During the last five years, the potato industry has faced a wide variety of challenges, including changing trends in consumer preferences, new environmental regulations, loss of crop-protection chemicals, increased input costs, new pest and disease pressures, as well as unpredictable growing conditions. Collectively, these factors have increased the potato grower's risks and decreased his profits. New improved potato varieties are the most productive and cost effective approach for addressing these challenges and meeting the demands of the industry and the consumer. New varieties provide substantial improvements in yield, quality and marketability, as well as improved sustainability by reducing inputs for disease and pest resistance and increasing fertility and water use efficiency. The group of researchers and industry personnel who participate in WERA027 serves the potato industry and consumers by conducting activities critical to providing a sustainable, healthy, inexpensive food supply, which also contributes to our nation's food security.

The states represented by WERA027 (California, Colorado, Idaho, Montana, Oregon, Washington, Texas) produce over two-thirds of all potatoes grown in the U.S. WERA027 is composed of a regionally-diverse interdisciplinary team of breeders, geneticists, physiologists, pathologists, agronomists, biotechnologists, entomologists, weed scientists, virologists, extension specialists, economists, growers, and other industry representatives. This team is crucial to U.S. potato variety development and in turn, sustainability of the U.S. potato industry. The team member’s combined participation allows for complete testing of improved germplasm that comes from federal and state breeding programs. Coordinated activities include parental identification and germplasm enhancement, controlled crosses, seedling production, selection and evaluation of germplasm, initial seed increase, complete in-field and post-harvest management research, advanced field and laboratory evaluations, processing quality and culinary attribute evaluation, specific growing region agronomic recommendation development, and screening for resistance or susceptibility to diseases using conventional and molecular marker approaches.

Russet Burbank, the predominant variety for many decades both for processing and fresh markets, has been steadily declining in acreage, largely as a result of the success of varieties developed and evaluated by WERA027 participants. New varieties from this region replacing Russet Burbank production include Ranger Russet, Umatilla Russet, Rio Grande Russet, Russet Nugget, Blazer Russet, Bannock Russet, GemStar Russet, Alturas, Premier Russet, Classic Russet, Clearwater Russet, Alpine Russet, Teton Russet, Sage Russet, Owyhee Russet, and Palisade Russet with newer varieties becoming more popular due to improved performance and quality.

Production of chipping varieties, fresh market red-skinned and specialty varieties (e.g., pigmented flesh and/or colored skin), and fresh market white-skinned varieties similarly has shifted away from one or two dominant varieties to that of numerous varieties, each with improved adaptation to different growing, storage or processing conditions, or market preferences. New varieties from the WERA027 group include: Ivory Crisp, CalWhite, Mazama, Modoc, IdaRose, Mountain Rose, Purple Majesty, Sierra Rose, Purple Pelisse, AmaRosa, and Huckleberry Gold. Yukon Gem, a more disease resistant and better yielding yellow-fleshed variety has increased in acreage in response to increased market demand and is competing well with Yukon Gold. Breeders in the western region have increased emphasis on yellow-flesh and other pigmented-flesh varieties to fill the growing demand for specialty options in the market. Private European seed companies also have begun to export yellow-flesh varieties, which are common in Europe, to the U.S., facilitated by Plant Variety Protection (PVP) laws that protect their intellectual property rights.

Russet Burbank generally requires very intensive management, including applications of larger amounts of fertilizer, water, and pesticides than newer varieties such as Bannock Russet, Alturas, Clearwater Russet and Classic Russet. The recent movement toward greater sustainability adds urgency to the need for alternative varieties better adapted to low input production.

Russet Norkotah and its later maturing, higher yielding clonal selections or lines, which were released out of the Texas and Colorado potato breeding programs, have become the predominant fresh market varieties in many areas. Russet Norkotah is early maturing with very smooth dark russet-skinned tubers that have good storage characteristics. The tubers are resistant to most physiological disorders, resulting in a high percentage of U.S. No.1 tubers. The early success of the Norkotah lines has been somewhat overshadowed, however, by controversy within the industry regarding the long-term sustainability of all Russet Norkotah clones. Russet Norkotah tubers can be less palatable than many other varieties when consumed as a baked potato, especially after being held in cold storage for long periods. Also, Russet Norkotah and the various Russet Norkotah lines harbor potato virus Y without displaying foliar symptoms, thereby making it more difficult for potato seed growers to rogue out, and also providing possible hidden inoculum source for more susceptible varieties.

New varieties need to be tested in key production areas and compared to the traditional varieties, which is one of the key strengths of the WERA027 cooperative project. Additionally, evaluation of germplasm from a range of sources under varying and ever adapting conditions offers the greatest probability of identifying superior varieties with improved pest resistance and reduced production inputs. Materials that are successful in the Northwest Tri-State (Washington, Oregon, Idaho) and the new Southwest Region (Texas, Colorado, California) variety evaluation programs, as well as material from other programs, are incorporated into the WERA027 evaluation scheme. Combining promising new genetic technologies and wild potato germplasm with traditional breeding efforts has resulted in superior new varieties.

Health considerations including improved nutrition provided by antioxidants and other phytonutrient compounds in potatoes are also being researched as part of the WERA027 program. The formation of acrylamides in fried potatoes has recently caused concern in the fast food industry and today new varieties are being developed that have lower sugar and/or asparagine concentrations and thereby reduce the formation of this questionable potato frying by-product. Storage conditions, as well as genetic and physiological characteristics have been studied by the WERA027 group in an effort to reduce acrylamide levels in processed potato products. Researchers at the WSU-USDA Prosser research station have also developed breeding efforts involving gourmet and colored-flesh varieties, including germplasm with increased levels of antioxidants.

Addressing sustainability issues is an important component of the WERA027 group. Some sustainability issues of increasing importance include reducing fungicide applications by developing varieties with late blight and Verticillium resistance, increasing water-use efficiency, and utilizing transgenic and other biotechnology breeding tools. Combinations of disease and pest resistance factors are targeting particular use of pesticides with an aim to reduce or eliminate them. For instance, Columbia Root-Knot Nematodes (CRKN) and Corky Ringspot disease (CRS) are addressed with two soil fumigants, Telone (1,3-dichloropropene) and Vapam (sodium N–methyldithiocarbamate), applied separately and at different times. Vapam also is used to control Verticillium wilt. With a dual CRKN and CRS resistant potato, it would be possible to control Verticillium with a green manure such as mustard. The omission of Telone and Vapam applications would save money and contribute to the pesticide reduction that MacDonald’s and other quick service restaurants seek for their French fry products.

Western region breeders are active in addressing additional issues such as plant variety protection and environmental impacts of potato production, and it is essential that these issues be discussed from many perspectives and that strategies be developed as a team. It is anticipated that new varieties will provide U.S. growers the ability to meet the challenges of a constantly changing market and production conditions, thereby maintaining and potentially improving their economic well-being and reducing their risks. New varieties will help maintain a healthy, inexpensive food supply for American consumers and contribute to a more sustainable potato production system with reduced inputs.

**Objectives**

1. Develop and exchange information on new potato selections among scientists and industry representatives.
2. Provide uniform, high-quality seed to each participating state for potato selections evaluated in regional trials.
3. Coordinate studies to optimize cultural management, disease and pest resistance, storage and processing characteristics that result in new potato selections that can be produced with minimal environmental impact and optimal usage under growing conditions in each participating state.
4. Strengthen collaboration with potato processing and fresh pack industries involved in the development and acceptance of new potato selections and releases.
5. Discuss major potato issues facing the scientific community and industry, and develop recommendations for addressing those concerns.

**Procedures and Activities**

WERA027 annual meetings provide a unique opportunity for program participants and industry representatives to share information, compare trial results, and discuss issues that impact the region's industry. In addition to annual meetings, participants exchange thoughts and ideas through use of e-mail and several Internet sites. Performance information for most advanced western regional clones is routinely provided at the Central Oregon website (http://www.css.orst.edu/coarc/database.htm), the Washington State University site at <http://www.potatoes.wsu.edu>), the University of Idaho site at (http://www.cals.uidaho.edu/potato/) and the Potato Variety Management Institute site at (www.pvmi.org). The annual meetings of WERA027 allow greater efficiency in resource allocation, reduced duplication of effort, effective communication between industry and research scientists, and ideas for new potato research projects to address important issues and upcoming problems.

The WERA027 incorporates federal, university, and industry research elements. Breeders from the USDA/ARS and several universities conduct pre-breeding and basic breeding, incorporate improved germplasm from other ARS and state programs and provide true seed for the variety development effort. ARS workers with the ARS project at Prosser, Washington complete germplasm enhancement activities that provide pest-resistant germplasm to other western breeding projects.

Cooperation by WERA027 participants has extended beyond the original regional variety trial framework. The late blight crisis in the U.S. potato industry is being addressed by WERA027 cooperators. All selections and varieties in the regional trial are tested for late blight resistance at Corvallis, Oregon. Common scab and rot diseases are evaluated at Aberdeen, Idaho. Viral resistance for these clones is routinely evaluated at Hermiston, Oregon and Kimberly, Idaho. Hermiston and Aberdeen sites also jointly evaluate early dying and net necrosis reactions in breeding entries. Researchers at Prosser, Washington screen regional entries for resistance to corky ringspot and Columbia root knot nematode as well. Improved resistance traits from several sources are being incorporated by USDA and state WERA027 breeders into potato germplasm. A major new coordinated effort to address the Zebra Chip Disease is now underway in several of the Western states including Texas, California, Idaho, and Washington as well as North Dakota and Nebraska. This includes research to develop varieties with tolerance/resistance to the disease and/or the insect vector. In recent years, Oregon State University has implemented marker-assisted selection (MAS) approaches to take advantage of the tools developed by basic genetics studies and translate them into applied potato breeding. New approaches to variety improvements such as gene transformation are also being utilized by university and USDA/ARS participants to produce improved varieties for testing in the regional trials.

Additional efforts come from state universities as they provide germplasm production and improvement, additional seedling production, completion of seedling selection and evaluation, initial seed increase, complete in-field and post-harvest management research, advanced field and laboratory evaluations including tolerance to commonly used herbicides, and all aspects of commercialization. Other important activities include evaluating processing quality and culinary attributes, defining quality variables in new varieties, and developing agronomic recommendations for specific growing regions.

The industry provides large-scale evaluation, seed production beyond the initial stages, collaboration in commercialization, and additional financial support. The overall result is unparalleled cooperation and efficiency, with each institution completing the duties for which it is best equipped.

**Expected Outcomes and Impacts**

* It is anticipated that among the results of the WERA027 cooperative testing program will be superior new potato varieties that will improve production efficiency and sustainability, reduce pesticide and fertilizer usage, provide better management practices for soil health, improve phytonutritive value, reduce acrylamide levels, contribute to the economic health of the western potato industry and local economies, and maintain reasonable potato prices to consumers throughout the U.S.
* Continuing work on the improvement of genetic diversity of potato allowing steady gains in the development of improved potato varieties.
* Publication of multiple research and extension articles related to the joint efforts of the WERA027 participants.
* Outreach via extension, meetings, annual potato grower meetings, industry meetings of the improved qualities of the new varieties and their more sustainable management practices.
* Cultivate the development of effective industry, state and USDA partnerships and cooperative programs.

**Projected Participation**

Include a completed [Appendix E](http://lgu.umd.edu/lgu_v2/pages/printvers.cfm?trackID=12256&CFID=279339&CFTOKEN=1f434419473f7251-D9D0DD47-CD95-3428-7CFA7E4ED7C69548#appEpv)

**Educational Plan**

Processing and fresh market industry representatives play a key role in developing, adapting and utilizing the information generated by the coordinated efforts of WERA027. Cooperative Extension specialists and agents/advisors are integral participants in WERA027. Regional trials are often located in grower cooperator fields for field day observations and programs. This type of continued industry participation in WERA027 is indispensable to the success of the program.

Annual meetings are held on a rotating basis in Washington, Oregon, Idaho or Colorado in conjunction with each state grower conferences, and the NW Tri-State and the SW Regional groups' annual meeting. Summaries of all regional trials are distributed and discussed. This allows and encourages dialogue among scientists, growers, extension, and industry personnel.

**Organization/Governance**

Administrative Advisor: Liaison with western university directors of the Agricultural Experiment Stations

Chair: Coordinates annual meetings and WERA027 petition renewal

Secretary: Records annual meeting minutes (available if required)

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