The Central Nebraska Loess Hills Prairie

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Nomenclature, whenever possible, follows *Flora of the Great Plains*, T. M. Barkley, Editor. 1986. University Press of Kansas, Lawrence, Kansas.

PRAIRIE AND WETLAND RESTORATION ALONG THE CENTRAL PLATTE RIVER, 1991-1998

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Abstract: In 1991, Prairie Plains Resource Institute began a Platte River grasslands ecological restoration project along the central Platte River. The major objectives of this project were to plant an increasing number of ac each year, beginning at approximately 15 ha (40 ac), locate and document wild sources of native plant seeds, develop effective harvesting and seed handling techniques, work on site-specific seedbed preparation techniques, create wetlands, and involve volunteers in the process of restoration. The project was supported by the U. S. Fish and Wildlife Service from 1991-1995, and since then by the U. S. Environmental Protection Agency Region VII, through UNL's Platte River Watershed Program. The majority of the restoration work has been done in cooperation with and on lands belonging to the Platte River Whooping Crane Maintenance Trust (Wood River, Nebraska), The Nature Conservancy (Platte River/Rainwater Basin Project Office, Aurora, Nebraska), and the U. S. Fish and Wildlife Service (Rainwater Basin Wetland Office, Kearney, Nebraska). All project objectives have been met to date. With assistance from more than 30 volunteers, approximately 315 ha (800 ac) of prairie and wetland have been planted with high-diversity grass and forb mixtures (minimum of 100 species per mix) and are being managed with various mowing, grazing, and burning schedules.

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Key words: Prairie Plains Resource Institute, seedbed preparation, seed handling techniques.

Much background about Prairie Plains Resource Institute (PPRI) and its pioneering role in prairie and wetland restoration in central Nebraska is included in a 2-part article by Whitney (1997). Additional how-to information (including a plant list of 140 species) on the PPRI restoration process can be garnered from Whitney (1998). The following paper is a general narrative of PPRI restoration work begun in 1991 which included, in addition to Platte Valley sites, a number of small plantings outside the valley, and a 63-ha (160-ac) Rainwater Basin restoration still in progress.

In the late 1970's, after visiting the historic restored prairies at the Morton Arboretum near Lyle, Illinois, and the University of Wisconsin—Madison Arboretum, I was impressed and intrigued by the concept of prairie restoration. Subsequently, I spent a great deal of time visiting a few widely scattered prairie remnants and native-vegetated roadsides in Hamilton and Merrick Counties, Nebraska, mostly along the Platte River. This enjoyable field work was instrumental in my learning about local prairie communities (xeric to wet) and in the collection of seeds from nearly 100 species to make a serious attempt at prairie restoration. Very small parcels of land to restore were available on property acquired by the fledgling PPRI (founded in 1980), but the task of high-diversity restoration seemed daunting at the time, even on 0.2-ha (0.5-ac) parcels.

The approach I used was to hand-collect at least a small amount of seeds from as many species as I could find that would be appropriate for the planting site. I mixed the seeds together and hand-broadcast onto various types of seedbeds ranging from earthmover-scraped areas to tilled ground. In my home greenhouse, I also learned basic propagation techniques for most of the species collected.

Successes followed most of my efforts during the early 1980's, yielding beautiful forby prairies by the end of the decade. As these early plantings evolved, I was excited by the possibilities of expanding the high-diversity concept beyond small areas; my sights became more focused on the potential of restoring prairies along the Platte River. In 1991, through a cooperative agreement between PPRI, the U. S. Fish and Wildlife Service, and the Platte River Whooping Crane Trust (then headquartered in Grand Island), the chance came to expand our restoration horizons. The first year's goals were as follows:

1. To locate and document wild native seed sources along the central Platte River.
2. To collect necessary phenological information on the plant species regarding seed collection.

3. To figure out ways to make seed collection and processing more efficient, including the creation of a small-scale harvesting machine.
4. To learn how to deal with challenges of handling and storing large quantities of seeds.
5. To experiment with various seed bed preparation and seed incorporation techniques.
6. To experiment with methods to enhance or create wetlands.
7. To plant approximately 15 ha (35-40 ac) of Platte River valley land.
8. To develop a volunteer program for collecting seeds and planting prairies.

At the beginning of the project, jumping from my accustomed 0.2-ha (0.5-ac) restorations to 15 ha (35 ac) involved considerably more effort, and was truly a leap of faith. But, my approach remained relatively unchanged from early restorations. Because I was uncertain about how much seed was enough when scattered over a large landscape, I tried to collect as much seed as possible. My annual seed collection list included (and still includes) at least 150 species, including dry sand ridge, mesic lowland tallgrass, and wet sedge meadow species.

Collection season the first year was continuous, so as not to miss anything, from the most obscure wet meadow sedge in June to the last aster late in the fall. Two important tool innovations helped. A simple tool for sedges was a hard plastic detergent jug made into a seed-raking collector. This was accomplished by cutting the lid off of the jug, then cutting teeth into the lip.

The second innovation was more complex. With the help of a creative and handy friend, we created a prototype reaper/harvester, complete with a vacuum conveyance and collection system. The first-year prototype was mounted onto the side of the pick-up truck. This prototype was later adapted to fit onto a Grasshopper™ lawn mower power unit. The machine allowed hydrostatic drive maneuverability, adjustable cutting heights from about 0.2-1.5 m (8 in to 5 ft), and it had a large bin to hold the clippings. It could be trailered behind a pickup and operated by 1 person.

This seed harvester was in use for 3 collection seasons and accomplished the harvesting of enough tallgrass seed and a number of fall-collected forbs to plant more than 39 ha (100 ac). Later, tallgrass harvesting was done with a 1960's vintage Allis-Chalmers™ combine owned by the Platte River Whooping Crane Maintenance Trust. The small-scale harvester concept worked well, but additional design and fabrication engineering is needed to perfect the concept.

I stored many forb seeds in 1-gal (4-L) plastic milk jugs. Large quantities of hand-collected grasses such as prairie wedgegrass (*Sphenophilis obtusata*) or Canada wild rye (*Elymus canadensis*) were stored either in 5-gal (20-L) plastic buckets or in large, inexpensive, plastic garbage barrels. The 5-gal buckets are invaluable vessels for seed collecting and planting, and can often be obtained for free from bakeries or construction sites. The lids of the large barrels are valuable as trays during the seed drying and processing stages.

Most collected material was processed by forcing it through fanning mill screens. This broke seed heads apart and separated seeds from stem, etc. After processing, the seeds were mixed together by general plant community types of sand ridge, mesic tallgrass, and wetland mixes. Bulk quantities of the tall dominant grasses are kept separate from the forb and hand-collected grass mixes. The dominant grasses require large protected spaces for winter storage.

To test wetland and dry upland seed mixes, I used a small earth mover to sculpt a long drainage and wetland pool into the first restoration site (Uridil #1 in Table 1), creating a spoil pile alongside the depression that simulated natural ridge topography. The 0.3-m (1-ft) depth relief of the artificially-created depression collected precipitation draining off the field and emptied into a more deeply excavated (1.0- to 1.5-m) standing water pool (dug below the level of the groundwater). The spoil ridge contained a high proportion of sand in order to favor development of an upland plant community.

That first year, I spent little time worrying about the actual seeding. When the time came to plant in spring 1992, I located 3 people to help sow seeds by hand. We improvised a sowing method (still used on most new plantings) of flagging the corners of a 0.4–ha plot (1.0–ac) of ground, then walking in pairs: 1 person sowing forb mix and another with the bulk grass mix, going back and forth across the area in 5- to 6-m swaths. Progress down the field is marked on both sides of the planting unit by strategically placing flags that the sowers can always aim towards. (A 0.4-ha plot is a large space to someone on foot. Without flagging, it would be easy to lose track of what has been planted and what has not.)

The forb mix in all plantings to date contains hand-collected grass seed as well as thousands of small, fluffy, and heavy forb seeds. The forb mix bulk is dominated by the large fluffy seeds of Canada

Table 1. A chronological listing of sites restored by the Prairie Plains Resource Institute in Nebraska, 1991-1998. Sites not in the Platte River valley are marked by an asterisk (*).

Tract Name	Planted	Location	Size	History	Comments
Uridil #1 (PRWC Maintenance Trust[a])	20 May 1992	Hall Co., 6.4 km (4 mi) SW of I-80 Exit 300 (Wood River exit)	13.8 ha (35 ac)	irrigated corn and milo, broken in 1970s, leveled for gravity irrigation, approx. 3-4 ha (8-10 ac) are prone to spring inundation due to high water in an adjacent stream	includes creation of a wetland; hand-broadcast, seed was hand-collected and harvested by prototype harvesting machine, see RMN10(1):5; culti-packed for seed incorporation, mowed in year 1
* **The Leadership Center** (NE Voc. Ag. Fnd.)	23 June 1992	Hamilton Co., east edge of Aurora, 4.8 km (3 mi) N of I-80 Exit 332	0.4 ha (1 ac)	a level Lincoln Creek lowland milo field, deep silt-loam soil	hand-broadcast and culti-packed, some commercial grass seed included, mowed in year 1
West Ruge (PRWC Maintenance Trust)	29 Apr 1993	Hall Co., 1.6 km (1 mi) NE of I-80 Exit 305 (Alda exit)	5.1 ha (13 ac)	a level lowland bean and milo field; no major slough features but can be inundated on rare occasion by an adjacent stream	hand-broadcast, seed was harvested by hand and the upgraded mower-mounted harvester, mowed in year 1
Robinson (PRWC Maintenance Trust)	23 May 1993	Phelps Co., 11.2 km (7 mi) SW of I-80 Exit 257 (Elm Creek exit)	15.7 ha (40 ac)	a level field with row-crop farming history; too far above water table to have wet surface features	tall grasses planted with E-Z Flow fertilizer spreader; forbs spread by volunteer riding on the spreader; culti-packed for seed incorporation.
Stuhr Museum	24 May 1993	Hall Co., 4.8 km (3 mi) N of I-80 Exit 312 (Grand Island/Hastings exit)	2.8 ha (7 ac)	a level dryland cornfield, sandy loam soil, no wet surface topography	hand-broadcast and culti-packed, museum added some commercial grass seed, unmowed in year 1
Morse (PRWC Maintenance Trust)	27 May 1993	Phelps Co., 11.2 km (7 mi) SW of I-80 Exit 257 (Elm Creek exit)	23.6 ha (60 ac)	level field with row-cropping history; no wet surface features	had been sown with a grass drill and purchased seeds of major tall grasses; we hand-broadcast a mix of forbs and non-dominant grass species, mowed in year 1
* **The Leadership Center** (NE Voc. Ag. Fnd.)	8 June 1993	Hamilton Co., east edge of Aurora, 4.8 km (3 mi) N of I-80, Exit 332	0.4 ha (1 ac)	a level dryland Lincoln Creek lowland terrace milo field, deep silt-loam soil	hand-broadcast and culti-packed, some commercial grass seed included, mowed in year 1
Dahms pivot (Nature Conservancy)	23 April 1994	Hall Co., 1.6 km (1 mi) S of I-80 Exit 300 (Wood River exit)	41.3 ha (105 ac)	included deepening an existing slough; a pivot-irrigated cornfield; native prairie broken in 70's; slough drainage topography still present; tract flooded extensively 2 of last 3 years	27.6 ha (70 ac) drilled by Truax drill with 5 species of commercial tall grasses; volunteer hand-broadcast 7 plots totaling 13.8 ha (35 ac) with high-diversity species mix, unmowed in year 1

Table 1. (Continued)

Tract Name	Planted	Location	Size	History	Comments
Dahms set-aside (Nature Conservancy)	23 April 1994	adjacent to Dahms Pivot above	3.1 ha (8 ac)	a tag-end piece of non-irrigated cropland, very low and often partially inundated during the spring, with wet alkali-encrusted soils	hand-broadcast, culti-packed to incorporate seeds into soil. unmowed in year 1
Trust Pits (PRWC Maintenance Trust)	5 May 1994	3.2 km (2 mi) SE of I-80 Exit 305 (Alda exit)	3.1 ha (8 ac)	the periphery of a gravel-mining lake (sandpits); the Trust dozed in the banks to make sections of the pits into a shallow wetland	hand-broadcast, culti-packed to incorporate seeds, unmowed in year 1
Caraway (Platte River Trust)	12 May 1994	Hall Co., 6.4 km (4 mi) NW of I-80 Exit 318 (Phillips/Grand Island Exit)	19.7 ha (50 ac)	a rolling loess site (the lowland prairies of the level Platte Valley grade upward some 15 meters to a loess plain	Planted with an EZ-flow fertilizer spreader after disking; culti-packed to incorporate seeds; this site would support an upland tallgrass prairie community, mowed in year 1
* **The Leadership Center** (NE Voc. Ag. Fnd.)	12 June 1994	Hamilton Co., east edge of Aurora, 4.8 km (3 mi) N of I-80, Exit 332 (Aurora Exit)	0.8 ha (2 ac)	a level dryland Lincoln Creek lowland terrace milo field, deep silt-loam soil	hand-broadcast and harrowed, mowed one in mid-summer
Dahms East (Nature Conservancy)	15 April 1995	Hall Co., 3.2 km (2 mi) S of I-80 Exit 300 (Wood River exit)	16.9 ha (43 ac)	a leveled, gravity-irrigated cornfield; 2-3 ha may occasionally become inundated on east eand during floods	hand-broadcast, no culti-packing, unmowed in year 1
Studnicka Buffer Strip (Nature Conservancy)	22 April 1995	Hall Co., SW of South Channel Bridge 4.8 km (3 mi) S of I-80 exit 305 (Alda Exit)	2 ha (5 ac)	had most recently been a cornfield; level and adjacent to main Platte channel; with a high water table and inundated during extremely high river flows (1995)	hand-broadcast; no culti-packing, unmowed in year 1
Uridil #2 (PRWC Maintenance Trust)	22 May 1995	Hall Co., 6.4 km (4 mi) SW of I-80 Exit 300 (Wood River exit)	19.7 ha (50 ac)	immediately north and similar to Uridil #1	includes a large-scale wetland creation; grasses planted by EZ-Flow fertilizer spreader; forbs spread by hand seeding out the rear tractor cab window, unmowed in year 1
Moeller Bean Field (PRWC Maintenance Trust)	6 June 1995	Hall Co., 2.4 km (1.5 mi) S of I-80 Exit 312 (Grand Island/Hastings Exit)	3.1 ha (8 ac)	a dryland farmed soybean filed occasionall inundated and with a high groundwater level despite lack of wet slough surface features	grasses planted by EZ-Flow fertilizer spreader pulling a harro; forbs spread by hand seeding out the rear tractor cab window, unmowed in year 1

Table 1. (Continued)

Tract Name	Planted	Location	Size	History	Comments
Stuhr Museum Wetland	17 May 1995	Hall Co., 4.8 km (3 mi) N of I-80 Exit 312 (Grand Island/Hastings exit)	1.2 ha (3 ac)	dozer-dug hole with sandy spoil mounds	was not planted in its first year, weedy by second, hand-broadcast
* **The Leadership Center** (NE Voc. Ag. Fnd.)	25 May 1995	Hamilton Co., E edge of Aurora, 4.8 km (3 mi) N of I-80, Exit 332 (Aurora Exit)	1.2 ha (3 ac)	a level dryland Lincoln Creek lowland terrace milo field, deep silt-loam soil	hand-broadcast and left alone
Johns (PRWC Maintenance Trust)	16 June 1995	Buffalo CO. NE, 8 km (5 mi) SE of I-80 Exit 257 (Elm Creek Exit)	3.1 ha (8 ac)	a part-sandy, part-lowland dryland crop field	grasses planted by EZ-Flow fertilizer spreader; forbs spread by hand seeding out the rear tractor cab window
Studnicka Wetland (Nature Conservancy)	13 April 1996	Hall Co., SW of South Channel Bridge 4.8 km (3 mi) S of I-80 exit 305 (Alda Exit)	5.9 ha (15 ac)	a historic slough, once straightened into a ditch, then reconfigured by dozer into a serpentine slough and sand ridges	hand-broadcast low areas and ridges with high-diversity mix of species, unmowed in year 1
Dahms East #2 (Nature Conservancy)	April 1997	Hall Co., 3.2 km (2 mi) S of I-80 Exit 300 (Wood River exit)	18.5 (47 ac)	2 parcels including sandy and alkali sites, level dryland crop field (usually corn)	hand-broadcast, no seed incorporation
Dahms South Drainage (Nature Conservancy)	April 1997	Hall Co., 3.2 km (2 mi) S of I-80 Exit 300 (Wood River exit)	1 ha (2.5 ac)	a dozed drainage system designed to alleviate water acumulation on a neighbor's crop field; courses through a native meadow and connects to existing drainage topography there	hand-broadcast
Anderson (Nature Conservancy)	April 1997	Phelps Co., 11.2 km (7 mi) SW of I-80 Exit 257 (Elm Creek exit)	11.8 ha (30 ac)	a level cornfield	hand-broadcast, no mowing first year
* **Springer Basin #1** (U. S. Fish and Wildlife Service)	April 1997	Hamilton Co., 3.2 km (2 mi) NE of I-80 Exit 325 (Giltner Exit)	9.8 ha (25 ac)	level soybean field, silty and well-drained; south end of Moeller Quarter	hand-broadcast, no incorporation, mowed in July of year 1

Table 1. (Continued)

Tract Name	Planted	Location	Size	History	Comments
* **Springer Basin #2** (U. S. Fish and Wildlife Service)	May 1997	Hamilton Co., 3.2 km (2 mi) NE of I-80 Exit 325 (Giltner Exit)	7.9 ha (20 ac)	hydric soils, north end of Moeller quarter	a thin hand-broadcast seeding with mesic and wetland species
* **Springer Basin #3** (U. S. Fish and Wildlife Service)	4 April 1998	Hamilton Co., 3.2 km (2 mi) NE of I-80 Exit 325 (Giltner Exit)	13.8 ha (35 ac)	soybean field, well-drained silty soils	hand-broadcast volunteer seeding by UNL and UNK wildlife clubs, no mowing in year 1
* **Springer Basin #4** (U. S. Fish and Wildlife Service)	25 April 1998	Hamilton Co., 3.2 km (2 mi) NE of I-80 Exit 325 (Giltner Exit)	10 ha (25 ac)	sown into 2nd-year oldfield in near-hydric soils on the north half of Moeller quarter	hand-broadcast, no seed incorporation, no mowing in year 1
Pawnee Hill/ Dexter Farm (private)	May 1998	Polk Co., along Highway 92 S of Clarks Platte River Bridge	2.8 ha (7 ac)	sown into overgrazed sod sprayed with roundup and 2,4-d for bluegrass and musk thistle control	hand broadcast, no incorporation, no mowing in year 1
Speidell Corn Tract #1 (Nature Conservancy)	May 1998	Buffalo Co., 6.4 km (4 mi) SW of I-80 Exit 279 (Minden Exit)	10 ha (25 ac)	a cornfield modified with dozer for wetland creation	hand-broadcast, no incorporation, no mowing in year 1
Speidell Trees (Nature Conservancy)	May 1998	Buffalo Co., 6.4 km (4 mi) SW of I-80 Exit 279 (Minden Exit)	7.9 ha (20 ac)	cedar tree removal area	hand-broadcast into slash and openings
Dahms South Pasture (Nature Conservancy)	May 1998	Hall Co., 4.8 km (3 mi) S of I-80 Exit 300 (Wood River exit)	39.4 ha (100 ac)	a pasture overseeding after early graze	hand-broadcast from a pickup box

[a] PRWC Maintenance Trust = Platte River Whooping Crane Maintenance Trust.

wild rye. Approximately 1.5 to 2 gal (< half a 20-L bucket full) of the forb mix is broadcast on a 0.4-ha (1.0-ac) plot. Standard application rates of the combine-harvested tallgrass species are 2.5 to 3 full buckets. For the first planting in 1991, we broadcast 3 buckets of grass seed, however the small prototype harvester collected much more straw and chaff. The 1992 and 1993 plantings were actually much lighter in seeding than subsequent seedings using a much cleaner mix harvested by the combine.

The seeds of the first planting were incorporated into the ground with a culti-packer implement fashioned from an old road roller and rotary harrow attachments.

The Uridil #1 site developed well despite trying conditions. It was the testing ground for new ideas, and I was under the scrutiny of project cooperators. Early on, I was not sure we had planted enough grass seed, and first-year weed growth was enormous on some parts. However, things looked good at the end of the first growing season; I could see many species with good populations.

As I was enjoying the sight of many forbs and grasses early in the summer of 1993 (and basking in the success a bit) the infamous rainy July of 1993 came along. Floods along the Platte River were not as extreme as the Mississippi River floods, but there was high water. Flooding in the South Channel adjacent to the Uridil #1 site inundated nearly a third of the planting for 2 to 3 weeks time. It killed the mesic vegetation that looked so good up to that time, but there were wetland species in the mesic tallgrass mix, such as cordgrass (*Spartina pectinata*) that benefited. The flood was a real lesson in stochastic events and restoration planning (i.e. know the site's hydrology!).

The plant community of the restoration was rapidly changed, and thereafter defined by the occurrence of an extreme disastrous event. The good news of the flood was in the fact that it proved 1 of the values of high-diversity restoration: ecological resilience due to diversity. There are species in the system that will benefit from extreme events. The native community will survive.

Weariness caused by the first large-scale hand-planting was a sure indication we needed more volunteers, or at least some mechanical assistance, when sowing large areas. But as the first planting progressed, it quickly became clear that the method itself worked well. This and subsequent volunteer plantings verify that hand-broadcast prairies develop uniformly and without the straight rows caused from seeding with a grass drill. Volunteers broadcast more than 40 ha (100 ac) per year presently. The forbs are widely and evenly dispersed, a situation that would be unlikely in a grass drill with settings optimized for a few select sizes and weights of seeds. Many small and heavy seeds would drop through the drill too quickly.

For mechanical assistance on some sites, I was able to use a tractor-pulled EZ-Flow™ granular fertilizer spreader (like a yard turf spreader, but about 4 m wide and pulled by a tractor) to seed grasses. When sowing with the EZ-Flow™, the forb mix was hand-broadcast through the rear window of the tractor cab. The EZ-Flow™ dropped an even stream of seeds onto the ground in rows about 0.2 m (8 in) apart. Since the seeds were not incorporated into the soil as they are in a grass drill, the winds and rains move them around a bit. The result is a random-looking planting, also without the row appearance of a grass-drilled planting.

The wetland planting of Uridil #1 was quite successful, even though many important wetland species appeared to be slower in developing and did not fill in as quickly as the prairie species of loamy mesic tallgrass sites. Perhaps this was due to the sterile sandy substrate left by the excavation process of wetland creation. The results of this 1992 experiment warranted further experimentation of this wetland creation method.

From the first year's planting, this restoration project subsequently grew to a 24-ha (60-ac) goal the second year. Then it grew to over 40 ha (100 ac) per year in ensuing years. It also included working with The Nature Conservancy (TNC) and with U. S. Fish and Wildlife Service on a 63-ha (160-ac) Rainwater Basin property. It could be argued that the Rainwater Basin wetland district south of the Platte River in central Nebraska is part of the Platte ecosystem. These wetlands, along with the river, are critical to large populations of Central Flyway waterfowl.

Table 1 contains a complete listing of all project plantings. Total restoration acreage is approximately 315 ha (800 ac) on 33 separate plantings. Six wetland sites are also included, a few of which expanded greatly on the original wetland dig idea tested on Uridil #1. On the Platte River Whooping Crane Maintenance Trust's Uridil #2 (adjoining Uridil #1 to the north) a much larger wetland was excavated to groundwater. On TNC's Studnicka property, a straight drainage was converted to a serpentine system containing numerous pools and ridges. And on TNC's Speidell tract, a 1998 wetland excavation created a spacious complex of drainage depressions and pools over a 10-ha (25-ac) site.

In addition to the large sites are a number of small ones such as at the Leadership Center in Aurora, and at the Stuhr Museum in Grand Island. It is my policy to continue planting small sites whenever the opportunity arises. These act as additional seed collection sites, they expose more people to prairie and restoration, and they are each an additional "field laboratory" for new techniques or different field conditions.

As of this writing, the annual seed collection and planting cycle is aimed at restoring between 60 and 80 ha (150 and 200 ac) in a given year. Many more marginal agricultural lands are slated to be restored in the future. Also, many low-diversity pastures will be overseeded in an attempt to increase their forb diversity. With the increases in planted acreages, it became desirable to minimize the time and equipment input on new plantings. Therefore, most new plantings are now done without seed incorporation or first year mowing of undesirable plant growth.

From meager and unproven beginnings, to the point where high-diversity restoration and wetland creation is becoming a standard procedure, the PPRI restoration process has changed little. **The key is to know the plants.** This emphatic statement implies that one must know where the plants are located, know the species in all seasons and all growth forms, and with respect to their community types, soils, and hydrologic requirements. From this knowledge the training of people for collecting the seed, processing and planting is straightforward.

The actual process of seed collecting, handling and planting is essentially a horticultural or an agricultural pursuit. As a restorationist, I take seeds from 1 place and put them onto another. Following an agricultural model, restorationists often strive in their projects to control nature in order to favor production targets. We cannot control many variables, so there is a tendency to develop strong notions about the few things that can be controlled. For example, just as in modern agricultural production, we strive for large-scale and high-efficiency accomplishments aided by mechanical and chemical technology. This is true for the processes of seed harvesting, planting, and control of undesirable plants (weeds!).

While it is practical and highly desirable to continue working on efficiency measures and new technology for restoration, such as I have done on this project, this should not prevent us from looking at other ways to do things. In addition, attention to the mechanics of restoration should not conflict with or detract from our seeing the greater ecological picture.

I prefer to include people in the restoration process over equipment whenever possible. If people participate, the results are usually excellent, more people are exposed to prairie and gain new knowledge about the process of restoration or management of grasslands, and volunteers can accomplish a great deal of work in a short amount of time. To plant with neophyte volunteers walking helter-skelter over a large field is anything but efficient or precise; but it works. More often than not, it is an enjoyable experience for the volunteers and it helps accomplish conservation and education objectives for restorationists.

I enjoy the horticultural and agricultural aspects of a restoration project, technological and otherwise. However, I do not think of the restoration as a static entity, or product, such as a field of beans. The ecological science of restoration (apart from the fundamental application of ecological knowledge related to the species collected, hydrology, etc.) is in testing and investigating our ideas about grassland ecology. By observing and studying the evolution of a restoration from a weed patch to a complex community, and by watching this evolution relative to the management practices we apply, we can gain valuable ecological insights.

During these 8 years of Platte River work, my own ecological perceptions pertaining to restoration and management has changed considerably. Like everyone else, I once viewed weeds in the early stages of a planting as a serious problem. I have seen extremely weedy restorations of cropland in which I could find none to few native seedlings in the first 2 years (and I know seedlings well). But the planting amazingly develops into prairie within about 5 years.

I have also had good luck with what is termed successional restoration (Packard 1994), whereby seeds are broadcast into an abandoned crop field, or oldfield, with dense weeds already established as the major vegetation. I have found that the succession of weedy species, native and non-native, is an interesting process. Species change each year, and subsequently many of the structural and spatial characteristics of the landscape also change dramatically. The progression keeps shifting until native grasses and forbs dominate and fire can be introduced into the system.

When a native perennial prairie system is fully established on all project sites, an active management will be initiated. Such management includes fire and grazing of various intensities, duration, and timings. This process has already begun on a few older sites.

The post-establishment monitoring and management phase of many of the Platte restorations is just beginning (Pfeiffer 1999), and could offer many new insights into how these restorations change. Also, much more scientific study is needed on the restorations regarding plant/insect interactions, wildlife use, grazing, and fire to name but few areas of interest.

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