

A Snapshot of Agricultural History:
The Oscar Will Seed Company Collection at the North Central Regional Plant
Introduction Station

Creative Component Project

By

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April 2010

Statement of purpose:

The purpose for this project is to use a case study involving the material maintained at the North Central Regional Plant Introduction Station Ames, Iowa and originating from the Oscar Will Seed Company of Bismarck, North Dakota, to demonstrate that a genebank is not only a reservoir for genetic material in the form of seeds and plants but also a reservoir for agricultural indigenous knowledge. The information in this document will be presented as an educational seminar aimed at an audience having general knowledge/interest of/in seed preservation and Native American agriculture.

Plan of Presentation:

The discussion here proceeds as follows: First, I discuss the purpose of a genebank. Then there is a brief review of the history of maize and the nature of landraces in genebanks. The following part describes the collectors of maize in the United States. The next section, and main body of this paper, deals with the landrace maize samples at the NCRPIS, the role of Oscar H. and George F. Will in assembling these specimens, the research approach to the collection and nature of the database, the role of the Three Affiliated Tribes in northern Plains horticulture, and a description and discussion of the Oscar Will Seed Company collections at the NCRPIS. Drawing on this background and information, the conclusions point out the unique nature of this data base and the utility of maintaining these specimens for historical and scientific purposes

Purpose of a Genebank:

What is a plant genebank? A place where genes are preserved. A place where seeds and other plant material are maintained for future use. A place where scientists can obtain plant material for research for the development new varieties to withstand pests and disease. A genebank does all of the above. But there is something else that a genebank preserves: the history of agriculturists. When an accession (a unique sample of seed or plant material) is collected it becomes a snapshot of the culture where it was developed. When an accession enters a genebank and if correct procedures are undertaken, the genetic profile of that accession should remain the same as when it was collected or donated. The curator of the accession, using established protocols, will regenerate the seed in such a manner as to preserve the accession as it was received. Not only does a genebank function to preserve genes it also captures important cultural information. Among the accessions maintained at the North Central Plant Introduction Station (NCRPIS) in Ames, Iowa, are various sets of material that are excellent examples of anthropological information preserved in form of passport records and the phenotypic expression within the plants themselves.

Short History of Maize:

The following project focuses on one crop which has been so closely associated to people that it cannot survive without us: maize. The earliest evidence of the domestication of *Zea mays* comes from the Balsas river drainage in the State of Oaxaca in Mexico. Archeological evidence suggests that domestication of maize occurred at or before 6,000 years ago (Piperno and Flannery 2001). Molecular dating evidence suggests that maize was domesticated some 9,000 years ago (Matsuoka et al. 2002). Most researchers also agree that *teosinte* is the progenitor of

maize (Eubanks 2001). The type of teosinte found in the Balsas river drainage has been linked using genetic data as the type most closely related to maize. Research suggests two paths of dispersal of maize throughout the new world. One path takes maize through western and northern Mexico up into the southwestern U.S. and then into eastern U.S and Canada. The other path takes maize from the highlands to the lowlands in the western and southern lowlands of Mexico to Guatemala, the Caribbean Islands, the lowlands of South America and then to the Andes Mountains (Matsuoka et al. 2002).

Maize is classified using morphological features of the ear. An ear consists of the cob and the kernels in situ. Much of what is known of maize from prehistoric times comes from cob fragments leaving scientists to infer ear characteristics from components that were not found in direct association (Eubanks 2001). Maize material conserved in genebanks can be valuable for use in comparison studies using ear morphology to extrapolate what archeological specimens might have looked like.

Landraces and Genebanks:

Crop Genebanks conserve a variety of accessions ranging in improvement status from wild to highly inbred. Not only do these accessions represent the genes carried in the seeds but also the agricultural heritage that that lead to the development of varieties. Traditional agriculture gave rise to landraces varieties. Landraces of a region are adapted to the local climatic conditions, cultural practices, disease, and pests. They are also adapted to low soil fertility, low plant populations and low yield. They may be classified by expected use, such a flour corn for grinding. Landraces are identifiable and usually have local names. They tend to be genetically

variable within a population which gives them insurance against hazards. The genetic variability provides good sources for modern plant breeding (Harlan 1975). How do landraces differ from modern varieties? In general, modern varieties result from improvements via a formal breeding program. They may be released under a registered name and breed true and uniform for distinctive properties. The term “landraces” was first used in the 1890 to refer to a variety that had been grown in a given locality by farmers to become adapted to local conditions with no intentional selection. It was a term used to describe the management of wheat and barley in pre-industrial Europe. These crops are largely self-pollinating and are managed differently than out-crossing crops. Another term “folk variety” has been described to cover out-crossing crops such as maize. Berg (2009) defines a “folk variety” as a farmer variety that is selected and maintained for its distinctive properties. Farmers may maintain several varieties on one farm, managing them in order to maintain each variety’s distinctive properties. These folk varieties differ from modern varieties by having unknown origins, more diversity and less varietal stability. Whether the term landrace or folk variety is used either term refers to a locally adapted farmer variety with the benefits of adaption and yield stability. Whichever term is used, farmer varieties cannot compete with modern varieties in the area of yield (Berg 2009).

At the North Central Regional Plant Introduction Station (NCRPIS) several crops important in Native American culture are being conserved. The largest collection consists of *Zea mays* (Corn). The maize collection numbers over 20,000 accessions ranging from landrace material to highly inbred lines. The NCRPIS was established in 1948 as the first of four regional Plant Introduction Stations. The mission of The NCRPIS is to conserve the genetic integrity of the accessions maintained at the station. The accessions (unique plant inventories) held at the station

consist of the actual seed and the information associated with the seed in the form of passport (or provenance) information and observation data collected while growing the material.

The quality of passport information in genebanks may range from poor to excellent. Information contained in passport data includes: donor, collector, habitat, location, pedigree, use, and any additional information associated with an accession. Of particular interest is cultural information about the use of an accession by the people who developed or donated the material to the genebank. Most of this information accompanies the seed when it is donated in the form of narratives on the packets or documents in the form of letters or shipping slips. Much of this type of information is just a short statement such as for PI 476869: “Adapted to deep planting in sand dunes and dryland farming. Drought tolerant. Cobs 12-14 rowed. Seeds floury, blue. Used for making piki wafer bread.” While sometimes the information is greater, as for Ames 22778, “The information on the Kickapoo involvement was provided by Haglan, B. through a conversation with an elder of the Meskwaki tribe. The elder spoke English and a variety of Algonkian dialects. He grows the vegetable crops for the feasts of his clan and identified this cultivar as being the one needed by the Kickapoo Indians for a particular, unspecified feast. He said he had been trading corn to the Kickapoos for years, saying that the Kickapoos claimed the weather was too severe for them to supply their own needs. He asked if I could grow a sizeable amount of it to be taken to Oklahoma and/or Mexico to be traded for bulrush and cattail mats, woven and sewn by Kickapoo women (Meskwaki women no longer construct these mats). The elder also explained how the Meshwaki gardeners were also familiar with this cultivar, but it was known that had come from the Kickapoo. The elder was given four ears. Barry Haglan grew plots of this corn in 1992, 1994, and 1995 west of Norwalk, IA.” But in most cases the information is short as for PI

213768 “Seeds white and purple. Flour type.” (Germplasm Resources Information Network: http://www.ars-grin.gov/npgs/acc/acc_queries.html)

Maize collecting in the USA:

Cataloging and documenting the Native American accessions has anthropological, cultural and agricultural importance. In Corn and Corn Improvement, Major Goodman and William Brown write “unlike that of most other countries, much of the indigenous corn of the USA was replaced by hybrids prior to the implementation of an organized program of germplasm preservation.”

The United States was colonized and native agriculture was disturbed at a greater rate than that of Central and South American countries (Goodman and Brown 1988 p59). Documenting the material maintained at the NCRPIS has importance in capturing a snapshot of time when these accessions were collected and donated to the National Plant Germplasm System (NPGS). When the material is grown every attempt is made to retain the genetic profile of the accession as donated. By doing this we can capture cultural activities as they occurred when a particular landrace was being used, whether it be by Native Americans or early Euro American farmers. A landrace that is being maintained by a group (town, farm community, or tribe) will change over time. Environmental changes, market demand and personal preference will cause shifts in gene frequencies within a landrace. If the genetic profile of an accession is maintained as it was received, then a part of history is preserved in the form of a living plant.

In the 1940’s the National Academy of Sciences – National Research Council embarked on a mission to preserve the races of maize of the Americas. In the introduction to the series of books that were published, J. Allen Clark wrote “They represent one of the irreplaceable agricultural

resources of this hemisphere” (Clark 1954, p78). Material was collected and books were published covering Central and South American countries including Mexico. Material from the United States and Canada was not included in the series. This project is an attempt to highlight the importance of preserving the cultural heritage represented by material preserved at the NCRPIS and how it that relates to Native American landraces and early Euro American landraces.

Landrace Maize at the NCRPIS:

The NCRPIS maintains over 20,000 accessions of maize (*Zea mays subsp mays*). Of these, 947 are listed as landraces originating in the United States with around 238 having a traceable affiliation to a Native American Tribe. This affiliation is based on the passport information that accompanied the accession when it was received by the National Plant Germplasm System (NPGS). Within the ~ 238 there are sets that were received as groups from donors and there is an opportunity to compare what has been maintained with what may have been lost. One set originating from the agricultural tribes of the Plains came from The Oscar Will Seed Company operating in Bismarck, North Dakota from 1885 to 1959, and was described in a book entitled Corn Among The Indians Of The Upper Missouri by George F. Will and George E. Hyde, published in 1917. George F. Will was the son of Oscar H. Will. The relationship that these two individuals had with the Native American corn originating in the Upper Missouri area presents a unique situation where a respect for the indigenous agriculturist was combined with a need to produce corn varieties that were useful in the harsh climate of the upper Midwest. Both the offerings of Native American varieties in the Oscar Will Seed Company catalogues and the publication of the Will and Hyde book predate the founding of the NCRPIS and the donation of

the accessions to the collection. Using information from the Oscar Will Seed Company Catalogues, the book by Will and Hyde and the information held by the NPGS in the GRIN database, can it be determined what remains of the varieties mentioned in the catalogues and book?

Who were Oscar H. and George F. Will?

In the maize collection at the NCRPIS the Oscar Will Seed Company material stands out as a truly unique set of accessions. Not only was Oscar Will a pioneer in the seed business, he also had a great admiration for the Native American agriculturist he encountered in North Dakota where his seed business was located. In looking at the material he offered in his catalogues and the material his son George F. Will wrote about in Corn Among the Indians of the Upper Missouri a picture develops of what material was grown in the past and what has been lost in the last century.

Oscar Will was born in 1855 in Pompey, New York. As a teenager he worked in his brother's nursery business in Fayetteville, New York. Following a letter sent to his brother, William, from Major Edward M. Fuller (a military comrade of William's) looking for someone to help him in his nursery business, Oscar traveled to Bismarck in the Dakota Territory in the spring of 1881. Fuller's business grew largely due to the "tree-claim" amendment of the Timber Act of 1878. The amendment allowed pioneers an extra 160 acres of land if trees were planted. In 1884 Fuller leased the business to Will. In 1885 the first catalogue was published with Oscar H. Will at the helm. Much of the business profited from selling trees to farmers and the railroad for such things as erosion control and as snow fences. At one point the company supplied two million trees to

the Northern Pacific Railroad to be planted along the railroad between Jamestown and Mandan, North Dakota. He also supplied 300,000 cottonwood trees to the Canadian government. In 1897 the company began to call itself the “Pioneer Seed House of the Northwest”.

Oscar Will also had an interest in supplying seed to farmers and home gardeners. In 1882 the pivotal event in the company’s growth occurred with the acquisition of Native American corn from the Fort Berthold Reservation, home of the Mandan, Hidatsa and Arikara Indians. From that material Will developed two of the company’s most successful corn varieties: Pride of Dakota and Gehu Yellow Flint. In 1914 the catalogue started offering the “Pioneer Indian Collection”. This collection varied each year but offered some combination of Native American corn, beans and squash, such as Hidatsa Red bean and Arikara Yellow bean, Mandan Squash, Nueta Sweet corn, Soft Yellow corn, and Arikara Flint corn. Nueta Sweet corn and Mandan Squash were presented to Will by James Holding Eagle, a Mandan, in 1907 (Schneider 2001). During his career as a proprietor of large seed business, Oscar Will had many interactions with the Native American tribes in the Bismarck area. From [The Time Line of Historical Events Relating to the Three Tribes of the Fort Berthold Reservation](#) on the Fort Berthold Library website, the 1882 entry lists “Oscar H. Will, a horticulturist, establishes a seed company in Bismarck, obtains corn seed from the Tribes at Fort Berthold” (<http://lib.fbcc.bia.edu/FortBerthold/Tmlno1.asp>). His admiration for the native agriculturist can be seen in his catalogues. In the 1914 catalogue he offers various Mandan Indian varieties accompanied by a picture of “Scattered Corn, one of the few surviving Mandan Indians”. The catalogue states “Few people realize that North Dakota has been an agricultural state for at least two hundred years. For at least that long Mandan Indians have grown these varieties of hardy

corn and vegetables, carefully selecting their seed for both earliness and drought resistance, and exercising great care to keep their several varieties of corn separate.” (Schneider 1994, pp33).

Many of the varieties of corn that he offered were directly developed from Native American varieties that were shown to be productive in the upper Midwest. In his 1886 catalogue, he offers a prize for the “best dozen ears of improved Ree corn” (Ree is an alternate name for Arikara).

Varieties like the Ree corn were grown by Will and others and became the backbone of his seed business

Oscar Will participated in many of the agricultural “shows” held the upper Midwest. In 1886 he presented an exhibit of 216 seeds at the Territorial Fair in Grand Forks, North Dakota. He also received a medal at the Columbian Exposition at the 1898 World’s Fair in Chicago. In 1905 he received a gold medal in the state exhibit at the Lewis and Clark Exposition in Portland, Oregon and received a bronze medal for his exhibit at the St. Louis World’s Fair.

The company also had international connections. In 1907 the company received orders from Colombia and Russia. In 1910 a shipment of seed corn was sent to Pretoria, South Africa.

In January of 1917 Oscar Will became ill and was hospitalized. After recovering enough to return home, he relapsed in April and remained in poor health until his death on August 17th, 1917. Oscar Henry Will was 62 years old at the time of his death. Upon his father’s death, George F. Will became president and general manager the company (Schneider 2001:2-15).

Like his father, George F. Will admired Native American agriculturists. George F. Will was born in Bismarck in 1884. Upon graduation from high school, he attended Harvard studying economics with an interest in anthropology. As a junior he led an excavation of the Burgois Double Ditch site near Bismarck. The report from the site included historical, linguistic, and ethnological data on the Mandan (Will and Spinden 1906). After graduating in 1906 he returned to Bismarck to work with his father in the seed company. In 1917 he and George E. Hyde published Corn Among the Indians of the Upper Missouri (Wedel 1956). With the aid of others, Will and Hyde collected Native American varieties and documented information from growing them in Bismarck. They knew the value of landraces and what the potential loss of those varieties would mean. In the dedication in Corn Among the Indians of the Upper Missouri George F. Will wrote:

“I dedicate this volume to my father, Oscar H. Will, who in 1881 first perceived the value of the native varieties of corn from the Upper Missouri Valley, and who began at that time the work of selecting and breeding from them, to the lasting benefit of the farmers of the Northwest”(Will and Hyde 1964, p7).

From the introduction:

“that the native corns of the Indians along the lower courses of the Missouri, however valuable they may have proven had the attention of breeders been turned to them, were neglected, and allowed in many cases to degenerate and often to disappear, without arousing the slightest interest or consideration from the agricultural investigators of the region. It seems very

possible that qualities of value may have been thus lost” (Will and Hyde 1964, p23).

George F. Will died in 1955 after an active life involved with the history, agriculture and civic affairs of North Dakota. The seed company continued to exist until 1959 when it went out of business (Wedel 1956).

Over the life of the company over 180 different varieties of corn were offered. Granted there may be some duplication in varieties due to name changes but many of the names will be recognizable to persons familiar with corn varieties that are historically important. See table #1. Listed are the names, first and last year offered, are the varieties available from the NPGS

In the 1915 Montana Agricultural College Experimentation Station Bulletin No. 107, Corn In Montana: History, Characteristics, Adaptation Will is recognized as “probably the foremost student of the Mandans” (Atkinson and Wilson 1915 page 34). This publication is remarkable in its coverage of corn culture both past and the current (early 20th century). It conveys history of Native American corn production in the Montana region which includes the upper Missouri area where the Mandan, Hidatsa and Arikara historically lived. Much of what is written about the Mandan comes straight from George F. Will. In the later chapters it covers varieties of corn grown by Montana farmers with several references to Oscar Will.

In all Will and Hyde looked at over 104 different native varieties. See Table #2

Table #1 lists the varieties of corn offered by the Oscar Will Seed Company (also known as the Oscar Will Seed House and the Pioneer Seed House).

Material and methods:

The purpose of this project is to investigate a subsample of the maize collection revolving around the Oscar Will Seed Company material held at the genebank. In order to do this I needed to look at what the seed company offered in its seed catalogs. Sometime in the mid 1990's I contacted Dr. Fred Schneider at the University of North Dakota. He had compiled the Oscar Will Seed Company Catalogs from the Will archives in the Institute of Regional Studies at NDSU. He provided me with a file of his compilation which covers the years 1885 through 1959. The volume of this material print equals 72 pages and includes information mainly on corn and other seeds attributed to the Native Americans Will had contact with. Schneider states at the front of the material that his primary interest was in the Native American cultigens and information available in the catalogs. Using this material I have listed all the varieties that were offered over the life of the company. Included in this list are the first year the variety was offered and the last year offered. Hank Will, grandson of Oscar Will also provided additional information regarding his grandfather's company. Still other information on material of interest associated with the Oscar Will Seed Company comes from the book that George F. Will and George Hyde published on the corn grown by the Native American tribes of the Upper Missouri. The book lists at least 104 different landraces specifically and others are mentioned, but not as well as the 104. To connect the catalogs, Will's book and the material in the NC7 collection, GRIN (Germplasm Resources Information Network) was used to examine the passport information associated with each accession. Additional information to verify GRIN data came from the Plant Introduction Books published with all the Plant Introduction accession information and cards that were produced at the station prior to the advent of GRIN.

Nature of the Database:

Review of the Oscar Will Seed Company catalogs presented some challenges. Over the life of the company there were over 187 different varieties of corn offered. In reality there are fewer because names changed over time and some varieties started out with one name, and, as the variety became more important to the company, received a name reflecting the Will company name such as Banana Cream Sugar Corn became “Will’s Banana Cream”. Some of the listings have descriptive information on the origin of the variety while others do not. The information from Corn Among the Indians of the Upper Missouri is more organized and reflects the author’s interest in the varieties of corn grown by the Native American that were featured. Information includes for most varieties include tribe of origin, a brief description of growth habit and whether it grew well in their trials. As mentioned in the introduction, information on accessions held in genebanks is only as good as what the donor provides. Drawing connections between the three resources sometimes was very easy, as in the case of Nueta sweet corn. In other cases connections could be inferred but were not conclusive.

Contained in the seed catalogues are lists of many varieties of corn that will be familiar to growers who have a familiarization with pre hybrid corn. Varieties such as “Angel of Midnight”, “Gehu” and Golden Bantam” are just a few examples of popular “Heirloom” varieties. One that stands out as a long lasting variety is “Stowell’s Evergreen”. This variety was offered in the first catalogue in 1885 and last offered in 1959. The variety dates back even farther to prior to 1866. In Indian Corn; Its Value, Culture, and Uses Enfield lists it as one of the sweet corn varieties commonly grown at that time (Enfield 1866). It is still offered today in seed catalogues, such as Gardens Alive 2010, specializing in selling old open pollinated varieties.

The most interesting of the varieties offered were those of Native American origin. Will sold varieties from the Mandan, Hidatsa, Arikara (Ree) and Assiniboine. There were approximately 12 corn varieties offered that carried the Mandan names and one that carried a band name of the Mandan (Nueta). There were at least two with the Arikara name – “Arikara White Flour” and “Ree corn”. He also offered an Assiniboine Yellow Flint. The Arikara and the Hidatsa contributed several varieties of squash and beans that were also offered as part of the “Pioneer Indian Collection” sold through the catalogues.

In Corn Among the Indians of the Upper Missouri, Will and Hyde discuss 11 varieties of Arikara corn, nine varieties of Mandan corn and only state that the Hidatsa got their corn from the other tribes.

The Three Affiliated Tribes:

At this point a short history of the Mandan, Hidatsa and Arikara is in order. The Mandan were practicing horticulture on the extreme northern margin of effective agriculture. Mandan agricultural traditions have been well documented by Will and Hecker in 1944 and Wood in 1967. They came to the Missouri Valley and the Plains out of the eastern and southern Woodlands. The Mandan were a powerful tribe whose territory extended 500 miles along the Missouri River prior to contact with Euro Americans. By 1797 their territory had shrank to a tight cluster of villages near the Heart River in central North Dakota (Spencer and Jennings 314 – 321). Lewis and Clark overwintered near the Mandan at Fort Mandan in the winter 1804-05 (Thwaites 164-276). In 1833 Maximilian, Prince of Wied, a German explorer, traveled through the area where the Mandan lived and made these observations on the corn that was grown at that time.

“Of maize (corn) there are several varieties of colour, to which they give different names. The several varieties are: 1. White maize. 2. Yellow maize. 3. Red maize. 4. Spotted maize. 5. Black maize. 6. Sweet maize. 7. Very hard yellow maize. 8. White or red-striped maize. 9. Very tender yellow maize. (Atkinson and Wilson 1915, p34).

The Mandan and the Hidatsa have existed as co-residents as far back as 1787 as witnessed by James Mackay when he visited them in the vicinity of the mouth of the Knife River (Wood 1977). In the early nineteenth century the Mandan lived in nine villages near the Heart River with the Hidatsa living near them and functioning as allies. Both the Mandan and the Hidatsa belong to the Siouan language family. Hidatsa agriculture was very well documented by Gilbert Wilson in his book Buffalo Bird Woman’s Garden originally published in 1917. In this book he carefully recorded the agricultural traditions of the Hidatsa people as told to him by Buffalo Bird Women. The book lists the nine varieties of corn that the Hidatsa grew and maintained including their Hidatsa names.

“Ata’ki tso’ki (White hard).....Hard white
 Ata’ki (White).....Soft White
 Tsi’di tso’ki (Hard yellow).....Hard yellow
 Tsi’di tapa’ (Yellow soft).....Soft yellow
 Ma’ikadicake (Gummy).....Gummy
 Do’ohi (Blue).....Blue
 Hi’ci ce pi (Red dark).....Dark red
 Hi’tsiica (light red).....Light red
 Ata’ki aku’ hi’tsiica (White, kind of light red)..Pink top”

(Wilson 1987, p58)

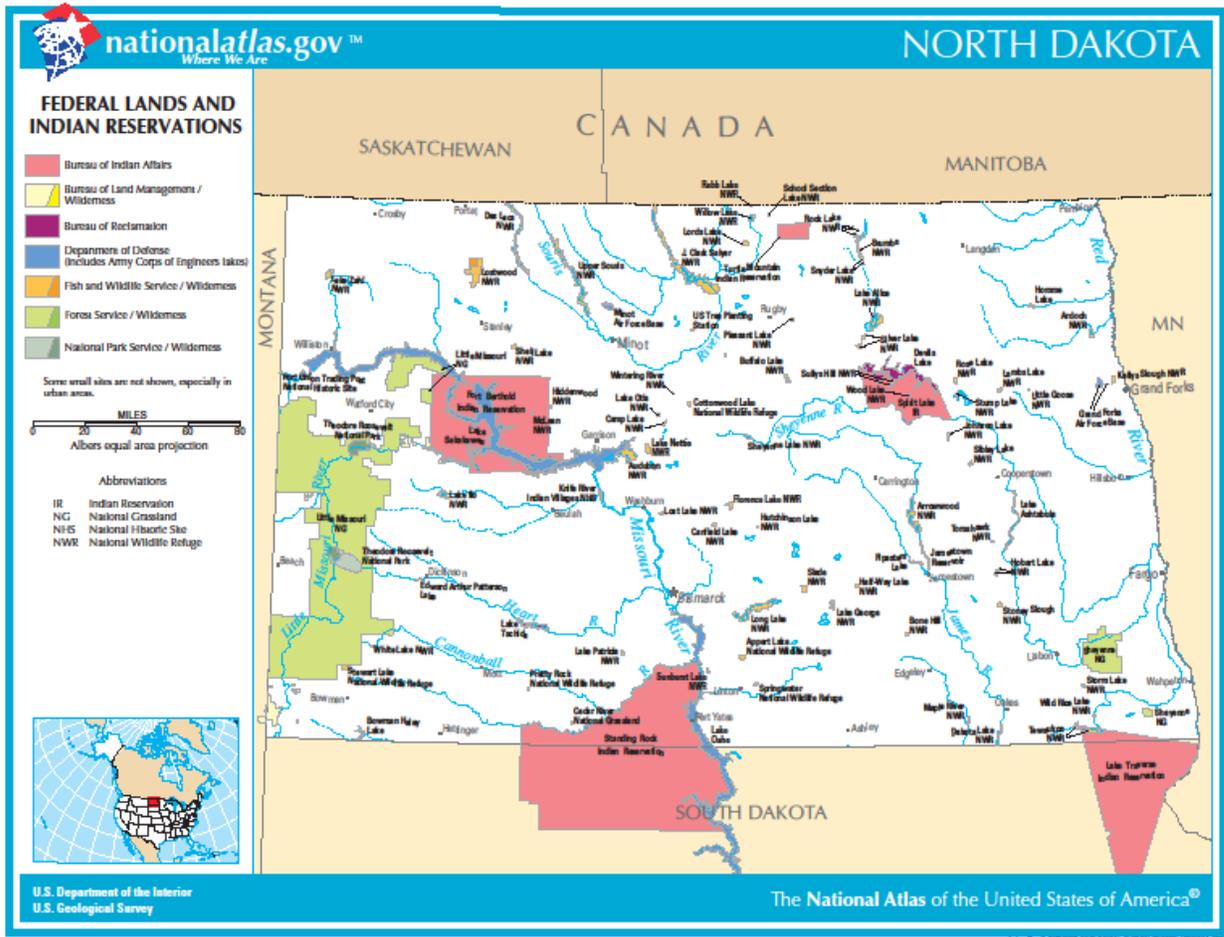
The third tribe to join the group, was the Arikara, who lived to the south along the Grand River. The Arikara belong to the Caddoan language family and are related to the Pawnee. In 1837, smallpox swept through the tribes and reduced the Mandan to 125 persons (Spencer and Jennings p314-318). In 1845 the Mandan and the Hidatsa moved further up river and built Like-a-Fish-Hook village. The Arikara joined them in 1862. The remaining members of the Mandan, Hidatsa and Arikara formed the Three Affiliated Tribes now located at Fort Berthold Reservation (Website of the Three Affiliated Tribes). By the time Oscar Will visited the tribes 1882, they had been occupying the same area for decades. When Will and Hyde documented the corn from the tribes of the Upper Missouri, much of the information on the origin of the varieties may have been blurred. In Corn in Montana , a report from an assistant surgeon station at Fort Berthold in 1854 who wrote Ethnology and Philology of the Hidatsa Indians in 1877 says:

“The Arikaree and the Mandan have doubtlessly tilled the soil for many centuries. Their accounts of the origin of corn are mingled with their earliest myths and traditions. There are some reasons for believing that the Arikarees represent an older race of farmers than the Mandans; for their religious ceremonies connected with planting are the more numerous and they honor the corn with a specie of worship. In every Arikaree lodge, there is a large ear of corn which has lasted for generations, sticking out of the mouth of a medicine bag. At their feasts they make offerings to the corn by rubbing a piece of meat on it, while they pray to it for plentiful harvest and address it by the name ‘mother’. The Hidatsa claim to have had no knowledge of corn until they first ate it from the trenchers of the

Mandan; and they have no important ceremonies connected with the harvesting, yet they cultivated it long before the advent of the white man”

(Atkinson and Wilson 1915p 30).

With the movement of the tribes to Fort Berthold the agricultural history’s of the Mandan, Hidatsa and the Arikara have to be examined as a unit.



Map of North Dakota with present day Native American Lands.

Oscar Will Seed Company Material at the NCRPIS:

So what portion of the Oscar Will material maintained at the NCRPIS represents the Native American offered by the Oscar Will Seed Company and how much of it can be connected to the material described by Will and Hyde?

There are two sets of material donated to the station that came from the Oscar Will seed Company through J.A. Clark of the National Research Council of the National Academy of Sciences and William Wiidakas, a long-time NDSU corn breeder. Combined these represent some 98 accessions. Some of these are not found in the Oscar Will Seed Company Catalogues but most are. Some of the names are exact matches such as Nueta, but others vary, making it hard to make a direct match. Two separate sets of accessions from Wiidakas overlap but the second set contains accessions that appear to be bulks of seed that may have been made to increase variability. These bulks carry accession identifiers such as “North Dakota Colored Flour Bulk 5” and ‘North Dakota White Dent Bulk 7,” which may not have come from the Oscar Will Seed Company since these are not listed in the catalogues. Other material in that set also appears to come from other sources. Only the material with a direct connection to Oscar Will has been considered.

Of the material offered by Oscar Will and written about by George F. Will, the number that survive in the NCRPIS collection may seem small compared to what was available at the peak of the seed company’s existence. Considering the amount of time that elapsed between the founding of the company, the height of the corn culture of the Native American of the Upper Missouri and the founding of the North Central Regional Plant Introduction Station in 1948 many potentially important accessions have survived.

Material that is maintained at the NCRPIS that was offered by the Oscar Will Seed Company and having Native American affiliation:

1. **Assiniboine Yellow Flint:** first offered in 1920; last offered in 1959. PI 21379 and/or PI 219871
2. **Burleigh County Mixed Flint Corn:** first offered in 1903; last offered in 1959. PI 219874. From Corn in Montana “This corn is improved mixed corn from the Mandan Indian origin. At the time of settlement of Burleigh County, North Dakota, the farmers secured seed corn from the Indians, which some of them have been raising ever since. This corn was catalogued by Mr. Will in 1887. It is of many colors and is simply a selected mixed Indian corn of quite high yield and good quality” (Atkinson and Wilson 1915 p60).
3. **Dakota Squaw Corn:** first offered 1929; last offered 1957. PI 219874. (the term squaw is considered offensive to Native Americans and is only used as it appears in the accession name. Even in 1915 the term as considered offensive as written by the authors of Corn in Montana “The writers do not sanction the use of the name Squaw. At present the word carries with it a reflection intimating an Indian woman of inferior character. Surely American corn growers will not approve of any disrespect to the good Indian mothers of long ago who adapted corn to our climate” (Atkinson and Wilson 1915 p61). (Burleigh County Mixed and Dakota Squaw appear as two names for the same accession but appear to be two separate but perhaps related varieties offered by the seed company. This may be an error in the initial passport information submitted to the NPGS in 1954)

4. **Dakota White Flint** (Pride of Dakota or Improved Pride of Dakota): first offered in 1908; last offered in 1945. PI 213784, PI 213790, and PI 219875. From Corn in Montana “ This corn was originated by Mr. Oscar H. Will of Bismarck, North Dakota, who furnished the authors with the following information regarding it: In the spring of 1882, Major Fuller secured a small quantity of squaw corn from a friend a Fort Stevenson. This corn was first catalogued by Mr. Will in 1886 under the name “Pride of Dakota”. Thus the Dakota White is the old Mandan corn.” Atkinson and Wilson 1915 p58).
5. **Mandan Black or Purple**: first offered 1933; last offered 1940. PI 213806. Mentioned by Prince Maximilian.
6. **Mandan Blue Flour** (clear blue to brown from Water Chief): first offered 1928; last offered 1941. PI 213811. The variety is listed as # 17 in Corn Among the Indians of the Upper Missouri “#Blue Corn: Kernels rather predominately flinty; ears rather short. Grows 34 to 50 in. tall; ears borne 2 to 11 in. above ground; 2 to 5 suckers per plant. Each plant has 1 to 2 ears and 1 to 3 nubbins. Ripe at Bismarck, 1916, in 96 days. (Will and Hype 1964 p301).
7. **Mandan Red Clay**: first offered 1935; last offered 1939. PI 213807. The variety is listed as # 19 in Corn Among the Indians of the Upper Missouri “Clay Red: Flour corn, color dull purplish-red (about like the common purple-red lilac), with bluish tinge on some kernels. White cob, 8-rowed; ears about 6 1/2 in. long. (Scattered Corn gives it in her list as one of the old Mandan varieties) (Will and Hyde 1964 p302).



Mandan Red Clay <http://www.ars-grin.gov/cgi-bin/npgs/acc/display.pl?1176000>

8. **Mandan Hard Yellow Indian Corn** (seed obtained from Scattered Corn Woman, Mandan): first offered 1914; last offered 1942. PI 213800. The variety is listed as # 15 in Corn Among the Indians of the Upper Missouri. “Hard Yellow: Flint corn, 8-rowed. A very pure strain and said by the Indians to be their earliest variety. Has 2 to 4 suckers; height of stalk 3 to 5 ft.; ears borne 6 to 17 in. above the ground. Ripened at Bismarck, 1916, in 92 days. Has 1 to 2 ears and 1 nubbin per plant. (Will and Hyde 1964 p 301).



Mandan Yellow Flint

<http://www.ars-grin.gov/cgi-bin/npgs/acc/search.pl?accid=PI+213800>

9. **Mandan Speckled Flour corn** (Fort Berthold): first offered 1931; last offered 1932. PI 213798.



Mandan Speckled Flour

<http://www.ars-grin.gov/cgi-bin/npgs/acc/search.pl?accid=PI+213798>

10. **Mandan White Flint:** first offered 1930; last offered 1941. PI 213802. . The variety is listed as # 16 in Corn Among the Indians of the Upper Missouri. “Hard White : Flint corn. Perhaps a heavier yielder than the Hard Yellow and a little later. Ears often shaded pink.(Will and Hyde 1964 p301)



Mandan White Flint

<http://www.ars-grin.gov/cgi-bin/npgs/acc/search.pl?accid=PI+213802>

11. **Mandan Yellow Flour:** first offered 1918; last offered 1958. PI 213794 and PI 219895. #

This variety is listed as #12 in Corn Among the Indians of the Upper Missouri “Soft Yellow: Flour corn. Height of stalk about 3 1/2 ft., ears borne 3 to 12 inches above ground. Suckers heavily, bears leaves on ends of ears and has many false ears. In 1914 ripe and hard in 90 days, at Bismarck. Ears 8-rowed, in a good season 6 to 7 in. long.” (Will and Hyde 1964 p301).

12. **Minnesota Bear Island Chippewa Corn** (Obtained from Mr. K. Hovde of Brevik, Minn, who purchased this seed direct from the Chippewa on Bear Island in Leech Lake.): first offered 1925; last offered 1939. PI 213801.



Bear Island Chippewa <http://www.ars-grin.gov/cgi-bin/npgs/acc/display.pl?1175994>

13. **Mixed Assiniboine:** PI 213793 and/or 219871. # 64 in Corn Among the Indians of the Upper Missouri “Fort Peck Assiniboine Mixed: Practically the same a No. 65 but a trifle later in ripening. Originally Ree corn? The agent at Fort Peck reported in 1878 that corn was planted there for the first that year, that Ree corn was the variety grown and that it had proven very satisfactory.” (Will and Hyde 1964 p312).



Assiniboine <http://www.ars-grin.gov/cgi-bin/npgs/acc/display.pl?1175986>

14. **Navajo Sacred or Cudei:** first offered 1932; last offered 1941. PI 222285. #80 in Corn Among the Indians of the Upper Missouri “Navajo Cudei or Scared Corn: A white flour corn with a purple cap or dot on each kernel - very odd. Very drought resistant. Produces large ears, some 12 in. long, 12- to 16-rowed and very light in weight, kernels round and usually rather small. Plants very leafy and bushy; in a dry year about 3 ft. high with ears borne close to the ground; 1 to 2 suckers; in a favorable year 60 to 80 in. high, ears 1 to 3 ft. on stalk. A heavy yielder. Ripened at Bismarck, 1914, in a heavy late soil, 115 days, and in 1916, 124 days. Lixokonkatit or “Black-eyed-Corn” A variety mentioned in the Skidi traditions as grown by the Pawnee in early times. Described as white corn with

black spots on the kernels. Such a variety is now grown by the Navajo, who call it Cudei and consider it sacred. The dot or “eyes” on the white kernels are really dark purple”

(Will and Hyde 1964 pp308-315).



Cudu <http://www.ars-grin.gov/cgi-bin/npgs/acc/search.pl?accid=Cudu>

15. **Nueta Sweet Corn:** first offered 1919; last offered 1959. PI 213796 and PI 219886. #20 in Corn Among the Indians of the Upper Missouri “Sweet Corn: Color red-brown when hard and dry. Ears 4 to 6 1/2 in. long; 10-rowed; white cob with a red ring about the edge of the pith. Very bushy and leafy; a heavy yielder, often 10 or 12 ears to a hill. Gives roasting ears in 50 to 60 days but dries more slowly than the other sorts. Never, or rarely,

eaten green by the Indians. Called Wrinkled Corn by the Mandans and Gummy Corn by the Hidatsas. Grows 36 to 50 in. tall: ears borne 2 to 13 in. above ground; plants have 2 to 4 suckers, 1 to 2 ears and 1 to 2 nubbins. At Bismarck, 1916 (poor year for corn), some plants of this variety has 2 large ears and 2 nubbins. Ripe and hard, 1916, 105 days.” (Will and Hyde 1964 p302).



Nueta Sweet Corn <http://www.ars-grin.gov/cgi-bin/npgs/acc/display.pl?1175989>

16. **Rainbow Flint Corn** (Squaw type from the Santee Indians of Nebraska): first offered 1924; last offered 1941. PI 213775, PI 213787 and PI 219888.



Rainbow Flint <http://www.ars-grin.gov/cgi-bin/npgs/acc/display.pl?1175968>

17. **Zuni Blue Flour Corn:** first offered 1930; last offered 1930. PI 213799. #89 in Corn Among the Indians of the Upper Missouri “Zuni Blue: At Bismarck, 1916, grew 60 to 72 in. tall; ears borne 9 to 18 in. up; plants have 2 to 3 suckers, and usually 1 ears and 1 nubbin; ripened 120 days.” (Will and Hyde 1964 p316).

Material that is maintained at the NCRPIS that (according to passport data) originated from the Oscar Will Seed Company and has Native American affiliation but was not listed in the Oscar Will Seed Company Catalogues:

1. Blue Flour: PI 213779
2. Cheyenne Agency Stripped: PI 213797.
3. Mated Chief Speckled Mandan: PI 213798

(May be # 18 in Corn Among the Indians of the Upper Missouri Spotted Corn or “Buska” (Mandan name). Flint and flour of mixed colors. Grows 40 to 52 in. tall; has 1 to 5 suckers (occasionally none, 1 to 2 ears and 1 to 2 nubbins per plant. Ripe at Bismarck, 1916, in 93days.(Will and Hyde 1964 p301)

4. Mandan Red Flour: PI 213808
5. Peruvian Red: PI 222297

Although these are not mentioned in the catalogues specifically, one can find them in crosses that were offered. For example, in 1930 a Zuni-Peruvian Red Hybrid was offered.

There were varieties offered in the Will catalogues that were the result of many years of selection and “improvement” whose origin has been blurred and may only be determined using molecular techniques. These varieties, while not traceable to a specific culture, do hold value for the adaptability selected through many years of trial and error.

1. **Northwestern Dent** (“Butcher” corn): first offered 1896; last offered 1959. PI 213776, PI 213788, and PI 219885. From Corn in Montana “Northwestern Dent is a corn of very doubtful origin. There are two theories concerning it; one that it is an old Indian corn which was raised very likely by the Indians of the Ohio River Valley; the other that it is a cross between a red flint, similar to King Philip, and a white dent. Mr. Will offered it first in his 1896 seed catalogue with the following description “After many years of experimenting, great expense and much labor, we have at last succeeded in securing a Dent corn that will mature in North Dakota and the Northwest generally. Northwestern Dent is the result of acclimation and careful selection and improvement of what is known

in some localities as the “Butcher” corn. It follows the Gehu and Improved Pride of Dakota very closely.” (Atkinson and Wilson 1915 pp 76-80). Northwestern Dent accounts for 5% of the background of U.S. hybrid corn (Troyer and Hendrickson 1990)

2. **Gehu:** first offered in 1889; last offered in 1959. PI 213778, PI 213792 and PI 219878. From Corn in Montana “Mr. L. D. Judkins, of Bismarck, North Dakota, crossed the Dakota White Flint with the Mercer Yellow Flint about 1887 or 1888. In 1889 Mr. Will bought all the seed from this cross and all rights to its introduction and sale. It was listed in the 1892 catalogue as follows “This is a new hybrid flint corn of beautiful, bright, glossy yellow color. I claim it to be the earliest valuable field corn in the world and superior to all other varieties of flint corn for cultivation in the Northwest. The name, Gehu, from the biblical man who “got there quick” (Atkinson and Wilson 1915 p60).
3. **Will’s Square Deal:** first offered 1906; last offered 1945. PI 219892. From Corn in Montana “This is a very early, hardy, northwestern corn. In 1900 Mr. Oscar Will sent to Ohio and secured a small quantity of the seed which was catalogued in that state as the “earliest dent corn on earth”. It proved to be early enough in Bismarck, North Dakota to mature about half the ears, which were very large, growing on a stalk about 8 feet high” (Atkinson and Wilson 1915 p87).
4. **Stowell’s Evergreen:** first offered 1885; last offered 1959. PI 219893. This is a very old variety of sweet corn. In Indian Corn; Its Value, Culture, and Uses “A late but prolific variety with a small cob, and long, deep kernels, which are much shriveled when ripe. It is hardy, but

tender, continues long in a succulent condition, and is also an excellent variety to plant for soiling” (Enfield 1866 pp64-65).

5. **Rustler’s White Dent:** first offered 1941; last offered 1945. PI 219891. From Corn in Montana “This corn was first introduced by the Northrup, Braslan, Goodwin Company of Minneapolis, Minnesota, in 1888. They give the following description and history of the variety in their catalogue of that year. “This valuable corn was obtained from a few kernels sent us in autumn of 1884 by a Dakota farmer who stated that he had matured it in that territory for seven successive years, and that it was the only corn anywhere in his section that could show such a record.” The correspondence in our possession seems to indicate that the origin of Rustler’s White Dent was an early white corn taken from the Indians to the northwestern part of North Dakota about thirty-five years ago. However, the evidence is not sufficient to justify a positive statement. Rustler’s White Dent is disseminated widely over the Northwest and is considered the foundation stock of the early white dent corns” (Atkinson and Wilson 1915 p84).

6. **Pioneer White Dent:** first offered 1911; last offered 1953. PI 219887. From Corn of Montana “The following information was furnished by Mr. Will, of Bismarck, North Dakota, who introduced Pioneer White Dent. “This is probably a selection from the Rustler. The seed was secured about eight years ago from Dr. B.F.Schuster, of Wyndmere, Richland County, North Dakota. At the time it had been raised by him for twenty years continuously, and he did not know where he had gotten the seed. I raised it, selecting the best for several years in the nursery, before we gave out any of the seed on contract, since which time I have

generally furnished the contractors from my nursery patch, up to last year.” (Atkinson and Wilson 1915 pp 85-86).

Of the varieties offered by the seed company that have survived that would be considered “Heirloom” open pollinated varieties by today’s standards there have been two studies to evaluate the survival of such material over time. Based on a USDA inventory survey in 1903, Pat Mooney and Cary Fowler (working on a FAO project) compared what was held in the NPGS genebank at National Seed Storage Laboratory at Fort Collins, Colorado to the 1903 inventory. They concluded that only 3% of the varieties offered in 1903 survived to 1983. A study by Paul Heald and Susannah Chapman from the University of Georgia and published in 2009 evaluated the 1983 study and repeated the comparison with the 1903 USDA inventory but used 2004 seed catalogues as the measure of what has survived. In 1903, 7262 different varieties of garden vegetable were offered. In 2004, 7100 different varieties of garden vegetable were offered. Of course, not all the same varieties were offered in 1903 as in 2004. In fact only 430 varieties of the 48 different vegetable types are the same. This is a 6% survival rate. Some striking examples are:

1. Cabbage – in 1903 there were 544 varieties. In 2004 only 81 varieties.
2. Field corn – in 1903 there were 434 varieties. In 2004 only 177 varieties.
3. Sweet corn – 1903 there were 307 varieties. In 2004 only 65 varieties.

In contrast, in 1903 there were 408 varieties of tomatoes offered but in 2004 there were 1536 varieties offered. Heald and Chapman account for the numbers in several ways:

1. Rate of Varietal Loss since 1903: 94% of the material is no longer available from common commercial sources.
2. Rate of Varietal Replacement Since 1903: Since there were 7262 varieties available in 1903 and 7100 available in 2004, this accounts for only a 2% loss. This is basically a market drive effect. Gardeners' preferences changed.
3. Doubts about Levels of 1903 Varietal Diversity: The author of the original 1903 USDA inventory acknowledged that "Variety names of vegetables in this county are being greatly multiplied every year by renaming old varieties". For example, of the 578 varieties of garden beans listed in the 1903 inventory, he concluded that only 185 (32%) represented distinct varieties.

Heald and Chapman concluded that the initial 1983 study over estimated the amount of diversity lost due to the above reasons and due to a mathematical error in that study (Heald and Chapman 2009). I too question the findings of the 1983 study because it predates the existence of the GRIN data base, which would have made it almost impossible to accurately document the material held by the NPGS, especially if they only looked at the material held at the National Seed Storage Laboratory in Fort Collins, Colorado.

What does this mean for the "Heirloom" open pollinated varieties offered by the Oscar Will Seed Company? Many of these varieties have survived. Some were available from not only the Oscar Will Seed Company but also from other sources. For example, "Minnesota 13" was offered by the Oscar Will Seed Company but only one in the NPGS collection originated from that source:

1. PI 214197 *Zea mays* subsp. *mays* Minnesota #13 from Ontario, Canada
2. PI 219882 *Zea mays* subsp. *mays* Minnesota #13 (Boyd Strain)*

3. PI 219883 *Zea mays* subsp. *mays* Minnesota #13 (Haney Strain)
4. PI 219884 *Zea mays* subsp. *mays* Minnesota #13 from North Dakota, United States
5. PI 267179 *Zea mays* subsp. *mays* Minnesota 13 from Minnesota, United States
6. PI 608618 *Zea mays* subsp. *mays* Minnesota 13 from Colorado, United States
7. PI 608619 *Zea mays* subsp. *mays* Minnesota 13 from Colorado, United States
8. PI 608646 *Zea mays* subsp. *mays* Minnesota 13 from Colorado, United States

Or in the case of “Gehu”, three of the accessions originated from the Oscar Will Seed Company:

1. [PI 213762](#) *Zea mays* subsp. *mays* Gehu Yellow from North Dakota, United States
2. [PI 213778](#) *Zea mays* subsp. *mays* Gehu from South Dakota, United States *
3. [PI 213792](#) *Zea mays* subsp. *mays* Gehu from North Dakota, United States *
4. [PI 214190](#) *Zea mays* subsp. *mays* Gehu from Manitoba, Canada
5. [PI 217483](#) *Zea mays* subsp. *mays* Gehu Flint from Colorado, United States
6. [PI 219878](#) *Zea mays* subsp. *mays* Gehu from North Dakota, United States *
7. [PI 267161](#) *Zea mays* subsp. *mays* GEHU from Minnesota, United States
8. [PI 303911](#) *Zea mays* subsp. *mays* WILLS GEHU YELLOW FLINT From Japan

*Originating from the Oscar Will Seed Company

Material with the same variety name but coming from different sources will have experienced selection pressure and may have differences for important qualities. Such issues can only be sorted out by phenotypic and genotypic studies.

Conclusion:

So what does this all mean? A genebank preserves agricultural history as a snapshot. When an accession enters a genbank and the genetic profile of that accession is maintained as it was received then we have a time capsule that can tell us about the past. George F. Will and George E. Hyde looked at over 100 Native American varieties and only a fraction of those survive at the NCRPIS. The issue is not of losing the material once it entered the genbank, but that the material did not survive long enough to make it to the genebank. If it had not been for Oscar and George Will and their interest in Native American agriculture, and those who donated their material to the NCRPIS, almost no Upper Midwest Native American material would exist in the NPGS.

Why is this material important? It is part of North American history and deserves to be maintained for all those who carefully selected the seed and carried it forward. In Corn in Montana the authors write:

“The Hidatsa, the Arikara and the Mandan – who lived along the Missouri River and its tributaries in North Dakota, were practicing a highly developed system of corn culture at the time of the first recorded visit of the white man in 1738. It is really astonishing , however, that these upper Missouri Indians, living under semiarid and northern conditions, should develop corn raising to a point that was not surpassed by any other tribe in America” (Atkinson and Wilson 1915 p29).

Oscar Will’s interest was to produce corn that was suited for the Upper Midwest. He depended on corn that the Native Americans developed over generations to grow in harsh undependable conditions. Will’s “Dakota Dent” was developed out of hardy Native American material. In the

face of climate change, should we not maintain the greatest diversity from areas of the world where participating in agriculture takes ingenuity and skill? Around 22 accessions having Native American affiliation with connections to either the Oscar Will Seed Company or Will and Hyde or both, survive. Based on descriptions of what the Native Americans of the North Dakota area grew from others who encountered their cultures (Lewis, Clark, Maximilian, Wilson), this material represented by these approximately 22 accessions are the most described varieties we will ever know. Of the material maintained at the NCRPIS, there are 13 accession attributed to the Mandan, of those, 10 originated from the Oscar Will Seed Company.

1. [PI 213763](#) White Thunder
2. [PI 213794](#) Mandan Yellow Flour*
3. [PI 213796](#) Nueta Sweet Corn*
4. [PI 213798](#) Mated Chief Speckled Mandan*
5. [PI 213800](#) Mandan Yellow Flint*
6. [PI 213802](#) Mandan White Flint*
7. [PI 213806](#) Mandan Black*
8. [PI 213807](#) Mandan Clay Red*
9. [PI 213808](#) Mandan Red Flour*
10. [PI 213811](#) Mandan Blue*
11. [PI 219895](#) Mandan Yellow Flour*
12. [NSL 283086](#) Mandan Collection
13. [Ames 24548](#) Fort Totten

*originated from the Oscar Will Seed Company.

Other sources of information about Native American varieties recorded only very basic data such as color of the seed. With the Will material we also have description of how well the material grew, the history of acquisition, type of corn and specific description of type and form. This set of accessions may be the best and most unique set of material because of the number of accessions and the people who found value in it.

This set of material also presents problems that all genebanks encounter. Passport data is very important and the best way to make sure it is accurate and complete is to record it as the material is accepted into a genebank. The longer the time between donation of the material and the completion of the passport information, the greater the chance that the opportunity for collecting the best information passes. For example, researchers retire, papers get lost, indigenous knowledge is lost, and people die. Secondly, many of the accessions appear to be somewhat inbred. This happens when small amounts of seed from a few individual plants are donated to genebanks. This is known as founder's effect. The accession is only as diverse as the sample received. The genes present at the time of donation contribute to successive grow outs while not truly representing the original population from which it came. This can make an accession appear different than cultural descriptions of the accession in situ. For example, if an accession is represented by blue and white kernel color but only the blue seeds were collected, then the blue genotype will be dominate future regenerations. This represents a shift in kernel color frequency from that of the original population. Thirdly, collecting material to be preserved in a genebank under prescribed standards that maintain the accession's genetic integrity speaks to the difference of what was and what still exists. If the material never is preserved, then it cannot survive to represent that stage of agricultural history.

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