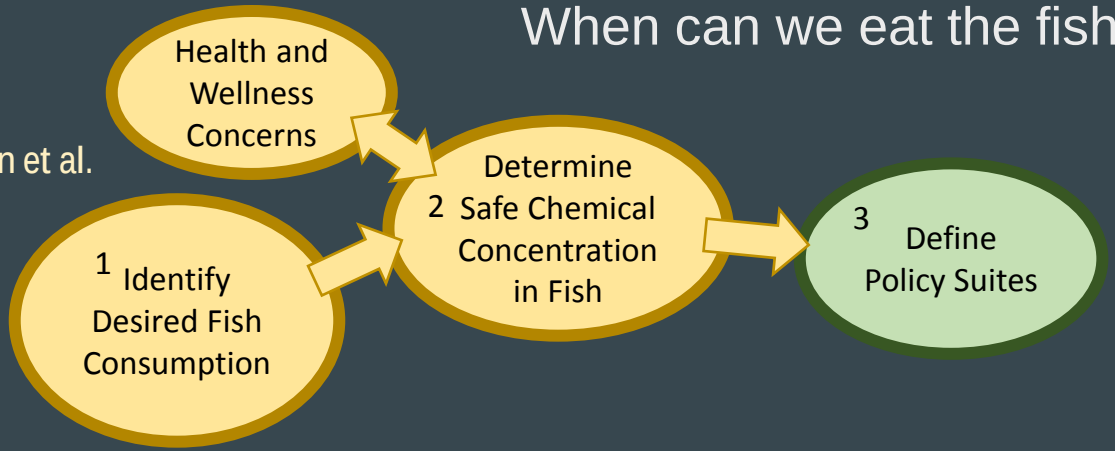
What is Health(y)?





(slide by Urban, Perlinger, et al. 2017)

When can we eat the fish?

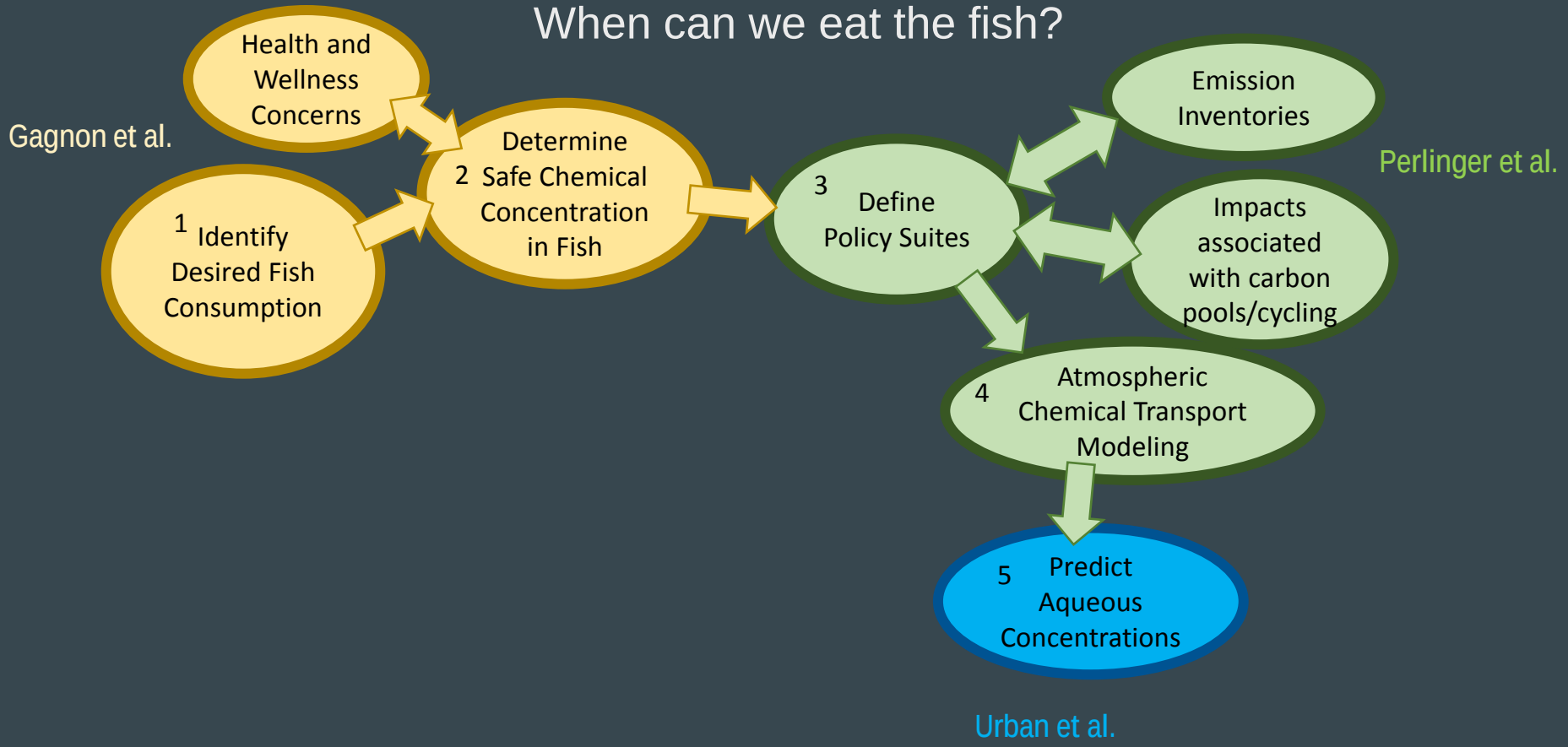


Gagnon et al.

Perlinger et al.

Urban et al.

Schematic by Noel Urban, Michigan Tech


When can we eat the fish?
Health and Wellness Concerns
Gagnon et al.
1 Identify Desired Fish Consumption
2 Determine Safe Chemical Concentration in Fish
3 Define Policy Suites
Emission Inventories
Perlinger et al.
Impacts associated with carbon pools/cycling
4 Atmospheric Chemical Transport Modeling
5 Predict Aqueous Concentrations
Urban et al.
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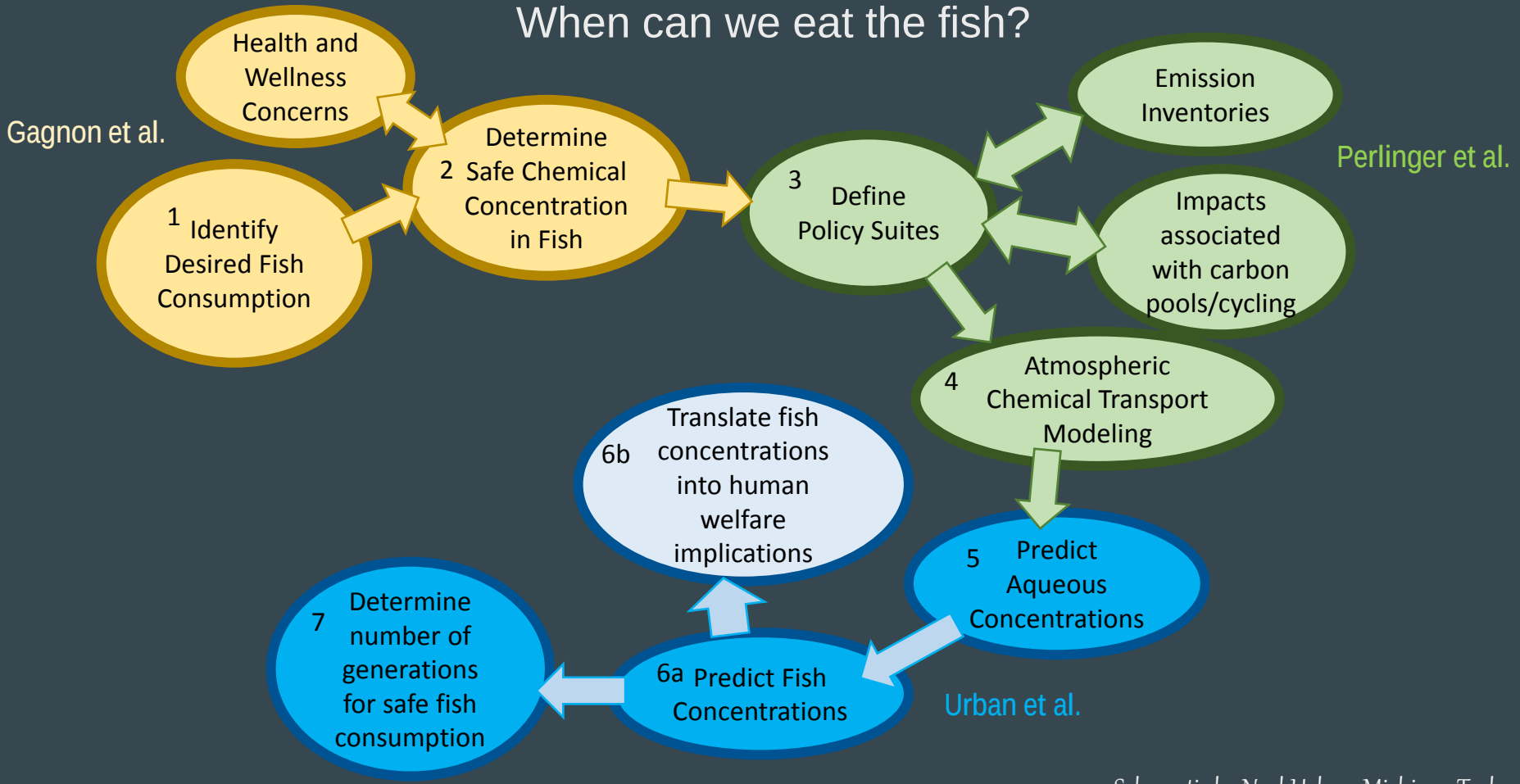

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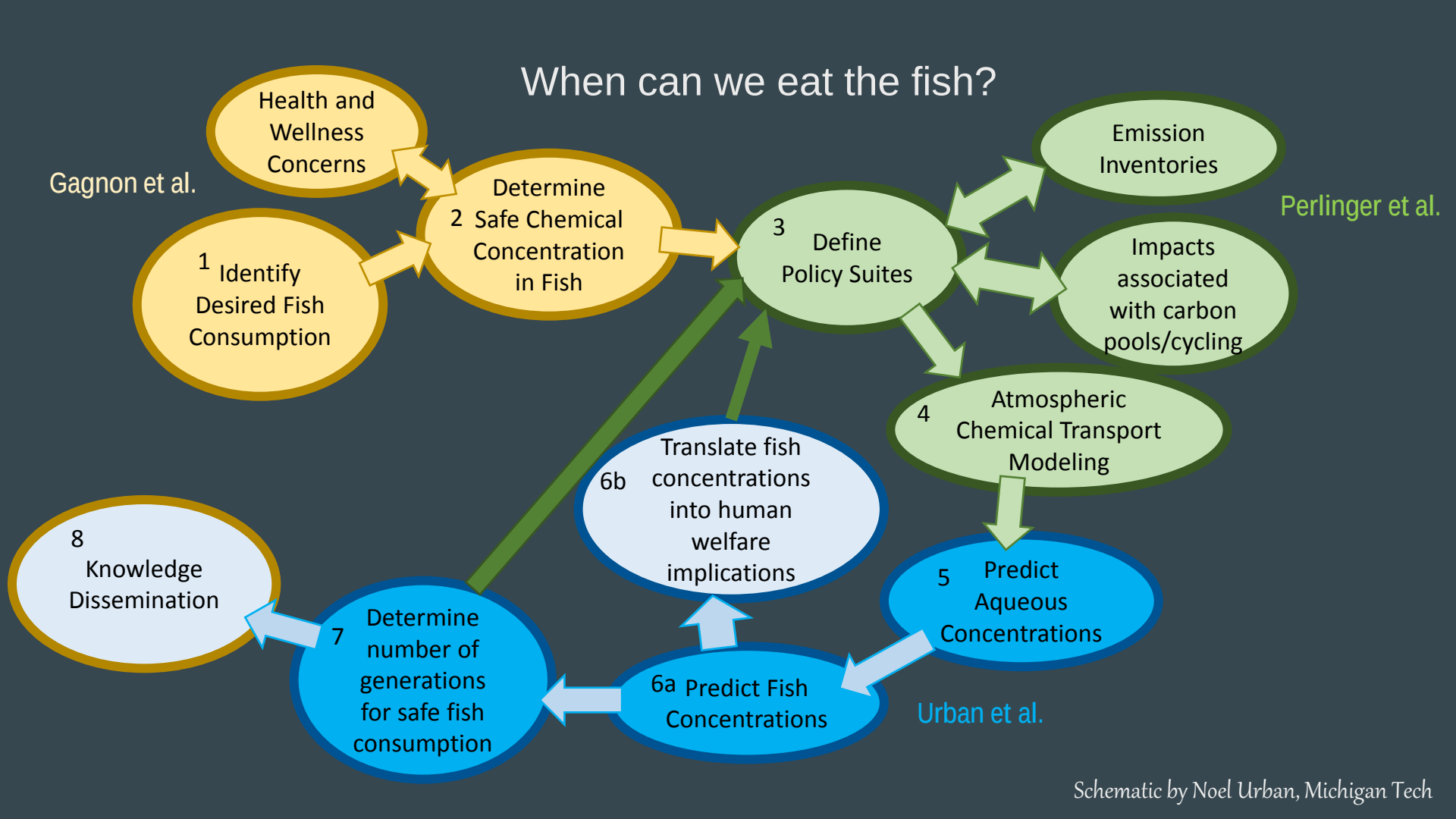
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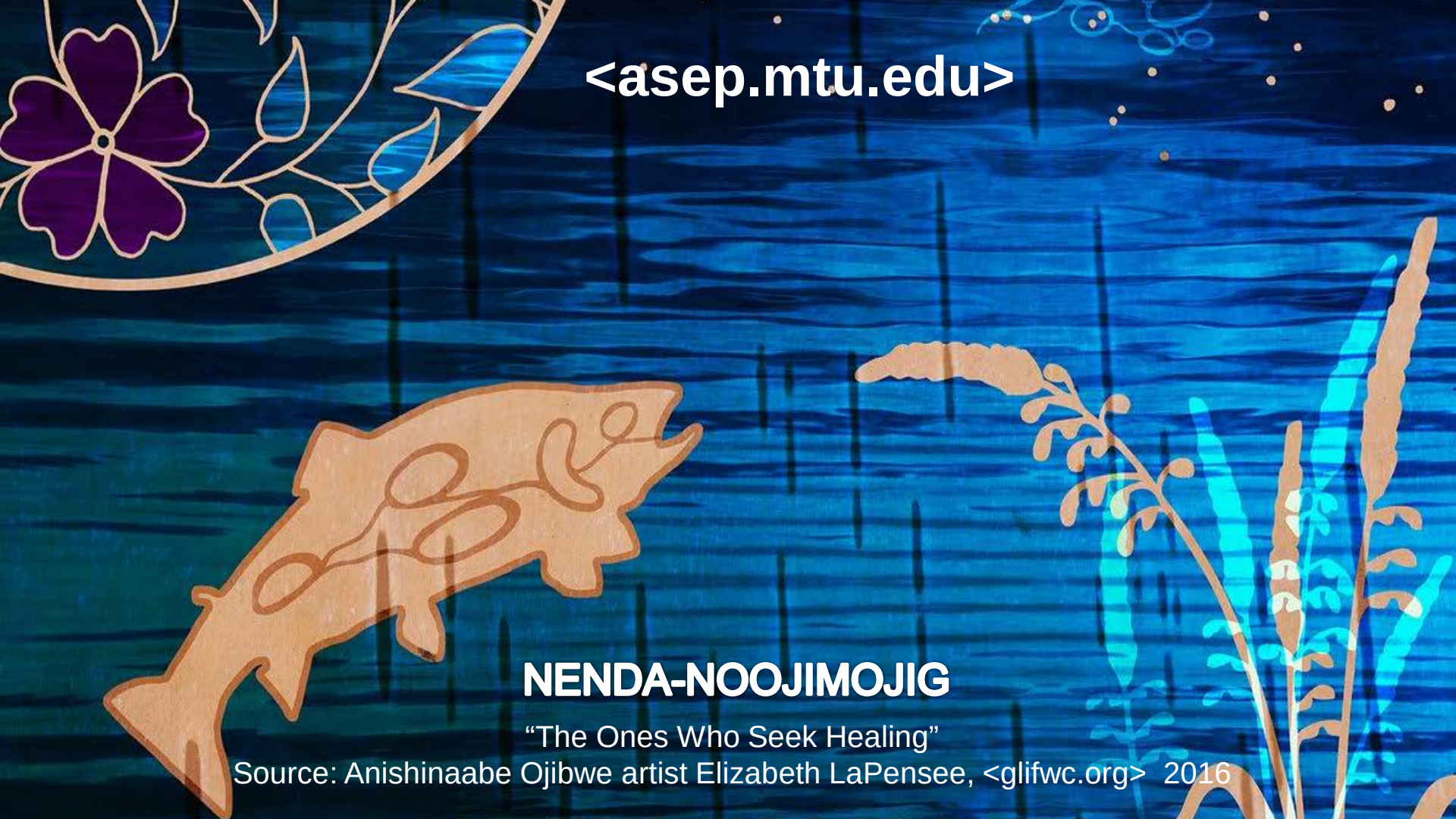
6a Predict Fish Concentrations
6b Translate fish concentrations into human welfare implications
7 Determine number of generations for safe fish consumption
8 Knowledge Dissemination
Schematic by Noel Urban, Michigan Tech


<asep.mtu.edu>
NENDA-NOOJIMOJIG
“The Ones Who Seek Healing”
Source: Anishinaabe Ojibwe artist Elizabeth LaPensee, <glifwc.org> 2016