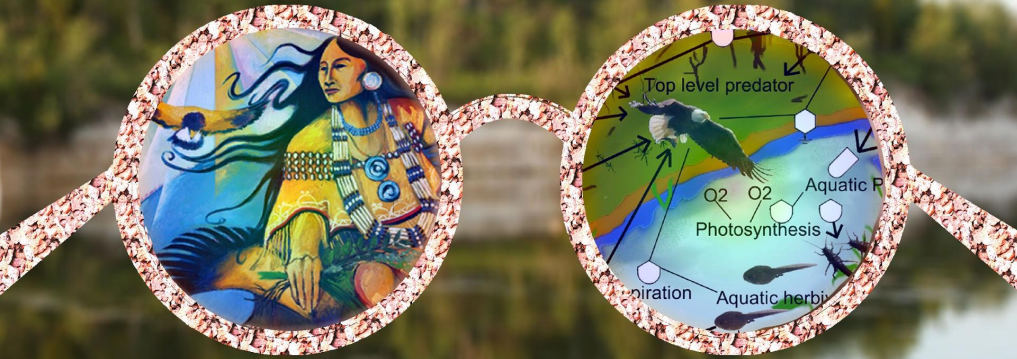


Indigenous Science & Academic Science:



Can we learn to see with both eyes?

Annie Sorrell

Tom Mackey

State University of New York

College of Environmental Science and Forestry

10/17/2019



Cathrine



Joanna



Tusha



Daabii



Cynthia



Loga



Sophie



Brian



Neil



Annie



Tommy



Dr. Kimmerer



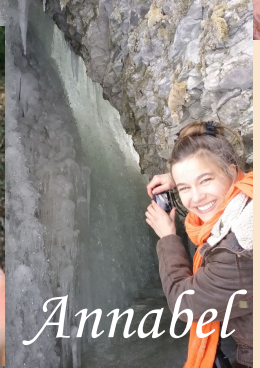
Sarah



Kaya



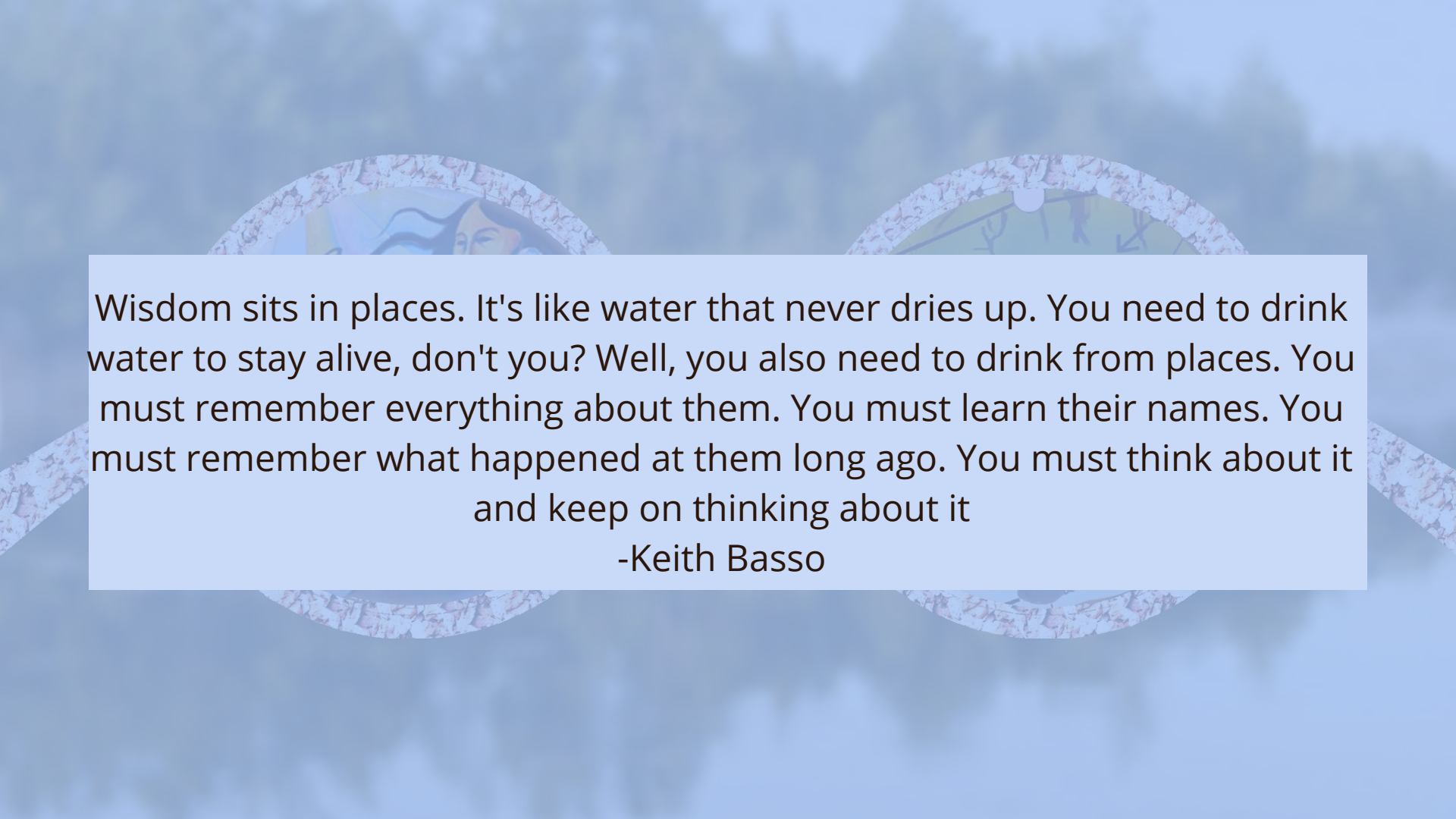
Jess



Annabel



Where we stand



Wisdom sits in places. It's like water that never dries up. You need to drink water to stay alive, don't you? Well, you also need to drink from places. You must remember everything about them. You must learn their names. You must remember what happened at them long ago. You must think about it and keep on thinking about it

-Keith Basso

Pre-Survey Questionnaire

Name a place that is important to your work as an educator.

How much do you know about indigenous relationships with that place?

Do you use science to teach in that place? If yes, how so?

Do you use indigenous science when you teach in that place? If yes, how so?

Indigenous perspectives of land

- ❖ Stewards of the Land
- ❖ 3 R's
- ❖ Generational Responsibilities
- ❖ Ensuring the land for future generations
- ❖ Sustainable use of resources since time immemorial
- ❖ Learning from the land



Multiple Worldviews: Multiple Sciences

Indigenous Science

Holistic, qualitative

Generated by the user

Time: Circular, emphasis on cycles/regeneration/process

Integrated and applied to daily living

Oral transmission (Traditions, history)

Inextricable from values

Decision Making: Seven generations

Responsibility, respect, reciprocity

Academic Science

Reductionist, quantitative

Generated by professionals

Time: Linear, emphasis on growth/progress/outcomes

Practiced and taught in elite settings

Transmission through journals, papers

“Objective”, value-neutral

Decision making: fiscal years, research grants, lifetimes

Reduce, Reuse, Recycle

How can a way of seeing/ worldview affect a place?



Mission Mountain
Wilderness Area

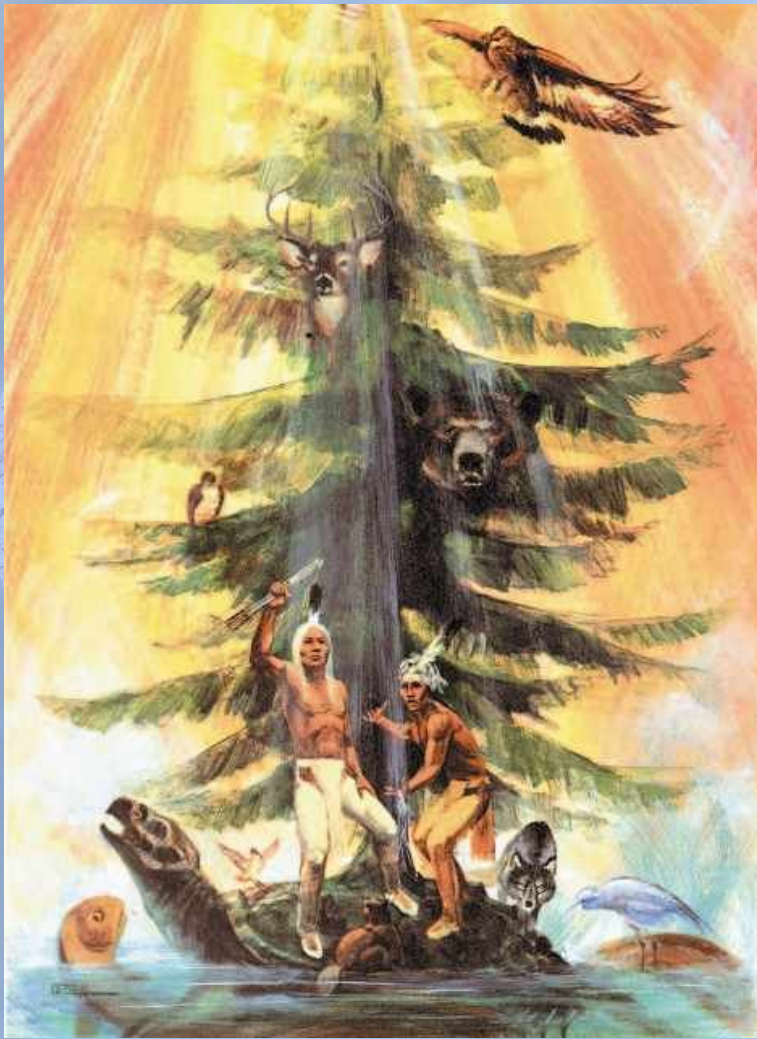


Onondaga Lake

Top level predator
Aquatic P
Photosynthesis
O₂ O₂
Aquatic herbi
piration



Image credit: staging.lakecleanup.com/

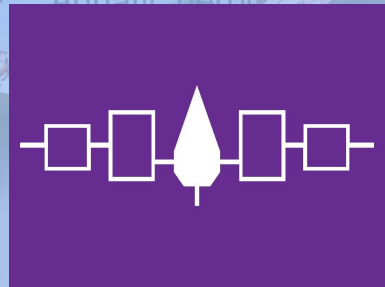


Onondaga Lake as **Spiritual and Political Center**

Birthplace of the

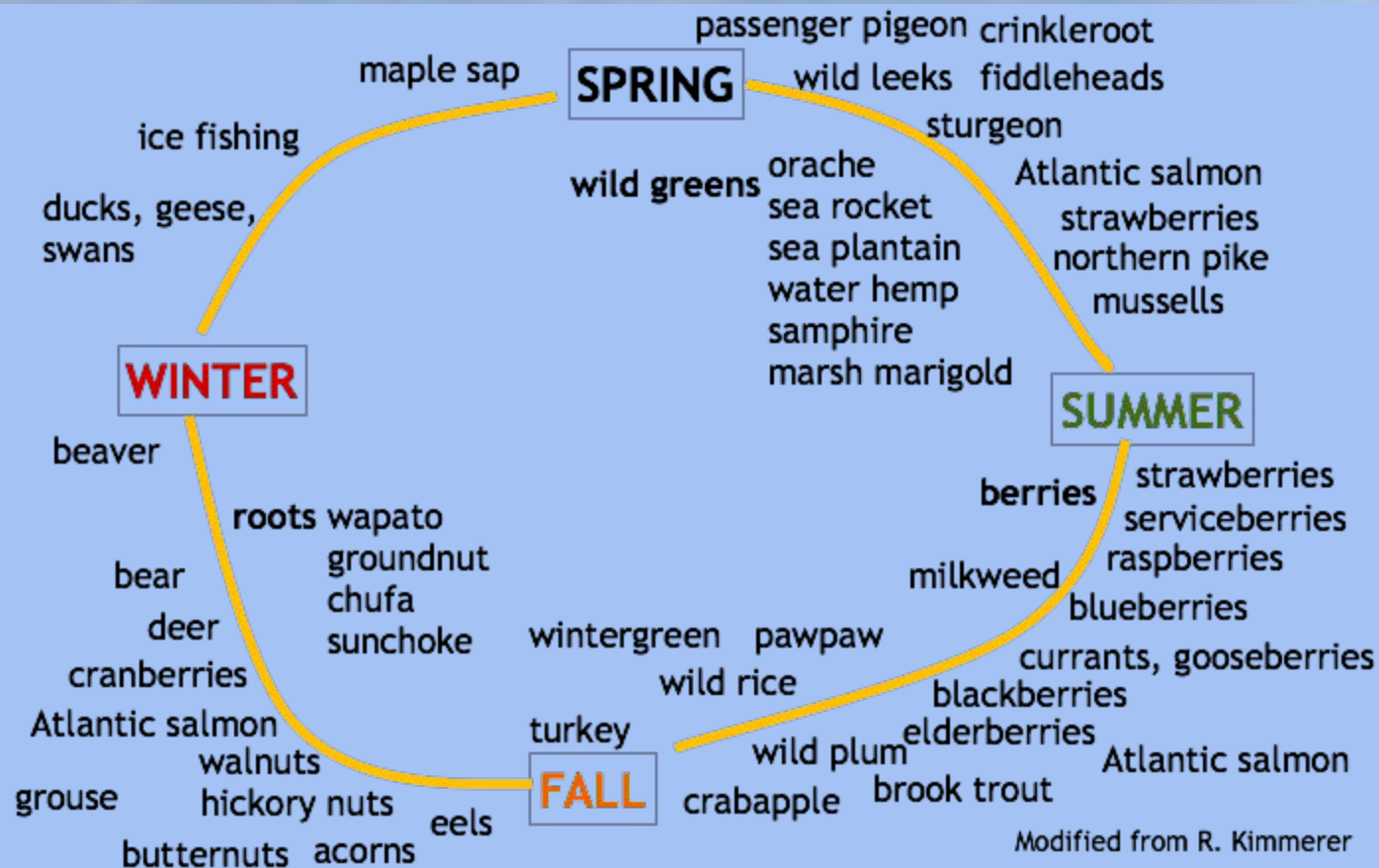
Haudenosaunee Confederacy

- ★ Seneca, Cayuga, Onondaga, Oneida, Mohawk, and later, Tuscarora Nations



Painting by Faithkeeper Oren Lyons, Turtle Clan, Seneca Nation

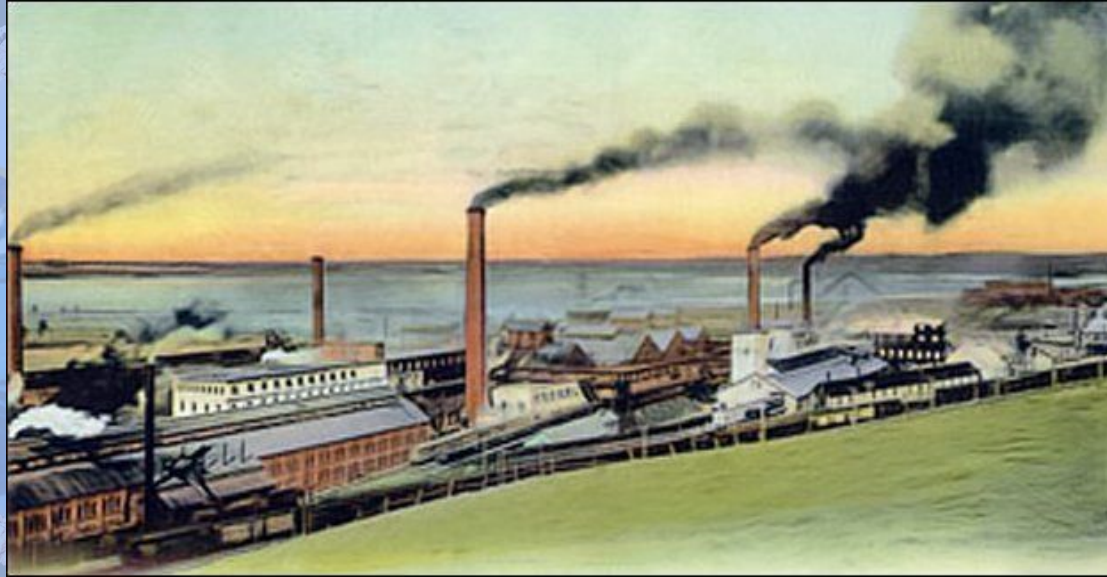
Onondaga Lake as provisioning landscape





Columbus Landing at Guanahani, 1492

Onondaga Lake as site of waste disposal



Soda Ash production: 1880s - 1980s

- Precursor to soap, glass, many other products
- Massive quantities of waste calcium chloride

Chlorine gas production began in the 1940s


- Major byproduct: **mercury**

Onondaga Lake as Superfund site



photo by Mike Grenlar

WARNING!



Fish from these waters contain chemicals and should not be eaten by women or children. Others should limit what they eat.

Hindi
ये पानीया आएका माछाएतका रसायनिक पदार्थक दुग्दक अति मधिया र ख्यातरने सेवक भन्नु हुँदैन। अन्तमे के खाते भये कोना खाना दिनु पर्दैन।

Burmese
သတိ! ဤရေထဲကနေထွက်လာသော အဖျားပေးဆေးပစ္စည်းများကို မိန်းမများ၊ ကလေးများနှင့် အားနည်းသူများက မသုံးစွဲရပါ။ အခြားသူများကလည်း သင့်လျော်သည့် အထိသာ စားသုံးရပါမည်။

Spanish
¡Peligro! Los peces de estas aguas contienen químicos y no deben ser consumidos por mujeres o niños. Las demás personas deben limitar lo que comen. Para excepciones por favor visite la página:

Para mas información: ပီရပ်ဆိုင်ရိတ်ရပ်နစ် များ အာဏာပိုင်အဖွဲ့မှ သတိပေးချက်များကို
Learn More! Go to www.health.ny.gov/fish or call the NYS Department of Health at 518-402-7800

Source: <https://www.syracuse.com>

Source: <http://www.onondaganation.org/land-rights/onondaga-lake/>

When is Restoration Complete?



CENTRAL NY NEWS

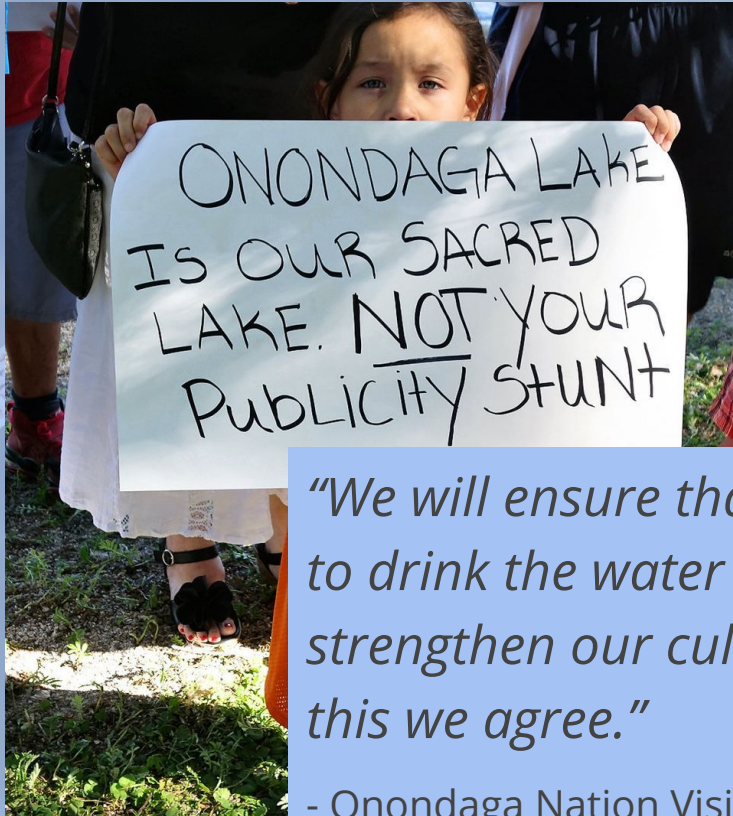
Onondaga Lake cleanup, decades in the making, will be done this month

Updated Nov 16, 2017; Posted Nov 16, 2017

*“Through the cleanup and habitat restoration, wildlife has returned to the lake in both the shoreline and surrounding wetlands... **Fishing, boating, and kayaking** are also now common occurrences seen on the lake and will be available for generations to come.”*

- Parsons Corporation, Engineering Firm

Onondaga Lake as site of **Biocultural Restoration**?



"We will ensure that the Lake is clean enough to drink the water and eat the fish. We will strengthen our culture and begin healing. On this we agree."

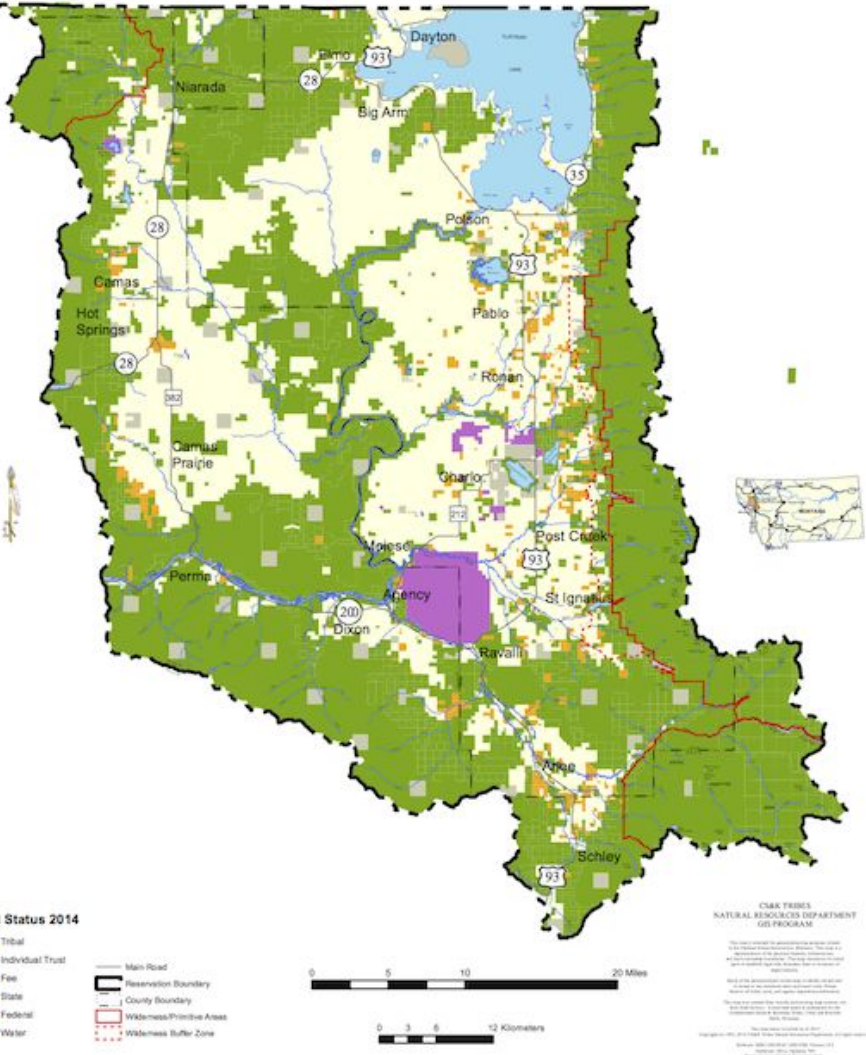
- Onondaga Nation Vision for a Clean Onondaga Lake

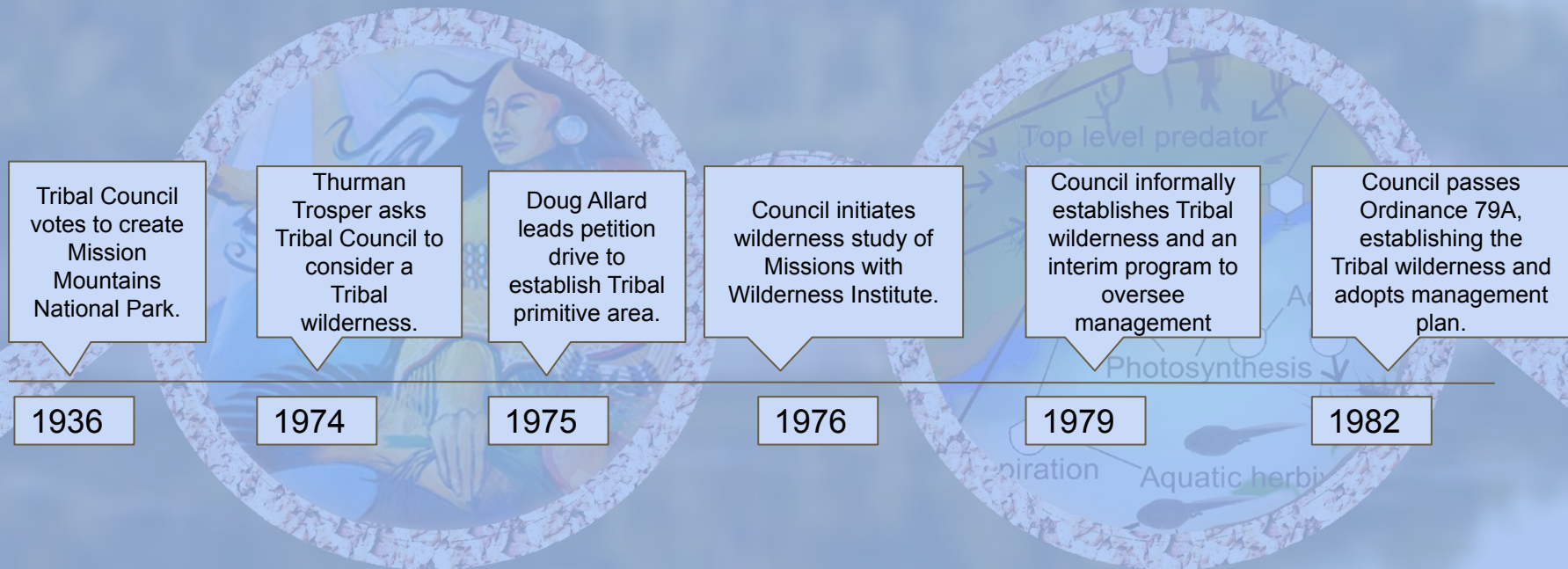
These mountains belong to our children, and when our children
grow old, they will belong to their children. In this way and for
this reason they are sacred.

-Doug Allard Save the Mission Mountains Committee



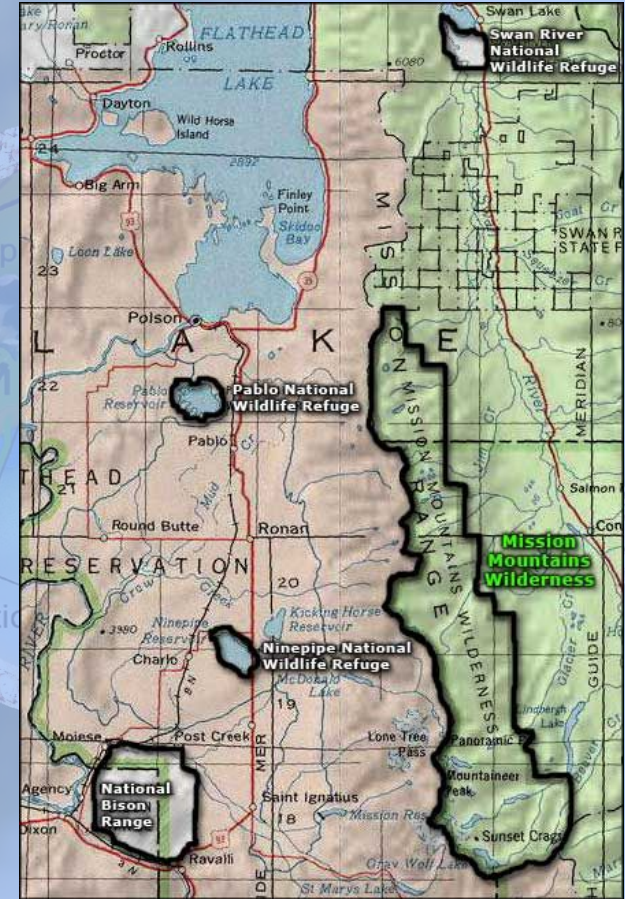
Flathead Reservation





We were tied to this land by our ancestor's and elder's stories that related our oral history and told us of Coyote's travels and activities. Every drainage, every lake, and every mountain, valley, and prairie had a significant story.

- ❖ First place in America in which an Indian nation had dedicated lands to be managed as wilderness.
- ❖ Covers approximately 91,778 acres.
- ❖ Elevation from 4,000 feet to over 10,000 feet at the mountain peaks and 34 miles long and an average of five miles wide.
- ❖ 9 major streams, 113 lakes greater than one acre in size created from glacial lake missoula.



“Protection and preservation of the area’s natural conditions in perpetuity.”



Special Grizzly Bear Management Zone - Established in 1982 along with and within the Tribal Wilderness, it covers approximately 10,000 acres surrounding McDonald Peak and Ashley Lakes drainage.

Trailless Area - When the Tribal Wilderness was established, this area, with a few minor exceptions, was trailless.

North Fork Post Creek Fishing Closure - Enacted in 1989 to protect naturally reproducing trout populations in the Summit Basin area from fishing harvest

Management Practices

- Important retreat from roads, motorized vehicles, media, and all the other technologies and noises of our modern society.
- For many Tribal people, wilderness is a peaceful sanctuary that provides much-needed solitude and an opportunity for spiritual renewal.
- Our Tribal communities depend on opportunities for subsistence hunting and fishing close to home.
- The Reservation's cleanest water begins in the Tribal wilderness and primitive areas.
- Provides our youth with healthy alternatives for recreation.
- Tony Incashola, has said we protect these area not for us, but for our ancestors, our elders, and our children.
- Has made the Confederated Salish and Kootenai Tribes a national leader in the conservation movement and brought international respect and acclaim to the Tribes.
- Brings thousands of visitors to the Reservation, many of whom spend money at Tribal businesses

Benefits for the wilderness area

Why is two-eyed seeing relevant to environmental education?

- Knowledge combined with values
- Reducing our impact as we learn our relationship
- Place-based values

“Environmental education is about re-storying our lives, the land, and our relationship to it. Through Two-Eyed Seeing it can also become focused on interconnection: between peoples, between ways of thought, between human beings and the natural world.” *Margaret McKeon, 2012*

Return to the place that you mentioned on your pre-survey.

How would you describe the story of that place through both lenses. What do you know and what information do you need?

What is your responsibility to that place?

How might you go about teaching reciprocity to that place?

Break-out Groups

Come up with a list of strategies for teaching two-eyed science in your educational setting. Your list might include:

- Activities
- Assessments
- Curriculum Topics
- The way you frame certain topics
- Writing/discussion prompts

As you work consider these questions:

How do you frame the difference between Academic science and Indigenous Science?

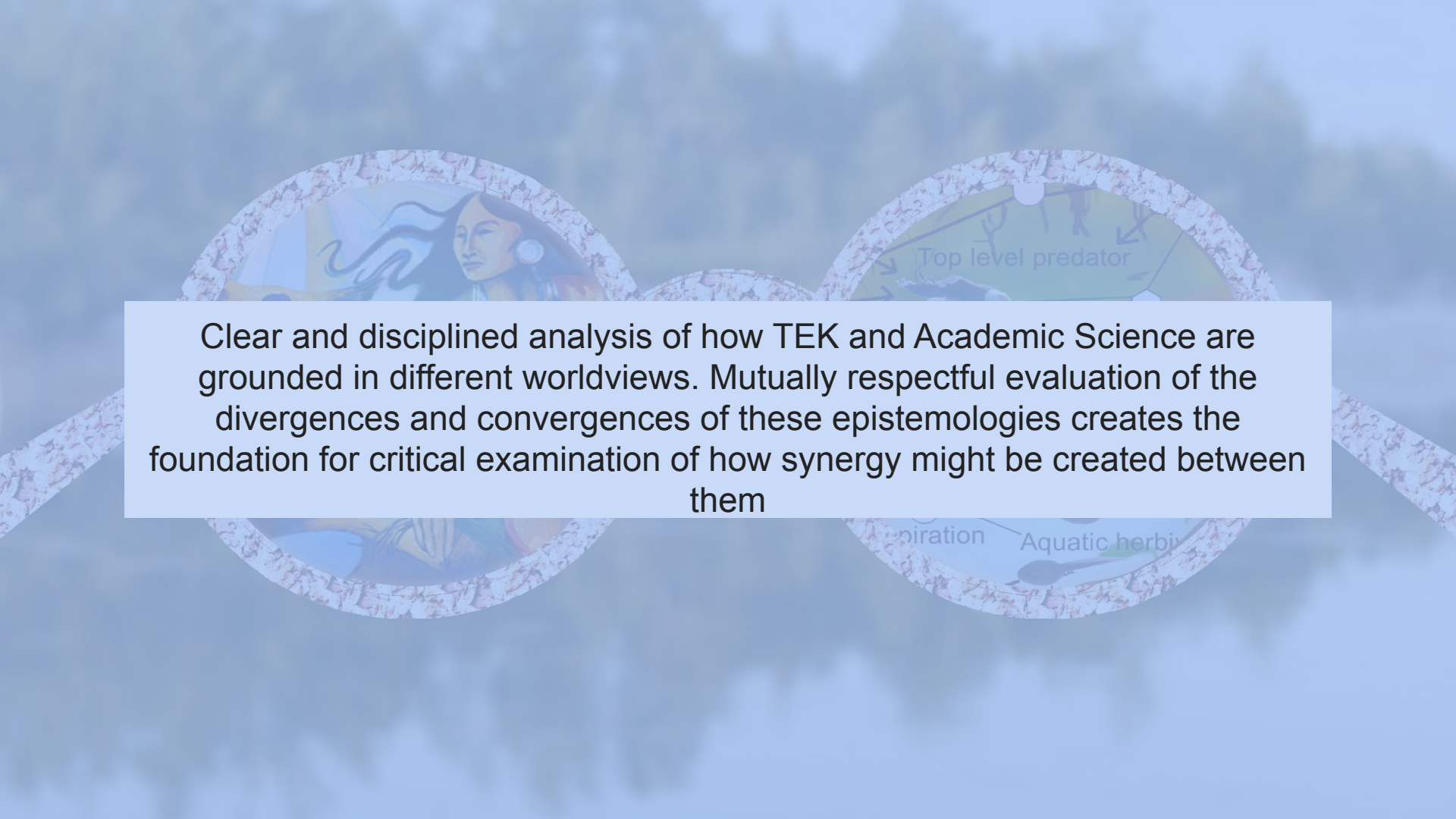
How do you give place a space to teach?

How do you acknowledge the people indigenous to a place? What if they are largely displaced?

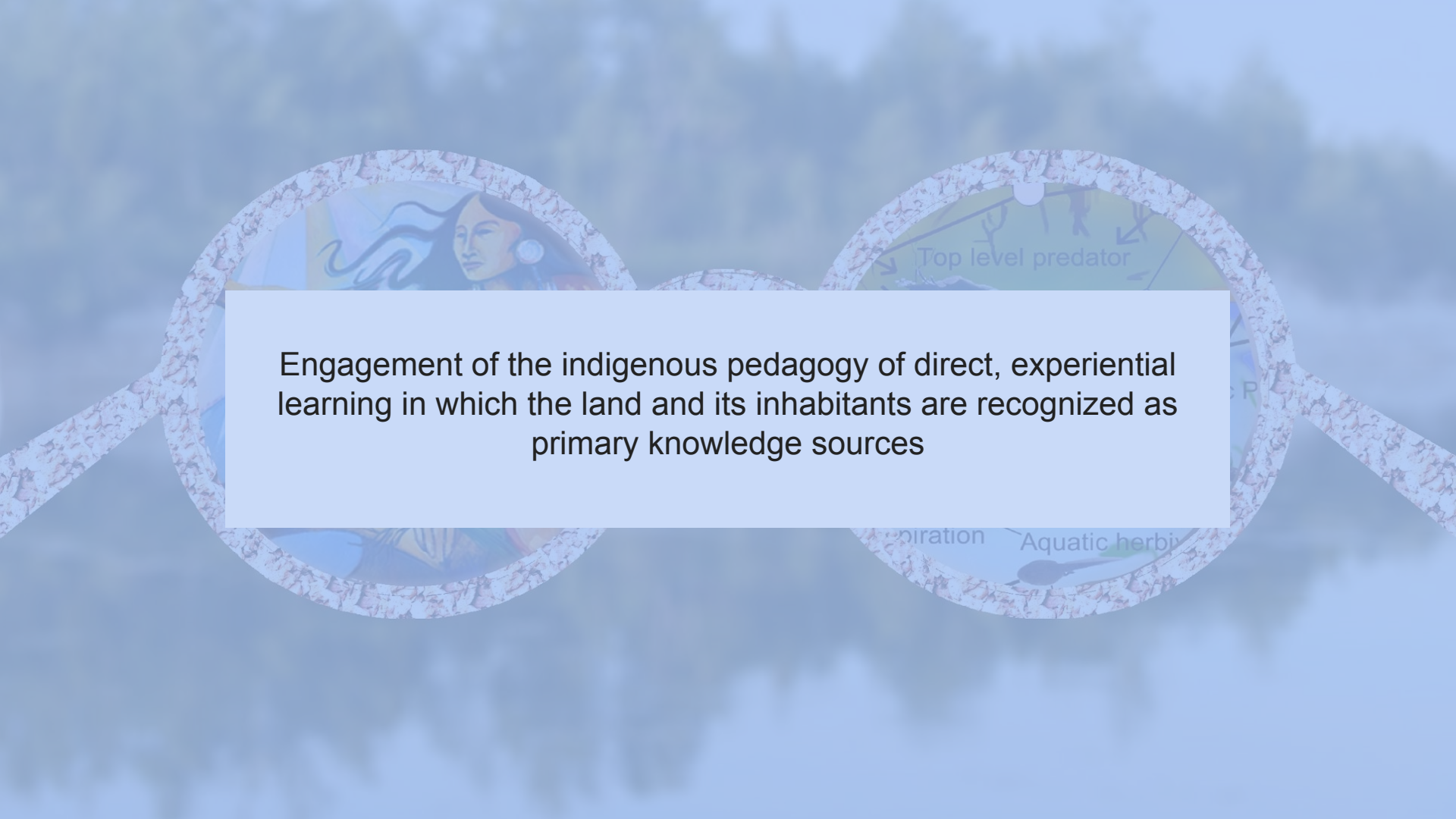
How do you motivate participants to value respect, responsibility, reciprocity?

Moving forward in the future with two lenses

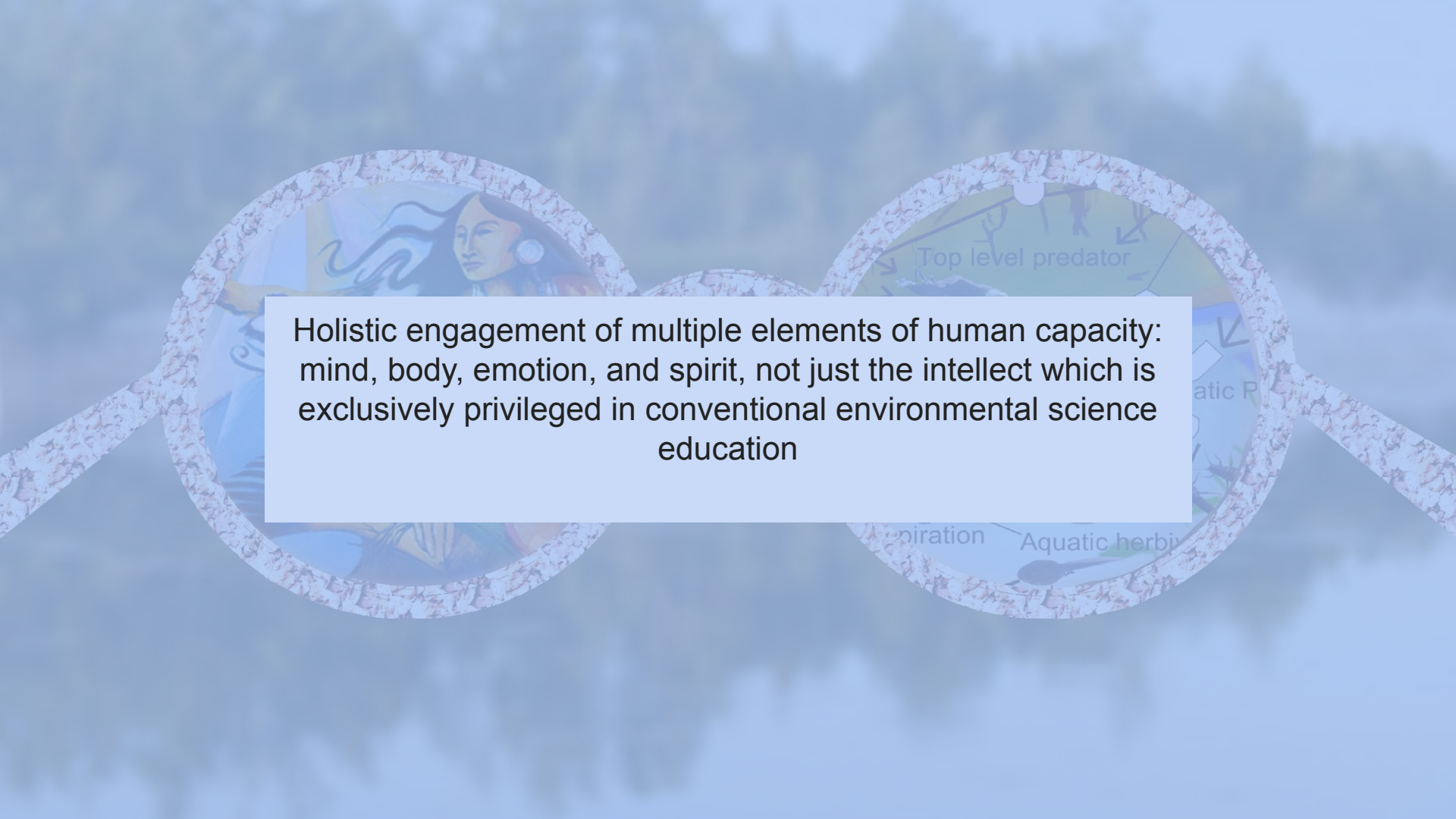


The background features a light blue gradient with a faint, circular graphic element. This graphic consists of several overlapping circles with a cork-like texture. The top-left circle contains a stylized illustration of a Native American woman's face. The top-right circle shows a food web diagram with the text 'Top level predator' and arrows indicating energy flow. The bottom-right circle contains the text 'piration' and 'Aquatic herbi'.

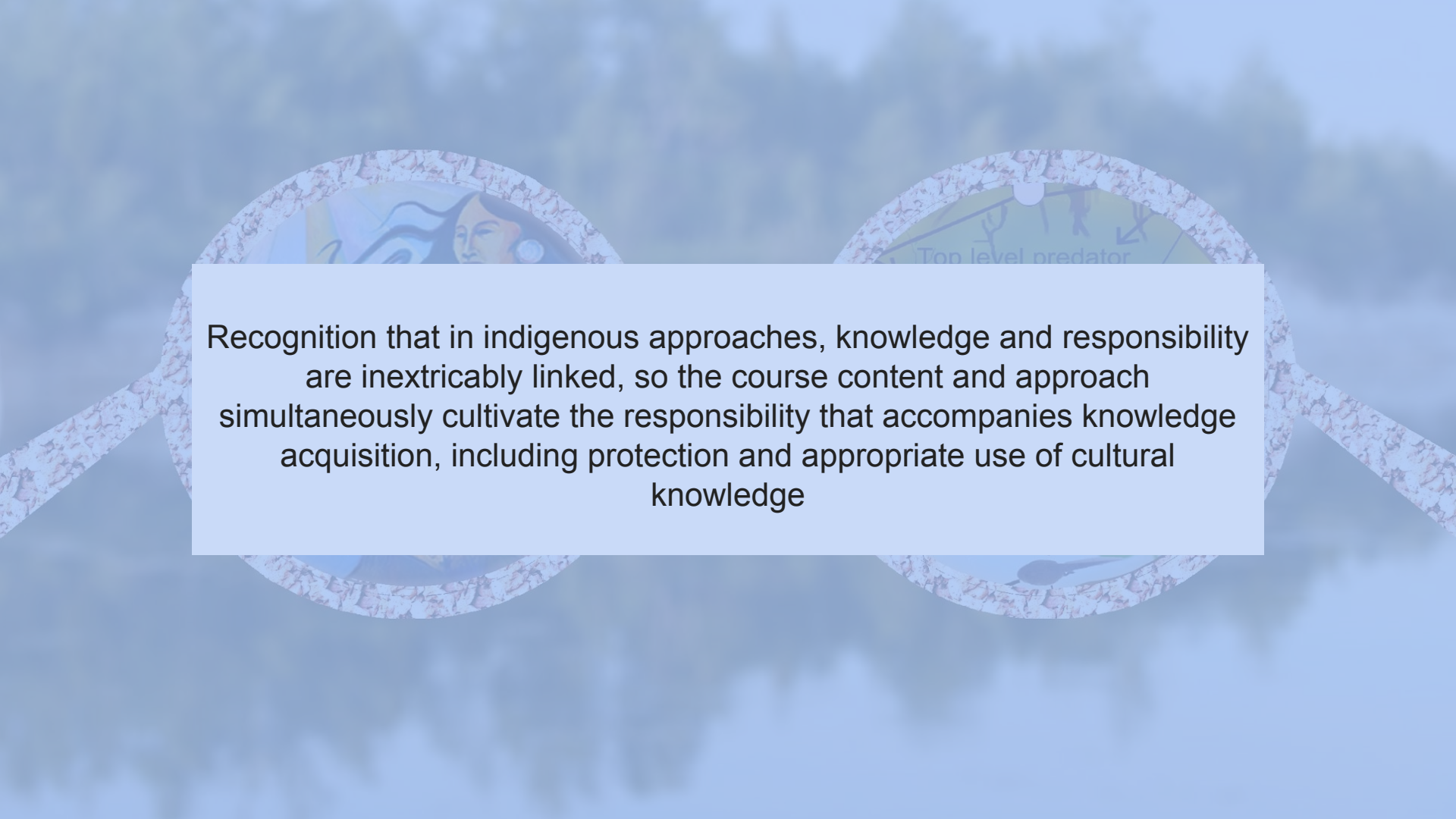
Clear and disciplined analysis of how TEK and Academic Science are grounded in different worldviews. Mutually respectful evaluation of the divergences and convergences of these epistemologies creates the foundation for critical examination of how synergy might be created between them



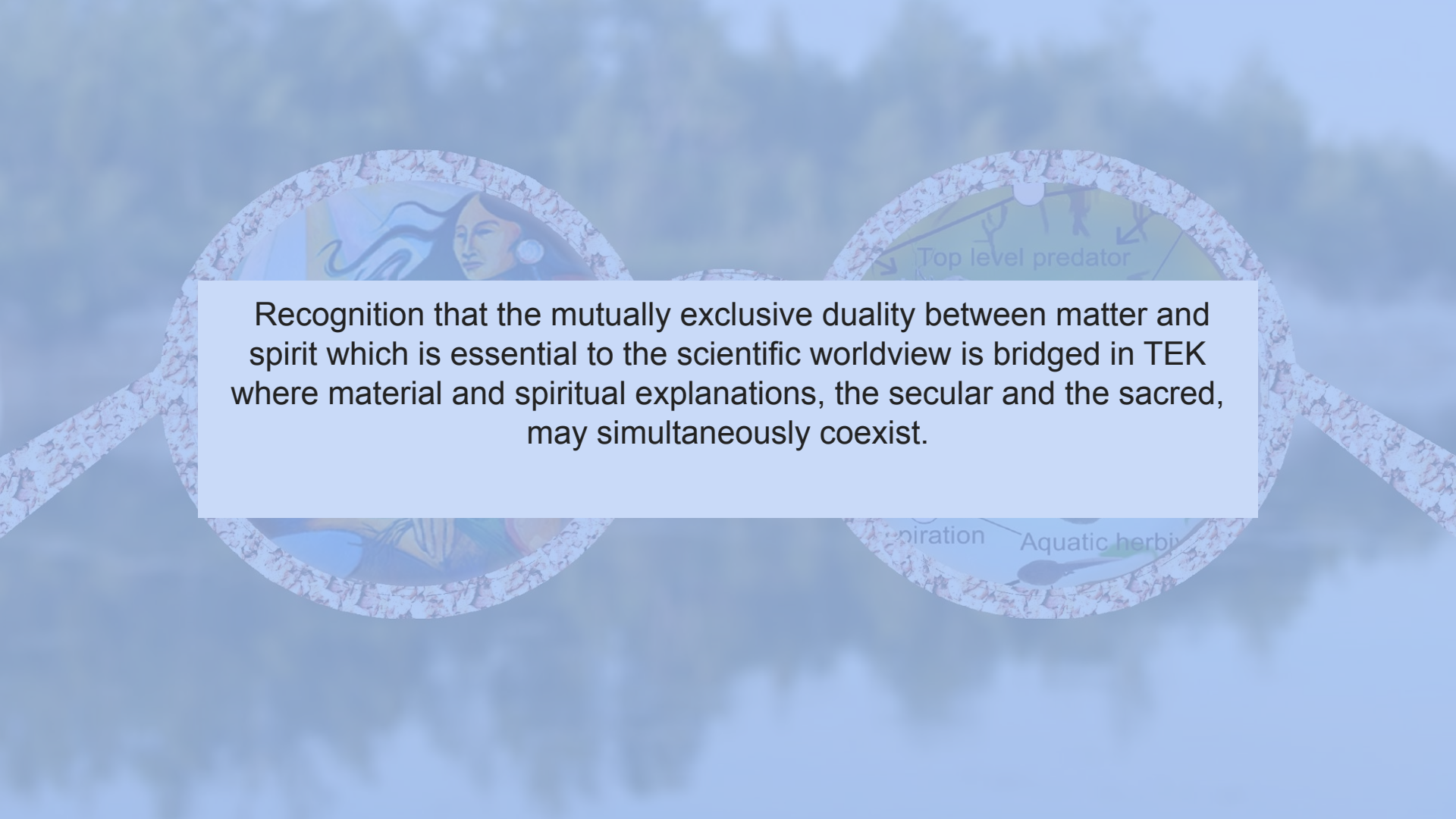
Engagement of the indigenous pedagogy of direct, experiential learning in which the land and its inhabitants are recognized as primary knowledge sources



Holistic engagement of multiple elements of human capacity:
mind, body, emotion, and spirit, not just the intellect which is
exclusively privileged in conventional environmental science
education

The background features a light blue gradient with two circular corkboard-style frames. The left frame contains a stylized illustration of a person's face. The right frame contains a diagram with arrows and the text 'Top level predator'. A white rectangular box is centered over the image, containing the main text.

Recognition that in indigenous approaches, knowledge and responsibility are inextricably linked, so the course content and approach simultaneously cultivate the responsibility that accompanies knowledge acquisition, including protection and appropriate use of cultural knowledge



Recognition that the mutually exclusive duality between matter and spirit which is essential to the scientific worldview is bridged in TEK where material and spiritual explanations, the secular and the sacred, may simultaneously coexist.

Thank You

Lemlmtš

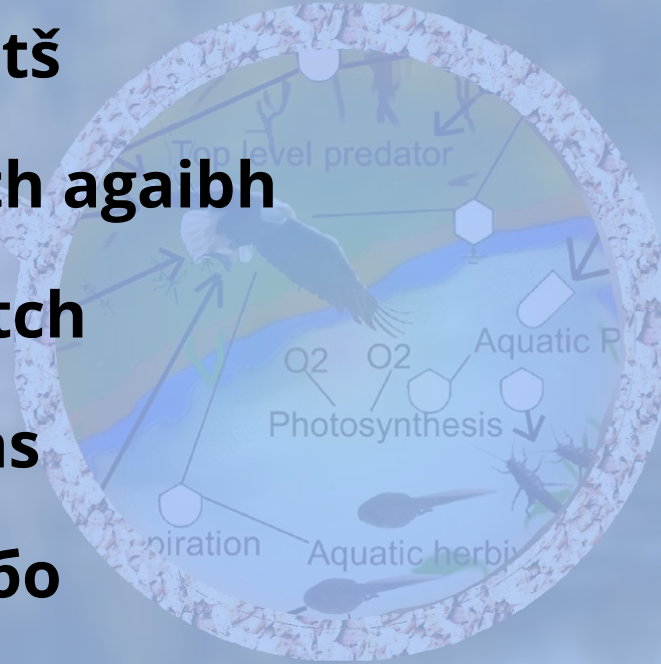
Go raibh maith agaibh

Miigwetch

Gracias

Спасибо

Нya:weh



Questions?



The People

We are carrying out our responsibility to the Lake. We take our children and grandchildren to important places around the Lake and teach them the proper names and stories for them. We have our own name for the Lake, one which conveys the respect and sacredness of the place and the proper relationship with it. Someday we hope to share this knowledge with our neighbors.

We will work to remove the contamination from the Lake and surrounding land. We will ensure that the Lake is clean enough to drink the water and eat the fish. We will strengthen our culture and begin healing.

Respect | Reciprocity | Responsibility | Relationship

U.S. Fish & Wildlife Service

Traditional Ecological Knowledge

*for Application by
Service Scientists*

Fishing at Ninepipe National Wildlife Refuge, Montana / USFWS



National Park Service

Traditional Ecological Knowledge

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Interdisciplinary Stewardship of Mother Earth

Welcome! This site is for anyone interested in working with Indigenous peoples for on-the-ground ecosystem stewardship. While hosted by the National Park Service, this site is intended to be a service for all those interested in traditional ecological knowledge.

Learn more:

<https://cnpe.home.blog>

Stay in touch:

2ways2know@gmail.com

END OF SLIDESHOW:: Extra slides below

Image Citations

Tree of Peace: Painting by Faithkeeper Oren Lyons, Turtle Clan, Seneca Nation

Columbus image: devongagliardi.blogspot.com

Nighttime boating Postcard: Public Domain, <https://commons.wikimedia.org/w/index.php?curid=11990390>

Beachgoers: <https://spectrumlocalnews.com/nys/central-ny/news/2018/04/12/onondaga-lake-beach>

Man holding Sturgeon: www.syracuse.com

Lakeview Amphitheater: www.NewYorkUpstate.com

Solvay smokestacks: <https://www.theeaglecny.com>

Solvay Process chemical diagram: <https://www.revolvy.com/page/Solvay-process>

Image Citations (continued)

Waste bed photo: <http://www.onondaganation.org/land-rights/onondaga-lake/>

No fishing sign: www.syracuse.com

Onondaga Lake Cleanup website:

“Honeywell to Complete Onondaga Lake Cleanup”:

Happy boaters/swimmers:

Young girl with sign

Onondaga Nation’s Vision for a Clean Onondaga Lake

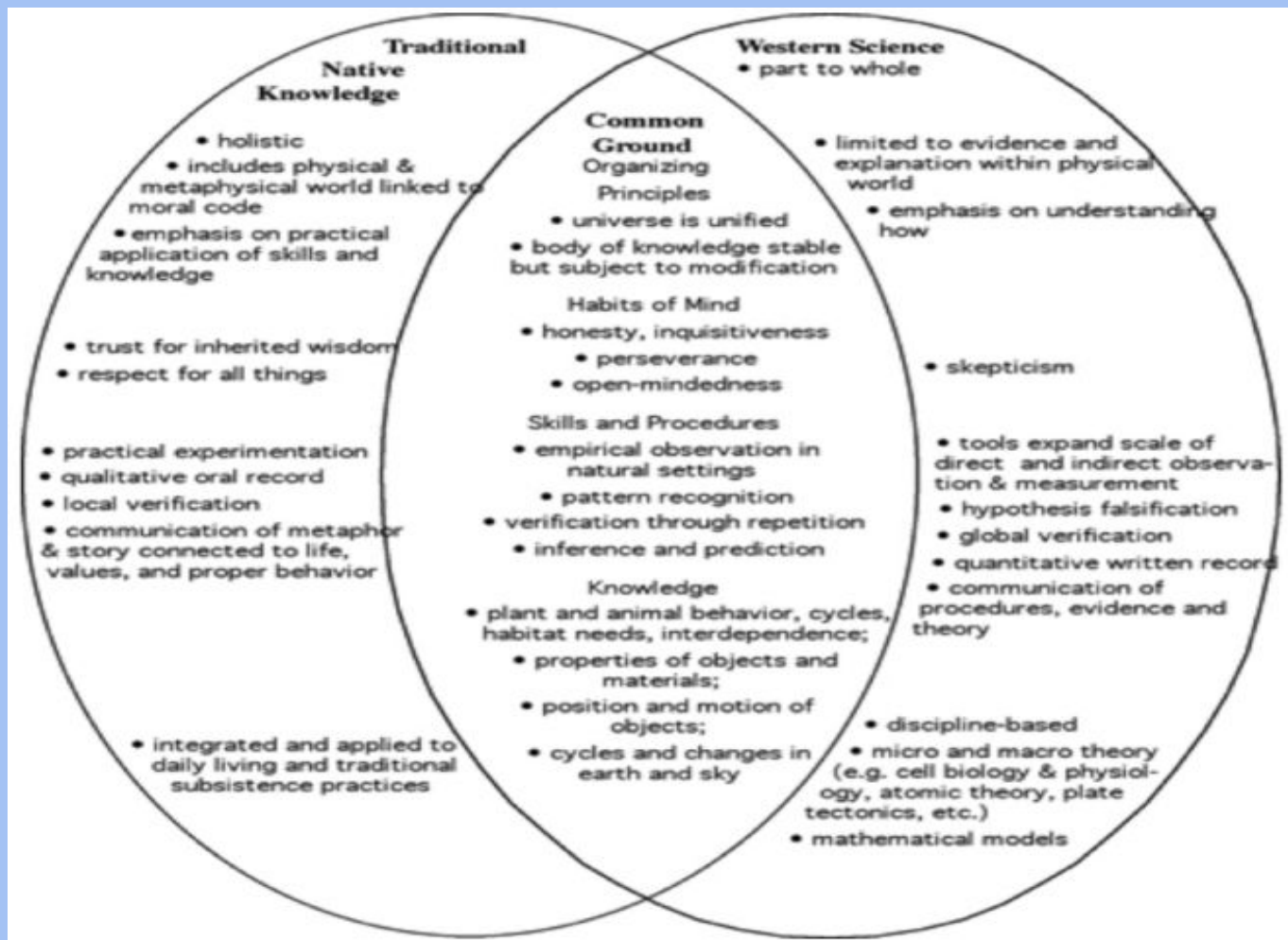
Aerial View of Onondaga Lake

From time immemorial, our ancestors lived near Onondaga Lake. The Lake, its waters, plants, fish, shore birds, and animals are an intrinsic part of our existence.

Long ago, the Peacemaker brought together the five Nations on the shores of Onondaga Lake to bury the weapons of war and form our government. The Grand Council of the Haudenosaunee Confederacy meets at Onondaga.

The Lake is the living sum of everything in its watershed: the fish, the people, the plants, the soils, the tributaries. Onondaga Lake provides water which should be safe for drinking. Fish and birds make their home in and around the Lake. Food and medicinal plants grow along the shores of the Lake.

The Lake was a place for people to fish and hunt. It was a place for children to play and swim and learn. Delegations would arrive at Onondaga for Confederacy meetings by traveling along the Seneca River to Onondaga Lake.



Worldview A

Worldview B

Community & Kinship

Holistic

Relatives

Where?

Cyclical Time

Balance & Regeneration

Journey & Process

Seventh-generation Decisions

Individuals & Ownership

Reductionist

Resources

When?

Linear Time

Progress & Growth

Outcomes & Results

Short-term Decisions

The integration of
the 3 R's

Having a seat at
the table

Observation of
Nature

Pattern
Recognition

Knowledge of the
Earth and the
cycles

Both quantitative
and qualitative



Sky Woman (by Bruce King, Oneida)

“The Lake is the living sum of everything in its watershed: the fish, the people, the plants, the soils, the tributaries...”

- from the Onondaga Nation Vision for a Clean Onondaga Lake



Table 2. Strategic plan developed with the *Voladores'* council, to recover *Zuelania guidonia* populations in the El Tajin archaeological site (Papantla, Veracruz, Mexico).

Strategy	Topics	Actions
Social organization	Territorial organization	To negotiate the council's intervention in all decisions related to El Tajin's territorial planning. Official requests to local and federal government institutions (Instituto Nacional de Antropología e Historia, municipal and state and federal authorities)
	Financial plan	Collaborative workshops and strategic planning. Outcomes: concluded funding proposals ready to be submitted to different governmental and nongovernmental organizations and foundations
	Educational program	To encourage various knowledge exchange activities among elders, healers, children, and herbalists to preserve Traditional Ecological Knowledge by using the <i>campesino a campesino</i> technique
	Collaborative alliances with academic institutions and organizations	To establish agreements with ecologists and other conservation and sustainability/sustainable development specialists and institutions
Agroforestry system	Traditional vanilla plantations	Seed collection from selected tree species in vegetation remnants Seedling production in nursery Planting of light-demanding species Planting of shade-tolerant species Vanilla cultivation

Traditional Ecological Knowledge as a tool for biocultural landscape restoration in northern Veracruz, Mexico

- Carano Tree culturally important in Totonac society.
- Codesign an agroforestry model for the recovery of Carano Tree populations by combining scientific and traditional agroforestry knowledge.
- Collaborative work revealed the Totonac extensive Traditional Ecological Knowledge and the need for the Voladores' group to strengthen alliances with other government and nongovernment organizations.



Looking Back for the Future: Local Knowledge and Palaeoecology Inform Biocultural Restoration of Coastal Ecosystems in New Zealand

Combined local knowledge of elders and environmental practitioners from two indigenous Māori communities and pollen evidence in soil cores from two islands and two mainland coastal sites to inform the planning of coastal ecosystem restoration initiatives in New Zealand.

Approach emphasizes the importance of placing humans within nature and the reciprocity of environmental and social well-being.



Ma Ka hana ka 'Ike (In Working, One Learns): Lessons for Community-Based Fisheries Management

- One long-enduring case of local level fisheries management, in Kahana
- Considerations for fisheries co-management emerging
 - Understanding historical contexts for enhancing institutional fit
 - Enduring community leadership
 - Balancing rights and responsibilities
 - Fostering community ability to manage coastal resources through both formal and informal processes.

