The UCLS Newsletter

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What is it?

This original stone monument contains three notches on its South face and three notches on its East face.
Be the first member to correctly identify the corner that this monument represents and you will be eligible for a free lunch at your next chapter meeting. Answers may be emailed to Susan at srmerrill@ucls.org. The earliest date and time of response will determine the winner.

In this issue: We introduce you to another one of our outstanding UCLS members, celebrate the accomplishments of a local high school student, and present an interesting survey in Cedar Breaks National Monument.

Additionally, you will be challenged by the north arrow completion, amused by discontinued Olympic events, and advertise for an exceptional job opportunity.

We invite you to share charismatic photos of yourself and/or a coworker, panoramic images of Utah's scenic wonders, or pictures of survey related tools and equipment. Additionally, we need interesting and unique descriptions or survey related stories to share with our membership. Remember, if you do not participate you have no right to complain. Please let us know your thoughts, recommendations, suggestions, or complaints.

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IN THIS ISSUE:

"Be willing to commit yourself to a course, perhaps a long and hard one, without being able to foresee exactly where you will come out."
-Oliver Wendell Homes Jr.

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Getting to Know our Members

Name: **Byron Goff**
Residing at **Salt Lake City, Utah**
My spouse is **Wendy** and I am a parent of **3** children
My hobbies and/or interests include **surveying, poker, darts and cooking.**
When I retire, I want to: **Retire? Maybe that day will come.**
I have been a member of the Utah Council of Land Surveyors for **many years** and wish they would **continue to focus on the education of new and prospective surveyors throughout our state. Our profession sometimes lacks the respect that it deserves, and education, training and involvement in the State Legislative process by the UCLS has had a very positive impact on the way surveyors are perceived.**
My current employer is the **Salt Lake County Surveyor's Office**
My position or title is **Field Operations Manager** and I am responsible for **protecting and preserving the Public Land Survey System of monuments throughout Salt Lake County**
I have been employed by this company since **2009** but have been involved in the surveying profession since **1985**
I became a surveyor because **all of my working life I've been surveying. I started my career pounding stakes during the summer at the age of 14. My education was in the field of Civil Engineering but my heart has always been with the surveying profession. I've been very happy to see the colleges and universities expand their focus on Geomatics and provide degrees to prospective surveyors through the years.**
During the past **10** years, **The Global Positioning System** has had the greatest impact on the surveying profession. However, during the next **10** years, I believe **Land based scanning and the use of point clouds** will have the most influence on its future.
In my opinion, the future of surveying is **bright. I've had the opportunity to work first hand with some wonderful surveyors and technicians that have come out of our colleges and universities. Most have shown great passion for the profession and I believe the future will be left in some good hands.**

July Where is it?

Corbin Van Nest was the first UCLS member to correctly identify the Tri-Corner monument of Utah, Nevada, and Arizona. However, he acknowledged a recent visit to the site and therefore felt compelled to withdraw his guess.

Jason Felt submitted his guess five minutes after Corbin, followed by Kelly Schmutz, Arthur LeBaron, Brad Peterson, James Couts, and Blake Lucus.

This sandstone monument marking the point common to Arizona, Nevada, and Utah was erected in 1901. The monument is approximately 6 feet tall by 16 inches by 12 inches with Arizona inscribed on the southeast side. Nevada on the northwest side, Utah on the northeast side, and 37 NL 1901 on the southwest side.

The corner position was established in 1901, as the initial point for the survey of the Arizona-Utah line. This line was run due west, checked by five latitude stations, with a measured distance of 277 miles 5.18 chains to the "Four Corners" monument.

The original mark, set in 1870 for the southwest corner of Utah, was destroyed because observations for latitude determined that it was 1 mile 31.51 chains too far north.

The 1901 corner mark was established 7.88 chains South of milepost 300 of the Utah-Nevada survey of 1870.

The Utah Council of Land Surveyors (UCLS), in conjunction with the Arizona Professional Land Surveyors (APLS), Nevada Association of Land Surveyors (NALS), Bureau of Land Management (BLM), and the Western Federation of Professional Surveyors (WFED) are collaborating to re-monument the tristate corner. Todd Jacobson, UCLS Color Country Chapter President is seeking volunteers and suggestions for this monument project. Please contact Todd at 435-627-4124.

LOCAL STUDENT WINS NATIONAL MATH CONTEST

Syracuse High School student wins NSPS National Math Contest

Syracuse, Utah: Collin Free a Sophomore at Syracuse High School is the recipient of the 2016 Richard E. Lomax National Trig-Star First Place Award. The National Society of Professional Surveyors (NSPS) has announced the recipients of their annual math contest for high school students at the pre-calculus and calculus level of study. The Trig-Star committee met on July 15 to determine the three top high school students from the national examinations submitted by state winners.

This year there were 38 state winners submitted.

The Richard E. Lomax National Trig-Star Awards are as follows:

- First Place: Collin Free, Syracuse High School, Syracuse, Utah
- Second Place: Avi Swartz, Cherry Creek High School, Greenwood Village, Colo.
- Third Place: Aaron Sun, Ed W. Clark High School, Las Vegas, Nevada

The Richard E. Lomax National Teaching Excellence Awards are as follows:

- First Place: Ashley Martin, Clearfield High School, Clearfield, Utah (Collin would travel to Clearfield a neighboring school in the same district for the Calculus courses not offered as his school)
- Second Place: Dotty Dady, Cherry Creek High School, Greenwood Village, Colo.
- Third Place: Saundra D. Jordan, Ed. W. Clark High School, Las Vegas, Nevada

The NSPS says past chair Richard Lomax was the driving force behind the elevation of the local Trig-Star program to the national level. In October 1994, board action named the high school math skills award in his honor. The Utah Council of Land Surveyors (UCLS) is the local affiliate of the NSPS and its members voluntarily sponsor the local contests at the high school and state levels.

This year the UCLS was successful in sponsoring eight high schools at the local level. Several hundred students participated in presentations about how math is used in everyday surveying and engineering practices as a result of these volunteer efforts. Sixty-two of these students went on to participate in the math contest itself. Twenty-two of those who completed the contest had their papers sent to the state level where the top three scores from each school compete for the state prizes. All together the UCLS awarded $3,550.00 in prizes this year at the local and state level.

Craig Free, Collin's Father said, "Thanks again for being involved with the Trig-Star competition. All of our kids have enjoyed being involved. We appreciate the National Society of Professional Surveyors and other for sponsoring this event. I teach junior high mathematics and appreciate any sponsors of events like this to help increase enthusiasm and skill in math." I believe they have had two other children participate in years past.

Ashley Martin said, "Thank you so much for all of your help with this competition. The kids were really excited about their prize money and to also be recognized was a cool thing for them. I look forward to working with you again." Ashley has been working with the UCLS to sponsor Trig-Star at Clearfield High School for close to ten years.

Jamie Bateman, former Math Chair Syracuse High School said, "It has been a pleasure working with you on behalf of our students...I hope to increase the number of students that get involved with Trig-Star." Jamie worked with the UCLS for many years sponsoring Trig-Star at Syracuse High School before she retired two years ago.

About the UCLS: The purpose of the Utah Council of Land Surveyors is to promote the common good and welfare of its members engaged in the practice of land surveying; to promote and maintain the highest possible standards of professional ethics and practice; to promote professional uniformity; to promote public awareness and trust in professional land surveyors and their work. https://www.ucls.org

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Brian Moe (Photo by Erika Blomdahl)

By: John Knox, PLS with James A. Lutz, Ph.D

John Knox, *PLS recently retired after 34 years of practice as a land surveyor. He now has the greatest job and the greatest boss ever.*

James A. Lutz*, Ph.D. is Assistant Professor of Forest Ecology at Utah State University. He studies the forests of the western United States.*

The authors wish to thank the management and staff of Cedar Breaks National Monument for assisting with this research.

Utah Forest Dynamics Plot

Six years back, I remember sitting on a log within the Yosemite forest Dynamics Plot (YFDP) thinking that "surveying just couldn't get any better than this". When Jim Lutz called in 2014 and requested assistance with the survey of another beautiful big-tree plot, this one within Cedar Breaks National Monument in southwestern Utah, I jumped at the opportunity. "The campground even has showers", he promised, reminding me of the primitive camping conditions of the YFDP. As if any encouragement was really necessary.

The Utah Forest Dynamics Plot (UFDP) was established in 2014 as a third research plot in a network of old-growth forests in the western United States. Within each plot, over 30,000 trees and shrubs are tagged, identified, and mapped. Every tree or shrub that reaches a diameter of 1 cm at breast height (1.37 m from where the plant exits the ground) is part of the study. The tags make the research a 'permanent plot' study, where the individual trees are revisited every year to assess their condition (mainly whether any existing trees died, and how, or if new trees have grown enough to join the data set).

The UFDP is located at about the highest elevation where closed-canopy forests occur in the United States - about 3,000 m. The forest trees include: bristlecone pine (the longest-lived individual tree on earth), limber pine, subalpine fir, white fir, Engelmann spruce, Colorado blue spruce, aspen, Douglas-fir, as well as a few individuals of ponderosa pine, two-needle pinyon, and juniper. Because trees in old-growth forest live a long time (more than 500 years in the case of the UFDP - and maybe even 1,000 years), to understand how forests change it's necessary to follow them for decades.

The three western plots (UFDP, YFDP, and the Wind River Forest Dynamics Plot in southern Washington state; WFDP) are in turn nested within a global network of 62 plots coordinated by the Smithsonian Institution Center for Tropical Forest Science (www.forestgeo.si.edu). The ultimate goal of this network of large plots is to understand how the world's forests work. An important part of the research is understanding how trees and shrubs interact with each other, and mapping their original rooting location accurately is critical to this objective. Once a 20 m grid is established, individual trees are referenced to the grid with a

combination of tapes and handheld lasers (Laser Technology Impulse 200 LR). Basically a station/offest method using a slope-corrected tape as a baseline. For a small, relatively cylindrical tree, our objective is to locate the tree to =0.10 m of northing and easting. For larger, less symmetric trees, and accuracy of =0.25 m is more realistic. In either case, our primary objective is to map close intertree distances accurately (i.e., relative distances between trees), with longer intertree accuracies being less important. However, some of our research uses LiDAR data to assess canopy structure, and to match the LiDAR data with the tree locations requires a high degree of accuracy across the entire plot.

The task of the surveyors was to establish a 20 meter rectangular grid, from which the trees and shrubs will be located and tagged. UTM coordinates were provided for proposed grid corners, with a allowable positional variance of +/-0.10 meters. Traverses would zig-zag through the plot via a series of interconnected loops, with grid corners staked out along the way. Basic closures would be monitored to ensure against blunders, but the final positions of traverse points and grid corners were to be established by least squared adjustment. In theory, and on paper, this sounded like a piece of cake, but experience gained within the YFDP told me that his would be no easy task. First off, the physical challenges. Each day began with a 45 minute downhill hike, carrying food, water, survey gear, rebar, and lots of rebar, with aluminum caps. But downhill was fine, even when teh only trail veered off to elsewhere. After 10 hours of scrambling through the forest, the days would end with a 60 minute uphill slog, a serious grind, and most days with soggy mud-caked boots. Add to that the elevation - 3000+ meters - and the old timers (John Knox, PLS and Patrick Busby, PLS) were regularly spotted with hands on knees, fighting for air. Night time temps regularly dipped into the low 30s, and nearly every day brought rain and hail, with the occasional horizontal snow. Plus that "grid to ground" thing... dealing with a combined scale factor of 0.9994 meant that raw field data would have to be scaled before traverse closures could be reviewed or stakeout of corners performed. And of course, the trees, always a tree or two on line, and strict instructions again the wielding of steel ("My kingdom for a brush hook!" was muttered a time or two).

2014

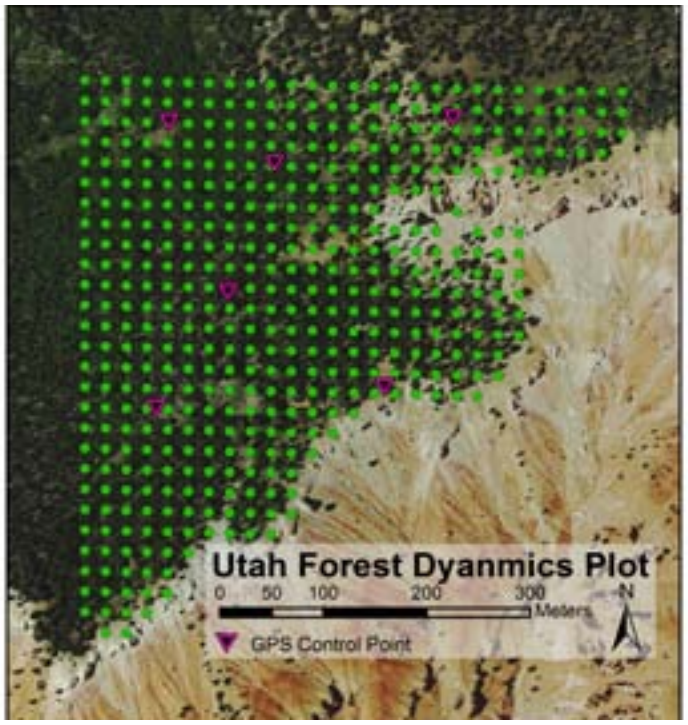
The surveying began in spring of 2014, when Lutz and tucker Furniss, a master's student at Utah State University and tree tagger extrordinaire, weathered inclement conditions (read: snow!) to install monuments and perform static GPS observations of four primary control stations. The data was sent off to OPUS, but sadly, due to 50+ mile distances to the nearest CORS stations and the unavoidable problems presented by tree canopy, only two of the four positions could be resolved positions provided a respectable intervisible baseline from which to begin traversing. In late June I met with Lutz and Furniss by the campfire at the YFDP for a strategy session, and to familiarize us all with a new data collector and software package. Due to scheduling conflicts, I couldn't be present to kick off the traversing, so I called in a favor from fellow PLS and close friend Patrick Busby. As Busby had been part of the team that surveyed in the grid corners at the YFDP a few years back, I knew I could sucker him into driving to Utah and donating his vast wealth of knowledge and wisdom for a week or so. He teamed up with Furness, who had been a member of our survey crew at the YFDP, and Kendall Becker, a Ph.D student at Utah State University, to begin the traversing. Periodically, when the unfamiliar software proved sufficiently perplexing, we held teleconferences to get the field crew back on their feet. The survey and tree tagging operations continued throughout

John Knox (Photo by Erika Blomdahl)

the summmer, during which time the GPS network was extended to two additional primary control stations. In September, I stopped by the plot for the purpose of training two new surveyors - Brian Moe, a summer hire working on the project, and Erika Blomdahl, Chief Field Operative for the Western Forest Initiative and master's student at Utah State University. Blomdahl skillfully assumed the role of crew chief, and together they continued traversing and stakeout until the snows came and ice crystals graced their pillowcases each morning. Note: winter camping as part of an adventure may be fun, but as a home away from home while working in the forest, not fun.

Data Processing

Data for 2014 was complied and adjusted using a Star*net least squares adjustment. The GPS baselines that could be resolved were processed in Trimble Business Center (TBC) and exported to Star*net input file (DAT) format. Total station raw data files were also converted to DAT format. The final 3D adjustment was performed by combining all processed GPS baselines and total station date, fixing only the CORS stations. Adjustment results were outstanding, considering the obstructed sky and long length of GPS baselines, and the unavoidable short legs and poor geometry of traverse data. After realistic weighting strategies were applied, error factors for measured angles and distances were a shade under 1.0 and for zenith angles was 2.0. GPS deltas weighed in predictably at 4.1. Coordinate standard deviations for primary control stations were under 0.01 meters, while those of secondary traverse points mostly fell under 0.02 meters. With exceptions for the few corner positions that happened to fall on trees or fallen logs, all set corners fell within the desired 0.10 meter variance.



2015

After (most of) the snow had melted, the crew regrouped in June 2015 for a final wave of surveying. Lutz provided the personnel needed to fill out two three-person survey crews. Knox and Busby were joined again by Furniss, Blomdahl, and Becker, and newcomer Sara Germain, a Ph.D. student at Utah State University, was occasionally able to break away from her botanical duties to assist with the surveying. Our goal was to set grid corners within an area that had recently been added to the plot. The Busby crew began by running a long circuitous traverse around the perimeter, adjacent to the drop off. The Knox crew cut across the center of the area, through the dense forest, and tied into Busby's traverse in three locations. Some loops closed as tight as 0.015 meters before adjustment. Grid corners were set as the traverses progressed, at an average of 15 points per crew per day. Slow going by urban survey standards, but collectively we were quite satisfied with the progress. Considerable time we spent running the total stations and the layout rods, setting sights, and pounding rebar. The ultimate size and shape of the plot was determined by the progress of the tree taggers - additional cells were surveyed as needed just ahead of tagging crews, right up until snowfall once again call the game.

At the conclusion of the second season's efforts, all survey data from 2015 was adjusted in Star*net, holding positions from the 2014 adjustment as fixed.

The following field equipment was used for this project:

-Leica GS15 GNSS receivers (2)
-Topcon Hiper SR GNSS receivers (2)
-Topcon OS105 total station (with Magnet running on-board)
-Topcon GTS312 total station with Topcon FC2600 Field Controller (also running Magnet)

All in all, it was another fantastic experience - great friendships and lifelong memories were forged. Despite the challenges brought about by inclement weather and steep terrain and by the complexity of the task, we (nearly) never stopped smiling. Not during the wild thunderstorms and close lightning strikes. Not during frequents pelting delivered by hailstones. Not after crawling out of damp tents to see the entire campsite covered with a sheet of ice. Not on that long uphill march at the end of each day. And only sometimes, while getting our near-daily rain soaking and slopping our way through the muddy forest, or while eating dinner huddled under a tarp in muddy work clothes and full rain gear. Perhaps Dr. Lutz will surprise us by establishing yet another big-tree plot, but topping the UFDP experience ... doubtful.

For more information about the UFDP, YFDP, and WFDP on the web, visit ufdp.org, yfdp.org and wfdp.org or follow the work on Facebook: "Utah Forest Dynamics Plot", "Yosemite Forest Dynamics Plot", and "Wind River Forest Dynamics Plot".

Erika Blomdahl (Photo by Patrick Busby)

Kendall Becker (Photo by Patrick Busby)

MATCH THE NORTH ARROW TO THE COMPANY

Company	A	B	C	D	E	
1 Iron Ridge Civil Solutions						**1 =**
2 Knox and Associates						**2 =**
3 Easterbrook Surveying						**3 =**
4 Lone Pine Surveying						**4 =**
5 Jones & Demille						**5 =**

Answers on Page 10

The Office of the Salt Lake County Surveyor will soon be recruiting for a Party Chief and Field Technician. For more information, please visit the Salt Lake County Human Resources Website at http://slco.org/human-resources/jobs/

Discontinued Olympic Events

Tug-of-war. This is a game of strength, which consists of two teams pulling a rope in opposite directions until the mid-point of the rope passes into the territory of the teams. It was an Olympic event from 1900 to 1920.

Live pigeon shooting. This was only part of the Games in the year 1900, after which it was replaced by clay pigeon shooting. Live pigeons were released in front of participants: two misses and you were out. The winner was the person who shot the most birds.

Plunging. This was held only once in 1904. This involved the rather pointless exercise of diving into a pool of water and remaining motionless until a minute was over, or your head popped out of the water. The person who was the furthest from the edge of the pool from where they had dived in was the winner.

Standing triple jump. If you think of the jumping events today, it involves a lot of high-speed running. But from 1900 to 1920, triple jump, long jump, and high jump were also contested from a standing position.

Solo synchronized swimming. This has been an event at the Olympics in 1984, 1988, and 1992 Games. A woman gets into a pool and tries to synchronize her swimming with the music being played.

Swimming obstacle race. In Paris in 1900, this event was held in the River Seine. Competitors swam about 200 meters, but in between had to climb a pole sticking out of the water, swim to some boats and climb over them, swim to some more boats and swim under them.

Gliding. In 1936 at the Berlin Olympic Games, gliding was included as an Olympic sport. Even though gliding as listed as an official sport in 1940, the Games were cancelled because of WWII, and after the war, people had lost their enthusiasm for sports involving fast-flying planes after experiencing firsthand what they could do.

Kabaddi. This was also included only once. It is a sort of team-wresting sport in which the object is for one member of a team to enter the other side's half of the field, and score points by tagging or wrestling the opponents. The attacker must then return to his side of the field, but has to hold his breath the whole time.

Poodle clipping. It was part of the Olympics in Paris in 1900, although it was just a trial event. 128 people competed in a Parisian Park in front of a crowd of 6000 to see who could clip the fur off the most poodles in a two-hour period...

Hot air ballooning. Again part of the Olympics in 1900 in Paris. Several hot air ballooning events were held and the French won them all. They tested distance, duration, elevation and targeted stopping.

Esquestrain long and high jump. The events were only present at the 1900 Paris Games; but they must have been amazing to watch, as the winning horses' jumps were over 20 feet long and six feet high.

Art. Between 1912 and 1948, Olympic gold medals were awarded in architecture, literature, music, painting, and sculpture.

Dueling pistol shooting. The dueling pistol event was held in 1906. It required competitors to shoot at human silhouettes dressed in frock coats, with a bull's eye on the dummy's chest.

Esquestrian Vaulting. Men's vaulting was an equestrain event contested as a part of the Summer Olympics during the 1920 games. Essentially, it is gymnastics and dance on horseback. It was the only time the event was conducted in the Olympics after which it was discontinued.

Croquet. There was only ever one croquet competition in Olympic games history, held in 1900 in Paris. France won all events, which is not surprising as mostly French competitors took part.

Club Swinging. Club swinging has appeared twice as an Olympic Sport, in 1904 and 1932. Club swinging involves the competitor standing erect with a club in each hand. The clubs look like bowling pins, or juggling clubs, and are whirled or swung very quickly around the body and head in a variety of patterns in a complicated routine.

Answers to North Arrow Question 1=B; 2=D; 3=A; 4=E; 5=C