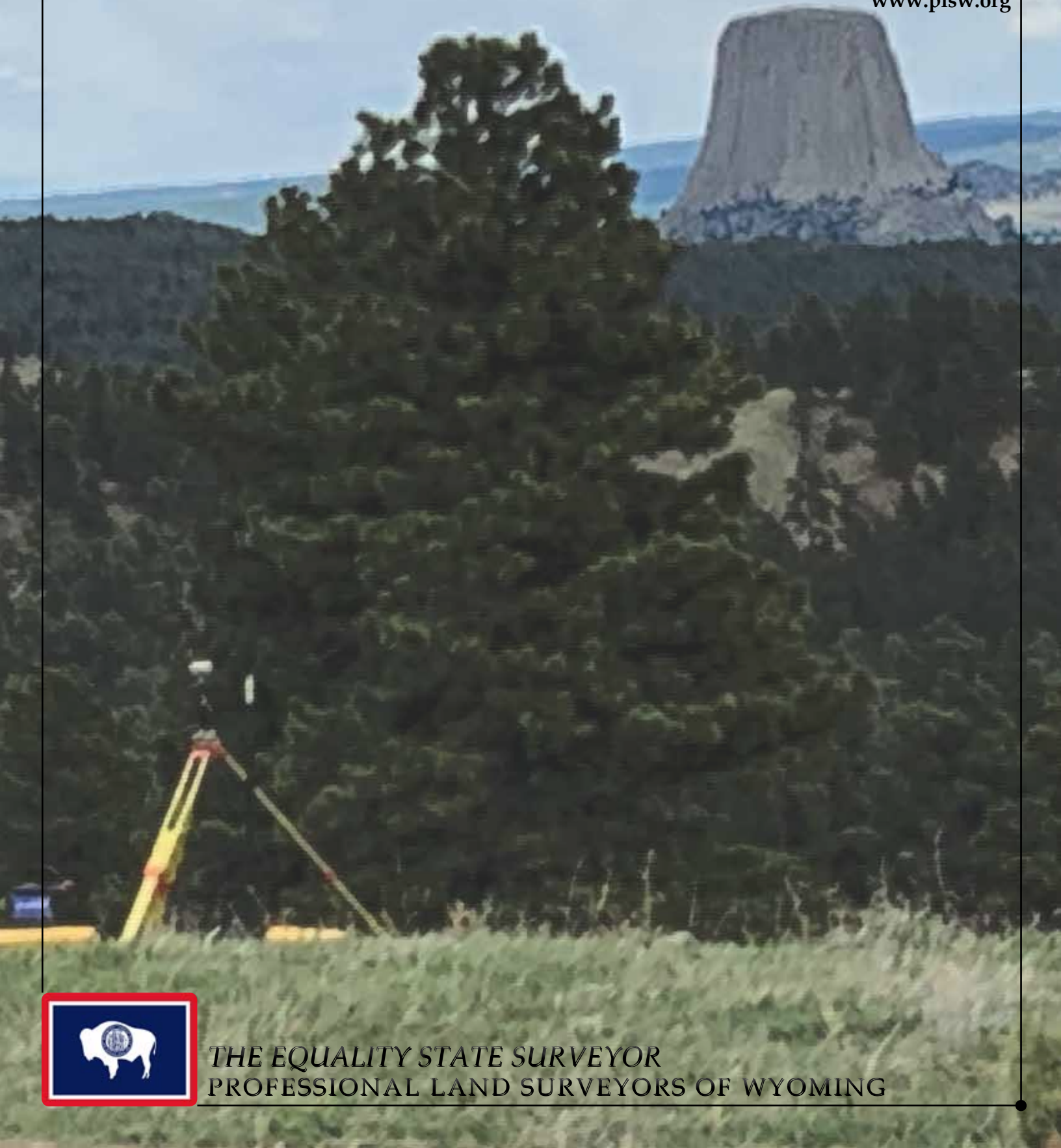


Volume 32: Issue 1  
January, 2021



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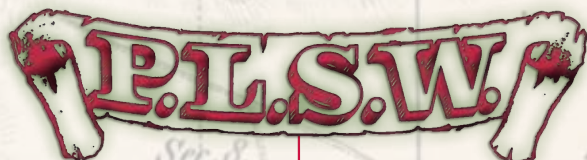
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On The Cover

Base station setup  
overlooking Devil's  
Tower

Original photo by  
Paul Heintz

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FOR LINES AND POINTS**

## 2021 PLSW SUSTAINING MEMBERS

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For more information please contact Jack Studley.

PLSW (Professional Land Surveyors of Wyoming; PO Box 8, Cheyenne, WY 82003) is a statewide organization of Land Surveyors registered to practice in the Equality State of Wyoming. PLSW is dedicated to improving the technical, legal, and business aspects of surveying in the State of Wyoming. PLSW is affiliated with the National Society of Professional Surveyors (NSPS) and the Western Federation of Professional Land Surveyors (WestFed).

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## PRESIDENT'S MESSAGE

Greetings everyone,

As fall has come and gone and we had in my opinion a successful Fall Technical Session. I would like to thank all those that made it come together and run smoothly. I realize this was not an ideal situation and I appreciate everyone's cooperation with this format. With any luck we will all be in person next year and not have to be dealing with a pandemic.

W.E.S. is just right around the corner and I would like to encourage everyone to sign up and make use of the classes we will have there this year. This will be in a virtual format this year and signup should start right around the January 1st. P.L.S.W. is funding a speaker so the format will be different from years past as we focus more on education rather than meetings this year. There is still a P.L.S.W. B.O.D. meeting at W.E.S. but the Annual meeting will be taking place at Fall Tech 2021.

WFPS is having a multi-state virtual conference in March as well! We are assisting on the Joint Conference Committee and could use a volunteer or two. Please reach out to Mark Corbridge or myself if you are interested in helping out with this. P.L.S.W. will be receiving a portion of the profits for our participation in it. The money we get will go to the Scholarship fund, since we did not hold a raffle at fall tech this year.

Cheers to everyone as we look towards a hopeful and joyous 2021.

I hope you all had a wonderful Holiday Season!

Brad Neumiller, PLS

President - Prefessional Land Surveyors of Wyoming

## ANNOUNCEMENTS

### CONGRATULATIONS!

The members of the Professional Land Surveyors of Wyoming would like to recognize the achievement of the following new Wyoming registrants:

Brad Oswald	Bailey, CO	LS 18173
Matthew Welinski	St. Cloud, MN	LS 18227
John Keller	Tulsa, OK	LS 18254
Jon Dittbenner	Broomfield, CO	LS 18256
Brandon Grove	Laramie, WY	SI 182

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### LINEs AND POINTS ARTICLE ROTATION SUBMISSION SCHEDULE BY CHAPTER

Responsible Chapter	First Call Date	Last Call Date	Publication Date
South Central Chapter	THANK YOU!! (SEE "BEHIND LOCKED GATES" IN THIS ISSUE)		
Southeast Chapter	March 1	March 15	April 1, 2021
Upper Platte Chapter	June 1	June 15	July 1, 2021
Southwest Chapter	September 1	September 15	October 1, 2021
Northeast Chapter	December 1	December 15, 2021	January 1, 2022
West Chapter	March 1	March 15	April 1, 2022
Central Chapter	June 1	June 15	July 1, 2022
South Central Chapter	September 1	September 15	October 1, 2022









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## New National Geodetic Survey Rocky Mountain Regional Advisor

It is with great pleasure that I was selected to become the new NGS Rocky Mountain Regional Advisor working out of the NOAA office in Boulder, Colorado. I have the honor to follow in the footsteps of Pam Fromhertz, who was the previous Regional Advisor as well as the Colorado State Advisor for many years prior to the regional transition. I have worked for NGS since 2002 and in 2013 I began working as a geodesist very closely with the advisor branch chief and the geodetic advisors. Working so closely with the advisors has helped me to appreciate how this job is a very important connection between NGS and our regional constituents. This job is essential in helping to inform our customers about the many things that NGS organizes, develops, and maintains for the National Spatial Reference System (NSRS) and other critical geodetic infrastructures. As a federal civil servant I am honored to have my primary duty be to inform and prepare the Rocky Mountain regional constituents. I look forward to working with all of you to prepare Wyoming for the modernization of the NSRS. I am a Rocky Mountain man at heart, having grown up in Colorado Springs and both of my parents were born in this beautiful region. As I adapt to my new role attending meetings, conferences, and webinars in Wyoming, I look forward to meeting all of you at these events virtually in the near term and in person in the future.

Brian Shaw



The best way to reach me is via email at [brian.shaw@noaa.gov](mailto:brian.shaw@noaa.gov) and you can find other contact information on the advisor website. <https://geodesy.noaa.gov/ADVISORS/>



## National Geodetic Survey Update

### NSRS Modernization Release Delayed

NGS has been working on developing and rolling out the modernized NSRS to replace the North American Datum of 1983 (NAD 83), the North American Vertical Datum of 1988 (NAVD 88) and the State Plane Coordinate System of 1983 (SPCS 83) originally planned for 2022. Due to various issues, NGS recently redetermined we were not going to be able to complete all of the things needed to release the new Reference Frames, Geopotential Datum, SPCS2022 and all of the tools and transformations needed for the modernized NSRS by 2022. Even though some components can be completed earlier, it was decided that it would be best to roll out all of the parts of the modernized NSRS together.

Read the Official Delayed Release Message here:

<https://geodesy.noaa.gov/datums/newdatums/delayed-release.shtml>

FAQs for this delay here:

<https://geodesy.noaa.gov/datums/newdatums/FAQNewDatums.shtml>

### Notable Dates and Deadlines

March 31, 2021 — SPCS2022 Deadline for Submitting Completed Designs

The SPCS2022 deadline for submitting requests and proposals has passed and was in March of 2020. The next deadline for submitting completed designs for the constituent defined zones will be March of 2021. The NGS State Coordinator Mark Corbridge has helped coordinate this effort for Wyoming. At this time it is expected that Wyoming will have one statewide zone, four NGS defined Transverse Mercator zones -- the same zone extents as today -- and a third LDP layer that will have the Wind River Indian Reservation LDP, but more LDPs can be added in the future.

For more information please visit:

<https://geodesy.noaa.gov/SPCS/policy.shtml>

December 31, 2021 — Submitting GPS on Benchmarks for the Transformation Tool.

In 2019 NGS started the GPS on Benchmarks Campaign for the 2022 Transformation Tool by releasing a list of approximately 90,000 benchmarks

across the United States and Territories to help define transformations between the current vertical datums (NAVD 88 for Colorado) and the future North America-Pacific Geopotential Datum of 2022 (NAPGD2022). To provide NGS with enough time to build the best transformation tool, December 31, 2021 was established as a cutoff date for data to be included. More information about the GPS on Benchmarks campaign is provided below or you can visit:

<https://geodesy.noaa.gov/GPSonBM/>

December 31, 2022 - Deprecation of the U.S. Survey Foot.

Over the last year NGS has been working with the National Institute of Standards and Technology (NIST) to deprecate the U.S. survey foot. There have been many webinars on this topic that can be found on the NGS website that go into the history of why this is happening. When the modernized NSRS is released it will only use the international foot but NGS will still support the U.S. survey foot for uses with the SPCS of 1983 and 1927. You can read the Federal Register Notice about the deprecation of the U.S. survey foot here:

<https://www.federalregister.gov/d/2020-21902>

### Notable Information

#### NGS Webinar Series

Every month NGS hosts webinars where speakers present information related to NGS programs, projects, products and services. These webinars help to educate and engage our constituents and help us to gather feedback from our customers. Registration is free and all of these webinars are recorded and made available for people to view at a later date.

[https://geodesy.noaa.gov/web/science\\_edu/webinar\\_series/](https://geodesy.noaa.gov/web/science_edu/webinar_series/)

#### New Online Lesson

NGS has developed Online Lessons in partnership with The COMET Program providing self-paced lessons on geodetic topics. The newest lesson "GNSS Positioning: Survey Planning and Data Acquisition" is the fifth lesson developed by NGS. This lesson joins Foundations of GNSS, two lessons on Gravity for Geodesy, and the final lesson

(CONTINUED ON PAGE 13)



by: Paul A. Heintz, PLS, EIT

# BEHIND LOCKED GATES



I have yet to hear surveyors sit around and reminisce about staking curb offsets or running a level loop for sanitary sewer, save for a lucky few, we spend much of our time doing so. What we all enjoy talking about is the work we do in pristine country that few others get to see. Often, we have access to land that is inaccessible to the general public, often by the way of locked gates on private land. I assume that a lucky few exist that get to do

several ranch surveys and township retracements each year and don't have to deal with construction and the demands that are entailed. Most of the time, our access to survey is a part of a project and we will be the last people to see the land as it has existed for thousands of years. Soon a pipeline, windfarm, oil wells, powerline, road, mine, housing development, etc. will be constructed and the aesthetic qualities that we all love will be scarred forever.



Rover pole on stone near summit of Beer Mug Mountain  
& Overlay of a Locked Gate on the Shook Ranch Mountain



Quite a few years ago I heard about an oil and gas play in the Bridger-Teton National Forest not far outside of Yellowstone. I wanted to be a part of the project, complete all of the necessary surveying, get the bill paid...but then have the construction aspects of the project fall through.

Over my career, I have been fortunate to be a part of several projects that had spectacular scenery, from topo'ing the top of Fred's Mountain for a restaurant, finding a stone near the summit of Beer Mug Mountain for a powerline, a township resurvey up top of Mormon Canyon for a windfarm, and the first 25 miles of a pipeline that ran from Devil's Tower to Guernsey (the remainder wasn't as scenic). Some of the projects that I have worked on I wished that they didn't go to construction, others I am proud to be a part of and look forward to being able to drive past them and point out to others in the vehicle that I worked on that, much as my father would do on every bridge he built.

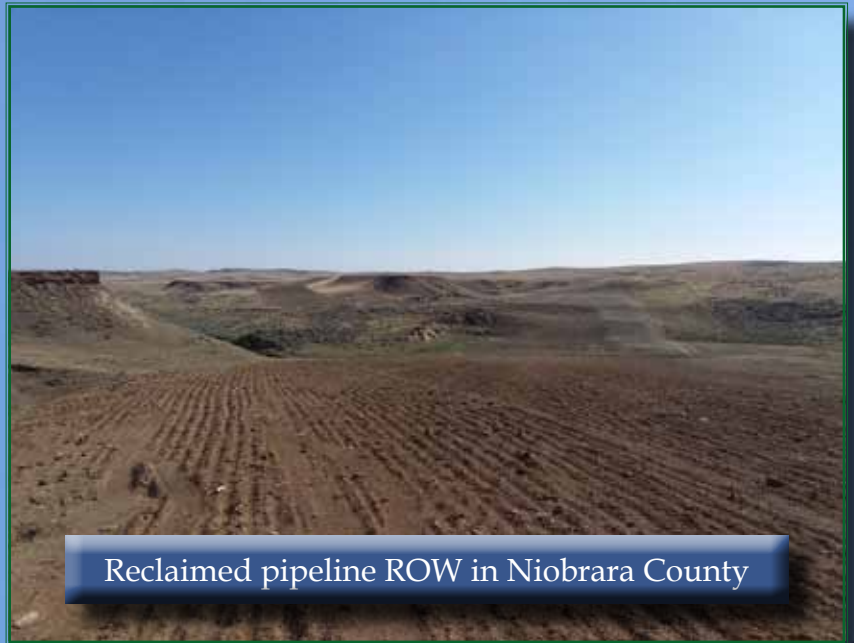
Land surveying has many attractive qualities and few detractors. To become a surveyor, you'll need to be able to perform in almost any weather conditions and for long hours. You will get run off by a landowner or two. Your equipment will fail you at an inopportune time. You will wear out boots and get your pants torn by barbed wire, hopefully just the pants and nothing interior to them. Each generation of surveyors seems to have it much easier than the last. When I started out, it was all total station work and GPS wasn't as prevalent as it is today. Soon L5 satellites will be numerous and we'll get the correction from other satellites alleviating all radio canopy issues that are the bane of many days out surveying. I've heard stories about the 3 digit LS's giving the 4 digit guys a hard time, but they returned the favor to the 5 digit guys like myself. Surveying is one of those things that you can do sound work by the book using grounded principals and still be proven wrong beyond a shadow of a doubt.

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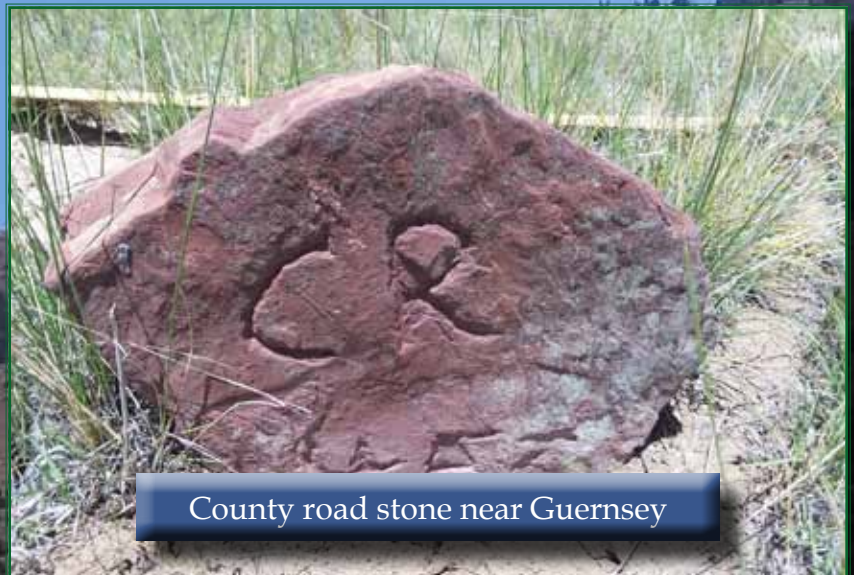


Sheep Creek canyon from an old homestead

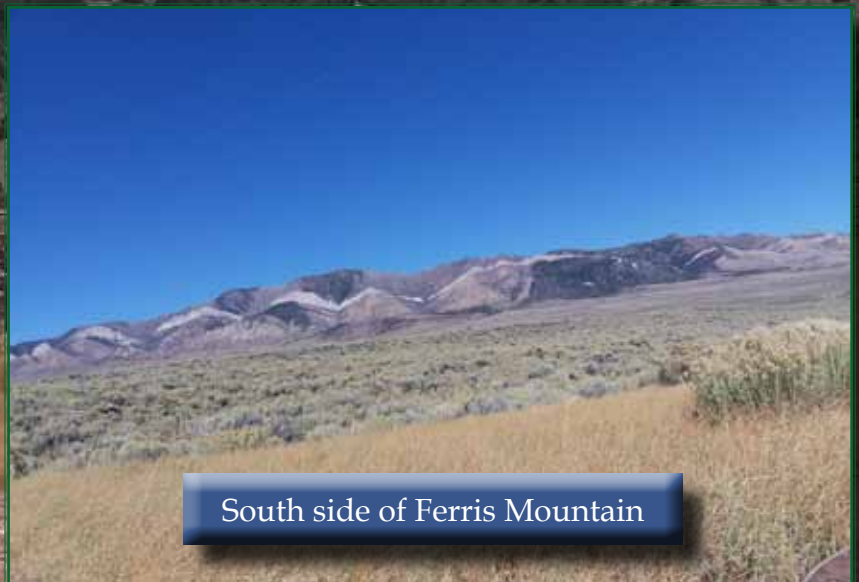




Reclaimed pipeline ROW in Niobrara County

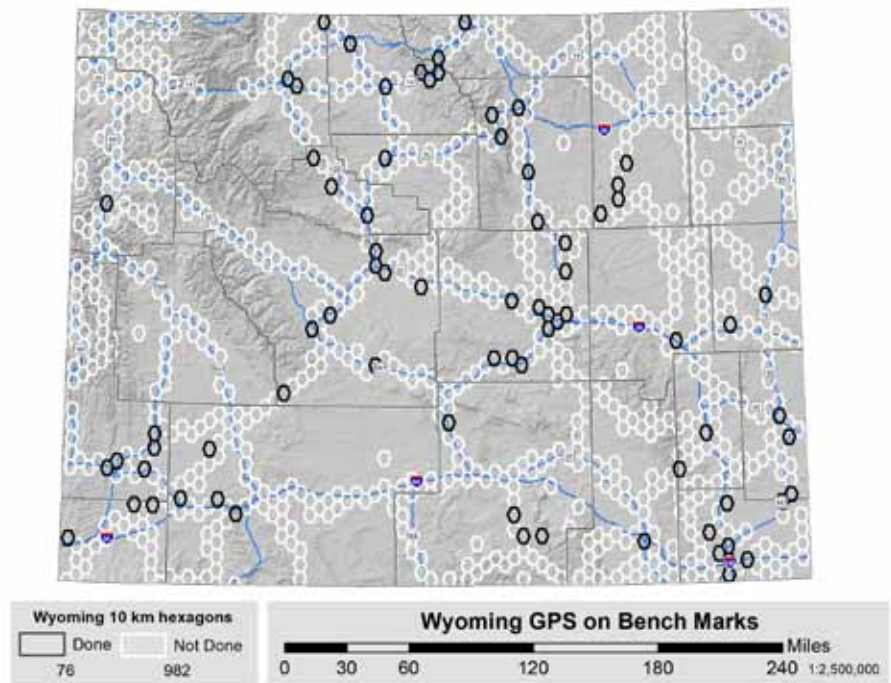


County road stone near Guernsey



South side of Ferris Mountain

(CONTINUED FROM PAGE 8)



is about Understanding Heights and Vertical Datums. These lessons are great opportunities to learn more about geodesy. Registration is required to take the training, but the lessons are free to any registered user.

[https://geodesy.noaa.gov/web/science\\_edu/online\\_lessons/index.shtml](https://geodesy.noaa.gov/web/science_edu/online_lessons/index.shtml)

There are also several educational videos developed in coordination with COMET on datums, surveying, and other topics that can be viewed here:

[https://geodesy.noaa.gov/corbin/class\\_description/NGS\\_Video\\_Library.shtml](https://geodesy.noaa.gov/corbin/class_description/NGS_Video_Library.shtml)

### GPS on Benchmarks

As mentioned above, NGS currently has an active GPS on Benchmarks Campaign for the 2022 Transformation Tool, running through December 31, 2021. This campaign's primary goal is to acquire as much data as possible to make the best transformation from the current vertical datums to NAPGD2022. To do this NGS has done a significant amount of analysis to identify and prioritize the benchmarks that would contribute the most for making the best transformation. The benchmarks selected for the priority list have two primary classifications that will impact the scale and the quality of the transformation. NGS is requesting two independent occupations on each mark to have confidence in the ellipsoid heights observed that will be used.

For scale, NGS decided to have two scales of marks to help our constituents evaluate their local needs. The first scale created hexagons at a spatial resolution of 10 kilometers which is NGS' primary goal for nation coverage and is a resolution we believed will be challenging but possible. Since some states and localities might want to collect data at a larger scale at the resolution of the transformation grid we have provided a second resolution at the 2 kilometer scale. This will enable cities and highly populated areas to collect occupations at a finer resolution to improve the transformation tool. A note for those that might notice that these hexagons are not truly 10km or 2km wide, you are correct! They are 2 arcminute (2 km) and 6 arcminute (10 km) hexagons which means they vary in size depending on the latitude. So if you look at hexagons in Puerto Rico they are smaller and wider than hexagons you will see in Alaska. We chose to classify them as an average distance in kilometers since we figured that would be easier for users to understand than saying 2 and 6 arcminute-wide hexagons.

For quality, NGS split the benchmarks into two priorities (A and B) based on the quality of the benchmark. Priority A benchmarks are all First and Second order benchmarks with an A,B, or C Stability. Priority B benchmarks are lower quality but were selected to help fill spatial gaps to assist the transformation spatial resolution.



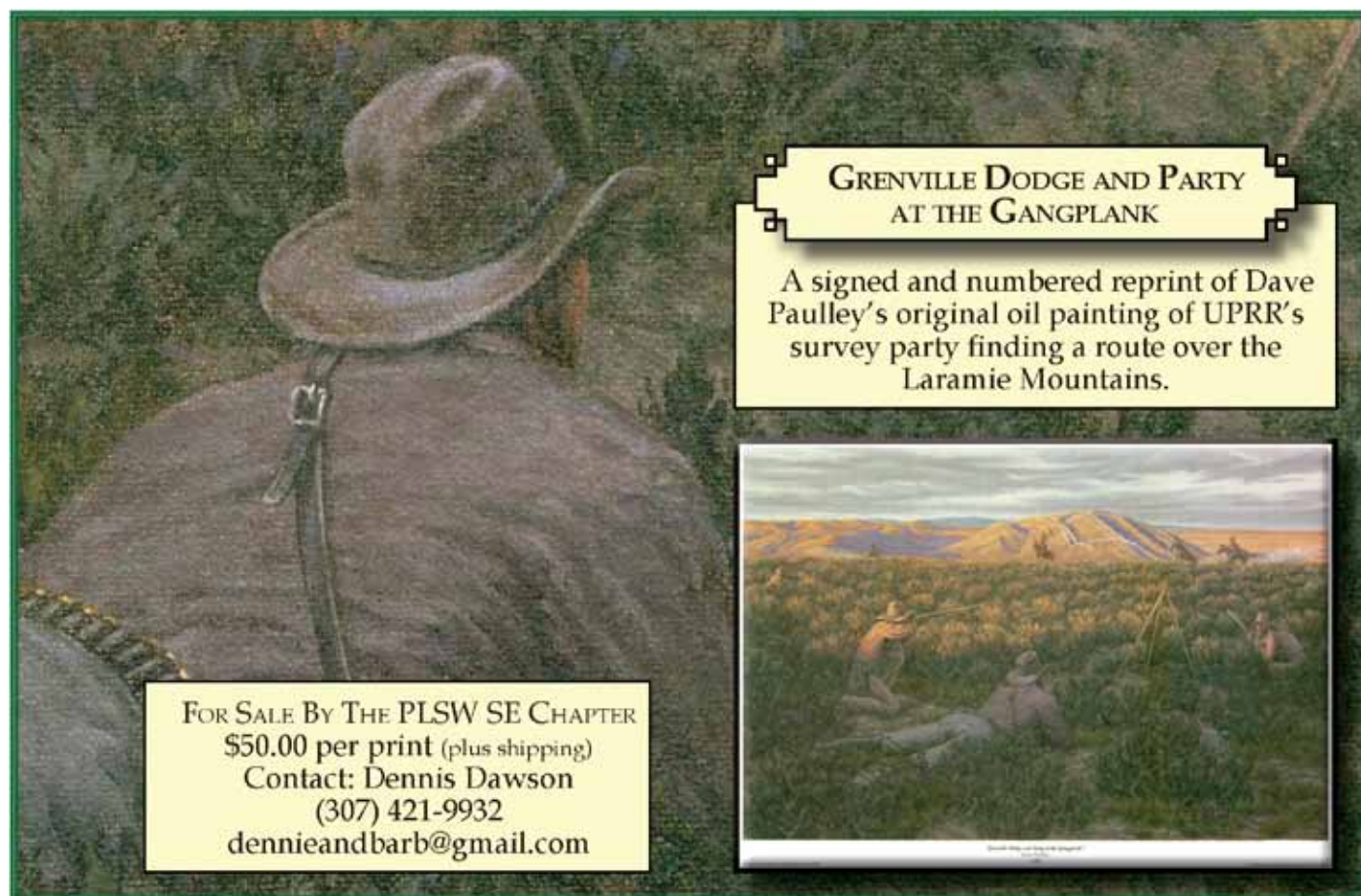
These priorities also have a number tied to the benchmark that identifies if it requires 1 or 2 occupations to be completed. So a benchmark with an A-1 priority needs one more occupation while a benchmark with a B-2 priority needs 2 occupations to be completed.

Many of the benchmarks with published datasheets have not been recovered since they were monumented—often in the 1930s and 40s—so we have provided a secondary list of Permanent Identifiers (PIDs) for each hexagon allowing users to have additional benchmarks that meet the criteria in case the primary benchmark selected for a hexagon is no longer there, or is not GPSable due to various reasons. We are requesting that users submit mark recoveries for any benchmarks that are not found or are not suitable for GPS observations. NGS has recently updated our Mark Recovery Form at: ([https://geodesy.noaa.gov/cgi-bin/mark\\_recovery\\_form.prl](https://geodesy.noaa.gov/cgi-bin/mark_recovery_form.prl)), making it much more user friendly and mobile device friendly. This form also allows you to take photos and even locate marks in your local area when using your mobile device. NGS also created a comprehensive Web

Map Application at: (<https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=6093dd81e9e94f7a9062e2fe5fb2f7f5>) that allows users to explore the priority list and hexagons in their area, providing a great tool for performing desktop recon before hitting the road to go hunt for benchmarks. The data that feeds this web map is being updated regularly, generally on a weekly basis.


So far in Wyoming (as of November 2, 2020), 76 of the 982 10 km hexagons have been completed. I have provided a map of the completed and needed hexagons for you to see your local area. I hope this inspires you to get out in the field and help this campaign either by performing GPS occupations in your local area, or going out and doing mark recoveries on the benchmarks in the priority list. These mark recoveries will greatly help NGS and other surveyors to know that a benchmark is still there or that it is not suitable for GPS. If you are interested in more technical details you can visit the Technical Details web page at

<https://geodesy.noaa.gov/GPSonBM/technical-details.shtml>.



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*(CONTINUED FROM PAGE 8)*

We are a part of the only profession that looks to recreate the past and plan for the future, trying to figure out how a surveyor completed a survey 100's of years earlier and trying to make it easy on the next surveyor to follow in our footsteps.

When I was trying to figure out what I was going to do for a living, I was told to look for something that still has a lot of old guys doing it, to look for passion, and look for people that don't want to retire. I found it all in land surveying. As I am doing the fieldwork, and to a lesser extent the office work, I can't imagine doing anything else. As we work to recruit the next generation of surveyors to take our place, we should highlight the experiences, wildlife, and the stunning vistas that we enjoy, all whilst getting paid to do so.

As I get close to the midpoint of my career, 18 years in and at least 18 to go, I think about all of the incredible surveyors that have helped build me into the surveyor that I am today and what I need to do to help construct the surveyors that will try to follow in my footsteps after I become less involved in surveying and try to go fishing 300 days a year. I think we should take the time to do some fieldwork with our crew chiefs and techs to entrench the reasons why we have specific procedures for data collection and staking and explain what could go wrong and why we try to mitigate any liability. Taking the necessary time to teach everybody working for you that everything we do has to be defensible in a court of law. I like the saying "In God we trust, everything else we verify."



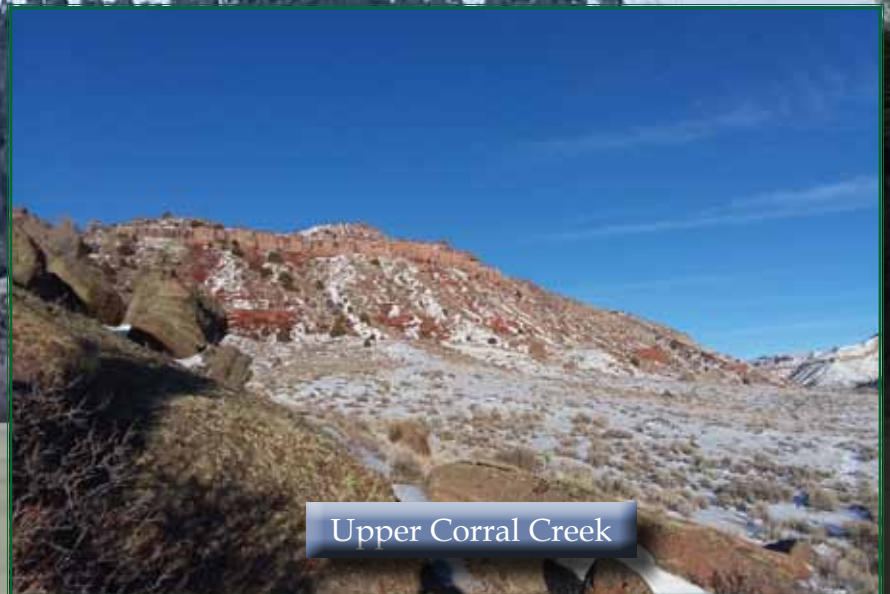
Snowdrift in mid-May that will be there for a while means I'll have to walk from there.

Viewing south at the Belle Fourche River





Reclaimed pipeline ROW near Belle Fourche River



Upper Corral Creek



Viewing north at the Belle Fourche river



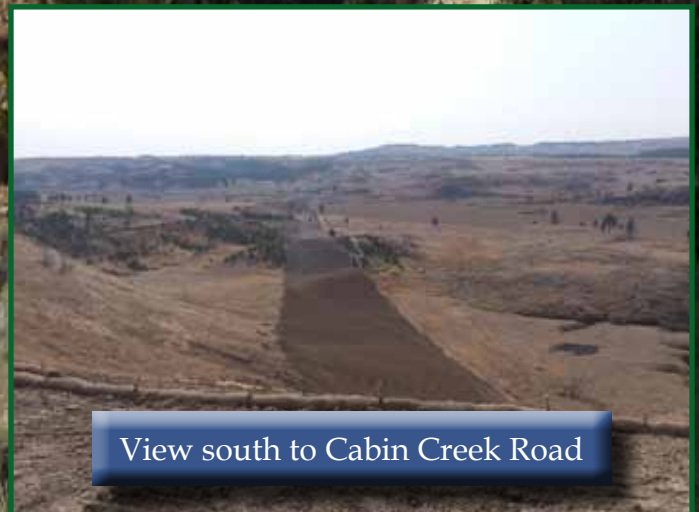
What we need to sell to the next generation is also the passion that we have for this profession and how surveyors in the twilight of their career just want to get out and survey, when the weather is decent. How we take 150 year old field notes and use them to find a stone that hasn't been seen since it was set and more on the art of surveying and less on equipment operation. We should explain how rewarding it is to decipher the notes and use math and gut instincts to help us follow in the footsteps of surveyors long gone. We should talk about the monster mule deer that was oblivious to our presence as we hike out to a corner, the herd of elk that blocked the road and took a while to all pass, the nosey cattle that we knew were going to take out our stakes as soon as we turned our backs, and the friendly horse that

followed us everywhere and wouldn't leave us alone. Even in heavily developed oilfields, we are the only ones to get away from all the, sometimes frantic, work being done to go look for a corner. Everybody else that works there is restricted to the graveled roads and well pads, but we are not. Foremost, I think we should sell our experiences and views that we get to see when we are working behind locked gates as we are the only profession that actually gets outside and does work, letting us be the last to see wild places before they get tamed in the name of progress.

Stone corner near Beer Mug Mountain



Stone corner set in 1873 on what is now the Dodge Ranch near Wheatland.



View south to Cabin Creek Road





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# HINTS TO AUTHORS



Dear Readers:

The editors of Lines & Points wish to convey our gratitude to the numerous authors who have contributed photographs, technical and professional articles, and other information to be incorporated into the quarterly journal. In recent years, the assembly and redaction of the submitted materials has taken on considerable technical application of the various English language compilers, office suites, and "publishing suites". This means that the communication and transfer of information and materials arrive at the editors' desktops in a multitude of formats and styles, which sometimes are not compatible with the PLSW personal computers.

We, the editors, are setting forth some simple rules for submitting materials which, hopefully will simplify your efforts and make the transition to the published version simpler and less time consuming.

1. If you have any questions or comments, please contact S. Dennis Dawson, Publications Comm. Chm., (dennieandbarb@gmail.com) or Michael A. Flaim, Editor-in-Chief (mike.flaim@bresnan.net).

2. If an article contains any illustrations, photographs, graphs, or other graphics, please transmit them as separate individual files. You may also include the illustrations within your manuscript, but the image integrity/quality is degraded seriously when attempting to extract them from the manuscript to create a published digital image. The Editor-in-Chief states that a much better digital resolution is obtained from the separate, individual illustrations submitted.

3. All submissions (electronic and snail mail) should be sent to S. Dennis Dawson (4005 Snyder Avenue; Cheyenne 82001). It is recommended a second copy be sent to Mike Flaim (1212 Southwest Drive; Cheyenne 82007).

4. It is strongly recommended that all submissions be transmitted six weeks prior to the publication deadline. The publication deadlines are: 1 January; 1 April; 1 July; and 1 October, annually.

5. Lines & Points is the official publication for the Professional Land Surveyors of Wyoming. Therefore, hence forth there will be incorporated in the publication all formal announcements pertaining to official business of the organization and other announcements. This includes announcements for the Annual Meeting; state-wide membership meetings; seminars; and the Fall Technical Session. These announcements are to be submitted to the PLSW Secretary/Treasurer John J. Studley (PLSW; Attn.: Mr. Jack Studley; P.O. Box No. 8; Cheyenne 82003) (jklz0318@gmail.com), at least four weeks prior to the publication deadline in which the announcement will appear. The PLSW Secretary/Treasurer will circulate the announcements to the Publication Comm. Chm.; the Editor-in-Chief; and the PLSW Board of Directors.

6. Advertisers and prospective advertisers should communicate directly with PLSW Secretary/Treasurer Studley about any advertisements and modifications.

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