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Wabanaki Youth in Science (WaYS): A Tribal Mentoring and Educational Program Integrating Traditional Ecological Knowledge and Western Science

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The Wabanaki Youth in Science (WaYS) program provides mentoring and training opportunities in the life sciences for Native American youth in Maine. This program, which was motivated by a shortage of young natural resource professionals to manage tribal lands, uses a multifaceted approach (i.e., camps, community outreach, and internships with cultural resource and natural resource mentors) to recruit and retain native youth in science fields. A defining characteristic of the program is the integration of knowledge from cultural resource and natural resource mentors. This approach helps students develop an understanding of contemporary natural resource problems informed by their community and culture, leading to greater relevance and persistence in science. Program outcomes include increased participant awareness of and interest in natural resource management and increased enrollment of Wabanaki youth in university science programs.

Keywords: Wabanaki, Native American, natural resources, mentoring, traditional ecological knowledge

A key component of persistence in sciences for Native American students is the melding of science and culture (traditional knowledge, lived experience, and values) in their curriculum (Akee and Yazzie-Mintz 2011). Despite increasing numbers of minorities in natural resource fields, Native Americans represent only about 1% of the student population in US natural resource programs (Sharik et al. 2015). A recent report by Sharik et al. (2015) highlighted the challenges that mi-

nority students and in particular native students face, including distance from tribal lands and the low diversity of faculty at 4-year natural resource institutions. However, they also note that Native Americans' long history of respecting the land, need to manage land holdings related to their sovereign rights, and encouragement from elders contribute positively to their pursuit of natural resource education.

Wabanaki (People of the Dawn) is the collective name of the Algonquian Indian

Tribes of the sub-St. Lawrence and northern New England (American Friends Service Committee 1989, Harper and Ranco 2009). From Vermont in the West to Nova Scotia in the East, the Wabanaki include the Abenaki, Maliseet, Mi'kmaq, Passamaquoddy, and Penobscot peoples (American Friends Service Committee 1989, Calloway 1991). The larger Wabanaki geographic region approximates the former French territory of Acadia, including the provinces of Nova Scotia, New Brunswick, and Prince Edward Island, a small portion of Quebec, and as far west as the Connecticut River (Morrison 1984, Harper and Ranco 2009) (Figure 1).

Wabanaki tribal nations are, like other indigenous peoples, deeply connected to places through thousands of years of observation and adaptation as well as through religious traditions and ceremony (Nicolar 1893). Before significant European arrival in the 17th century, the population density in Wabanaki territory was lower than it was to the south and west, where

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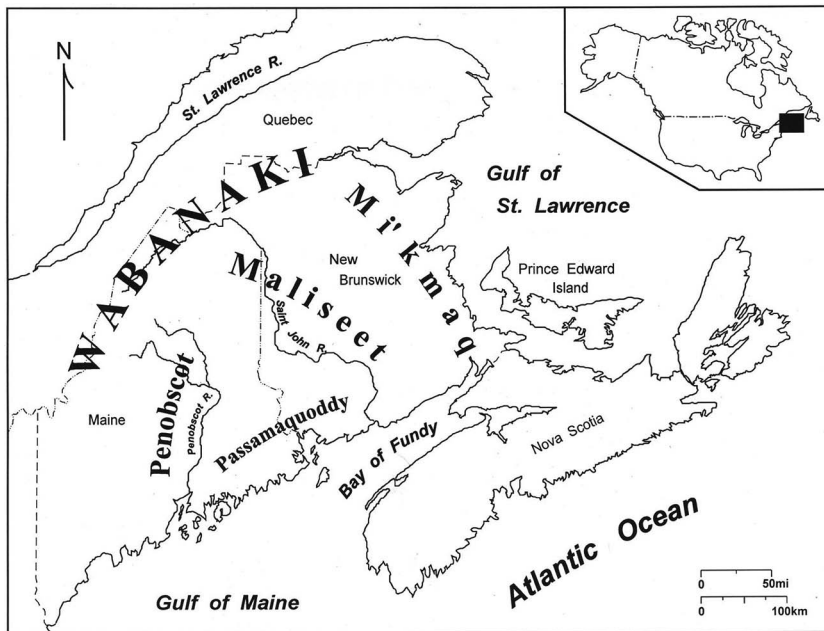


Figure 1. Wabanaki Tribal Nations in Maine and New Brunswick. (Map by Stephen Bicknell, courtesy of the University of Maine, Department of Anthropology.)

large-scale agriculture was more common (Cronin 1983).

Between the middle of the 17th century and middle of the 19th century, the original-growth forests managed by Wabanaki peoples for hundreds of years through burning and other low-impact means, were cut down (Cronin 1983, Williams 2003). This, along with European and American laws limiting access to common-pool resources and the damming of all the major waterways in Wabanaki territory, dramatically changed the ways in which Wabanaki peoples could access and use the natural resources on which they had depended for thousands of years (MacDougall 2004). Relationships of trust and responsibility between Wabanaki peoples and these natural resources, maintained in oral traditions and through traditional ecological knowledge (collectively owned knowledge, innovations, and practices of indigenous communities [TEK]), have been hindered by these changes.

In 1980, the Maine Indian Claims Settlement Act (MICSA) allowed for the Passamaquoddy Tribe and the Penobscot Nation to purchase some of their ancestral lands (Brodeur 1985). Whereas MICSA has also hindered the ability of the Wabanaki Nations to exercise clear legal authority over these lands, it coincided with the rise of formal institutional management of Wabanaki natural resources by Wabanaki Tribal Nations. In the last 30 years, a major challenge for Wabanaki Nations has been to make sure

Wabanaki people are the ones doing the science and making the decisions about these natural resources using TEK that reflects Wabanaki cultural values.

The Wabanaki and the Penobscot Nation specifically seek to recruit a next generation of scientists to fill natural resource professional roles and replace those who will retire. According to John Banks, director of the Department of Natural Resources of the Penobscot Nation, “There’s a concern that younger Tribal members won’t be ready to fill jobs when some of us older members retire. Today, you really need to get a college education in science to best manage our natural resources” (Oberlander 2016). The tribes also hope to connect the next generation to their cultural heritage and environmental legacy (carr 2014).

In addition to meeting needs related to tribal lands, increasing the participation of

Native American people in forestry, wildlife management, and related fields is important for informed and creative natural resource management. Numerous studies have documented the positive effects of diversity on creativity and problem solving (e.g., Robinson and Dechant 1997, Østergaard et al. 2011). In a recent study of tribal and nontribal land management professionals, Bussey et al. (2016) observed differences in the influence of cultural identity and spiritual connections to the forest on knowledge generation, transmission, and content of TEK and western science. The inclusion of diverse stakeholders in knowledge discovery and decisionmaking thus leads to more informed natural resource management, with benefits to the diverse publics that use those resources.

The WaYS Program

The desire to develop a program to improve Native American persistence in science began at the University of Maine, Wabanaki Center.¹ The Wabanaki Center’s mission is to build and sustain a mutually beneficial relationship between the University of Maine and Native American communities. With funding from the National Science Foundation, a position was created in 2013 to work with the Maine Wabanaki community on development of a model education program. This program, called Wabanaki Youth in Science (WaYS), represents a long-term effort to engage Wabanaki Tribal students (grades 6–12) in their cultural heritage and environmental legacy to promote persistence in sciences through college and into a career.

The WaYS program uses a longitudinal, multifaceted approach including the following:

- Camps: summer week-long “earth camp” and four seasonal weekend “mini” earth camps

Management and Policy Implications

The longitudinal and multifaceted approach used in the Maine WaYS program is a promising model for other initiatives aimed to engage tribal youth in life sciences. Three key components include summer camp and seasonal mini camps, traditional ecological knowledge programs at tribal teen centers and Boys & Girls Clubs, and internships with cultural resource and natural resource mentors. By connecting with middle and high school students, establishing mentoring relationships, and providing internships, the WaYS program encourages native youth to pursue higher education. In addition, internships with tribal and nontribal institutions provide pathways to employment and bring diverse perspectives to natural resource management.



Figure 2. WaYS interns collecting understory plant data on a milacre plot in a white pine (*Pinus strobus*) plantation degraded by a dense understory of nonnative invasive plants such as glossy buckthorn (*Frangula alnus*). (Photo courtesy of Kevin Brusie.)



Figure 3. WaYS interns work on plant identification in support of their vegetation monitoring work. (Photo courtesy of Kevin Brusie.)

- TEK programs at tribal teen centers and Boys & Girls Clubs
- Internships for students working with cultural resource and natural resource professionals

The WaYS earth camp was developed based on a review of efforts by the Alaska Native Science and Engineering Program; US Geological Survey, Mashpee Wampanoag summer program; US Fish and Wildlife Service, Native American program; and Native Earth Environmental Youth Camp at Akwesasne (State University of New York). The WaYS earth camp is unique from these programs

because of the longitudinal connection that it provides to students through the internship/mentorship program. Students garner opportunities during earth camp to work with environmental leaders and tribal elders on environmental issues pertinent to their tribes. By the end of earth camp, the intention is that there will be a long-term internship for the students, working with cultural and natural resource professionals on an environmental issue key to their community. One student, for example, started in the program in 2013 as a high school junior and has worked for 3 years with the Department of

Natural Resources of the Penobscot Nation. Today she is a college sophomore majoring in wildlife ecology.

Mini camps, which were suggested by students in the WaYS program, are an offshoot of the earth camp that continue engagement and opportunity year-round. These camps also provide an opportunity for younger students to participate and for older students to act as peer mentors, thus continuing the connection and learning for all ages. In addition, after-school programs are used to connect with students throughout the year. These programs focus on younger students and aim to initiate the connection between western science and TEK, in a shorter time frame and within the bounds of students' learning abilities.

As the program's success grew, so did partnership and internship opportunities for WaYS students. One such partnership that provides employment, training, and mentoring to Wabanaki students is "WaYS Forward," an 18-month habitat restoration project in collaboration with the US Department of Agriculture [USDA] Forest Service. WaYS Forward uses an innovative combination of TEK and western science, with mentoring from tribal members and natural resource professionals. Students are employed as summer field technicians on the Penobscot Experimental Forest (PEF)² in Maine, where they work on ecological monitoring and habitat restoration, i.e., nonnative invasive plant inventory and control, in a long-term USDA Forest Service research area.

In the summers of 2015 and 2016, six students from the Penobscot and Passamaquoddy Tribes were employed as interns through WaYS Forward.³ Work activities in 2015 included laying out study areas and sample plots, inventorying vegetation and other forest features such as deadwood, assessing wildlife habitat, and collecting and summarizing data (Figures 2 and 3; see also Supplemental Figures S1–S5⁵). In 2016, students returned to apply nonnative invasive plant control and develop a demonstration area and educational outreach materials. Throughout the project, interns received training and mentoring from numerous natural resource professionals on topics ranging from plant and bird identification to equipment use and timber marking. Part-time employment opportunities continue over the school year, during which

⁵ Supplementary data are available with this article at <http://dx.doi.org/10.5849/jof.16-066>.

time students summarize their data and compile reports of results.

Student feedback suggests positive outcomes and increased awareness of the role of natural resources in their lives. Sadie, a 2015 WaYS intern, said that her internship experience "...made me realize that the work that I'm doing here [at the PEF] is important to science and our future, but it is also important to our history and to people of our past" (Oberlander 2016). Shantel, a 3-year participant in earth camp and also a WaYS intern, shared that "My culture is definitely a huge part of my interest in forestry" (Oberlander 2016). She is now a first-year student in Ecology and Environmental Sciences at the University of Maine. In the first 3 years of the program, more than 100 Wabanaki youth have participated in WaYS camps, activities, or internships.

The WaYS initiatives have resulted in a number of partnerships within and outside of the tribes. These partnerships provide students with innumerable benefits and opportunities, including but not limited to long-term mentorship programs, funding to help with college, and a foundation to understand that culture and science are not exclusive of each other. This training provides a strong foundation for students and supports persistence in science when they enter post-secondary education. So far, WaYS is the primary contributor to a 15% increase in the number of Wabanaki youth enrolled in science-related fields at the University of Maine.

Strengths of the WaYS Model

There is little research about the transition from high school to college for native youth, although statistics show that it is difficult. Numerous works have highlighted the important role of culture in native college students' persistence in science (Guillory and Wolverson 2008, Akee and Yazzie-Mintz 2011). WaYS provides the bridge for a successful transition between secondary and postsecondary education for native youth in Maine.

Along with the integration of western science and TEK, an important factor in the success of WaYS is the year-round nature of the program. In addition to seasonal mini camps, student internship employment continues part-time through the school year, providing continuity and connection with the program, the community, and resource professionals (cultural and western science).

The 2014 Native Youth Report (Executive Office of the President 2014) highlighted the continued challenge that native youth face with respect to educational equality and success. Simply put, "high schools...do not have the right courses, strong mentorship, or opportunities that lead to a successful college experience [for native students]" (Executive Office of the President 2014, p. 17). In light of this challenge, WaYS provides an avenue for students who are excited about natural resources to pursue that interest in a place-based, community-driven learning environment. If these interests are relevant to their community and important to them, students' passion or persistence will not be diminished. According to Barry Dana, former Chief of the Penobscot Nation, "The beauty of featuring culture in this program [WaYS] is the students won't walk away. They're already vested" (Oberlander 2016).

Conclusion

The WaYS program, which is heavily tied to melding culture and science in a place-based, community-driven internship and environmental education program, bridges the gap between western science education and TEK critical to native peoples past, present, and future. John Banks, director of the Department of Natural Resources of the Penobscot Nation, explains that "This program combines two worlds in a way that, we hope, helps students understand that a science degree doesn't mean giving up their cherished culture and traditions" (Oberlander 2016). As a result, the program provides future tribal environmental leaders with the skills they need to meld native culture and western science in a way that strengthens their decisionmaking as it relates to environmental concerns. Early results are positive and suggest that the multipronged, long-term, and integrative model employed by the WaYS program may be a guide for similar efforts elsewhere.

Endnotes

1. For more information, see naps.umaine.edu/.
2. For more information, see www.nrs.fs.fed.us/ef/locations/me/penobscot/.
3. For a video about the project, see stories.wellsfargobank.com/different-cultures-intersect-in-a-maine-forest/.

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