2018 Washington State Annual Report to the
W-6 Technical Advisory Committee

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Summary:
In 2017, 126 Washington State residents requested a total of 6,032 germplasm samples from the National Plant Germplasm System (NPGS). Recipients were with universities (37, 32 at WSU), USDA (17), private research groups (10), commercial firms, seed companies and nurseries (27), and non-profit organizations (8), as well as 27 private individuals. Recipients received germplasm (in the form of seeds and cuttings) from 17 NPGS repositories or stations in 239 orders (Appendix I, Table 1). Of the 126 recipients, 2 had no contact information and 7 email addresses were invalid, so 117 recipients received our notice to report their results, and a follow-up notice was sent to those who did not initially respond. Of these, 29 (25%) provided feedback regarding the germplasm they received (Appendix I, Figure 1).

The germplasm material was used in diverse scientific disciplines such as agronomy, anthropology, archaeology, botany, genetics, horticulture, plant pathology, entomology, and soil science, and contributed significantly to scholastic and economic activity in the State of Washington (Appendix II).

The utilization of the germplasm material from the NPGS in 2017 included exploring and utilizing genetic diversity in the USDA Pea Single Plant Plus collection (C. Coyne); a study of the mechanism of C_4 photosynthesis, a process which enables plants to effectively assimilate CO_2 in warm climates, with high water use efficiency (G. Edwards); checking and confirming pathogen phenotypes (W. Chen); and collecting flower volatiles for attraction studies of paper wasp with new plants (A. Kenny Chapman). Germplasm material was used by private research firms (Adaptive Symbiotic Technologies, Battelle-USDOE, GeneShifters LLC, Green Apis Evaluations, KWIAHT – Center for Historic Ecology of the Salish Sea, Phase Genomics, Phytelligence Inc., Seattle Indian Health Board), and for commercial nursery and seed propagation and distribution (Alta Rosa Farm, Bear Creek Farm, Bell Mountain Fruit, Brady's Orchard, Callison's, Crites Seed Inc., Dogfairy Ranch, Feil Orchards Inc., Hawley Farms LLC, Highland Specialty Grains, Landmark Turf & Native Seed, Laz R Us LLC, M & A Farm, Northwest Meadowscapes LLC, NWT Seeds, Osborne Seed, Peaceful Acres Natural Habitat, Pure Line Seeds, Inc., Raintree Nursery, Renaissance Orchards, S.S. Steiner Inc., Sundquist Farm, Tonnemaker Hill Farm, Topcliffe Farm, Tortoise Garden, Watershed Garden Works). Individuals and civic organizations requested material for evaluation and testing of *Phaseolus* spp and *Vicia faba* for local production [D. Borman, K.Wilkins (Orcas Island Seed Bank)], and propagation of optimal *Malus* spp. for home orchards (Western Cascade Fruit Society, Olympic Orchard Society) and community co-op orchards (J. Shannon, Shaw Island).

Several recipents stressed the importance of the NPGS service, and mentioned in particular the value of NPGS as a system for acquiring material for research work. Some wrote of the increasing difficulty of obtaining germplasm for breeding uses from private sources, so that the NPGS is globally important for the development of new breeding programs. One recipient noted

that the availability of unique and rare varieties has allowed growers to begin the process of re-establishing viable local commercial farms that can compete at a very small scale. Another described it as “an invaluable resource.”

In general, material requested arrived in good condition and grew well, but a few instances were noted in which seed exhibited poor or no germination. One recipeient of scionwood from the Geneva repository noted that the rubber bands around the samples were too tight and dented the scionwood. One serious complaint was registered from a request to W6 repository for material to use in “replanting / restoring abandoned irrigation canals, ponds and dry areas”. The requester received no material and “a rather insulting email” stating that the germplasm was not available for home gardening. Such a response reflects poorly on the NPGS as a whole and potentially damages good relations with future requestors/recipients.

Publications

Germplasm recipients reported the following publications that included materials they received from NPGS in 2017, as well as materials received earlier:

1. Bodah, E. T., L.D. Porter, B.C. Cordoba, and A. Dhingra. 2016. Evaluation of pea accessions and commercial cultivars for Fusarium root rot resistance. Euphytica 208: 63-72.

2. Carpenter M.A., M Shaw, R. Cooper, T.J. Frew, R.C. Butler, S.R. Murray, L. Moya, C.J. Coyne, G.M Timmerman-Vaughan. 2017. Association mapping of variation in starch chain length distribution in pea (*Pisum sativum* L.) using carbohydrate and starch metabolism candidate genes. BMC Plant Biology 17:132.

3. Holdsworth W.L., E. Gazave, P. Cheng, J. Myers, M.A. Gore, C.J. Coyne, R.J. McGee, M. Mazourek. 2017. A Community Resource for Exploring and Utilizing Genetic Diversity in the USDA Pea Single Plant Plus Collection. Horticulture Research 4;17017; doi:10.1038/hortres.2017.17.

4. Jain, S., L.D. Porter, A. Kumar, R.R. Mir, S.D. Eigenbrode, and K.E. McPhee. 2014. Molecular and phenotypic characterization of variation related to *Pea enation mosaic virus* resistance in lentil. (*Lens culinaris* Medik.). Canadian Journal of Plant Science 94: 1333-1344.

5. Landry E., C.J. Coyne, R. J. McGee and J. Hu. 2017. A modified mass selection scheme for creating winter-hardy faba bean (*Vicia faba* L.) lines with a broad genetic base. Euphytica 213: 72. doi:10.1007/s10681-017-1843-2

6. Larsen, R.C. and L.D. Porter. 2010. Identification of novel sources of resistance to Pea enation mosaic virus in chickpea germplasm. Plant Pathology 59: 42-47.

7. Ma Y., C.J. Coyne, D. Main, S. Pavan, S. Sudheesh, S. Kaur, J.W. Foster, J. Leitão, S. Sun, Z. Zhu, X. Zong, R.J. McGee. 2017. Development and validation of breeder-friendly KASPar markers for *er1*, a powdery mildew resistance gene in pea (*Pisum sativum* L.) Molecular Breeding 37:151 https://doi.org/10.1007/s11032-017-0740-7

8. Porter, L. D. 2012. Pea germplasm with partial resistance to *Sclerotinia sclerotiorum* that extends the time required by the pathogen to infect host tissue. Crop Science 52: 1044-1055.

9. Porter, L. D. 2012. Selection of pea genotypes with partial resistance to *Sclerotinia sclerotiorum* across a wide range of temperatures and periods of high relative humidity. Euphytica 186:671-67.

10. Porter, L.D. 2010. Identification of tolerance to *Fusarium* root rot in wild pea germplasm with high levels of partial resistance. Pisum Genetics 42:1-6.

11. Smýkal P, I. Hradilová, O. Trněný, J. Brus, A. Rathore, M. Bariotakis, R. Rani Das, C. Richards, C.J. Coyne, S. Pirintsos. 2017. Macroecological patterns of wild relatives of domesticated pea in the Mediterranean Region and the Fertile Crescent. Scientific Reports 7:17384 DOI:10.1038/s41598-017-17623-4

12. Voznesenskaya, E.V., N.K. Koteyeva, G.E. Edwards, G. Ocampo. 2017. Unique photosynthetic phenotypes in Portulaca (*Portulacaceae*): C_3-C_4 intermediates and NAD-ME C_4 species with Pilosoid type Kranz anatomy. J Experimental Botany 68: 225-239 doi:10.1093/jxb/erw39

13. Whitson, William. 2017. Potato: Morphological Observations of USDA Accessions 2017. Cultivariable web page, accessed 3/2/18 https://www.cultivariable.com/potato-morphological-observations-of-usda-accessions-2017/

14. Whitson, William. 2017. How to grow wild potatoes. Cultivariable web page, accessed 3/2/18 https://www.cultivariable.com/instructions/potatoes/how-to-grow-wild-potatoes/

Appendix I: Summary of requests 2017.

Table 1. Number of Washington State plant germplasm requests and total samples sent from all NCGR stations in 2017.

Station	No. Requests	Total samples
COR	37	496
DAV	6	23
GEN	24	346
GSOR	1	9
MAY	1	1
MIA	1	1
NA	7	19
NC7	23	860
NE9	4	178
NR6	4	384
NSGC	26	282
NSSL	1	29
OPGC	5	6
S9	23	193
SOY	2	56
TOB	5	11
W6	69	3,138
TOTAL	**239**	**6,032**

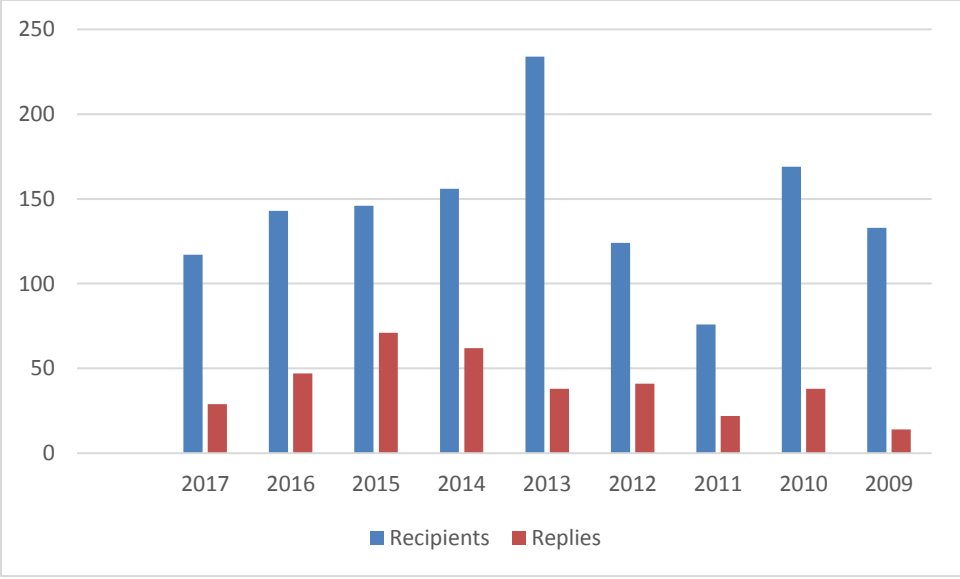

Figure 1. Number of Washington State germplasm recipients and responses, by year.