Increasing Native Plant Materials for the Verde River Watershed

Needs Assessment Survey Results

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with funding from Friends of Verde River Greenway

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Abstract

Successful watershed restoration is made possible by a reliable and affordable supply of native plant materials. Currently there is very little native seed production or native plant from local genotypes in Northern Arizona. This has been hindered more by economic and institutional inefficiencies than by biological constraints as multiple entities work independently to meet small-scale restoration needs.

In April 2016, the Friends of Verde River Greenway conducted a survey of potential native plant materials buyers and growers in the Verde River Watershed. The results highlight uncertainties in the native plant materials market, but also points to the promise of a native plant materials partnership and identifies key players in the region. The survey revealed that local genotypes are important to the majority of native plant materials buyers. Over half of the respondents expressed interest in buying from a partnership, and those who were uncertain about contributing funding identified that the type of agreements to accommodate this would be important. Half of the growers who took the survey expressed interest in producing native plants for a partnership. The high responses by producers on all the potential opportunities indicate that if designed correctly, a native plant materials partnership can provide multiple benefits. We are proposing a cooperative of restoration partners and public and private producers. Coordinated production is expected to increase the availability and diversity of plant materials, stimulate the native seed industry, stabilize the seed market, reduce restoration costs, and ultimately improve restoration success.

Introduction

This report examines the feasibility of expanding the availability of native plant materials in the Verde River Watershed. This research is an outcome of the Verde Watershed Restoration Coalition (VWRC) Watershed Planning Workshop in February 2015, which identified a native plant propagation center/tree replacement program as a priority and a Native Plant Working Group was formed to investigate and create a strategic action plan.

VRWC continues to complete successful restoration the Verde River Watershed, yet in order to "move beyond the weeds, " and successfully restore native habitat, stakeholders identified a lack of available native plant materials. In spring 2016 a native plant working group convened to begin to identify how to increase production of native seed and plant materials from local genotypes. These were our initial goals:

1) Provide a regional source of native plant and seed material for restoration and research purposes;
2) Provide native plants at affordable cost to regional projects;
3) Provide economic development opportunities through native plant propagation in Verde Valley;
4) Provide training, equipment, storage and outlet for regional farmers to grow native plant seed and be economically viable.

Background

The Verde River Watershed is located in the Arizona/New Mexico Mountains ecoregion 32,000 acres of riparian on approximately 459 streamside miles. Verde Watershed has a 2,000-year farming history beginning with the Hohokam people who irrigated their crops of corn, beans and squash from cracks in limestone rocks, which carried water from Beaver Creek and the sinkhole we call Montezuma Well.

In 1997 11,330 acres of the Verde River Watershed were actively irrigated and pasture was the predominant crop (Department of Water Resources 2000). Working with farmers to transition to native plant production will provide multiple benefits 1) increase natural habitat to conserve native pollinators; 2) prepare farms to be more resilient in the face of climate change, 3) reduce stress on the system and leave more water in the river.

Upon further investigation into native market supply and demand, we found a significant disconnect. In order to close this gap we began a conversation about native plant materials and instead of building a greenhouse, as originally planned, we decided to grow connections between buyers and producers.

In order to understand the existing native plant market in our region, we created a needs assessment survey in conjunction with Southwest Decision Resources with the Survey Monkey platform in April 2016. We decided to temporarily name our group the Verde Native Seed Cooperative (The Co-op). The survey links and a description of the proposed mission and goals of the The Co-op were emailed to 84 people. 5 people opted out of the survey, as they did not define themselves as either a grower or buyer. In total, 37 individuals responded to the survey: 18 growers and 21 buyers. A few respondents filled out both. Total response rate was 46%.

The goal of the survey was threefold: 1) to get a baseline understanding of native plant material needs from buyers; 2) gauge the capacity for native plant material production by growers (nurseries and farms) in the Verde River Watershed; and 3) to determine the level of interest and/or capacity to participate in a partnership around regional native plant production. Our objective in the survey is to determine they key players to participate in a collaborative process to develop a regional plan for coordinating native plant materials production in the Verde River Watershed.

Response from Native Plant Material Buyers

Native plant material buyers were chosen from a list of federal, state, non-profit and private companies known to participate in restoration projects in the region. They were asked to complete 13 questions about how they procure native plant materials for their work. 21 plant buyers took the survey, representing private businesses, educational institutions, federal and state agencies and non-profit organizations. (Figure 1.) illustrates the responses for the main uses for native plant materials and (Figure 2.) shows the main type of native plant materials purchased.

Figure 1. What is/are the main uses of the native plant materials you purchase?

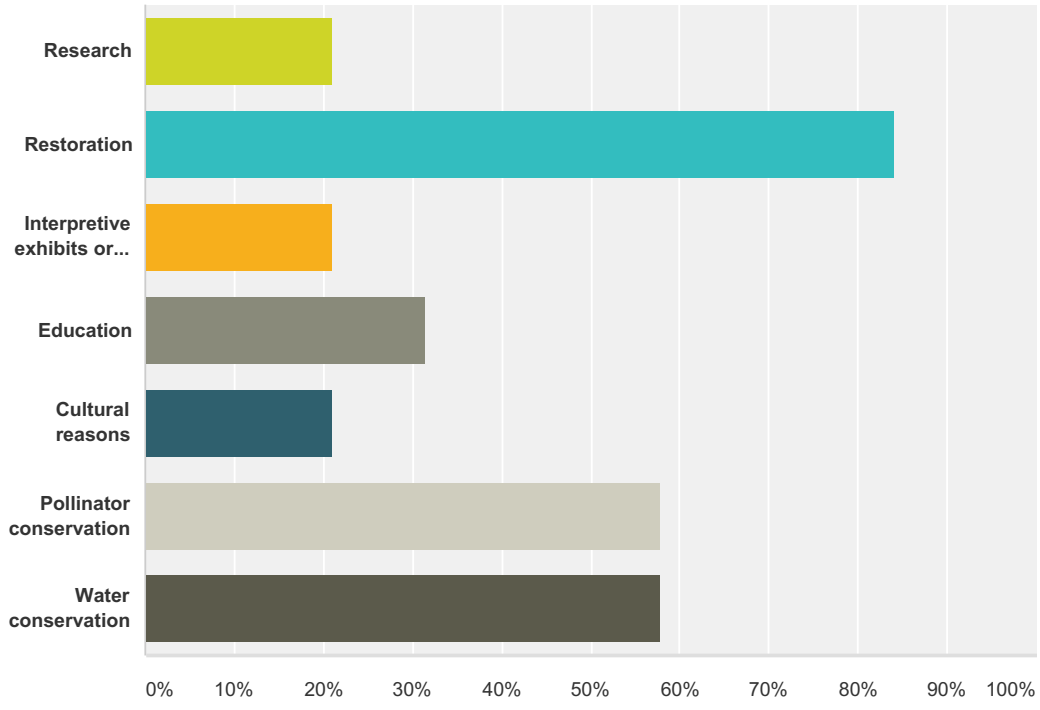
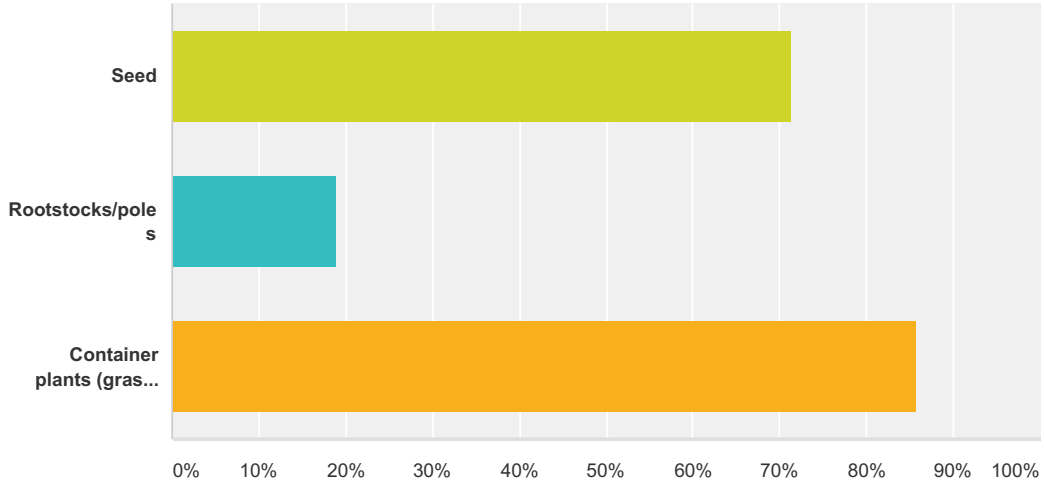


Figure 2. What type of native plant materials do you purchase?



When asked to estimate how much they spend on native plant materials each year ADOT and the USFS could not specify a number, however the individual amounts from respondents totaled $139,000 annually. When a range was listed, the median amount was calculated. (See Appendix Table 2.).

When respondents were asked if there are species or native plant materials that they need, but are often unavailable, a few indicated that commercial seed supplies are variable and some species are not always available. Some of the responses listed that they have trouble sourcing forbs, native species mulch, milkweeds, cottonwood & willow poles from local/regional stock. In years where there are multiple large fires, there is occasionally competition for certain species. Buyers are currently sourcing native seeds from Granite Seed, the Northern Arizona University greenhouse, Flagstaff Native Plant and Seed, Mountain States Nursery, Verde River Growers and Santa Ana Nursery.

The priority species lists utilized in the survey were compiled from lists provided by regional restoration consultants who have implemented projects in NPS Parks and Monuments in the Verde Watershed, as well as VWRC program managers (See Appendix Table 3. and 4.). The limitations of these lists include lack of definition of workhorse and foundation or key species for project sites within our region that are not currently available or that need to be locally-procured We created a detailed follow-up survey for plant materials buyers and hope to utilize this information to create a smaller list of priority species to be grown in pilot projects (See Appendix Table 5.).

As far as rating the quality of the commercially available native plant materials, the majority responded that they were very high quality (72%). Many noted the importance of weed free seed and require either lab results or closely review seed

certificates. We also learned that organic, non-chemical plant material production methods are required to produce NPS plant material.

When asked to rate the importance of local genotypes in plant materials, (67%) responded that it was either extremely important or very important to their work. However, there was some confusion as to the definition of "local genotype" for the purposes of this survey. In the comments individuals listed that being weed free is the most important aspect of seed selection. Another responded: "that it depends on the species and the project, wind pollinated grass species for watershed stabilization not so important. Forbs, shrubs, trees it is much more critical." The Forest Service buys common grasses for their projects, and responded that: "Unfortunately these have already been moved around a lot so we don't really know what is out there and if it is native to our area. Seeding efforts sometimes fail but it is hard to say whether is it due to genotype, environmental conditions or methods used." Another response indicated, "We specify plants that grow well in the biome where they will be planted but do not require local sourcing. Many roadside species are wind pollinated and/or wind dispersed so there is less of a concern with maintaining a local genotype in most cases." A restoration consultant noted that: "Local adapted varieties are extremely important for most clients."

Participation and Funding

Over half of the respondents (57%) indicated they would be willing to buy native plant materials from a local partnership of growers and buyers in the Verde Valley, (24%) indicated maybe and (19%) responded that they were unsure and would need more information to decide. One person commented, "It is generally best to work with one grower that can be most trusted." Another comment indicated that: "It would depend on what is grown. It may be useful for lower elevations lands and trails projects (in the Sedona area) but different species would be needed for the Flagstaff area." An ADOT representative responded that "contractors have to meet federal contracting requirements on many of our projects, so there might be some hurdles for the partnership to meet them, but ADOT would not prohibit use of materials from this type of group unless there was a legal requirement not allowing it."

Over half of the respondents (63%) indicated that they were unsure and would need more information before they decided they would be willing to contribute some initial funding for a plant materials partnership, in exchange for plant materials produced by members as they become available. (21%) were not willing to contribute and (16%) would be willing to contribute upfront funding. Some comments indicated that the respondent did not have that authority, or that it was uncertain if this could work under state procurement laws. Others noted a lack of capacity on the part of their organization to support an initial investment. The NPS responded that it is already funding FVRG to strategize how best to provide the necessary local genotypes and plant materials for restoration at Verde Valley NPS units.

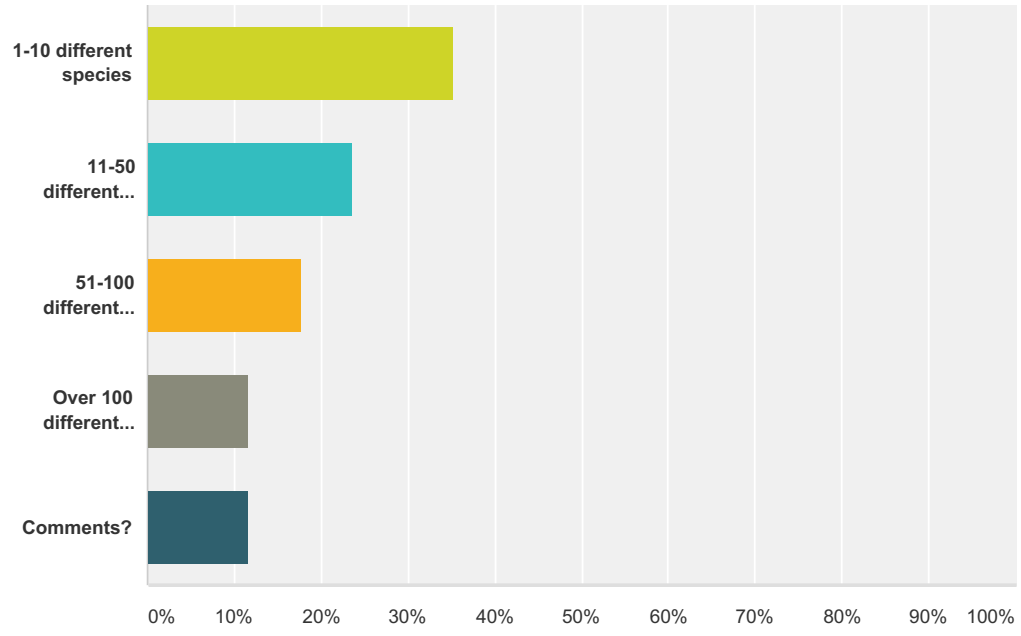
Responses from Native Plant Material Producers

18 plant producers completed the 9-question grower survey. Of the respondents, there are (5) vegetable or alfalfa farmers, (3) non-profit native plant producers, (3) educational/public institutions, (2) commercial nurseries, (1) state agency, (1) commercial seed company, (1) landscaping company and (1), tribal agency. (41%) responded they grow native plant materials for use by their organization and almost a third (29%) grow native plant materials for commercial use, while (12%) grow native plants for personal use and (18%) are not currently growing native plant materials.
We realized that the survey did not specify a definition of "native plant," which was confusing to at least one of the respondents.

When asked whether they use regionally sourced seed (28%) responded that all seed is regionally sourced, (50%) responded that some seed is regionally sourced, (5.9%) responded that they work with native seed sourced from other regions, and (17%) do not collect or store regionally sourced seed. However, the survey did not specify the definition of regionally sourced seed and whether this means from the Verde River Watershed or Arizona/New Mexico Mountains Ecoregion. For the purposes of this research, we collected lists of current native seed and plant materials being grown by respondents.

Half of the respondents (50%) source their seed from a national vendor, while (25%) either source their seed from local or regional partners/growers or have no need for locally sourced seed. Again we realized that we did not specify or define the terms "regional" or "local" for this survey (Figure 3).

Figure 3. If you are growing native plants, approximately how many different species are you growing?



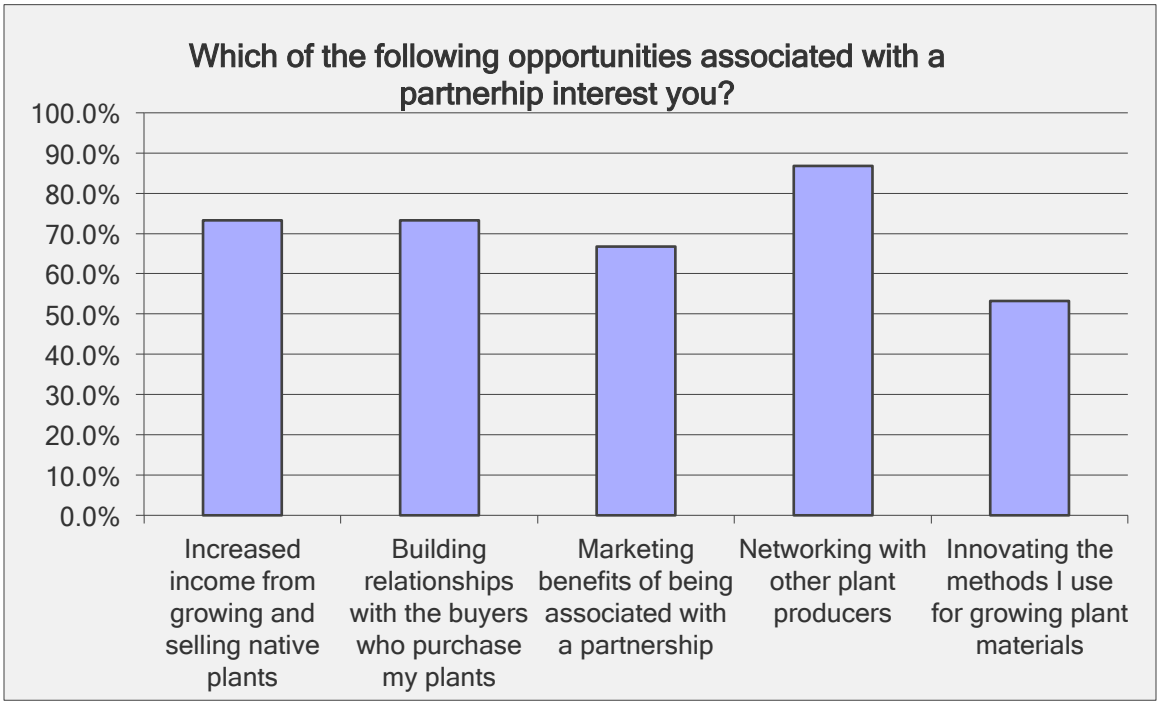
Level of Interest In a Partnership

Over 50% of the growers responded that they would see benefits to partnering with a cooperative. Surprisingly, the highest response rate (87%) was the opportunity to network with other plant producers. We will be inquiring further into the question of how producers would like to network, so we can build those activities into the partnership. The high responses by producers on all the potential opportunities indicate that if designed correctly, a native plant materials partnership can provide multiple benefits.

We were encouraged to see that there was interest expressed by the producers in participating if the opportunities we indicated above were part of the Verde Native Seed Cooperative (Figure 4).

The majority of respondents (83%) indicated that the main obstacle to growing plants for a regional plant materials partnership was lack of capacity/space, while (50%) indicated they lacked time. (17%) indicated that partnerships are not the best use of time. Two respondents were already maxed out on space to grow more plants. None responded that they were unclear about the goal of a regional plant materials partnership.

Figure 4. Opportunities for growers associated with a native plant materials partnership.



Capacity for Growing Native Plants

Despite the fact that many growers lack capacity, the survey indicated there is both greenhouse and field capacity to initiate native plant materials production in the Verde River Watershed and Flagstaff. This information will allow us to connect individual growers with native plant production needs knowing their capacity and level of interest (See Appendix Table 6.).

Discussion and Further Research

The preliminary results of the survey point to the important elements that will make a potential partnership successful as well as what information is still missing. Follow up interviews are being conducted with potential buyers including the Freeport-McMoRan Mine, City of Camp Verde and Cottonwood for parks and recreation planning and potential tree replacement program, Arizona Department of Transportation, Arizona Game and Fish Department, and Arizona Bureau of Land Management. The survey was helpful to gather baseline information to determine which respondents should be asked to join the partnership in order to build ownership of participants in the early stages. (See Appendix Table 1).

Results from a survey published in 2010 of both buyers and suppliers of native plant materials to assess the feasibility of developing a native plant and seed industry in Northern Arizona found the two biggest obstacles were lack of consistent demand and a deficiency of native plant production knowledge (Peppin et al. 2010). Survey results suggested that before northern Arizona initiates a market, efforts should resolve: (1) agreement on the definition of "local-genotype," (2) consistent management decisions across agency jurisdictions concerning the use of native plant materials, (3) increased availability and lowered cost of native plant materials, (4) a consistent and reliable demand for native plant materials, (5) increased communication and information sharing among producers, land managers, buyers, and researchers (6) stronger collaboration/partnerships among federal, state, private, and non-profit entities, and (7) a stable funding mechanism for the development of native plant materials (Lynn et. al. 2008).

A more recent report investigating the restoration seed market servicing Colorado Plateau BLM land holdings found similar trends, including shortage of native plant materials and increased cost, especially years with extreme fires. This unpredictable market was connected to wild collected seed. The findings suggest that increasing long-term storage capacity during productive seed years would stabilize the market. The report pointed to an interagency strategy to increase field production of species in high demand and limited supply while still allowing growers to make a reasonable profit. Agencies need to create a mechanism for longer-term supply contracts with growers would provide stability in demand and encourage more production. Of course, funding for these efforts is also paramount to success (Camhi and Perrings, 2016).

In 2015, the Institute for Applied Ecology (founders of the Willamette Valley Native Plant Partnership) received funding to support a coordinator to develop a collaborative program to improve the supply of native seed for New Mexico and Arizona. The goal of this Southwest Seed Partnership (SWSP) is to coordinate with efforts already underway as well as identify new partners that need native seed to prioritize production efforts and pool resources to improve plant material availability and costs for the entire ecoregion. The SWSP is also initiating needs assessment surveys for both restoration seed users and for restoration seed producers in New Mexico to help identify high priority species for wild collection and production. We are collaborating with this effort and sharing the results of this survey widely.

Next Steps: Building a Regional Partnership

The baseline needs assessment survey will help design a native plant partnership that provides a regional source of native genotypes (seed and plants) for restoration and research purposes in the Verde Watershed. The results point to the feasibility and need to work at the watershed level to produce native plant materials in the AZ/NM Mountain Ecoregion.

Successful watershed restoration is made possible by a reliable and affordable supply of native plant materials. Currently there is very little native seed production or native plant from local genotypes in Northern Arizona. This has been hindered more by economic and institutional inefficiencies than by biological constraints as multiple entities work independently to meet small-scale restoration needs. Reports by Peppin et al (2010) and Camhi & Perrings (2016) point to the need for a centralized, coordinated, regional effort to reduce duplication, streamline distribution, and benefit from economies of scale. We propose to form a cooperative of restoration partners and public and private producers, facilitated by a Plant Materials Coordinator. Coordinated production is expected to increase the availability and diversity of plant materials, stimulate the native seed industry, stabilize the seed market, reduce restoration costs, and ultimately improve restoration success.

Our goal is to balance demand and supply by partnering with local nurseries and farmers to grow natives to sell directly to customers who have determined the priority species most in demand. This approach benefits the regional economy and creates more resilient farm systems, which is better for pollinators and farmers. Native plant material production will help continue the work that VWRC has already begun to create a restoration economy, “A cultivated network of relationships whereby people gain skills and the capacity to make their livings by caring for place.” (Borderlands Restoration)

The results of the The Co-op needs assessment and the research, interviews, and site visits completed from January-April 2016 suggests that a The Co-op can fill a niche

of a smaller regional effort to bring buyers and growers to the table and to balance supply and demand for native plant materials. The challenges will be finding funding for consistent coordination and developing the capacity of regional growers to grow native seed at the field scale. However the long-term economic and ecological benefits of transitioning farmland in the Verde Watershed largely used to grow pasture to native plant production will be worth the commitment.

The The Co-op will begin by building relationships between buyers and growers, much like the Community Supported Agriculture business model that connects farm crop production with members who purchase a weekly share of vegetables. The next steps would be to gather potential members, determine priority species for the funded grow-out (seed increase) pilot projects and seed collection for 2016. The partnership is also providing educational and networking opportunities for growers.

Species Selection

As referenced earlier in the report the results from our 2016 survey regarding priority species were not comprehensive. However, we want to instead, focus on growing species that are:

1) difficult to source;
2) whose local genotypes are known to be or estimated to be important for establishment, for supporting target wildlife species, or are required for project; and/or
3) who are priority based on current and projected future distribution within regional project areas.

After we have results from the follow-up survey we will use guidelines to developed by WVNPP to determine which species to put into production. These guidelines evaluate each species, including consistent demand, broadly acceptable genetics across large-scale seed transfer zones, cost per pound, production logistics, ecological diversity, and seed viability for storage constraints (WVNPP Strategic Plan 2013-2017).

Pilot Grow-Out Projects

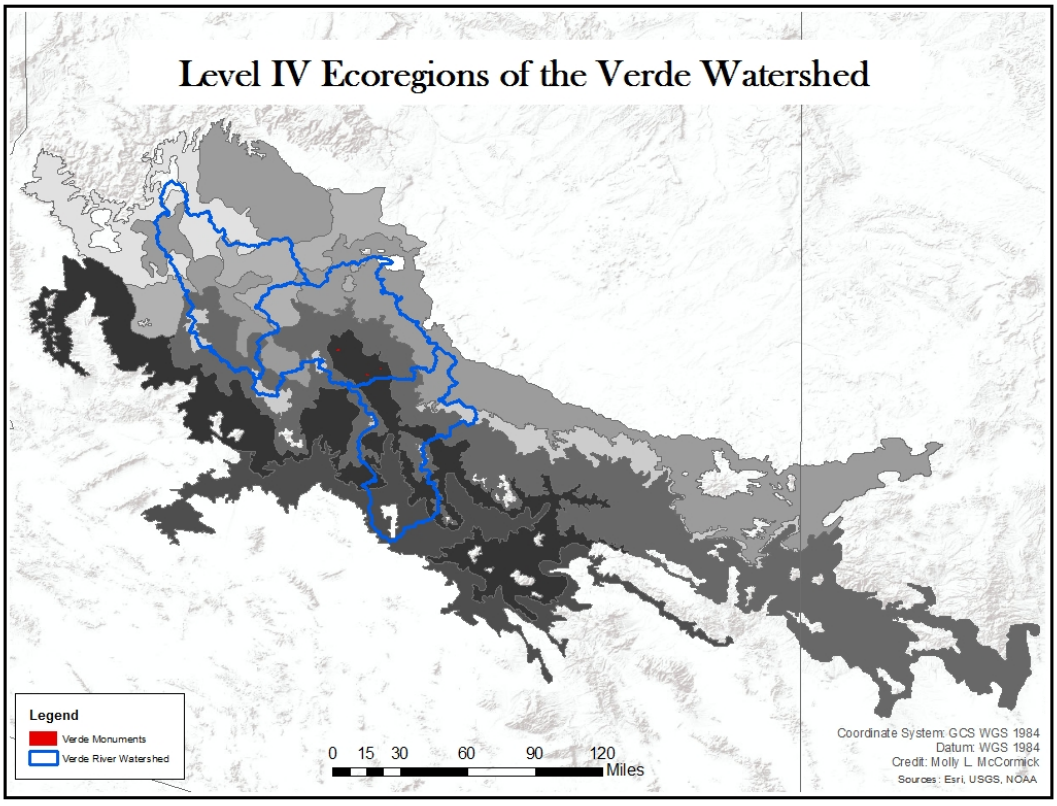
Friends of the Verde River Greenway (FVRG) and the Nature Conservancy (TNC) are funding two field-scale pilot projects grow out (seed increase) projects and seed collection for 2016. 5 acres is located at TNC's Shield Ranch and another 1 acre is located at the Yavapai-Apache's Cloverleaf Ranch, both in Camp Verde. The Co-op will develop the scope of work/best practices, provide technical support to the two pilot project growers. The growers will be providing labor and keeping records. In July, growers will have the opportunity to tour the Tucson NRCS Native Plant Materials Center with the Plant Manager to see production fields, equipment and weed management techniques for field scale native plant cultivation. The ultimate goal is for regional farmers to diversify crops and income by successfully growing native plant materials.

Seed Collection Strategy

Once we have feedback from buyers in the partnership as to the top 5-10 priority species, consisting of grasses, forbs, shrubs and trees to collect and produce regionally, the Co-op will work with partners to identify collection sites, obtain broad collection permits across land management jurisdictions, beginning with Coconino and Prescott National Forests. We will train NPS and VWRC seed collection crews. We will be coordinating among regional partners to identify and share seed cleaning equipment and storage needs and ultimately set up a seed lab in the area, which would consist of cleaning tools, storage supplies, and a computer for data processing.

The Co-op will be utilizing various scientific tools such as seed transfer zones, USGS climate partitioning app created by Kyle Doherty, and Northern Arizona University common garden experiments), and our ability to locate local populations for collection and experimentation. These tools will provide us with a range of seed transfer zones, depending on buyer needs. (Figure 5.)

Figure 5. Provisional seed zone map



Ten Level IV Ecoregions exist within the Verde River Watershed. Provisional seed transfer zones use this resolution for restoration at large scales or for widely distributed species (Erickson, 2014). However, given the heterogeneity of the watershed's topography and soils, a watershed-focused plant materials effort may

provide genotypes that are better suited for the local restoration projects. (Cartographer: Molly L. McCormick)

Research Opportunities

Another goal of the Co-op is to improve quality and genetic appropriateness of native plant materials used in restoration, mitigation, and revegetation projects through scientific research. Current research projects in conjunction with FVRG include collaborating with an Northern Arizona University (NAU) graduate student whose research is nested within a five-acre pollinator habitat restoration project at Shield Ranch. NAU is establishing a cottonwood (*Populus fremontii*) common garden experiment in the Verde Watershed and this research will help improve quality and genetic appropriateness of plant material.

Public Outreach

The Co-op sees that public education will help promote the use of regional native plant material with commercial landscaping, on private land, municipalities, agricultural sector and educational institutions.

Conclusion

The Co-op can play a targeted role as a small collective of buyers and growers of native plant materials in the AZ NM mountains ecoregion. We will be working to meet the demand for local seed while diversifying income for agricultural producers in our region. We will be in close communication with the SWSP as this partnership develops as we have significant overlap in ecoregion and partners. However, we would like to build the capacity of our partnership to use science and seed transfer zones to reliably produce, clean, store, and ship enough weed-free seeds to meet the demand of small, regional restoration projects.

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Appendix

Table 1. Action Team: Verde Native Seed Cooperative

Co-Leaders		
Name	***Affiliation***	***Email***
Anna Schrenk	Friends of Verde River Greenway	anna.schrenk@verdewrc.org
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Kristi Haskins	Arboretum at Flagstaff	kristin.haskins@thearb.org
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Michael Meihaus	Fred Phillips Consulting LLC.	mmeihaus@fredphillipsconsulting.com
Potential Participants		
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Allen Haden	Natural Channel Designs	allen@naturalchanneldesign.com
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LeRoy Brady	ADOT	lbrady@azdot.gov
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TBA	AZFGD	
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Table 2. Amount Spent Annually on Native Plant Materials by Buyers

Name	Affiliation	Annual Amount Spent on Native Plant Materials
Michael Meihaus	Fred Phillips Consulting LLC	$20,000
Heather and Garrett Mead	Conserve Roots Landscaping	$500-1,000
Windmill gardens	owner	$20,000
Laura Moser	USDA FS Coconino NF	$2,000-25,000
Anna Schrenk	Friends of Verde River Greenway/ VWRC	just getting started $5000 for next 3 years
Kevin Grady	NAU	$35,000
Joanne Allen	Verde NRCD	$50
Zoe Davidson	BLM NM	$1000 at most
Debra Crisp	USFS	It depends on the need. For fire rehab. (BAER) it is generally native grass seed. For smaller projects such as lands and trails projects it could be shrubs or forbs depending on site.
George Christianson	Dead Horse Ranch State Park	$100
Nigel Sparks	Flagstaff Native Plant and Seed	$10,000
Kris Gade	ADOT	Cannot report total amount as most construction projects for ADOT require the contractor to source the plant material specified by ADOT
Joel Barnes	Prescott College	$500
Guy Whol	Prescott Creeks	about $1,000 but depending on projects
Mara Kack	Highlands Center Natural History	$4,000-$6,000
Allen Haden	Natural Channel Design, Inc	$12,000
Steve Buckley	National Park Service	~$30,000

Table 3. Survey Plants Ranked In Order of Importance by Respondents

Species Latin Name (Common Name)	Response %	Response Ct.
Other (see list below of other plants specified)	72.2%	13
Bouteloua gracilis (Blue gramma)	50.0%	9
Bouteloua curtipendula (Side oats gramma)	44.4%	8
Asclepias spp. (butterfly weeds)	38.9%	7
Atriplex canescens (four wing saltbush)	38.9%	7
Achnatherum hymenoides (Indian ricegrass)	33.3%	6
Aristida arizonica (Three awn)	33.3%	6
Populus fremontii (Fremont's cottonwood)	33.3%	6
Prosopis veluntina (velvet mesquite)	33.3%	6
Muhlenbergia rigens (deergrass)	27.8%	5
Fraxinus veluntina (velvet ash)	22.2%	4
Prosopis glandulosa (honey mesquite)	22.2%	4
Salix exigua (Coyote willow)	22.2%	4
Jugulans major (Arizona Walnut)	16.7%	3
Rhus trilobata (3-leaf sumac)	16.7%	3
Ribes cereum (Wax currant)	16.7%	3
Muhlenbergia wrightii (spike muhly)	11.1%	2
Pleuraphis jamesii (James galleta)	5.6%	1
Sporabolous contractus (Spike dropseed)	5.6%	1
Panicum obtusum (Vine mesquite)	0.0%	0

Table 4. Other Plants Specified

Species Latin Name (Common Name)
Baileya multiradiata (Desert marigold)
Elymus elymoides (Bottlebrush squirreltail)
Elymus glaucus (Blue wildrye)
Fallugia paradoxa (Apache plume)
Foqueria splendens (Ocotillo)
Heliomeris multiflora (Showy goldeneye)
Hesperostipa comata (Needle and thread)
Koeleria macrantha (Prairie junegrass)
Lupine succulentus (Arroyo lupine)
Melampodium leucanthum (Blackfoot daisy)
Pascopyrum smithii (Western wheatgrass)
Penstemon eatonii (Eaton's penstemon)
Penstemon spp. (Penstemon)
Sphaeralecea coccinea (Globe mallow)
Sporobolus airoides (Alkali sacaton)
Sporobolus cryptandurus (Sand dropseed)

Species Latin Name (Common Name)
Tagetes lemmonii (Mexican Marigold)
Fendlera rupicola (false mockorange)
Arctostaphylos pungens (pointleaf manzanita)
A. pringlei (Pringle manzanita)
Purshia mexicana (cliffrose)
Sambucus sp. (Elderberry)

Table 5. Follow-up Priority Species Survey List

Species Latin Name (Common Name)	Life Form
Foqueria splendens (Ocotillo)	Cactus
Achillea millefolium var. occidentalis (Western yarrow)	Forb
Asclepias asperula (Antelope horns)	Forb
Asclepias erosa (Desert milkweed)	Forb
Asclepias latifolia (Broadleaf milkweed)	Forb
Asclepias nyctaginifolia (Mojave milkweed)	Forb
Asclepias subverticillata (Horsetail milkweed)	Forb
Asclepias tuberosa (Butterfly milkweed)	Forb
Baileya multiradiata (Desert marigold)	Forb
Eriogonum racemosum (redroot buckwheat)	Forb
Eriogonum umbellatum (sulfur-flower buckwheat)	Forb
Gaillardia pinnatifida (blanketflower)	Forb
Heliomeris multiflora (Showy goldeneye)	Forb
Heterotheca villosa (hairy goldenaster)	Forb
Linum lewisii (Western blue flax)	Forb
Lupine succulentus (Arroyo lupine)	Forb
Machaeranthera tanacetifolia (Tansyleaf tansyaster)	Forb
Melampodium leucanthum (Blackfoot daisy)	Forb
Mirabilis multiflora (Colorado Four O'Clock	Forb
Penstemon eatonii (Eaton's penstemon)	Forb
Penstemon barbatus (Beardlip penstemon)	Forb
Penstemon eatonii (Eaton's penstemon)	Forb
Penstemon linarioides (Toadflax penstemon)	Forb
Penstemon palmeri (Palmer's penstemon)	Forb
Penstemon parryi (Parry's beardtongue)	Forb
Penstemon pseudospectabilis (Desert penstemon)	Forb
Sphaeralecea ambigua (Desert globemallow)	Forb
Sphaeralecea coccinea (Scarlet globemallow)	Forb
Tagetes lemmonii (Mexican marigold)	Forb
Pollinator Seed Mix	Forb
Achnatherum hymenoides (Indian ricegrass)	Grass

Species Latin Name (Common Name)	Life Form
Aristida arizonica (Three awn)	Grass
Bothriochloa barbinodis (Cane bluestem)	Grass
Bouteloua curtipendula (Side oats gramma)	Grass
Bouteloua eriopoda (Black gramma)	Grass
Bouteloua gracilis (Blue gramma)	Grass
Bouteloua hirsuta (Hairy gramma)	Grass
Elymus elymoides (Bottlebrush squirreltail)	Grass
Elymus glaucus (Blue wildrye)	Grass
Eragrostis intermedia (Plains lovegrass)	Grass
Festuca arizonica (Arizona fescue)	Grass
Hesperostipa comata (Needle and thread)	Grass
Hesperostipa neomexicana (New Mexico feathergrass)	Grass
Leptochloa dubia (Green sprangletop)	Grass
Koeleria macrantha (Prairie junegrass)	Grass
Muhlenbergia porteri (Bush muhly)	Grass
Muhlenbergia rigens (deergrass)	Grass
Muhlenbergia wrightii (spike muhly)	Grass
Panicum obtusum (Vine mesquite)	Grass
Pascopyrum smithii (Western wheatgrass)	Grass
Pleuraphis mutica (Tobosa grass)	Grass
Pleuraphis jamesii (James galleta)	Grass
Poa fenderiana (Mutton grass)	Grass
Schyzarcrium scoparium (Little bluestem)	Grass
Setaria leucopila (Streambed brstlegrass)	Grass
Setaria macrostachya (Plains bristlegrass)	Grass
Sporobolus airoides (Alkali sacaton)	Grass
Sporobolus cryptandurus (Sand dropseed)	Grass
Sporobolus contractus (Spike dropseed)	Grass
Sporobolus wrightii (Alkalii sacaton)	Grass
Grass Seed Mix	Grass
Arcostaphylos pringlei (Pringle manzanita)	Shrub
Arctostaphylos pungens (pointleaf manzanita)	Shrub
Atriplex canescens (four wing saltbush)	Shrub
Artemesia ludoviciana (wormwood)	Shrub
Artemisia tridentata (sagebrush)	Shrub
Chamaebatiaria millefolium (fernbush)	Shrub
Fallugia paradoxa (Apache plume)	Shrub
Fendlera rupicola (false mockorange)	Shrub
Krascheninnikovia lanata (Winterfat)	Shrub
Purshia mexicana (cliffrose)	Shrub
Rhus trilobata (3-leaf sumac)	Shrub
Ribes cereum (Wax currant)	Shrub

Species Latin Name (Common Name)	Life Form
Salix exigua (Coyote willow)	Shrub
Sambucus nigra (Elderberry)	Shrub
Various shrubs for the habitat types we work in - species are not as important as overall diversity.	Shrub
Fraxinus veluntina (velvet ash)	Tree
Jugulans major (Arizona Walnut)	Tree
Pinus ponderosa (Ponderosa pine)	Tree
Pinus edulis (Pinyon pine)	Tree
Populus fremontii (Fremont's cottonwood)	Tree
Populus tremuloides (Aspen)	Tree
Prosopis glandulosa (honey mesquite)	Tree
Prosopis veluntina (velvet mesquite)	Tree
Quercus turbinella (shrub live oak)	Tree
Various trees for the habitat types we work in - specific species are not as important as overall diversity.	Tree

Table 6. Native Plant Materials Production Capacity By Respondent

Affiliation	Details on Growing Capacity
Northern Arizona University	Possible to grow approximately 5000 plants (in NAU greenhouse)
Windmill Gardens	unknown
Museum of Northern Arizona	20 seedbeds within 0.75 field acres, if not already being used for other projects.
Spring Creek Ranch	1/2 acre
Prescott College	Prescott College is in the early stages of relocating our agroecology/small scale agriculture program to The Juniper Ranch in Skull Valley
Granite Seed Company	If you want the acres to be local, then zero. If we can grow out seed on our farms using your local materials then we could potentially have several hundred acres available for seed production. This would depend on the species and the potential yields.
The Arboretum at Flagstaff	It depends on the compensation, but we have 200 ac, much of it uncultivated. Unfortunately, we can't grow for free.
Watters Garden Center	1 acre
Whipstone Farm	Really depends on the demand, the potential income and the difficulty in propagating individual species or harvesting seed. We mostly grow vegetable and flower crops, but I would consider adding natives to the line up.
Zopilote Produce	Closer to 0 acres than 1 acre
Verde River Growers	Several hoophouses and shade houses
Yavapai-Apache Tribe	Cloverleaf Ranch

Affiliation	Details on Growing Capacity
Hauser Farms	Indicated they did not have capacity/space