State of Nevada

Annual Report for Calendar Year 2018 to the W-6 Technical Committee

Compiled by Melinda Yerka

Summary:

Table 1 summarizes NV use of the NPGS in FY 2018. Fifteen (10 in 2017) individuals from Nevada placed 39 orders (17 in 2017) and received 2138 (91 in 2017) accessions from the NPGS in 2018. Plant materials were used for historical/anthropology (11%), genetics research (57%), botanical/taxonomic investigations (4%), breeding/varietal development (20%), and education/teaching (8%) efforts. The division between genetics research and breeding/varietal development is especially blurry this year due to the initiation of my own new plant breeding and plant genetics program in 2017 at the University of Nevada, Reno (UNR), wherein initial germplasm development using molecular strategies requires extensive genetics work to identify alleles in the most promising parent lines in a new area. Researchers at UNR continue to be the primary users (54%). All users were contacted via email and 4 out of 13 responded. Users reported one manuscript in total.

Table 1. Summary statistics for NV in FY 2018.

	Historical	Genetics	Taxonomy	Variety Devo	Teaching
# accessions used for each purpose	234	1217	96	427	167
% accessions used for each purpose	11	57	4	20	8
# requests for each purpose	11	12	6	6	4
% requests for each purpose	28	31	15	15	10

NPGS Germplasm Users in Nevada:

University of Nevada System Affiliates

1. **Richard Rosencrance**, UNR Department of Anthropology. Research use notes: I am an archaeologist specializing in paleoethnobotany and coprolite analysis in the Great Basin. Analysis of ancient coprolites for the macro botanical remains can provide insight into past diet and environment. These seeds will be used as a comparative collection for identifying archaeologically recovered specimens.

1 *Achnatherum hymenoides*
2 *Achnatherum occidentale*
3 *Allenrolfea occidentalis*
4 *Allium tuberosum*
5 *Apocynum androsaemifolium*
6 *Artemisia tridentata*
7 *Atriplex canescens var. canescens*
8 *Atriplex confertifolia*
9 *Atriplex gardneri*

10 *Atriplex hymenelytra*
11 *Atriplex lentiformis*
12 *Atriplex polycarpa*
13 *Atriplex torreyi*
14 *Bistorta bistortoides*
15 *Camassia quamash*
16 *Castilleja oresbia*
17 *Distichlis spicata*
18 *Elymus elymoides*
19 *Ericameria nauseosa*
20 *Eriogonum inflatum*
21 *Eriogonum ovalifolium var. ovalifolium*
22 *Eriogonum shockleyi*
23 *Festuca arundinacea*
24 *Festuca idahoensis*
25 *Festuca ovina*
26 *Festuca pratensis*
27 *Grayia spinosa*
28 *Hesperostipa comata*
29 *Juncus bolanderi*
30 *Juncus ensifolius*
31 *Krascheninnikovia lanata*
32 *Larrea tridentata*
33 *Leymus cinereus*
34 *Lomatium bicolor var. leptocarpum*
35 *Lomatium californicum*
36 *Lomatium dissectum*
37 *Lomatium foeniculaceum*
38 *Lomatium macrocarpum*
39 *Lupinus argenteus var. argenteus*
40 *Mentzelia albicaulis*
41 *Mentzelia multiflora*
42 *Perideridia bolanderi*
43 *Poa secunda*
44 *Sarcobatus vermiculatus*
45 *Scirpus microcarpus*
46 *Sporobolus airoides*
47 *Tetradymia glabrata*

2. **Won-Gyu Choi**, UNR Department of Biochemistry. Research use notes - This request of 500 *B.napus* lines will be used to study for GWAS about metal toxicity resistance.
   - 492 accessions of *Brassica napus*
   - 8 accessions of *Brassica napus subsp. Rapifera* Metzg.

3. **John Cushman**, UNR Department of Biochemistry. No research notes at the time of his order.
   - First order of 26 accessions, second order of 29 accessions:

1 *Cereus hildmannianus*
2 *Cylindropuntia spinosior*
3 *Hylocereus spp.*
4 *Hylocereus spp.*
5 *Hylocereus spp.*
6 *Nopalea cochenillifera*
7 *Opuntia aciculata*
8 *Opuntia crassa*
9 *Opuntia ellisiana*
10 *Opuntia engelmannii*
11 *Opuntia engelmannii*
12 *Opuntia ficus-indica*
13 *Opuntia ficus-indica*
14 *Opuntia ficus-indica*
15 *Opuntia ficus-indica*
16 *Opuntia humifusa*
17 *Opuntia hyptiacantha*
18 *Opuntia macrorhiza*
19 *Opuntia polyacantha var. erinacea*
20 *Opuntia robusta*
21 *Opuntia spp.*
22 *Opuntia spp.*
23 *Opuntia spp.*
24 *Opuntia spp.*
25 *Opuntia spp.*
26 *Opuntia x vaseyi*

1 *Opuntia polyacantha var. erinacea*
2 *Opuntia polyacantha*
3 *Opuntia spp.*

4 *Opuntia ficus-indica*
5 *Opuntia spp.*
6 *Opuntia spp.*
7 *Opuntia spp.*
8 *Opuntia ficus-indica*
9 *Opuntia robusta*
10 *Opuntia ficus-indica*
11 *Opuntia ficus-indica*
12 *Opuntia streptacantha*
13 *Opuntia streptacantha*
14 *Opuntia robusta*
15 *Opuntia rastrera*
16 *Opuntia robusta*
17 *Opuntia robusta*
18 *Opuntia spp.*
19 *Opuntia x vaseyi*
20 *Opuntia spp.*
21 *Opuntia aciculata*
22 *Opuntia ficus-indica*
23 *Opuntia spp.*
24 *Opuntia spp.*
25 *Opuntia spp.*
26 *Opuntia humifusa*
27 *Opuntia spp.*
28 *Opuntia engelmannii*
29 *Opuntia spp.*

Responses to the three standardized email questions:

1. We have a 5-year collaborative research project supported by NIFA under (award #2018-68005-27924) with NALPGRU to characterize the Opuntia collection in Parlier, CA. Cladodes were used to evaluate the genetic relationships among accessions within the collection via chloroplast and nuclear genome sequencing.

2. None of the germplasm was or will be released to the public. Not a goal of our current project.

3. Nothing published yet.

We are expanding the collection, but that is movement of material in the other direction. We are also conducting investigations into viral/bacterial pathogen detection and insect pest treatment of infected members of the collection.

4. **Melinda Yerka**, UNR Department of Agriculture, Veterinary & Rangeland Sciences. Numerous requests due to starting up a new genomics-assisted breeding program. Research notes – Plant genetics and plant breeding/variety development.
   - 152 accessions of *Cenchrus americanus* (*Pennisetum glaucum*)
   - 406 +44 +28 +9 +2 +46 +9 = 544 total accessions of *Sorghum bicolor*
   - 7 accessions of *Zea mays*

Responses to the three standardized email questions:

1. In 2018 plants were grown in three northern NV environments to determine the best site for my breeding nursery. The UNR Experiment Station in Fallon, NV was identified as the best location based on better plant performance and much lower weed pressure than Reno and Sparks. Numerous cross-pollinations were made among superior-performing pearl millets and sorghums. The F1 plants were self-pollinated in a winter nursery at Puerto Vallarta, Mexico in Winter 2018 and the F2 populations are now being grown in Fallon and Vega, TX for initial selections.
2. The intent is to develop genomic prediction methods to create inbred lines and eventually hybrids having specialty grain traits to reach niche markets. Sorghum is by far our primary focus, especially improving genotypes having waxy (high amylopectin)

endosperm for diverse fermentation (ethanol, alcoholic beverages) and food end uses. Pearl millet and corn are minor portions of the breeding program and we focus on food quality traits for flour and fresh consumption, respectively. We expect to publicly release new germplasm within four years to seed companies along with genomic and phenotypic information to assist molecular breeding techniques.

3. No publications yet.

5. **John Baggett**, UNR Department of Biochemistry (Ph.D. student in Dr. Melinda Yerka's lab). Research use notes - This germplasm is going to be used for the creation of publicly available molecular markers.
   - 16 accessions of *Sorghum bicolor* and 1 accession of *Sorghum bicolor* subsp. *Verticilliflorum*. New genotyping and bioinformatics methods are being developed to differentiate heterotic groups of sorghum for use in breeding. A manuscript is in preparation.

6. **Haley Toups**, UNR Department of Biochemistry (Ph.D. student in Dr. Grant Cramer's lab). Research use notes - Rice will be germinated on plates and grown hydroponically for ~2 months. When plants are of sufficient size, plants will be treated with phytohormones and harvested after 1 hr. Tissue will be analyzed via transcriptomics, western blots, and for metabolites with GC-MS.
   - 2 accessions of *Oryza sativa*.

7. **Xiangui Jiang**, University of Nevada, Las Vegas (UNLV). Research use notes - Class instruction. Biodiversity is the variety and variability of life on Earth. This includes all of the plants and animals that live and grow on the Earth. We are going to perform a biological diversity analysis of *Angelica* and *Lonicera*. We will compare genes from different genetic sources.

1 *Alnus japonica*
2 *Angelica anomala*
3 *Angelica atropurpurea*
4 *Angelica atropurpurea*
5 *Angelica atropurpurea*
6 *Angelica breweri*
7 *Angelica cartilaginomarginata*
8 *Angelica dahurica*
9 *Angelica dahurica*
10 *Angelica gigas*
11 *Angelica gmelinii*
12 *Angelica lineariloba*
13 *Angelica lucida*
14 *Angelica lucida*
15 *Angelica lucida*
16 *Angelica sylvestris*
17 *Angelica sylvestris*

1 *Lonicera ferdinandi*
2 *Lonicera korolkowii*
3 *Lonicera maackii*
4 *Lonicera maackii*
5 *Lonicera maackii*
6 *Lonicera morrowii*
7 *Lonicera reticulata*
8 *Lonicera reticulata*
9 *Lonicera tatarica*
10 *Lonicera tatarica*

Non-University Affiliates

8. **Christopher Bernau**, USDA PMC. 406 accessions of *Sorghum bicolor.* Research use notes – Plant breeding/varietal development. For working with Dr. Melinda Yerka on cover cropping systems for Nevada.

9. **David Rhode**, Desert Research Institute (DRI). Two request types for different purposes. First: Research use notes - Archaeological and paleoenvironmental seed identification.

1 *Abronia fragrans*
2 *Aconitum barbatum*
3 *Aconitum columbianum*
4 *Aconitum delphiniifolium*
5 *Actaea racemosa*
6 *Androsace septentrionalis*
7 *Anemone berlandieri*
8 *Anemone bungeana*
9 *Anemone multifida*
10 *Anemone tomentosa*
11 *Anemone tuberosa*
12 *Boerhavia coulteri*
13 *Boerhavia intermedia*
14 *Boerhavia spicata*
15 *Boerhavia triquetra*
16 *Caltha leptosepala*
17 *Gentiana affinis*
18 *Gentiana algida*
19 *Gentiana calycosa*
20 *Gentiana parryi*
21 *Gentiana sceptrum*
22 *Gentianella amarella subsp. acuta*
23 *Gentianella quinquefolia var. occidentalis*
24 *Gentianopsis detonsa subsp. yukonensis*
25 *Gentianopsis thermalis*
26 *Nigella sativa*
27 *Portulaca suffrutescens*
28 *Primula hendersonii*
29 *Primula pauciflora*
30 *Samolus ebracteatus*
31 *Saxifraga mertensiana*
32 *Tellima grandiflora*
33 *Thalictrum fendleri*
34 *Thalictrum minus*
35 *Thalictrum simplex*
36 *Tripterocalyx wootonii*

Second: Research use notes - Historical, cultural and anthropological research. Study of paleoenvironmental and archaeological specimens

1 *Abutilon theophrasti*
2 *Achnatherum lettermanii*
3 *Achnatherum occidentale subsp. californicum*
4 *Aconitum columbianum*
5 *Aconitum delphiniifolium*
6 *Agave utahensis var. nevadensis*
7 *Agoseris apargioides*
8 *Agoseris glauca*
9 *Agoseris glauca*
10 *Agoseris grandiflora*
11 *Agoseris heterophylla*
12 *Agoseris retrorsa*
13 *Androsace septentrionalis*
14 *Anemopsis californica*
15 *Antennaria parvifolia*
16 *Antennaria parvifolia*
17 *Artemisia borealis*
18 *Artemisia californica*
19 *Artemisia cana*
20 *Artemisia cana subsp. bolanderi*
21 *Artemisia ludoviciana subsp. ludoviciana*
22 *Artemisia tridentata subsp. parishii*
23 *Artemisia tridentata subsp. tridentata*
24 *Artemisia tridentata subsp. tridentata*
25 *Artemisia tridentata subsp. vaseyana*
26 *Artemisia tridentata subsp. wyomingensis*
27 *Blepharipappus scaber*
28 *Calandrinia ciliata*
29 *Calycadenia multiglandulosa*
30 *Chamaebatiaria millefolium*
31 *Chamaenerion latifolium*
32 *Chrysothamnus greenei*

33 *Chrysothamnus viscidiflorus subsp. puberulus*
34 *Cirsium neomexicanum*
35 *Cirsium quercetorum*
36 *Cirsium undulatum*
37 *Cladium mariscus subsp. californicum*
38 *Clematis hirsutissima*
39 *Clematis lasiantha*
40 *Crepis acuminata*
41 *Crepis elegans*
42 *Crepis modocensis*
43 *Cyperus eragrostis*
44 *Deinandra fasciculata*
45 *Deinandra floribunda*
46 *Dendromecon rigida*
47 *Enceliopsis nudicaulis var. nudicaulis*
48 *Epilobium brachycarpum*
49 *Epilobium densiflorum*
50 *Ericameria nauseosa*
51 *Ericameria paniculata*
52 *Ericameria parryi*
53 *Erigeron acris*
54 *Erigeron aphanactis*
55 *Erigeron bloomeri*
56 *Erigeron clokeyi*
57 *Erigeron compositus*
58 *Erigeron divergens*
59 *Erigeron divergens*
60 *Erigeron eatonii*
61 *Erigeron engelmannii*
62 *Erigeron engelmannii*
63 *Erigeron glacialis var. glacialis*
64 *Erigeron nanus*
65 *Erigeron tweedyi*
66 *Eriogonum racemosum*
67 *Eriophyllum lanosum*
68 *Eriophyllum pringlei*
69 *Eriophyllum wallacei*
70 *Eucnide urens*
71 *Fagopyrum tataricum*
72 *Festuca idahoensis*
73 *Fimbristylis thermalis*
74 *Fremontodendron californicum*
75 *Garrya fremontii*
76 *Gentiana calycosa*
77 *Geraea canescens*
78 *Hedysarum alpinum*
79 *Helenium autumnale*
80 *Helenium bigelovii*
81 *Helenium puberulum*
82 *Hemizonia congesta*
83 *Hesperostipa comata subsp. intermedia*
84 *Hesperoyucca whipplei*
85 *Heterotheca grandiflora*
86 *Heterotheca villosa var. villosa*
87 *Hieracium albiflorum*
88 *Hieracium scouleri*
89 *Horkelia cuneata subsp. cuneata*
90 *Horkelia daucifolia*
91 *Horkelia fusca subsp. parviflora*
92 *Horkelia sericata*
93 *Hulsea heterochroma*
94 *Hymenoxys cooperi*
95 *Hymenoxys hoopesii*
96 *Hymenoxys lemmonii*
97 *Isocoma acradenia var. eremophila*
98 *Isocoma menziesii var. vernonioides*
99 *Ivesia gordonii*
100 *Kallstroemia parviflora*
101 *Lasthenia californica*
102 *Lepidospartum squamatum*
103 *Limnanthes douglasii subsp. rosea*
104 *Limonium californicum*
105 *Lomatium austiniae*
106 *Lomatium bicolor*
107 *Lomatium californicum*
108 *Lomatium canbyi*
109 *Lomatium canbyi*
110 *Lomatium cous*
111 *Lomatium dissectum*
112 *Lomatium foeniculaceum*
113 *Lomatium graveolens*
114 *Lomatium macrocarpum*
115 *Lomatium nevadense*
116 *Lomatium nudicaule*
117 *Lomatium tracyi*
118 *Lomatium triternatum*
119 *Lomatium triternatum var. triternatum*
120 *Lomatium utriculatum*
121 *Lomatium vaginatum*
122 *Malacothamnus densiflorus*
123 *Microseris laciniata subsp. laciniata*
124 *Microseris nutans*

125 *Nama densa*
126 *Nama pusilla*
127 *Nama rothrockii*
128 *Nassella viridula*
129 *Nolina bigelovii*
130 *Nolina parryi*
131 *Nothocalais troximoides*
132 *Osmadenia tenella*
133 *Palafoxia sphacelata*
134 *Pedicularis crenulata*
135 *Pedicularis racemosa*
136 *Peraphyllum ramosissimum*
137 *Perideridia bolanderi*
138 *Perideridia bolanderi subsp. bolanderi*
139 *Perideridia gairdneri subsp. borealis*
140 *Perideridia howellii*
141 *Perideridia lemmonii*
142 *Perideridia oregana*
143 *Perideridia parishii*
144 *Perideridia parishii subsp. latifolia*
145 *Perityle stansburyi*
146 *Petradoria pumila*
147 *Phacelia linearis*
148 *Phytolacca americana*
149 *Picradeniopsis absinthifolia*
150 *Platystemon californicus*
151 *Poa glauca*
152 *Psathyrotes annua*
153 *Pseudognaphalium californicum*
154 *Pseudognaphalium canescens*
155 *Pseudognaphalium ramosissimum*
156 *Psilocarphus oregonus*
157 *Psilostrophe cooperi*
158 *Reseda luteola*
159 *Rhus ovata*
160 *Rhynchospora latifolia*
161 *Sagittaria sanfordii*
162 *Sarcobatus vermiculatus*
163 *Saxifraga bronchialis*
164 *Saxifraga mertensiana*
165 *Senecio atratus*
166 *Senecio bigelovii*
167 *Senecio eremophilus*
168 *Senecio fremontii var. inexpectatus*
169 *Senecio integerrimus*
170 *Senecio serra*
171 *Senecio spartioides*
172 *Senecio spartioides*
173 *Sisyrinchium bellum*
174 *Sisyrinchium idahoense*
175 *Sphaeromeria potentilloides var. nitrophila*
176 *Staphylea bolanderi*
177 *Torilis arvensis subsp. elongata*
178 *Townsendia annua*
179 *Townsendia incana*
180 *Washingtonia filifera*
181 *Whipplea modesta*
182 *Xerophyllum tenax*
183 *Yucca brevifolia*
184 *Yucca brevifolia*
185 *Yucca elata*
186 *Campanula rotundifolia*

Responses to the three standardized email questions:

1. The seeds I received are used as identified voucher reference specimens in a personal seed collection for analysis of plant remains from archaeological and paleoenvironmental collections in North American and central Asia.

2. I did not release any materials to the public.

3. One publication contains plant identifications that were checked with my seed collection, though I'm not sure if the seeds references were actually NPGS germplasm.

10. **Brant Stewart**, Sadalsuud Foundation. Research use notes - Public education, demonstrations. I am interested and working towards growing out, preserving, and

eventually baking with landraces from the Middle East.

- 28 accessions of *Triticum aestivum* subsp. *aestivum*
- 14 accessions of *Triticum monococcum* subsp. *monococcum*
- 90 accessions of *Triticum turgidum* subsp. *durum*
- 8 accessions of *Triticum turgidum* subsp. *polonicum*

11. **Lesley Defalco**, U.S. Geological Survey. Research use notes - Genetic studies. My collaborators and my research team conduct research to support the Mojave Desert Native Plant Program. These seeds will be sown into gardens that occur within ten Mojave Desert common gardens that occur across the ecoregion. This network of gardens was established in a collaboration between USGS and BLM (Southern Nevada Field Office and California State Office), Ft. Irwin National Training Center, and Utah Division of Wildlife Resources.
    - 10 accessions of *Chylismia brevipes* subsp. *brevipes* and 1 accession of *Chylismia brevipes* subsp. *pallidula*.

12. **David Bialek**, no institution named. Research use notes - Botanical/taxonomic investigations. Tolerance of varieties selected in a controlled desert environment.
    - 1 accession of *Mentha* x *piperita* and 1 accession of *Adenanthera pavonina*.

13. **Rachel Cline**, no institution named. Research use notes - Historical, cultural and anthropological research. I am researching fig variants that are hoped to be more adaptable to the arid southern Nevada area. Our area has been limited to only a few varieties for years and feel there are many others that may be well adapted. I currently have around 20 varieties I am observing. This project started just recently, I expect it will be 3-5 years before I have any substantial data.
    - 1 accession of *Fragaria* x *ananassa.*

14. **Mackenzie Kephart**, no institution named. Research use notes - Varietal Development. The use of this germplasm is going toward a Supervised Agricultural Experience. The plants will allow for different varieties of plants to be made, in hopes of making better varieties that can be planted in the wild and replace diminishing plant numbers as well as provide for diminishing pollinators.
    - 2 accessions of *Trifolium hybridum*
    - 1 accession of *Lotus corniculatus*
    - 2 accessions of *Fragaria* x *ananassa*

PUBLICATION:

Oviatt CG, JS Pigati, DB Madsen, **DE Rhode**, and J Bright (2018). Juke Box Trench: A Valuable Archive of Late Pleistocene and Holocene Stratigraphy in the Bonneville Basin, Utah. Utah Geological Survey Miscellaneous Publication 18-1. Salt Lake City.