

The Native Agriculture to InVigorate Ecosystems (NATIVE) Project

National Audubon Society, Inc.



Final Report

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Dr. Daniel Scheiman, Bird Conservation Director/NATIVE Project Manager

Jonathan Young, Field Projects Manager/NATIVE Project Coordinator

Ruddie Allen, Field Technician

Background

The goal of Audubon's Native Agriculture to InVigorate Ecosystems (NATIVE) project is to assist historically underserved producers in Arkansas with increase crop diversity and biodiversity, and reduce their farms' vulnerability to climate change, through an innovative, cash crop that provides on-farm conservation benefits while also contributing to conservation regionally. Specifically, Audubon provided farmers with the technical and financial resources needed to grow Arkansas native plants in row-crop style production plots. The seed is a commodity in high demand by conservation organizations that restore prairie habitat for wildlife.

Climate change poses a tremendous threat to agricultural production. Shifts in temperature and precipitation patterns; frequency and intensity of extreme weather events; and climate variability will disproportionately affect those who lack the resources to adapt their farming practices, especially historically underserved producers. Two adaptation strategies are diversifying crops and increasing biodiversity on the farm. Native warm season grasses and pollinator-friendly wildflowers are economical, environmentally sustainable, alternative cash-crops that are able to withstand drought and other severe weather events exacerbated by climate change that will negatively impact traditional crops. Even on small acreage, as is often owned by historically underserved producers, native grasses and wildflowers can provide needed soil, water, and

wildlife habitat conservation that will become increasingly critical and challenging with climate change.

Because of current high commodity prices, farmers are typically unwilling to take land out of production for conservation purposes. Yet unlike traditional Farm Bill conservation programs that simply set aside land and cause producers to forego income, native plants are an innovative crop that diversifies farm income while still providing conservation benefits. Income from native plants can be derived from the sale of seed for public prairie restoration projects and private landscaping; high-yield, drought-tolerant forage; and biomass for conversion to biofuels. Perennial native crops are economical, requiring less labor, equipment-use, water, and soil amendments than traditional annual row-crops. They do not have to be replanted each year. They are environmentally sustainable too. Native plants hold the soil, filter and slow water, provide wildlife habitat, and sequester carbon in their deep roots, meaning production plots can double as buffers and filter strips for traditional row-crops.

As with local food production, there is a growing demand for locally sourced, locally produced native plants. Using local ecotype native plants for habitat restoration projects is important because these plants have evolved to their particular environment (i.e. climate, soil, predators, etc.), giving them a greater chance of survival. The National Seed Strategy for Rehabilitation and Restoration Success calls for the establishment of nationwide networks of native seed collectors, farmers, and growers working to develop an adequate supply of genetically appropriate seed for habitat restoration. Action 1.2.2 of this strategy identifies the need to train small farmers to assist with smaller-scale, niche market seed production, and to promote a seed market system that is responsive to regional native seed needs of agencies.

In Arkansas, the Arkansas Natural Heritage Commission, Arkansas Game and Fish Commission, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Audubon Arkansas, and The Nature Conservancy have committed to using regionally specific plant materials for restoration projects; the seed supply is a limiting factor for restoring new acreage. Furthermore, the U.S. Department of Agriculture (USDA) encourages farmers to plant native grasses and wildflowers to benefit declining birds, pollinators, and other wildlife. Rather than buy seeds from other states, Arkansas farmers could buy better-adapted, locally grown seeds from their fellow farmers, if only the supply was commercially available.

As a leader in bird conservation, Audubon has the ability to unite diverse stakeholders to take action for birds and the environment. For more than a century, Audubon has been a leading voice in conserving precious habitat and wildlife for future generations. Audubon's mission is to conserve and restore natural ecosystems, focusing on birds, other wildlife and their habitats for the benefit of humanity and the earth's biological diversity. This mission is realized by engaging people in bird conservation through science, policy, education, and on-the-ground conservation action. What defines Audubon's unique value is the demonstrated ability to mobilize communities in support of protecting common and threatened bird species and the critical habitat they need to survive.

Methods

We recruited new producers through connections made by our established producers, project partners, and USDA staff. Producers received an incentive payment of \$350/acre/year over two years for each acre newly enrolled in this project. Modeled similarly to incentive payments currently in use with USDA conservation programs, Audubon's payments enabled producers to overcome the financial barrier of starting a new crop. Producers were responsible for preparing planting beds, including applying herbicides to reduce weed competition, disking, and achieving appropriate bed firmness. They were responsible for continued maintenance as well. Audubon's Project Coordinator and our native plant consultant Thomas Foti worked one-on-one with them throughout the project to ensure that they understood the protocols, had planting success, and were satisfied with the assistance they received.

Audubon and project partner Arkansas Natural Heritage Commission collected starter grass and wildflower seeds from public and private native prairie remnants in each of four ecoregions—Grand Prairie, Ozark Prairie, Arkansas River Valley Prairie, and Blackland Prairie. Seeds were collected by hand and flail-vac, and with help from volunteers (Fig. 1) and a habitat restoration contractor. Seeds were sent to Roundstone Native Seed in Kentucky for cleaning and viability testing. Wildflower seeds were germinated into plugs. Plugs significantly improve survival, and decrease the time to maturity and seed production, resulting in improved crop yields.

Grass seeds were planted using either broadcast or no-till drilling, depending on the farm and the equipment available. Plots were established at a seeding rate of 10 lbs. per acre. Wildflower plugs were set on 36-inch rows with variable spacing between each plant, depending on the species' requirements. A plug setter sourced from Roundstone, and later sourced locally was used to insure proper establishment. Wildflowers were set in plastic mulch with drip tape irrigation, provided by Audubon, to suppress weeds and provide water until plants became established (Fig. 2). A cover crop or regular mowing kept weeds down between rows.

We randomly collected five soil samples at depths 0-6 inches from each native grass plot and a nearby traditional row-crop field. Samples were given to the University of Arkansas Cooperative Extension Service to quantify nutrient availability and organic matter to test the hypothesis that once established, native crop fields will have a higher percentage of soil organic matter than traditional row-crop fields. Soil organic matter retains moisture, increases water infiltration, and enables soil to hold valuable nutrients.

Producers harvested grass seeds from their production plots using a combine or Audubon's tractor-mounted flail-vac. They harvested wildflower seeds by hand, by flail-vac, or by push-combine, depending on the species. Seeds were brought to the Little Rock Audubon Center for cataloging, then were stored temporarily at a warehouse outside Little Rock owned by Central Arkansas Water. Audubon transported the farmers' seeds to Roundstone to be cleaned, stored, certified weed-free, and tested for viability (Fig. 3). Arkansas conservation organizations have first right of refusal for purchasing the seed before it can be sold on the open market on the farmers' behalf. In exchange for a share of the profit, Roundstone shares with producers their 20 years of experience in native plant production and marketing. By helping producers establish this business partnership, Audubon is putting them on the path to sustainability beyond USDA

funding, improving their chance for success, reducing their overhead costs (e.g. no need to buy their own seed cleaner), and opening new national markets to small-scale Arkansas farmers.

Results

At the start of this project in 2016 we were working with three historically underserved farmers in the Grand Prairie region of Arkansas who collectively were producing seeds of four grass species on 59.6 acres. For this project we recruited ten more producers across four prairie ecoregions, expanding production to include 19 wildflower species, on 104.5 acres (Fig. 4). One-hundred and sixty-eight volunteers and a contractor helped us collect 476 pounds of grass seeds of five species, and 235 pounds of wildflower seeds of 59 species. Only certain species were sown into production plots (Table 1; Fig. 5), selected by quantity of seed, desirability for restoration, and perceived ease to grow and harvest by farmers. The remainder are banked at Roundstone for future use.

Seed production (pounds/acre) varied each year depending on which species were mature, timing of harvest, weather, and viability. Grasses have been as high as 96 lbs./ac (1,346 lbs. from 14 ac; Fig. 6). Wildflower production was as high as 41.5 lbs./ac (166 lbs. from 4 ac). Importantly, producers are earning income from their crops. One of our most established producers made \$14,000 from the sale of a single year's seed harvest. Another made \$1,400 from the sale of just two wildflower species in one year. She invested that back into her farm by buying a greenhouse. She'll use the greenhouse to produce her own plugs from seeds, then sell potted native plants. This will further diversify her income, which includes potted ornamental flowers, hay, and pumpkins she sells at the farm and in town.

We have producers that have planted, harvested and sold seed in all four prairie ecoregions. Some producers are just starting off, others have not yet harvested because their crops are not yet fully established. The producers that have put in the time and effort have been able to turn a profit from established crops. Wildflower production plots have had the best yield per acre with higher crop value compared to grass crops, but wildflowers also require more investment of time and maintenance, especially weed management.

Though actual sale price will depend on seed availability and market conditions at the time of sale, our producers could collectively make upwards of \$36,000 from their 2019 season (Table 2). Roundstone pays producers about 40% of the sale price. That's about \$62/lb., competitive with traditional rowcrops like soybean, corn, and millet.

Challenges

Producers who committed to farming these crops and making them a priority on their farms have been successful. We have had some producers that did not keep up with maintenance, then eventually lost interest and did not harvest. Just like any crop, it takes time and commitment to farm native seeds. Some farmers were more focused on their traditional crops, and gave up on the seed crops before realizing income. Especially during the pandemic, some have put priority on crops they are more familiar with and know they can sell in order to keep their farms solvent.

Past experience shows that once a farmer sees a return on investment in their native crop they invest even more time in it, but that threshold is harder to reach at the moment. One farmer recently expressed his disappointment with the size of his first check from Roundstone due to low viability of one of his seed crops; fortunately that did not dissuade him from harvesting this season. Though Audubon is not privy to the details of the financial arrangement between a farmer and Roundstone, we've learned that more transparency is important upfront about the nature of the native seed market. This has led us to encourage the farmers to work more directly with Roundstone after they become established in the project. This also aids in the project continuing on its own in the future.

One farmer replaced a portion of his Switchgrass plot with soybean. One reason was he needed a traditional commodity crop to guarantee income to get a farm loan from the bank. He expressed to us that if he had income estimates for Switchgrass this might have satisfied the bank. Now we know going forward to provide such an estimate to our producers based on seeds already sold. Another grass producer needed a well in order to plant wildflowers. Unfortunately, there was no time for her to apply for USDA cost-share assistance for well installation, let alone receive approval and install a well in time for wildflower planting. If USDA application acceptance and money distribution could be rolling for historically underserved producers, this would have made timely well installation possible.

Impacts to Conservation

Audubon's NATIVE Project is a strategy of the Arkansas Native Seed Program (www.arkansasheritage.com/storyline/native-seed-program-moves-forward) and the Arkansas Monarch and Pollinator Conservation Plan (arkansasmonarchs.org). Both plans express the need for more locally produced, locally adapted seed for local restoration projects. Indeed, agencies are buying our farmers' seed through Roundstone. The U.S. Army Corps of Engineers has bought the bulk of Big Bluestem, Little Bluestem, Indiangrass and Switchgrass available from our Grand Prairie producers. They have committed to reseeding using only local ecotype seeds for their Grand Prairie Irrigation Project. Likewise, Arkansas Natural Heritage Commission bought our farmers' wildflower seeds for a 12.5-ac restoration project in the Grand Prairie. The University of Arkansas's Rice Research Station has also purchased seed to test native grasses' ability to prevent levee erosion. Audubon has known for years this demand was coming, and we have positioned historically underserved producers to be the primary suppliers.

Of course the conservation benefits extend to our producers as well. Native plants are improving soil organic matter. One farmer used a portion of his seeds to plant his own conservation buffer. Wildflower plots are magnets for pollinators (Fig. 7). A producer learned that one "weed" on her farm is Green Milkweed (*Asclepias viridis*), a highly desirable native. So before applying herbicide where she did not want this plant growing, she transferred some to pots to propagate for sale. Before enrolling in the NATIVE Project she would not have realized the value of this and other native plants for wildlife and her business. Attendees of a 2019 National Black Growers Council farm demonstration day on one of our producer's farms (Fig. 8) were treated to the sight of a covey of Northern Bobwhite, which had returned to the farm since Switchgrass was planted. You can't ask for a better endorsement than that!

List of outputs, outcomes and deliverables

- Recruited ten additional producers across four prairie ecoregions, expanding production four grass species and 19 wildflower species across 104.5 acres.
- Attended five partner workshops to try to recruit producers.
- Recruited 168 volunteers to collect seeds from remnant prairies.
- Collected 476 pounds of grass seeds of five species, and 235 pounds of wildflower seeds of 59 species from remnant prairies.
- Sowed 249,661 wildflower plugs to start 18 acres of production.
- Harvested upwards of 96 lbs./acre of grass seed from production plots.
- Harvested upwards of 41.5 lbs./acre of wildflower seed from production plots.
- Tested seed viability.
- Tested soil for organic matter.
- Provided producers with annual incentive payments.
- Provided producers thousands of feet of drip tape and plastic mulch for wildflower plots.
- Connected historically underserved producers to national markets through Roundstone Native Seed.
- Demonstrated to farmers that agricultural production and conservation can not only coexist, but can be one and the same.
- Wrote a new technology and innovative approach fact sheet concerning how native plant production assists with climate change adaptation and can be integrated into on-farm conservation.
- Promoted the project through articles (ar.audubon.org/native) and events, including the 2020 Soil and Water Conservation Society's International Annual Conference (an NRCS-approved event).
- Reinforced a push-combine and fabricated two more for producers to use to harvest wildflowers (Fig. 9). These 4-ft push-combines have a gas-powered sickle bar and ground-driven reel that pulls the wildflower into the hopper and cuts the head off. This innovative machine is lightweight and easily disassembled, so it can be transported and operated by one person.

Next Steps

The 2020 prairie seed collections and producers' harvests are being brought to the Little Rock Audubon Center for cataloging and short-term storage. In January we will deliver the seed to Roundstone for cleaning, testing, storing, and marketing. Through another USDA grant we have an obligation to recruit two additional producers for grass production. While searching for new producers we will continue to provide technical advice and equipment for current producers. We will continue to facilitate their business partnership with Roundstone, anticipating that by next growing season Roundstone will be able to provide the support farmers need without Audubon and USDA support (Fig. 10).

Table 1. Species currently in production plots.

Grasses	Scientific Name
Big Bluestem	<i>Andropogon gerardii</i>
Switchgrass	<i>Panicum virgatum</i>
Little Bluestem	<i>Schizachyrium scoparium</i>
Indiangrass	<i>Sorghastrum nutans</i>
Wildflower	Scientific Name
Cream Wild Indigo	<i>Baptisia bractiata</i>
White Prairie Clover	<i>Dalea candida</i>
Purple Prairie Clover	<i>Dalea purpurea</i>
Pale Purple Coneflower	<i>Echinacea pallida</i>
Rattlesnake Master	<i>Eryngium yuccifolium</i>
Sawtooth Sunflower	<i>Helianthus grosseserratus</i>
Ashy Sunflower	<i>Helianthus mollis</i>

Rough Blazingstar	<i>Liatris aspera</i>
Prairie Blazingstar	<i>Liatris pycnostachya</i>
Wild Bergamot	<i>Monarda fistulosa</i>
Slender Mountain Mint	<i>Pycnanthemum tenuifolium</i>
Meadow Beauty	<i>Rhexia virginica</i>
Rough Coneflower	<i>Rudbeckia grandiflora</i>
Missouri Coneflower	<i>Rudbeckia missouriensis</i>
Compass Plant	<i>Silphium laciniatum</i>
Showy Goldenrod	<i>Solidago speciosa</i>
Yellow Crownbeard	<i>Verbesina occidentalis</i>
Baldwin's Ironweed	<i>Vernonia baldwinii</i>
Missouri Ironweed	<i>Vernonia missurica</i>

Table 2. Cleaned weights and potential sale price of seeds harvested by producers in 2019 and now available for sale by Roundstone Native Seed, LLC. The sale price is an estimated market value that does change over time. PLS is pure live seed, a measure of viability.

Common Name	Scientific Name	Bulk lbs.	Est. PLS%	Est. lbs.	Price/unit	Est. Sale Price
Grand Prairie						
Big Bluestem	<i>Andropogon gerardii</i>	60.00	60	36.000	\$ 22.00	\$ 792.00
Little Bluestem	<i>Schizachyrium scoparium</i>	31.56	60	18.936	\$ 20.00	\$ 378.72
Switchgrass	<i>Panicum virgatum</i>	182.71	85	155.304	\$ 14.50	\$ 2,251.91
Indiangrass	<i>Sorghastrum nutans</i>	52.00	75	39.000	\$ 20.00	\$ 780.00
Pale Purple Coneflower	<i>Echinacea pallida</i>	0.09	85	0.077	\$ 150.00	\$ 11.55
Rattlesnake Master	<i>Eryngium yuccifolium</i>	18.85	60	11.310	\$ 275.00	\$ 3,110.25
Downy Sunflower	<i>Helianthus mollis</i>	0.64	50	0.320	\$ 195.00	\$ 62.40
Prairie Blazingstar	<i>Liatris pycnostachya</i>	161.50	50	80.750	\$ 180.00	\$ 14,535.00
Bergamot	<i>Monarda fistulosa</i>	2.29	75	2.190	\$ 200.00	\$ 438.00
Slender Mountainmint	<i>Pycnanthemum tenuifolium</i>	7.63	85	6.486	\$ 440.00	\$ 2,853.84
Rough Coneflower	<i>Rudbeckia grandiflora</i>	11.68	60	7.008	\$ 400.00	\$ 2,803.20
Compass Plant	<i>Silphium laciniatum</i>	189.00	80	151.200	\$ 275.00	\$ 41,580.00
Missouri Ironwood	<i>Veronia missurica</i>	10.67	70	7.469	\$ 275.00	\$ 2,053.98
AR River Valley						
Prairie Blazingstar	<i>Liatris pycnostachya</i>	61.63	50	30.815	\$ 180.00	\$ 5,546.70
Rough Coneflower	<i>Rudbeckia grandiflora</i>	16.43	60	9.858	\$ 400.00	\$ 3,943.20
Downy Sunflower	<i>Helianthus mollis</i>	3.45	50	1.725	\$ 195.00	\$ 336.38
Missouri Ironwood	<i>Veronia missurica</i>	0.27	70	0.189	\$ 275.00	\$ 51.98
Slender Mountainmint	<i>Pycnanthemum tenuifolium</i>	18.07	85	15.360	\$ 440.00	\$ 6,758.40
Blackland Prairie						
Missouri Coneflower	<i>Rudbeckia missouriensis</i>	7.89	60	4.734	\$ 500.00	\$ 2,367.00
Pale Purple Coneflower	<i>Echinacea pallida</i>	3.60	85	3.060	\$ 150.00	\$ 459.00



Figure 1. Volunteers collect wildflower seeds from a prairie remnant.



Figure 2. A project producer sowing wildflower plugs. Plugs are planted into rows of plastic mulch with drip tape irrigation. This controls weeds and provides water until plants are established.



Figure 3. A rental truck packed to the ceiling with seed from farmers' production plots and remnant prairies. Even more bags were loaded after this photo was taken.

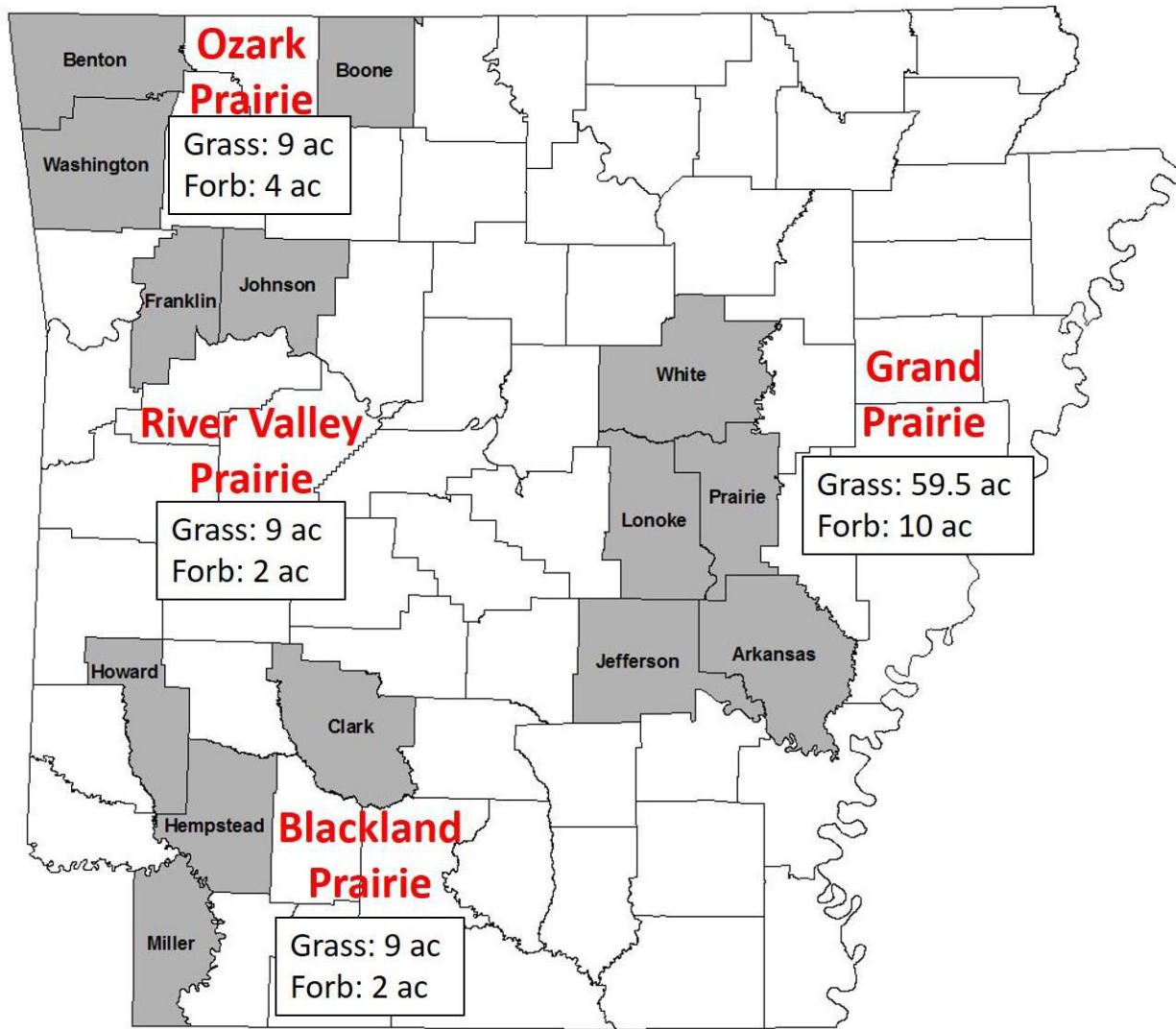


Figure 4. Acreage enrolled in native plant production by prairie ecoregion.



Figure 5. (Clockwise from top-left) Prairie Blazingstar, Rough Coneflower, Bergamot, and Compass Plant production plots in their first growing season after sowing plugs.



Figure 6. Grass production plots and seed harvesting.



Figure 7. Butterflies feeding on Slender Mountainmint on a producer's farm.



Figure 8. Learning about Audubon's NATIVE Project at a National Black Growers Council field day in July 2018.



Figure 9. Using one of Audubon's push-combines (right) to harvest wildflowers.



Figure 10. NATIVE Project producers meeting with Roundstone Native Seed and Tom Foti.