Southwest 2013 Potato Collecting Trip Report

August 27-September 05, 2013

Participants:
Bamberg, John and Ingrid (JB and IB), Alfonso del Rio (AdR), Charles "Chico" Fernandez (CF). JB + AdR = USPG research staff, CF = USPG retired, IB = previous collector and spouse of JB. Dr. David Kinder, Ohio Northern University (cooperator at Mesa Verde only). Thus, collection prefix = BdRFK numbers 271 - 286.

Objectives and Outcomes:
1. Start project to answer question: In light of evidence that most genetic diversity is within populations, if one collected two megapopulations intensely, how much of the total USA *jamesii* diversity would be captured? Collect DNA from N (Mesa Verde) and S (Ida Canyon) megapopulations of *jamesii*. Compare with rest of *jamesii* collections. Accomplished.

2. Answer question: How much have pops from the same site changed, 1958 vs 1972 vs 2013, as revealed by more modern DNA markers than those used to test this in our 1997 work? Re-collect the 2013 version of SBV 1 Mt. Lemmon (fen 564024) and SBV 2 Ida Canyon (jam 564047). Accomplished.

3. Re-collect germplasm that has not survived in the genebank from last year's PAT exploration or other reported sites. No time available to revisit these sites.

4. Give participating longtime CIP colleague Gomez a good sense of USA collecting. Stop at representative habitat spots and particularly assess vigor of previously visited populations, perhaps re-collecting. Dr. Gomez was unable to come. Observations at previous sites resulted as follows: No plants found at Mule Creek (jam 664008) or NM180/12 intersection (jam 564050), unable to revisit Catwalk (jam 664009), plants found at Coal Creek (jam 664007) and Pipe Fence (jam 664006) similar to 2011. The 2012 collection from Montezuma Canyon road culvert (jam 667012) looked poor. Mt Lemmon parking lot S slope (fen 667024), Mt. Lemmon Meadow (fen 667023) sites' plants not nearly as robust as in 2012.

5. Collect more extensively in identified diversity hot spot in Chirichahua and search other reported sites from which we have collected no germplasm or past

collections have been lost. Accomplished for Chirichahua. Rucker Canyon, Onion Saddle, San Pedro river bottoms near Sierra Vista [Liz Makings 1583], Mule Pass near Bisbee, likely habitats between Gallup and Eagar, and NM Rt. 180/12 intersection, Mule Creek Post Office, Turkey Creek bottoms in Coronado National Monument searched unsuccessfully. Confirmed survival of *jamesii* at Faraway Ranch (last seen in 1995), Collected first formally reported potato from Dragoon Mountains (fen #3).

Germplasm:
Collected 16 samples of *Solanum jamesii* and *Solanum fendleri*.

Insights for Collecting and Research:
1. Technical work on collecting methods needed in light of less reliable presentation of collectable propagules, a problem perhaps exacerbated by climate change. Thus made first successful collection of pollen (and subsequent hybrids at genebank) and prepared materials to confirm hybridity with AFLPs. Keeping fruit cold seemed to delay grubs, and developed highly effective method for killing grubs in fruit after return to genebank. Overnight shipping of leaves to Madison on dry ice preserved leaf samples well for DNA. Need culture method for poor meristems and immature seeds.

2. Insects: Very heavy insect pressure-- most fruit had multiple oviposit scars. First time common Colorado Potato Beetle seen heavy feeding at Magdalena (#14) and large black beetles feeding (see Photos section).

3. Virus: Are plants PVX infected (later tests at genebank indicate they are not, but extensive leaf samples in field would be of interest to see if this is also a pressure on the plants).

4. The value of green: Across the region, habitats were astoundingly green. First thought is that over-all green is promising, since wild potato is an herb that should be thriving too. But when everything is so green, extra vegetation is distracting and perhaps obscures locations that would only be wet enough in a normal/dry year. Also, access may be thwarted by high creeks and washed out bridges. And with so many other plants growing, is wild potato losing the competition? Is insect pressure increased because of extra moisture and vegetation? It is not a trivial issue that moist soil with lush vegetation results in poorly founded stepping stones in steep slopes, and the potential for slippery vegetation between shoe and footing. Finally, we wonder if lush vegetation resulted in more, and more active snakes.

This year we saw two big rattlesnakes and a few more other snakes, in contrast to almost never seeing snakes in 20 previous years of collecting.

Itinerary and Accomplishments:
Tue27th: Fly to Albuquerque, rent 2013 black Chev Equinox road vehicle to drive to SW corner of CO (city of Cortez) and nearby Mesa Verde National Park. **Wed28th**: Meet cooperator Dr. David Kinder of Ohio Northern University (has research permit). Sample 100 bulks of leaves of megapopulation in Navajo Canyon. Start drive to southeast AZ. **Thu29th:** Look between Gallup and Eagar. Collect pollen and fruit at Eagar (jam #1), collect fruit at Alpine (fen #2). Check previous sites Catwalk, Mule Creek, Coal Campground, Pipe Fence. Through Safford to Willcox lodge. **Fri30th:** Get white 2014 Chev Silerado extended cab 4x4 at Sierra Vista. Search in Rucker Canyon on S slopes of Chirichahua mountains, pass through Middlemarch Pass of Dragoon Mountains collecting fruit (fen #3). **Sat30th:** Collect seven fruit samples at Barfoot diversity hotspot (fen #5-#11), and new fruit collection at new Barfoot saddle site (fen #12), Rustler Park closed due to fire. Fail to refind lost 2004 collection from Onion Saddle (636415), observe *jamesii* plants at Faraway Ranch (592407) not seen since 1995 despite several interim visits. **Sun1st**: Scout condition of Ida Canyon plants-- they looked good, search promising spot at Mule Pass near Bisbee, scout access to San Pedro river bottom site of Liz Makings 1583. **Mon2nd**: Unsuccessful search at Liz Makings 1583 San Pedro river bottom jam site, return to Ida Canyon to collect 30 bulk samples of leaves for DNA and germplasm (jam #4) for SBV2 re-collection study. Return Silverado and retrieve Equinox, drive to Tucson. **Tue3rd**: Visit Mt Lemmon summit parking lot S slope and Mt. Lemmon Meadow sites of 2012. Re-collect 1992 SBV1 site (fen #13) as plants and fruit. Observe plants at Hitchcock Camp (658184) and Middle Bear Camp (641040) collection sites. FedEx package with leaves to Madison, start return to Albuquerque, lodging at Wilcox. **Wed4th**: Late afternoon visit to previous site Magdalena (564056), collecting 14 plants and one fruit to add to re-collection study (jam #14). Lodge Albuquerque. **Thu5th**: Fly back to Wisconsin. On Oct 21, 2013 received from David Kinder tuber samples from Mesa Verde (#15) and fruit samples from Chaco Canyon (#16).

Preparations:
Monitor regional rainfall through spring and summer. Permit from USFS (see Permit section). Garmin GPSs borrowed from PEO, and uploaded tracks, waypoints and notes from DeLorme Topo 7 and GoogleEarth. Preselected stopping sites by GoogleEarth elevation, vegetation and shadow (steep N/E slopes). Standard collecting clothing and gear. Flights to Albuquerque from

Madison and vehicle rental. Conditioning hiking. GPS plugged into canned laptop Topo 7 maps in lieu of limited internet reception in mountains.

Deposit of records, germplasm and files:
US Potato Genebank, 4312 Hwy 42, Sturgeon Bay, WI, 54235. 920-743-5406. john.bamberg@ars.usda.gov. Query GRIN text "BdRFK". Detailed trip log and additional miscellaneous notes available from JB at USPG.

List of collections

Temp trip collection # -- nickname	BdRFK	PI[1]	Species	Type	Propagule collected
Collection #1 -- Eagar	271	669594	jam	Re-collection	plants, seeds, pollen
Collection #2 -- Alpine	272	669595	fen	Re-collection	seeds
Collection #3 -- Dragoon Mountains	273	669596	fen	New	seeds
Collection #5 -- Barfoot slope	274	669597	fen	New	seeds
Collection #6 -- Barfoot slope	275	669598	fen	New	seeds
Collection #7 -- Barfoot slope	276	669599	fen	New	seeds
Collection #8 -- Barfoot slope	277	669600	fen	New	seeds
Collection #9 -- Barfoot slope	278	669601	fen	New	seeds
Collection #10 -- Barfoot slope	279	669602	fen	New	seeds
Collection #11 -- Barfoot slope	280	669603	fen	New	seeds
Collection #12 -- Barfoot saddle	281	669604	fen	New	seeds
Collection #4 -- Ida Canyon SBV2 re-collect	282	669605	jam	Re-collection	DNA, plants
Collection #13 -- SBV1 re-collect	283	669606	fen	Re-collection	plants, seeds
Collection #14 -- Magdalena	284	669607	jam	Re-collection	plants, seeds
Collection #15 -- Kinder Mesa Verde	285	669608	jam	New	DNA, tubers
Collection #16 -- Kinder Chaco Canyon	286	669609	jam	New	seeds

[1]Full narratives with location coordinates, habitat and plant descriptions, collection details and disposition are available in GRIN by query on individual PI number or the "BdRFK" collector prefix. Also access GRIN for updates and eventual evaluation data on these stocks.

Financing

Karen Williams of USDA/ARS/PEO provides $5,260.

Trip Claims: JB = $1805, AdR = $2200, CF = $514 for Total = $4519. Contributed off budget: meals and incidental expenses for IB and CF, flights for IB, driving costs between Sturgeon Bay and Madison, lodging at Madison for JB & IB, and sample shipping costs.

Permit

Email of July 25th suggesting no permit needed, as we are "cooperating agents" (although JB never received a reply from Chad Bell):

From: Sutton, James J -FS
Sent: Thursday, July 25, 2013 12:14 PM
To: Bell, Chad B -FS
Cc: Stamer, Marc -FS; Taiz, Josh -FS; Bamberg, John; Warner, Kevin -FS
Subject: FW: Permission to collect potatoes in 2013 -- OK

Hi Chad,
John Bamberg's research has been on the Santa Catalina and Nogales RD's and have not required a permit from him - he works for the USDA and collects small amounts of wild potatoes for their research and gene bank.
Do you concur that a permit will not be needed?
For researchers from "Fed" agencies I usually don't involve the Rangers if the biologists concur - knowing how busy the Rangers' are I don't want to waste their time.
Thanks,

James Sutton
Santa Catalina Ranger District
5700 N. Sabino Canyon Road
Tucson, AZ 85750
(520) 749-7725 office
(520) 749-7723 fax

Kinder Permit: MEVE-2009-SCI-0009

We were stopped while searching in Coronado National Monument. JB sent this email to clarify that we had not collected in CNM, but the nearby CNF:

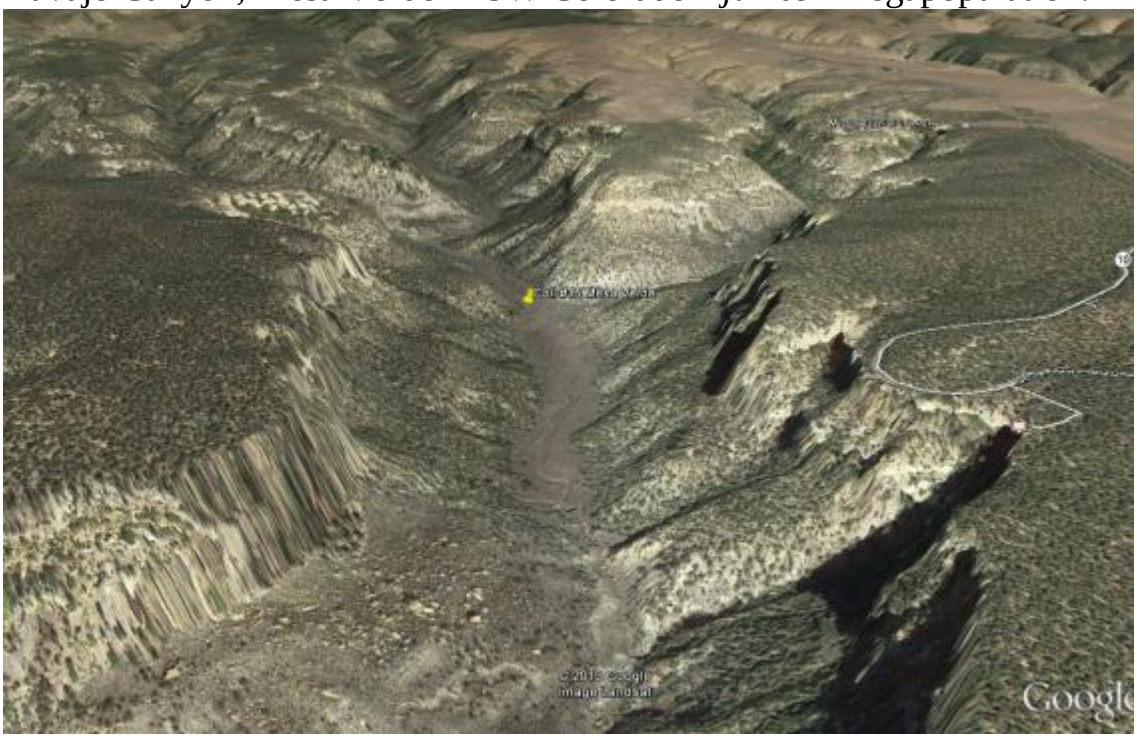
Email sent to CNM on September 6, 2013

My colleagues and I were collecting wild potato in the area on Sept 2 for USDA/ARS. We were stopped by an NPS officer just W of the visitor center. In hindsight, I think there may have been a misunderstanding. My colleague told him that we had indeed collected plant samples, but he meant that we had collected samples ELSEWHERE. We did NOT, in fact, collect any plant samples in the CNM--we only searched for them (unsuccessfully). Please contact me if you have any questions or concerns. --John

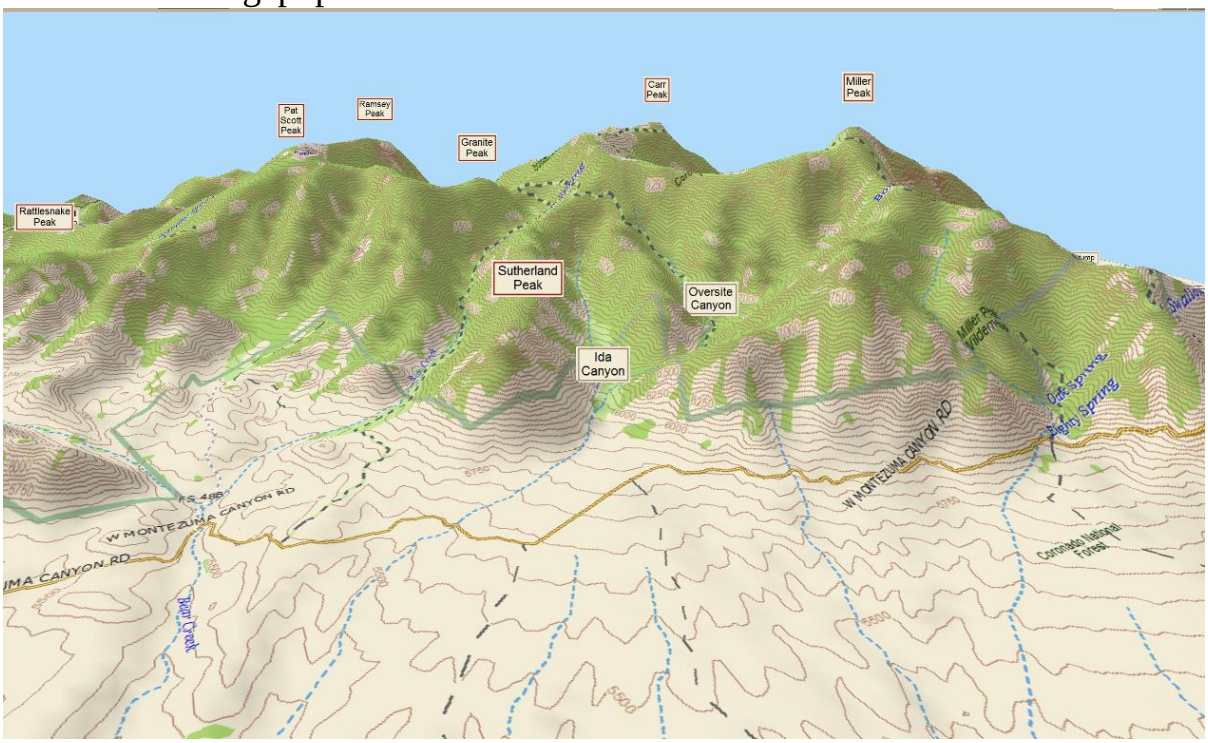
Maps and landscape views

General Trip map

Navajo Canyon, Mesa Verde in SW Colorado-- *jamesii* megapopulation.



Ida Canyon, S Huachucas, extreme S Arizona-- *jamesii* Coll #4 SBV2 re-collect, and DNA of megapopulation.



Chiricahua Mountains, Barfoot Park vicinity hotspot collections

Photos:

IB, K, AdR at Mesa Verde

Many thousands of *S. jamesii* carpeting the ground at Mesa Verde

Plant collections with fruit made for seed increase at genebank.

IB, JB, AdR. Lunch break at Rucker Canyon where habitat looked very favorable

First *S. fendleri* from Dragoon Mountains

Extremely abundant and huge *S. fendleri* plants on very steep slope at Barfoot Park

JB at San Pedro lookout Sta. Catalina Mts.

IB at Barfoot Park horse corral

Magdalena *S. jamesii* site #14

CF, JB and AdR ready to look at Barfoot Park

Common CPB and large black beetles at Magdalena *jamesii* site #14

Looking down over Mule Pass tunnel near Bisbee

Appendix.

Collecting narratives as sumbitted

PI 669594. BdRFK 271. S. jamesii. United States. Arizona. Apache county. Apache National Forest. Near Eagar. Approximate re-collection of 564053 = SBV 27. Just S of Eagar near triangle intersection. At WSG N34° 05.679' W109° 14.188' and 7304 ft. Coll #1. Thursday, August 29, 2013. Abundant plants flowering and fruiting to 24" tall, very green and healthy. Under scattered trees just off access road and extending about 1000 ft to the south toward highway. Collected many flowers for pollen; Collected 23 fruit, many with fly scars, yielding 275 seeds.

PI 669595. BdRFK 272. S. stoloniferum form fendleri. United States. Arizona. Apache county. Apache National Forest. Near Alpine. From Alpine 5 miles S on 191 (previously 666). Approximate site of 458418, 564042, 592415. At WSG 33° 47.302'N x 109° 10.112'W and 8160 ft. Coll #2. Thursday, August 29, 2013. Few small plants, rare fruit and somewhat immature. Under large Ponderosa in needle mulch and hiding under fallen limbs. One plant badly eaten by Colorado Potato Beetle. Collected 5 fruit containing 34 seeds.

PI 669596. BdRFK 273. S. stoloniferum form fendleri. United States. Arizona. Cochice county. Dragoon Mountains. Coronado National Forest. Near Middlemarch Pass. On road from Pearce to Tombstone. On Middlemarch Pass road just W of intersection with N Middlemarch Road. S side of road. At WSG 31° 51.602'N x 109° 57.301'W and 5685 ft. Coll #3. Friday, August 30, 2013. About a dozen plants to 10" tall, small, yellow, insect eaten. No flowers, a few fruit. Near creek bed in gravelly sand. Under junipers and hiding in fallen branches. Collected 7 fruit yielding 140 seeds.

(Collection #4 is out of sequence)

PI 669597. BdRFK 274. S. stoloniferum form fendleri. United States. Arizona. Cochise county. Chiricahua Mountains. Coronado National Forest. Near Barfoot Park. From Willcox S on 186, E on 181, to Chiricahua National Monument entrance, then SE on Pinery Canyon Road to Onion Saddle, then S on FR42D. S side of Barfoot Park access road. At WSG N31° 55.089' W109° 16.447' and 8500 ft. Coll #5. Saturday, August 31, 2013. Thousands of plants, some very large. Flowering and fruiting, some mature fruit. Very steep upward slope to S just above roadway. In black, moist soil and among rocks, herbs, brush under large pines. Collected 259 fruit, badly insect infested, yielding 1000+ seeds.

PI 669598. BdRFK 275. S. stoloniferum form fendleri. United States. Arizona. Cochise county. Chiricahua Mountains. Coronado National Forest. Near Barfoot Park. From Willcox S on 186, E on 181, to Chiricahua National Monument entrance, then SE on Pinery Canyon Road to Onion Saddle, then S on FR42D. S side of Barfoot Park access road. At WSG N31° 55.077' x W109° 16.430' and 8540 ft. Coll #6. Saturday, August 31, 2013. Thousands of plants, some very large. Flowering and fruiting, some mature fruit. Plants making thick mats of 1/4" thick stems lying prostrate on the steep slope, then shoots curving upward. Very steep upward slope to S high above roadway. In black, moist soil up against N facing cliffs. Collected 32 fruit, badly insect infested, yielding 175 seeds.

PI 669599. BdRFK 276. S. stoloniferum form fendleri. United States. Arizona. Cochise county. Chiricahua Mountains. Coronado National Forest. Near Barfoot Park. From Willcox S on 186, E on 181, to Chiricahua National Monument entrance, then SE on Pinery Canyon Road to Onion Saddle, then S on FR42D. S side of Barfoot Park access road. At WSG N31° 55.070' x W109° 16.408' and 8500 ft. Coll #7. Saturday, August 31, 2013. Thousands of plants, some very large. Flowering and fruiting, some mature fruit. Plants making thick mats of 1/4" thick stems lying prostrate on the steep slope, then shoots curving upward. Very steep slope to S above roadway. In black, moist soil and among rocks, herbs, brush under large pines. Collected 14 fruit, badly insect infested, yielding 54 seeds.

PI 669600. BdRFK 277. S. stoloniferum form fendleri. United States. Arizona. Cochise county. Chiricahua Mountains. Coronado National Forest. Near Barfoot Park. From Willcox S on 186, E on 181, to Chiricahua National Monument entrance, then SE on Pinery Canyon Road to Onion Saddle, then S on FR42D. S side of Barfoot Park access road. At WSG N31° 55.091' x W109° 16.434' and 8460 ft. Coll #8. Saturday, August 31, 2013. Thousands of plants, some very large. Flowering and fruiting, some mature fruit. Plants making thick mats of 1/4" thick stems lying prostrate on the steep slope, then shoots curving upward. Very steep upward slope to S high above roadway. In black, moist soil up against N facing cliffs.Collected 16 fruit, badly insect infested, yielding 21 seeds.

PI 669601. BdRFK 278. S. stoloniferum form fendleri. United States. Arizona. Cochise county. Chiricahua Mountains. Coronado National Forest. Near Barfoot Park. From Willcox S on 186, E on 181, to Chiricahua National Monument entrance, then SE on Pinery Canyon Road to Onion Saddle, then S on FR42D. S side of Barfoot Park access road. At WSG 31° 55.070'N x 109° 16.375'W and 8425 ft. Coll #9. Saturday, August 31, 2013. Abundant plants, flowering and fruiting, some mature fruit. Steep slope to S above roadway. In black, moist soil and among rocks, herbs, brush under large pines. Collected 75 fruit yielding 650 seeds.

PI 669602. BdRFK 279. S. stoloniferum form fendleri. United States. Arizona. Cochise county. Chiricahua Mountains. Coronado National Forest. Near Barfoot Park. From Willcox S on 186, E on 181, to Chiricahua National Monument entrance, then SE on Pinery Canyon Road to Onion Saddle, then S on FR42D. N side of Barfoot Park access road. At WSG 31° 55.096'N x 109° 16.417'W and 8385 ft. Coll #10. Saturday, August 31, 2013. Abundant plants flowering and fruiting, some fruit mature. Steep downward slope to N below roadway. In black, moist soil and among rocks, herbs, brush under large pines. Collected 6 fruit yielding 20 seeds.

PI 669603. BdRFK 280. S. stoloniferum form fendleri. United States. Arizona. Cochise county. Chiricahua Mountains. Coronado National Forest. Near Barfoot Park. From Willcox S on 186, E on 181, to Chiricahua National Monument entrance, then SE on Pinery Canyon Road to Onion Saddle, then S on FR42D. N side of Barfoot Park access road. At WSG N31° 55.081' x W109° 16.353' and 8430 ft. Coll #11. Saturday, August 31, 2013. Abundant plants, some flowering and fruiting, some mature fruit. Slope to N below roadway. In black, moist soil, but more open to sun in needle mulch under trees and brush.Collected 80 fruit yielding 220 seeds.

PI 669604. BdRFK 281. S. stoloniferum form fendleri. United States. Arizona. Cochise county. Chiricahua Mountains. Coronado National Forest. Near Barfoot Park. From Willcox S on 186, E on 181, to Chiricahua National Monument entrance, then SE on Pinery Canyon Road to Onion Saddle, then S on FR42D. Barfoot saddle at about 50 ft up from junction of trail leading to Barfoot lookout tower. At WSG N31° 54.877' x W109° 16.451' and 8685 ft. Coll #12. Saturday, August 31, 2013. About 20 plants with mature fruit hiding among rock crevices. N-facing, open, steep slope with rocks and grass. Collected 39 fruit yielding about 120 seeds.

PI 669605. BdRFK 282. S. jamesii. United States. Arizona. Santa Cruz county. Huachuca Mountains. Coronado National Forest. Near Ida Canyon on Montezuma Pass road. Approximate re-collection of 564047, SBV 2. From Sierra Vista S on 92 to Montezuma Canyon Road and over pass to Ida Canyon road and trailhead. Along about 1/4 mile of stream bottoms NE of water tank which is at N31 22.783 x W110 19.835. Abundant over about 10 acres total area. At WSG N31° 22.903' x W110° 19.777' and 6100 ft. Coll #4. Monday, September 2, 2013. Very many plants, all sizes, mostly dark green and rarely flowering, no fruit. Shady cottonwood and oak stream bottoms with much leaf mulch. Collected 30 bulks of 20 leaflets for DNA and 14 plants.

PI 669606. BdRFK 283. S. stoloniferum form fendleri. United States. Arizona. Pima county. Santa Catalina Mountains. Coronado National Forest. Near Tucson. Approximate re-collection of SBV 1 = 564024. From NE Tucson on Hitchcock-Catalina Highway toward Mt. Lemmon. Just before Summerhaven town and ski road, just across highway from road to medical facility. At WSG 32° 26.881'N x 110° 45.303'W and 7925 ft. Coll #13. Tuesday, September 3, 2012. Occasional plants with a few flowers and maturing fruit. On fairly open, steep NW facing slope in dark mulch soil with herbs, around rocks and under brush. Collected 8 plants and 6 fruit yielding about 50 seeds.

PI 669607. BdRFK 284. S. jamesii. United States. New Mexico. Cibolo National Forest. Near Magdalena town. Approximate re-collection of 564056 = SBV 31. W on 60 at 12.2 miles from Magdalena town. S of Tres Montosas at picnic pulloff on N side of road just across from jct of old NM52 = Fr549. At WSG 34° 4.569'N x 107° 27.172'W and 7160 ft. Coll #14. Wednesday, September 4, 2013. Very abundant plants of various sizes, sometimes flowering but only one fruit observed. In sandy soil under junipers and in open, hiding in branches and brush or right along pavement. Heavy damage by typical Colorado potato beetle and common black beetle on some plants. Collected 14 plants.

PI 669608. BdRFK 285. S. jamesii. United States. Colorado. Montezuma county. Near Mesa Verde National Park. From Cortez town, E on 160 and 10 S into park. To Ranger station and hiking trail to main ruins, then trail to Navajo Canyon (not open to public). At WSG N37° 10.453' x W108° 29.890' and 6282 ft. Coll #15. Wednesday, August 28, 2013. Perhaps hundreds of thousands of plants very robust and green in wide range of sizes, but rarely flowering. In grass and brush carpeting broad open canyon, perhaps up to 100 acres in area. Collected 100 samples of 20-leaflet bulks for DNA. David Kinder later collected, and on October 21 sent about 50 small tubers.

PI 669609. BdRFK 286. S. jamesii. United States. New Mexico. San Juan County. Navajo Reservation. About 50 miles S of Farmington/Bloomfield. S on 550 to access road to Chaco Culture National Historical Park. Chaco Canyon. At WSG 36° 1.931'N x 107° 55.066'W and 6200 ft. Coll #16. October 21, 2013. Fruit from plants collected at Chaco Canyon in previous years and propagated by David Kinder in Ohio. Collected 3 fruit.

Appendix.

Potato Collecting Proposal, 2013

May 13, 2013

Time: Up to two weeks in September, 2013
Participants: J&I Bamberg, A. del Rio, Rene Gomez (CIP)

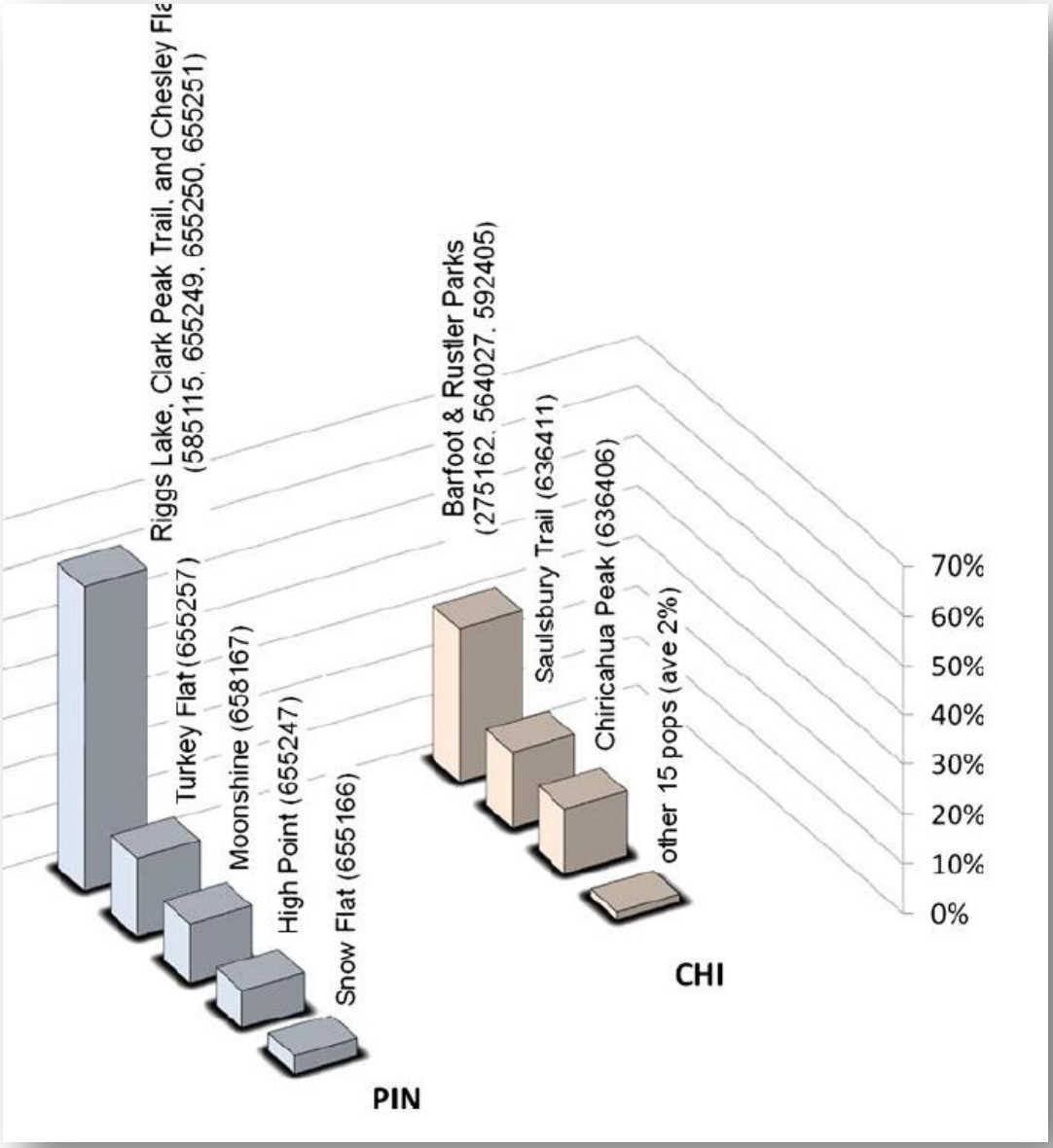
Objectives and expedition methods

1. Answer question: If you collected two mega-pops intensely, how much of the total USA_{jam} diversity would you miss? Collect DNA from N (Mesa Verde) and S (Ida Canyon) mega pops of *jamesii*. Compare with rest of *jamesii* collections.
2. Answer question: How much have pops from the same site changed, 1958 > 1972 > 2013? Re-collect the 2013 version of SBV01 (Mt. Lemmon) and SBV02 (Ida Canyon).
3. Re-collect germplasm that has not survived in the genebank from last year's PAT exploration. as time permits.
4. Give participating longtime CIP colleague Gomez a good sense of USA collecting. To accomplish 1 above, we need to drive from southwest CO to southeast AZ, through a big part of the USA potato range. We can stop at representative habitat spots. If it is a particularly good season at local sites, we might even explore for new samples.
5. Collect more extensively in identified diversity hot spot in CHI, and search never-explored, never-collected, never-reported potential potato habitats at S side of CHI from Rucker Lake area (see below).

Contingency: If time, money or conditions are limiting, we would eliminate CO stop and the cross-region drive, focusing on southeastern AZ. If more limited in time and money, a very useful shorter trip would be to fly to Denver, and explore a place we have never visited: the foothills W of 25 between Santa Fe, NM and the CO border.

Rough costs expectations:

1960	lodge for two
1400	per diem for two
800	air for two (WI to Albuquerque or Tucson)
600	truck rental
300	gas
200	supplies, permits, misc.
5260	



From "7-mountain" and "Remote" publications, CHI had the 2nd most unique alleles (PIN = 30%, CHI = 22%). We went back to PIN Riggs Lake area for more intensive sampling, but not CHI. We could go to indicated easy CHI sites (Barfoot & Rustler) but could also try for slopes from S approach, in proximity to the REMOTE collections that had more unique alleles according to Remote/Easy studies (approach from Rucker Lake, which ties in with our idea that diversity is associated with mountain lakes).