

The

OREGON SURVEYOR

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503-656-4915 | lee@townshipsurveys.com

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paulgalli75@yahoo.com

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541-273-2191 | mason.marker@oit.edu

EXECUTIVE SECRETARY

MARY VANNATTA, CAE

PO Box 2646
Salem, OR 97308-2646
503-585-4551
execdirector@plso.org

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	PRESIDENT-ELECT	Greg Solarz	koos@charter.net
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Umpqua 7	PRESIDENT	David Edwards	topgun58@qwestoffice.net
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	SECRETARY/TREASURER	Steve Haddock	witnesstree@eoni.net

PLSO office

MAIL PO Box 2646, Salem, OR 97308

PHONE 503-585-4551 FAX 503-585-8547

EMAIL office@plso.org WEB www.plso.org

AFFILIATED WITH





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Professional Land Surveyors of Oregon

Executive Director

Mary VanNatta, CAE
PO Box 2646

Salem, OR 97308-2646

503-585-4551 • Fax: 503-585-8547

execdirector@plso.org

www.plso.org

Publications Committee

Greg Crites, PLS, *Editor*
gac@deainc.com

Oran Abbott • oranabbott@gmail.com

Paul Galli • paulg@hhpr.com

Chuck Wiley • charleswiley@gmail.com

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8201 SE 17th Ave

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President

Linda L. Pope

Advertising

Dustin Lewis

Design

Lisa J. Switalla

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CONTENTS

From your Chair, <i>by Lee Spurgeon</i>	3
Editor's Note, <i>by Greg Crites</i>	4
View from the PLSO office, <i>by Mary Louise VanNatta</i>	6
Reports	
PLSO legislation update, <i>by Scott C. Freshwaters</i>	7
da Vinci Days, 2013, <i>by Bill Lauer</i>	15
Features	
Letter to the Editor, <i>by Mike Jackson</i>	5
10 common psychological investor mistakes, <i>by Ron Kelemen</i>	8
Teaching with Spatial Technology—TwIST 2013, <i>by Tim Kent</i>	10
Deeds: A primer for surveyors, <i>by Knud E. Hermansen</i>	12
Finding the center, <i>by Paul Putkey</i>	16
Kootenay River Resurvey Project— July 31, 2012, part 2, <i>by Robert Allen</i>	21
Happy Birthday, Willamette Meridian and Baseline!, <i>by Tim Kent</i>	26

On the cover: Royce Hill, BLM cadastral surveyor, demonstrating the use of a solar compass. *Photo by Tim Kent.*

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Address changes & business

All notifications for changes of address, membership inquiries and PLSO business correspondence should be directed to:

Mary VanNatta, CAE
VanNatta Public Relations
503-585-4551 • Fax: 503-585-8547
execdirector@plso.org

Editorial matters & contributions of material

Editorial matters should be directed to:
Greg Crites, Editor, gac@deainc.com

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Why buy the cow?

I must admit that at this point, I was beginning to feel a tad bit perturbed. The meeting with Mr. Adjoiner, his screeching harpy of a daughter and her husband, and the angry police officer had drawn on into the second hour and there was still no resolution in sight. The meeting started out poorly, having Mr. Adjoiner coming into my office a little more than a fashionable 27 hours late dragging his posse in to give me a desperately needed and rare piece of his mind for having the audacity of determining the boundaries of his neighbor's property in a way that matched fence lines almost exactly. Being a little bit late to a meeting is usually not a problem with me, but I knew this meeting was going to be contentious, and I figured my best strategy was to be as professional as possible, and that meant bringing out the tie.

Yes, the tie, a fashion accessory that is worn round the neck. It imbues its wearer with a sense of professionalism and authority. Common folks fear the tie, so you can generally get away with a lot more with a lot less explanation while wearing one. Being 27 hours late and arriving in my office unexpectedly left me with the tie in the closet and wearing my field uniform—Carhartt head to toe. So when I dressed up the previous day, it was a complete waste of a tie.

Mind you, I am not trying to be judgmental here—being a professional surveyor does provide some unique wardrobe challenges. In the same day, we may be doing a field inspection and meeting with other professionals, so I often times adopt the “California casual compromise.” Professional from the waist up, and utility from the waist down. Besides, wearing a tie in

the field can be a true safety hazard, just like dressing like a slob in front of a judge, lawyer, or engineer can be a career hazard.

At this point in the meeting, Mr. Adjoiner started invoking the nuclear options, “If you do not retract your survey, I am going to talk to my lawyer and...” This is where I begin making invocations to God or the gods (trying to be inclusive here). “If in your infinite wisdom, Dear Lord, you see fit to end my life in a quick and painless way, say having a flaming asteroid landing on me or to be eaten by an aerial tornado borne shark, please do it now before Mr. Adjoiner finishes this sentence.” But it is not to be. “...I will sue you till (insert something really bad in here).” I must admit I was taken aback by Mr. Adjoiner's choice of wording, but he receives my begrudging admiration for originality and the use of iambic pentameter in such a crude and vulgar way. “What in the world makes *YOU* think *YOU* can determine where *MY* boundaries are? Who do you think *YOU* are!”

I resisted the urge to ask Mr. Adjoiner to turn his head to left at a 90 degree angle and raise his eye level 30 degrees, where not more than three feet away from his oversized head is my professional license signed by the governor, or is it Bob Neathamer? Anyway, it is someone important, I am sure of that, and now that I think of it, I am not really sure that the Governor and Bob Neathamer aren't the same person, having never seen the two of them together at the same time. That license is proof that I have recognized expertise in the science of measurement, geodesy, mathematics, land law, and a working knowledge of construction and engineering.



Furthermore, most surveyors are highly skilled in government science, psychology, and dispute resolution. Having a surveying license provides a certain legitimacy and esteem which land attorneys, judges, planners, and engineers readily recognize, but is somehow lost on the public in general, and Mr. Adjoiner in particular. But just then a dangerous thought crossed my mind. Perhaps it was a random synaptic firing or perhaps I was beginning to look at the problem from Mr. Adjoiner's perspective, but the image of my grandmother saying “Why buy the cow when you can get the sex for free?” crossed my mind. She was a dear sweet woman, but she could sure butcher a metaphor in the most interesting way.

And why should Mr. Adjoiner buy that cow? He purchased a cut-rate survey from a firm that consisted of individuals who lost their license—thankfully—and a rubber stamp. That cut rate survey punted on resolving the boundary lines in question, telling Mr. Adjoiner that he was best served hiring an attorney, as opposed to doing a significant amount of detective work to figure out the actual intent of the deed writer, or even acting like a professional and working on a resolution prior to bringing in expensive attorneys which are draining both Mr. Adjoiner's and his neighbor's bank accounts. Is it his fault

Continued on page 5 ►



A word about membership

I received a list of delinquent members from the PLSO office last week. Naturally, I had to look to see if I recognized any names. I was a wee bit disconcerted to see how many folks I knew on the delinquent list. This letter isn't a harangue to renew membership, though I may be justified in doing a little "soap boxing." Many of you know me and probably have some expectation that I should be getting on the bandwagon, beating my fists on the podium or some other form of admonishment, to try coaxing those of my peers who are delinquent in their membership to renew, but I'm not going to do that! There are always reasons for such delinquencies, not the least of which is the fact that our accountants don't feel the same sense of urgency when you submit your check request.

The last issue of *The Oregon Surveyor* contained some insightful articles. Several of them have stirred interest among our readers. As editor, this is an outcome that I hope for with every publication.

In my article entitled "Serendipity," one of our members contacted me to flesh out additional details regarding Alonzo Gesner, the GLO and former County Surveyor noted in both my "serendipitous" moment and in Andrew Plett's well-written article regarding his work/research experiences in the Willamette Valley. I'm sure Andrew will be interested to know, as I was, that the selfsame Alonzo Gesner was a three-year-old lad listed among the members of the ill-fated Meek wagon train coming to the Oregon Territory in 1848! Way cool, eh? But there's more, though I won't take the time to fill you in here. Find out for yourself! Go to the BLM website and do a little

research on the survey of Township 4 South, Range 14 East. Use the link provided via the PLSO webpage.

Lee Spurgeon had the temerity to write an article entitled "Waging Peace." I'm sure many of you read it and I'm sure it stirred some differing emotions—probably driven by the temper of your experiences with your County Surveyor(s). I was delighted to have the President-elect of OACES, Michael Jackson, Lane County Surveyor, weigh in with a well-reasoned reply to Lee's letter. It's reprinted on page 5 of this magazine.

Talking about controversial, don't miss reading Paul Putkey's great article entitled "Finding the Center." How many of you have used this method to reestablish or compute the center of section? Not me! Play around with the formulas using one of your own surveys as the data set. How much of a difference in position would result relative to your intersection of lines drawn between the quarter corners? Now let's talk about positional tolerance. Are all of your section subdivisions now wrong? I'm betting Jeff Lucas would have something to say about it!

I found Knud Hermansen's primer on deeds was a great refresher, especially considering how specialized my work of late has become. I'm sure I'm not alone in recognizing the value of polishing our old knowledge bases that have corroded through lack of use.

Tim Kent has supplied a great update on what's happening with TwiST. I was both excited and surprised to read of the success of the program this year, as I'm sure you will be. This kind of outreach is especially rewarding to the participants, both as instructors and as students. I've read reports from

teachers who participated and can't say enough about how excited they are to have this tool to take back to their classrooms. Programs such as this need to be continued. I spent several years of frustration because the state of the economy prevented us from offering this valuable program.

Part 2 of the Kootenay River resurvey project brings to a close yet another chapter in the ongoing saga regarding the life and times of David Thompson. I hope it serves to highlight his incredible accomplishments, especially considering the era in which he lived. I have a special affinity to the ongoing efforts of the North American Land Surveyors. I have dipped paddles from canoes peopled with folks like Robert Allen, Denny and Delores DeMeyer and Bill Chapman. The special and lifelong connections such experiences create are part of the benefit I've received from being a member of the PLSO, a benefit that would never have occurred otherwise.

Discussions like these, both informative and thought provoking are what make *The Oregon Surveyor* such a valuable benefit to our organization. Our membership has been surveyed numerous times and has resoundingly stated that this magazine represents a cornerstone of membership in the PLSO. The continued vitality of this organization depends on *your* membership. The vitality of *your* professional life depends in part on your participation in this organization. Renew today! ◉

Letter to the Editor

■ *Mike Jackson, President-Elect OACES, Lane County Surveyor*



I read with great interest the article “Waging Peace” by Lee Spurgeon, PLSO Chair, in the last issue of the *Oregon Surveyor* [Vol. 36 Issue 2, 2013]. Thank you Lee, for tackling a ticklish subject!

Living as I do in Eugene, where the words “wage peace” can be found on bumper stickers, tie-dye shirts, hats, and an occasional tattoo; I find seeing these two words just part of a normal day. It has been said waging peace is harder than waging war. So, we as individuals continue to march in the direction we’ve chosen, it’s all about attitude.

I have stated on more than one occasion how fortunate I feel to have been given the opportunity to be a County Surveyor. More recently, I was asked to serve as President-Elect for OACES (Oregon Association of County Engineers and Surveyors). Two positions not easy to perform, but two positions I take very seriously.

I have chosen to respond to Lee’s article in order to carry on the act of waging peace, with a willingness to rejuvenate a relationship long overlooked. With the permission of the OACES group, they have allowed me to speak as one voice.

This group (OACES), more particularly the County Surveyors, is one of the best groups of people with whom I have been associated. We come from all backgrounds and experiences, with two goals in mind: to carry on the act of maintaining an accurate permanent record that will endure the test of time and to make it available to the public. Many of us feel our relationship with the private sector is good, one County Surveyor called his relationships “collegial and friendly,” this is a good place to start, I think.

In Lee’s article, he spoke of the symbiotic relationship between the private and County Surveyors. Lee is right on. We do need each other to be truly successful and to leave a legacy for future generations of surveyors. Relationships are a delicate thing which we all have to traverse in life.

Good relationships are normally cultured by both sides, giving and taking in kind. I can say without question the County Surveyors in Oregon want to have a good relationship with everyone who practices in their county. We look forward to opportunities to engage our peers in conversations regarding our profession. We don’t always have the answer, but together we can find one.

The “tremendous resources” Lee spoke of is true. Each of our offices are a valuable resource painstakingly catalogued in order to help the user research their project. In addition, our local knowledge of an area within the county is invaluable. Having a fresh set of eyes and another brain to look over a puzzle you may have encountered is a sweet deal, I think. All we ask is that you talk to us. We will listen and, if asked for our opinion, we’ll give you one.

Granted there are times when we have differences of opinions with a private land surveyor. In fact, there are times we County Surveyors don’t agree with each other. As professionals, we all have a level of respect that overshadows these differences. This makes us all a great group to be around.

In Lane County, we have a poster hanging in many of our work areas, which you may have seen, called the “Basic Principles.” I think they are an excellent reminder of what communicating means. Allow me to repeat them: Focus on the situation, issue, or behavior, not on the person. Maintain the self-confidence and self-esteem of others. Maintain constructive relationships. Take initiative to make things better. And lastly, lead by example.

In every relationship needing rejuvenation, someone needs to step forward to offer an olive branch if that relationship has a chance at renewal. I would like to offer this branch on behalf of the County Surveyors of Oregon.

Thank you all for this opportunity. ◉

Chair Message: “Why buy the cow?,” *continued*

that he doesn’t treat surveyors as professionals when the surveyors he has been dealing with aren’t bothering to treat themselves as professionals? Why pay a full price for a survey when surveyors are willing to give their services away?

If we tolerate the \$300 and \$400 survey to establish approximate corners, can we seriously consider ourselves a profession? And as a digression, what exactly is the difference between the \$300 approximate corner survey and the \$400 variety? Does the \$400 survey actually stop the crew truck to throw stakes at the fence corners while the \$300 variety has the truck merely slow down?

So can I really blame Mr. Adjoiner? No, not really. We won’t be seen as professionals until we start acting like professionals. A moment of Zen tranquility flushed over me and I smiled in the middle of another diatribe aimed at myself, surveyors, attorneys, and possibly mothers—which stops Mr. Adjoiner in his tracks. “What the (insert bad paragraph length epithet here) are you smiling at?” Creative. One gets so weary of the same six bad overused curse words and for moving the goal post forward on that account.

I thank you, Mr. Adjoiner. ◉

■ *Mary Louise VanNatta, CAE; PLSO Executive Secretary*

Nurture your professional networks

Many of us planted our gardens last spring. My dead office plants can attest to the fact I do not have a green thumb. I'm told it's because I often forget to water them. Have you ever been told that if you neglect something it will not survive? This is also true with relationships. One of the most beneficial aspects of your business life is your professional network and if you do not tend to it, it will not thrive nor produce for you. So what are the steps for nourishing these relationships?

Understand that you've planted your network garden with your contacts.

You might not even think about all those contacts in your iPhone or your Facebook friends as your professional

network. There must have been some reason you planted these people into your system. Maybe one person sold you a car or hired you for a survey project. They may share a common interest in running or are part of your service club. Whatever the reason, you have placed these people in your network garden and they are just waiting to interact with you.

Give each relationship what it needs to germinate and grow.

Decide how you want to manage and care for your relationships. Just as vegetables and flowers need different amounts of sun, water and nutrients, friends, family and business colleagues all need something unique from you.



Surprisingly, some people have difficulty assessing the right amount and kind of attention to give each group. Your clients may not want to see cute pictures of your new puppy or see pictures of your surgery scar on Facebook. Your family will become quickly irritated by updates about your company's computer upgrade. A long conversation with your Mom might be in order, but your boss just wants a quick update. Plan those in advance or you might find only partial success.

Provide personal attention to your relationships.

No automatic watering system will truly maintain your network garden. Omnibus emails or Facebook updates lack the personal touch your relationships need. Take the time to have coffee, send personal emails or even call on the phone and check in with friends. Pay extra attention to the ones who matter or need the most at the time. Do the best you can to attend to each contact.

When the need arises you may reap the rewards of your work.

You've worked hard caring for your network garden and it's in full bloom. Well-tended, each relationship should have grown at a healthy pace and is ready for harvest. When you are in need of advice or even a job or more clients now is the time to seek out those well managed relationships and give them the opportunity to share the joy of giving to you in a healthy networking relationship. ◉

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Note: Recently written up in GPS World Magazine.



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PLSO legislation update

■ Scott C. Freshwaters, Legislative Committee Chair; PLSO Liaison to OACES

There isn't anything to add to my last report in regards to legislative interests of concern to PLSO. However, there have been some positive developments in regards to the "Call Before You Dig" laws.

I attended the OAR Committee of the Oregon Utility Notification Council meeting on July 2, 2013, in Wilsonville with Gary Anderson, Carl Clinton, Ron Singh, and Emily Ackland. The Committee voted to amend the OARs and their manual with particular items of interest to surveyors (listed right). Please take note that this is not a completed process and is subject to change, as any changes must be voted on by the OUNC Committee. ©

Definitions

(13): "Non Invasive" The definition of "non-invasive", as stipulated in OAR 952-001-0090 (2)(c) is:

The exposure of any underground facility using a practice which does not damage any part of the facility.

FAQS

22. Are the processes used in Survey Activities considered to be excavation?

Not all of the work processes used by surveyors are considered to meet the definition of excavating. Activities such as the placement and setting of tri-pods, setting of PK nails, setting of lath, flags and hubs; that moves or displaces earth, rock, or other materials up to a depth, as measured from the ground surface, that is no greater than 12 inches. The work of exposing survey monuments may be conducted so long as the work is done in a non-invasive manner.

If you have any questions, concerns, or burning ideas for legislation, please contact Scott C. Freshwaters at sfreshwaters@chamberscable.com, office 541-593-1792, cell 541-420-1822.

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10 common psychological investor mistakes

■ By Ron Kelemen, CFP®; The H Group, Inc., Independent Wealth Management Solutions™

Given the recent market correction and turbulence, this would be an excellent time to reflect upon common mistakes investors make and how to avoid or minimize them if you don't have your portfolio professionally managed.

1. Anchoring

This takes the form of attaching significance to what may have been an arbitrary or no longer relevant starting point. It can happen when stores show a discount from the regular retail price. And it can happen with a stock that was at \$200, but now it's at \$100, so surely it must "bounce back." However, the real value of the stock is based on its fundamentals and comparable investments, not what it once was. The same principle applies to real estate.

Solution: Evaluate investments only as if it were a new purchase. Don't hold it if you wouldn't buy it now.

2. Loss aversion and risk taking

TV game shows illustrate time and again that people will take a sure gain over a chance to win more. However, while investors are risk-averse when it comes to protecting their gains, they are risk seekers when it comes to dealing with their losses. They hang on to losers, turning small losses into big ones. As a rule of thumb, studies have shown that people find losses roughly 2 ½ times as painful as gains are pleasurable.

Furthermore, if you do nothing and you are wrong, it doesn't hurt as much as proactively making a

bad decision. This is a bias toward inaction, and it causes avoidance behavior. In a study of 10,000 discount brokerage accounts by UC Davis professor Terrance Odean, the winning stocks that individuals sell significantly outperform the losers they hang on to over four months, one year, and two years.

Solution: Try to remember that the stock doesn't know you own it. Compare it against other opportunities. Would you buy it if you never owned it?

3. Decision framing

Most investors are heavily influenced by the way in which the information is presented.

Solution: Consider the source, whether it be your colleague, golf partner, broker, or the internet. What's right for them isn't necessarily right for you.



4. Mental accounting and asset segregation

This is a huge problem among my retired clients. I've also seen it with 401(k) participants who put their contributions into the guaranteed account and the "free" employer contributions into the riskier choices. When investors separate funds into different real or mental accounts, they make decisions about those accounts in isolation.

Solution: Remember that better decisions come from considering the entire portfolio.

5. Diversification errors

The most common error we see in diversification is the tendency for investors to spread their investments equally across all options. Thus, a retirement plan with five choices gets 20% into each portfolio. In reality a more carefully allocated portfolio could potentially provide more return with lower risk.

Solution: Intelligent asset allocation.

6. Over-weighting the recent past

Boy is this ever a timely one! Whether it is with residential real estate or stocks, investors tend to drive their investment vehicles through the rear-view mirror. Several studies have documented the lackluster performance of the last year's top rated and top performing mutual funds.

Solution: Remember that no trend continues forever, no sector stays hot for very long and last year's losers could be this year's winners.

7. Spotting trends that aren't there

Recognizing patterns allows us to understand the world and decide what to do. The problem is that there is so much information available, that more "trends" can be coaxed from the noise. We often seek patterns to support our decisions, often without adequate confirming research. We put more weight on information that supports our beliefs, and we discount contrary evidence.

Solution: Play devil's advocate. Try giving extra weight to contrary evidence. Consider the source.

8. Overconfidence

Confidence provides a sense of control and order. But it leads to investing shortcuts. Investors tend to overestimate their own knowledge and rely too heavily on their intuition. They ascribe talent to their successful decisions and forget about the bad ones. (Does

this remind you of anyone bragging about his or her hot stock picks?)

Solution: Do your homework. Look for facts to reach the opposite conclusion. Remember and learn from your mistakes without dwelling on them.

9. Short time horizons

This problem is shared among investors, advisors, mutual fund managers, and corporate leadership. Everybody is focused on the last quarter's results and is working to make a quick buck in the next quarter. The problem is, this short-term gratification causes knee-jerk reactions and comes at the price of solid long-term performance.

Solution: Focus on the long term. In 10 years, a good or bad quarter is immaterial.

10. Hindsight bias

If you lost money in real estate or stocks recently, you probably *now*

think that you saw a correction coming fairly soon, and it was so obvious. In fact, several studies have indicated that few people are actually able to accurately recall their assessment of an event's probability *after* the event has happened. It's so easy to learn in retrospect why a particular investment strategy did or did not work. This hindsight can falsely create the belief that the world is a knowable and controllable place, which is not the case. This can lead to either unrealistic overconfidence or paralysis. **Solution:** document your decisions before implementing them. Try to remain humble by learning from your mistakes. You may be an investment genius, but in the end, most people are only as smart as the market is good. ☉

Ron Kelemen is an independent CFP.™ He offers fee-only investment management and wealth management advice through The H Group, Inc. 500 Liberty St. SE, Ste #310, Salem, OR 97301 800-285-6240, www.planningvisionprocess.com

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TwIST 2013

■ *Tim Kent*

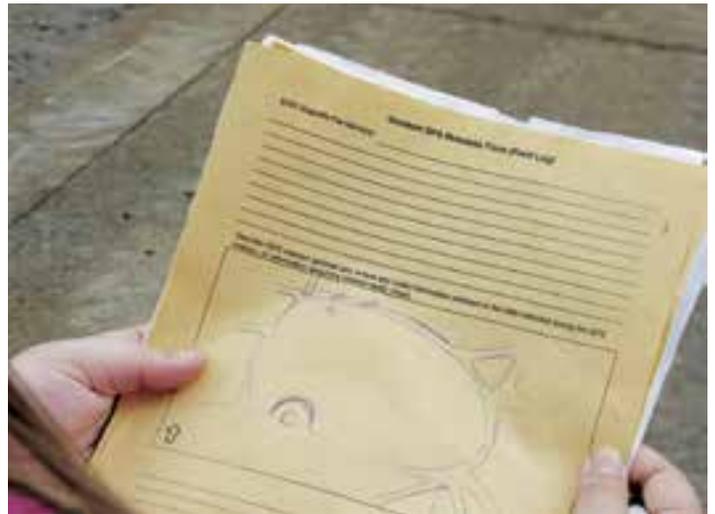
This year's version of this popular training course for K-12 teachers was a resounding success. There were 24 teachers from various western states that learned about the many aspects related to GIS, GPS, and other related technology that they would be able to pass on to their students in the years to come.



The last week of June on the Clark College campus in Vancouver started with a little rain but transformed into beautiful weather the rest of the week. The teachers were in the classroom in the morning and roving around campus most afternoons, collecting data with their new GPS units, measuring their pace, and using their new hand compasses in a variety of exercises.

Professor Mason Marker from Oregon Tech in Klamath Falls started the week with a primer on GPS. Most of the students experience with GPS was what they had in their cars. Some of them were totally in awe at what was behind the GPS technology that Professor Marker played out for them. After an initial learning curve on the use of the GPS units, the teachers gathered numerous data points all around the campus. It was great to watch them in their many “aha” moments as it all began to come together.

Dr. John Ritter, also a professor from Oregon Tech, told the teachers that he would “knock their socks off” with the ESRI GIS software and he proved it right. He took the students through polygons and points and some places that they had never imagined. They used real data gathered in the afternoon sessions and moved and manipulated it into

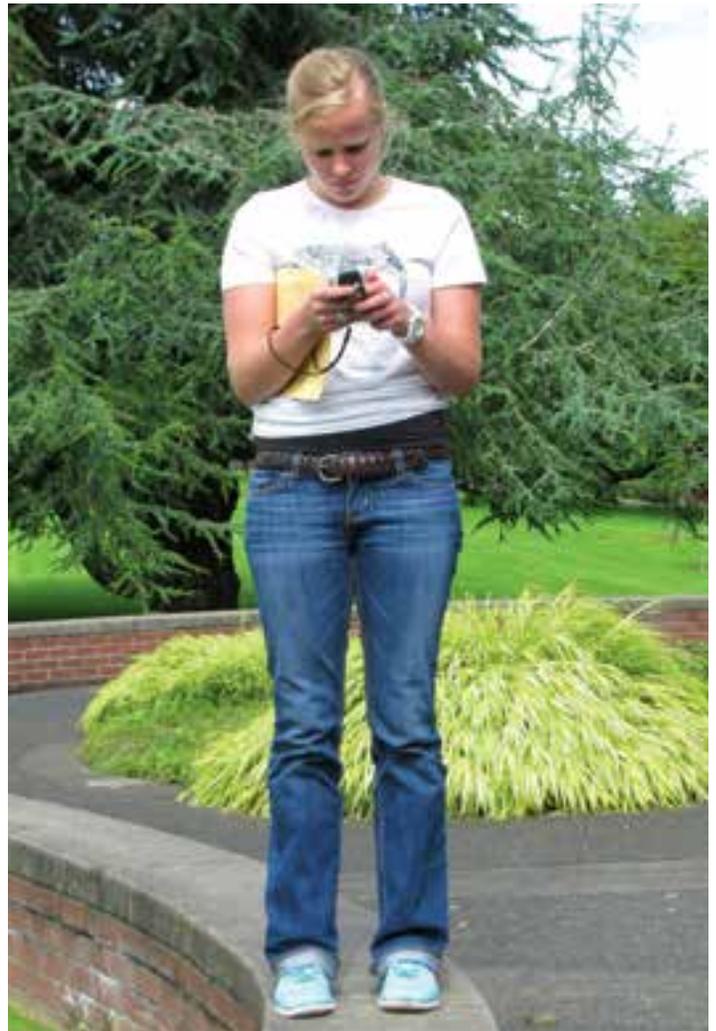


some very interesting final GIS renditions. Many of the teachers learned this software during the week and were able to take it home and put it to use.

A back to the basics session was held one afternoon where the teachers were given a hand compass, a primer on pacing, and a quadrangle map of the campus. They then surveyed a closed traverse with those primitive yet very effective tools, calculated the closure, and also final coordinates for the traverse points. Many of the teachers saw an immediate teaching moment from this exercise to pass on to their students. They also scaled a point from the 1927 quadrangle map and put that data into their GPS unit which was on the 1983 datum. Only a couple of teachers caught the difference and ended up very close to where they were supposed to be. Others we had to chase down and bring back to campus. The bottom line is they learned a lot about datum's and how much they mattered.

A huge thank you is due to the efforts of Richard Heieren, a PLS from Alaska and a member of the Board at NCEES





for their monetary support to the teachers. They provided funds for their registration fee along with most of their travel costs. In these tight economic times, this course would have been very difficult to have without that support.

Of course this training would not have been possible without the excellent support and instruction from my colleagues at Oregon Tech, Professors Marker and Ritter. I am indebted to them for their effort with TwiST. ◊



Teaching With Spatial Technology



Deeds: A primer for surveyors

■ Knud E. Hermansen, PLS, PE, PhD, Esq.

☑ *General Warranty?*

During the course of searching the records, surveyors will review numerous deeds. I've often had surveyors ask about the difference between the various types of deeds. This article is an overview of the common forms of deeds used to convey title to property. Most current deeds fall into one of four categories:

- 1) General Warranty
- 2) Special Warranty
- 3) Quit Claim deed
- 4) Bargain and Sale deed

General Warranty Deed

The General Warranty deed is often referred to simply as a warranty deed. It is a deed conveying title where the seller (grantor) makes six covenants or promises to the buyer (grantee) as part of the conveyance. (Some states have limited or eliminated one or more covenants in a warranty deed by statute.) The six covenants that are part of a warranty deed are further divided into present and future covenants.

The three present covenants are:

- **Covenant of Seisin**—The grantor covenants to the grantee that the grantor has title and possession of the property. If a grantor conveys property burdened by a valid and current lease, the grantor would breach this covenant because they grantor had the title to the property but not the possession.
- **Covenant of Right to Convey**—The grantor covenants that the grantor can validly grant or convey both title and possession. A life tenant that delivers a warranty deed to the grantee is in violation of this covenant. The life tenant had the right to convey the possession but not the right to convey the title to the property.

- **Covenant Against Encumbrances**—The grantor covenants that there are no encumbrances against the title. Encumbrances could include easements, mortgages, trusts, and limitations on the title. A landowner that conveys property where the neighbor has secured an easement across the property by prescription is in violation of this covenant.

The three future covenants are:

- **Covenant of Warranty**—The grantor covenants that the grantor will protect and defend the buyer against anyone who comes and claims a superior title to the property. Under this covenant, the grantor will have to defend any claim against the title of the grantee if and when a person comes forward with a claim to the title to the property the grantor conveyed by warranty deed.
- **Covenant of Quiet Enjoyment**—The grantor covenants to the grantee that the grantee will have unimpaired use and unrestricted enjoyment of the property. For example, this covenant would be breached if someone obstructed the easement that provides access to the property (based on a claim of right).
- **Covenant of Further Assurances**—The grantor covenants to the grantee that the grantor will take actions reasonably necessary to perfect the grantee's title if found defective. For example, if a grantor delivered a deed to the grantee where the acknowledgement was found to be defective (e.g., notary commission expired), the grantor would be required to take the steps necessary to deliver a deed with a valid and effective acknowledgment.

The distinction that often arises between present and future covenants involves when the breach of a covenant occurred and when the statute of limitations begins to run. A breach of the present covenants will occur, if at all, at the time of conveyance. If a breach occurred, the time period of a relevant statute of limitation will commence at that time. On the other hand, the breach of a future covenant will occur after the time of conveyance, perhaps decades later.

The grantor may limit any of the warranties within the deed by express wording in the deed. For example, a grantor may state within the deed that the property is subject to an easement. Because the grantee is put on notice of the easement, the covenant against encumbrances would not apply to the easement cited in the deed.

The warranties that are included in a warranty deed extend back in time to the inception of title. The warranties made by earlier grantors also extend to future owners of the property. For example, assume a title defect occurred in 2001 when Ames owned the property. Ames conveys the property to Betty by quit claim deed. Betty conveys the property to Chad by special warranty deed. Chad conveys the property to Diane by warranty deed. Diane conveys the property to Edgar by quit claim deed. In 2013, he discovers the 2001 title defect. Edgar can sue Chad for breach of warranty for the title defect occurring in 2001. Edgar can sue Chad, even though Chad was not Edgar's grantor. The title defect that Chad had warranted occurred before Chad owned the property. Because of the long reach of the warranties back in time and future predecessors in title,¹ warranty deeds are losing

☑ Special Warranty?

☑ Quit Claim deed?

☑ Bargain and Sale deed?

popularity in favor of title insurance to protect the grantee. Warranty deeds may now be rare in certain states.

The title found at the top of the deed is not determinative if the deed is a warranty deed unless the state has a *Short Forms Deed Act* that allows for abbreviated wording in the deed to determine the covenants present in the deed.

Under the common law, a deed had to state the following or similar words in the habendum clause in order for the deed to be a warranty deed and the six covenants to be present:

To Have and to Hold, the premises hereby conveyed, ...and the Grantor(s) do for themselves, their heirs, successors and assigns covenant with the Grantee, their heirs, and assigns that the Grantor(s) are well seized of the premises as a good indefeasible estate in fee simple; and have good right to grant and convey the same ...and the same are free from all encumbrances whatsoever... and the Grantors do by these presents bind themselves and their heirs, successors and assigns forever to warrant and defend the premises hereby conveyed to the Grantee and its assigns against all claims and demands whatsoever...

Special Warranty Deed

The category of special warranty deed is similar to a general warranty deed with one important difference. The covenants in the special warranty deed only extend to any breaches in title that were caused by the grantor or occurred during the time the grantor owned the property. In other words, the grantor in a special warranty deed only warrants the title against the grantor's own actions or omissions.

The habendum clause for a special warranty deed would have wording the same or similar to the following:

To Have and to Hold, the premises hereby conveyed,...and the Grantor(s) will warrant specially the property thereby conveyed,...and that he, his heirs and personal representatives, would forever specially warrant and defend the property unto the grantee, his heirs, personal representatives and assigns, against the claims and demands of the grantor and all persons claiming by, through, or under him.

Because of the phrase “specially warrant” and other words found in the special warranty deed, an uninformed grantee tends to believe “specially warrant” is better than “generally warrant.” Some states have eliminated special warranty deeds or changed the name or language in the deed to prevent heightened and mistaken expectations by the grantee. For example, Maine law has changed the name of a special warranty deed to a quit claim deed with covenants of warranty. Many states have also limited the number of covenants that arise in favor of the grantee by a special warranty deed.

Quit Claim Deed

A quit claim deed is also known as a “release” deed. As the name states, a quit claim deed does not actually state or claim that title is being conveyed. Rather, the grantor is quitting or releasing any claim they have in the title to the property against any present claims made or that can be made by the grantee for the title against their grantor.

In theory, if Sally had title to the property and quit any claim she had in the property to Sam, Sam would not have gained title to the property.

However, Sally who does have title would be estopped from denying that Sam doesn't have title after delivery of the quit claim. Sally has by delivery of her deed to Sam asserted that she would not claim title to the property against Sam, his heirs, or assigns. Because Sally is merely quitting her claim she is making no covenants to Sam that she in fact actually has title.

Most states, as a practical matter, do view a quit claim deed as the conveyance of title. There are no warranties in the quit claim deed other than what a state law mandates. The quit claim deed is usually recognized by the use of the words “quit claim” or “release” rather than words such as “grant,” “convey,” “give,” or similar words found in warranty deeds. There is usually no habendum clause in a quit claim deed. A “Sheriff's Deed” or a “Tax Deed” are categorized in most states as a form of quit claim deed.

The quit claim deed is often used where the grantor does not want to be held to warranties and the grantee is in no position to demand warranties from the grantor. This is usually the case when the property is being conveyed for less than the fair market value or the grantee is faced with a “take it or leave it” situation.

For example, assume a spouse dies without a will leaving a surviving spouse and two adult children sharing the title to the decedent's property. It is not uncommon for the adult children to quit claim their interest in the estate to their surviving parent so the surviving parent will have full use and control of the property. The generous nature of the children toward their surviving parent would not go so far as to include warranties that the children may be called upon

Continued on next page ▶

Deeds: A primer for surveyors, *continued*

later in their lives to defend to a successor-in-interest to the surviving parent (i.e., later owner of the property).

A quit claim deed is often used to affirm a boundary line agreement. The owner on each side of the agreed boundary is willing to quit any claim to the owner on the other side of the agreed boundary. Given the uncertainty in the boundary location, the owner is not willing to warrant the conveyance made to the neighbor.

Bargain and Sale Deed

A bargain and sale deed does not usually warrant against any encumbrances. The bargain and sale deed does mean that the grantor claims to have title to the property. This type of deed has often been supplanted by the quit claim deed in many jurisdictions. The bargain and sale deed was used frequently in tax sales and for foreclosure actions. Other covenants may be made a part

of a bargain and sale deed if the covenants are specifically stated.

This review should help surveyors understand the common forms of deed they will encounter as part of their practice. The form of deed is seldom critical in providing surveying services. The form may be an indication of a problem related to a boundary and provides some fodder for thought. ◦

Endnotes

1. Of course the obligations of the grantor imposed by warranties ends with the death of the grantor and probate of the grantor's estate.

Knud Hermansen is a licensed surveyor, engineer, and attorney at law. He teaches in the Surveying Engineering Technology program at the University of Maine and offers consulting services in boundary retracement, surveyor liability, roads & easements, boundary litigation, and alternate dispute resolution.

Journey all over the universe in a map, without the expense and fatigue of traveling, without suffering the inconveniences of heat, cold, hunger, and thirst.

—Miguel de Cervantes

A map of the world that does not include Utopia is not worth even glancing at, for it leaves out the one country at which Humanity is always landing.

—Oscar Wilde

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Willamette Chapter outreach

da Vinci Days, 2013

■ *Bill Lauer*

The Willamette Chapter of PLSO hosted a booth on Saturday and Sunday, July 20 and 21 at the “da Vinci Days” festival in Corvallis. This popular event is held annually as “a celebration of art, science and technology.” It represents a good venue for surveyors to educate the public about the land surveying profession, as well as generate interest in it as a career opportunity. Our chapter hosted a booth last year as well, and all volunteers felt it was worthwhile.

This year we had nine volunteers from the Willamette Chapter of PLSO: Dave Bateman, Bob Cook, Brenda James, Bill Lauer, Jamey Montoya, Louise Parsons, Tyler Parsons, Ed Query and Ray Wilson. They each spent three hours during the weekend answering questions and demonstrating various tools of the trade. Other participants included OSU’s Michael Olsen, Assistant Professor in the Civil and Construction Engineering Department, who lent his time and expertise demonstrating a 3D laser scanner with his student, Nick Kules (who also works for Watershed Sciences). The scanner brought a significant “wow” factor to the booth. The final member of our booth “corps” was Patrick Mahedy with Geospatial Services within OSU’s Campus Operations.

We all thought the public interest was good and the event was worthwhile for PLSO. Many people, young and not-so-young, expressed serious interest in the land surveying profession and took materials offered at the booth. All volunteers had fun, too. This year we had great weather and a shady spot for our booth. After “serving their time” the volunteers used their free passes to enjoy other booths, demonstrations, entertainment and food. ◉



Images of visitors at the PLSO booth taken by the 3D laser scanner



Finding the center

■ Paul Putkey

The subdivision of land under the Public Land Survey System (PLSS) can be simple or complex. Surveyors must carefully evaluate original survey notes and plats to understand how townships and sections were created and subdivided. Resurveys, completion surveys, protracted plats, draftsmen's procedures, rectangular limits, and lotting may complicate a subdivision. In its simplest form, the subdivision of a standard section (i.e., six hundred and forty acre) begins with the intersection of straight lines from "opposite corresponding quarter-section corners."¹ This intersection creates four one hundred and sixty acre quarter sections and a center ¼ corner. This principal is codified in Title 43 of United States Code 752, but what is the definition of a straight line and how does that definition affect the location of the center ¼ corner?

With the publishing of *Manual of Surveying Instructions: For the Survey of the Public Lands of the United States (The 2009 Manual)*, the Bureau of Land Management has clarified what a straight line is and what it is not. *The 2009 Manual* defines a "straight line"² as a line of constant bearing, in reference to true meridian. This definition requires surveyors to account for the convergence of meridians in many calculations. In the past, many surveyors have only accounted for convergence when calculating baselines, standard parallels, and latitudinal township boundaries. *The 2009 Manual* now defines the requirements for applying convergence to include "section lines, subdivision-of-section lines, and many grant and reservation lines."³ In a more basic view, surveyors must account for convergence for all lines which are latitudinal curves. The focus of this article is to offer a simplified solution to the *The 2009 Manual's* requirement to subdivide sections, into quarter-sections, using the intersection of "lines of constant bearing"⁴ to establish the center ¼ corner.

My approach is to limit the use of ellipsoidal geometry by employing a two part solution. Part one calculates the section's center using plane geometry, as many surveyors have done in the past, to establish a temporary point by bearing-bearing intersection. The second part is to correct the temporary point for convergence. One key rule will assist with the math. Convergence is based on the east-west distance of a line, or the change in (Δ) departure. With this understanding, a surveyor may focus correcting the temporary point along the line with the greatest Δ departure, or the latitudinal curve. By steering clear of

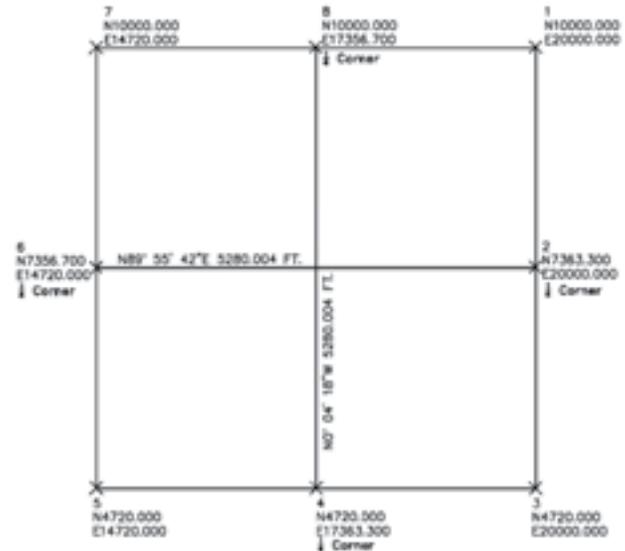
most of the more complex ellipsoidal bearing-bearing intersection solution, a surveyor can calculate a viable approximate position.

The following is a simple example. Using the ground coordinates contained the sample section (Figure 1), calculate the center quarter for mean latitude of 45° north, North American Datum 1983:

$$\left. \begin{array}{l} \textit{Ellipsoid data for this example:} \\ \textit{Geodetic Reference System 1980 (GRS 80)} \\ \textit{Semi - Major Axis Length (a) = 6,378,137.000 meters} \\ \textit{Flattening (f) = } \frac{1}{298.257222101} \approx 0.003352811 \\ \textit{First Eccentricity (e) = (2f - f^2)^{1/2} \approx 0.081810191} \end{array} \right\}$$

FIGURE 1 Sample Section

Note: See Figure 1 enlarged on page 18



Part 1 Compute a bearing-bearing intersection (Figure 1)

Step 1 Find courses and distances for lines 4-8, 4-6, and 6-2 by inverse.

- 4-8: 5280.004 feet @ 359°55'42" → N 0°04'18" W
- 4-6: 3733.527 feet @ 314°55'42" → N 45°04'18" W
- 6-2: 5280.004 feet @ 89°55'42" → N 89°55'42" E

Step 2 Calculate interior angles (Figure 2).

- 45°
- 45°
- 90°

Step 3 Calculate length of line 6-9 and 4-9 (see Figure 2).

- a. $6-9 \frac{C}{\sin(c)} = \frac{A}{\sin(a)} \rightarrow A = \sin(45) \times \frac{3733.527}{\sin(90)} = 2640.002$
- b. $4-9 \frac{C}{\sin(c)} = \frac{B}{\sin(b)} \rightarrow B = \sin(45) \times \frac{3733.527}{\sin(90)} = 2640.002$

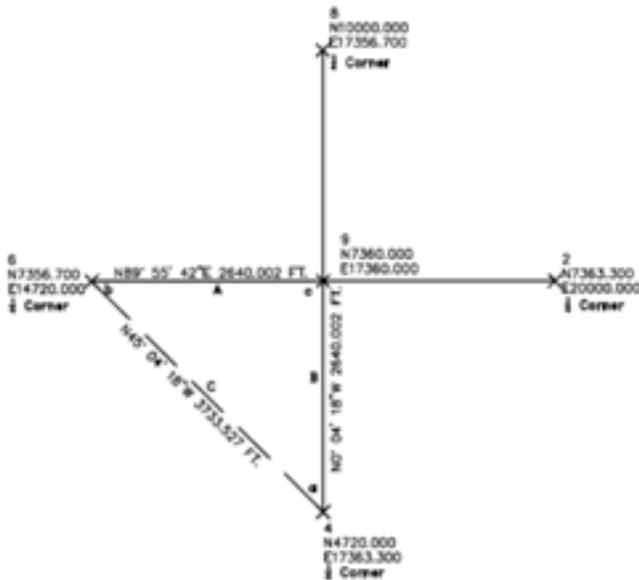
Step 4 Calculate position of center.

- a. Northerly 4-9 $\rightarrow \cos(0^\circ 04' 18'') \times 2640.002 \text{ feet} = 2640.000$
 $N4720.000 + 2640.000 = N7360.000$
- b. Easterly 6-9 $\rightarrow \sin(89^\circ 55' 42'') \times 2640.002 \text{ feet} = 2640.000$
 $E14720.000 + 2640.000 = E17360.000$

Temporary center quarter N7360.000 E17360.000

FIGURE 2 Bearing Intersection

Note: See Figure 2 enlarged on page 19



Part 2 Accounting for convergence

Step 1 Calculate the mean geodetic bearing for line 6-2.

- a. Calculate forward bearing for line 6-2 by inverse $\rightarrow N 89^\circ 55' 42'' E$
- b. Determine Δ departure for line 6-2:
 $\sin(89^\circ 55' 42'') \times 5380.004 = 5280.000$
- c. Calculate angular convergence for ellipsoid GRS 80. The following is a modified equation from *Geodesy for Geomatics and GIS Professionals*:⁵

$$c = \left(\frac{M \times \tan\theta \times \sqrt{1 - e^2 \times \sin^2(\theta)}}{a \times \frac{39.37 \text{ in}}{1 \text{ m}} \times \frac{1 \text{ ft}}{12 \text{ in}}} \right) \times \frac{180}{\pi}$$

Where $M = \Delta$ departure, $\theta =$ mean latitude, $e =$ first eccentricity, and $a =$ length of semi-major axis in meters

Note: See equation enlarged on page 18

$$c = \left(\frac{5280 \text{ ft} \times \tan(45^\circ) \times \sqrt{1 - 0.081819191^2 \times \sin^2(45^\circ)}}{6378137.000 \text{ m} \times \frac{39.37 \text{ in}}{1 \text{ m}} \times \frac{1 \text{ ft}}{12 \text{ in}}} \right) \times \frac{180}{\pi}$$

$$c = 0.0144^\circ = 0^\circ 00' 52''$$

- d. Calculate back bearing \rightarrow Rules

$\left\{ \begin{array}{l} \text{If forward bearing is northerly add convergence} \\ \text{If forward bearing is southerly subtract convergence} \\ \text{If forward bearing is east or west subtract convergence} \\ \text{Back bearing is opposite of forward bearing} \end{array} \right\}$

$$N 89^\circ 55' 42'' E + 0^\circ 00' 52'' = S 89^\circ 56' 34'' W$$

- e. Determine mean geodetic bearing:

$$\frac{89^\circ 55' 42'' + 89^\circ 56' 34''}{2} = N 89^\circ 56' 08'' E$$

Step 2 Determine the forward bearing to center quarter.

- a. Calculate Δ departure for line 6-9:
 $\sin(89^\circ 55' 42'') \times 2640.002 = 2640.000$
- b. Determine convergence for forward bearing where $M = \Delta$ departure/2

Note: See equation enlarged on page 19

$$c = \left(\frac{\frac{2640 \text{ ft}}{2} \times \tan(45^\circ) \times \sqrt{1 - 0.081819191^2 \times \sin^2(45^\circ)}}{6378137.000 \text{ m} \times \frac{39.37 \text{ in}}{1 \text{ m}} \times \frac{1 \text{ ft}}{12 \text{ in}}} \right) \times \frac{180}{\pi}$$

$$c = 0.0036^\circ = 0^\circ 00' 13''$$

- c. Apply convergence to mean bearing to acquire forward bearing

{Rule - Direction is opposite of back bearing}

$$N 89^\circ 56' 08'' E - 0^\circ 00' 13'' = N 89^\circ 55' 55'' E$$

Step 3 Adjust temporary position for approximate center ¼ position from point 6.

- a. Determine cord distance (cd) for forward bearing:

$$cd = \frac{\Delta \text{ departure}}{\sin(\text{forward bearing})}$$

$$cd = \frac{2640}{\sin(89^\circ 55' 55'')} = 2640.002$$

- b. Adjust latitude and departure

$$\cos(89^\circ 55' 55'') \times 2640.002 = 3.136$$

$$N7356.70 + 3.136 = N7359.836$$

$$\sin(89^\circ 55' 55'') \times 2640.002 = 2640.000$$

$$E14720.000 + 2640.000 = E 17360.000$$

Approximate position for center quarter: N7359.836 E17360.000

Continued on next page ▶

Finding the center, *continued*

The resulting distance and bearing from the temporary position to the approximate geodetic position is 0.164 feet at a bearing of S 0° E. Many surveyors may argue that this is an insignificant amount and not achievable. The real argument is not the influence convergence has over short distances, but is why should a surveyor take the time to calculate and understand convergence in the PLSS?

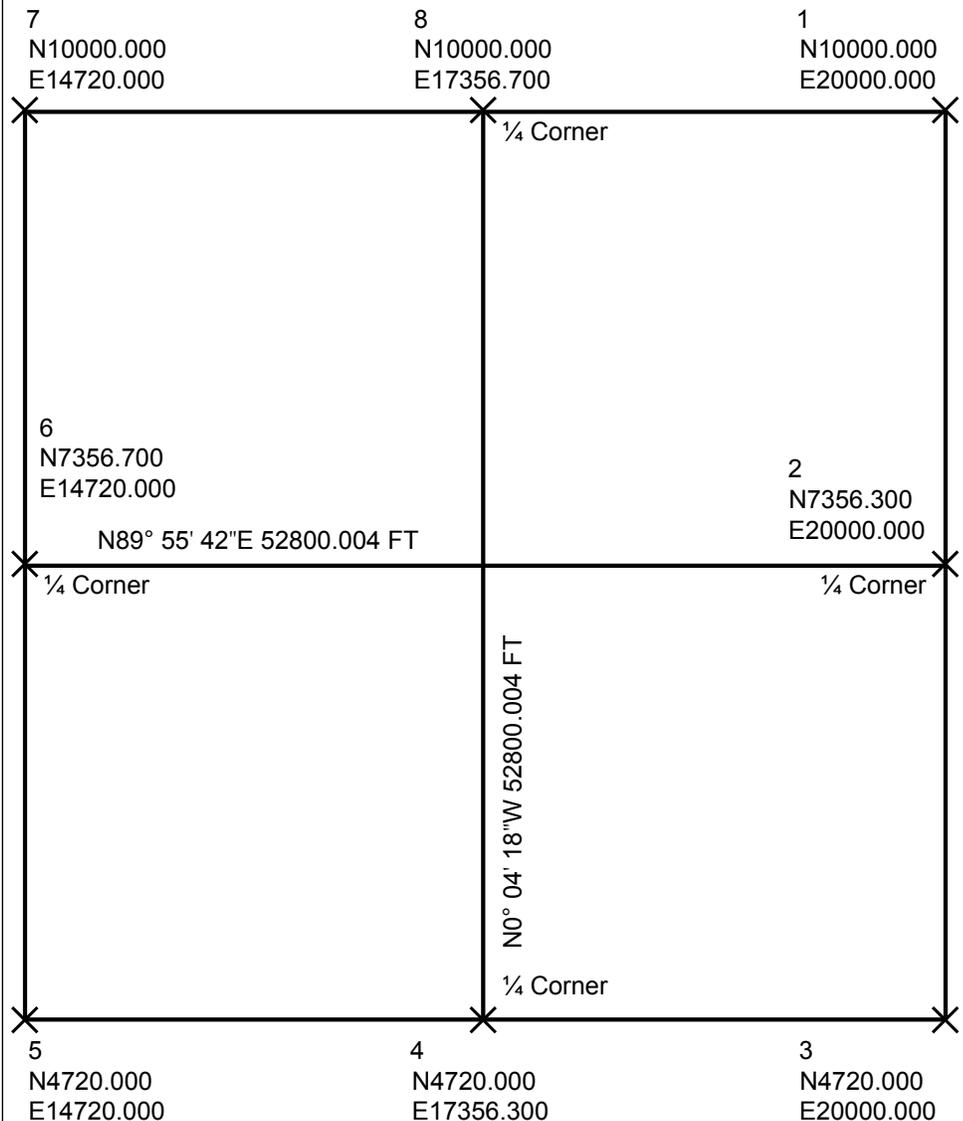
I believe there are three reasons a surveyor needs to understand convergence in the PLSS. First, surveyors need understand convergence and its application in the PLSS to conduct resurveys (dependent and independent), retracements, evaluate boundary disputes, and interpret plats and land titles which originated in the PLSS. Second, Oregon Revised Statute 209.250 and 209.070 requires surveyors to “Make all surveys of legal subdivisions with reference to the current United States Manual of Surveying Instructions.” Finally, all surveyors need to defend their work from challenge. By failing to incorporate convergence in determining the center ¼ corner of a PLSS section, no matter how small the value is, a surveyor invites attack on their entire survey. ◉

Paul Putkey is a 2010 graduate of the Oregon Institute of Technology, Geomatics, Survey Option. He is working towards his professional license as a field survey technician with Otak, Inc. at their Gearhart office. He can be reached at paul.putkey@gmail.com.

Endnotes

1. U. S. Department of the Interior. *Manual of Surveying Instructions: For the Survey of the Public Lands of the United States*. Bureau of Land Management (Denver, CO: Government Printing Office 2009), 69.
2. U. S. Department of the Interior. *Manual of Surveying Instructions*, 29.
3. U. S. Department of the Interior. *Manual of Surveying Instruction*, 30.
4. U. S. Department of the Interior. *Manual of Surveying Instructions*, 60.
5. James A Elithorp Jr. and Dennis D. Findorff. *Geodesy for Geomatics and GIS Professionals* (Ann Arbor: Copley Customs Text Books), 92

Figure 1 (enlarged)



Equation from Part 2, Step 1

Calculate angular convergence for ellipsoid GRS 80. The following is a modified equation from *Geodesy for Geomatics and GIS Professionals*:⁵

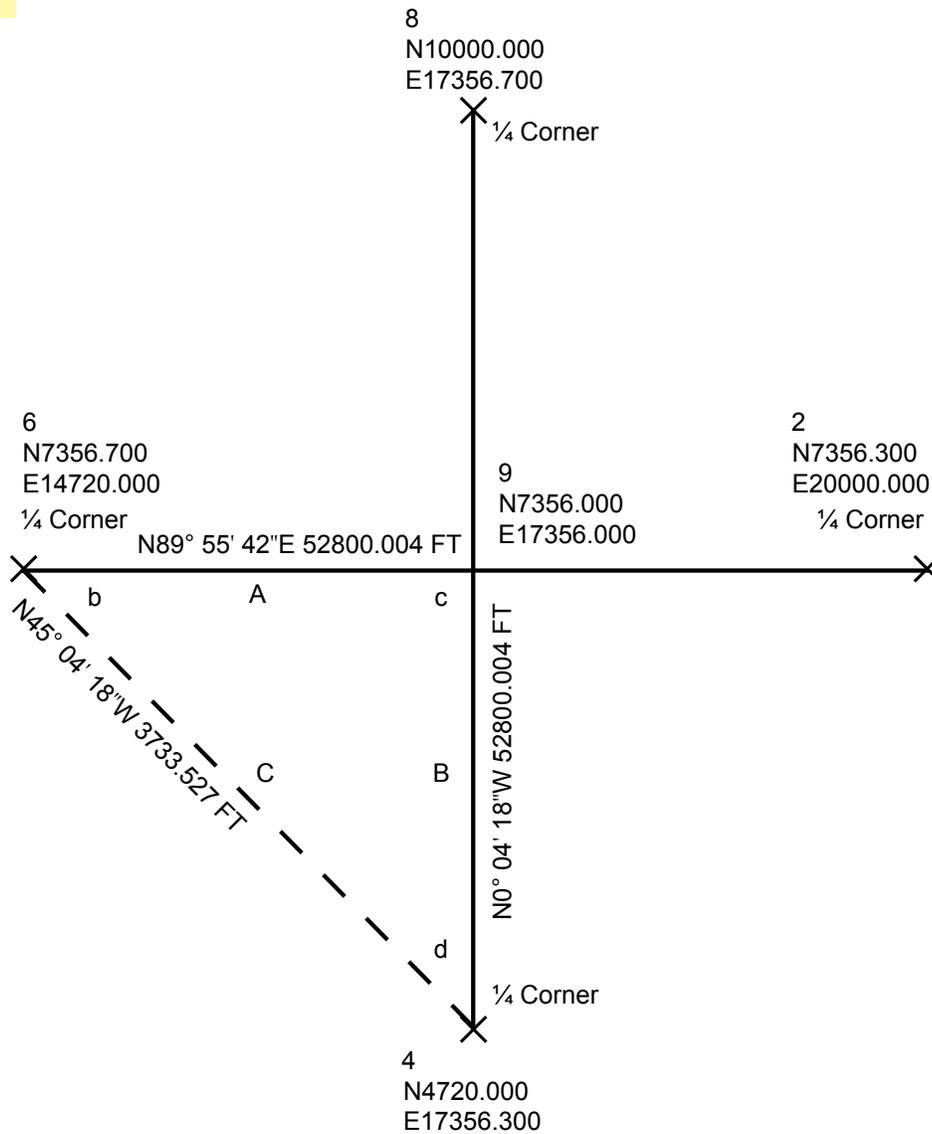
$$c = \left(\frac{M \times \tan\theta \times \sqrt{1 - e^2 \times \sin^2(\theta)}}{a \times \frac{39.37 \text{ in}}{1 \text{ m}} \times \frac{1 \text{ ft}}{12 \text{ in}}} \right) \times \frac{180}{\pi}$$

Where $M = \Delta$ departure, $\theta =$ mean latitude, $e =$ first eccentricity, and $a =$ length of semi-major axis in meters

$$c = \left(\frac{5280 \text{ ft} \times \tan(45^\circ) \times \sqrt{1 - 0.081819191^2 \times \sin^2(45^\circ)}}{6378137.000 \text{ m} \times \frac{39.37 \text{ in}}{1 \text{ m}} \times \frac{1 \text{ ft}}{12 \text{ in}}} \right) \times \frac{180}{\pi}$$

$$c = 0.0144^\circ = 0^\circ 00' 52''$$

Figure 2 (enlarged)



Equation from Part 2, Step 2

b. Determine convergence for forward bearing where $M = \Delta \text{ departure} / 2$

$$c = \left(\frac{\frac{2640 \text{ ft}}{2} \times \tan(45^\circ) \times \sqrt{1 - 0.081819191^2 \times \sin^2(45^\circ)}}{6378137.000 \text{ m} \times \frac{39.37 \text{ in}}{1 \text{ m}} \times \frac{1 \text{ ft}}{12 \text{ in}}} \right) \times \frac{180}{\pi}$$

$$c = 0.0036^\circ = 0^\circ 00' 13''$$

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Kootenay River resurvey project

July 31, 2012, part 2

■ Robert Allen

Participants Robert Allen (project lead), John Armstrong, Barbara Belyea, Bill Chapman, Delores DeMeyer, Denny DeMeyer, Bill Watson, and Don Watson. All participants, except for Barbara Belyea, were involved in GPS, photography, paddling and logistics.

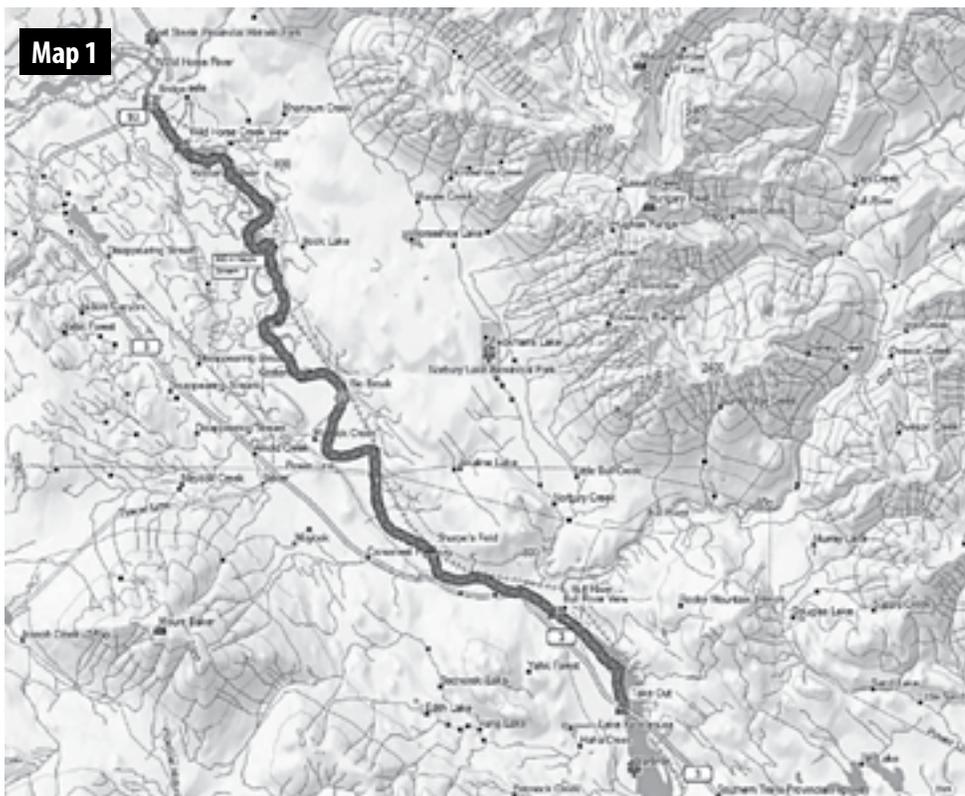
Sponsors This project would not have taken place without the financial support of the 2011 David Thompson Columbia Brigade Society, The North American Land Surveyors Canoe Team and their sponsors, and the participants.

Questions Contact Robert Allen, Box 607, Sechelt, BC, V0N 3A0, 604-885-9581, robert_allen@dccnet.com

Description of project

In October 2005, Denny and Delores DeMeyer, Bill Chapman, and Robert Allen attended a symposium on David Thompson. One of the speakers, Barbara Belyea (author of *Columbia Journals: David Thompson*), asked me if there was any project that we land surveyors could do to commemorate David Thompson. I immediately thought of comparing a handheld GPS survey of the Kootenay River with that of David Thompson, from Fort Steele to Wardner.

Our 2012 paddling team consisted of John Armstrong, Denny DeMeyer, Bill Chapman, and Robert Allen.



Mapping the route

As previously noted, we did a handheld GPS track survey of our paddle down the river and it is shown by the red line on the following map. This background map (Map 1) is from Garmin's Topo Canada, version 4, series and it shows six waypoints, our track, and much other topographic detail in the area.

Map 2 (*page 22*) is a cut from a map that David Thompson prepared and on it he notes numerous rivers, creeks, and mountains. The following table refers to that map.

Description of map annotations

Thompson used descriptive names for the streams he crossed and depending on their size, he called them a river, rivulet, brook, etc.

Continued on next page ►

Kootenay River resurvey project, *continued*

#	David Thompson's Name	Present-Day Name	#	David Thompson's Name	Present-Day Name
1	Lussier's Brook	Lussier River	10	(no name creek)	Sand Creek
2	Obs	(observation)	11	Muddy Brook	Kikomun Creek
3	(no name creek)	Mouth of St. Mary R.	12	Obs	(observation)
4	Torrent River	St. Mary River	13	Stag River	Elk River
5	(no name)	Fort Steele	14	McGillivray's River	Kootenay River
6	Skirmish River	Wildhorse Creek	15	(no name lake)	Jim Smith Lake
7	(no name creek)	Arnold Creek	16	Trout Lake	Kiakho Lakes
8	(no name creek)	Norbury Creek	17	(no name lake)	Moyie Lakes
9	Bad River	Bull River	18	(no name)	Cranbrook

Description of map annotations

Thompson used descriptive names for the streams he crossed and depending on their size, he called them a river, rivulet, brook, etc.

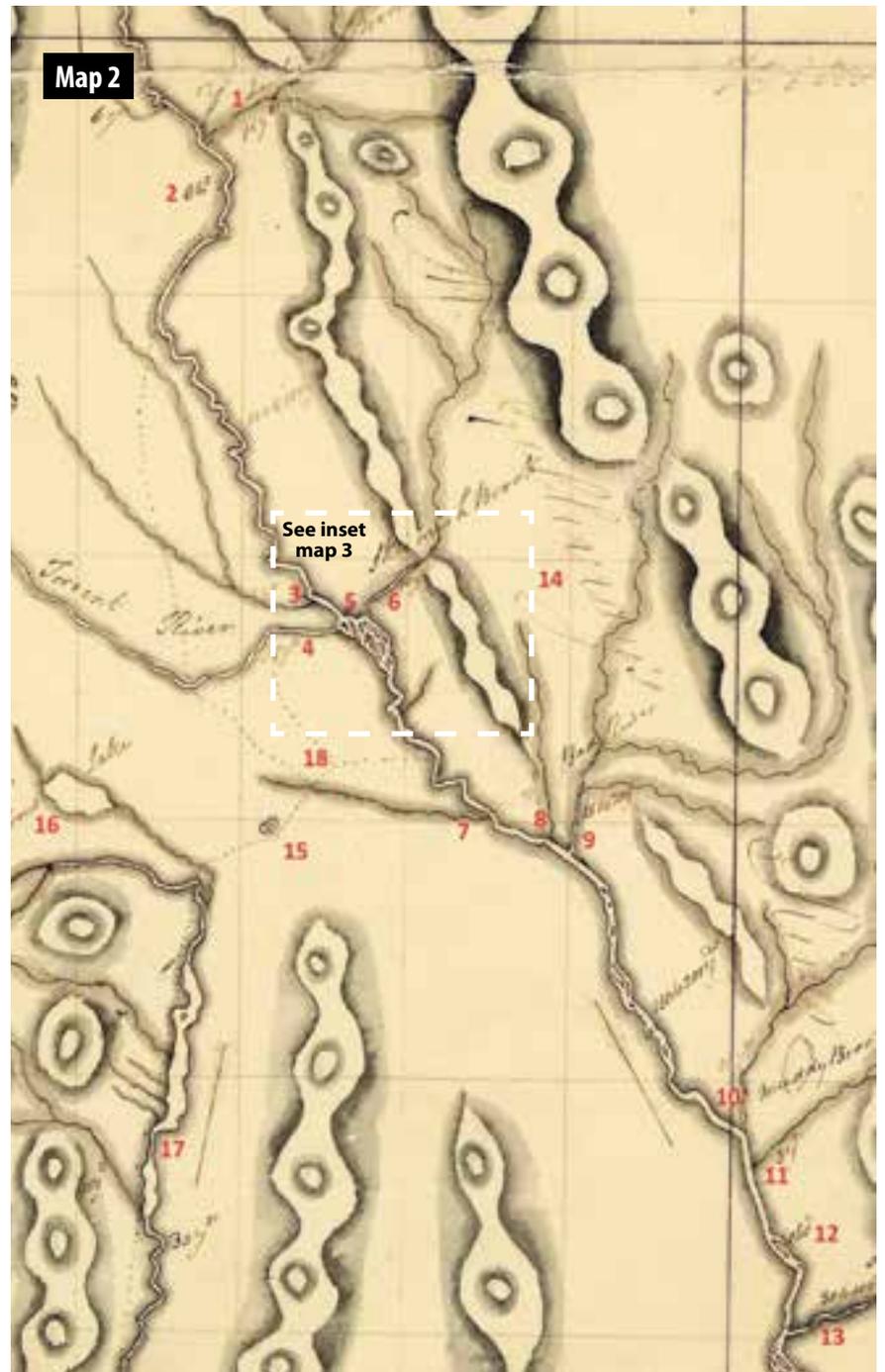
Nº 1 on the map, *Lussier's Brook* (Lussier River), was named after one of his crew men.

Nº 2 wasn't a 'place name' but was a point where he took observations on the sun with his sextant as it crossed the meridian at noon. This would enable him to calculate his latitude with a fair amount of accuracy. But in order for him to determine his longitude, it would require a different type of observation and much more detailed calculations. Thompson's calculated latitude for this point was 49°54'15".

Nº 3 shows as the mouth of an unnamed creek that is now the mouth of the St. Mary River.

Nº 4 was the mouth of the *Torrent River*, now the St. Mary River, but the lower part of that river changed its course since Thompson's time and its mouth is now located at the position of number 3 on the map. Modern topographical mapping shows a flat delta between numbers 3 and 4 with some back channels and sloughs where the river once ran its course. Thompson also noted in his narrative that the course of the *Torrent River* looking upstream was on a bearing of N 67°W. The first course looking upstream now is S 45°W, a substantial difference and further proof that the river has changed direction. Given that Thompson called it the *Torrent River* indicates that it may have had substantial water flow and current to it and that could be enough to help change its course.

Nº 5, Fort Steele, came into existence just over 50 years after Thompson passed by this way, but it is shown to give its relationship to Thompson's map.



№ 6, Skirmish Brook (Wildhorse Creek) was the site of a gold rush in the 1860s and placer mining changed its direction of flow. Most of the islands on Thompson's map no longer exist.

№ 7 and № 8 were creeks of sufficient size to have Thompson take notice them, but he didn't give them a name.

№ 9, Bad River (Bull River), impressed Thompson with its difficulty of travel and crossing. In 1793, Sir Alexander MacKenzie named another river the Bad River due to the extreme difficulty in travelling it. MacKenzie's Bad River is in the same Rocky Mountain Trench, but about 700 km northwest. It flows southerly out of Pacific Lake just south of the continental divide. His Bad River is now called James Creek and is part of the Captain Creek, James Creek, Herrick Creek, and McGregor River system that flows into the Fraser River. These four waterways were all named after Captain James Herrick McGregor, a British Columbia Land Surveyor, who was killed in action during WWI. MacKenzie travelled these waterways on his quest to find a route to the west coast of North America.

Lake Koocanusa begins south of the *Bad River* (Bull River) and is backed up behind the Libby Dam, near Libby, Mont. The name "Koocanusa" is derived from the KOOtenay River,

CANada, and the USA. On our 2012 paddle, we stopped at the Hwy 3/93 bridge near Wardner. At that time, Lake Koocanusa was a lake, but during our paddle with the 2011 David Thompson Columbia Brigade, it was a river as far south as Kikomun Creek.

№ 10 was not given a name, but was subsequently named Sand Creek.

№ 11 was given the descriptive name of *Muddy Brook* and was renamed to Kikomun Creek. Kikomun Creek Provincial Park is nearby and the largest lake within the park is Surveyors Lake.

№ 12 wasn't a 'place name,' but was another point where Thompson took observations on the sun with his sextant as it crossed the meridian at noon. Thompson's calculated latitude for this point was 49°12' 42".

№ 13, Stag River, is now known as the Elk River and has its headwaters in the Rocky Mountains.

№ 14 is *McGillivray's River*, named by Thompson after a significant family who were partners in the North West Company. It is now known as the Kootenay River and it, too, has its headwaters in the Rocky Mountains, northeast of Canal Flats. As the Kootenay River flows past Canal Flats, it is only three kilometers from the headwaters of the Columbia River in Columbia Lake and it flows southerly

into the U.S. as far as Libby, Mont. Once the river enters the U.S., it is called the Kootenae River. From there it flows past Troy, Mont., Bonners Ferry, Ida., back into Canada past Creston, B.C., and then into Kootenay Lake. After the waters flow through Kootenay Lake, the Kootenay River starts again near Nelson, B.C., and meets up with the Columbia River at Castlegar, B.C.

№ 15 is shown as small fetal shaped lake on Thompson's map. This is Jim Smith Lake which is located southwest of Cranbrook.

№ 16, Trout Lake, appears to be Kiakho Lakes.

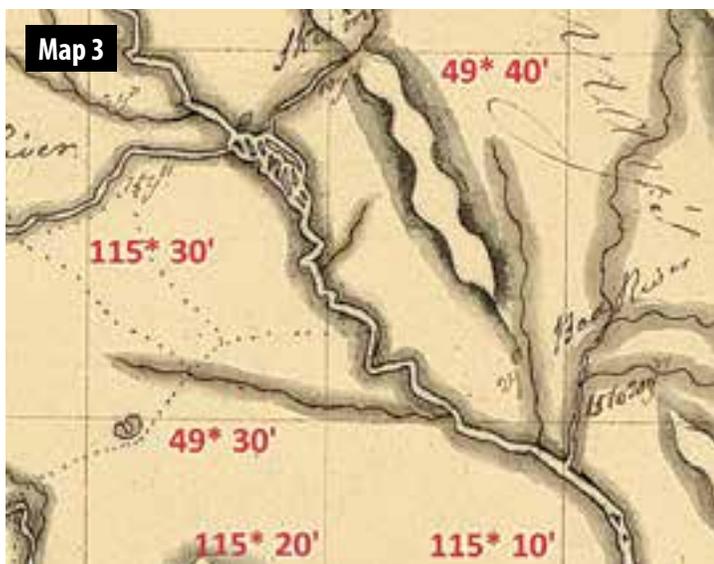
№ 17, two lakes with no name(s) are Moyie Lake(s).

№ 18, near the trail junctions, was known as Joseph's Prairie but we now know it as Cranbrook.

Thompson's maps

Map 3 is an enlargement of Map 2—without annotations—and covers the area through which we paddled. The grid lines on the map are in increments of ten minutes of latitude and ten minutes of longitude. The mouth of the *Bad River* (Bull River) according to Thompson is near 49°30' north latitude and 115°10' west longitude.

Continued on next page ▶



Comparison of Thompson's map and our GPS track

The red line on Map 4 (page 23) is our GPS track superimposed onto Thompson's map. We didn't have any definite starting or end points that were common to both surveys so we overlaid our track onto Thompson's map the best we could. Thompson's survey and map are very accurate—given the equipment and technology of his day. He took compass bearings and estimated distances and made notes of them, all while paddling many hours per day in all types of weather conditions. The only significant difference on this part of his map was between points A and B and that is because the river made a significant change of direction over time. The old channel between those points was still visible and may still be navigable by canoe; it went in the general area as shown on Thompson's map. We chose to follow what is now the main river course. The shape of the river between points B and C is very similar to what Thompson mapped and some of the difference could be from the placement of our GPS track (red line) on the map or even which side of the river we paddled on, but it is most likely due to a change in the river by erosion.

Point C is one location that is very similar on both surveys and one that we can perhaps get a better comparison of Thompson's latitude and longitude with present day mapping. Scaling from Thompson's map gives a location of 49°31'35" and 115°16'25". Based on our GPS track survey and modern topographical mapping, that location is 49°30'40" and 115°32'10"; very close for latitude (about one minute different) and closer than one might think for longitude. One must also keep in mind the following: David Thompson determined latitude and longitude using celestial methods, i.e., astronomically. Modern maps and GPS methods use a geodetic datum that is land based

(WGS 84). This difference in datum alone could result in variation of over 300 metres in latitude and longitude. Also David Thompson's equipment: sextant, mercury artificial horizon, ephemeris (nautical almanacs) and methods of the time (lunar distance) only allowed for an accuracy of about 300 METERS in latitude and about 15–25 KM in longitude. While that may seem a lot, the lunar distance method of determining longitude (1767 to 1905) was developed for ships at sea and not for early land based surveyors and explorers. Any ship knowing its location east and west by 15–25 KM in the middle of the ocean would have been thankful. It usually took 4–6 hours of complicated calculations to figure your longitude after taking as many sextant readings as practical, usually 6–8 lunar measurements.

Determining longitude is a function of time. One second of time equates to 15 seconds of arc; so one minute of arc would be four seconds of time. A difference of 15.75 minutes of (arc) longitude would only equal 63 seconds of time. Thompson had pocket chronometers, a special type of watches, to keep time but they were mostly used for determining local apparent noon. He also took other solar and other stellar observations to check the time on his chronometers but they involved difficult observations and very time consuming calculations. Determining accurate time was a big problem for not only Thompson but for all others during his era as well.

Note: Lunar distance was one of two methods for determining longitude, using a sextant held sideways to measure the horizontal distance between the moon and the sun, another navigational star or one of the four navigational planets. The other method of determining longitude was the chronometer, or mechanical method, using very precise clocks. Chronometers were

very expensive and only the navies of the larger European countries could afford them.

Thompson's narrative

The images on page 25 (*Pages A and B*) are copies of part of Thompson's narrative, most of which he wrote when he 'got back to civilization.'

Page A starts on Saturday, April 23, 1808 and carries on with Sunday, April 24. There is a small amount of overlap between Page A and Page B. Page B continues on with Monday, April 25 with the last notation being his calculated position of his observation point 12 as noted on Map 2 shown previously.

On Page A, Thompson talks about arriving at the Torrent Rivulet. He writes: "... begg [beginning] of Co [Course] the Torrent Rivulet from which I returned last Oct. it is abt [about] 20 Yds [yards] very rapid current, its course from the mountains which we see clearly is N 67°W to its falling into this river." Thompson's writing is very difficult to read, but fortunately Barbara Belyea in her book *Columbia Journals: David Thompson* deciphered most of what Thompson wrote and these pages can be read on pages 77 and 78 of her book.

River access

There is a good 'put in' for small boats at Fort Steele, downstream from the Hwy 93/95 Bridge but there weren't many other river accesses noted during our paddle. Most, if not all, of the land adjacent to the river is private property and if there were any public accesses, they were well hidden. The 'take out' we used at the Hwy 3/93 Bridge is suitable for small car top boats or canoes only but not suitable for any boats on a trailer. There is a good boat launch at the community of Wardner, just another two KM south of the Hwy 3/93 Bridge and boats of any size can be put in or taken out there. The Kootenay River from Fort Steele to

Happy Birthday, Willamette Meridian and Baseline!

■ *Tim Kent*

The 162nd birthday of the point that governs all land location in Oregon and Washington was celebrated recently at Willamette Stone State Park. Surveyors from the Oregon State Office of the Bureau of Land Management organized and hosted a lunch-time celebration at this 1½ acre park in the hills west of downtown Portland.

The park, the smallest in the Oregon State Parks system, was in great shape with the stainless steel monument imbedded in the remains of the stone that was set in 1885. The three benches honoring John B. Preston, William Ives, and C. Albert White were in place as established.

Champ Vaughn, a retired BLM employee from the Lands Department and also the president of the Oregon Geographic Names Board, gave a presentation on the historical beginnings of the early surveys and other related land activities. His book, *The United States General Land Office in Oregon*, will be published by the BLM later this year.

Royce Hill, a BLM cadastral surveyor, came dressed in period clothing and demonstrated the use of many surveying tools of the trade, including the solar compass. The sun was shining and all interested parties were able to see this amazing instrument in operation.

Even though it wasn't a banner year for celebrating this historic mark, it remains a focal point in all of our dealings with surveying in the Pacific Northwest. ◉



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