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Tribal Seed Sovereignty and Rematriation: Fulfilling Our Responsibilities through Relational Work with Traditional Seeds of the Mandan, Hidatsa, and Arikara Nation

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Mandan Bride corn, Hidatsa Shield beans, and Arikara sunflowers are on the drum, meaning our seed relatives with Indigenous origins have been coopted by seed companies and are available commercially. The great white northern bean finds itself as the backbone of American dishes such as bean soup and barbeque baked beans and ham. This variety of bean has a long relationship with our Mandan, Hidatsa, and Arikara (MHA) ancestors and was later commercialized by the Oscar Will Seed Catalogue, but no longer retains attribution to us.[1] At the same time, our traditional heirloom varieties of *góòxaadi* (corn), *awaashá* (beans), *gagúwi* (squash), *maabhá á* (sunflowers), and *gagúwicahaa* (watermelons) are absent from our kitchens, restaurants, grocery stores, gardens, and food stands. Few MHA tribal members have tasted or can identify traditional heirloom varieties that our ancestral seed-keepers nurtured and bred for thousands of years.

The purpose of this manuscript is to share our strategies for seed rematriation that developed as a result of a collaborative agreement between the Indigenous institution Nueta Hidatsa Sahnish (NHS) College and a federal research institution, the USDA Agricultural Research Service–Northern Great Plains Research Laboratory (NGPRL), and among NHS College's other partners, Pawnee Seed Preservation Society, the

University of Montana, and Montana State University. This project's objective is to contribute to revitalizing the vibrant food culture of the MHA Nation. As part of this seed rematriation process, NGPRL established a traditional MHA garden at their experimental farm to multiply seeds for NHS College. The methods employed include an attitude of learning and acceptance, a commitment to one another, and relationship-building. The overarching goal is to support and strengthen the Indigenous seed sovereignty of MHA by nurturing the health of the NHS College Traditional Seed Cache.

This Indigenous research embodies the history, dreams, and hopes of a group of people creating a sense of meaning, belonging, and place in the world by reclaiming and recultivating MHA varieties of corn, beans, squash, sunflowers, and watermelon. This project contributes to the revitalization of seed sovereignty back to the members of the Three Affiliated Tribes, also known as the Mandan, Hidatsa, and Arikara Nation. Through reconnecting the MHA people with our traditional seeds, we aim to breathe life back into our relationship with our seed relatives. The act of seed sovereignty also strengthens our tribal food system, offering access to nutrient-dense foods that our people's DNA recognizes and remembers.

The process of rematriation is lengthy, iterative, and uncertain. The primary objective of this article is to collaborate with MHA relatives, especially the Pawnee, to outline steps and best practices for seed rematriation. We hope this article will provide resources to other tribal institutions and future generations to create their own path forward for seed rematriation. Through sharing experiences and insights, we aim to contribute to the broader dialogue on preserving Indigenous food sovereignty.

We share our story of seed rematration founded in relationality and respect. Seed rematriation is the process of reestablishing intimate relationships with plant relatives and recentering them within the culture from which they originated.[2] We hope that, through this Indigenous knowledge-sharing methodology, we allow readers to draw their own conclusiona and build upon what they know to lift up and inspire additional seed rematration.[3]

> I grew up eating corn soup and squash, but that doesn't necessarily mean they were our traditional varieties. Also, I grew up eating Mandan white beans (commercially known as the great white northern bean). I didn't grow up with anyone telling me about MHA-specific varieties or saying these are our traditional foods until my adolescence. That was when I heard more about things being unique to MHA.
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> —Ruth De La Cruz

Seed Rematriation Movement

We as Indigenous peoples have a right to self-determination.[4] Colonization stripped us of that right. Now, in the twenty-first century we collaborate internationally with our relatives for inspiration and mentorship as we take our steps forward to claim our right to food and seed sovereignty. Seed rematriation is an essential relationship that needs to be grown to support food sovereignty and security.[5] Deb Echo-Hawk and her team at the Pawnee Seed Preservation Society have been leading the seed sovereignty movement as a means to support food sovereignty for more than twenty years.

> [M]any years of experimentation and keen observation allowed us to accumulate knowledge on how to adapt to and live symbiotically with the land that nourished us. Teachings embedded within our intergenerational routines passed down the knowledge and reverence that assure that our Indigenous food system will perpetuate. Food security is the knowledge of local flora, phenological cycles, and climate adaptation in this time of unnaturally accelerated environmental change.
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> —Deb Echo-Hawk

Reclaiming this systematic methodology, knowledge, and analysis is the backbone of seed rematriation that supports Indigenous food sovereignty. Seed sovereignty is the authority and right to protect traditional varieties, the intellectual property that originated from a culture. Seed sovereignty includes processes and activities such as fostering seed-saving activities, and cultural and spiritual practices. The work of the Cherokee Nation Seed Bank and Pawnee Seed Preservation Society along with many other nations preceded our efforts, and we use their wisdom as we move forward.[6] They answered questions that we face during our journey: Where are our seed relatives? Who are our seed relatives? How will our seed relatives adapt to climate change?

Seed rematriation is a recent term in scholarly work coined by Martín Prechtel.[7] Seed rematriation is the endeavor of rekindling intimate bonds with our plant relatives and the revitalization of these relationships into the culture from which they originated. The process relies on intentional returning of seeds back to the culture that developed them and the restoration of the matriarchal aspects of stewarding seeds. The process includes both the physical return of seeds but also the empowerment of women as custodians of traditional knowledge and seeds. What is more important, seed rematriation acknowledges the displacement and structural violence that took seeds from their place of origin.[8] Seed rematriation is the process of care that recognizes seeds as more than just biological entities with potential for growth: they are entities with cultural, spiritual, and symbolic significance. Seed rematriation work is occurring globally—for example, work with the Jala maize variety in Mexico.[9]

Seed rematriation is grounded and grown in the soil of the Indigenous research paradigm through the roots of relationality. Seed rematriation focuses on rebuilding kin relationships with our seed ancestors, who have been violently separated from us by colonial history. By rebuilding our relationship with seeds and with institutions that now directly affect how our seeds are governed and cared for, we are creating, sharing, and developing knowledge. One such example is the Heritage Seeds for Sustainable Lifeways project at the University of Michigan, which has created a protocol for seed rematriation for museums.[10]

Modern History of MHA's "Four Sisters"

The seed rematriation process has been an ongoing vibrant force on the Fort Berthold Indian Reservation. We have maintained traditional seed caches for thousands of years. A traditional seed cache is the physical, spiritual, and intellectual condition for a traditional storage system to provide seeds for all tribal members, while maintaining the following characteristics: (1) seed viability, (2) genetic diversity, (3) Indigenous

traditional ecological knowledge, and (4) protection from threats. It is the sum of the health of each seed and variety, and is a base to food sovereignty. Traditionally known as a seed bundle, a collection of seeds is passed from one relative to another in the same manner as a ceremonial bundle.

Over a century ago, Seed matriarchs such as Scattered Corn and Waheenee (Buffalo Bird Woman) made intentional efforts to document Indigenous traditional ecological knowledge and steward seeds for future generations.[11] Both matriarchs born before the formation of Fort Berthold worked with anthropologists to document precolonial agricultural customs. Their work is some of the most detailed descriptions of Indigenous agriculture in the Northern Plains. Waheenee and Scattered Corn now hold spiritual and cultural significance within the food sovereignty movement and provide valuable cultural wisdom. In the last several generations, seed-keepers such as Gerard Baker, Tillie Walker, Amy Mossett, Rosemarie Mandan, Cora Black Bear, and Margaret Snow have assumed the responsibility for stewarding the intimate relationship between the culture that developed the seeds and their plant relatives in addition to the physical rejuvenation and maintenance of our seeds.[12]

Right before the first garden blessing at the NGPRL, we shared a meal with Elder Gerard Baker. Gerard is one of the elders who has been stewarding MHA Nation seeds for more than fifty years. On that day, he bestowed on us seeds that he had gathered, nurtured, and regrew from relatives, elders, seed enthusiasts, and scholars. While sharing food together, Gerard blessed the start of our seed rematriation process by sharing that the ancestors told him that we were the right group at the right time to proceed with this work to revitalize our seed relatives. Our MHA culture is rooted in our relationship with the "four sisters"—maize, beans, squash, and sunflowers. We bred many traditional varieties over thousands of years. A traditional variety is a variety that was developed by our ancestors and coevolved with us.

Our ancestors lived along the banks of the *Maa daah hey* (Mandan for the Missouri River) and its tributaries, which contributed to their economic wealth and existence as a cultural center in the Great Plains of North America. Women, as the owners of the gardens, were the leaders of food and economic sovereignty within the MHA Nation as illustrated in the precolonization economic trading dominance (see fig. 1).[13] The MHA Nation is a union of three tribes who formally joined together at Like-a-Fishhook Village after facing decades of colonization, disease, and land dispossession. MHA found unity with one another through our shared cultural value of cultivating the four sisters.[14]

Food and gardening are foundational elements, binding peoples and cultures, healing divisions, and alleviating tensions that force communities apart.[15] The decline of a food culture signifies the erosion of civilization and community. The United States government spent centuries trying to abolish the tribal nations' food culture through bison genocide, boarding schools, reservations, commodity boxes, and forced adoption of western agricultural practices.[16] Figure 2 shows the decrease in the land base of Fort Berthold, which significantly contributed to the loss of food sovereignty of the MHA Nation. The women-led, community-centered gardening that nourished and built our people for thousands of years was the target of the US government. The system

of capitalism transformed traditional agriculture on Fort Berthold through its values of individualism and profit, shifting agriculture to one dominated by machinery, male labor, external amendments, and commodity crop production.[17]

MHA seeds have been on the drum since the 1880s, which means MHA seeds have been commercialized and non-Indigenous owned companies have been profiting without financially compensating us. The Oscar Will Seed company, located in Bismarck, North Dakota, obtained seeds from MHA tribal members beginning in the 1880s, bred and multiplied them and made them commercially available nationwide until the company was bought out in the 1950s.[18] Oscar Will Seed catalogues depicted racist images of Indigenous peoples on their covers and created the narrative that they saved the seeds from being lost. Oscar Will prospered off of Indigenous ingenuity to sell and support the capitalist expansion of agriculture to northern agricultural homesteads. Many commercial corn varieties now grown in monocultures across the dry, cold prairie climate of the north have genetics that were bred by our MHA ancestors.[19] But our seeds are much more than the commercial potential that seed companies use as a means to build wealth, power, and control. Our seeds are our ancestors, they hold our history, and they are our future. Our seeds connect us to the cosmos, to our spirituality, and our culture. Our seeds also tell the story of trauma and how we are working together collectively to strengthen ourselves and Mother Earth.[20]

Fast forward to today: Ruth De La Cruz (MHA tribal member and food sovereignty director) and Bernadine Young Bird (MHA elder and professor of Native American studies) at the Nueta Hidatsa Sahnish College nourish and lead the cultural resurgence of the four sisters at the college. NHS College carries the responsibility of building capacity (the process of developing and strengthening the skills, instincts, abilities, processes, and resources that communities need to survive, adapt, and thrive) and support for tribal food sovereignty. Seeds are the foundation of sovereignty, a symbol of hope for abundant seasons to come. Responding to the call from MHA ancestors and relatives, NHS College is dedicated to recentering the four sisters within MHA culture. In the past twenty-five years, at least four earlier NHS College efforts have focused on revitalizing traditional varieties and gardening: one was stewarded by Lydia Sage-Chase, the great-great-granddaughter of Scattered Corn; another traditional garden was stewarded by Tillie Walker; the third was a gardening apprenticeship program led by Amy Mossett and *Aruhadi da Maguuca*; and the fourth was a community gardening resource program led by Bernadine Young Bird.[21]

> Many tribal members do not garden traditional or contemporary style. The garden project goal I set, therefore, was to increase awareness and knowledge of gardening. The motive was to begin reintroducing our gardening practices and produce back into our diets. The funding was limited, but I was able to set up in our communities to provide some seed, basic gardening tools, and informational brochures in many areas related to gardening.
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> —Bernadine Young Bird

Their transformative work commenced with the establishment of the Four Sisters Garden at Nueta Hidatsa Sahnish College, providing a space for traditional gardening, community gardening, orchard cultivation, and research. Bernadine Young Bird is the caretaker of the traditional garden and instructs the Traditional Gardening and Foods course, which is a requisite for a Native American studies degree.

Founded in 1973 and chartered by the MHA Nation, NHS College stewards a living and breathing traditional seed cache. Ancestral seeds have been passed to us from many directions and many relatives. The NHS College Traditional Seed Cache is enriched and rejuvenated through generous donations of seeds that have been cherished and passed down through the generations from elders and MHA tribal members. Scholars and other institutions have also returned seeds to the cache at NHS College. The college distributes seeds to MHA tribal members.

In 1994, NHS College attained land-grant institution status, increasing its agricultural research capabilities. By 1997, the college identified land for gardening and agricultural research, entering into a lease agreement with the Army Corps of Engineers for community capacity projects and research endeavors. Situated on land taken from the tribe during the construction of the Garrison Dam in 1951, the Four Sisters Garden addresses the dual goals of combating high diabetes rates and revitalizing cultural significance through improved diets. The Garrison Dam was built on the Missouri River, flooding all of the arable land that the MHA Nation had farmed for generations (see fig. 3). The MHA community members were forcibly relocated to less fertile dry land without access to good soil or water for cultivation. The United States Army Corps of Engineers claimed ownership of all land on the newly formed reservoir's shore. This catastrophic event severed the MHA Nation from their historical agricultural land, resulting in the erosion of intergenerational gardening knowledge transfer. Fortunately, some displaced community members guarded seeds that could no longer be cultivated, passing them down to subsequent generations.[22]

Despite the intentional destruction caused by the Garrison Dam, elders and community members resiliently reestablished gardens, passed on stewardship values, led grassroots gardening organizations, and safeguarded seeds. These actions ensured the enduring legacy of MHA Nation's agricultural heritage, underscoring the strength and determination of MHA people to reconnect with their cultural roots and reclaim their relationship with the land and seeds.[23]

Methods

Situating Ourselves

We used the Indigenous research principle of relationality to approach our work within seed rematriation.[24] This is a case study of an Indigenous research project utilizing collaborative, participatory-action research methods centered on experiential learning and creating positive action.[25] The two lead researchers were brought together to heal past institutional discrimination and to envision a path forward in support of Indigenous research and Indigenous seed sovereignty. We chose NGPRL as a strategic partner, primarily due to its location on our ancestral land of the Mandan Tribe along

the banks of the Heart and Missouri Rivers. Replanting ancestral seeds there would trigger our seed relatives' memory, bringing life back to them by growing them in their homeland. Land and labor required for seed multiplication were a limitation to the health of the NHS College Traditional Seed Cache. Our hope was that partnering with NGPRL would address these land and labor limitations.

The USDA Office of Tribal Relations recognized the potential impact of the collaboration to serve as a pilot project to support Indigenous seed sovereignty and foster collaborative research between USDA and a tribal college. The director of the USDA Office of Tribal Relations provided crucial financial support. The collaborative effort between NHS College and NGPRL advances seed sovereignty goals. It serves as a model for navigating nettlesome federal bureaucratic processes in future collaborations with tribal institutions and healing intergenerational institutional trauma inflicted by the federal government.

Our Sharing Circle

A sharing circle is an Indigenous research strategy in which hierarchy is removed and each person is given the chance to share their lived experience and to be heard.[26] To increase the strength of our story of seed rematriation on Fort Berthold, collaborators, leaders, and mentors were asked to join in this manuscript by contributing their lived experiences and wisdom related to seed multiplication and keeping. Through a blind sharing circle, we asked our coauthors to answer fourteen questions individually, such as "What challenges, stumbling blocks, and lessons learned during your work would you like to share with other Indigenous seed scholars? What are some cultural, ethical, or moral questions that you've thought about or dealt with in your work?" We then wove our collective words of wisdom together into this story of MHA seed rematriation. We choose this method due to past experience with tension created by large manuscript writing teams.

We especially look toward our Pawnee relatives to mentor us. Our Pawnee relatives, under the guidance of seed keeper Deb Echo-Hawk, initiated the seed rematriation and sovereignty process more than two decades ago. The Pawnee and Arikara, who separated from one another in the 1500s, share corn varieties. It is said that Pawnee and Arikara have brought corn to the upper Midwest from Central America.[27] They worked with non-Indigenous home gardeners in the traditional Pawnee homelands in Nebraska to regrow and multiply Pawnee seeds for Pawnee tribal members. Deb Echo-Hawk established the Pawnee Seed Preservation Society (PSPS) to steward seeds and support this collaborative effort.

Steps toward Building Relationality

In this section, we walk through the process of relationality that we've gone through with our seed ancestors. Below is our process of seed rematriation–share, observe, reflect, experiment, and grow.

Vision Creation

Creating a clear vision has allowed our partners to align their missions and collectively advance toward a shared goal. One of our coauthors described it as follows:

> My hopes and wishes are for every MHA tribal member to have the means and ability to garden like our ancestors before us, so that we are able to integrate our own traditional foods—four sisters' crops—back into our diets. This project will be able to provide our MHA tribal members on and off Fort Berthold with our own heirloom seeds to help increase their knowledge of growing healthy foods that can be reintroduced back into our daily diets.
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> —Sonya Abe

In order to develop a clear vision and to articulate resources and barriers to achieving the vision, NHS College implemented a food sovereignty needs assessment. The needs assessment sought guidance from stakeholders and collected baseline data on the food sovereignty status of the MHA Nation. A key achievable goal in realizing the vision is to increase MHA tribal members' access to traditional seed varieties historically grown within MHA gardens before colonization. A first step toward the goal is nourishing the existing NHS College Traditional Seed Cache to increase access to seed varieties. This story describes our effort to support the health of the NHS College seed cache by increasing the total quantity of seeds, expanding the varieties available, and strengthening the genetics of seeds available. We nourish the physical, spiritual and cultural components of the NHS College Traditional Seed Cache. Therefore, we are part of a cultural movement and larger vision of enriching MHA cultural identity through home gardening, consumption, and recognition of varieties developed by our MHA ancestors. NHS College is the change agent and leader for this movement.

Fostering an Advisory Team

NHS College formed an MHA Seed Multiplication Advisory Team, serving as a crucial source of vision, ethical insight, moral guidance, and cultural knowledge. In addition, the team is a valuable source of mentorship and networking, fostering a close connection with the MHA Nation. The Seed Multiplication Advisory Team functions as a sharing circle, in which listening and learning from one another is prioritized and decisions are made collectively.[28] The advisory team is kept small and comprises active members who can provide regular feedback, wisdom, guidance, and attend outreach events. We are deeply grateful and honored for the substantial long-term commitment required from advisory team members to make the project successful. Diversity and representation is a key consideration in the advisory team composition, with careful attention paid to balancing representation from each of the three affiliated tribes, a range of gender and age group differences, and the inclusion of individuals involved in gardening and health efforts within the MHA Nation.

The advisory team responsibilities encompass four areas: (1) determining the project's direction; (2) providing valuable moral, cultural, and historical leadership;

(3) supporting outreach events; and (4) providing leadership related to the stewardship of common intellectual property. An illustrative example is the team's collaborative development of criteria for selecting what seed sources and pedigrees to prioritize for multiplying out.

Identification of Traditional Varieties

Many younger MHA generations have not had the opportunity to develop kin relationships with our seed ancestors. Therefore, we rely on the Seed Health Advisory Team to actively collect memories from various sources, including community workshops, anthropological accounts of traditional practices, historical records, Buffalo Bird Woman's insights, and photographs of 4-H county fairs from the turn of the twentieth century.

> Sometimes, I wonder how many varieties of traditional seeds may have gone extinct that we may not be aware of. Cultural and moral thoughts brought to my attention within our community include many tribal members being elders by the time they consume our MHA traditional foods.
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> —Tiana Dubois

While perusing commercial seed catalogs, we have found that many varieties have names linked to MHA, such as Mandan Bride corn. However, attributing their provenance is not straightforward. The Seed Multiplication Advisory Team is crucial in navigating these complex questions surrounding identities and determining which provenances should be incorporated into the NHS College Traditional Seed Cache. In addition, the historical account by Buffalo Bird Woman and Scattered Corn serves as a valuable gift into characteristics of various varieties.[29] "Scattered Corn Woman [is] an elderly Mandan matron and daughter of the last Mandan corn priest. According to her, the Mandans had at one time what they considered to be thirteen distinct varieties of corn. They were: soft yellow corn, soft white corn, red corn, spotted corn, blue corn, yellow flint corn, white flint corn, clay red corn, pink corn, black corn, red wrinkled sweet corn, society corn (described as having yellow kernels streaked with red), and Keika corn."[30] Resources we find useful are George Francis Will and George E. Hyde's *Corn among the Indians of the Upper Missouri* and Alfred Atkinson and Milburn Lincoln Wilson's *Corn in Montana* (see fig. 4).[31]

Our Pawnee relative, Deb Echo-Hawk, provides mentorship in our directionality:

> My hope is that all of the Pawnee varieties will be completely strengthened in their homeland and that we will now analyze what we recorded and learned about each variety for the Pawnee to use in the future. Part of that process means correcting information in George Will and George Hyde's book *Corn among the Indians of the Upper Missouri*.

Locating Dispersed Seeds and Reestablishing Place Connection

Anthropologists, commercial seed companies, and seed collectors, stretching back to the era of Lewis and Clark, have removed MHA seeds from MHA territory. These seeds now find themselves scattered across private collections and in museums.[32] We have found seeds residing at institutions such as the USDA's Germplasm Resources Information Network (USDA GRIN), the Minnesota State Historical Society, the North Dakota Heritage Center, the Minnesota Science Museum, the Harvard Peabody Museum, the Smithsonian, the Michigan State University Museum, and, we assume, many others.[33]

> I have a tightness in my throat when seeds are in other institutions. It is sad that the seeds are left and cared for—in ways that are good and bad—in non-MHA ways. However, that doesn't make them less our seeds.
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> —Ruth De La Cruz

Our seeds were sometimes violently taken from our care, but they remember where they are safe and are waiting for the right time and place to come back to life. Our seed relatives are beings, who, just like us, have memory, retain and pass on information for future seasons. The seeds uprooted from their cultural context and left dying in vaults may no longer be viable for germination. Nevertheless, they serve a vital role by offering guidance on seed characteristics—genetic reservoirs for future genetics research. Our endeavor to compile a list of MHA traditional varieties from MHA elders and from these diverse sources is time-consuming, complicated by lingering colonial power structures and hampered by geographical distances. Despite these challenges, the ongoing commitment to this collation process is essential for weaving together and supporting the seed rematriation process, acknowledging its complexities, and ensuring preservation for future generations.

Sourcing Germinable Seeds

Identifying sources of seeds that still germinate is imperative for seed rematriation and to prevent extinction of our traditional varieties. Frank Kutka et al.'s article "Techniques for Regenerating Old Seeds" (*Tribal College and University Research Journal*, Vol. 6, 2022) is an excellent resource on techniques for germinating old seeds. A viable seed is a seed that can germinate after years of being kept dormant and can produce a new crop. However, when old seeds cannot be awakened, we have sourced seeds from USDA GRIN seed bank, academic institutions, commercial seed producers, community members, and the NHS College Traditional Seed Cache. A seed bank is a Western scientific institution that holds and rejuvenates seeds to preserve genetic diversity. USDA GRIN seeds have been donated and collected since 1898. Seeds can be requested through the online shopping cart for research and education, and are freely available to tribal members. MHA seeds held in USDA GRIN are in the public domain and are, therefore, available to any requester whose reason for requesting the seeds meet the requirements delineated by USDA GRIN.

We found scholars, academic institutions, and commercial seed companies are enthusiastic to return seeds or give a sample of seeds back to NHS College and allowing them to take back the responsibility for caring for our intellectual property. However, gaining access to the seeds by some institutions and scholars has been difficult and not always fruitful, but important for the healing process.

Spiritual Leadership and Cultural Protocols

> Culturally, we respect our seeds. We say a prayer over them when we plant. We continue caring and praying over them and all that affects our gardens—wind, rain and sun. We give prayer and thanks for our harvest—give thanks for all who helped maintain the garden and share with them some of the harvest or other gift. Many of our ceremonies, songs, and practices are no longer known or practiced, but our worldview and spirituality is still intact. It is important to maintain this relationship of a symbiotic and spiritual bond to all living things, including our plants.
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> —Bernadine Young Bird

The Seed Health Advisory Team, alongside elders' guidance, is pivotal in providing spiritual leadership for the project. Before planting, a garden blessing, facilitated by elders, sets a spiritual foundation. Throughout the growing season, the garden remains open for visits by tribal members. Our advisory team members generously share stories, cultural protocols, and the identification of spiritual leaders, and engage in discussions of the evolution and adaptation—not just the preservation—of culture. We have also looked at documents such as Waheenee's description of how gardening fostered cultural and societal roles as we approach our work.[34] Gardening as ceremony and as the ecosystem that holds the community together are two cultural responsibilities at the foundation of our seed rematriation process. Ceremony is our way of finding guidance and alignment with the work that the seeds have to do. When entering the garden, it is important to set our intention for growing and be in the correct mind space before entering. We must be careful that our thoughts and words are nourishing while in the presence of malleable plants.

In ceremony, we quiet ourselves, listening with our hearts rather than our heads, and turn to our elders—the seeds, our human elders, and our ancestors for wisdom that will guide our work. Ceremony may be done by elders or bundle holders. Ceremony also leads when we plant, sing our songs for planting and for the water, and light the pipe at the beginning of the planting season and at its conclusion, with gratitude for the harvest. We place our first gift, tobacco, in the ground before the seeds are set. Reciprocity is practiced by giving an offering before entering the garden. Remember, when prompting elders for specific duties or trading traditional seeds, the ceremonial protocol should be followed (e.g., tobacco or blanket gift-giving).

Community is the ecosystem of Indigenous well-being. Therefore, we need to resist the individualism in Western culture. Dominant American culture values the individual over the community. In the past, we thought about how something would impact our community before thinking about ourselves. Before the Garrison Dam,

each family nurtured and stewarded specific varieties of corn to maintain pure seeds but traded with one another to have a variety for eating. Sonya Abe said, "Our MHA Nation's intellectual property and data should be respected as belonging to us as a collective. We should have the right to keep our information for our own people as traditional and present-day knowledge and data."

The deep connection between the garden practices, seeds from MHA ancestors, and contemporary MHA knowledge keepers prompts continuous reflection on how to honor the MHA Nation's seeds, food, and garden wisdom. Outreach events led and advised by members of the MHA Nation provide proper protocols and guidance for each event. These gatherings provide opportunities for connection, the uniting family members, introducing partner organizations, fostering intergenerational engagement, and creating friendships. "Hand games, for instance, stand out as a memorable and culturally enriching activity within the community. The emphasis on fun, inclusivity, and intergenerational engagement ensures that these events become cherished moments, contributing to the preservation and celebration of cultural heritage," said Kahheetah Barnoskie.

Fostering the Health of a Traditional Seed Cache

Seed health is the ability of a collection of seeds to maintain genetically robust varieties that are continuously adapting to climate, land, and culture, producing healthy crops. In addition, it is the physical condition of a collection of seeds to germinate and form a healthy population free from disease or other detrimental developmental conditions. According to observations by scientists at the USDA gene bank, seed germination decreases by approximately 10 percent each year—and it is worth noting that the storage methods this estimate was derived from were not Indigenous storage methods. Seeds that are stored long-term need to be grown at least every ten years to maintain germination. A living seed bank is a collection of seeds regularly grown to maintain their life force. This serves as a means of climate-change adaptation and cultural preservation.[35] However, the health of a traditional seed cache may be weakened if not appropriately stewarded. This presents a delicate practice of maintaining genetic diversity within varieties and maintaining the varieties' unique characteristics. We seek guidance from the Seed Health Advisory Team in answering these questions. Methods for maintaining genetic diversity, uniqueness, and cultural identity include outcrossing, cross-pollinating seed families, and isolation during pollination.

Some conditions that threaten the health of a living seed bank include a weakened variety, cross-pollination, and bottlenecking. A weakened variety is when a variety has a lack of robust genetics within a collection of seeds that leads to decreased vigor, poor germination, and disease. This occurs when there has been a genetic bottleneck. A bottleneck is when there is a limited gene pool within a seed collection that makes the variety more susceptible to disease and leads to decreased quality over time. Bottlenecking occurs when a variety is reduced to just a few seeds and the genetic diversity within the variety has been lost. To prevent bottlenecking, it is recommended to grow a large population of mature plants. For genetic preservation, the number of

mature plants producing seed should be as follows: maize (a minimum of 300—800 is better, an eighth of an acre is best), squash (twenty-five or more), beans (twenty or more), sunflowers (eighty or more), watermelons (twenty-five or more).[36]

Seeds can be strengthened by invoking their seed memory. A seed memory can be brought back to life by growing the variety in the locations where it was originally grown. Different soil, weather, and water availability affect genetic diversity and epigenetics. Therefore, our collaboration with the USDA Agricultural Research Service–Northern Great Plains Research Laboratory (NGPRL), located on our traditional homeland and implementing Indigenous traditional ecological knowledge such as four sisters, is critical. An essential part of health is maintaining seed integrity. Seed integrity is achieved when a seed's genetics display characteristics that represent the stories and histories shared by elders and passed down through our culture. Many of our seeds, mainly corn, have become cross-pollinated and do not consistently present standard pure varieties anymore. We must go through the thoughtful process of variety stabilization to support the health of our traditional seed cache. Variety stabilization is growing a variety for multiple seasons and selecting the desired characteristics to get a population of seeds that consistently presents the desired characteristics. We can conduct back-crossing or the drawing out of genetics to reach seed integrity.

> For example, we identified two varieties of corn that our ancestors documented, but these varieties only presented themselves in some kernels of a cob. By replanting the variety for a couple of generations and selecting for those cobs and kernels, we will be able to draw out the genetics of varieties that we thought were lost.
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> —Deb Echo-Hawk

Cross-pollination is when pollen from one plant pollinates another. Allowing two varieties to cross-pollinate each other can be helpful when trying to increase the strength of a variety by introducing new genetic diversity. If cross-pollination occurs unintentionally and unnoticed, this results in the loss of seed integrity and will no longer present stable characteristics. In other words, the variety is no longer pure. Seed families help return strength to genetics. Rhonda O'Brien said, "Through the history of native corn, tribes created new varieties from multiple ancestral varieties. These ancient varieties, as well as the new varieties developed by the tribes, create a 'seed family.' For example, Pawnee red flour corn was likely developed from Pawnee white flour corn, Pawnee red speckled corn, and Pawnee red flint corn, since each of these varieties begin to appear in weakened Pawnee red flour corn. These varieties are in the same 'family' and can be used to help genetically strengthen each other. It is one of the lessons that Pawnee corn has taught us over time." Weakened varieties and bottlenecking can be prevented by planting and pollinating a sufficient population.

Gardening

The first growing in the 2023 season was inaugurated with a garden blessing at the USDA Agricultural Research Service in Mandan, North Dakota, led by the Seed Advisory Team and members of the MHA tribal community. What does Indigenous

agriculture and the work of seed-keeping look like now? In our work, we have reflected upon the tensions between preservation and adaptation of Indigenous traditional ecological knowledge. In this first year, we tried to grow the garden in four sisters style, following documentation by Buffalo Bird Women and Gilbert Wilson for Arikara planting techniques.[37] However, the mounding process delayed our planting, made it difficult to weed, and hampered our bean harvest. We sought guidance from the Seed Advisory Team as we made decisions about adapting and evolving Indigenous agriculture to our present context. Our colleagues at the University of Montana shared insight into the evolution of Indigenous agriculture techniques.

> In practice, this has looked like planting more shallowly than in Buffalo Bird Women's book, as our clay soils hold moisture and can cause deeply planted seeds to rot. It has also led us to listen to local cues about timing plantings, such as waiting for sunflowers to volunteer themselves as cues for when to plant the sunflower, rather than planting when the ice breaks upon the Clark Fork River in Missoula, which can happen as early as February or early March. It has also meant that we do irrigate the garden, as this is the common practice at our farm and in our semiarid climate, although our irrigation practices are something we would like to reflect on because we value developing drought tolerance.
>
> —Caroline Stephens

Various philosophies exist regarding gardening responsibilities and supporting the advancement of Indigenous gardening. On the one hand, we add irrigation, fertilizing, covering, and so forth to give the plants the best conditions to thrive. On the other hand, we expose plants to harsher conditions, provide less additional support through amendments, watering, and protection, and then select seeds from the plants that survive to make our varieties more resilient. We discuss these important philosophies with the Seed Advisory Team during the winter months. For example, the team decided to use weed barrier fabric to reduce weed pressure and reduce labor demands.

We familiarized ourselves with traditional pollination protocols documented by Buffalo Bird Woman, such as space isolation, planting in blocks, and selecting the best ears to save for seed.[38] We separated beans and watermelon that could cross-pollinate by distance (wind pollination), used time exclusion for squash, and hand-pollinated corn (e.g., bagging tassels and silks in maize due to being unable to apply spatial distancing). We had planned to use exclusion bags (insect pollination) for sunflowers but could not do that this first year. Distance separation guidelines for preventing cross-pollination by wind is 800 feet for maize, squash, watermelons, and sunflowers. The final step to ensure the genetic strength of varieties is to monitor both plants and seeds each year to make sure undesirable genetics are removed by culling seeds after harvest. We wish we had known the wisdom of our partners before we lost a variety of sunflowers. We are currently searching for a new seed provenance for that variety.

> These frail, old seeds being rematriated to tribal groups need to regain their strength while maintaining their traditional characteristics. A lot of these ancient seeds are delicate and vulnerable to the changed land. A good practice when first

> handling ancestral seeds that have been rematriated is to really baby those seeds and plants for a few years, maybe in greenhouse setups. Further, be careful [to avoid] cross-pollination with other breeds of the same plant, so as to not lose those old characteristics. That way, when a deer eats one of the few plants of a limited seed supply, you're not cursing at them.
>
> —Kahheetah Barnoskie

In the summer of 2023, nine varieties of corn were grown, four varieties of beans, six varieties of sunflowers, six varieties of squash, and one variety of watermelon. Other pests and challenges, such as excessive fungus on corn, late planting and harvest of beans, limited labor capacity to hand pollinate, weeds, deer, raccoons, and grasshoppers, provided abundant learning opportunities. Active involvement through regular visits to the garden by advisory team members facilitated cultural protocols related to planting and spirituality. Corn smut thrived on a couple of corn varieties. During one visit to the garden, Sonya Abe remarked that she had been told by her grandfather that when someone farts in the garden, it leads to corn smut. We carefully harvested, hulled, and air-dried our harvest. We separated out cobs and squashes for consumption that appeared to have been accidentally cross-pollinated between varieties.

Deb Echo-Hawk has shared with us that we need to use proper storage methods to maintain seeds strong with high germination rates. Deb recommended keeping seeds attached to the cob until just before selecting seeds for planting, because seeds that are removed from the ear tend to deteriorate faster and have lower germination rates. Keeping the seeds on the cob also allow you to better understand the genetics of the parent plants. You can identify the genetic variety better with a visual inspections—lost once you shuck the corn. Glass jars with canning lids are the best means to store corn seeds; avoid storing seeds in plastic baggies. The baggies keep air from getting to the seeds, lowering their germination percentage. Seeds need to be kept in dry, dark conditions from year to year. Vacuum sealing seeds and storing them in a freezer allows them to maintain germination for many years.

Selection of Seeds to Maintain Traditional Characteristics

Saving seeds is an intentional act of deciding what genetics to pass on to the next generation. Our ancestors were plant breeders and intentionally selected plant traits to be resilient to climatic conditions, pests, and nutrition. We need to have the same intentionality our ancestors had when choosing what seeds to keep for planting the following year. By observing, documenting, and analyzing each variety's characteristics, we select desirable traits to help the tribe accomplish what they desire to do with the different varieties.

This fall at the Mother Corn Harvest Time Workshop on Fort Berthold, elders, upon seeing the traditional squash variety display, exclaimed, "They are not supposed to have green stripes." We realized that we needed to carefully select and document feedback from community members on the unique characteristics of each traditional variety. We must maintain this seed integrity in our seed saving. Therefore, we created a selection protocol for each variety to maintain the uniqueness of each variety while

still retaining genetic diversity. For example, one squash exhibited a blue spot on the bottom, and one had a variety of shapes, from long tubal to round hubbard. So, abiding by MHA elders and the Seed Advisory Team requests, we are making decisions based on such criteria when saving seeds. "The 'drawing-out' of genetics that represents some form of cross-pollination with non- Hidatsa squash varieties is an attempt to maintain or reestablish seed integrity," said Sidney Fellows.

Close observation of the plants throughout the growing season, including monitoring changes in color, shape, and other distinctive features, allows us to document ancient characteristics such as albino seedlings. After harvesting, we selected the seeds from plants that displayed consistent and desired traditional characteristics for further propagation. We identified some seed lines that appeared to be crossed, and decided to try new seed sources and provenances for some varieties during the next season. This careful process aims to restore the unique characteristics of traditional varieties and align them with the knowledge passed down by community members. The engagement of knowledge-keepers in this selection process plays a crucial role in ensuring the continuity of traditional traits within the seed collection. Deb Echo-Hawk said, "We Pawnee were lucky to have old data to compare our corn to and realize it had not changed in over 100 years. In the years that we have studied corn, it is evident that ancient traits still exist, such as kernels growing in the tassels and eight-row cobs."

Deb Echo-Hawk found that corn gardens planted in a solid square will better stand up against the wind and pollinate each other, with the plants in the center of the garden being the tallest and strongest and producing the best seed. This is what we call a border row effect, the result of position and not genetics. In this context, the plants work together: the center plants depend on the border plants for protection and would not grow as strong and tall without their relatives providing that protection. We then select plants and seeds from the middle of a row, and when hand pollinating corn, only saving seeds from the middle of the cob. Be aware that pollen from other sources could accidentally enter the silks before they were covered with a bag, or the silk bag could have blown off after hand pollination. The kernels on the ends of the cob may be used for food.

> We are working to recover cultural knowledge for the protection of genetic diversity. This requires relationship-building, and, owing to the fractionation of knowledge caused by the great disruption of colonization, piecing this knowledge together from many sources is likely our best opportunity to understand ancestral knowledge in this area.
>
> —Jill Falcon Ramaker

Developing Relationships with Traditional Varieties

> Kincentrism finds that everything in nature has equal moral status, and that we have relationships to it simply because everything in the ecosystem is interconnected. To apply that ethic is through Indigenous management of the ecosystem, which promotes the continuance of everything, much like managing a family dynamic.
>
> —M. J. DesRosier

Observational listening is a foundational methodology of Indigenous traditional ecological knowledge. Building relationships with plant and seed relatives is a journey of experimentation, appreciation, and spirituality. We nurture this relationship through storytelling, workshops, and the involvement of tribal elders. As practitioners of seed tending and keeping, we need to respect the seeds, plants, soil, and land as sentient entities equal to us, the human caretakers who share a spiritual relationship. These teachings are central to this work and cannot be decoupled from it. Our responsibility is to take care of the plants as parents would care for our children through song, consistent tending, and recounting traditional stories.

> In the Anishinaabe way, we recognize ourselves, two-leggeds, as the last ones lowered down in our creation story. In this way, we know that the plants are our older brothers and sisters. Just as with any living being, each of these relatives has their own work to do. These relatives care for us with sustenance. Reciprocity means we are responsible for creating a positive environment where the plants can do their work to the best of their ability.
>
> —Jill Falcon Ramaker

Indigenous observational listening is different from what the dominant culture teaches about listening. It is relational. It builds relationships between ourselves and our plant kin and the environment with which they call home. Language is an essential medium for fostering identity with our ancestral crops. Many specific plant and gardening terms are lost, along with names for varieties. Derogatory variety names given by white men and commercial seed companies violate our seed relatives. The advisory team developed a naming protocol for all ancestral varieties. Language experts, recordings, historical documents, elders, and scholars helped us revitalize the language associated with seeds. Outreach materials in Nueta, Hidatsa, and Sahnish languages normalize and disseminate culture and identity.

Relationships need to be developed, not only in gardening but also in the kitchen and on the plate. Squash leather and new recipes for stuffed squash developed new culinary approaches that create bridges for modern palettes to appreciate traditional varieties. Our modern palettes crave sugar, fat, and salt. Our ancestral diet was high in protein and fiber. Over time, we have bred and selected corn and squash varieties that are sweeter than what our ancestors ate.

> In our gardens, we do weekly potluck work parties. This time spent raising food and sharing food builds beautiful relationships. We need to learn new ways to protect the plants while they are in the field. In the past, we had singing platforms where our young people and sometimes our old people sat and scared away the winged ones and four-leggeds that also wanted to eat the plants.
>
> —Jill Falcon Ramaker

Education, Capacity Development, and Citizen Engagement

Overwhelmed by squash and watermelons, we distributed the abundance to schools on Fort Berthold, where students had their first chance to try a traditional watermelon variety. Watermelon-tasting workshops at reservation elementary schools allowed youth to develop an appreciation for the seedy, paler, and not-as-sweet ancestral watermelon. Engaging in educational initiatives and building community capacity is integral to the seed work and ensuring that the future will be better for the next generations.

This past winter, squash processing provided a space for tribal members to participate in the project, fostering capacity development in food processing and preservation. Tasting events held in conjunction with outreach activities introduced tribal members to decolonizing their palates. In addition, we distributed squashes to Head Start programs, sober-living lodges, elder organizations, and high schools.

Tribal members lead the inaugural MHA Garden and Seed Summit to disseminate the history, culture, and spirituality interwoven with seed-keeping and gardening. Ensuring the health of the traditional seed cache at Nueta Hidatsa Sahnish involves vital seed regeneration and gardening by MHA Nation members. NHS College seeds are only available to tribal members with an ID who sign an agreement that one-half of their harvest will be returned in seeds back to NHS College. This distribution underscores the dedication to preserving and sharing traditional seeds within the MHA community.

Evaluating Outcomes

We plan to understand our impact through tribal members' ability to recognize, consume, and grow traditional varieties. Presently, MHA tribal members identify only a limited number of varieties, highlighting the need for comprehensive revitalization efforts. Our work is not a quick process with immediate rewards, but will take decades of capacity inertia. Our Pawnee relatives have been working on seed revitalization efforts for more than twenty years. We anticipate each new growing season will bring new lessons and challenges, emphasizing the patience required for this work. Our seed relatives will teach us something new every year. Kahheetah Barnoksie said, "It is very healing to see crops grow that you worked with your own hands and to reconnect with our ancestors who once grew these traditional seeds."

Our Next Steps

In the steps toward building relationality with our seed relatives, we described the steps we have taken as part of our action research process to support seed rematration on Fort Berthold. We have made many mistakes, some still too tender to put into words, but we hope the reader can adapt and reflect on what we have shared. We have some questions that we are still "chewing on" related to the identity and intellectual property rights of our seed relatives.

Chewing Questions

During our process, we have stumbled upon questions that require us to be critical of our biases and reflect on how we would like to move forward with this vital role of kinship. Who are our ancestral seed relatives? This seems like a simple question. What varieties and crops does a community identify with now or has identified with in the past? Polenta and tomatoes did not exist in Italy during the pre-Columbian exchange, yet they are intrinsic to Italian identities now. The chili peppers that define Indian and Southeast Asian cuisines did not exist during the pre-Columbian exchange; now they are a defining characteristic of many culinary identities worldwide. New foods are incorporated into diets and culinary identities quickly. At the same time, dishes and recipes are rejected, forgotten, and excluded from culinary identities due to shifts in power, preference, communication, and access. Who has the right to say what is part of a culinary identity, and who does not have the right? Who can be an influencer?

The Cherokee Nation grappled with these same questions while working to establish their seed bank.[39] After historical research, they learned that the tomato variety commonly called the Cherokee tomato had only been a distinct variety since the beginning of the twenty-first century. Does that mean that the Cherokee tomato is a traditional variety or not? Is there a specific date delineating when traditional culture ended and modern culture began? Indigenous identities, cultures, and communities are not trying to recreate the past. Indigenous cultures are living, dynamic, and vibrant, continually defining and delineating identity.

For example, the MHA Nation probably started cultivating the Arikara watermelon in the eighteenth century. Since then, taste, palate, culinary preference, and the genetics of breeding watermelons have changed. To our modern palate, we found the Arikara watermelon was bland and extremely seedy. How do we select which watermelon seeds to save for next year? Do we continue to preserve this variety as it is? Or as we save seeds, do we slowly select for specific characteristics that would make the watermelon more accessible to modern palates? We conducted tasting panels with tribal members and chose seeds from the sweetest melons to save and replant for next year.

Curcubitea pepo was the predominant species of squash grown until *C. maxima* was introduced. Cultivation of *C. maxima* was probably adopted due to sweetness and improved culinary characteristics compared to *C. pepo*. *Curcubitea pepo* was bred to be eaten immature as mallow (how we eat zucchini now). Stories from elders suggest that distinct varieties existed; this contradicts Buffalo Bird Women, who described squashes as *not* distinct, allowing one variety to cross-pollinate with another. This season, we have found that our *C. pepo* now has tough rinds that require a bandsaw to access their flesh—tough to such an extreme that we have contemplated using their rinds as serving bowls. Our elders tell us that the violence of the construction of Garrison Dam may have forced the squashes to develop these new characteristics. This observation leads us to question whether the removal of the dam could be part of the MHA people's path toward food sovereignty, providing the opportunity to heal the land and our plant relatives.

Protecting Intellectual Property Rights for Traditional Seeds

As we move forward with our process of seed rematriation, we will shift from focusing on collecting and disseminating our relatives and the cultural knowledge that weaves us together to protecting our intellectual property rights and hopefully removing them from being "on the drum."

> The corn industry is always looking for new genetics to improve modern strains of corn. It is a constant worry that the industry will want to claim a variety before it is protected, or that the industry will acquire a corn variety to improve the genetics of modern-day corn varieties at our cultural and economic expense.
>
> —Deb Echo-Hawk

Nontribal law strips seeds of their intimate relationship with Indigenous seed-keepers. Intellectual property law transforms seeds into commodities that can be bought and sold. For thousands of years, Indigenous people have traded seeds in reciprocity with one another and maintained protocols to respect our seed ancestors. As Indigenous people, we view seeds as a community intellectual property, which often conflicts with non-Indigenous legal protocols that define seeds as being owned by a single entity or individual. There are some questions we are chewing on as we move forward: (1) For what purposes can traditional seeds be used—food, seed-saving, breeding and research, or commercialization? (2) Who should benefit from seeds and earn revenue—individuals, seed-keepers, tribes, or a specific institution? (3) What is the timeframe for the use and benefit of traditional seeds—one time or in perpetuity? (4) Who should be able to steward traditional seeds—tribal members, any seed-keeper, only Native-led organizations?[40]

End of the First Season

> Thanks again for the delicious watermelon. My daughter and I are enjoying it. I'm not sharing it with my BF. Ha-ha. It's tasty, for sure—lots of seeds. I like the color and the flavor. My daughter loves any watermelon. I'm going to pickle my watermelon rinds. See how they turn out. Lots of love, emotion, and memories with our seeds. Very important to family and life.
>
> —Sonya Abe

The project's first year has yielded a total production of eight varieties of corn (twenty-eight gallons of corn seeds), seven varieties of squash (500 or more), four varieties of beans (one-half of a gallon of seeds), and one variety of watermelon (150 or more) grown on half an acre at the NGPRL) in Mandan, North Dakota. In addition, through our work we have sparked interest, commitment, and devotion of MHA members and allies to breathe life back into our seeds. Last week, we hosted a seed summit with more than 100 participants to celebrate the upcoming growing season and to share the spirituality and cultural importance of our traditional varieties. As the project grows into its second year, we have extended invitations and developed partnerships with local institutions that support MHA culture to garden and steward specific seed varieties. Currently, we have four additional partners committed to growing seed and returning it back to NHS College after the growing season. The partners volunteer

to garden, guarantee pollination isolation, and then return all the seeds back to NHS College for distribution to tribal members.

We are currently preparing to hand out the first batch of seeds to MHA tribal members. With the gift of seeds, these tribal members must commit to a code of ethics that includes returning a portion of their seed harvest back to the NHS College Traditional Seed Cache. As the research grows, the focus will shift to human nutrition, supporting home gardening by MHA tribal members, and increasing consumption of traditional varieties. We hope this research provides a valuable reflection on the intersection of genetic preservation, community engagement, and the potential benefits of embracing traditional crops in modern contexts.

> I hope that we will continue to learn and grow together as we work for intertribal food sovereignty, a vibrant twenty-first-century (and beyond) Indigenous food system on the Northern Plains and Rockies. I hope that this work will change us. The seeds are leading; they are bringing us home to the land. I am excited about the process of listening to them together with my fellow Buffalo Nations relatives.
>
> —Jill Falcon Ramaker

Acknowledgments

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