Farmer Rancher Grant Program
Final Report From

North Central Region
Sustainable Agriculture Research and Education (NCR-SARE) Program

PROJECT IDENTIFICATION

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Project Title: Filling the Niche and Closing the Loop: Developing a Wildflower Nursery for the Restoration Market Using Forest Biomass By-Products as the Garden Foundation".
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PROJECT BACKGROUND

Ecologically, our forest farm is located in a region called the Southwest Savanna BioRegion in the Driftless Area, unglaciated land that spans parts of Iowa, Illinois, Wisconsin, and Minnesota. Turtle Hill is situated along the east branch of the Pecatonica River in Blanchardville, Wisconsin. Eighteen acres of forest is managed using sustainable forestry standards under a management plan that extends into 2026. We are a certified tree farm under the American Tree Farm System. Our forested lands include a 1/4 mile stretch of central hardwoods along the Pecatonica River, dry and dry-mesic oak woodlands and savanna in the uplands, a wild nut (oak and hazelnut) and wild fruit tree planting, and a white pine planting. Each management area is treated as a unique part of a larger system, incorporating concepts of landform, soil, and potential vegetation into management prescriptions. We use minimal herbicides in invasive species removal and implement prescribed fire in the woodland components of our forest lands. Our management plan involves annual Timber Stand Improvement (TSI) practices and periodic sustainable harvests. From the by-products of these practices we generate a source of lumber for woodworking, firewood for our heat source, and wood chip mulch for our garden needs.

Of 24 total acres, six acres of land is used for our wildflower farm, vegetable garden, and home. One nine-month cattle-panel hoop greenhouse is in operation, and we are in the process of building an attached greenhouse onto an existing garage for passive solar gain in the garage and to further our growing needs. We manage 1/2 acre of organic raised bed gardens on-site for both wildflower starts and produce for ourselves. Three acres of full sun, dappled sun, and full shade native plant forest gardens are prepared for plantings – the exotic plants and shrubs have been removed and plants established. We are expanding our bee operation to 20 hives in 2012.

A botanist by training and profession, I am aware of the lack of diversity in the woodlands and forests of the Driftless Area. As such, I am committed to the following mission: 1. to foster the

protection of native medicinal and useful plants, shrubs and trees through their propagation and long term care in both a formal and forest garden setting, 2. to encourage their long term perpetuity through seed collection and active seed dispersal, and 3. to provide a reliable local source of rare and unusual native herbaceous and woody plants for the local market.

My husband and I have always been of the conviction that a multi-faceted approach is necessary to generate an income from our sustainable land stewardship practices. We call this our "diverse portfolio". In this way we practice sustainability on our forest farm, for to rely too heavily on one product over another would quickly result in the demise of that resource. Our small-scale logging approach at the appropriate time is most effective in completing our forest stewardship goals and in creating small scale changes that we can follow up with the appropriate actions without hiring outside of our family, using large equipment, or relying on herbicides to keep the resultant growth down. This project solidified that understanding.

We have found the following combination of products have begun to provide a small, but growing income:

1. dimensional lumber (white pine, black cherry, black walnut, black oak, and red oak)
2. wood chip mulch from TSI harvests
3. forest and wildflower honey and value-added fruit and honey products from the apiary.
4. wildflowers from our small scale nursery and custom growing of specialty plants.

PROJECT DESCRIPTION

GOALS:

Our goals initially were to answer a specific suite of questions concerning wildflower collecting, propagation, and survival. We expanded from this to questions about the wood chip mulch itself, its properties and its uses.

<u>Wildflowers:</u>

Seed collecting standards: Do populations fit for collecting from exist for uncommon and locally uncommon plants in the southwest savanna landscape of Wisconsin? We researched the feasibility of locating desired species with populations large enough to accommodate the current standards for collecting to ensure genetic diversity: a plant population must be large enough (50 or more individuals) to sustain a collection of at least 5000 seeds without taking more than 20 percent of the seeds set.

Secondly, what standards from the research community can be used by the small-scale wildflower nursery business owner to document changes in populations? We used the plant collections made in 2010 and 2011 to further develop our record-keeping procedures for documenting seed origin, location, and size of the original population. We also planned to research the literature for protocols developed to record data on different aspects of survivorship and reproduction over the years. Survivorship data particulars will be specific to each species, depending on flowering, pollination, seed set, and senescence of each individual species. These matter to the small-scale nursery owner interested in developing permanent collections from which to gather seeds once established, and from which to harvest root stock once plentiful. .

Growing select wildflowers starts in mulch-rich garden beds: What is the success of select wildflower seedlings grown in our 60:40 nursery beds compared to nursery beds comprised of native soil enriched with compost with a wood chip mulch cover?

Growing select wildflowers post year 1 using forest garden/permaculture strategies: What is the survival rate of rare and uncommon plants throughout the first year of re-location from the nursery beds into the forest garden environment?

PROCESS

Seed collecting standards: Investigating the possibilities of locating for collection seeds of highly conservative and uncommon plant, shrub, and tree species of savannas and open forests was done through the following channels:

1. Through communication with the local non-profit organizations whose mission is the restoration of remnant prairie and savanna habitat and with local nurseries, research on local sampling pressures was accessed. I researched which local nurseries in the area hire/contract seed collectors in order to understand the local sampling pressure on existing populations.
2. Landowners with quality habitat, information gained from public records, aerial photography, from communication with other practitioners, and from roadside surveys, were approached.
3. Throughout the 2010 and 2011 growing seasons, I surveyed roadsides off of main highways for remnant populations that met my collecting criteria listed above. Locations within 50 miles, or in Iowa, Dane, Lafayette, and Green counties, were targeted.

Documenting seed lineage for the small-scale grower:

1. Conversation with members of the seed-collecting/wild seed nursery formed the foundation of my inquiry into the rules and procedures followed within the for-profit conservation community.
2. Botanical garden research procedures for rare plant collections were also part of my literature search. Contact with the research personnel involved with the Seeds of Success program at the Chicago Botanical Garden provided information on their documentation procedures, specifically.

Growing select wildflowers in mulch-rich garden beds (60:40 mulch:native soil mix): We assessed the survival and growth of native plant starts in three different soil mediums described below. In all situations, we matched the species with the soil that best suited its natural growing conditions and compared that with seedlings grown in pots of Miracle-Gro® and Pro-Mix® – the standard in the native plant nursery trade.

1. 300 square feet, or six beds 2.5 ft. by 20 ft long. They are raised beds comprised of seasoned wood chips mixed 60:40 with native soil. These beds were used in 2010. Plants of sandy soils and dry to dry-mesic conditions were grown here.
2. 100 square feet, or two beds 2.5 ft. x 20 ft. long. One raised bed is comprised of layers of decomposed leaves and aspen wood chips. Similar to lasagna style gardening, one raised bed is composed of (from bottom to top) a layer of manure from the adjacent farm, sawdust from the sawmill, leaves mixed with aged grass clippings (bags from a yard in

town) and covered with aspen wood chips. Plants of dry-mesic and mesic soil conditions were grown here.

3. We used three beds 2.5 ft. by 20 ft. long comprised of 2-year-old food-based compost, native sandy soil, aged cow manure, and leaves, all mixed together. This is the soil composition for our raised garden beds that we use for our personal produce. Plants of mesic and wet-mesic soil conditions were grown here.

Growing select wildflowers using forest garden/permaculture strategies: Our goal is to successfully establish permanent populations of highly conservative native plant species on site. These populations will be monitored for survival, seed set. Success with a rare plant introduction is achieved when a species is able to reproduce successfully on its own. This is our goal. Maintaining the appropriate habitat conditions is crucial to this success.

1. Locations within our 6 acres of homestead space were identified as priority areas for habitat enhancement work, e.g., removal of weedy and exotic species, to prepare for plantings.

2. In Fall 2010, we established 100 rootlets of golden seal and ginseng on the property by locating the appropriate canopy light and soil combination.

3. In Fall 2011 we established populations of 10 additional native plants of savanna habitat and an additional 100 rootlets of ginseng and goldenseal. Again, efforts were made to match plant needs with the appropriate site from referencing plant community research texts.

PEOPLE

Rich Henderson, WI Department of Natural Resources, Research Division – Rich discussed the original project, answered questions about seed collecting procedures and ethics, and provided extensive suggestions for G1 population sources.

Tony Pillow, Ginseng Grower – Tony provided rootlets of ginseng and goldenseal from native populations in Vernon County and assistance with locating appropriate sites for planting.

Gene Hendrickson, retired dairy farmer and neighbor – Gene provided us the "green goods" – cow manure and a way to move it and wood chips from point a to point b.

Conversations with many individuals within the native seed trade and conservation field added to my knowledge base.

RESULTS

Local plant sources - availability and opportunity

1. During the growing season each year, I searched within a 50 mile radius of our nursery for populations of native plants that fit the following requirements:
    a. A population size of minimum 50 plants.
    b. A native population or planted established population, e.g., not planted within the last 10 years
    c. A population with enough seed set to allow a taking of 2000 seeds without taking more than one-third of the seeds ready at that time.

My search yielded extremely discouraging results. Initially, I was targeting private landowners. Working with a non-profit organization that connects private landowners with conservation and stewardship education, I felt I would have a large pool of potential properties to select from. However, those parcels of land with appropriate sized populations were ALREADY known by local seed collectors, and being targeted for seed. Most lands that I visited are so degraded that I could not ask for seed – the landowners needed it more for their own efforts at restoration. After these discoveries, I began looking to roadsides of rural roads, hoping for better results. Along these linear corridors are remnants of prairie and savanna that do contain a selection of quality native plants. However, for only those listed below was I able to locate significantly sized populations of plants for dry and dry-mesic savanna and prairie habitat.

In order to survive as a small-scale native plant nursery selling local eco-type seed, I have two choices:

1. Collect behind other collectors from known, large populations and risk its depletion.
2. Collect from smaller populations, and add genetic diversity by collecting from numerous small but separate populations.

Documentation of seed genetics and collection history:
Surprisingly, my research efforts yielded very little in the form of documentation used by either native plant nurseries or research institutions. Most have a policy to document the source location and year of the initial collection, but past that, little information is recorded. Most small nursery owners keep their knowledge in their head, knowing the specifics of the different species that they carry, particularly the unique and unusual species. I spoke at length on this issue with leaders in the conservation world and in the local nursery trade and have been provided very few clear answers for how to document survival other than with intense annual monitoring. In cases where seeds are collected from wild populations, estimates of population size are not recorded and whether species are increasing or decreasing due to collecting pressure is not monitored.

Within the botanical garden network, serious monitoring protocols exist for documenting plant population size using cohort level information. This type of data is collected on wild populations of rare or endangered species, as well as to track plant introductions. These surveys are conducted every few years. This type of record-keeping is the most complete way to address survival and success. It is a very time consuming procedure, and not appropriate for the small nursery owner.

A quick but effective measure of plant population size, flowering, and reproduction is used by the WI DNR for rare plant surveys. This document, modified, will serve as my template for keeping track of long-term survival. This also allows me to provide the WI DNR information about my wildflower nursery practices and collecting procedures. Many of the species I am propagating are rare or threatened, and their collection and propagation is tracked by the WI DNR Endangered Resources Division.

Native plant seedling survival in 60:40 wood chip:native soil mix
During both years of the experiments, growing in nursery beds far exceeded performance of growing in pots. We saw a reduction in our water usage, our reliance on expensive plant mediums, and produced hardy plants that have successfully been out-planted into the wild.

Plants were only watered initially after planting and then again only during times of drought. Average time spent watering per month (June – September): 2 hours.

Plant survival in pots was a different story. In 2010, pots required watering every other day, resulting in an average per WEEK of 45 minutes – 1 hr. Despite watering at least 3 times a week with the pots in partial shade, I lost on average 2 pots per flat (32 pots/flat) each week. Some species experienced root rot; others dried out. Using our own potting soil slowed down the rate of loss, but my husband and I decided to transplant the remaining plants into the raised beds rather than deal with the loss. The plants transplanted in late June and July into the raised beds were watered for a few days to promote establishment, and then only watered during long periods of hot stressful weather.

In 2011, we planted all species directly into garden beds to avoid the losses experienced in 2010.

The results of plantings are shown below.

Species	Common Name			
		# planted, spring '11	Survival, 9/15/11	
Started 2011				
Helianthus occidentalis	Western sunflower	30	30	100%
Eupatorium sessilifolium	Woodland boneset	35	20	57%
Helianthus pauciflorus	Stiff sunflower	18	15	83%
Tephrosia virginiana	Goats Meadow Rue	14	14	100%
Cacalia atriplicifolia	Pale Indian plantain	50	45	90%
Penstemon grandiflorus	Large-flowered penstemon	30	30	100%
Hypericum pyramidatum	Giant St. John's wort	25	25	100%
		# planted	Survival 7-20-10/ 9-20-10	Rate
Started 2010				
Cassia marilandica	Wild Senna	27	27	100%
Veronicastrum virginianum	Culver's Root	32	32	100%
Aster patens	Clasping aster	32	32/32	100%
Silene regia	Royal catchfly	85	74*	87%
Manfreda virginica	False agave	36	25/32	88%
Baptisia leucantha	Cream indigo	15	15	100%
Liatris cylindracea/squarrosa	Blazing Star	64	49	76%
Hibiscus lasiocarpus	Hibiscus	150	45/45	30%
Started 2009				
Liatris aspera	Rough Blazing Star	13	12	92%
Ceanothus americana	New Jersey Tea	40	40	100%
Kuhnia eupatorioides	False Boneset	8	8	100%
Silpium laciniatum	Compass Plant	16	14	87%

Allium cernuum	Nodding Onion	64	64	100%
Aster azureus	Sky Blue Aster	14	14	100%
Silpium integrifolium	Rosinweed	18	18	100%
Eryngium yuccifolium	Rattlesnake master	16	16	100%
Asclepias incarnata	Swamp Milkweed	16	16	100%
Parthinium integrifolium	Wild Quinine	16	16	100%

*this 2010 plant species was planted out of pots into the raised beds during mid-summer.

DISCUSSION

Native plant propagation

Native plant propagation and cultivation is both an art and a science. For rare and uncommon savanna and woodland species, very little knowledge on optimal growing conditions is shared amongst practitioners. Many species are similar in their growing needs to their prairie counterparts, for which much information is known and shared. Also, the market for woodland and savanna species is primarily located in urban areas, for native plant shade gardens. It is cost prohibitive for landowners to purchase live plant material for woodland restorations.

Establishing plant populations for seed sales will require at least 5 more years to allow the plantings to mature to the point of sustainable harvest. Further, establishing plant populations for the harvest of live material - for plant sales or for medicinal purposes - will also require at least 5 years. As such, the plant populations are a long-term investment.

Out-planting into the woodlands and savannas has been so successful for me that I will continue to grow and move plants out into our woodlands and savannas for propagation and harvest purposes. This style of growing leaves the valuable nursery space for annual herbs and produce and produces strong, healthy perennial native plants. Maintaining habitat conditions suitable for the plantings will require standard methods of ecosystem maintenance – prescribed burning and brush management. This, overall, will reduce our time per unit effort and improve the health of our natural habitats as well. The primary issue with this style of gardening is the record-keeping involved in re-locating plantings. Pink marker flags help.

Wood chip mulch in gardens

At the start of this project we were inundated with an excess of wood chip mulch from our savanna restoration efforts – the genesis for this research project. As well as our use of mulch in the garden for the wildflower plantings, we found a variety of other uses for wood chip mulch.

Wood chip mulch has been an interesting medium to work with; with many capabilities, but also interesting challenges. Some of the findings that we've had are noted below:

1. Wood chips performed as a substrate for burgundy wine cap mushroom production. We will be inoculating more wood chips this upcoming season.
2. To kill existing vegetation in preparation for a new garden area, pile wood chip mulch at least 2 ft. high and layer with other degradable waste, such as grass.
3. Within a demonstration garden including dry and dry-mesic plants, the wood chips are too rich to be used as a mulch cover.

4. The wood chips seem to promote the growth of wild sorrel. Sorrel can effectively choke out small plantings with its extensive root mat.
5. In woodlands, where in 2010 we used wood chips in our woodland garden areas we have seen the increase in Sheep Sorrel (Rumex acetosella) distribution and abundance. This is not good news – Sheep sorrel is an aggressive noxious species in our region. It grows on the pile and around the edges, living off of the decaying chips. I am not sure which comes first – the seeds or the environment.

OUTREACH:

In November 2011, Charles and I gave a talk at the NCR-SARE Farmer's Forum, at the National Small Farm Trade Show & Conference in Columbia, MO. We expanded the talk to demonstrate the role that land stewardship plays in our life and our efforts to sustainably use the waste products from our efforts and replace them with "something" better, e.g., native plant populations. This, ultimately, is our goal with our way of life and our life's work, to serve as an example of sustainable living and ecological stewardship of land.

We also presented a poster on the project at three different landowner conferences during the course of our SARE grant time period. These conferences are: Madison Woodland Landowners Conference (2010), The Prairie Enthusiasts Conference (2011), and Tri-State Forest Landowners Conference (2011).

We had also hoped to have a field day at our farm, but I did not get the event together. In lieu of this, I am working on two additions to our website, www.turtlehill.wordpress.com, to explain the project.

My husband and I run a small land stewardship service, primarily working with landowners of small parcels of wooded property. We are often employed in exotic species removal and timber stand improvement (TSI). With all of our contacts, we have been discussing the importance of recycling woodland waste products and encouraging people to chip up their "waste wood" and compost it rather than burn it up in large burn piles. In this one-on-one matter, during 2010 and 2011 we reached out to 10 different landowners. Our greatest success comes from our stewardship work with Don and Donna Justin, owners of a 220-acre bed and breakfast resort called Justin Trails Bed and Breakfast (www.justintrails.com). Wood chips from our TSI work there is being used in their extensive manicured gardens around the home-scape, incorporated into the compost pile for food waste, and spread along the hiking trails around the property. Their interest and participation in the project concepts are likely our biggest success this year. In addition, anywhere from 4 to 15 people volunteer their time in exchange for reduced stay rates during "work weekends". During that time, Charles and I are working and educating, sharing what we know about nature, land management, and the struggles of land stewardship and "wood waste".