

# Most cultivated potatoes are considered to be a single species

WILD from Page 1

alone, Bamberg's exploration increased the diversity of his facility's collection of one wild potato, *Solanum jamesii*, by almost one-third.

He believes there may be many more undiscovered sites, as many botanists are apt to miss the small plants.

"There are about 5,000 total wild accessions," Bamberg said, referring to different populations of spuds within a common species. "There are species you can look at and say, 'Oh, that's a potato.' Others look very strange, with leaves almost like marigolds or African violets. However, they all have in common the capacity to form small potatoes underground."

Most cultivated potatoes are considered to be a single species, *Solanum tuberosum*, Bamberg said.

Latin America, where potatoes originated, is considered the treasure trove of wild material. Bamberg, however, specializes in seeking wild spuds closer to home. There are roughly 100 known wild potato species throughout the Americas. Two wild species — *S. jamesii* and *S. fendleri* — are scattered around Colorado, Utah, Arizona, New Mexico and Texas.

Researchers say there's an added urgency to broaden their collections, given the threats to wild potato habitat such as development, erosion and climate change.

## Breeding wild

Accessions of *S. Jamesii* are of special interest to breeders. They are known to possess some anti-cancer properties, strong late blight resistance and other desirable qualities.

The catch is *S. Jamesii* is evolutionarily far different from today's cultivated potatoes, making it extremely difficult for breeders to cross the two. Last summer, Bamberg's lab was able to produce the first six hybrids ever resulting from *S. Jamesii* using a high-tech double-pollination method.

Bamberg's team also works with the numerous species found in Latin America. One such species, *S. microdontum*, produces tubers that don't turn green when exposed to light. Greening is a common problem among fresh potatoes exposed to grocery store lighting.

Upon hearing of Bamberg's work with *S. microdontum*, Rich Novy, a USDA-Agricultural Research Service potato



John Bamberg, right, project leader at the Potato Introduction Station in Wisconsin, and David Kinder, a researcher with Ohio Northern University, explore Mesa Verde National Park in Colorado looking for wild potatoes.



Potato breeder Rich Novy reviews digital images of potato crosses derived from wild germplasm while discussing the importance of wild materials to breeding for new industry challenges.

breeder in Aberdeen, Idaho, requested selected stocks from the gene bank. Novy currently has families of *S. microdontum* crosses growing in his greenhouse.

Novy has also identified a significant gene for potato leafroll virus resistance in a wild species and bred crosses with the wild species *S. berthaultii* that exhibit extreme resistance to potato virus Y. This year, the Tri-State Potato Breeding Program is scheduled to release Payette Russet, a potato originating from Novy's program with PVY resistance from another wild source.

"A lot of (wild) material is in advanced breeding clones

that are currently being evaluated for release," Novy said.

Often, breeders look to wild South American material believing it may have co-evolved with diseases and developed natural resistance. But even in the case of zebra chip, a relatively new disease that sullies spuds with bands that darken when fried, Novy believes wild populations offer great promise.

"There may be genes conferring resistance to another bacterial pathogen that also confer resistance to zebra chip," Novy said.

Novy suspects the wild species *S. chacoense* may have zebra chip resistance in its

background.

"I think it is good to have the gene bank with its associated species to be able to address new diseases or new variants of established diseases," Novy said. "Ideally, you want to look at the cultivated bank to begin with, but if it's not there, go to the wild species."

## Broader gene pool

Other breeders who use wild potato material often rely on Chuck Brown for re-breeding — or making the initial crosses to develop wild spuds into a form that more closely resembles a cultivated potato. These crosses can be more easily bred with cultivated

potato species.

Brown, a USDA-ARS breeder in Prosser, Wash., has leaned heavily on the wild species *S. bulbocastanum* found in Mexico. The species is resistant to Columbia root-knot nematode, and advanced breeding lines from its crosses could save growers fighting the pest in excess of \$300 per acre in fumigation costs.

Brown first started working with *S. bulbocastanum* when Bamberg sent him material in 1988.

"If you ask me, for a lot of things that are on our minds right now where I would go to search (for resistance), I would go into *S. bulbocastanum*," Brown said. "The reason for that is so many resistances have been found to late blight and other things."

Brown said it could still be five years to a decade before the first varieties with *S. bulbocastanum* in the background are released.

Wild potatoes have already helped the industry develop a host of specialty varieties with resistance to diseases such as black dot, potato mop top virus and powdery scab, and Brown has a line with wild parentage, POR06v12-3, in advanced trials that resists all strains of PVY and tobacco rattle virus.

It's no surprise to Brown that wild spuds often provide the answers to industry challenges while the bank of cultivated material falls short. Wild species result from mil-

lions of years of evolution, while cultivated spuds have existed for a few thousand years. Humans have selected potatoes for qualities such as pleasing colors, but most wild spuds are white. And the spuds in the Andes Mountains of South America that were chosen as the basis for cultivated potatoes lacked strong resistance to diseases, Brown said.

"The wild species are more likely to have strong resistance genes," Brown said.

## A wild idea

Officials of the Idaho Potato Commission believe wild potatoes could play a role in helping Eastern Idaho farmers cope with pale cyst nematode. The discovery of the pest has led to a quarantine in the area.

Growers with infested fields, all confined to 23 square miles in Bonneville and Bingham counties, have been prohibited from planting spuds, which provide a host crop for PCN. The commission recently secured \$150,000 through USDA's Specialty Crop Research Initiative to screen about 10 wild potato species for PCN resistance. They in turn will be used to breed resistant commercial varieties.

Pat Kole, the commission's vice president, said the timing is ideal because scientists in Peru have an especially robust collection of wild material that they recently finished cataloging.

Louise-Marie Dandurand, director of University of Idaho's Pale Cyst Nematode Project, will help screen the material for the commission. She's also involved in a project that was recently awarded a \$3 million grant to screen for resistance to pale cyst nematode and golden nematode in cultivated potatoes. Cornell University nematologist Xiaohong Wang hopes to identify a gene or family of genes in wild spuds responsible for PCN resistance. Modern technology allows scientists to quickly isolate important genes through molecular markers. This has dramatically improved the science of breeding, so Bamberg envisions wild potatoes will become increasingly important to the industry.

"We've probably only just scratched the surface of finding useful traits in the gene bank's germplasm, and there is probably much more diversity in the wild yet to be collected," Bamberg said.

# The Corps list of allegations

WOTUS from Page 1

Among the allegations, the Corps contended:

- That the rule removes Clean Water Act protections from some bodies of water where it is now enforced. That's because the rule limits coverage to lakes, ponds and other waterways that are within 4,000 feet of a navigable water or tributary. The Corps says there's no scientific basis for the limit, and no legal authority for the agencies to abandon its current jurisdiction.

- That because the EPA acknowledged that abandoning jurisdiction could create "significant adverse effects on the human environment, the National Environmental Policy Act requires the Corps to perform an Environmental Impact Statement

- That while the rule envisions the agencies extending regulation to isolated bodies of water that have a "significant nexus" with navigable waters of the United States, the definitions of such bodies as having "no hydrological connection with navigable waters" makes it unlikely the agencies will be able to establish a nexus that will withstand a court challenge.

Peabody also stated the Corps' concerns went unaddressed and EPA's portrayal that the rulemaking process was a joint endeavor is false.

"The preamble to the proposed rule and the draft preamble to the final rule state that the rulemaking has been a joint endeavor of the EPA and the Corps and that both agencies have jointly made significant findings, reached important conclusions, and stand behind the final rule. Those statements are not accurate ... as the process followed to develop it greatly limited Corps input — a practice that has continued thus far in the interagency review process. ...

"The critical fact remains that the most important concerns regarding the defensibility and implementability of the draft final rule remain unaddressed ..."

In a May 15 memo to Darcy regarding

EPA's economic analysis of the final rule and technical support document, Peabody stated the Corps' technical review "indicates both documents are flawed in multiple respects."

"... Corps data provided to EPA has been selectively applied out of context and mixes terminology and disparate data sets. ... the documents contain numerous inappropriate assumptions with no connection to the data provided, misapplied data, analytical deficiencies, and logical inconsistencies. As a result, the Corps review could not find a justifiable basis in the analysis for many of the documents' conclusions."

Peabody further distanced the Corps from EPA's documents.

"The Corps provided EPA with raw data ... However, the Corps had no role in selecting or analyzing the data that EPA used in drafting either document. As a result, the documents can only be characterized as having been developed by EPA, and should not identify the Corps as an author, co-author or substantive contributor.

"To the extent that the term 'agencies' includes the Corps of Engineers, any such reference should be removed. Finally, the Corps of Engineers' logo should be removed from these two documents. To either imply or portray USACE as a co-author or contributor to these documents, other than as the provider of raw unanalyzed data, is simply untrue."

When reached for comment, the EPA did not address specific concerns outlined in the memos.

"As with any multiagency rulemaking, the EPA and Army/Corps worked closely and carefully to make sure that all concerns surrounding the Clean Water Rule were addressed before finalization," a spokesman said in an email. "The Peabody memos were internal, deliberative Army/Corps documents, so any questions regarding recommendations or issues that were raised within the Department of the Army prior to finalization of the Clean Water Rule should be directed to the Army."

# 28 state AGs want WOTUS implementation delayed

By CAROL RYAN DUMAS  
Capital Press

Attorneys General from 28 states have requested EPA and the Army Corps of Engineers delay implementation of a controversial rule they say unlawfully expands the agencies' jurisdiction under the Clean Water Act.

The AGs on July 28 sent a letter to EPA Administrator Gina McCarthy and Assistant Secretary of the Army, Civil Works, Jo Ellen Darcy asking them to immediately extend the effective date, Aug. 28, of the new rule defining waters of the U.S. (WOTUS) by at least nine months to allow for appropriate judicial review.

The 28 states, including Idaho, immediately challenged the rule in five separate lawsuits filed upon or soon after its June 29 appearance in the Federal Register.

"... it will necessarily take some time for the courts to resolve the merits of these various cases with their different claims," the AGs stated in the letter.

"Even under a fairly aggressive schedule, the pending challenges will likely not be fully briefed and argued for at least nine months," they stated.

Absent a court-granted preliminary injunction, the agencies' intended implementation will cause immediate harm to states, their regulatory programs and local industries by increased permitting and compliance requirements under the agencies' "sweeping new asserted jurisdiction," the AGs said.

The agencies' increased jurisdiction comes at the direct ex-

pense of states, which previously had exclusive jurisdiction over state waters. It exceeds the statutory authority of Congress under the Commerce Clause and infringes upon state's rights under the 10th Amendment of the Constitution, they stated.

In addition to injuring states' sovereign capacity, increased burden will be placed on states as they develop and build infrastructure projects, increasing the cost and complexity of obtaining necessary permits, the AGs stated.

The new regulation will also have a significant impact on agriculture, homebuilding, oil and gas, and mining as those industries try to navigate between established state regulatory programs and new burdensome and conflicting federal requirements, the officials stated.

"Given the gravity of the Constitutional issues implicated by the states' claims and to avoid these hardships, the courts should be granted the opportunity to resolve the pending challenges to the agencies' new WOTUS Rule," the AGs stated.

In a written statement in response to Capital Press' request for comment, EPA stated (in part):

"While we can't comment on the lawsuit, it's important to remember that EPA and the U.S. Army Corps of Engineers finalized the Clean Water Rule because protection for many of the nation's streams and wetlands had been confusing, complex, and time-consuming as the result of Supreme Court decisions in 2001 and 2006.

"... the Agencies developed a rule that ensures that waters protected under the Clean Water Act are more precisely defined, more predictably determined, and easier for businesses and industry to understand."

Capital Press has also contacted the Idaho Attorney General's office and the North Dakota AG's office, which has led states' efforts in the WOTUS challenge.

That office said it had no comment beyond a press release issued on Thursday in which North Dakota Attorney General Wayne Stenehjem stated: "A federal rule of this scope and significance needs thorough judicial review before costly and disruptive burdens are imposed on North Dakotans. The rule is unnecessary, unlawful, and will do nothing to increase water quality in our state."

Six other lawsuit challenging the WOTUS rule represent agriculture, private property owners, businesses, chambers of commerce, energy companies, trade associations, manufacturers, home builders, forest owners, road and transportation builders, real estate investors, and legal foundations.

On July 21, a district judge in Georgia ordered EPA and the Corps to respond to a motion by the state of Georgia, et al, for preliminary injunction by July 31 and set a court date for Aug. 12.

Also on July 21, the federal government filed a motion to temporarily stay all proceeding and consolidate the 11 district court challenges in a single district court.