

# The UCLS Newsletter



April 2023

## Where is it?



The Utah Legislature's 45-day general session came to an anticlimactic end after legislators hashed out essentially all of the headlining issues and finalized the state's record \$29 billion budget by passing 575 Bills.

The 2023 session was largely dominated by debates over complex and generational issues facing the state, including what Utah should do about the record drought gripping the West and threatening the Great Salt Lake, how to tackle the state's housing affordability crises, and how to fund other big budget priorities, including education.

How, or will the recent legislative changes impact surveyors and/or surveying? Hopefully, more information will be forthcoming.

The subject of this publication's "Where-is-it?" competition is from Utah State Code regarding the statute of limitations for surveyors. Specifically; *An action against a surveyor for acts, errors, or omissions in the performance of a boundary survey filed pursuant to Section 17-23-17 shall be brought within five years of the date of the filing.*

The first UCLS member who correctly identifies where this statute of limitations is found in State Code is eligible for a free lunch at your next UCLS chapter meeting. Answer may be emailed to Susan at [srmerrill@ucls.org](mailto:srmerrill@ucls.org). The earliest date and time of response will determine the winner.

**In this issue:** we review legislative changes and the potential impact these changes may have upon the professional land surveyor. Additionally, reports were submitted by various working committees of the Utah Council of Land Surveyors.

The medium age of land surveyors has continually increased and therefore the passing of our peers should not be a surprise. However, the unfortunate deaths of Walter Cunningham and Carl Larsen is a memorable loss to the membership of the UCLS.

We continue with Part 5 of the Business Ethics, Article 4 of Thoughts on Professional Practice and Education, and explore the feasibility of using Lidar for Surveying.

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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Utah Council of Land Surveyors  
PO Box 1032  
Salt Lake City, UT 84110

Phone/Fax:  
801-964-6192

Website:  
[www.ucls.org](http://www.ucls.org)

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**"For each petal on the shamrock,  
this brings a wish your way: good  
health, good luck, and happiness  
for today and every day."  
- Irish Blessing**

**UTAH COUNCIL OF LAND SURVEYORS**

PO BOX 1032, SALT LAKE CITY, UT 84110

Phone: 801-964-6192 / Fax: 801-964-6192 / E-Mail: [ucls@ucls.org](mailto:ucls@ucls.org)[www.ucls.org](http://www.ucls.org)**UCLS Executive Board 2023 and Committee Chairs****State Chair**Andy Hubbard (GS)  
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PO Box 1032  
Salt Lake City, UT 84110  
(801) 964-6192  
srmerrill@ucls.orgTo contact a UCLS Officer, please visit  
<https://www.ucls.org/officers>To contact a UCLS Committee Chair, please visit  
<https://www.ucls.org/committee-listing>

## A Sound Plan Gives Strength to New Year's Resolutions

by: Bob Kowalski

If you're starting the new year on the right foot by making resolutions, be careful what you wish for. The resolution might be a challenge with a bigger cost than anticipated.

Setting goals - especially in line with the turn of the calendar - is a noble pursuit. Keep in mind that unless you're highly disciplined, or realistic with your expectations, there can be pitfalls.

According to consumer data company Statista, only 22 percent of Americans stuck to their resolutions one month into 2022. Another 63 percent never made any resolutions, the company's research showed.

Things aren't much better overseas. A recent study from the United Kingdom revealed that nearly two-thirds of respondents abandon their resolutions within a month.

The goal of resolutions is to improve - yourself, your career, your health, your family. Goal-setting is good for the mind, and research shows that having a specific goal not only inspires action toward that end, but increases the chances of completing that goal, because neurons in the brain are rewired to that purpose.

Speaking of the brain, Americans apparently can use some help on that front. A recent Gallup poll shows that only 31 percent of Americans consider their mental health to be "excellent," the lowest rate recorded in polling in more than two decades. Perhaps making plans for the new year can improve that aspect.

If health - mental or otherwise - is at the top of your list for 2023, researchers at Northwestern University recommend starting with sleep.

"Sleep is closely tied to weight, blood pressure, blood sugar and even what we choose to eat," said Dr. Donald Lloyd-Jones, chair of the department of preventive medicine at Northwestern University Feinberg School of Medicine.

Fitness and exercise are some resolutions that are easy to take up and to stick with, in part because of the wide variety of outlets. Fitness can include a simple stretching routine at regular intervals, suited to whatever your schedule and determination decide. Exercise can extend to high-intensity workouts or training for a long-distance run.

Just as there's no ceiling for how far you're able to push your body for fitness, there's no floor as well. Every step you take is a move forward from the stationary position where you started. And exercise improves overall mental health, combatting anxiety, stress and depression, according to scores of studies.

If stepping up your game in the workplace is on your list for 2023, you're far from alone. A recent poll commissioned by CSU Global and undertaken by OnePoll shows 56 percent of Americans want to make gains in their professional career in 2023.

How can you accomplish that? Essentially the same way you'd approach any resolution: making a plan, researching the steps and adapting your behavior. Goals, professional development and reaching out to others are the steps most people take to gain a foothold at work.



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*A Sound Plan Gives Strength to New Year's Resolutions Continued*

Here are some pros and cons about New Year's resolutions:

**Pro: You're motivated to do better**

Resolutions provide motivation to accomplish something, and a roadmap to improvement or betterment. Few people decide to increase behavior that's harmful; for instance, far more people commit to quit or reduce smoking than decide to take up or increase smoking.

**Con: Outside forces can limit your goals**

If a resolution relies on cooperation or contribution from outside forces, it could end unsuccessfully. Vowing to increase your pay depends on outside forces in the workplace (unless you're self-employed or manage your own salary). Saying that you'll eat healthy in the new year might not take into account all of those business trips that lead to airport dining or lunch meetings with little time left to work off the calories.

**Pro: Successful resolutions open the door for further growth**

Having a reasonable target not only requires you to give serious thought to your plan, but also factors in points where you might stumble on your way. Resolving to lose weight might lead to better meal planning, shopping habits and improved culinary skills.

**Con: High expectations can harm your success rate**

Setting goals that are too ambitious might lead to an early exit, or disappointment in failure to reach the overreaching goal. Cut yourself some slack and build in break times so the resolution doesn't wear you down mentally. That could lead to reluctance to set goals in the future.

As with any effort, it all starts with determination and a roadmap. That can give you one resolution to accomplish almost immediately: Make a plan!

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## Spring 2023 Education Committee Report

The Education Committee learned a lot over the last year and are excited to implement these lessons in 2023. Last year we set goals to streamline the scholarship program and will be following the goals this year. During the conference this year we learned even more about how NOT to do a golf tournament. While it went well, there are a great number of lessons learned and we are excited to try better next year. That said we are very proud of what we accomplished:

- We had the largest number of participants to date in our Field Forum
- Successfully completed a golf tournament again as apart of the annual conference.
- Raised nearly \$28,000 during the conference for the WMCEF
- During the last quarter of 2022 and first part of 2023 members of the UCLS and the education committee participated in approximately 15-20 outreach events including Trigstar kick off meetings.
- Applied to the Governor's Office for official recognition of surveyor's week. We are waiting to hear back.
- In January we met with the State Education CTE coordinator and will be looking to meet again and talk more about presenting surveying in schools.

We look forward to what the next part of the year brings. Over the next month we will:

- Get all our outreach materials posted on the UCLS website.
- Reach out to our Chapters about presenting at a luncheon on surveying outreach strategies.
- March 25th we will be at the Clark Planetarium, where they have invited us to present on surveying and recognize surveyor's week.
- In April we will be announcing and promoting our scholarships applications.



## 2023 UCLS Legislative Consultant Recap

Ryan Peterson - Peterson Consulting Group

On March 3rd, the 2023 Utah legislative session adjourned “sine die”, which, for those of you who aren’t familiar with that term, means without any future date being designated. It is the fancy way for the legislature to end the legislative session at midnight on the 45th day. This session saw the appropriation of a record \$29 billion dollar budget and several very impactful policy decisions. For the first time in recent memory, the legislature finished their business a few hours early, and many legislative leaders have said in the press that they felt that this was the most impactful and effective legislative session the state has seen in years.

The session started with a bang as the legislature passed bills dealing with transgender youth medical care and a school voucher program. Issues with significant press and public interest are typically saved until later in the session while stakeholders work out their differences. This year the legislature sent a message right from the start, letting people know that they were not going to spend the entire session on a few hot button issues. Similar to last year, water was also a major topic for the legislature as the state experienced another difficult drought year and the levels of the Great Salt Lake continued to drop. Even with record snowfall, the legislature wanted to make sure that the citizens of the State of Utah knew they cared about the water situation in the state and that they were willing to put their money where their mouth is on the issue. With the strong economy in the state, the other major issues on the hill this session was tax cuts. There will be a nearly \$800 million tax cut that Utahns should see on income, gas, and social security.

There were a few issues this session on the hill that were impactful to the land surveying profession that we were able to work on with the UCLS Legislative committee and UCLS leadership. UCLS and their representative on the hill were able to connect quickly with legislators and other organizations to ensure that the interests of professional land surveyors were protected. While land surveying is important to so many sections of Utah State code, we wanted to point out a few of the bills that we worked on during the session that UCLS was directly involved in on behalf of its membership.

-Senate Bill 219 Criminal Trespass Amendments. This was a very interesting bill for UCLS to be participating in. Skinwalker Ranch is a 512-acre property located in Uintah County. It is known for numerous reports of paranormal and UFO activity and was made famous with several episodes about the ranch on Netflix. The owners of the ranch were working with Senator Ron Winterton to pass a bill to discourage people from flying over their property and using

technology to gather information about it by making it a criminal trespass. Unfortunately, an unintended consequence of the bill would be that any surveyor using a drone, LiDAR, or any other technology would be in violation of criminal trespass for any incidental information gathered on an adjacent property in the process of doing their contracted work. UCLS was able to meet with Senator Winterton and legislative staff multiple times in order to get the bill substituted in a way that protected Professional Land Surveyors. UCLS also met with government organizations, the insurance industry, and Google Fiber and Google Maps, to build a coalition of interested parties in order to amend the bill in a way where privacy was protected, but surveyors were also able to do their work without fear of being charged with Criminal Trespass.

-House Bill 351 County Recorder Modifications. Representative Jordan Teuscher introduced HB351 with the intention of establishing some uniformity throughout the state by creating the County Recorder Standards Board. This bill ended up being quite controversial and by the time it was passed and sent to Governor Cox, it had been significantly modified 5 times. This bill was supported by UCLS as long as one of the board members was a UCLS member that is appointed by the board. We worked with Representative Teuscher to ensure that through all of the iterations that the UCLS remained part of the board. That goal was accomplished, and while the bill took on a number of different changes, the UCLS representation was never questioned.

-House Bill 406 Land Use, Development, and Management Act Modifications. Every legislative session there is a large LUDMA bill that is worked on all session. This year it was a 2100 line bill dealing with a number of significant issues related to land use. UCLS is always very aware of what is being done in these sections of code. The issue of boundary line agreements and lot line adjustments is often a topic when drafting this legislation. UCLS was able to use their relationships with the Land Use Task Force to amend portions of this bill to ensure that the interest of professional land surveyors were protected in the final draft.

UCLS is a strong, respected organization on Utah’s Capitol Hill. It is vital that the organization stay involved and that their voice is heard on many issues facing the state. We will remain engaged throughout the interim and make sure that we are heard as topics are being negotiated moving towards the 2024 legislative session.

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## Legislative Committee Report

Dave Hawkes, P.L.S. UCLS Legislative Committee Chair

The Legislative Committee got off to a late start this year as we found ourselves without a Lobbyist, however, Peterson Consulting Group was once again retained as our consultant just prior the start of the Legislative Session and did a great job representing us at the Capitol.

There were several bills introduced this year that have an impact on our profession, listed as follows:

**SB 219, Criminal Privacy Violation Amendments:** Introduced by Senator Winterton.

This bill as introduced raised some grave concerns for the profession and our ability to capture and use data in the course of our work. This bill as introduced would have had a negative impact on our use of Drones, Lidar, Aerial Photography and the collection of data across property boundaries.

Through a concerted effort by members of the UCLS Board, the Legislative Committee, the Peterson Consulting Group, and others we were able to get this bill amended to exclude surveyors.

(7) (a) This section does not apply to lawful practices of:

(i) a law enforcement agency; or

(ii) another government entity.

(b) Subsection (3)(d) does not apply to a land surveyor if:

(i) the land surveyor is performing a survey service in good faith pursuant to a Bonafide contract; and

(ii) for any data pertaining to property not owned by a party to the contract described in Subsection (7)(b)(i) that is captured incidentally by the land surveyor, the land surveyor:

(A) does not share, publish, sell, or distribute any incidentally captured data pertaining to property that is not relevant to the contract described in Subsection (7)(b)(i); and (B) upon completion of the contract, deletes or destroys any data pertaining to property that is not the subject of the contract.

**SB 174, Local Land Use & Development Revisions:** Introduced by Senator Whyte

We did not have much of an opportunity to give comments on this bill. It was introduced at the last minute without our input in its original form. This bill would have required the preparation of an Amended plat if a Lot Line Adjustment was done. However, the bill was amended to exclude the need for an Amended Plat with a Lot Line Adjustment. We are not certain how or by whom the requirement for the plat was removed but, I will give credit to Ryan Peterson, of the Peterson Consulting Group, as the change came after he became involved and had conversations with the parties behind this legislation. In my opinion this turned out to be a positive bill with much needed changes to the Land Use Code and getting subdivisions approved.

If I may humbly add a note of admonishment here. Please take the time to read and get acquainted with this bill, its changes to the code, and the effective dates. The survey community does not have a stellar reputation with some of the main drivers of this bill. We have been working hard to get a seat at the table and made great headway last year but found ourselves excluded again this year, even after reaching out to them during the interim period. Please become intimately familiar with the Land Use Codes and comply with them, learn the difference between, and the proper use of a Boundary Agreement, Boundary Adjustment, Lot Line Adjustment, etc... Our lack of understanding, or unwillingness to comply, has caused heartburn with some powerful groups and resulted in our being left out of the process.

**HB 433, Public Land Geographic Data Amendments:** Introduced by Rep. Spendlove

While we had nothing to do with this bill it is one to be aware of. This bill requires the Utah Geospatial Resource Center to make available online certain information about publicly owned land. As many of you know, it is very difficult, in several jurisdictions, to find ownership of publicly owned property, this should fix that problem.

Lastly, the bill that I personally am most excited about, which should bring County Recorders into conformity with one another is;

**HB 351, County Recorder Modifications:** Introduced by Rep. Tuescher.

This bill established the County Recorder Standards Board for the purpose of making rules that establish statewide standards for county recorders; requires counties to establish an appeal authority to hear and decide appeals from a county recorder's application of rules made by the board; requires county recorders to comply with the board's rules and the county's appeal authority; describes the membership and appointment of board members; requires the Department of Commerce to provide staff support to the board; requires the board to report annually to the Legislature; and makes technical changes.

This bill was touch and go toward the end of the process but ultimately prevailed with two day left in the session. The UCLS Board will appoint a board member who will serve a four-year term. It is my suggestion that the person chosen should either be an active member of the Standards and Ethics Committee or the Legislative Committee.

I would like to personally give my thanks to Devron Anderson for his work on HB 351 and the interactions he had with Representative Teuscher in getting a member of the UCLS on this board. I'd also like to thank Bahy Rahimzadegan for bringing this bill to our attention early on and keeping us up to date on its progress. The UCLS Board, Legislative Committee, and the Peterson Consulting Group corresponded tirelessly as this bill moved through the process keeping an eye on changes and seeing that our representation was not compromised.

I feel that this is an appropriate place to add that my company Boundary Consultants initiated a law suit against the Davis County Recorder last year over their requirement to either write descriptions using NAD 83 bearings or to provide a rotation to NAD 83 with your description. We prevailed receiving a Summary Judgment against the county and their interpretation of Section 57-10-11 of the Utah Code, albeit they still have until March 21st to file an appeal. It is my hope that with the passage of HB 351 that the arbitrary interpretation of codes by some of the 29 county recorders will end and that there will be consistency throughout the system in the application of code.

We as surveyors still have many areas of concern over the code that affects not only our profession but that of our clients and the public at large, along with future code still to be written. I would like to extend an invitation to all, licensed or unlicensed, to actively participate in the Legislative Committee. Help protect our profession and those we serve. Email me at [Dave@boundaryconsultants.biz](mailto:Dave@boundaryconsultants.biz) if you would like to participate. We have been mostly idle throughout 2022 but will begin to start meeting on the second Tuesday of April and each month thereafter at 5:30 pm either in person or by ZOOM.

I am grateful for the opportunity I have to serve on this committee and express my heartfelt gratitude to those who have selflessly served and to those who will serve on this committee.

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## Chair's Message Spring 2023

by: Andy Hubbard

As I reflect on my career in surveying, I look back to when it really began. Was it the day I started at a civil engineering and land surveying company instead of an architectural firm after I completed my drafting degree, or was it when I went back to school and started taking surveying classes from Salt Lake Community College, or was it after working hard and passing the PLS exam and getting licensed? Those are the defining milestones along my path to where I am today. However, I believe it was the first time I held a level rod for my father, a general contractor. He was trying to construct a building on Hill Air Force Base in the mid 80's but there was a ground water issue. With every footing hole they dug, they filled with water. It needed to be monitored daily to determine any changes, so on the weekends he would take me with him to "hold the rod." Turns out the water tank uphill of the site was leaking rather badly and, once discovered and turned off, the ground water dried up, allowing the construction to progress. But that, as a 9-year-old boy, was my first introduction to surveying. I just did not realize it. Now I am surrounded with many mentors and peers who have helped me along the way, many of whom I was able to see and connect with at our annual conference. It is always nice to get together to see familiar faces and make new acquaintances and understand our history while learning and expanding our professional knowledge.

This year's Annual Conference just finished up in St. George. It was a little earlier than we typically hold it due to some scheduling conflicts with the Dixie Center, but attendance was good. The weather was also what we have come to expect for Southern Utah in February, a bright sunshine and 50–60-degree weather. While there were some hiccups and differences for the overall experience with the meals and Wednesday afternoon sessions, I felt overall it was an informative conference, but lessons were also learned on what should be done each year. As we begin to prepare for the 2024 conference, I would encourage you to plan on attending and putting it on your calendars for February 21-23, but also to get involved with the conference committee.

When I was first licensed and became a member of the UCLS, I was not aware of the full benefit of membership other than it was a discount on the conference. Now, after serving as the Golden Spike Chapter President and now State Chair, I have realized many people devote their time and talents to promote and protect the surveying profession in Utah. One of the best ways this happens is by members serving on committees. Within the Amended and Restated Bylaws of Utah Council of Land Surveyors (UCLS.org) in Section 3.16, it creates our Standing committees, each with its own focus and purpose.

**Executive Committee.** This Committee shall consist of the State Chair and those members of the Board of Directors who are Chapter Presidents. The Executive Committee, when the Board of Directors is not in session, shall have and may exercise all of the authority of the Board of Directors except that the Executive Committee shall not have the authority of the Board of Directors in reference to providing for the sale, lease or other disposition of all or substantially all of the property and assets of the Corporation otherwise than in the usual and regular course of its business, providing for a voluntary dissolution of the Corporation or a revocation thereof, or amending the Bylaws of the Corporation.

**Legislation Committee.** The principal duties of the Legislation Committee shall be to plan and pursue ideas for state legislation that is OR attempt to prevent state legislation that is NOT in the best interests of the public health, safety, and welfare, or the profession of surveying and the Corporation.

**Education Committee.** The principal duties of the Education Committee shall be to plan, promote, and implement formal surveying educational programs including workshops, seminars, and forums (e.g.: CST program); standardize continuing education units; and to oversee the administration of the Corporation's scholarship program as directed by the Board of Directors.

**Publication Committee.** The principal duties of the Publication Committee shall be to prepare newsletters, press releases, articles, and other announcements for the purpose of educating the membership and improving the public image of the surveyor and the practice of land surveying and to recognize Corporation and individual achievements and events.



*Chair's Message Spring 2023 Continued*

**Conference Committee.** The principal duties of the Conference Committee shall be to plan, prepare, and implement the Corporation's annual conference.

**Standards and Ethics Committee.** The principal duties of the Standards and Ethics Committee shall be to review and act on all complaints from surveyors and the general public involving surveying or surveyors' ethics, advise the Division of Occupational and Professional Licensing (DOPL) upon request, and to prepare, maintain, promote, and implement a Standards of Practice manual.

**Historical Committee.** The principal duties of the Historical Committee shall be to collect, acquire, protect, and preserve the history and artifacts of the Corporation and the land surveying profession for the purpose of display, reference, and education by establishing and maintaining a repository of records, a survey reference library, and a digital and written history of the same.

**Membership Committee.** The principal duties of the Membership Committee shall be to recruit and retain membership in the corporation, promote the profession and the benefits of membership, evaluate and implement programs to that end (e.g. TrigStar, BSA merit badge), maintain a current membership roster, and to generate periodic licensed surveyor and survey technician salary and benefit comparisons.

A few of these committees are strong and function as described, while others are sporadic. I know there are many of you who would ask what does the UCLS do for me? I would paraphrase President John F. Kennedy and say, "Ask not what the UCLS can do for me but what can I do for the UCLS." All kidding aside, we function as a voluntary organization, and we need volunteers for our committees.

Do you enjoy the maps on the calendars at the conference, or the history of surveying? Contact Matt Clark. He is the Historical Committee chair and would love some additional members. Do you want to help ensure there are surveyors ready to take over when you retire? Contact Trent Williams with the Education Committee. They have been reaching out in amazing ways to make the next generation aware of surveying. Do you prefer to promote the UCLS organization? Tyler Harper is eager to meet you and get the Membership Committee moving toward reaching its potential. Have you ever thought, "I would like to share my experience on this project, and maybe write up a paragraph or two on this and send it out to the membership," especially with a unique or complex solution? Steve Keisel with the Publication Committee is always looking for articles and information to include in the newsletters. The Standards and Ethics committee creates model standards for surveyors in Utah, helping ensure we follow the codes and rules we are licensed under. Evan Wood is the committee chair and is happy to welcome you. Or are you more of an event planner? Do you want to help pick the food, topics and sessions for the annual conference? Then the Conference Committee can use your help. James Coutts is the committee chair. Finally, the Legislative Committee is actively engaged in reviewing proposed bills and passed legislation affecting the Surveying profession. I would encourage you to contact David Hawks and get involved.

Each of these committees needs members like you. When you become a member of the UCLS, you have the option to check which committee you are interested in. Do more than check a box and forget about it. Each of us has some reason we got involved in the surveying profession. If you are like me, it has been a wonderful experience that I want to share with others, which is why I got involved. I encourage you to do the same. Time is finite, and we all have obligations outside of our profession. I am asking for just a little of that time to share with others.

Since I was sworn in as the State Chair of the UCLS, I have been busy working with the Legislative Committee and our legislative consultant on the proposed legislative bills during the session. It was interesting, fast, enlightening, frustrating, and rewarding. I have also been working with the Education Committee on the results of the fundraising efforts from the conference, and what they have planned for the coming year. The Membership Committee has a new chair who is excited to work with members to increase and retain our membership to build a stronger organization. The Standards and Ethics committee has finalized a set of Model Standards for Condominium Plats. This will be like our Subdivision Plat model standards and, once approved by the board, will be sent out to the membership. The Historical Committee and Education Committee are working on getting an exhibit set up at local museums to highlight the history of surveying in our state. Finally, the Publication Committee has prepared the Foresight magazine and is working on the next newsletter.

*Chair's Message Spring 2023 Continued*

I would encourage you to review each of the committee reports included in this issue, along with the legislative consultant's report of the work he completed during this year's legislative session. I have made good friends, stumbled, and learned many things since I was licensed, and when I first got involved at the chapter level it was no different, but I have learned that while I can do a lot, I am not able to do it all, I need others to help me. I hope I can continue to serve on committees throughout my career and when the time comes, to help when asked.

In conclusion, I have a few quotes I would like to share with you...

"We make a living by what we get, but we make a life by what we give." - Winston Churchill

"I am only one, but I am one. I cannot do everything, but I can do something. And I will not let what I cannot do interfere with what I can do." - Edward Everett Hale

Please consider how the Profession of Surveying has helped you and see if you can find a little time to volunteer on one of the committees.

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### Walter Marvin Cunningham

1952-2023



Walter Marvin Cunningham, 70 years old, died on January 15, 2023, in Cottonwood Heights, Utah. He was born on December 23, 1952, in Landstuhl, Germany, to Charles Leonard Cunningham and June Brown. He grew up in Alaska, and was living in Anchorage at the time of the 9.2 Alaska earthquake, which destroyed his family's restaurant, after which his family moved to Soldotna on the Kenai Peninsula. In 1970 he represented the State of Alaska at the American Legion's Boys State and Boys Nation. At the age of 18 he joined The Church of Jesus Christ of Latter-day Saints, and later served in the France-Belgium mission.

He worked in construction of the Alaska Pipeline, fought forest fires for the BLM, and worked as a commercial fisherman. He served in the U.S. Air Force, where he attended the Defense Language Institute learning Spanish and became a Voice Processing Specialist, or linguist. He graduated from Brigham Young University with a degree in Cartography. He worked for many years as a land surveyor, and became an Associate Professor at Salt Lake Community College, where he headed the Land Surveying and Mapping program. He was

a member of the Utah Council of Land Surveyors, and received the Surveyor of the Year award in 2006 and the Lifetime Achievement Award in 2017.

He married Ronda Read on April 9, 1988, in the Jordan River Temple in South Jordan, Utah. He served in many Church positions, including Primary music director, Primary and Sunday School teacher, scout leader, and stake executive secretary. He is survived by his wife Ronda Cunningham; his children Celeste Cunningham, Jeremiah Cunningham (Adriana Susana), James Cunningham (Heather Mathiesen), Charity Cunningham, Nathan Cunningham (Valerie), and Matthew Cunningham; his brother Charles Cunningham; his sisters Carol Cunningham and Janay Clanton; 16 grandchildren; and one great-granddaughter. He is preceded in death by his parents and his brother Ralph Cunningham.

In lieu of flowers, the family suggests contributions to the Walter M. Cunningham Education Foundation at [wmcef.org](http://wmcef.org) or [ucls.org](http://ucls.org).

Funeral service will be held on Saturday, January 28, 2023, at 11:00 a.m., at the Greenfield chapel, 6634 South Greenfield Way, Cottonwood Heights, UT 84121. A viewing will be held one hour prior to the service, and also on Friday, January 27, 2023, from 5:30 p.m. until 8:00 p.m. at Memorial Cottonwood Mortuary, 4670 S. Highland Dr., Holladay, UT 84117. Interment will be at Memorial Lake Hills Cemetery.

**Morris Carl Larsen**

1937-2022



Mesquite, NV - Morris "Carl" Larsen was born February 28, 1937 in Salt Lake City, Utah and passed away December 4, 2022 at Dixie Regional Hospital. He was 85. He is survived by his wife of 52 years Marilyn, daughters Cori (Gary) Hogan and Michelle McGaughey, and step-children Greg (Charlene) Waters, Doug Waters, and Shannon Waters, and sister Jane (Craig) Booth. Preceded in death by his parents Fred and Elaine, first wife Cora "Mickey" Parker Larsen, son Steven Larsen, stepson Butch Waters, brother Fred (Pat) Larsen, and sister Elaine McBride. Also survived by three generations of grandchildren - at last count it was 40!

From an early age, Carl displayed a natural athletic ability and was a three-sport letterman at West High School in Salt Lake. He was selected as a southpaw pitcher out of high school to attend rookie training camp for the Brooklyn Dodgers and went on to play semi-professional baseball for a short time. If baseball was his first love, golf was his second. He picked up clubs in the early 70's and never looked back. He had the short game of a sniper and the trash talk to match. He was an avid bowler and served as president of the Salt Lake City Bowling Association and was a national director on the American Bowling Congress. Inducted Salt Lake Bowling Association Hall of Fame in 1990. After moving to Mesquite, NV in 2001 he became active in the Mesquite Men's Bowling League and continued his short game prowess on golf courses surrounding his home. He enjoyed watching sports of any kind, right to the very end. If it involved a ball, he was still watching, picking teams, and placing bets.

After his short stint in the baseball minor leagues, he joined the Navy and learned his trade in the sea Bees as a surveyor. He made a career of it and eventually partnered and owned his own business, Larsen & Malmquist Consulting Engineers & Land Surveyors. He was elected to multiple terms as the Salt Lake County Surveyor starting in 1974 and founded the National Association of County Surveyors, an affiliate organization of the National Association of Counties.

Carl was an avid member of the Democratic party. He had the gift of gab and never met a stranger that didn't become a friend, even for just that moment. His kids teased him that he was "always running for office." He had a servant's heart and gave his time freely to civic and sports groups and taught his kids to vote and volunteer and did this by example. He was a longtime member of the International Footprint Association and put his heart and soul into the many hours he served.

His ashes are blessing the greens in Mesquite, where he undoubtedly dropped a few long putts on his golf group, earning the coveted 50 cent skin. A celebration of life will be held at the Mesquite, Nevada Veterans Center on February 25, 2023 where friends may call anytime from 1-4pm.

## The Business Ethics Field Guide - Part 5 Suspicious Without Enough Evidence

By: Brad Yarbrough

*This series features 13 articles from Brad Agle, Aaron Miller and Bill O'Rourke, co-authors of The Business Ethics Field Guide. Each article focuses on a common work dilemma, while providing real life examples and insightful solutions. For more information, please refer to the cover story in the August 2021 issue.*

How many times have you sensed that something must be wrong, but you weren't entirely sure? This dilemma is not about how you stop something; it's about how you discover if there is something that should be stopped. Of course, the way you investigate matters. Looking into potential wrongdoing often appears to be an outright accusation, so tact is required.

The first question is to ask if you are the right person to investigate. If not, maybe your responsibility is to be sure an investigation is conducted by a more appropriate person. The investigator must be experienced with the issues and have a strong reputation for fairness, especially if the results are likely to become public. Remember, by selecting that person you will likely be jointly responsible for the results, so be careful in that selection.

Additionally, consider confidentiality. If others have a need to know, tell them an investigation is occurring. Sometimes it can begin confidentially, but as soon as a likelihood of misconduct is uncovered, give them a summary as soon as practicable. Likewise, be careful not to share the information with the wrong people (those who have no need to know about the investigation). Remember that at the "right" time, the accused parties should have a right to confront the evidence.

### A Case Study

An anonymous allegation was made on the company's compliance telephone line that a Plant Manager in Australia was spinning the safety results. Our company received 1,200 such calls annually and about 90 percent had little to no substance. However, every complaint was investigated.

I sent the manager with the company's best safety record keeper to Australia to investigate. She called a week later and informed me of 50 unreported incidents. Most were minor first aid cases, but four were more serious, recordable cases. She spoke with the victims and the safety manager. In each case, they were instructed by the Plant Manager, not to report the incidents. When confronted, the Plant Manager denied the allegations but could not refute the evidence.

These facts were reported to the Operations leaders of the company. They invited me to a meeting in New York City where they asked if the company had to fire the employee in question. I responded, "No, he's already fired himself. Now 60,000 employees are watching you to see what you do about it."

The Plant Manager was terminated and of course, all the employees noticed. In fact, the Operations leaders who made the final decision enhanced their personal reputation for supporting and reinforcing the safety value of the company.





*Business Ethics continued***The Right Questions**

Here are some critical questions to ask when suspicions emerge:

Who is accountable for solving the problem? Once they are identified, bring them into the discussion and keep them advised. It may be appropriate to hand the responsibility for the investigation to them.

What if the allegations are true? What if they are false? Ignoring allegations that turn out to be true can have harmful results and might create a bigger mess that needs to be rectified. The consequences of ignoring an allegation could be serious and potentially make you complicit in the conduct. Treat allegations as just that and not as facts. Putting too much credence on allegations could bias an investigation or destroy a reputation, even if the excused is exonerated.

Are the accusations reliable? Did the accusation come from a trustworthy source? Does the accuser stand to gain from their claims? Even reliable accusations may be explainable or excusable. Most investigations will reveal three or four sides to a story. Keep an open mind to the facts and the reasons for the conduct.

**Some pitfalls**

Be careful of the following traps:

- Acting hastily. Acting too quickly is a common mistake. Gather the facts quickly, then act.
- Delaying action. Don't delay the investigation nor the action. Delaying or not acting is acting. It will cause confusion in the organization or will be seen as condoning the behavior.

- Avoid Bias. Bias and the appearance of bias must be avoided as much as practicable. Be careful to be objective in describing the program, in charging the investigator and in reviewing the information. Be as factual as possible in the explanations.

- Not Gathering Sufficient Evidence. To maintain credibility, be thorough. Try to corroborate the truth. Be thoughtful and deliberate in every step of the process.

- Report Results Appropriately. Report results to the leaders who need to know the information. Know that there may be legal or policy reporting requirements. If the accused is exonerated, try to keep the accusation and investigating confidential.

**In Summary**

It's important to ask if your organization has clear rules for handling complaints. Does your organization have a culture of fairness? Should you anticipate that allegations will occur?

Allegations are unavoidable. Have policies and rules on who will investigate various types of allegations, who will review results and who will be made aware. Some organizations have a Compliance Department that handles these matters, while others use their auditors, lawyers or human resource professionals depending on the type of allegation. What is important is that there is a process and procedure in place.

Misunderstandings will occur in organizations. The best way to address them is by having an open, honest, fair culture where employees are encouraged to speak-up when they have questions and where leaders listen and respond to them.

**13 ETHICAL DILEMMAS**

Upcoming articles in this series will take a closer look at each dilemma.

- 1. STANDING UP TO POWER**  
Someone in power is asking you to do something unethical.
- 2. MADE A PROMISE**  
Conflicting commitments force you to choose.
- 3. INTERVENTION**  
You see something wrong. How do you proceed?
- 4. CONFLICTS OF INTEREST**  
Multiple roles put you at cross purposes.
- 5. SUSPICIONS WITHOUT ENOUGH EVIDENCE**  
You believe something is going on, but you're not sure.
- 6. PLAYING DIRTY**  
Achieving justice but by doing something unethical.
- 7. SKIRTING THE RULES**  
Bending the rule for a better outcome.
- 8. DISSEMBLANCE**  
Misrepresenting the truth for better outcome.
- 9. LOYALTY**  
Giving up ethical stance to protect valued relationship.
- 10. SACRIFICING PERSONAL VALUES**  
Living ethically might put burden on others.
- 11. UNFAIR ADVANTAGE**  
When opportunity exists to wield an unfair upper hand.
- 12. REPAIR**  
When you are responsible for a mistake.
- 13. SHOWING MERCY**  
You could grant forgiveness, but you don't know if you should.

## Thoughts on Professional Practice and Education

### Article 4: Business and Management in Education

by Knud E. Hermansen  
P.L.S., P.E., Ph.D., Esq.

This is the fourth article I have prepared in the series offering thoughts on professional practice and education. The focus of this article, I hope, will assuage some individuals that I offended by my last article and will give hope to friends that will see I am now writing with the sense that I appear to have lost with my last article.

I know I am not alone when I say I wish I knew as a young surveyor what I now know about running a business. I can stand in front of a dozen or more surveyors that run their own surveying business, some for decades, and discuss rules and regulations that by law apply to them. What I reveal shocks many of them as they realize the deficiencies in their knowledge and business practice. They were unaware or confused about rules and regulations they should be adhering to or should have adhered to when running their business.

I might quickly add, I will not claim to know the entire plethora of knowledge on government regulations as applied to business. Who would know all the governing rules except for the most dedicated bureaucrat or regulator? Sadly, the federal, state, and local governments continue to do their best to create more difficulties in starting and running a business - especially if you contract with the government.

The first time a surveyor hears the phrase 'cash flow' should not be during their first year of owning a business as they sit in their office, the time near midnight, the pay for employees due the next day. Having never heard of the term 'cash flow,' the new business owner cannot understand how they must pay sooner using what they won't have until later.

The new graduate that is checking into the human resource manager at the onset of their surveying career should not wonder what is meant by a 401k, employer match, vesting periods, and pre-tax contributions.

This missive is not meant to discuss politics or even the various subjects that may fall under the concepts of 'business' and 'management' education. Rather, the focus is to advocate that relevant business and management topics be presented to students studying in a four-year surveying program.

Faculty would be disappointed when collecting alumni data to discover graduates described their job title as 'survey technician' ten years after graduation. After ten years, the graduate is expected to be licensed and in management. Yet, many survey programs have failed to give students any relevant knowledge that would aid the graduate to take on management positions where survey graduates are expected to spend most of their professional careers.

I would opine the lack of adequate business and management courses in surveying programs stem from two conditions. The first condition arises because of the lack of business and management experience that faculty have. Many faculty do not have the experience, training, or knowledge to teach relevant business and management courses. Even survey programs at larger universities can't always draw on the business school faculty to help educate the surveying student in relevant business courses. While the business school faculty may be able to educate the surveying student regarding contracts, business entities, employee law, etc. topics such as mechanics liens, survey fee makeup, right of entry laws, road safety laws, Dig-safe, OSHA, federal contracting, and other such survey specific areas will not be covered in a course taught by the business school.

The second condition thwarting the introduction of business and management courses into a surveying program is the difficulty in fitting more courses into a surveying degree program. Universities limit the maximum number of credits for a bachelor of science degree. ABET accreditation requires certain courses and credit hours. NCEES has established topics covered in the FS exam that must be covered in the aca-

*Thoughts on Professional Practice and Education Continued...*

Finally, the university requires all students at the university take certain courses for the regional accreditation the university maintains.

If the reader will indulge me, I will get upon a soapbox regarding the last limitation mentioned - that is University accreditation requirements. I have found it frustrating that regional accreditation often requires courses such as diversity, artistic expression, humanities, and other general education courses popular among liberal arts faculty but worthless in a business or a professional environment. (Not all general education is dismissed by practitioners. Course such as communication and writing courses are the exception. These courses and their content are appreciated by employers.)

For 30 years I have examined hundreds of employment-surveys prepared by alumni and survey employers sent by the University for program self-improvement. In those 30 years and after review of hundreds of documents, I have yet to see a single employer or alumni say how useful artistic expression and similar courses have been toward their career. The mention of these courses is a common occurrence only under a category where alumni cite courses of no use in their life and wasted tuition money.

Having given my opinion, I now offer advice by suggesting professional societies that advocate for surveying programs also look at the courses in the survey program to ensure there are business and management courses that provide the graduate with the knowledge to become leaders in both the profession, community, and a surveying business.

\*Other books and articles by Knud can be found at <https://umaine.edu/svt/faculty/hermansen-articles/>

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Dear Terminus,

I have been married to a land surveyor for over 30 years now and I am at the end of my rope. I know that many wives have written about their husbands "wandering eyes" and inappropriate attention to any young woman who get within 100 yards. My husband's problem is boundary markers and property lines. We cannot walk down a city street without him searching for any old granite bound or brass marker at every street intersection. We cannot hike in the woods without him wandering off to stone walls in search of "stakes and stones" and "witness blazes". When we visited the Four Corners (Colorado, Utah, Arizona, and New Mexico), it was understandable, but every time we go out it's the same distraction. After all this time I thought he would get tired of constantly being at work as a land surveyor, but it only seems to get worse. How can I get him to spend more time sharing his life and attention with me and our family?

Frustrated in Utah

Dear Frustrated-

I hear from many surveyors' spouses with similar complaints (and not just women). It seems that surveyors believe that being a land surveyor is a full-time lifestyle choice and not a job. While I wouldn't call it a cult, it seems to affect many professionals in a similar way. Interventions from family may help and some surveyors have gained sharing and mindfulness skills when grandchildren come along. I also know that many older surveyors become less concerned with boundary things 10-15 years after retiring (others cannot kick the habit). It sounds like your situation should get better with time. Until then, one sure-fire way to keep his attention would be to put on an orange vest and grab a red and white pole - he will find that irresistible. Just remember - surveyor's right is your left and surveyor's left is your right.

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**Thinking On Our Feet: December 31 Marks the End of the U.S. Survey Foot**  
**Never Fear: The international foot is staying put**  
by: Jennie Lyons, NOAA



*Wooden ruler placed against a generic land map. On New Year's Eve 2022, NOAA and the National Institute of Standards and Technology (NIST) will retire the U.S. survey foot and replace it with the international foot. (Getty Images)*

NOAA and the National Institute of Standards and Technology (or NIST) are starting the new year off on the “right” foot.

On New Year's Eve, the two federal agency partners will officially retire the use of one of two measuring feet, to reduce surveying errors that can cost money.

Discontinuing the use of the U.S. survey foot and embracing of its replacement - the international foot - are also part of NOAA's modernization of the National Spatial Reference System.

“Officially retiring one of these measurements will reduce accidental confusion in engineering, surveying, mapping, agriculture and other industries that depend on accurate positioning,” said Juliana Blackwell, director of NOAA's National Geodetic Survey.

The difference between the U.S. survey foot and the international foot is tiny and barely noticeable in everyday use and function. But when it comes to measuring the distance between coordinates that span hundreds or thousands of miles, the difference can add up to several feet - and lead to costly errors and delays for various types of projects.

The U.S. began reconciling two slightly different versions of the foot in 1959, when it adopted a definition that differed just 1/100 of a foot per mile from the U.S. survey foot, established in 1893. The 1959 definition became known as the international foot because several other nations also adopted it at about the same time.

From this point forward, surveyors will refer to the international foot as simply the foot.

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**Salt Lake Chapter Report**  
by: Chris Donoghue

The Salt Lake Chapter would like to welcome our new chapter rep, Doug Kinsman and chapter secretary, Scott Bartlett. As a presidency, we are here to provide a pathway to the UCLS board with any comments, questions, suggestions, or concerns. My phone line and email are always available to any of you. I look forward to the upcoming year with a great lineup of luncheons starting in April. If anyone has any luncheon suggestions for the future, send them to Chris Donoghue ([christopher.donoghue@slcgov.com](mailto:christopher.donoghue@slcgov.com)) and we will see what we can do to facilitate the topic. If there is one thing we could ask everyone, it would be to get involved on a committee and get involved with our profession. Choose a committee that interests you and attend the monthly meetings. You will be surprised at how much can be learned, as well as taught at these committee meetings. Befriend your fellow surveyors, we all need each other to help push the surveying profession into the future.

I look forward to a great and productive year!



**Been There, Done That:  
Another Tale From a Country Land Surveyor  
“Them Hills, They Be Strange”**

by: Edward Goodrich, Jr., LLS 677

There probably isn't a single person reading my tale that has not heard about the Hatfields and McCoys. The famous Hatfield and McCoy Blood Feud of the Appalachians started just around the time our Civil War was supposed to have ended and the feud raged on until 1891. But, just like all disagreements, not all of them really end.

This legendary hillbilly feud started with some hard feelings about the blue and the gray and with a little hog thievery thrown in to keep things moving. Yes, they say that it ended in 1891, but people didn't get the two sides together to shake hands until 1976 and finally managed them to sign a truce treaty in 2003. Holding grudges came easy to people in the Appalachians.

This famous legend lives on. It was the basis for countless books and documentaries. Television glorified it with game shows like "Family Feud" and who can forget the "Beverly Hillbillies?" Making fun of people living in the Appalachians hills can be easy. Lest we forget, land surveyors frequently get out into the woods where some people live off the grid. Off the grid and off more than the grid.

I have come across some of the saddest hovels in the middle of nowhere. Once encountering a husband, wife and infant living practically in a cave. Not so hillbilly funny. One wonders how things happen?

On another survey adventure around forty-six years ago, I was driving around one old family farm with an elderly son riding shotgun to point out the various frontage points to me. It was a large farm in a rural area with several sections on different roads. We would drive up to a spot, he would point and describe to me what I could find for a corner and line at each stop. I would take some notes, get out, hang a flag and we would continue our adventure to the next corner. Kind of like a Mortgage Survey.

The last road was a Class VI narrow dirt road, looking more like a wide path as we headed down. There were no overhead utilities, but there were recent truck tire tracks. My passenger guide became restless as we slowly proceeded along.

He pointed out a corner of stone walls and told me the farm ended here, but picked up again on the other side of this small parcel. A small cottage with smoke coming out the top of the chimney was barely visible through the trees. I put the truck in gear, and my guide became more fidgety. He cleared his throat, loudly and looked at me, straight in my eyes and spoke curtly, "we're close enough!" I was young then and you've heard the old saying, "young and dumb?" I'll admit that I was young. We turned around.

We completed our adventure and returned to the farmhouse where I was handed a stack of deeds, mortgages, tax maps and sketches. Now I was off. My visit to the town hall and registry of deeds was soon followed by the field work. Everybody knew the farm family and were sad to see that they were selling out and leaving town. Well, almost everyone. Nobody told me "The Rest of The Story!"

We worked to survey around the property for a couple of days until we came to the old Class VI road. I can't swear to it, but the sky darkened up above when we got there. As a surveyor, I like things quiet. Just forest creatures, maybe some light wind and water sounds can be soothing. Grunts are not.

We started traversing around the little out parcel following the stone wall as my client had described. The boundary was heading back toward the road and was going to pass within about 60' of the little cottage. That's when we heard grunting. Not hearing any banjo playing, we continued.

*Been There, Done Tat: Another Tale From a Country Land Surveyor Continued...*

The grunting got louder as we neared the cottage. Soon we heard the addition of low volume cussing. I recognized many of the words. We reached the point on the wall that was opposite the noise maker. There it was. A man of small build, hard at work with only one hand, on his left arm. His right was moving, but had no hand. This woodsman was lifting 4' pieces of firewood onto his saw buck and then using a hand cross cut saw to create his stove wood.

Now remember, I told you I was young and something else or other. I climbed over the stone wall and approached the guy to let him know what we were doing. First mistake. At the time, I was wearing a brown khaki outfit, shirt, pants and hat, he thought that I looked like an official.

I started to walk up to him, saying hello, waving and offering my hand to shake. He puts down his saw and replaces it with his axe. Which he quickly raised. Over his head. At this point he speaks to me for the first time. "What you government men doing on my land?" I stopped my approach. Imagine that? I start to explain what I was doing and who I was working for. He stepped closer to me. Truly believing in Newton's Law of Motion, I took an equal number of steps backwards.

I am not the best of dancers, but fortunately I had all of the right moves that day. Talking to each other was going nowhere. The tango that we were doing was getting me closer to the boundary line wall and I was hoping that as soon as I got over it, I would be on sanctuary ground. I scrambled over the wall, backwards. I had my Hudson Bay cruising axe by my side, but somehow a reenactment of a medieval battle had little appeal. One of us may have ended up like the Monty Python's Black Knight. My assistant and I noticed that it was two o'clock and thought why not knock off early today.

Back at the truck, equipment stowed away, we headed into town. By a stroke of luck, there was a police cruiser at the town hall. The chief of police was in, and I asked him questions. He knew the wood chopper, best to leave him alone he advised. Too late for that.

The chief explained that the one-handed man lived alone in the cottage. He had lost his right-hand years ago in an industrial accident, his wife left him and he was pretty bitter about things. I believed that.

Apparently, he argued with anybody about everything. He used to have a hook on his right hand, but they had to take it away from him for public safety. Remember, we're in the Appalachian woods.

I explained to the officer that we needed to finish the job. The chief said that he would be there the following day to talk with the cottage owner and distract him while we surveyed the remainder of his line. Sounded like a plan to me. The fateful day arrived. The chief was quite a talker. We traversed quickly. No shots were fired. No creatures were harmed during this event. The survey and the plan were completed, my boss was paid and I have not been down that road since.

One final tidbit that I need to tell. That nervous elderly son of the farmer, I really wanted to talk to him in the worst way after this! My boss told me that it would be best not too. I was young, once.

The logo for "Mentoring Mondays" features the word "Mentoring" in a cursive script, with a surveying tripod symbol integrated into the letter "g". Below it, the word "MONDAYS" is written in a bold, blocky, distressed font.

This fantastic program is a weekly Zoom meeting featuring live Q&A's on your favorite surveying topics. Every Monday, the forum is hosted by a rotating series of guest speakers who are among the best in the surveying business.

[mentoringmondays.xyz](http://mentoringmondays.xyz)

## Do You Need Aerial Lidar for Survey?

If you've looked into drone surveying lately, or do drone surveying regularly, you've almost certainly heard the hype around drone-based Lidar systems, after all, it's hard not to get excited about flying robots with lasers! But seriously, advancements in technology have allowed drone Lidar price and system complexity to drop significantly from the 6 figure bespoke Lidar systems of "old". This makes it a much more viable option for surveying and you can actually see a quick return on investment in certain applications.

Is drone-based Lidar the be-all-end-all way to survey with a drone now? No. Is it revolutionary technology? Yes. Can it help **you** collect survey data more efficiently? It depends on your use case.

Much like a drone that collects photogrammetry data, the Lidar system is just another tool in your surveying toolbox. Each type of system has its own unique benefits and drawback. In fact, many drone-based Lidar systems of today collect both photo and Lidar data simultaneously, which can give you the best of both worlds. That being said, even those systems can be overkill depending on your typical survey site context.

Before taking the plunge into the world of drone Lidar data collection there are some things to thoughtfully consider to help answer whether or not a drone-based Lidar system is worth the added cost above photogrammetry systems for **your** surveys.

First, let's go over the fundamental differences between the two technologies.

### PHOTOGRAMMETRY VS. LIDAR What's the Difference?



Photogrammetry relies on photos, taken in succession usually at a nadir angle, with overlap to produce an orthophoto. A single orthophoto may consist of tens, hundreds, or even thousands of individual jpegs stitched together. In photogrammetry, photos are stitched together based on keypoint matches; similar points from photo to photo that the software identifies as a match. Very basically put, when distinct matches can be made, an orthophoto can be made. The quality of that orthophoto depends on many factors, such as lighting, overlap, subject area, GCPs, drone RTK capability (or not), and camera specs just to name a few.



*Do You Need Aerial Lidar for Survey? Continued...*

*Example of a single nadir image that might be taken during a photogrammetry mission.*

Lidar (Light Detection and Ranging) data, on the other hand, relies on laser pulses produced by the Lidar system. The system emits laser beams towards the subject area at a rate and pattern specific to whatever system is being used, but they all do the same basic thing. The sensor records each laser pulse that bounces back to it, this is known as a “return”. Each return is recorded as a data point with an x,y,z value as the drone flies and ends up as part of a raw point cloud. Most Lidar sensors can record at least a quarter-million returns per second (and that’s on the low end). Due to the number of individual data points being recorded, it is almost always necessary to have RTK positioning capabilities in order to produce high-quality Lidar data. Lidar quality depends on the RTK capability, GCPs, and the capabilities of the sensor itself. Unlike photogrammetry, Lidar does good lighting to produce good data. In fact, depending on the sensor, bright lighting can actually marginally decrease the quality of Lidar data.



*Screenshot of a Colorized Lidar Point Cloud*



*Do You Need Aerial Lidar for Survey? Continued...*

If you flew the same site with Lidar and Photogrammetry, the end deliverable might look somewhat similar, but the process of getting there is completely different. Photogrammetry data starts with photos taken from the drone, which then get compiled together and run through photogrammetry software to create the orthophoto/DSM. It's not until the photogrammetry processing is complete that a point cloud is produced from those keypoint photo matches mentioned earlier.

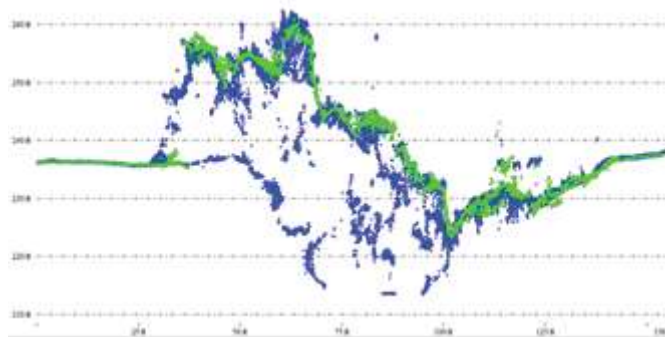
In contrast, Lidar data is initially stored as a point cloud with potentially billions of points as its raw output. The disadvantage here is that you virtually always end up with a ton more data than you probably actually need (you could potentially find the location of the 15th highest twig on a given tree if you'd like with a point cloud like this). Because of this, there is usually a fair amount of post-processing necessary to extract the data that's important to your project. The other disadvantage to Lidar is that it is almost always noisier, and less accurate than photogrammetry data in certain mediums. That being said, Lidar definitely has its utility in areas where photogrammetry just doesn't cut it.

So, when does Lidar make sense?

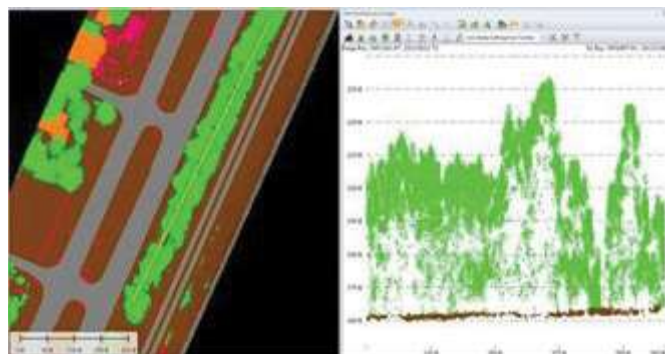
### VEGETATION PENETRATION

As mentioned earlier, photogrammetry relies on point matches from photo to photo in order to produce a complete orthophoto. There are certain surfaces, such as **tree canopies, tall grain fields, scrub brush, and other ground obscuring, homologous surfaces that make it almost impossible for a keypoint match to be accurately made from photo to photo. This is where Lidar data has a huge leg up on photogrammetry data.**

Since the Lidar data isn't relying on any sort of matching to represent the subject area like photogrammetry, it simply needs a viable surface to "bounce" its lasers off of. This is an important distinction because while a photogrammetry drone can only map what it can match from photo to photo, a Lidar system just needs to get one laser beam to bounce back off of a surface at any given time to have that surface represented in the point cloud, which is the advantage of using Lidar in vegetated areas for surface extraction.



*Cross/section of Lidar (Blue) vs. Photogrammetry (Green) in a heavily vegetated creek bed.*



*Another cross-section view of Lidar penetration beneath trees.*

*Do You Need Aerial Lidar for Survey? Continued...*

On that same note, most Lidar sensors will have the ability to record “multiple returns”. This means that every laser pulse has the ability to record not only the first surface it impacts, but the second, and even third, etc. depending on the sensor you’re using. The more returns being recorded per pulse, the better the vegetation penetration will be in virtually all cases.

**If you plan on mapping moderate to heavy vegetation, Lidar will be the best aerial tool for the job. Otherwise, ground shots should be taken traditionally beneath the vegetation.**

**HARDSCAPE/VEGETATION FREE MAPPING**

If most of your sites are clear or have pretty sparse vegetation/tree cover, photogrammetry will probably be your best bet. As touched on earlier, photogrammetry data tends to be of higher quality than Lidar data on visible hardscape features due to the ease of keypoint matching most hardscape features from photo to photo and having less noise than Lidar. **If you’re flying in an open urban environment, a shopping center, or even a housing tract without many trees and brush, Lidar may not be the best tool for the job.**

Using the Zenmuse L1 sensor, which collects both Lidar and photogrammetry data simultaneously, we have done completely controlled apples-to-apples data quality tests between the two types of data, and we’ve found that the photogrammetry data is better on sites without heavy vegetation and tree cover.

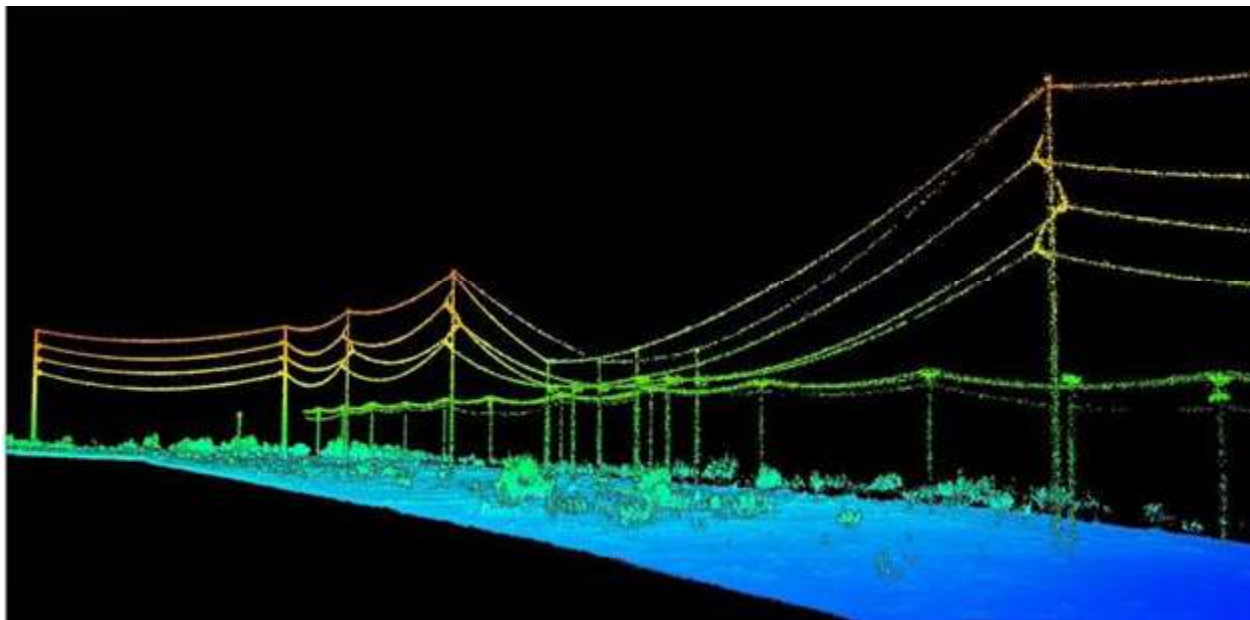
**If most of your sites fall into this category, an RTK-enabled photogrammetry drone would probably be a better investment than a Lidar system, however, there’s one more scenario to consider before counting Lidar out.**

**POWERLINE MAPPING**

If your drone survey project requires actual x, y and z locations of the powerlines themselves, Lidar is a MUST. Powerlines themselves, are almost never represented in a photogrammetry model accurately. Powerlines are often too thin and ambiguous to create reliable keypoint matches necessary for accurate photogrammetry.

Lidar, as mentioned, just requires a laser to bounce off of the wire and back to the sensor in order to create a data point on the wire.

**If you do powerline mapping, Lidar should definitely be considered.**



*Powerlines captured in L1 Lidar Mission*

*Do You Need Aerial Lidar for Survey? Continued...*

## THE VERDICT

While the above points can set you in the right direction, not everyone's applications are as simply categorized, and there will most certainly be more nuances that need to be discussed to ensure you're making the best decision for your business. At Aerotas, we take a holistic approach to help you meet your drone data processing needs and that often begins with assessing what aerial platform will work best for you and set your drone program up for profitability, reliability, and ultimately, success. If you have any questions or would like to learn more about how Aerotas can help your drone surveying program thrive, we'd love to hear from you! [info@aerotas.com](mailto:info@aerotas.com)

## KEY TAKEAWAYS

### Lidar is probably a good choice for Survey if:

- Many of your prospective sites have tree/brush cover where photogrammetry would not adequately extract good surface data.
- You need to survey x, y, z powerline locations.

### Lidar might not make sense if:

- Your project sites are typically cleared or very sparsely vegetated.

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## Where Is It?



Mike Herbst was the first UCLS member to correctly identify the location of our last "Where-is-it" competition. Mike was followed by Charles Heaton and Leon Day.

The Devils Slide, located in Weber Canyon near the small town of Croydon in Morgan County, is a classic example of how different rock layers, depending on their composition, are affected by weathering and erosion.

The sides of the slide are hard, weather-resistant limestone layers about 40 feet high, 25 feet apart, and several hundred feet in length. In between these two hard layers is a shaly limestone that is slightly different in composition from the outer limestone layers. This middle layer is softer, which makes it more susceptible to weathering and erosion, thus forming the chute of the slide.

Looking like a large playground slide fit only for the Devil, this site is a tilted remnant of sediments deposited in a sea that occupied Utah's distant geologic past. Approximately 170 to 180 million years ago, a shallow sea originating from the north spread south and east over areas of what are now Montana, Wyoming, and Utah. This sea extended as far east as the present-day Colorado River and south into northern Arizona.

Over millions of years, massive amounts of sediment accumulated and eventually formed layers of limestone and sandstone. In northern Utah, these rocks are known as the Twin Creek Formation and are approximately 2700 feet thick. About 75 million years ago, folding and faulting during a mountain-building episode tilted the Twin Creek rock layers to a near-vertical position. Subsequent erosion has exposed the near-vertical rock layers and created Devils Slide.