

Navigation Northwest

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Editor Notes

- *We continue our search for outings where navigation and/or communications issues provide “Lessons Learned.”*
- *The third Navigation Summit in the past four years is scheduled for Saturday, February 24, 2018. Facilitator is Sara Holt, Program Center Education Manager.*

Undersea Navigation – Does it relate to wilderness navigation in any way?

By Jerry Logan

When the dean of Mountaineers navigation instructors asked me to write a piece about lessons from a career of navigating submarines in many of the world's oceans, my first thought – after agreeing to do it – was: “there is no similarity.” But, upon reflection, there are many common principles, and even methods that can be applied. I will focus on a few, to keep this brief.

First, a picture of what sailing a submarine through the ocean is like. Submerged travel is most akin to flying an airplane. When operating below periscope depth, a submarine must be capable of safe navigation independent of external fix sources – usually visual fixes using 3 lines of bearing when in proximity to identifiable landmarks or navigation aids, or GPS only when not in sight of visual navigation aids.

The ship's position is estimated using a couple different sources – the Quartermaster's dead reckoned position (the DR) is one, and estimated positions (EPs) from the ship's inertial navigation units are others. At every position interval (the period of time between plotting each of the above estimated position sources that varies from a few to 15 minutes) a sounding is taken to determine the depth of water beneath the ship's keel. This step is critical, because as long as the value is greater than zero the ship is not aground, which as we know is NOT GOOD.

Second, the submarine is one of the few environments where everything is remotely sensed. You are isolated inside the submarine and the available inputs are:

- SONAR displays where various traces on a screen represent noise detected on a given bearing. Donning headphones one can listen to those noises as detected on the SONAR hydrophones.
- The fathometer – the only intentional noise the submarine puts into the water – measures depth beneath the keel by measuring the time for the transmitted pulse to reflect off the bottom back to the ship.

When fully submerged, that is pretty much it.

The fathometer is the external input that is the focus of submerged navigation. That sounding beneath a ship's keel is the closest parallel to a mountaineer's measure of the current altitude.

The mariner evaluates his DR and plotted EP's against each other and the concurrent sounding to estimate ship's actual position. An error estimate is applied around the DR that must encompass all EP's. This position uncertainty circle is then kept clear of any location that is considered hazardous to navigation; that is the sounding is close enough to zero that the risk of grounding is beyond the tolerance for the current mission.



Captain Logan on the bridge of the USS Michigan when surfaced. Note the line leading from harness to deck from left hip.

So the essence of submarine navigation is to keep all estimated positions clear of hazardous areas, based largely on the sounding. The mountaineer similarly uses altitude to validate her estimated position obtained from proximity to land features, or positions obtained from GPS units. The mountaineer's DR comes from estimated distance traveled along a trail for a given time traveled. Comparing DR position to altitude is much akin to comparing DR and EP's to current sounding.

Submariners have developed techniques to fix a ship's position while remaining deep using bathymetric navigation. That is, comparing the sequence of soundings encountered to the DR track. Using this method, a ship can very accurately obtain a fix based on bathymetry alone. This is equivalent to the mountaineer observing contours that closely resemble an observed landform and determining an accurate position based on this information alone.

A word about modernization and the similar effect on submarine navigation, and all other types for that matter. Over the last 30-plus years of my experience navigating at sea, technology has provided tremendous improvement. The advent and improved accuracy of GPS, the development of extremely accurate and reliable ESGN (Electrostatically Supported Gyro Navigator) and RLGN (Ring Laser Gyro Navigators) systems have made submerged navigation much safer.

The development of electronic chart databases and electronic charting devices has nearly eliminated the requirement for paper charts and hand preparation of the charts. What has not changed is the requirement for navigators to be skilled in the art and science of navigation, and to understand the basis of the information the electronics are providing.



Kitsap Branch Chair Logan on Observation rock on Mount Rainier. Note the climbing harness.

The prudent navigator recognizes the fallibility of any technology and is careful about monitoring the performance characteristics of each device upon which she relies. The mountaineer is similarly challenged to not blindly follow the direction
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of her GPS unit, but to use the GPS-provided information as another input into her practice of orienting and navigating.

The U.S. Navy has renewed its emphasis that foundational navigation skills remain valid in order to operate in environments where GPS is unavailable due to mechanical failure, severe weather or active denial by an adversary. The mountaineer is similarly wise to practice all navigation skills and not become complacent to the availability of GPS and digital maps in order to be able to safely return to the trailhead after the batteries go dead, the phone gets wet, the software faults or the instrument meets a hard place (a rock) or a deep place (a crevasse).

There is much more that could be covered here, but my hope is that this introduction provides Mountaineers with an enhanced understanding of wilderness navigation thru a look at some similar problems faced by submariners at sea, submerged.

--Jerry Logan's last active duty assignment was Commodore of Submarine Squadron 19 in Bangor, Washington. He is Kitsap Branch Chair, Navigation Chair, and a climb instructor and leader. Contact him at cjtjlogan@gmail.com.

UTM vs. Decimal Lat/Long? Is that is the question?

By Bob Boyd

The military and Search and Rescue (SAR) organizations have driven several navigation technology advances over the past few decades. Might eLatLong push aside UTM for wilderness navigators?

No one likes change, but U.S. land navigation changes over the last 230 years include:

1785 Section, Township, and Range system accepted by Congress.

1851 Initial point for Oregon & Washington Territories established on Portland's West Hill.

1899 Lat Long grid system accepted by Army Corps of Engineers.

1927 NAD27 (North American *Coordinate* Datum). See Clarke's 1866 widely used earth Ellipsoid [Clarke](#).

1949 UTM (Universal Transverse Mercator) coordinates accepted by U.S. Army.

1983 NAD83 (North American *Coordinate* Datum) based on earth's center.

1984 WGS84 (World Geodetic *Coordinate* System) based on US GPS satellite imagery.

2001 USNG (United States National Grid) Coordinates, adopted as federal standard.

2005 Mountaineers stopped teaching Section, Township, Range and adopted UTM.

2003? Seattle Mountaineers begin teaching GPS use.

2013 Wilderness GPS (Burns & Burns) published by Mountaineers Books

2017 E911 Decimal Degree Lat Long, is used 240 million times per year.

Federal 1999 legislation mandated an enhanced (e911) emergency response system including cell tower and/or gps determined lat/long location (+/- 300m) by 2012. Several states have adopted Next Gen 911 system (NG911), which can transmit text, images, video and data to the call center. Washington issued a 5-year NG911 contract to TCS in 2016 to build out the new system. As of April 2017, 12 counties (not King) employed text-to-911 services.

What if...

Two of your party are sent out with the GPS location of a mountaineering accident. What information should they be prepared to give the e911 operator? Your party has only cell phones, no satellite communicators.

Consider this...

1. The e911 operator prefers to receive your location electronically as a decimal degree, lat long coordinate, that you may not have.
2. The coordinate that you are calling in may be hard to understand, so you ask the operator to repeat what you are reporting.
3. You include your coordinate datum.

4. You use the suggested UTM reporting form: *WGS84, Zone 9, UTM Coordinates xxxxxxEasting, xxxxxxNorthing.*
5. You wait until help arrives.
6. This reporting process should be taught to our navigation students.
7. The Federal Standard *USNG* coordinates are rarely used

The Search & Rescue Units and First Responders see the benefits of using decimal degrees Lat Long. So what's new--a system called NG911 (Next Generation 911) that aims to upgrade emergency response systems, to keep up with technology and the sharing of data. To read more, go to *www.ng911.org*

Further thoughts...

It would be interesting to see software that generates a Decimal Lat Long Grid Map, such as 47.48°, 47.49°, 47.50° or 121.41°, 121.42°, 121.43°, etc. On a Decimal Lat Long map, all bearings are true, but all distances would need to be scaled from the bar scale. With UTM xx at 1:24000, the grid squares are 1km on a side.

This is the easiest lat long format you will ever teach.

Bob Boyd is a member of the Mountaineer's Navigation Committee, a member of King County Search and Rescue, and a State of Washington Licensed Land Surveyor. He is a frequent Navigation Northwest contributor. Contact: robert.boyd@comcast.net

Lost in the Books (Or just off trail?)

By Bruce Crawford

The Safety Officer was quoting from the book *Deep Survival* one day last summer as he gave the pre dawn motivational message to the crews fighting the Jolly Mountain forest fire. It was part of the focused and informative daily online video briefing that most of our neighbors in upper Kittitas Valley watched, while holding their breath, hoping the fire could be contained and afterwards everyone would get to go home.



U.S. Forest Service photo, burn zone Upper Kittitas County, September 2017.

I read *Deep Survival*, and then the two other books noted below, as I sought more information on the process of getting lost. My goals were to understand where we could train people to break that chain of events, or at least to increase their odds of survival. To clarify, I know next to nothing about Search and Rescue (SAR), but am focused on navigation training.

Gonzales, Laurence. 2004. **Deep Survival: Who Lives, Who Dies and Why.** WW Norton, NY.

Gonzales provides diverse stories and examples of accidents and failures, as well as survival. The stories come with explanations of the human psychology and brain science of how people are drawn into the situations, and the process of how they make bad, or good choices. He also shows how situations can become significantly more dangerous than people understand.

As I'm focusing on the navigation aspects, here is a take on the five stages of being lost:

1. Denial, urgent activity, trying to make the map fit where you think you might be, "bending the map," instead of trying to find your location on the map.
2. Understanding you are lost, then frantic activity terminated by injury or exhaustion.
3. Emotional flameout followed by adopting a strategy, too late to be effective.
4. Deterioration rationally and emotionally when the strategy fails.
5. Survive where you are or die.

As with the five stages of anything, real life is typically chaotic, with stages repeated or missing.

When we teach navigation, we are really focused on changing the behavior in stage one of being lost. We teach tools and we teach a set of methods. By doing that, we teach people to slow down, analyze and carefully draw conclusions when they would otherwise be speeding up and panicking rather than thinking. We are trying to replace an emotional pathway with skills, a checklist and a sustained thought process.

There is a lot of other information in this book focused mostly on surviving in differing situations. That information is focused on your thought process and managing your emotions. Essentially, getting to stage 5 of being lost without the additional damage along the way, and then how to think so you will survive.

Syrotuck, William G. 2000. **Analysis of Lost Person Behavior**, 3rd Edition. Barkleigh Productions. Seems to be the original SAR reference book on this subject. More below.

Koester, Robert J. 2008. **Lost Person Behavior: A Search and Rescue Guide on Where to Look - for Land, Air and Water**. dbS Productions (Plus the map exercise book). This seems to be the current generation of statistics for SAR planning.

These latter texts provide mostly a statistical analysis of lost person cases for use in planning how to search for a person. They describe the statistical process, then give the numbers. If you're into numbers like me, they tell stories.

The authors categorize the types of people into groups such as: despondents, gatherers, ORV users, hikers, day climbers and multi day climbers (noted as "mountaineers.") The book also splits the statistics by the type of environment to account for where the cases it is summarizing occurred.

While I found many of the statistics for various groups of people interesting, the one of immediate application regards mountaineers; if they survive their initial problem/accident on day one, they have a very low fatality rate compared to other groups when out for multiple days. A well-trained and equipped party really

makes a difference. Being well prepared to spend night(s) out improves your survival odds a lot.

Syrotuck also points out that many people fare poorly in Western Washington winters, and he defines "bad weather" as being wet and below 45 degrees, or just lots of rain. Yup, I much prefer dry snow.

The map exercise book indicates people tend to go off route at bends and switchbacks in trails (continuing straight when they should turn), junctions (choosing the wrong branch), or other places that can cause confusion (where the trail becomes less clear). This relates directly to teaching navigation students to maintain situational awareness.

Summarizing all the books in terms of navigation, we can teach the following:

- Don't just follow your leader, pay attention to your route.
- Keep a persistent watch for possible changes in the direction of a trail or route.
- When a choice in routes appears, or the route becomes diffuse, or you are confused, stop and use all your available navigation skills. We all have a favorite tool or skill, but practice using them all regularly. Chances are, if you are confused, your favorite tool or skill may not apply well to the situation.
- When everything else really fails, skip the panic, exhaustion or injury, and emotional meltdown steps noted in Deep Survival, and focus your available energy on warmth and shelter. The better prepared you are to bivouac, the better you will do.
- Humor is good. My dad taught us "When in trouble, when in doubt, run in circles, scream and shout" to help panic-proof us. We learned to quickly acknowledge our concern or fear and then focus on motivated problem solving.

--Bruce Crawford is a veteran member of the Seattle Navigation Committee. A keen scrambler and musher, he models METRO wastewater flow by day. Contact: brucec@bikejor.com

Death of the Paper Map 'Greatly Exaggerated'

By Chris Wayne

<https://www.directionsmag.com/article/7069>

There is no doubt we live in a digital world, and portable digital mapping is changing the way we use geography to solve problems. Before you send out your plotter for surplus, though, I'll suggest that hard copy maps are not just relevant, but also *essential*, in our ever-more-digital geographic world. Behind every map is a story, and behind every story is a map, paper or digital.

This isn't a Luddite rant on why we should all toss our phones and tablets and PCs and go back to the days when you had to keep turning your pencil so the line on the vellum would be the same size even as your lead wore down. (Anyone remember that?) Instead, I'd like to offer some compelling reasons to keep paper maps in your GIS toolbox.

Paper maps encourage real-time, face-to-face interaction.

Picture four different meeting rooms filled with passionate, engaged people in different locations on different dates. Each room is discussing the revision of the trail system in a beloved park. In one room are the park staff-biologists, cartographers, planners, trails crew and others; in the other rooms are the public-hikers, bikers, skiers, equestrians, hunters and retirees.

The demographics are different, but everyone is looking at the same maps. Every person in every room has different opinions on how, or even *if*, changes should be made. Of course, this could all be done online: Post the map on a website with a form for comments, or even develop an app where people can mark up the map. But, is that really a substitute for the knowledge that is exchanged when people engage face-to-face? People gather around paper maps.

How many people can gather around a phone or monitor at once? A big map on a screen can be seen by hundreds or even thousands, but how do you easily interact with it? When the maps are laid out and the pens passed around, a conversation begins. Knowledge and experience are shared. With professional guidance, all that knowledge and experience will become digital data. Let's explore reasons to appreciate the value of paper maps.

Paper maps turn small images into big pictures.

Student research on Indian Removal in a U.S. History class morphs from information to enlightenment as they all take their small group maps to the big map on the wall and draw their findings. A story begins to emerge, with dots and arrows and text. Names and numbers from individual tribes become a tale of thousands of individual people marching thousands of miles. As more

conversations begin, one young lady looks at the map and sighs, "People aren't very nice."



As small mental images become big pictures, the story unfolds. Research, drawings and paper maps become new digital information with tools like Story Maps, Esri's ArcGIS Online, Google Earth or several other web mapping apps. Story map templates take away the burden of building a base map. In this case, locational accuracy isn't as critical as showing the vast scale of tribal relocation from one region to another. These stories can be told and shared with a broader audience, but it started with a paper map.

Paper maps bridge the digital divide.

Some maps simply must be in hard copy. They may be displayed in a visitor center, handed out to rescue crews in a briefing packet, or published in a journal. More often than not, the clients requesting these maps aren't GIS folks, but they need maps to do their jobs and have strong ideas about how the map should look when it is finished.

We have all made many map revisions “over the shoulder,” making real-time on-screen changes with the client. We all know, though, that what you see on the screen isn’t necessarily how it’s going to look when it’s printed. If it is going to be a hard copy, we need to see what the final product is going to look like.

Paper maps encourage immediate reflection.

I always advise mapmakers (including myself): for every hour you spend making a map, an average reader will spend ten seconds looking at it. A compelling map, though, will draw the viewer in, and could make that ten-second glance turn into 30 seconds, or a minute, or longer; and those ten seconds per individual reader will add up to hours of cumulative viewing time.

Before you publish it, find a way to see your map from the outside. Between the cartographer and client, we know the content and data in detail. After so many revisions, we often stop seeing the forest for the trees; but remember that your audience will be seeing this for the first time, maybe the only time. This map may be your one and only chance to tell your story.

That’s why third-party review is critical. Pass on the hard copy map to someone who might be representative of your intended audience, in its final format. Stand back and let them digest it. They will definitely see things that you don’t. Their initial reaction and subsequent comments will lead to a better product.

Paper maps aren’t keyholes.

A geo-mentor of mine, Dr. John Ritter, advised me of this. He is passionate about improving public health in our community, and used his maps to bring funding for bike lanes into an underserved neighborhood by presenting them at a city council meeting. Instead of zooming in to a specific place on their device, the audience zooms in on the map with their eyes and their minds, while everything else around their area of interest is still visible. With a paper map, everyone sees the details in the context of the greater picture.

At the city council meeting, Dr. Ritter’s presentation was lauded for being the only one that was data-driven. Rather than throwing numbers and charts up on a screen, he gave them the data on a map, and they gathered around, talking to one another. The health risks in everyone’s neighborhood were there for all to see, and the conversations continued yet again.

Paper maps create digital data.

After each trails meeting, our heroic GIS specialist takes each version of each map and digitizes the mark-ups. There are numbers and words and lines, each one associated with a specific place. Two maps per meeting, a dozen or so people per

meeting, four meetings, and now you have 100+ different perspectives on the same topic using the same data.

Turning the written notes into GIS data can be a challenge. Is this a point, a line, a polygon, annotation, or a combination? Like all GIS projects, having a data schema is the first step in an iterative process. It may start with some basic shapefiles or CAD drawings, so you can get everything in there. As the picture unfolds, and more data is added, the data schema can be further refined.

Our role as geographers goes beyond making maps from digital data. We are translators. There are so many rich data sources, and our talents lie in our ability to bring these into a common language, the language of a map. Data can come from a GPS, a paper map, or a mental map. An historian who doesn't even know Excel may see the world in narrative terms, but can describe a site location in detail. Sit down with him and a paper map. The memories become dots and lines on a map that become digital data.

Decades ago, a biologist took detailed notes of bird sightings and put them on a Mylar map that lay unseen in a cabinet, until it was scanned and georeferenced and then overlaid on a recent digital map of the same birds. With collaboration, knowledge becomes data, and data become digital maps. Then these digital maps become paper maps, and the cycle of exchanging knowledge begins again. The conversations continue.

Conclusion

Analog and digital are both part of an ongoing, iterative process. All the paper maps I mentioned came, of course, from a digital GIS database, but way back when, most of the digital data upon which we depend came from analog sources. How many hours have been spent by our forebears digitizing ground surveys, Mylar sheets and 9x9 air photos? Now the information gleaned from the Post-its ® and mark-ups adds new knowledge to the digital database.

One final advantage of paper maps: When was the last time you wrapped a present with a leftover web app?

Editor's Note: Article was harvested from the weekly ezine, Directions Magazine and is reprinted with permission.

Navigation 2018 Across the Branches

Everett

Chair Joel Heidal

Joel is new to the chair position in Everett. The Basic (Wilderness) Navigation Course continues at Camp Edwards.

Foothills

Chair Ryan Dubberly

We're starting an Alpine Scramble course and will need a wilderness navigation course. At present we're looking for a field trip site. If we can find a location for a wilderness navigation class, I am hoping to have it up and running by Fall 2018, if not Spring 2019 will be the launch date. Selection criteria include:

- Accessible most of the year (Meany Lodge does not fit this category) - We want to offer both Spring and Fall classes with the options to expand.
- Commercial map available for the area. USGS/Green trails/ETC
- Easy to identify locations on the map for on-trail map practice. There should be some on-trail navigation to discuss key concepts.
- Clear area where we can set up a "wagon wheel"/stump locations to check bearings 50' from the center
- Wooded area for compass runs of 400' or more.
- Plenty of parking to accommodate 12-75 students. People can carpool, but we want to be able to have this course run 24-400 students per year.
- An area where we will not bother the public
- Restrooms are a plus, but not required
- Prefer not to require a use fee, but I am open to it on USFS/USDA/State land.

We are launching a winter (snow travel) navigation class January 2018. Details to follow regarding a one or two night class and the material it'll cover. We're also preparing to set dates for two Staying Found classes, one in April and one in May.

Seattle

Chair Brian Starlin

Seattle is offering the full suite of Wilderness Navigation, Introduction to Map & Compass and GPS classes – six independent sessions per offering. An ad hoc sub committee is looking into further modernization of navigation instruction with a greater emphasis on smart phone and dedicated GPS devices

Kitsap

Chair Jerry Logan

Kitsap has embraced the eLearning course for the workshop portion of the Wilderness Navigation Course. We've shortened the time to two weeks to discourage procrastination.

Tacoma

Chair Rick Finkle

Tacoma continues to offer the Basic (Wilderness) Navigation course.

Olympia

Chair Mike Kretzler

Olympia continues with the Basic (Wilderness) Navigation course. We moved our Field Trip to a new location.

Bellingham

Bellingham navigation instruction is wrapped into climbing and scrambling courses.

All Branch Summit

An all branches Navigation Summit is scheduled for Sunday, February 25, 11 to 3 pm at the Seattle Program Center. Program Coordinator Sara Ramsay is the facilitator. Attendance by invitation.

Wilderness Navigation Course Offerings--Seattle

Basic Navigation transitioned to Wilderness Navigation in 2016, clearly focused on wilderness/back country travel including off trail navigation to meet requirements for Alpine Scramble, Basic Climbing, Snowshoe and BC Ski students (and others). Altimeters and GPS units (basic point position) are included.

Date & Day	Workshops*	Date & Day	Fieldtrips
Monday, Jan 22 to Tuesday, Feb 13	Online Classroom	Saturday, Feb 17	Heybrook Ridge
Thursday, Jan 25	Program Center	Saturday, Feb 17	Heybrook Ridge
Tuesday, Feb 27	Program Center	Saturday or Sunday, Mar 17 or Mar 18	Heybrook Ridge
Tuesday, Mar 6	Program Center	Saturday or Sunday, Mar 17 or Mar 18	Heybrook Ridge
Tuesday, Mar 27	Program Center	Saturday, Apr 7 or 14	Heybrook Ridge
Mon, Sep 24 to Oct 23	Online Classroom	Saturday, Nov 3	Heybrook Ridge
Thursday, Oct 25	Program Center	Saturday, Nov 3	Heybrook Ridge

**Note: Students may enroll in the elearning program, as available, to complete the workshop online prior to their fieldtrip.*

Smart Phone and Dedicated GPS Navigation Course—Seattle*

Are you interested in learning to use your smart phone as a wilderness GPS? Maybe you have had a dedicated GPS for years and want to get the most out of it? The Smart Phone and Dedicated GPS Navigation course is for you! We will cover basic usage of both dedicated GPS units and the Gaia GPS app for smart phones, as well as common issues that can affect GPS accuracy and ways to avoid them. This course is an evening at the Mountaineers Seattle Program Center, split between a classroom lecture and a hands on outdoor exercise. Prior completion of the Wilderness Navigation course is strongly encouraged. Fee and Badge.

Topics include:

- Overview of how GPS works
- Common accuracy issues and solutions
- Review of UTM coordinates – Working knowledge is assumed
- Entering waypoints
- Navigating to a way point
- Back tracking a route
- Overview of emergency communication devices (SPOT & PLB)

Students need to bring a GPS enabled device to the class; loaners are not available. We cover both Gaia for iOS and Android devices (\$20, pro not required/Free to Mountaineers) and Garmin dedicated units. Other brand GPS units are welcome, but instructors may not be familiar with them. Lead course administrator is Michael Hutchens.

The current URL provides a description and the 2018 dates are on the calendar:
[GPS2018Seattle](#)

Smart Phone & Dedicated GPS Course	Location
Wednesday, January 31	Seattle Program Center
Wednesday, April 18	Seattle Program Center
Wednesday, May 23	Seattle Program Center
Wednesday, June 6	Seattle Program Center
Wednesday, August 22	Seattle Program Center
Wednesday, September 26	Seattle Program Center

Introduction to Map & Compass (& Altimeter) – Seattle*

The Seattle Navigation Committee scheduled six 2018 Introduction to Map and Compass dates at the Seattle Program Center from 6:30 to 8:30 p.m. Instructors are drawn from the pool of Wilderness Navigation Course teachers.

Administrative leads are Nina Crampton & SuJ'n Chon. This Getting Started introductory class does not satisfy the navigation requirement for Alpine Scramble, Basic Climbing, Snowshoe or Backcountry Ski. Fee, no badge.

Intro to Map, Compass (& Altimeter)	Location
Monday, January 15	Seattle Program Center
Wednesday, April 25	Seattle Program Center
Monday, May 14	Seattle Program Center
Monday, June 11	Seattle Program Center
Monday, August 13	Seattle Program Center
Monday, September 10	Seattle Program Center

Other Seattle 2018 Navigation Seminars/Clinics*

Seminars/Clinics	Dates
Instructor Training in Person – No fee	Wed, Jan 17
Instructor Training Elearning – No fee	Wed, Oct 10
Mentor Sessions Wilderness Navigation – No fee	Thur, Feb 15, Mar 15, Apr 5, or Nov 1
Wilderness Navigation Equivalency – No fee	Rolling enrollment
Contact Leader Lynn Graf	

Other Branches 2018 Navigation Courses*

Branch	Course	Dates
Everett	Basic Navigation Workshop and Field Trip at Camp Edward	Saturdays Mar 3 or 31
	Wilderness Navigation eLearning Option	Under Consideration
Foothills	Staying Found	Saturday, Apr 14
	Wilderness Navigation	Under Development
	Back Country Winter Navigation	Thursday, Jan 25

Kitsap	Both series have Elearning Wkshp Option	Feb 14 thru 28
		Sep 17 thru 28
	Wilderness Navigation Lectures Option	Thursday, Feb 14 or Oct 4
	Wilderness Navigation Wkshp/Field Trip	Saturdays, Mar 3 or Oct 6, or Sunday Oct 7
Olympia	Navigation Lectures 1 and 2	Tuesday & Thursday Apr 17 & 19
	Navigation Field Trips	Saturday or Sunday Apr 21 or 22
Tacoma	Wilderness Navigation Lectures 1 & 2; Field Trip	Mar 12 & 19; Saturday 24
	Wilderness Navigation Lectures 1 & 2; Field Trip	May 8 & 10; Saturday 12
	Wilderness Navigation Lectures 1 & 2; Field Trip	Aug 7 & 9; Saturday 11

* Check mountaineers.org for up-to-date listings.

Navigating Through the Wild Elearning Course – No Badge

Books -- National	Online Lessons Support Backcountry Off Trail Travel -- Contact Doug Canfield, Books	Completed, No plans to repeat
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Mazamas (Portland, OR) 2018 Navigation Instruction*

Portland	Navigation Skill Builder Class – Videos, Wkshp, Field work	TBD 2018
	Smartphone GPS	TBD 2018

*Northwest climbing clubs support similar goals for exploration, learning and conservation. Reciprocity is routinely granted across state lines. Mazamas lead navigation instructor is John Godino, contact johngo.pdx@gmail.com.

Navigation Gear, Apps & Links of Interest

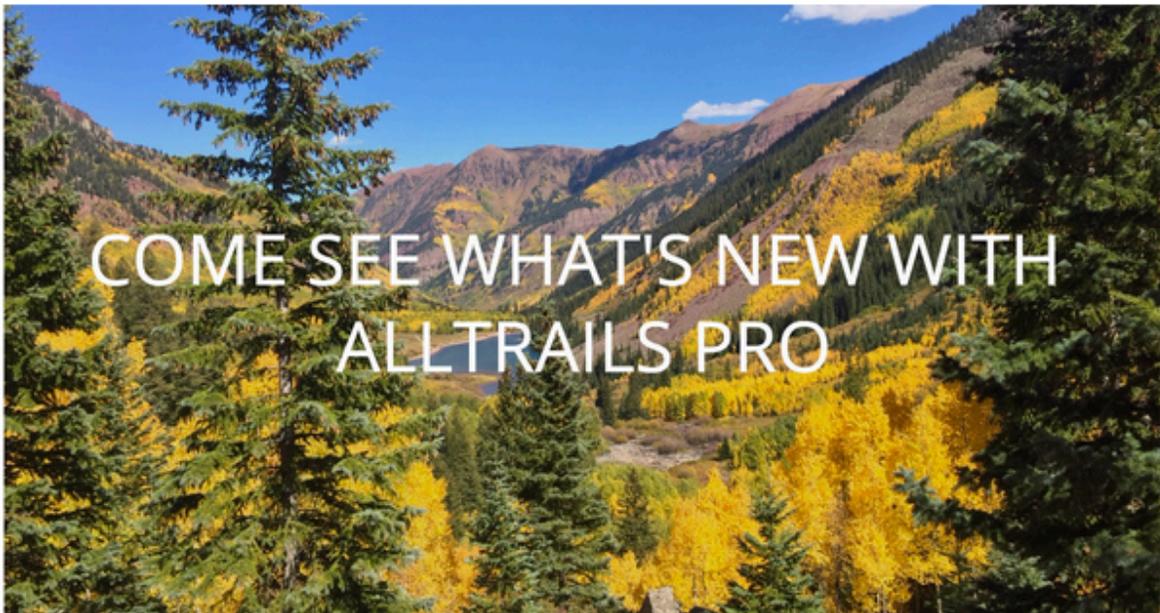
Your comments and suggestions are ever welcome regarding the Seattle Navigation website and links in Navigation Northwest. –Pat Podenski, Section Ed

The Gear...

- Navigating city streets on night hikes? Try the Nebo “Big Larry” COB LED light. Editor and wife use Big Larrys to lead and sweep hikers across city streets alternating between red flash (crossings) and white (sidewalks and park trails). A great partner to the headlamps all wear. Runners find favor with “Little Larry.” [Around\\$17](#)

The Apps...

- AllTrails Pro tools upgrade announced with emphasis on custom maps, Quickdraw to create custom maps, real-time overlays, and more print options. Site: <https://www.alltrails.com/>



We're excited to announce our new and improved Pro tools to help you spend more time outside doing what you love!

[CHECK OUT WHAT'S NEW](#)

Google maps will work like Google Earth by using the mouse control key to change from 2-D to 3_D view. Try it on a tall mountain – a John Godino. See: [Full3d](#)

(Following apps first published in June 2017 issue)

Free (or nearly) Altimeter Apps For Smart Phones

By Lynn Graf

	App Name	Device	Developer	Cost
	Gareth Altimeter	Android	Gareth Price	free
	Accurate Altimeter	Android	AR Labs	free
	Pro Altimeter	iPhone	Hunter Research and Technology	\$0.99
	Altimeter Plus	iPhone	Sichtwerk AG	free

Short guide to a few recommended altimeter apps for cell phones

Don't want to spend the money for a classic wristwatch altimeter, one more gadget? Basically all SmartPhones nowadays have GPS capability. This means that they can pinpoint your spatial position without cell service, which is often spotty or non-existent in the backcountry (and searching for a signal drains the battery, in case you haven't noticed). Many of the newer models (iPhone 6 and later, for example) also have a pressure sensor. This can be used for extra correction or a cross-check of elevation by barometric pressure (which is what wristwatch altimeters use) but that is not really necessary and requires more frequent calibration.

Here are recommendations for two very basic apps for Android and two for iPhones.

Selection Criteria (not in order of importance): low or no cost, easy to use, no cell service required, no ads, low memory and storage usage, reasonable speed at obtaining GPS signals, clear numerical display, recommendation from Mountaineers member(s) who have used it in the field.

There are many more out there, more all the time, and increasingly with features in addition to GPS-based elevation. We invite you to try them, see how they work for you, and let us know if they don't work as advertised. If you want additional information, see the article in Navigation Northwest

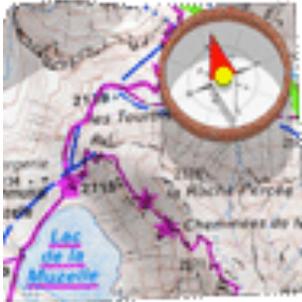
(<https://www.mountaineers.org/blog/how-to-pick-an-altimeter>) describing a systematic comparison of several Android apps.

Also, The Mountaineers currently has a deal for free use of GAIA Pro that basically turns your cell phone into an advanced GPS device. Check the website under "Benefits" (<https://www.mountaineers.org/membership/benefits/instructions-for-redeeming-member-benefits>). It is highly recommended but requires time and practice to set up and use efficiently. The Seattle Navigation GPS class features Gaia as the app of choice. Backcountry Navigator, another full-service GPS app, also has many followers. Both are well worth it, in my opinion, but a paper map, compass and altimeter app will get you a long ways, both on and off-trail.

--Lynn Graf is a past Seattle Navigation chair and an active hikes and scrambles trip leader. She is a frequent contributor to Navigation Northwest. Contact her at: lynn.graf@gmail.com.

Free (or nearly) GPS Apps for Smart Phones

By Brian Starlin and Emma Agosta

Screen Shot	App Name	Device	Developer	Cost
	MyTrails	Android	FrogSparks	Free Pro €2
	GPS Essentials	Android	Schollmeyer Software Engineering	Free
	Handy GPS	iPhone	Anthony Dunk <i>[Note: Also authored Coordinate Master to convert Lat/Long to UTM]</i>	Free
	Altimeter GPS	iPhone	Andrea Piani	Free

Criteria for Android and iOS GPS:

- 1) Backcountry oriented (Topo Maps rather than street maps)
- 2) Works offline, in airplane mode, with only the GPS on

- 3) Can display UTM and Lat/Long
- 4) Has at least NAD83/WGS84, but gets extra points if it has NAD27
- 5) Extra points if it's available for Android and iOS
- 6) Able to save data and send in GPX format
- 7) Able to import GPX format
- 8) Accurate (although I believe it's based on underlying GPS hardware)
- 9) Extra credit if tracks can be shared on a cloud service
- 10) Free

We used a 10-point scale with higher numbers meaning more of the above features were found. Also, there is a main point we need to make. Gaia is a serious app for backcountry use and has all the features we want. And Gaia Pro is currently free to Mountaineers members.

Android Reviews (Brian)

>>GPS ESSENTIALS (mictale.com) -- 5 points

Only available on Android.

It only uses cached maps, which limits its offline usefulness.

Very robust dashboard, highly configurable.

Limited selection of map sources

The UI is clunky. It uses a thing called "streams" to store data. The Import/Export functions were hidden in the "streams." The track recording was also buried in the stream screens. The Dashboard is great, but the other functions are clunky.

>>HANDY GPS (BinaryEarth) -- 2 points

Great for just displaying your coordinates in various formats. It has very limited maps -- a blank screen, and the Google Maps. The map does not work offline and cannot be downloaded.

>>MYTRAILS (FrogSparks) -- 6 points.

Great selection of maps. I think it has only NAD83/WGS84 because I don't see a Datum setting. Tracks and waypoints can be saved as GPX. The free version can only save the current track, plus one. And can only store 100 tiles at a time in the offline storage. UTM displays on the screen. It's on Android.

>>RAMBLR (Bientus) -- 2 points

This is more of a journaling and trip sharing app than a GPS app. It's very focused on tracking and sharing details of a trip. It has Google Terrain and OpenCycle maps. It can use an offline map. It does not display coordinates, but it can show you your location on the map background. As I said, it's a journaling app.

iOS Reviews (Emma)

Additional features I noticed are under "other features and comments."

>>ALL TRAILS -- 3 points, free

Hiking oriented but by trail (not backcountry). More like WTA app. Works offline. WGS 83/84. Available for IOS and Android. Map overlays (such as USGS topo) are in the Pro version (\$29.99/year). No UTM or Lat/Long. Other features/Comments: ability to track a route, keep history etc. Many other apps do this for hiking, biking, running and other sports. I do not believe these are the kind of apps our readers are looking for.

>>ALTIMETER GPS -- 4 points, free.

Not backcountry oriented. Lat and Long: yes. No UTM. Elevation (ft/meters). Accuracy: unknown. Available on both? Some features only work with internet (i.e. choice of map format). Other features/comments: Weather, barometric pressure. Compass heading, Step Counter. Speedometer. Save position. Ads (non intrusive at the bottom, yet one can accidentally click). Find feature to search for location.

>>DECLINATION -- 1 point, free

Not backcountry oriented (map: satellite view). Lat and Long and UTM. Works offline: yes. Accuracy: unknown; Datum: ? Other features/Comments: Declination; Ability to search by Lat and Long. Ads.

>>HANDY GPS -- 6 points, free

Not backcountry oriented. Works offline: yes. UTM and Lat/Long, (plus elevation); Datum: ? Available for both IOS and Android. Able to save data and email : yes. GPX file: no; Accuracy level (+-10m). Other features/comments: nice display: uncluttered; intuitive, user-friendly; key features: Map. Digital Compass. Can save waypoints and email position from within the app. No ads. My favorite among free but cannot compete with Gaia.

>>MAP TOOLS -- 3 points, \$0.99

Street oriented; Works offline; Lat and Long and UTM; Datum: ?; GPX format: no; accuracy: unknown. Other features/comments: Not intuitive. Confusing zoom in and out feature. Declination provided.

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And the links ...

- There's an app for that. A story from the UK of lost hikers who were able to install a smartphone app (OS Locate - iOS and Android) to provide their location to search and rescue so the hikers could receive a compass bearing to follow back to the trailhead.
<https://www.grough.co.uk/magazine/2017/10/15/rescue-team-gets-lost-walkers-to-download-os-locate-app-to-guide-them-from-fell#>
- Another UK article with 10 tips for navigation in bad weather.
<http://www.tgomagazine.co.uk/skills/navigation-skills/10-tips-for-mountain-navigation-in-bad-weather/>
- This resource has been noted before, however it bears repeating: free National Geographic PDF quad maps.
<http://www.natgeomaps.com/trail-maps/pdf-quads#internalmap>
- Instructions for printing (including large sized) Gaia GPS maps.
<https://blog.gaiagps.com/print-maps-online/>

Philip Werner (Section Hiker website) reviews the Garmin inReach Explorer. Philip compares the inReach to the SPOT Gen 3 satellite messenger, explaining why the inReach is a big step up.

<https://sectionhiker.com/garmin-inreach-explorer-satellite-communicator-review/>

Finally, a couple of features in the premium version of Gaia GPS:

U.S. Forest Service Motor Vehicle Use Maps Now Available

<https://blog.gaiagps.com/u-s-forest-service-motor-vehicle-use-maps-now-available/>

NeoTreks Land Use Maps Now Available

<https://blog.gaiagps.com/neotreks-land-use-maps-now-available/>

Navigation Gear--Compasses

Required Compass Features: Seattle Wilderness (Basic) Navigation Course & Foothills Staying Found Seattle Mountaineers—Revised March 2017

1. **Adjustable declination:** If there is one feature that simplifies map and compass work, this is it. Compasses with adjustable declination can often be identified by the presence of an adjustment screw, usually brass or copper-colored, and a small key attached to the lanyard. It allows you to move the orienting arrow in relation to the azimuth ring.
 - All students **MUST** have a compass with adjustable declination. The presence of a declination scale does not guarantee that it can be adjusted. Avoid the 'tool-less' declination feature on the Brunton (see below).
 - Even if you already have a compass without adjustable declination, you may not use it in this course. Experience indicates that such compasses detract from the learning experience.
2. A **transparent rectangular base plate** with a direction of travel arrow or a sighting mirror.
 - Transparency allows map features to be seen underneath the compass.
 - A rectangular shape provides straight edges and square angles to plot on the map.
3. A **0 to 360 bezel** (the rotating housing) marked clockwise from 0 to 360 degrees in increments of two degrees or less. In general, bezels should be large to allow use while wearing gloves - the larger size also improves accuracy. Do not get one marked in 0-90 degree quadrants OR one marked in 0-6400 mils!
4. **Meridian lines:** Parallel 'meridian lines' on the bottom of the interior of the circular compass housing rotate with the bezel when it is turned. Longer lines are better. Meridian lines run parallel to the north-south axis of the bezel, however turned, for plotting and triangulating on the map.
5. A **ruler and/or gradient scale** engraved on one of the straight edges, used for measuring distances. In the U.S. 1:24000 scales (rather than 1:25000) are preferred.
6. A **3 to 4-inch base plate**. A longer straight edge makes map work easier.

Additional recommendations

- A sighting mirror in the cover: Reduces error introduced when moving compass from eye-level after sighting to waist-level for reading the dial.
- A liquid-filled housing: Reduces erratic needle movement (common on better compasses). In some cases, steadying the compass needle can be difficult
- An inclinometer: A gravity driven arrow that allows you to measure slope angle.

Current favorites: Silva, Suunto, Kasper & Richter, and Brunton are the common favorites. Their quality and usability varies, so **keep any receipt**. We have unfortunately seen many defective compasses in the past. Beware the UST ~\$7 knock-off baseplate compass available via Amazon and other outlets. Our gear tests show it to be unreliable.

--From Silva, with a sighting mirror, is the Silva Ranger 515 CL (not the CLQ). Without a mirror is the Silva Explorer Pro (not the 203 or Polaris). Silvas are available at Cabela's or online.

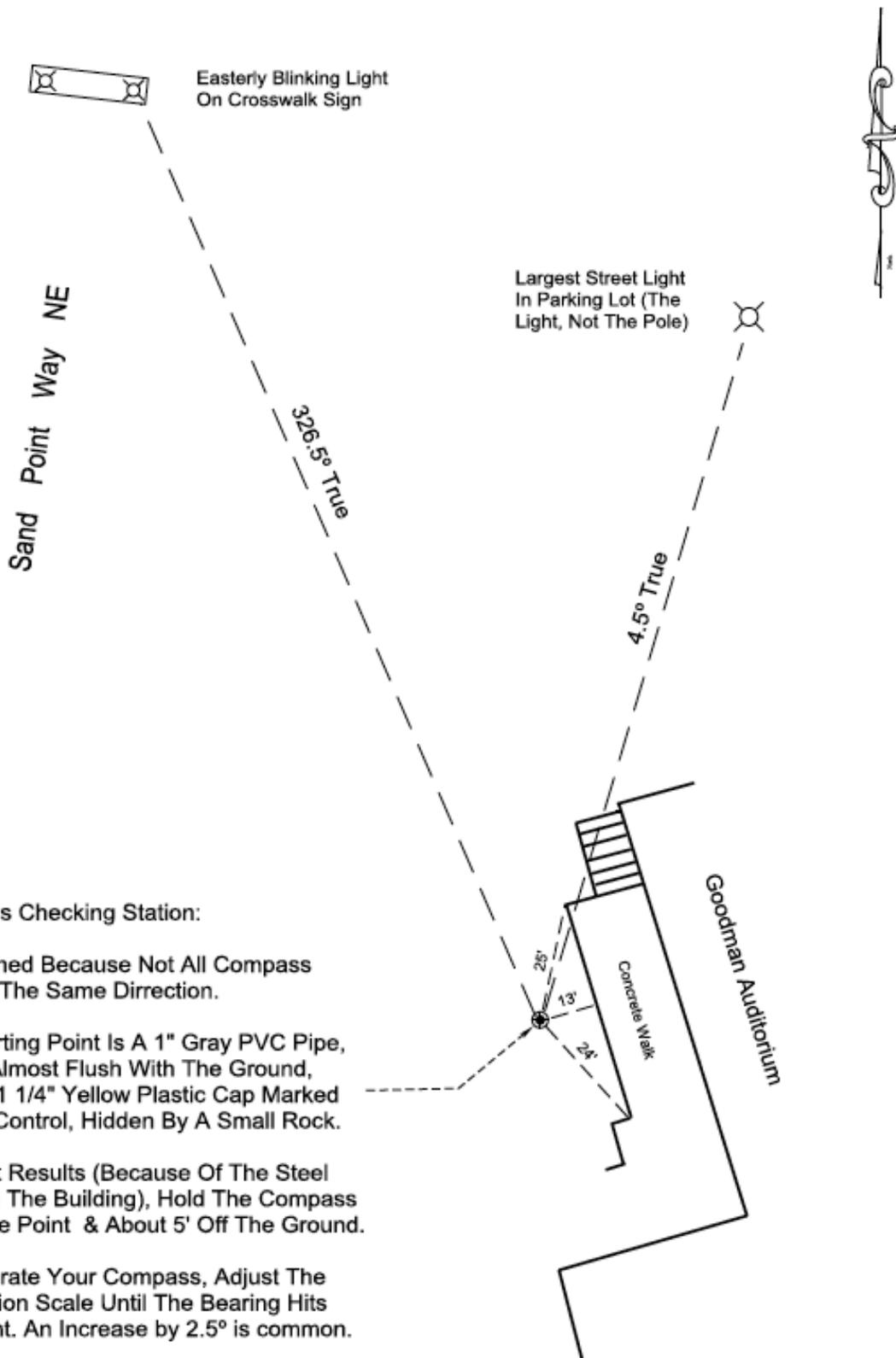
--K & R has the Sherpa and Alpin using 1:25,000 vs. 1:24,000 rulers. They are available online.

--Brunton has several compasses that meet our requirements but present issues with "tool-less declination", lack of clearly visible meridian lines or scales and curvy shapes. Several tool-less declination models have come apart in user hands. Preferred models are TruArc 15 (mirrored), and TruArc 5 (non-mirrored). The TruArc 10 has measurement scales (good) but curvy sides (not good). The TruArc 3 lacks clear meridian lines and is short. Bruntons are available at REI, Cabela's or online.

--Newly available retooled Suunto MC-2 (mirrored) and M-3 (non-mirrored) 2016 models passed all bench tests with flying colors. Suunto is currently available at REI, Feathered Friends and online.

Manufacturers make continuing improvements and corrections in models.

(Rev Mar2017/bb)



Compass Checking Station:

Established Because Not All Compass Point In The Same Dirrection.

The Starting Point Is A 1" Gray PVC Pipe, Driven Almost Flush With The Ground, With A 1 1/4" Yellow Plastic Cap Marked Survey Control, Hidden By A Small Rock.

For Best Results (Because Of The Steel Roof On The Building), Hold The Compass Over The Point & About 5' Off The Ground.

To Calibrate Your Compass, Adjust The Declination Scale Until The Bearing Hits The Light. An Increase by 2.5° is common.

Please Hide With Rock When Finished.

RWB
2/2014

Seattle Program Center Compass Calibration Station

Navigation Northwest Copy and Publish Targets 2018

Calendar 2018	Copy Deadlines	Publish Dates
Volume 6, Issue 1	March 1	Late March 2018
Volume 6, Issue 1	June 1	Late June 2018
Volume 6, Issue 1	September 1	Late September 2018
Volume 6, Issue 1	December 1	Late December 2018

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p.hendrickson43@gmail.com

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Guidelines for contributor submissions:

- Word doc...Google doc OK but not a PDF
- 12 pt Verdana
- Standard margins
- Indicate in body of text where you would like figs/tables etc. to go
- Send figures, tables, photos as attachments or by separate email
- Refer to figs by number in body of text
- No footnotes, header or footer
- Author blurb with preferred email contact address

Kindly contact editor for further information regarding topics, length, tables, figures, deadlines...

"Do not go where the path may lead, go instead where there is no path and leave a trail." --Ralph Waldo Emerson, American writer, 1803-1882

(Rev09Jan2018/ph)