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Client Relations Team

Angela Stoltz (Cherokee) School of Education
Kyle Harmon (Nanticoke) Tribal Leader, Nanticoke Indians of the Eastern Shore
Justin Gallardo, College of Behavioral and Social Sciences
Emma Schrantz, School of Architecture, Planning and Preservation
Ricky Fairhurst, School of Architecture, Planning and Preservation
Shaliah George, College of Arts & Humanities
Michael Molyneaux-Francis, Clark School of Engineering
Matt Lagomarsino, College of Agriculture and Natural Science
Christine Cestello Hinojosa, School of Architecture, Planning and Preservation
Garth Rockcastle, School of Architecture, Planning and Preservation
Patricia Cossard, University Libraries

U.S. DEPARTMENT OF ENERGY SOLAR DECATHLON 2017

Native American Client: Research Report

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Note: In this report, various names are used when describing Native American peoples: Native Americans, First Americans, First Nations, Indigenous People, Tribal Nations, Indian Tribe, Tribal Leaders, American Indians.



Team Maryland visits the National Museum of the American Indian on the National Mall, July 2, 2017.

From Left to Right: Ricky Fairhurst, Justin Gallardo, Christine Hinojosa, Thomas Cossard-Mehalsick, Leo Tune, Patti Cossard, Katerina Cossard, Margaret Tune, Emma Schrantz, Catherine Harmon, Preston Harmon, Dominique Harmon, Kyle Harmon, Julius Harmon, Ella Clark, Angela Stoltz, Lydia Clark.

Photo by: Mandy Foster

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reACT AND THE NATIVE AMERICAN CREATION STORY

Analysis of Ojibwe/Chippewa Creation Story demonstrating how reACT meets our client's needs with a focus on the earth processes, sustainability, and living systems. Analysis by Matt Lagomarsino, Leader of the Living Systems Team.

Ojibwe Creation Story <http://tmbci.org/history/>

Long ago, Kitchi Manitou, the Great Spirit, had a dream: He saw the sky filled with the sun, earth, moon and stars. He saw the earth covered with mountains and valleys, lakes and islands, prairies and forests. He saw trees, flowers, grass and fruit. He saw all manner of beings walking, flying, crawling and swimming. He saw birth, growth, and death. And he saw some things that lived forever. Kitchi Manito heard songs and stories, he touched wind and rain, he experienced every emotion and he saw the beauty in each of these things.

After his dream, Kitchi Manitou made rock, water, fire and wind. Into each he breathed life and to each he gave a different essence and nature. From these four elements Kitchi Manitou created the earth, stars, sun, and moon. Kitchi Manitou gave special powers to enhance all of his creations. To Ahki' (the Earth) he gave growth and healing. The Earth is said to be our mother because she gives life, protects, and nurtures. In this way it is understood that a woman preceded man on Earth. To Gee'sis (the Sun) he gave powers of light and heat, and is referred to as Grandfather because he watches over us during day. To the water he gave the power to purify and renew. And to the wind he gave the power of direction, voice of music and the breath of life.

On the new earth, Kitchi Manitou made mountains, valleys, plains, lakes, islands and rivers. Everything had its place on the new earth. Kitchi Manitou sent his singers in the form of birds to the Earth to carry the seeds of life to all sacred directions: Wauban (east), Shawan (south), Ningabian (west) and Keewatin (north). Two other sacred directions were the Sky above and the Earth Below. In this way life was spread across the earth. The Creator made the plants. There were four kinds: flowers, grass, trees, and vegetables. To each plant he gave the spirit of life, growth, healing and beauty. And he placed each one where it would be most beneficial. Kitchi Manitou then created the animals and gave each of them special powers. All of these parts of life lived in harmony with each other.

Kitchi Manitou then took four parts of Mother Earth and blew into them using a Sacred Shell. From this union of the Four Sacred Elements and his breath, man was created. It is said that Kitchi Manitou then lowered man to the Earth. Thus, man was the last form of life to be placed on the Earth. From this original man came the Anishina'be people. Kitchi Manitou created us in his image, a natural people and a part of the Mother Earth. We live in brotherhood with all that is around us. Man, as the last of Kitchi Manitou's creation, regarded plants, animals, and all of creation as elders because those life forms were created first. Although last and weakest of his creations, we were given the greatest gift of all, the power to dream. Thus, Kitchi Manitou has brought his dream to life.

reACT incorporates the essence and mastery of all four of the elements that were so important to the Ojibwe people: Ah'ki our Mother Earth, Gee'sis the sun, sacred water, and breathing wind.

To the earth he gave growth and healing.

The plants in all reACT living systems were chosen mindfully and with intent, each with a specific use. Many of these plants, such as the herbs and vegetables, promote growth and healing for the inhabitants of the house, and also for a wide range of fauna that use these plants for various reasons. Using a very diverse pallet of plants is a common aspect throughout almost all of the Native American tribes in North America, and Team Maryland wants to stress the importance of this. Diversity, especially bio-diversity, is an essential foundation of sustainability. High plant diversity fosters interactions between species creating functional communities that are much more productive than the systems functioning separately. The Three Sisters is a growing method that represents this synergy between plant species as they live in mutualism.

To the sun he gave the power of light and heat.

The sun's energy is directly harvested by reACT's PV solar panels. Independence from external energy sources is one major aspect of sustainability. Harvesting our power on site from the sun allows us to take full advantage of the energy source right in front of us. Also, energy from the sun is renewable everyday the sun shines, meaning that it is naturally and daily replenished. In contrast, fossil fuels are a finite resource that take millions of years to develop and will continue to diminish with use.

To the water he gave the power to purify and renew.

reACT's on site water will begin in the rain-catchment system then filtered to potable standards. After use, it will be treated, purified some to potable standards and other to greywater, which will be used to irrigate and grow vegetables and plants, directly linking the water and earth, and mimicking earth's natural processes. Making every possible use out of natural products is a Pan-indian value. Likewise, reACT aims to reuse every last drop of water for another purpose after it's done its first task.

And to the wind he gave the power of direction.

The courtyard works as a bridge between the outside of the house and the inside, allowing for natural air to flow and give life to the house, while offering more space for plants. It also functions to let the house breathe. reACT utilizes the nature of air to directionality, e.g., hot air from the greenhouse is directed into the solar attic to be reused in the climate comfort system (HVAC).

Kitchi Manitou then took four parts of Mother Earth and blew into them using a Sacred Shell.

The modular design of the house represents the shell that in Ojibwe folklore was used to create the first man. Our logo, being a turtle, symbolically represents the symbiosis of all the four elements that went into the house and how each part comes together to create an even more impressive and efficient whole. Our logo, functionally, represents all the various teams that worked together to get the house where it is today. Just like the synergy of earth's elements creates a huge network of interactions between organisms and allows for endless possibility, the synergy of our teamwork allowed us to tackle the hardest problems and create a working house that was never thought to be possible before.

DEMONSTRATE MARKET NEED FOR reACT

A western science-centric approach serves to produce new knowledge, however, it reveals little about context and outcomes (Sarewitz & Pielke, 2007). Indigenous knowledge systems (IKS) are based upon learning derived from traditions, cultural practices, and rituals of everyday life and have been the foundation of knowledge systems for thousands of years (Chhetri & Chhetri, 2015). Team Maryland argues that western science and indigenous knowledge systems are complementary and enrich each other. Enos (2002) characterizes the agency of cultural reclamation to be “deep sovereignty,” i.e., agency in protecting core Indigenous values, knowledge systems, and ways of being. Enos’ deep sovereignty framework is grounded in respect for indigenous agency to self-determining language, resources (land and culture), wellness and health, and religion. Team Maryland supports Native American deep sovereignty by engaging in relationships rooted in Indigenous practices and worldviews (Django & Samy Alim, 2017).

In 2012, 5.2 million people in the US identified themselves as American Indian or Alaska Native, with another 1.2 million self-identifying as Native Hawaiians or Pacific Islanders. According to the 2010 Census, 67-92% of American Indians and Alaska Natives reside outside tribal lands (Norris et al. 2012). A major challenge for Native American communities today is sustaining relationships between people and place, especially for those living in cities. Team Maryland believes that a deep attachment to place is critical for offsetting the long-term effects of colonization and promoting cultural and environmental sustainability. reACT (resilient Adaptive Climate Technology) is built to facilitate that deep attachment through the adaptive technologies developed by Team Maryland. reACT is designed to improve connection to local ecosystems. reACT’s sustainable and regenerative design principles are in harmony with indigenous deep sovereignty through promoting quality of life while simultaneously respecting Mother Earth and her sacred resources.

reACT has an ambitious goal of accelerating the transformation of the residential construction industry. Team Maryland seeks an industrial leader to leverage the research and development investments it has made in its Solar Decathlon entry, and by bringing to the negotiation table a ready and interested market. This interest is not in the single or literal Decathlon home to be featured in the 2017 competition, but in its prototypical “DNA” and flexible configurations. By working with industry leaders and by developing market “off-takers,” Team Maryland intends to generate greater industry investment and willingness to collaborate, in exchange for contractually sharing in the fruits of a substantial market segment. reACT is positioned to accelerate the housing industry’s embrace of the Living Building Challenge goals of Red List avoidance, Responsible Industry and Net Zero Waste. These goals are intended to create a materials economy that is non-toxic, ecologically restorative, transparent, and socially equitable. Furthermore, reACT will serve as a seminal and flexible prototype for housing that is more readily adaptable to a diverse range of clients, communities, construction technologies and ecological environments.

The central strategy to ignite a paradigm shift is the choice of reACT target market of Native American communities. Recognizing the extreme housing needs in many Native communities—along with the vulnerability of reservation land to climate change and the challenges of living as a Native American in an urban setting--reACT uses sustainability and regenerative design principles to promote quality of life and culture. reACT achieves this by focusing on techniques and technologies that make homes more energy efficient, healthy, and in harmony with Native American culture. reACT will embrace emerging sustainable building practices that promise to transform and support tribal housing projects, while also providing the two-thirds of Native Americans living in urban centers with housing options that support a more harmonious, balanced and sustainable interactions with the natural world.

By providing access to technical assistance and control of their own financing, tribes can achieve green, culturally appropriate housing even after years of being marginalized. Tribal leaders are increasingly seeking sustainable

housing and renewable energy power systems that utilize sustainability best practices and renewable energy technology in order to provide their communities with cultural renewal, self-sufficiency, economic opportunity, and sustainable returns on investment that compliment tribal culture. reACT is dedicated to mindfully support tribal embrace of sustainability and self-determination. Team Maryland is seeking to influence the manufacturing partner to develop production plants in close proximity to tribal lands, to contribute to expanding training and economic opportunities for members of the tribal community.

reACT advances a design built on developing homes as kits of interactive and disentangled systems and parts that can be efficiently manufactured, transported, assembled and disassembled. The kit of parts is conceived as an effective new high performing combination of ingredients able to be arranged or configured into diverse and clearly differentiated building sizes and forms. Assembly, standardization, and flexibility of components, along with an intrinsic disentanglement (to better “future proof” home building) of systems and their interdependence are among the strategies the Team Maryland has employed to increase build-ability, reduce construction and transportation costs, while facilitating changes and/or upgrades over time.

Climate Change, Resilient Adaptive Technology, Native American Clients

Decades of research on global climate change shows that human activities are adversely affecting our ecosystem and the stability of our climate. Native American communities are especially vulnerable to the effects of climate change and it is important that through mitigating climate change that their cultural integrity be respected and they can succeed in a globalized society. We recognize the western scientific perspective on climate change is evolving to move more towards an understanding that affirms the global significance of indigenous knowledge systems. The principles of Agenda 21 reveal that sustainable development requires a conceptual differentiation that is able to meaningfully articulate scientific and indigenous forms of knowledge (United Nations Conference on Environment and Development, 1992). Team Maryland believes that Native Americans can contribute valuably to more sustainable interactions with the natural world (Chhetri & Chhetri, 2015).

Team Maryland, and its prototype reACT, understand that any attempt to join western scientific and indigenous knowledge systems may reflect the history of power relations (Simpson, 2004). We are also aware that traditional knowledge is not homogenous, even within small communities. Our aim is to contribute to the thoughtful and respectful integration of indigenous knowledge with scientific data, analysis, and innovation so that the rich body of IKS can inform science and in turn, science can contribute tools that will allow indigenous communities to make informed decisions (Alexander, 2011). We aspire to open a path for meaningful exchange of information, so that efforts to deal with climate change can be strengthened.

We believe there is a very receptive audience in the next generation of western science trained students and future decision-makers to include traditional knowledge systems and indigenous culture in their decision making processes. Locally based indigenous societies who balance their collection of natural resources are especially important for a resilient environment and society. Indigenous community survival is dependent upon living in balance and harmony with the environment. If these communities did not maintain resilient environments, they would not exist today. This fundamental way of life is the basis of the Seventh Generation Principle that has guided indigenous communities for thousands of years and is built upon the oral histories that have informed indigenous people of the ways to walk “The Good Red Road” and the dangerous consequences of deviating from this sacred path.

reACT is a space where Native American and western scientific practices have the opportunity to connect in a joint effort to reduce the negative effects our current lifestyles have on Mother Earth. Through collaboration, we can highlight the value of IKS by optimizing sacred resources: water, wind, the earth and the sun, and we can begin to balance our desires for comfortable living with a mindfulness toward Mother Earth and future generations.

Team Maryland has identified complementary western and Native American ecological approaches (Gordon 1993, Vogt et al. 2010). First, we are committed to a long-term perspective that examines issues at a scale relevant to the functioning of the various ecosystems that we inhabit. This is similar to the Seventh Generation Principle; we imagine the impact our sustainable technologies will have on future generations and on the sustainability of these ecosystems, and are not motivated by the output of products or the acquisition of profit. Second, like IKS we recognize Mother Earth as a living, breathing being. Through reACT, we have attended to how the air (Mother Earth's breath) moves through the house through our unique heating ventilation and cooling system (HVAC) system optimizing thermal efficiency. We have brought the Earth into the house by incorporating portable living green walls and outdoor living spaces. Our commitment to water protection is evident in our water systems design, where each drop of water is accounted for and reused or recycled. While we recognize that our personal value systems shape ecosystem structure and function in various ways that can constrain, promote, or reduce sustainability, the adaptive technologies developed through reACT have been designed to improve our connection to local ecosystems. reACT is in harmony with IKS which recognizes that we as humans are intimately linked to all existence in an intricately designed web.

Sustainable Decision-making practices

Although the importance of science in the pursuit of sustainable development is widely recognized, its role in and its relationship with society has been undergoing a critical examination. In contrast to scientific knowledge, indigenous knowledge is holistic, functional and adaptive to changes in social and natural environment, and it has been transmitted for many thousands of generations (Rist & Dahdouh-Guebas, 2006).

Team Maryland recognizes that the decision-making processes used by Native Americans differ from the western scientific approach, partly because of their fundamental beliefs in their connectedness to all that the Great Spirit has created. While each of the 550+ North American Native American tribes are unique, there are core pan-Indian cultural values and practices that glue tribes together. These include beliefs regarding the optimization of resources for land, housing and food. These Pan-Indian values are embedded in reACT.

Many models can help us change how we make decisions. Ours is simple: move towards dialogue with indigenous decision-making practices. This will help western trained decision-makers understand how to live more sustainably. Indigenous groups have less difficulty dealing with the concept of sustainability because of their traditional knowledge and value for Creation. These are the people we should look to gauge if we are on the right track for making sustainable choices.

Many Native Americans do not have a short-sighted approach to resolving conservation, poverty, economic development and climate change problems. A common decision-making practice is guided by the Seventh Generation Principle where tribal leaders consider the effects of their actions and decisions for their descendants seven generations into the future. There is a clear understanding that every action has consequences for something and someone else, reminding us that we are all ultimately connected to creation and the Creator (Cawston, 2013). Every action has both an immediate and long-term consequence. Native American culture and life are organized around a highly refined awareness of the environment which we have sought to adopt in reACT by considering the life cycle of each and every piece of material and resource (Capra, 1982).

Indigenous people have been forced to adapt for survival after exploitation by colonial powers. Their decisions are made locally, based on the environment and available resources. We recognize that their decision-making models promote sustainable growth and development more harmonious with ecological systems than those from the western capitalist perspective. The reACT team supports IKS by agreeing that decision-making needs to be adaptive to new information as it emerges. reACT values the importance of sustainably living in harmony with all things.

The Native American model of keeping one foot in the past while making decisions that consider seven generations into the future can help industrialized societies begin the journey towards ecosystem-based decision-making and sustainability. The key to the Native American model is the intimate connection to nature, where decisions on resource use always includes nature. It is a fact that we cannot live without clean drinking water, yet this precious resource is treated as a commodity in capitalist decision making processes rather than a basic human right. For Native Americans, Mother Earth and her precious resources are not tradable or negotiable items. Team Maryland is aligned with the Native Americans' value for the Earth and its resources and these shared values are evidenced in reACT's carefully designed HVAC, water, solar, living green wall systems and open source SmartHouse software.

TARGET CLIENT NARRATIVE, HOW reACT RESPONDS TO THEIR NEEDS

Client History & Current Conditions

The net effect of colonization was stripping away of Native American identities, cultures and ways of life. The primary mission of US assimilation policies was to abolish all traces of traditional tribal cultures. The purpose was so that any Native Americans who survived violence, war, disease, loss of food, resources and their homelands would be absorbed into mainstream US society to eventually disappear. While the permanent and multigenerational effects of colonization include the loss of traditional lands, resources, languages, histories and traditions for many Native American tribes, some Native Americans secretly maintained their traditional practices. Their traditional resource management practices can be examined alongside ecosystem and adaptive management concepts that have been developed by western world scientists.

Tribal leaders are increasingly seeking sustainable housing and renewable energy technologies to provide their communities with cultural renewal, self-sufficiency, economic opportunity, and sustainable returns on investment that compliment tribal culture (Blandford et al., 2013; Office of Energy Efficiency and Renewable Energy, 2014). Moreover, a global Indigenous food movement was started with the Declaration of Atitlan in Guatemala (Indigenous Peoples' Consultation on the Right to Food, 2002). The declaration asserted that food sovereignty is a right for all Indigenous people, which includes finding ways to revitalized connections between themselves, the food of their ancestors, plants, animals, and place (Reinhardt, 2015). Native communities are actively building sustainable food systems in order to increase healthy food access and awareness in order to stimulate tribal economic growth and development as seen in the support granted by the [First Nations Native Agriculture and Food Systems Initiative](#) (ICMN, 2014). Revitalizing Indigenous cultures involves a careful relationship with local ecologies as well as food gathering and harvesting (Reinhardt, 2015). Restoring Native food systems is an immediate and fundamental need for the continued survival, and physical and spiritual wellbeing of Native peoples and Mother Earth – now and into the future. The costs of doing nothing – and the potential benefits of action – are massive.

Team Maryland is developing a lasting relationship with the Nanticoke Indian Tribe and the St. Croix Chippewa Indians of Wisconsin. Team Maryland's outreach and participation in the Solar Decathlon will raise awareness of Native American culture and ecological concerns to the greater American population. Most importantly, Team Maryland is negotiating agreements with the Lac Courte Oreilles Ojibwa Community College and the American Indian Higher Education Commission to co-develop curriculum in the areas of sustainability and green technology workforce development. A group of Ojibwa Community College students will intern with Team Maryland to bring their perspective to our project and to learn construction skills. Our Native American team members are also members of this community and are helping to realize long-lasting ties. Moreover, the University of Maryland's American Indian Student Union is working with reACT to further the ties to the Nanticoke. In bringing the reACT design to market, we hope to influence a partnering manufacturer to build a plant on or near the reservation where these homes will be manufactured using principles of "responsible industry" according to the Living Building Challenge and the Native American Seventh Generation decision making model.

Client Profile

The prototype for the Solar Decathlon 2017, has been developed for a household of two married adults, in their late 20's, with a baby on the way. While originally from Turtle Lake and enrolled members of the [St. Croix Chippewa Indians of Wisconsin](#), they are among the many Native Americans who live as expats from their traditional territory. While there are over 300 reservations in the U.S., more than two-thirds of Native Americans live in urban areas (Ogunwold, 2002). Urban Native Americans created new indigenous communities, different from the reservation-based communities, which face many challenges, but also possess significant strengths and resilience. Reservations are much more likely than urban settings to provide a culturally-grounded homeland with

familiar geographic features, a shared history, with plants and animals that form the basis for a traditional diet and source of medicines (Weaver, 2012). The relocation of Native Americans from many different tribes to urban locations has resulted in emerging multitribal urban Native communities, which has led, in some cases, to the development of a pan-tribal, but distinctly Native, identity.

Both spouses are employed by [The Herbal Garden Wellness Organization](#), a pan-Indian service organization. The wife is a Registered Nurse Dietician (RND), she directs the Nutrition Management project where she serves indigenous community members who suffer from diseases such as Diabetes II, Cancer, and Anxiety. Access to Native healthcare is a challenge for Urban Natives (Weaver, 2012). Tribal governments, urban Indian organizations, tribal food policy councils, and other community-driven groups are increasingly exploring comprehensive health and wellness policies and plans, the Herbal Garden Wellness Organization is an example of one. RDNs have tremendous potential to shape the public health landscape to advance American Indian and Alaskan Native health (Fleischhacker, 2015). Likewise, service providers can network with each other and work to connect programs that serve urban Native people as a means to alleviate some of the fragmentation in the service delivery system and community. A more unified service delivery system can strengthen community infrastructure and counteract isolation of community residents (Weaver, 2012).

The husband is a recent graduate of the [Lac Courte Oreilles Ojibwa Community College Extension Program](#), with a focus on sustainable agricultural practices. He directs the Community Gardens project where he helps urban indigenous communities to become healthy & well through sustainable organic community gardens using ancestral methods (Mehusiah, 2005). Both spouses are working to increase their family's and their clients access to healthy, nutritious foods, while reducing their reliance on commercially processed foods. Both are working towards establishing food systems that support indigenous self-determination, wellness, communities, families, economies and rebuild relationships with the land, water, plants and animals that sustain us.

There are a growing number of Native people and organizations in the United States both on and off tribal land committed to leading clean, sustainable, and culturally competent lives. A real-life example of this is [Monycka Snowbird](#) (Ojibwe) who, living in Colorado Springs' off tribal land, raises animals and indigenous plants to feed and make household products for her family and neighbors. She works with both Native and non-Native organizations throughout her region to educate and promote the benefits of urban food production, known in some places as backyard, micro, or urban farming. She leads educational classes for children and adults, including seed cultivation, plant recognition, harvesting, and livestock butchering (Walker, 2015).

Our young couple are expat registered members of the St. Croix Chippewa Indians of Wisconsin, a band of indigenous people called Ojibwe, itself a part of the Anishinaabe, the second largest ethnic group in North America. The challenge of our couple is how to live a meaningful Ojibwe lifestyle not only in an urban environment but in a completely different region of the country (Weaver, 2012). The Ojibwe are a woodland culture in the Great Lakes region who traditionally relied on the forest and waterways for their needs. Turtle Lake, where the reservation is located is at an elevation of 1171'. Denver is called the Mile-High City because its official elevation is exactly a mile above sea-level or 5280'. The city is in a semi-arid continental climate zone, whereas the traditional lands of the Ojibwe are found in watersheds around the Great Lakes. Our young couple considers the gardens and landscape surrounding their home a vital part of the residence as a whole. Their way of adjusting to their new urban lifestyle is based upon the land they are now in, thus they prefer to have reACT's garden and landscape embody the local and Native place.

The couple maintains their Ojibwe identity through *minobimaadiz*, a moral lifestyle that is in harmony with all of creation. It is achieved through the *Niizhwaaswi Mishomis Kinoomaagewinawaan*, or the Teachings of the Seven Grandfathers, an example of intergenerational knowledge. These teachings are passed down generation to generation in the "teaching lodge." Here elders teach the young are about Anishinaabe traditions, creation stories,

Grandfather Sun, Grandmother Moon, and Brother Sky as well as the central responsibility to care for and protect Mother Earth. Our couple communicate frequently with their friends and family still on the reservation and plan to travel back and forth between the city and the reservation for family matters and ceremonies (Weaver, 2012). The Teaching Lodge happens in the Spring and all generations share feasts and learn what their names represent, what medicines do, what the clans are, and what their responsibilities are (National Museum of the American Indian, 2017). When the baby is born our couple plans to make the Teaching Lodge an annual event so that their child has a real and enduring connection to the St. Croix Chippewa Band.

The Teachings of the Seven Grandfathers are moral values by which the Ojibwe live, that is, *Nibwaakaawin* (wisdom, intelligence, prudence), *Zaagidwin* (mutual love and zeal), *Manaadjitowaawin* (respect, honoring all creation), ***Aakodewin*** (bravery, facing a foe with integrity, doing what is right regardless of consequence, having a strong heart), *Gwekowaadiziwin* (honesty, righteousness), *Dibaadendizowin* (humility, know yourself as a sacred part of Creation, patience, compassion), and *Debwewin* (truth, honesty). Accordingly, we have to take care of Mother Earth or we will not have a home. We must all share in this responsibility. We need to make sure that Mother Earth and everything the Creator gave her will always be here for future generations. The Grandfathers teach how to take care of Mother Earth and each other.

reACT's sustainable and regenerative design principles are aligned with the Ojibwe way of life through promoting quality of life while simultaneously respecting Mother Earth and her sacred resources. The homes' design is a way for our couple to live ethically and culturally authentic. Despite its humble size, reACT enables families to incrementally build larger and more technologically advanced infrastructures, creating a home capable of evolving with its occupants. In addition, reACT's living systems and attention to optimizing resources by limiting waste are aligned with our couple's desire to reduce their negative impact on Mother Earth while living an urban life.

reACT's Aspirations

- Position reACT as an industry model, embracing principles of the *Living Building Challenge*, *Responsible Industry* and *Net Zero Waste* by exemplifying non-toxic, ecologically restorative, transparent, and socially equitable architecture
- Prove reACT's adaptability to a diverse range of climates, communities, construction technologies and ecological environments, as well as to other cultural and logistical variables such as building material supply chains
- Conserve resources via both active and passive heating/cooling, green mold-resistant wall prototypes, drip-irrigation, rainwater-catchment and greywater filtration systems
- Enable efficient manufacture, transport and assembly alongside flexible configuration, building sizes and forms via disentangled systems design
- Offer families building expansion/contraction options with easily upgradeable advanced technical infrastructure and features into their evolving homes (e.g. by adding multiple modules, PV arrays, SmartHouse control systems, composting toilets, dual-barrel composting, grey-water irrigation, and rain-catchment systems)
- Automate reACT's performance via detailed, physically based model data-driven by open source weather forecast feeds developed by Team Maryland student engineers
- Developing an open source computer model that includes first-principles description of solar irradiance, house PV array power output, nominal house energy-related loads, and thermal modeling of reACT and its HVAC system
- Transferring intellectual property to a like-minded housing industry partner, ready to bring to market reACT's prototypical DNA and flexible configurations

HOW reACT'S DESIGN DETAILS, MATERIAL, AND EQUIPMENT DEMONSTRATE APPEAL TO TARGET MARKET

Traditional ecological knowledge (TEK) does not take just one form. Indigenous communities have variable practices that keep them embedded in their cultures (Alexander, 2011). It is important to realize that there is not one model that we should be adopting but that specific applications should vary depending on the location of a community and how they have historically responded to their changing environment. Team Maryland is aware of the need to avoid lumping all traditional practitioners under one umbrella. There is not a one-to-one correlation between the degree of traditional ecological knowledge held by a community and whether the community is ranked as being sustainable (Alexander, 2011).

Native Americans and other indigenous communities have strong local cultural roots and even today are unwilling to forgo certain traditions for economic gain. We contend that there are many lessons to be learned from a people who have lived for several thousand years on their land, who lost their lands to colonists, but who adapted and survived to re-emerge as important drivers of natural resource policies today. Native Americans and Indigenous peoples are superb adapters who succeeded in retaining, and in some cases reclaiming, critical elements of their identities and cultures despite colonization.

System-based Approaches & Interconnected Relationships

Native Americans have survived and continuously adapted to the new challenges they face. However, colonization has had permanent consequences. Many Native Americans live well-below the poverty level. Suicide, drug and alcohol addiction, and domestic violence rates are higher for Native Americans than any other North American ethnic groups, symptomatic social characteristics reflected in nearly all communities that suffer long occupations by foreign armies (Weaver, 2012). Nonetheless, tribes continue to work to improve and protect their livelihoods, cultures and traditions, and many still practice a respectful and unique form of system-based approach to nature which humanize sustainability practices. Understanding this approach gives us clues how we can make sustainable choices while adapting to a changing environment. It also helps us to recognize that human beings cannot be removed from nature, nor nature from human beings.

A key element of humanizing sustainability practices is to have core values and cultures that are local or regionally placed and held by a community with a long history. Native Americans have these characteristics and have decision making practices aimed for the betterment of the community, as opposed to one individual. Thus, we contend, their practices are best practices for making ecosystem-based decisions and responding to disturbances that cycle through human landscapes (Cawston et al., 2013).

Learning through Living: SmartHouse Controls

Native Americans, and other indigenous communities, have the behavior and thinking that binds their traditional ecological knowledge-base and make them ideal sustainability managers. TEK represents experience acquired over thousands of years of direct contact with the environment (Bonny & Berkes, 2008). The culture and social drivers of Native Americans is an ideal model since they have lived within their environments and have accumulated many lessons more closely linked to their environments and where the knowledge is shared inter-generationally (Cawston et al., 2013).

reACT's SmartHouse Control system is based upon systems engineering that integrates HVAC, power, water and irrigation subsystems. It responds to climate data to direct architectural responses mimicking the manner in which practitioners of traditional ecological knowledge would manually respond. For example, the shading of the house will react to daylighting data to keep the house cool in the summer and warm in the winter. Another example would be, when weather data indicates rain, the system will shut off the drip-irrigation system. Moreover, the SmartHouse system allows for human interaction, a TEK master will be able to impart knowledge and practices to the system for even better architectural responses to climate conditions. A key innovation is the accessibility of

data from multiple house sensors and weather data for personal use and manipulation. reACT has developed and will demonstrate an open-source system whose software will be made freely available to the public.

Appliances

Energy Star. An interactive “Solar Attic Chambers” houses and dries clothes as well as drying (preserving) and even low-temperature baking of some food through the innovative repurposing available building components, in entirely new ways. Hotwater Heater, refrigerator, dish washer, stove top, microwave, washing machine.

Materials

sustainably sourced. The home incorporates diverse native materials with significance to the diverse indigenous landscapes and Biome's of America. More importantly, the life cycle of each material has been considered with the intent of optimizing resources by limiting waste. Building materials and equipment are largely recycled and sustainably sourced to abide by the Seventh Generation principle.

Well-being

It is well documented that reducing stress and eating non-processed organic foods increases health and well-being. According to the Living Community Challenge, creating environments that optimize physical and psychological health and well being is essential.

- Elements such as engaging with nature is important for reducing stress (Green, 2011).
- Architectural daylighting and access to unfiltered sunlight increase mood and have benefits such as raising vitamin D levels (Rockcastle, 2017).
- Growing one's own food organically produces more nutritious meals with less exposure to the heavy metals in fertilizers and pesticides used in commercial farming operations.
- Herbs and berries, especially important in the traditional Native American diet, have also been identified as sources of various phytochemicals, many of which possess important antioxidants (Dragland, 2003).
- Honoring cultural heritage in the arts, cuisine, and sports is another way of grounding the individual in a place (Living Community Challenge, 2017).

The Three Sisters

Native Americans are considered to be the first ethnobotanists of the Americas (Anderson 2009). The Western Hemisphere provided the world with at least 60% of the foods we know today, e.g., okanacosimaan (squash), opiniig (potatoes), mandaamin (corn), (bagaanag) peanuts, mashkodiisimin (beans), ookwemin (cherries), mitigominan (acorns), miinan (blueberries), miskominikaa (raspberries), ode'iminan (strawberries), and anishinaabeziinzibaakwad (maple sugar) (Crosby, 1972). Native Americans value harvesting most of their cultural foods from nature while the average westerner gets their organic food from the grocery store.

The “[Three Sisters System](#)” is a Native American agricultural innovation of companion planting. Perhaps the most well known example of this technique, it is where squash, corn and climbing beans grown together support each other in many beneficial ways. The three crops create a system whereby water need is minimized, fertilizers are unnecessary, efficient use of space to grow these crops, and natural microenvironment for beans and squash to grow where normally they couldn't (Braun, 2017). Climbing or pole beans wrap upwards around the corn stalks, while the large squash leaves help to keep competitive plants out and shade the ground, and therefore provide moisture and protection for the corn roots. A properly maintained garden of Three Sisters can help ward off night-time visitors such as raccoons, deer, and rabbits because of the densely grown vegetation and can provide shelter for birds (Mihesuah, 2003). reACT's vegetable garden highlights the use of this system. Companion planting was practiced in various forms with various plants by the indigenous peoples of the Americas prior to the arrival of Europeans. Today, it is a technique often used in organic growing. Native organizations such as the [Hopi Tutskwa Permaculture Institute](#), teach the companion technique as part of its programs to pass knowledge to future

generations and rebuild culturally sustainable and healthy communities.

Living Systems

Team Maryland recognizes the importance of indigenous peoples' connection to the land and sacred resources: earth, water, wind, and sun. The living systems within and surrounding reACT are considered an extension of the building and a vital part of the residence as a whole. We have brought the Earth into the house by incorporating portable living green walls and outdoor living spaces. Our commitment to water protection is evident in our water systems design, where each drop of water is accounted for and reused or recycled. reACT features a built interior surrounding a spacious glazed courtyard that acts as a greenhouse for our movable green walls in winter. In honor of our clients' sensibilities the building's design makes specific celestial references, such as an east-facing main entrance and the courtyard that opens to the sky. By recalling the natural environment, reACT's design embodies the theme of returning to a Native place.

Access to food, food stability and affordability are severely limited for many Native American communities. Many communities are disconnected from their food sources both in knowledge and in distance. Restoring Native food systems is an immediate and fundamental need for the continued survival as well as physical and spiritual well-being of Native peoples and our Mother Earth – now and into the future. The costs of doing nothing – and the potential benefits of action – are massive. Studies show food stability, affordability, and access is severely limited for Native communities. According to a report from the USDA's Economic Research Service released in December, 2014 just 25.6 % of all tribal areas were within a mile's distance from a supermarket, compared with 58.8 % of the total U.S. population (Kaufman, 2014). reACT's living systems contribute to the sense of place, food security, and the understanding of responsibility towards sustainable produce.

reACT's living systems include an interior hydroponic wall demonstrating how herbs and greens can be grown year round and minimize water use; an exterior vegetable garden demonstrating the Three Sisters system and how a kitchen garden can be sustained in an urban environment; two movable green walls demonstrating vertical gardening and wellness to be achieved through aromatherapy and connection to nature; as well as exterior landscaping that demonstrate the principles of xeriscape gardening.

Various water systems are used for different applications, e.g., the interior vertical hydroponic garden demonstrates one method of water conservation by using a closed-loop subsurface irrigation system with small amounts of trace minerals and nutrients. Leafy greens, salad greens, small herbs and small edibles will be grown using this system which will be placed in the kitchen. This growing system only uses as much water as the plants need and recirculates water to minimize water usage. By installing it indoors, edibles can be grown year-round and further limits the need for water replacement because there will be less evaporation in the climate controlled interior. Our hydroponic system dramatically reduces the amount of nutrients required to grow these edible plants, and does not require pesticides or herbicides. Our hope is to use recycled grey water for the hydroponic system, which will reach non-potable re-use standards.

Water is a valuable limited resource, so, in order to conserve it, landscaping benefits from xeriscape techniques. Essentially, xeriscape design achieves water conservation. The guiding principle is utilizing plants and designs that reduce the amount of applied water and maximize the use of natural precipitation. Techniques include: choosing soil that drains quickly and stores water simultaneously; choosing regionally-specific, native plants; using mulch or plants that shade the soil (such as in the Three Sisters System); using soaker-hoses or drip-irrigation systems to avoid overwatering and evaporation; not cutting turf too short and reducing its footprint as much as possible. Low maintenance is an added benefit of a xeriscape garden. Wherever possible reACT's landscape utilizes xeriscape and uses rainwater supplemented with gray-water filtered from the house for drip-irrigation. Moreover, reACT's SmartHouse System will monitor weather data in order to control the drip-irrigation actions.

Dismountable green-wall panels and planted trays can travel between the exterior and inside the greenhouse (courtyard) for protection from frost and inclement conditions. These vertical gardens will grow a mix of aromatic plants. There are numerous wellness benefits in less clement seasons as well, when the walls live inside the greenhouse; the indoor human-nature connection and the plants chosen for their aroma therapeutic qualities will aid in improving both physical and psychological well-being. Inside the courtyard, the plants will also have the ability to work to improve indoor air quality and create a more nature connected indoor atmosphere for residents.

reACT's living systems are designed to aid homeowners in their understanding of food producing plants and their production techniques, especially in relation to water usage and waste. The exterior barrel-composter allows for homeowners to minimize waste from food scraps and maximize the potential nutrients for the exterior landscape gardens, all the while raising the homeowners' awareness of their agency to cycle leftover nutrients from their edible plants to the soil and then back into their plants. The living systems plan demonstrates the integration of sustainable innovations possible for ethically producing local food, and improving food security in low-socioeconomic communities. By creating sustenance for homeowners on site, the ecological footprint of their eating habits will be reduced dramatically.

Another important role of the living systems is to aid the formation of functional food webs around the exterior of the house. By bringing in a diverse array of plant and soil life, we hope to encourage thriving communities of beneficial microbes, insects, and other pollinators that create stable and diverse food webs. By creating habitat for these smaller organisms, we allow for larger organisms to move back into their natural habitat. Creating these functional food webs in close proximity to our house praises and honors these important creatures that allow us to survive. No matter where reACT is placed geographically, vegetation shall be tweaked to fit the biome and corresponding food webs indigenous to that locality. The main goal of living systems is to create a sense of harmony and balance between the house, its human residents and the surrounding ecosystems, which we feel is a fundamental step that humanity must take in order to evolve into a sustainable future where we live in symbiosis with the living systems around and within us.

Diet

The Solar Decathlon 2017 Home Life Contest calls for Hosting two dinner parties for neighbors and VIP guests. Team Maryland has created two separate menus (see Appendix IV) from traditional Ojibwe recipes. Team Maryland recognizes that these menus are not what tribal members normally would eat. They are constructed for two purposes. First, to recognize the work of the [Decolonizing Diet Project](#) (DDP) and the [Native American Culinary Association \(NACA\)](#) to work with native foods to reclaim Indian identity through food, landscape and health. Our menus have tried to follow the guiding principle that cuisine is a reflection of specific indigenous food ingredients and landscapes (Choi, 2016). Thus, wild rice and blueberries are highlighted on the menu since they are ingredients that not only match the Ojibwe country landscape, but also have deep historical and cultural meaning to the Tribe(Norrgard, 2009).

The Decolonizing Diet Project (DDP), at the Northern Michigan University Center for Native American Studies, was an exploratory study of the complex relationships between humans (Ojibwe) and the Indigenous foods of the Great Lakes Region in the United States, the traditional homeland of the Anishinaabe (Reinhardt, 2015). Insight into the biological, cultural and legal/political dimensions of these relationships resulted. Findings demonstrated that the most common traditional foods were wild rice, corn, sunflower, squash, pumpkin seed flour, blueberries, cranberries, blackberries, raspberries, wild leeks, pinto beans, green beans, great northern beans, black beans, maple syrup, sweet potatoes, pecans, duck eggs, turkey, bison, venison and multiple varieties of fish. Spices included sea salt, dried sweet fern, leek salt, sunchoke powder, ground lambs quarter seeds, sumac, grasshopper, and wood sorrel. Salads, salsas, soups, casseroles, roasts, breads, muffins, pancakes, waffles, puddings and cookies

were made from these foods. Overall, the health benefits of eating DDP menus were significant changes in weight, girth, overall cholesterol, LDL, and Triglycerides. Recommendations for future studies included coupling the diet with Indigenous gardening techniques to increase sustainability (Mihuseh, 2005). Perhaps the most important result was to prove that the relationships between humans and Indigenous foods must and can be strengthened along with connections to past and future generations (Reinhardt, 2015).

Our second purpose is to inspire a conversation with our Solar Village neighbors about the role of food in tribal culture, history, ceremony, and self-determination, or as Enos (2002) defines deep sovereignty. It is our hope that our neighbors will leave with a better understanding of the impacts of climate change on the food and landscape of the Ojibwe tribe, especially highlighting endangered plants.

Water

Water is sacred to American Indians as it should be to all humanity. The Water Protector Movement has grown out of the North Dakota Access Pipeline protests. In a recent interview, Native American activist [Raymond Kingfisher](#) stated: "One of the things that we accomplished at Standing Rock was that we became aware of all of the water issues. We learned a lot of things about the environment and the laws that were pertaining to treaty rights and how to do civil disobedience. So it was a learning process. From all that education, we learned about solar energy. We learned a lot of new things that we never learned about, being native. So now, as the movement goes, since we all were forcefully moved out of camp, a lot of the groups, different groups are branching off and going out and making different camps throughout the United States. These camps are resistance camps that are resisting against pipelines, corporations, oil, fossil fuel corporations, all these different industries that are ruining our water and polluting our land." (Ortiz, 2017) The solution to protecting water is to move to sustainable energy sources like solar that can be harvested from nature without threatening and impacting other gifts of Mother Nature.

Water is an especially scarce resource that societies cannot survive without and where current patterns of climate change is altering who owns it. This year's Solar Decathlon competition features a juried component where water conservation and re-use methods will be judged. reACT emphasizes remedies to potable water scarcity through careful design considerations and research of existing water filtration components.

The first design solution is rainwater catchment and a filtering system to achieve potable quality standards. The second solution is greywater filtration also to actualize potable re-use. We recognize that rainwater and greywater are different types of water. reACT features technology that separates the two grades of water based on its quality then channeling it to appropriate filtration that will process it for re-use. Separating the two types of water helps guarantee the potable quality of filtered water. Furthermore, Team Maryland will be conducting immediate tests of our filtered water to ensure that it meets potable standards. We will also be sending our water samples to an EPA-certified lab for double verification. reACT acknowledges that water is a scarce resource, but we also want to guarantee the safety of the filtered water.

The methods in developing a filtration system required the identification of several things; different types of water coming from a residential household, necessary filters to take out different sized particles, components inside the water, and the typical residential household water budget. The goal of the design is to filter light grey-water coming from the house and filtering that to potable standards. The purpose of this design is to incorporate it into a community structure where the costs will be paid back in the future.

HVAC

The goal of reACT's HVAC design is to make cooling and heating affordable. By integrating a state-of-the-art most efficient variable refrigerant flow (VRF) air-conditioning system and heat pump water heater system (HPWH) with the courtyard solarium, reACT is able to provide comfort efficiently and affordably. In modern society, air

conditioning has become a necessity due to the large demand for residential thermal comfort and healthy environment of the living space (Aynur, 2010). However, air conditioning is a heavy draw on any home's electrical power source. reACT's VRF and HPWH systems reduce this cost by being installed in the solar attic adjacent to the courtyard solarium where they can absorb heat that is passively produced in the courtyard. Moreover, the Energy Recovery Ventilator (ERV) recovers energy from vent air and returns fresh air to the home supplementing the efficiency of the cooling system.

For heating, these systems are prepared for severe Winter Storms. These systems harness heat from the solarium so that even in severe winter temperatures, reACT can efficiently provide enough heating to the house. In the event of severe cold, the systems utilize naturally passive preheated air from the solarium mixing it with ambient air to mildly condition it to a comfortably warm temperature.

REFERENCES

- Alexander, C. et al. (2011) Linking indigenous and scientific knowledge of climate change. *BioScience* (61), 477-484.
- Anderson, K. (2009) *Traditional ecological knowledge: An important facet of natural resource management*. National Resource Conservation Services, USDA.
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1045244.pdf
- Aynur, T. (2010) Variable refrigerant flow systems: a review. *Energy and Building*, 42(7), 1106-1112.
<https://doi.org/10.1016/j.enbuild.2010.01.024>
- Berkes, F. (1992) *Sacred Ecology: traditional ecological knowledge and resource management*. Philadelphia, PA: Taylor & Francis.
- Berkes, F., et al. (2000) Rediscovery of traditional ecological knowledge as adaptive management. *Ecological Applications*, 10, 1251-1262.
- Blandford, M., et al. (2013). Building Green and Respecting Native American Identity: Housing, culture and sustainability in Native American communities. *Community Investments*, 25(2), 13-17.
https://www.huduser.gov/portal/SCinIC/Building_Green.pdf
- Bonny, E. & Berkes, F. (2008) "Communicating Traditional Environmental Knowledge: Addressing the Diversity of Knowledge, Audiences and Media Types." *Polar Record* 230(230): 243-54.
- Brand, R., & Karvonen, A. (2007). The Ecosystem of expertise: Complementary knowledges for sustainable development. *Sustainability: Science, Practice, & Policy*, 3(1), 21-31.
- Braun, L. (2017) *Three Sisters Agriculture and how it can create more sustainable agricultural systems*.
<https://duesllc.wordpress.com/2017/03/06/three-sisters-agriculture-and-how-it-can-create-more-sustainable-agricultural-systems/>
- Capra, F. (1982) *Uncommon Wisdom*. Toronto, ONT: Bantam.
- Cawston, R. et al. (2013). *The River of Life: Sustainable Practices of Native Americans and Indigenous Peoples*. Berlin: De Gruyter.
- Chhetri, N. & Chhetri, N. (2015) *Alternative Imaginations: Examining Complementarities across knowledge systems*. In *Indigenous Innovation: Universalities and peculiarities*. Rotterdam: Sense Publishers. 11-23.
- Choi, H. (2016) 'Going Green' Is Really 'Going Native': Western Apache Chef Nephi Craig. *NPR Codeswitch: Race & Identity, Remixed*. Podcast: April 4, 2016.
<http://www.npr.org/sections/codeswitch/2016/04/04/470071043/going-green-is-really-going-native-western-apache-chef-nephi-craig>
- Crosby, A. (1972) *The Columbian Exchange*. Westport CN: Greenwood.
- Divina, F., and M. Divina (2010) *Foods of the Americas: Native Recipes and Traditions*. Berkeley, CA: Ten Speed.
- Dragland, S. et al. (2003) Several culinary and medicinal herbs are important sources of dietary antioxidants. *The Journal of nutrition* 133(5). 1286-90.
- Enos, A. (2002) *Deep Sovereignty: Education in Pueblo Indian Communities*. Paper presented at the *Annual Meeting of the National Indian Education Association*. Albuquerque, NM.
- Fleischhacker, S. (2015) Emerging Opportunities for Registered Dietitian Nutritionists to Help Raise a Healthier Generation of Native American Youth. *Journal of the Academy of Nutrition and Dietetics*, 116(2), 219-225.
<http://dx.doi.org/10.1016/j.jand.2015.10.018>

- Gordon, J. (1993) Ecosystem Management: An Idiosyncratic Overview. In Aplet, G. *Defining sustainable forestry*. Covello, CA: Island Press. 240-244.
- Green, J. (2011) Research Shows Nature Helps With Stress. *The DIRT: Uniting the Built Environment with Natural Environments*. <https://dirt.asla.org/2011/09/08/research-shows-nature-helps-with-stress/>
- Hertzler, R. (2011). *The Mitsitam Cafe Cookbook: Recipes from the Smithsonian National Museum of the American Indian*. Golden, CO: Fulcrum.
- Hess, C., & Ostrom, E. (2007) *Understanding knowledge as a commons*. Cambridge, MA: MIT Press.
- ICMN (2014) First Nation Development Institute Awards \$400K to 12 Native Food-Systems Projects. *Indian Country Today*, June 3. Accessed June 30, 2017. <https://indiancountrymedianetwork.com/news/business/first-nations-development-institute-awards-400k-to-12-native-food-system-projects/>
- Indigenous Peoples' Consultation on the Right to Food (2002) *Declaration Of Atitlán, Guatemala*. http://cdn5.iitc.org/wp-content/uploads/2013/07/FINAL_Atitlan-Declaration-Food-Security_Apr25_ENGL.pdf
- Institute for Government Research (1928). *The Problem of Indian Administration*. Baltimore: Johns Hopkins Press. <http://www.narf.org/nill/resources/meriam.html>
- International Living Future Institute (2014). *Living Building Challenge, 3.0*. <https://living-future.org/lbc/>
- (2017) *Living Community Challenge, 1.2, Standard*. <https://living-future.org/lcc/>
- Kaufman P, et al. (2014) Measuring access to healthful, affordable food in American Indian and Alaska Native Tribal areas. *US Department of Agriculture Economic Research Service Economic Information Bulletin Number 131*. Washington, DC: US Department of Agriculture Economic Research Service. <https://www.ers.usda.gov/publications/pub-details/?pubid=43908>
- Levi-Strauss, C. (1962) *The Savage Mind*. London, UK: Weidenfeld and Nicholson.
- Lewis, D. (1995) Native Americans and the environment: A survey of Twentieth-Century Issues. *American Indian Quarterly*, 19(3), 423-450.
- McGregor, D. (2004) Coming Full Circle: Indigenous Knowledge, Environment, and Our Future. *American Indian Quarterly*, 28(3-4), 389-410.
- "Medicines of the Turtle Mountain Chippewa." *Turtle Mountain Chippewa Heritage Center*. <http://www.chippewaheritage.com/heritage-blog/medicines-of-the-turtle-mountain-chippewa>. Web. 15 Apr. 2017.
- Mihesuah, D. (2003) Decolonizing Our Diets by Recovering Our Ancestors' Gardens. *American Indian Quarterly*, 27(3/4), 807-839.
- (2005). *Recovering our ancestors' gardens: Indigenous recipes and guide to diet and fitness*. Lincoln, NE: University Press.
- NativeTech: Indigenous Food and Native American Recipes* (2017). <http://www.nativetech.org/recipes/index.php>
- Norrgard, C. (2009) From Berries to Orchards: Tracing the History of Berrying and Economic Transformation among Lake Superior Ojibwe. *American Indian Quarterly* 33(1), 33-61. <http://www.jstor.org/stable/25487918>
- Office of Energy Efficiency and Renewable Energy (2014). *Energy Department Announces Up to \$7 Million to Expand Clean Energy and Energy Efficiency on Tribal Lands*. Retrieved from

https://energy.gov/eere/articles/energy-department-announces-7-million-expand-clean-energy-and-energy-efficiency-tribal?utm_source=PA934&utm_medium=email&utm_campaign=ProgressAlerts

- Ogunwole, S. (2002) *The American Indian and Alaska Native Population: 2000*. Washington, DC: US Census Bureau.
- Ojibwe Indians (2017). Michigan State University Department of Geography, Environment, and Spatial Sciences. <http://geo.msu.edu/extra/geogmich/ojibwe.html>.
- Ortiz, E. (2017) After #NoDAPL, 'Water Protector' Movement Continues with Resistance Camps Across the U.S. *Truthdig*. Apr 21. http://www.truthdig.com/avbooth/item/nodapl_movement_continues_with_resistance_camps_across_us_20170421
- Paris, D. & Samy Alim, H. (2017) *Culturally Sustaining Pedagogies : Teaching and Learning for Justice in a Changing World*. New York: Teachers College Press.
- Reinhardt, M. (2015). Spirit Food. In *Indigenous Innovation*. Sense Publishers, 81-105.
- Rist, S. & Dahdouh-Guebas, F. (2006) Ethnoscience—a step towards the integration of scientific and indigenous forms of knowledge in the management of natural resources for the future. *Environment, Development and Sustainability*, 8, 467-493.
- Rockcastle, S. (2017) *Perceptual dynamics of daylight in architecture*. PhD dissertation. Switzerland: Ecole Polytechnique Federale de Lausanne.
- Sarewitz, D. & Pielke, R. (2007) The Neglected heart of science policy: Reconciling supply of and demand for science. *Environmental Science*, (1), 5-16.
- Simpson, L. (2004) Anticolonial Strategies for the Recovery and Maintenance of Indigenous Knowledge. *The American Indian Quarterly*, (28/3), 373-384. Project MUSE, [doi:10.1353/aiq.2004.0107](https://doi.org/10.1353/aiq.2004.0107)
- United Nations Conference on Environment and Development. (1992) *The Global Partnership for Environment and Development : A Guide to Agenda 21*. Geneva: UNCED.
- U.S. Nuclear Regulatory Commission. (2014) [The Tribal Protocol Manual](#).
- Vogt, K. et al. (2010) *Sustainability unpacked: Food, energy and water for resilient environments and societies*. UK: Earthscan.
- Weaver, H. (2012) Urban and Indigenous: The Challenges of being a Native American in the City. *Journal of Community Practice*, 20(4), 470-488. <http://dx.doi.org/10.1080/10705422.2012.732001>

APPENDIX I: HISTORICAL PERSPECTIVE ON U.S. & TRIBAL RELATIONS

One of the more important messages to take away from this Appendix is that tribes are unique governmental entities. Each of the 566 Federally-recognized tribes is a sovereign nation and has its own customs, cultures, concerns, interests and needs. Moreover, there are eighteen states which have agency programs to evaluate and recognize American Indian tribes and organizations for the purpose of providing aid or assistance. However, there are Pan-Indian wrongs and traumas that we are currently trying to address and be sensitive to.

St. Croix Chippewa Indians of Wisconsin re-gained their federal recognition under the Indian Reorganization Act. The Nanticoke Indian Tribe's territory covers Delaware and Maryland's Eastern Shore and is state-recognized by Delaware. The Piscataway Indians' territory covers most of what is now the DC metropolitan area. The Piscataway Conoy Tribe is recognized by the State of Maryland.

[Shaping The Relationship Between Tribes And The Federal Government \(excerpted from U.S.NRC. \(2014\) *The Tribal Protocol Manual*\)](#)

This outline provides a framework to discuss the evolving relationship between Native American tribes and the Federal government, and identifies important events that have shaped this centuries-old relationship.

The relationship that exists today between the Federal Government and Native American tribes developed over hundreds of years. It spans the arrival of Europeans in the 15th and 16th centuries, evolved through the American Revolution and the War of 1812, and continues through various eras defined by Federal actions, legal decisions by the courts, wars, and other watershed events throughout the 19th and 20th centuries. This complicated relationship evolved as the Federal government enacted treaties, laws and policies to clarify the relationship between the Federal government and the various Indian nations, often reflecting the national interests of particular time periods.

The following chronology is intended to trace at least seven distinct eras, as viewed by historians, of the United States and Native American relations. These are:

Treaties (1608-1870)

A treaty is a formal, written contract that defines the terms of an agreement between two sovereign nations. Treaties were the legal instruments by which the British and colonial governments defined United States-American Indian relations. Between 1607 and 1776, Indian Tribes entered into 175 treaties with the British and colonial governments. Article II, Section 2, Clause 2 of the United States Constitution authorizes the President, with the consent of Congress, to enter into treaties with Indian Tribes and thus govern the conduct of the Government in Indian relations. From 1787 to 1868, the U.S. government ratified 371 such treaties with Native American Tribes; no treaties have been ratified since 1868.

Removal (1830-1850)

Congress passed the Indian Removal Act which allowed and funded the removal of members of the Chickasaw, Choctaw, Creek, Seminole and Cherokee Nations from their lands. This legislation "was to provide for an exchange of lands with the Indians residing in any of the States or territories, and for their removal west of the river Mississippi." President Andrew Jackson, an advocate of Indian Removal policy, oversaw this significant change in United States policy and law concerning the rights of Native Americans to practice their traditional ways of life in their homelands. The legislation in effect allowed the removal of Indian Tribes to western territories to allow non-Native American populations to move into the southeastern United States formerly occupied by those Tribes. The Choctaw Nation was the first to be removed in 1831 followed by the removal of the Seminole Nation in 1832, by the Creek Nation in 1834, the Chickasaw Nation in 1837, and finally removal of the Cherokee Nation in 1838. The Cherokee call their journey to Oklahoma the "Trail of Tears;" it has been estimated that approximately 4,000 of the 15,000, nearly 1/3, relocated Cherokee died en route to Oklahoma. Historians have recognized that many Native Americans suffered from exposure, disease, and starvation while en route to their

western destinations.

Reservations (1850-1871)

Reservations are parcels of land allocated by the Federal government to the Indian Tribes for their use and management as sovereign entities. Tribal reservations were created when Indian Tribes that were relocated from their traditional homelands were relocated again to a more western territory. The Indian Appropriations Act of 1851 (formally referred to as the Appropriation Bill for Indian Affairs) allocated monies to move Tribes onto newly created reservations. Contemporary legislators and policy makers described reservations as a means to protect the Indian Tribes from encroachment by white settlers moving westward. The very Tribes being protected were often those who had earlier been removed to the western territories in the 1830s. Indian Tribes were strongly opposed to this Federal policy that sought to impose an agrarian, geographically restricted way of life on Indian populations.

Assimilation (1871-1928)

With the passage of the Dawes Act of 1887, the Federal government policy dramatically shifted from the allocation of communal (Tribal-owned) reservation lands to the assimilation of Native Americans into “mainstream” American society. This Act granted privately held landholdings to individual Indians, thus replacing the extensive communal Tribal holdings. Reservations were subdivided into smaller parcels to encourage Indians to engage in an agricultural economy (160 acres were allotted to families and 80 acres were allotted to individual persons). Other assimilation policies included educating Native American children in government boarding schools, which involved taking children from their families. The government run schools forbid the use of Native American languages and the practice of traditions, customs and religious ceremonies, and discouraged family visits. Tribes consider the Dawes Act to be one of the most destructive laws enacted by the U.S. government. The Indian Citizenship Act, granted U.S. citizenship to Native Americans in 1924. Although the 1924 Act granted Federal citizenship rights to Native Americans, many did not achieve full citizenship and suffrage rights until 1948. According to a survey by the Department of Interior, seven states still refused to grant Indians voting rights as late as 1938.

At the request of the Secretary of the Interior, on June 12, 1926, the Meriam Commission was charged with investigating the affairs of Indians living on reservations in the United States. The Meriam Commission was financed by the Rockefeller Foundation, not by any government agency or agent, in an effort to maintain unbiased standards for the survey. The investigation evaluated nearly all reservations and specifically examined the educational, industrial, social, and medical activities of the Bureau of Indian Affairs, as well as Indian property rights and economic conditions. The Meriam Commission identified significant deficiencies in the educational, industrial, social, and medical systems on Indian reservations in 26 States. The Meriam Report of 1928, [*The Problem of Indian Administration*](#), took aim at Indian boarding schools and recommended a shift in focus away from boarding facilities due to the substandard diet, education, and clothing they provided. “The survey staff finds itself obligated to say frankly and unequivocally that the provisions for the care of the Indian children in boarding schools are grossly inadequate.” Although the general abandonment of boarding schools did not take place until the 1970s, the Meriam Report led to the implementation of new Federal policies affecting Native Americans. The policies of the Assimilation era came under increasing attack with publication of the Meriam Report of 1928.

Reorganization (1928-1942)

Congress passed the Indian Reorganization Act of 1934, also known as the Wheeler-Howard Act, in order to implement reforms recommended following the Meriam Report. The Reorganization Act was enacted to decrease the Federal control of Indian affairs and to increase Indian self-government and responsibility. Significant parts of the law were the curtailment of the allotment of Tribal lands to individual Indians and restrictions on the alienation of allotted and Tribal lands. The Indian Reorganization Act provided economic development of Tribal lands and

resources by establishing the rights of Tribes to establish businesses and other organizations, to establish a Tribal credit system, to home rule, and to provide vocational education and training to Tribes. The Indian Reorganization Act is considered by many Tribes and historians to be a cornerstone for independence of and self-determination by Native American Tribes.

Termination (1943-1968)

The Termination era marks another major shift in Federal policy concerning Native Americans. House Concurrent Resolution 108 stated, "it is the policy of Congress, as rapidly as possible, to make the Indians within the territorial limits of the United States subject to the same laws and entitled to the same privileges and responsibilities as are applicable to other citizens of the United States, to end their status as wards of the United States, and to grant them all of the rights and prerogatives pertaining to American citizenship;" H. Con. Res. 108 states that certain Indian Tribes and individual Indians "should be freed from Federal supervision and control and from all disabilities and limitations specially applicable to Indians: The Flathead Tribe of Montana, the Klamath Tribe of Oregon, the Menominee Tribe of Wisconsin, the Potawatomie Tribe of Kansas and Nebraska, and those members of the Chippewa Tribe who are on the Turtle Mountain Reservation, North Dakota." This resolution served to "effectively terminate Federal trust protection of American Indian reservation lands." This policy dismantled tribal governments. Termination greatly undermined the trust relationship between the Federal government and Native Americans.

This resulted in the immediate withdrawal of all Federal aid, services, and protection, as well as the end of reservations for affected Indian Tribes. Terminated Tribes became subject to State laws, their reservation lands could be sold to non-Indians, and the Act in effect, reversed many of the economic and educational reforms that had been implemented during Reorganization. The relocation of Tribal people from Native communities into larger, commercial U.S. cities became a general trend after World War II.

Due to Alaska's late arrival to statehood status, Native American issues played out differently there. As Alaska did not become a State until 1959, Alaskan Tribes were not considered in the Termination Policy in 1953. The discovery of oil in the Kenai Peninsula and Cook Inlet regions in 1957 and along the North Slope in 1968, brought the subject of native land ownership to the head of a conflict over State land selection. During this time frame, Alaskan Tribes were represented by the Alaska Federation of Natives, who lobbied tirelessly for a fair land claims settlement act and which resulted in the Alaska Native Claims Settlement Act. Signed into law by President Richard Nixon on December 18, 1971. Tribal sovereignty was ended with the ANCSA and all Native rights were subject to State law. The Tribal village corporations owned only the surface of the selected land, minerals located below the surface belonged to the regional corporations.

Self-Determination (1968-present)

President Richard Nixon emphasized the importance of Tribal self-determination after pointing out the failure of the Termination policy in his Special Message on Indian Affairs speech. President Nixon condemned forced termination and recommended that U.S. policies concerning Indians should serve "to strengthen the Indian sense of autonomy without threatening his community." The trust relationship between Native Americans and the United States government was reaffirmed and financial support for Tribes guaranteed. The passage of the Indian Self-Determination and Education Assistance Act in 1975 was a milestone in U.S.-Indian relations. The Act acknowledged the right of Tribal governments to contract with the U.S. government and to determine how to spend appropriated Federal funds for the benefit of their Tribal members.

At the present time, Tribes actively assert their sovereign rights and have achieved greater political and economic independence through Tribal self-determination. Despite heightened Tribal and cultural awareness, Tribal assertiveness, and Federal Executive Orders and judicial rulings supporting these changes, many Tribes are discouraged by particular Federal policies or positions, a lack of adequate appropriations for Indian programs, and

the perception of cultural insensitivity on the part of the Federal government.

APPENDIX II: ACT TO RECOGNIZE THE NANTICOKE INDIAN TRIBE

AN ACT TO AMEND TITLE 29 OF THE DELAWARE CODE TO RATIFY, DESIGNATE, AND FORMALLY RECOGNIZE THE NANTICOKE INDIAN TRIBE AS AN AMERICAN INDIAN TRIBE IN THE STATE OF DELAWARE.

WHEREAS, the Nanticoke Indian Tribe (“the Tribe”) is a sovereign American Indian Nation made up of the Nanticoke people; and

WHEREAS, the Tribe’s ancestors lived in what is now the County of Sussex, and many descendants of the Tribe continue to live in the County of Sussex and elsewhere in Delaware; and

WHEREAS, the Tribe has been recognized by the State of Delaware, dating to at least 1881; and

WHEREAS, the members of the Nanticoke Indian Tribe living in Sussex County were first recognized by Act of the General Assembly in 1881, 16 Del. Laws, ch. 359, and said Act granted to the Nanticoke Indian Tribe a corporate charter with the power to establish and manage its own school district for members of the corporation, and to admit new members to the corporation; and

WHEREAS, since 1903 the General Assembly has permitted members of the Nanticoke Indian Tribe to “appear before any justice of the peace or notary public of this State and, on the evidence and proof that such person belongs to or is a descendant of the Nanticoke Indians, may procure from such justice or notary a certificate reciting such facts,” 22 Del. Laws ch. 470, codified at 29 Del. Code §105; and

WHEREAS, the Nanticoke Indian Association was incorporated as a nonprofit organization on February 23, 1922; and

WHEREAS, § 105(b) of Title 29 of the Delaware Code further provides that “descendants of the Nanticoke Indians . . . shall be recognized as such within this State”; and

WHEREAS, §§ 5404 and 5406 of Title 7 of the Delaware Code establish a committee to oversee the “treatment and disposition” of Native American remains discovered within the state of Delaware, and that said committee shall consist of, among others, “the Chief of the Nanticoke Indian Tribe [and] two members appointed by the Chief”; and

WHEREAS, in 1937 the General Assembly declared that any child entitled to membership in the Nanticoke Indian Tribe, or who has a parent or parents who are entitled to membership in the Nanticoke Indian Tribe, may attend school established for Indians, 41 Del. Laws ch. 174; and

WHEREAS, § 3131(a) of Title 16 of the Delaware Code permits an “American Indian” to, upon providing “substantiating documentary proof” that includes, “but is not limited to, an affidavit satisfactory to the State Registrar or any local registrar and signed by the Chief of the tribe that according to tribal records the person whose certificate is to be amended is a member of the tribe of the Chief whose signature appears on the affidavit,” amend his or her birth certificate to reflect his or her status as an American Indian; and

WHEREAS, the Delaware Department of Justice has repeatedly represented to the Indian Arts and Crafts Board of the United States Department of the Interior that the Nanticoke Indian Tribe is the “only Indian Tribe Recognized by the State of Delaware”; and

WHEREAS, the United States Census Bureau designated the Tribe as a “state designated tribal statistical area” for the 2010 Census; and

WHEREAS, the Nanticoke Indian Tribe maintains a museum in the Town of Millsboro to celebrate its heritage and educate the public about its history and culture; and

WHEREAS, the General Assembly finds that longstanding legislative and cultural history of the Nanticoke Indian Tribe in the state of Delaware entitles the Tribe to ratification of their status as an Indian Tribe by this State; and

WHEREAS, Chapter 1, Title 29 of the Delaware Code should be amended to acknowledge, ratify, and strengthen the Tribe's historical recognition;

NOW, THEREFORE, BE IT ENACTED BY THE GENERAL ASSEMBLY OF THE STATE OF DELAWARE:

Section 1. Amend Chapter 1, Title 29 of the Delaware Code as follows:

§ 106. Nanticoke Indian Tribe of Delaware; recognition.

(a) The Nanticoke Indian Tribe of Delaware is designated and recognized as an American Indian Tribe with a tribal governing body carrying out and exercising substantial governmental powers and duties. The Tribe is recognized as eligible for all programs, services, and other benefits provided to Indian tribes by the United States or any state thereof because of their status as American Indians.

(b) The Nanticoke Indian Tribe of Delaware is designated and recognized as the first state-recognized tribe in Delaware, and has been so recognized since March 10, 1881.

Approved August 02, 2016

APPENDIX III: NATIVE AMERICAN PERSPECTIVES ON NATURE, PROBLEM SOLVING AND DECISION PROCESSES

excerpted from Cawston, Rodney et al. (2013). The River of Life: Sustainable Practices of Native Americans and Indigenous Peoples. Berlin: De Gruyter.

- Nature has no boundaries or borders
- Nature doesn't have to be manipulated all the time, nature can appear vacant
- Humans are part of nature
- There is unity between nature and humans
- Nature is where humans and spirits interact
- Emphasis on living in balance and harmony with nature
- Nature is everywhere and is interconnected
- Everything in nature should be respected, the sacredness and spiritual significance of nature and earth is important
- Thinking: Web-based (as opposed to linear) with a Systems view
- Knowledge sources
 - Traditional ecological knowledge (TEK)
 - Cultural/Spiritual Values
 - Oral History and Elders are important sources of knowledge
- Science is participatory and experiential
- Resource Management
 - Individuals-to-community
 - Adaptive ecosystem management
 - Bottom up ecosystem management
 - Social, cultural, spiritual values are given to resources
 - Resources do not need to be useful to be valued
- Level of Decision Making
 - Local and community
 - No special interest groups controlling decisions
 - Emphasize: Society, Communal harmony, Kinship and Cooperation
- Belief: There exists a Creator/Great Spirit/Great Mystery
- Ceremonies and Rituals emphasize
 - Self-discipline
 - Performing various tests of physical ordeals
 - Purification practices, fasting, vision-seeking
 - Rituals, stories, dancing, art, chants, and music maintain culture

APPENDIX IV: FUNDAMENTAL AND FOUNDATIONAL REACT PRINCIPLES

Originally drafted by the sd2017 reACT Client and Tribal Relations Team and approved by leadership 6/21/2017

Climate Change, Resilient Adaptive Technology, Native American Clients

Team Maryland and its prototype reACT (resilient Adaptive Climate Technology) are aware that any attempt to join western scientific and indigenous knowledge systems (IKS) may reflect the history of power relations (Simpson, 2004). We are also aware that traditional knowledge is not homogenous, even within small communities. Our aim is to contribute to the thoughtful and respectful integration of indigenous knowledge with scientific data, analysis, and innovation so that the rich body of IKS can inform science and in turn science can contribute tools that will allow indigenous communities to make informed decisions (Alexander, 2011). We hope that we can open a path for meaningful exchange of information so that efforts to deal with climate change can be strengthened.

We think there is a very receptive audience in the next generation of western science trained and future decision-makers to include traditional knowledge and culture in their decision process. Most important are examples of locally and place-based or indigenous societies who balance their collection of natural resources so that the environment and society are resilient. If they did not maintain resilient environments, they as a community would not be alive today. Indigenous community survival is dependent upon how well they treat nature.

reACT shows where Native American and western world practices need to connect and become compatible. No Native American would suggest the western world practices and technologies should be thrown out and not used, however, we can all agree that practices need to balance with the 'human' side of society.

Overlap of Western and Native American Ecological Approach (Gordon 1993, Vogt et al. 2012)

- Incorporate a long-term perspective and examine issues at a scale relevant to the functioning of the ecosystem; Rely on mythologies and traditional knowledge to maintain and promote a long-term view
- Focus on the sustainability of ecosystems, not on the output of products; Look at the Earth as alive, whole and having a "soul", with no man-made boundaries
- Adopt a holistic understanding of the way all the parts are linked together in an ecosystem and the feedbacks among those linkages; View everything as interconnected so there is a need to consider everything in coupled social and natural ecosystems
- Recognize that human values shape ecosystem structure and function in myriad ways that can constrain, promote, or reduce sustainability.

We recognize the western world perspective on climate change is rapidly evolving and beginning to move towards the Native American approach. These similarities suggest is that the western world does not need to develop new paradigms. However, we suggest that there has to be recognition that Native Americans do have something to contribute to resource management. There also has to be recognition that the process used by Native Americans to make decisions differs from the western world scientific approach because of their nature based cultural traditions.

Native Americans have a diversity of behavioral attributes that depends on place, on where a tribe lives, but, the reader also has to recognize that there are core cultural roots, values and behavior that glue tribes together even if a specific cultural attribute varies among the tribes.

Sustainable Decision-making practices

There are many models that can help us to change how we make decisions. Ours is a simple model: move towards thinking and behaving like an American Indian. This will make western trained decision makers superb adaptive managers. Native Americans and other indigenous groups have less difficulty dealing with the sustainability concept because of their traditional knowledge. These are the people we should look to when figuring out whether we are on the right track for making sustainable choices.

The Native American approach to environmental problems is to restore or mitigate problems that they did not cause before they lose cultural value. American tribes do not have a short-sighted approach to resolving conservation, poverty, economic development, and climate change problems. A common decision-making practice is guided by the principle of Seventh Generation. This guiding principle mandate that tribal decision makers consider the effects of their actions and decisions for descendants seven generations into the future. There is a clear understanding that everything we do has consequences for something and someone else, reminding us that we are all ultimately connected to creation (Marchand, 2013). Native American culture and life are organized around a highly refined awareness of the environment (Capra, 1982).

Who better to learn about sustainability than the people who survived having their cultures and way of life threatened, eliminated, and transformed over a span of several hundred years after the arrival of European colonialists to North America? Indigenous people have been forced to adapt for survival after exploitation by colonial powers. The resultant decision-making models, based on Native American traditions and culture, have promoted sustainable growth and development more in harmony with ecological systems. Native American cultures understand the importance of sustainably living in harmony with all things. Indigenous decisions are made locally so they live with the impacts. In order to be sustainable decision making needs to be adaptive and change its goals as new information emerges.

We think that the Native American model of keeping one foot in the past while making decisions that factors in '7th generations into the future' can begin the trajectory for industrialized societies to begin the journey towards ecosystem-based decision-making and essential sustainability. The key to the Native American model is their continued connection to nature and where decisions on resource uses always includes, not excludes, nature. Native Americans also set aside certain culturally based factors that are not part of the tradable or negotiable items.

Target client narrative, how reACT responds to their needs

History & Current Conditions

The net effect of the US policies from the 1700s onwards to 1975 was to effectively preclude tribes from developing and benefitting from their own resources and developing their own economies. US policies were generally intended to strip away anything valuable that Native Americans might own and to move them onto smaller and smaller areas of lands that at this time had no or little perceived value. The primary mission was to abolish all traces of traditional tribal cultures and to physically relocate Native Americans into urban areas. The hope was that Indians would be absorbed into mainstream US society and disappear. However, American tribal members were resilient, maintaining, as best conditions allowed, their practices and taught future tribal members cultural resiliency skills. These practices can be compared to the ecosystem management and adaptive management concepts that have been developed by western world scientists.

Tribal leaders are increasingly seeking sustainable housing and renewable energy technologies to provide their communities with cultural renewal, self-sufficiency, economic opportunity, and sustainable returns on investment that compliment tribal culture. Team Maryland is developing a lasting relationship with various tribes, both in Indian Country and on the Eastern Seaboard. Team Maryland's outreach and participation in the Solar Decathlon will raise awareness of Native American culture and ecological concerns to the greater American population. Most

importantly, Team Maryland is negotiating to co-develop curriculum in the areas of sustainability and green technology workforce development. Furthermore, in bringing the reACT design to market, we hope to influence a partnering manufacturer to build a plant to benefit tribes.

Client Profile

The prototype for the Solar Decathlon 2017, has been developed for a household of two married adults, in their late 20's, with a baby on the way. While originally from Delaware, they are among the many Native Americans who have moved away from their community in order to find employment. The wife works as a nurse and the husband is a recent graduate of a Land Grant Extension Program, with a focus on sustainable agricultural practices to increase access to healthy, nutritious foods, which will improve health and provide less reliance on commercially processed foods. They are members of the Nanticoke Nation.

Native American life is lived in a manner that harmonizes humanity with all created things. This is achieved through principles of love, respect, honesty, bravery, humility, truth, and wisdom. reACT's sustainable and regenerative design principles aligns with and promotes quality of life while respecting Native American cultures. Despite its humble size, reACT enables families to incrementally build larger and more technologically advanced infrastructure creating a home that evolves with its occupants. reACT's living systems and attention to limiting waste will help our couple to live more in harmony with nature.

How reACT's design details, material, and equipment demonstrate appeal to target market

Location, Location, Location

However, practicing traditional ecological knowledge (TEK) does not take just one form. Indigenous communities have variable practices that keep them embedded in their cultures (Alexander, 2011). It is important to realize that there is not one model that we should be adopting but that this approach should vary depending on the location of a community and how they have historically responded to their changing environment. Team Maryland is aware of the need to avoid lumping all traditional practitioners under one umbrella. There is not a one-to-one correlation between the degree of traditional nature knowledge held by a community and whether the community is ranked as being sustainable (Alexander, 2011).

Native Americans and other indigenous communities have strong local cultural roots and even today are unwilling to forgo certain traditions for economic gain. We contend that there are many lessons to be learnt from a people who have lived for several thousand years on their land, who lost their lands to conquerors but who adapted and survived to re-emerge as important drivers of natural resource policies today. These are the people to learn from since they are superb adapters and were able to retain the memory of the critical elements of their identities and cultures despite being conquered.

System-based Approaches & Interconnected Relationships

Native Americans have survived and continuously adapted to the new challenges they face. However, they face high poverty and continuing battles to improve and protect their livelihoods, cultures and traditions. But they have adapted and still practice a respectful and unique form of system-based approach to nature which humanize sustainability practices. Understanding this answer gives clues to how a people can make sustainable choices while adapting to a changing environment. This also recognizes that people cannot be removed from nature and nature is not better off if there were no people living in these environments. Since Native Americans think about the group or village and are not focusing on the individual, they are better at making ecosystem-based decisions and responding to disturbances that cycle through human landscapes. A key element of humanizing sustainable

practices is for people to have a culture and core value that is local or regionally placed and held by a community with a long history.

Learning through Living: SmartHouse Controls

Native Americans, and other indigenous communities, have the behavior and thinking that bound their knowledge base and make them ideal Global Sustainability Managers. The culture and social drivers of Native Americans is an ideal model to adopt since they have already had to live within their environments – they have learned many lessons that societies more closely linked to their environments have accumulated as traditional knowledge and where the knowledge is intergenerational (Marchand, 2013). TEK represents experience acquired over thousands of years of direct contact with the environment (Berkes, 2008).

Living Systems, Well-being, Diet

One important way that indigenous people enhanced their well-being is through their diet and nutrition. Native Americans are considered to be the first ethnobotanists of the Americas (Anderson 2009). Improve food security in a low-socioeconomic tribal community. Native Americans value harvesting most of their cultural foods from nature while the average western European get their organic food from the grocery store. Native Americans manage their lands using traditional ecological tools like fire so the land supports the growth of cultural foods, e.g. berries, camas, etc. The idea of a plant having a 'soul' is not difficult to defend. Scientific research documented plants communicating with one another. Scientists at the University of Exeter documented how plants under attack will communicate with other plants to by releasing a gas ([//www.bbc.co.uk/news/science-environment-16916474](http://www.bbc.co.uk/news/science-environment-16916474)). Several years ago, the idea of 'screaming' plants rose onto the conscious of the western world when the ability of plants to communicate became common knowledge.

Water

Water is an especially scarce resource that societies cannot survive without and where current patterns of climate change is altering who owns it.

Native American Perspectives on Nature, Problem Solving and Decision Processes

- Nature
 - Nature has no boundaries or borders
 - Nature doesn't have to be manipulated all the time, nature can appear vacant.
 - Humans are part of nature
 - There is unity between nature and humans
 - Nature is where humans and spirits interact
 - Emphasis on living in balance and harmony with nature
 - Nature is everywhere and is interconnected
 - Everything in nature should be respected, the sacredness and spiritual significance of nature and earth is important (Nez Perce; Pope Frances Encyclical on Climate Change)
- Nature Managers
 - Individuals-to community
 - Adaptive ecosystem management
 - Bottom up ecosystem management
- Thinking
 - Web-based (as opposed to linear)
 - Systems view
- Knowledge source

- Traditional ecological knowledge (TEK)
- Cultural/Spiritual Values
- Elders/Shamans are important sources of knowledge
- Science
 - Participatory
 - Experiential
 - Intergenerational stories of nature
- Resource Values
 - Social, cultural, spiritual values for resources
 - Resources do not need to be useful to be valued
- Level of Decision Making
 - Local and community
 - No special interest groups controlling decisions
 - Emphasize:
 - Society
 - Communal harmony
 - Kinship
 - Cooperation
- Belief
 - There exists a Great Power or Great Mystery and various other nature-based gods
- Ceremonies and Rituals
 - Emphasize
 - Self-discipline
 - Performing various tests of physical ordeals
 - Purification practices, fasting, vision-seeking
 - Rituals, stories, dancing, art, chants, and music maintain culture

FIRST NATION PROTOCOL

Protocols are appropriate ways of using Indigenous cultural material, and interacting with Indigenous people and their communities. Protocols encourage ethical conduct and promote interaction based on good faith and mutual respect. Indigenous protocols arise from value systems and cultural principles developed within and across communities over time.

Non-American Indian people have a poor record of developing relationships with First Nations communities, it boils down to the lack of understanding that protocols exist within First Nations. It should follow then that if you are wanting to work with Native People that you need to make an honest effort to observe and understand their protocol. American Indian people have traditions that are based on their respect for the Mother Earth. Understanding and respecting Native ways, the protocol that has been developed and in use for thousands of years, is the first step to being able to work together. Protocol is the way to have a meaningful conversation.

First Nation Protocol on Traditional Territory

When working on or within the traditional territory of a First Nation there is protocol to follow. It can be customary between one First Nation and another to acknowledge the host First Nation Peoples and their traditional territory at the outset of any meeting. The long struggle by First Nations for respect has been tough, but through it all this basic protocol has survived and thrived.

If you want to work effectively with Indigenous Peoples and specifically with a First Nation, one of the best ways is to show respect to the Nation by following traditional territory protocol. This can be established at the beginning of any meeting by acknowledging the host community, its people, and its territory.

Why is it good protocol to thank the host nation? Because you are acknowledging that that Nation has had a relationship since time immemorial with the land you are standing on. It is a sign of respect and recognition, and you can't go wrong with respect and recognition.

A simple example is: "I would like to thank the _____ for agreeing to meet with us today and for welcoming us to your traditional territory." Keep in mind that your spirit and sincerity can matter more than your particular words.

Gift Giving Protocol

Gift giving is a very basic part of Indigenous relationship building. Native American cultures are built on communal values with a large emphasis on the importance of giving, being equals, and the distribution of wealth. Generosity is the way of life. To Native Americans, the act of giving brings us closer together and is a loving commitment to our community. Whatever you have the ability to give will always be greatly appreciated by a Native American, as long as you're giving your best.

Unlike mainstream American culture, where giving is viewed in terms of recognition, power, or prestige, for most Native Americans, giving is a way to honor future generations and clan members. There are many forms of giving in Native American culture. The guiding principle in Native American philosophy is that giving should be mutual and equal by all parties. Native cultures are based on the philosophy that humans are the stewards of the natural world, and not consumers of the world's resources. "Wealth" in Native American culture is measured by a combination of spiritual qualities, material goods, and behavior. Leaders are selected for their ability to take care of the tribe by sharing their wisdom and wealth.

Gift giving is a means of giving thanks, of bringing the people together, of gaining honor, of distributing material goods so that all may survive, of teaching. It maintains the balance that is needed to hold a nation together and

to keep an individual in the right relationship within him or herself and with the community—a community that is not just composed of humans, but also of animals, plants, even the stones. For all things are alive.

Protocol for traditional gifts for the Nanticoke are wampum and tobacco

Sacred tobacco is one of the most sacred of plants for Native people. It is used first as an offering for everything and in every ceremony. Per protocol, at ceremonies the offer of tobacco is made to the Elder leading those ceremonies along with an honoring gift.

Wampum is a traditional shell bead of the Eastern Woodlands tribes of the indigenous people of North America. Wampum was used by the northeastern Americans Indians as a form of gift exchange.

Wampum belts were used as a memory aid in oral tradition, where writing could be encoded in wampum strings. Wampum belts are read right-to-left. Wampum was also used for storytelling. The symbols used told a story in the oral tradition or spoken word. There was no written language, so wampum was a very important means of keeping records and passing down stories to the next generation. It remains valuable way to encode the object with a story. Wampum is a living record and has many uses which include inviting a person to a meeting, showing title, and showing that a speaker is truthful.

Tobacco Offering Protocol

The very first thing that should be mastered in honoring the Native American ways is the gifting of tobacco. Using pure tobacco with no additives is a must. As a show of honor and respect a pouch of tobacco wrapped in a large piece of red fabric should be given to a teacher or leader of ceremony. This should always be given before you ask for healing, teaching or direction in a matter of importance. It is a gift for what is being offered. When offering tobacco, say: “I am offering you this tobacco for _____”.

Honoring Gift Protocol

Wampum is still used by various Native nations throughout northeastern North America for ceremonial use. It used to signify the importance or the authority of the message associated with it. As such, important agreements would have a large amount of wampum that had been loomed into a "belt". Wampum belts are used to record significant events and alliances.

Dance Protocol

Indigenous performance is an important part of Indigenous culture – ceremony, storytelling, celebration, mourning, coming together and telling of events in Indigenous people’s lives, both past and present. The Indigenous performing arts are an important means of expressing Indigenous heritage.

Music and dance have always been essential to the spiritual, cultural, and social lives of Native peoples. Unique forms of ritual, ceremonial, and social dancing remain a vital part of contemporary community life. Everywhere dance is found, it is accompanied by distinctive Native musical styles. Rich music and dance traditions create strong ties that bind American Indian communities to all living things, to the earth, spirit world, and—when people have deep ancestral claims to their dances—to the past.

Please respect the spiritual nature of Native American dance, please ask permission of performers before taking pictures.

Smudging Protocol

Please respect the spiritual nature of the Smudging Ritual, please ask permission before taking pictures.

OPENING GIFT

TOBACCO (SEMAH)

In its original form, tobacco had both honor and purpose. Traditional tobacco is intended to be used in small amounts for prayers and ceremonies. Sacred Tobacco can be used as a daily offering to say prayers and give thanks for all the gifts the Creator has given to us. Sacred Tobacco is lain on the Earth, our mother, in thanks for providing all the things that help sustain our physical beings. Offering Tobacco to water is an acknowledgment of the lifeblood that sustains us all as well. Without water, we would cease to exist.

Sacred tobacco is used to make smoke, and is one of the most sacred of plants for Native people. It is said to be the main activator of all plants. It was given to us so that we can communicate with the Spirit world and when you use it, all things begin to happen. Tobacco is always offered before picking medicines. When you offer tobacco to a plant and explain your reasons for being there, the plant will let all the plants in the area know your intentions and why you are picking them, tobacco is used first as an offering for everything and in every ceremony.



HONORING GIFT



Two Row Belt: The Two Row Wampum belt is the symbolic record of the first agreement between Europeans and American Indian Nations on Turtle

Island/North America. 2013 marked the 400th anniversary of this First Covenant.

It symbolizes the equal relationship of the native people of North America with the “White” man. One purple row of beads represents the path of the natives’ canoe which contains their customs and laws. The other row represents the path of the White mans vessel, the sailing ship, which contains his customs and laws. The meaning of the parallel paths is that neither boat should outpace the other, and the sovereignty of each path is equal and complementary. The First Covenant agreement outlined a mutual, three-part commitment to friendship, peace between peoples, and living complementary paths forever called *kaswentha*. Team Maryland seek to honor a mutual vision with the Nanticoke by emphasizing that ecological stewardship as a fundamental prerequisite for this continuing friendship.

The Two Row belt is made of white and purple beads. The white beads denote truth, the purple boats (canoes for Indians and sailboats for Europeans). In between the two rows of purple beads are three rows of white beads. The first row of white beads is “peace,” the second row, “friendship,” and the third row, “forever.” The Two Row Belt, as it is commonly known, depicts the *kaswentha* relationship in visual form via a long beaded belt of white wampum with two parallel lines of purple. Recently, many sustainability, environmental and climate protection organizations have used the Two Row Belt as a record of common objective to protect the environment and save it for future generations.

About the Artist: Haohyoh, (Ken Maracle), is a faith keeper of the Lower Cayuga Longhouse and a member of the Cayuga Nation, Iroquois Confederacy, Deer Clan. He has been making reproduction Wampum Belts for more than 30 years. He speaks the Cayuga language and is

knowledgeable about the history of Wampum and the history of the Iroquois people. My work is on display at many different museums throughout the US and Canada, including: Akwesasne Museum (Hogansburg, NY), Canadian Museum of Civilization (Gatineau, QC), Glenn Burnie Historic House (Winchester, VA), National Museum of Dance (Saratoga Springs, NY), Native American Centre (Buffalo, NY), New York State Museum (Albany, NY), Oneida Nation Museum (De Pere, WI), Plymouth Historical Museum (Plymouth, MI), Seneca Iroquois Museum (Salamanca, NY), Woodland Cultural Centre (Brantford, ON), and the National Museum of the American Indian (Washington, DC)

CEREMONIAL SAGE (SUKODAWABUK): SMUDGING



Sage is used in many different ways, it helps the people prepare for ceremonies and teachings. Because it is more medicinal and stronger than Sweet grass, it tends to be used more often in ceremonies, it also has physical healing properties, you can boil sage and drink it as a tea. Sage is for releasing what is troubling the mind and for removing negative energy, it is used for cleansing homes and sacred items. There is male and female sage.

Since it is believed, in many cultures, that the plants we use to burn and purify ourselves provides us with access to their soul and power, it is essential that we ask their permission before gathering these plants. Take only what we need without damaging the plant and give thanks for what we took. If you did not pick these plants yourself, know that someone else did that for you and that you could still give thanks for the life of those plants and the people who did pick them.

The format of the smudging in today's rituals varies from culture to culture and so does the plants and herbs used for such sacred ceremony

APPENDIX VI: MENUS FOR DINNER PARTIES

Native Lands Menu

DINNER #1

Appetizer

Wild Rice Salad

The Ojibwe “have a symbiotic relationship with wild rice, assisting its cultivation, harvesting, and preparation. Some Native people continue the centuries-old method of harvesting rice by paddling into the fields in canoes and gently shaking the rice from the stalks into baskets.” (Foods of the Americas)

Entree

Venison with Juniper and Wild Huckleberry Sauce

Hunters throughout the Great Lakes have long cooked game such as venison (Waawaashkeshi) over a fire of juniper. Deer were also tracked to find wild herbs for use both medicinally and culinary. (Foods of the Americas)

Dessert

Banana Muffin topped with Mixed Berry Wojapi

Berries are high in pectin and can be used to make jam. The Ojibwe often made jellies from chokecherries, buffalo berries, wild blueberries and currants. In Native American cultures, certain berries were utilized medicinally. With naturally anti-inflammatory properties, the fruit was also used to ail swelling, kidney disorders, and infections. (Michigan State University)

Beverages

Chippewa Chilled Maple Syrup Beverage

Maple Sugar (linzibaakwad) and box elders (a member of the maple family) were an important staple of the Indian nations surrounding the Great Lakes area. Often maple sap would be available before the fish in the Spring causing natives to camp and harvest in maple abundant areas in the Fall & Winter. The maple sugar symbolized harmony between the people and the natural and supernatural worlds. (Lessons of Our Land)

Wild Raspberry Tea

Turtle Lake Ojibwe were known to utilize tree bark, maple, oak, roots, seeds, and fruits for both food and medicinal purposes. Wild raspberry tea, a traditional favorite of the Ojibwe, was often created from crushed roots to help relieve a variety of ailments. (Chippewa Heritage)

Rivers & Lakes Menu

DINNER #2

Appetizer

Three Sisters Soup

In many Native communities, “women planted, hoed, weeded, and harvested communally. The staple crops they grew came to be known as the Three Sisters (corn, beans, and squash). A Native American agricultural innovation, this complementary growing system is of the bean climbing the natural trellis provided by cornstalks, while the broad-leaved squash plants spread out below, to prevent weeds and keeping moisture in the soil.” (Mitsitam Cafe -- National Museum of the American Indian)

Entree

Acom Crusted Salmon with Gluckaston (seaweed, corn & shrub needle water)

During the Spring, Ojibwe men often fished from dugout canoes using nets, hooks, and fish traps. In conjunction, fish such as salmon (Kokanee) were honored through various rites and ceremonies. The Ojibwe Fish Clan, Giigoonh, associated fish with long life and wisdom. (Michigan State University)

Dessert

Double Cornbread Muffins

As far back as the 1600s, corn has been an abundant and traded currency throughout indigenous cultures. In addition, corn helped to sustain diets without the use of pesticides and harm to the soil. The Ojibwe referred to corn as min-dor-min. (Michigan State University)

Beverages

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