

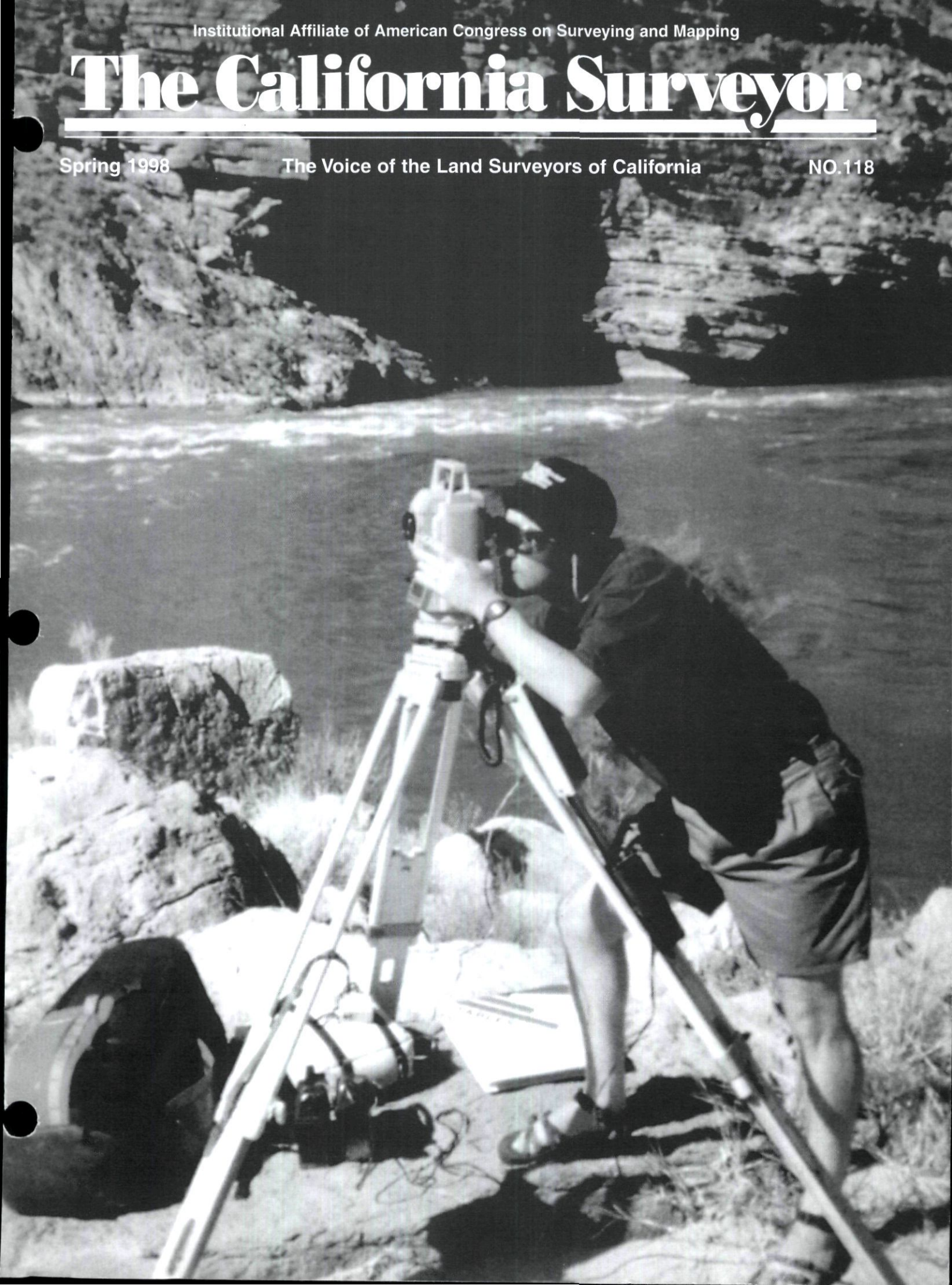
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The California Surveyor

Spring 1998

The Voice of the Land Surveyors of California

NO.118



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"Recognizing that the true merit of a profession is determined by the value of its services to society, the California Land Surveyors Association does hereby dedicate itself to the promotion and protection of the profession of land surveying as a social and economic influence vital to the welfare of society, community, and state."

"The purpose of this organization is to promote the common good and welfare of its members in their activities in the profession of land surveying, to promote and maintain the highest possible standards of professional ethics and practices, to promote professional uniformity, to promote public faith and dependence in the Land Surveyors and their work."

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Surveying the Colorado River through the Grand Canyon, from the article "The Trip of a Lifetime," appearing on page 15.

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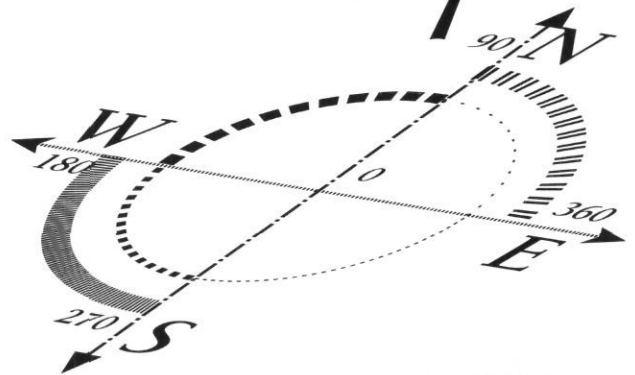
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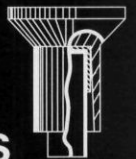
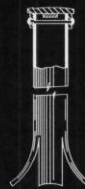
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President's Message

Why Bother to Belong to CLSA?

By: Steven C. Wilson, PLS

I am looking forward to serving you during this year as President of the California Land Surveyors Association. During the past few years, I have gained much insight into the operations of the California Land Surveyors Association, and I have also learned some things about the governmental, legislative and political processes that have a very profound effect on our day-to-day practices as Professional Land Surveyors. During this time, my opinion about the value that C.L.S.A. holds to the land surveying profession has become more consistent than ever with the basic premises that I expressed in another article written over two years ago. That article ended with, "Along with all of the other possible incentives, one truth exists. How can a person who is genuinely interested in land surveying afford not to belong to CLSA?" After that article was published in the California Surveyor, I expected that many would get the message and promptly join. The membership statistics tell me that a much more direct approach is necessary.

C.L.S.A. is a volunteer organization, and as such the elected Officers, Board of Directors, and Committee members serve without any monetary compensation for the time expended. There can be many reasons why some of us become involved to the point where our discretionary free time becomes scarce. I think most of us hold the belief that what we contribute does make a difference. Perhaps the most widely held belief is that professionals have a responsibility to contribute to the good of their profession. Individually, we may conclude that the more you give, the more you also get from your efforts. All of the above are true to some degree for those who actively participate in C.L.S.A. If you agree with what I have just said, you are probably already a member. If you do not agree, it is time to wake up to what is happening

around you.

It is very foolish to have a sense of security about our Land Surveying Profession. Changes are occurring very rapidly in government, regulatory agencies nationwide, and those ubiquitous, rapid, technological leaps ahead. Some changes that have happened or may soon become reality are:

1) Have you noticed that last year the Engineering Surveying Program at the California State University in Fresno disappeared? It is now known as "Geomatics Engineering". What do you actually know about geomatics? Are you aware that this change has already occurred in Canada and Europe?

"How can a person who is genuinely interested in land surveying afford not to belong to CLSA?"

2) Did you know that our Board of Registration was almost sunset last year? Senate Bill 828 extended the life of BORPELS for two more years, however, this bill also contained language that widely broadened the industrial exemption for all engineers except for Civil Engineers.

This change was being pushed by the electronics industry in Silicon Valley. It was not obvious that this rider to SB 828 would not kill the bill. If this bill did not pass, BORPELS would not continue to exist. How would you feel about being regulated generally by the Department of Consumer Affairs without any distinct board of our own? Do you know what the year 2000 will mean to us?

3) BORPELS is now considering dropping "Registered" or "Professional" from our titles in favor of "Licensed". Do you have an opinion about that? You might want to be prepared to have new rubber stamps or seals made if it becomes reality.

4) Are you aware that the state employees' union, the Professional Engineers in California Government, has succeeded in placing a CONSTITUTIONAL AMENDMENT on the June 2, 1998 ballot entitled: "Government Cost Savings and Taxpayers Protection Amendment"? In my opinion, it is an over-reaction to the "Contracting-Out" dilemma that Caltrans has been dealing with the last several years. This measure has a deceptive title, and is thinly justified as a public safety issue. Don't be fooled. This measure, if it passes, will socialize all Land Surveying, Engineering and Architectural services if any state funding is used for its design, construction, or maintenance. This includes highways, county roads, city streets, schools, hospitals, prisons, and even private subdivision design if the streets are dedicated. (The C.L.S.A. Board of Directors did take a stand opposing this measure, which was unpleasant knowing we have members employed by the State of California.)

5) Are you abreast of the latest changes to the Professional Land Surveyors Act? Changes to the laws that regulate our practice occur annually. The Board of Registration is also planning to do a major Professional Land Surveyors Act rewrite after the Professional Engineers Act is done. This is an excellent example of why you need to be represented by a strong society.

6) Do you have an opinion about mandatory continuing education in order to maintain your license? Are you aware that over one-half of the states now require it? Are you willing to let the lawmakers pass legislation that will have a significant effect on your ability to practice as a Land Surveyor without having any say in the process?

7) What do you think about the "Record of Survey" issues statewide. C.L.S.A. is actively working on making the "Record of Survey" process as easy as possible. Do you have an opinion about the sometimes onerous process that we must go through to put a "Record of Survey" map on file? Or, are you one of those who do not always comply with the present law, or worse yet, just ignore the requirements?

8) There are 58 counties in California, and each interpret the Professional Land Surveyors Act, the Subdivision Map Act, and the California Environmental Quality Act differently. Some of the counties have created ordinances that expand upon state law, and those various interpretations affect you directly. C.L.S.A. is often asked for opinions, as friends of the court, such as in an "Amicus Curiae" brief.

9) Consider that the state, counties, local agencies,

attorneys, architects, planners and engineers also have their own agendas and attempt to control the legislature with a multitude of new bills each year. These groups are well organized, and are ambitiously expanding their influence. Believe me, they don't care a hoot about you.

C.L.S.A. has a Legislative Committee that actively pursues all new legislation that the Board of Directors authorizes, and this committee, along with our paid Legislative Advocate also closely watches legislation introduced by others that may have an effect on the practice of Land Surveying.

C.L.S.A. also has committees that actively participate and monitor the activities of many other related professional societies that affect your practice. No other organization in California is specifically dedicated to the well-being of the Land Surveyor. You might think that everything will turn out for the best without your support. If you do, be prepared for the worst.

The California Land Surveyors Association gets its power from the members it represents. Every Professional Land Surveyor needs to support CLSA. To become a Professional Land Surveyor, one must have education, experience and an aptitude to understand the science and art of surveying. As professionals, we must be constantly evolving and involved, or we will be left behind.

During this past year, I have had the pleasure of meeting with many of the local C.L.S.A. chapters throughout California. I have found that each of the local chapters has its own character, as they are a manifestation of the idiosyncrasies that exist in the various counties within California. There is a lot of common ground among all of the local Chapters too. At the meetings that I did attend as a guest speaker, the topic was "The Upcoming Year for C.L.S.A." This will indeed be an interesting year. ❖



From the Editor

By: *Phil Danskin, PLS*

In the beginning . . .

The California Bear was a fine boat. Sturdy and dependable, yet modest. She belonged to a society of rag-tag sailors called the Sea-Elle-Ess-A. The Bear and it's crew could run circles around the boat of the affluent Our-Sea-Eee Yacht Club which had eight times the sailors and the wealth of a sultan.

The Our-Sea-Eee Yacht Club dabbled in hydrographic mapping from time to time. Although they had the tools to perform such tasks, they did not have the proper knowledge to do so. Those rag-tag sailors of the California Bear were treated as though they were not sea-worthy. When the Our-Sea-Eees secured a government-contract to sail and chart, they would entice the rag-tag Bear crew to work for them.

The Our-Sea-Eees suggested that the inferior Sea-Elle-Ess-As were not true sailors and must sail under Our-Sea-Eees' flag. That was the last straw for Sea-Elle-Ess-A and war was declared for the right to hoist their own colors.

It took the "Jie-Gant-Tic Incident" for California to recognize Sea-Elle-Ess-A as the superior sailors.

The incident . . .

It was a warm Spring day in 1969. The "Jie-Gant-Tic" disembarked port with a group of Explorer Scouts on a run in San Francisco Bay. These young sailors were anxious to learn and equally anxious to get underway. The sky was clear and clean. Overhead cumulus clouds provided respite from the brilliant sun, which was playing hide-n-seek with the "Jie-Gant-Tic." The radar was inoperative which required the crew to keep a sharp eye out. It was time to test the crew and the scout's knowledge.

Captain Windbag ordered a course plotted to an area of the bay known as the "sloughs." The sloughs are a labyrinth of water that would challenge the skills of all on board to maintain careful attention to their position on the chart. The first-mate's vigilance soon paid off, when she became

suspicious of the chart's accuracy. The way-points did not match positions on the chart with positions obtained from radio navigation.

The tranquil day was shattered by the sudden appearance of a squall line. Showers began with such intensity, that visibility was only a few hundred meters. It was time to batten down the hatches and to slow the vessel. All eyes on the bridge were quickly scanning between the chart and the bay - keeping a vigilant lookout for other traffic or obstacles.

Through the mist something large was beginning to emerge - and, it was dead ahead!

"Right full rudder! Reverse engines! Rig for collision!" the captain exclaimed. Eventually the "Jie-Gant-Tic" shuddered to a stop. Because her salty crew reacted in such unison, the vessel avoided collision with the uncharted island!

"Damn it, Bob!" Captain Windbag screamed. "Where the hell did that come from?!"

Now off their port side sat an island larger than Alcatraz! The shaken captain sternly looked at the chart once again. He thought to himself, "The chart is current. We cross-checked our position with radio navigation. GPS confirms the position. But no island was depicted on the chart!"

Captain Windbag decided they had had enough excitement for the day and ordered them to return to port. As the Jie-Gant-Tic was docking, the Windbag noticed Captain Hogan of the nearby California Bear was on the bridge and thought if anyone knew charts, it was Hogan. Windbag told Hogan his woes and Captain Hogan asked to see their chart. Hogan compared Windbag's chart with the previous version aboard the Bear. The captains looked over the charts and low and behold, the island was omitted from the newer chart! Captain Hogan's face turned cherry red with anger. "Lt. Curtis, call Schumacher up here," requested Hogan. "I recall him mentioning the Coast Guard requested updating charts in this area and I heard the Our-Sea-Eee's were awarded the contract."

Schumacher came to the bridge with the words the captain suspected. "Yes sir, captain. The Our-Sea-Eees got the contract for charting the sloughs last year."

The crew of the California Bear were furious. They knew the difficulties in charting such a tricky area.

The profession . . .

"Do you remember when the ship seemed like a pipe-dream?" Lt. Curtis asked.

"Yeah," Captain Hogan replied. "I recall joining forces with the guys in Sacramento. This organization began over a simple dinner at Jonesy's Steak House - when we decided to pool our resources and build a new ship, the California Surveyor."

Lt. Curtis, salty before his time, knew somebody in the war department and worked on acquiring surplus material and plans. The group drew plans and decided the keel would be laid . . . sometime in '66.

There you have it - an abstract and condensed genealogy of this keen vessel and it's Sea-Elle-Ess-A crew.

Imagine the above gift, if you will. Like the crusty ol' sailors of Sea-Elle-Ess-A, we too were handed, (on a silver platter), a fine organization: **The California Land Surveyors Association!** The sea trials are finished, most of the "bugs" worked out and the engine's "broke-in." Now it is our duty to keep her sea-worthy.

In the beginning CLSA was not going to allow to be relegated as mere technicians to the civil engineer. The Engineers portrayed us as savant hillbillies that had a passion for reading numbers or as Pocket-Protector geeks carrying The Book of Peters. They pictured the surveyors in tattered jeans with sumac stains and laughed at their foot-ware. Vibrams with such deep crevices you could traverse Swamp and Overflow and still possess dry socks.

It was CLSA's forefathers who brought about public awareness that surveyors are not the aforementioned hillbillies, contrary to popular belief! It was CLSA that helped to enlighten our related professions, (and the public), to the vast responsibilities and duties of professional surveyors. And thus brought awareness to our profession. At the Association's conception, it expressed concern to legislature that the public needed protection from the "other profession". Subsequent to 1982 engineers were required to be licensed surveyors in order to practice surveying.

It is in your best interest to join this Association. The benefits of membership far outweigh any detriments, perceived or otherwise. Attend chapter meetings and see what's there for you. I guarantee you will come away with useful and beneficial knowledge.

Better yet join CLSA, and get involved at any level. Do it now. Today will be yesterday tomorrow.

Steve Wilson, our Association President, made this directive at our January Board meeting: "If there is something you don't like about CLSA - TELL ME!" If you do not like the direction CLSA is taking, then let him know. General Patton once said, "If everyone is thinking alike, then nobody is thinking!" We want and need your input, participation, wisdom and energy to make this great profession greater! Like our fabricated Sea-Elle-Ess-A sailors, let's fly our colors and continue to be the epitome of sea-worthy.

Now, dive in the trenches with the rest of us!

Sincerely,
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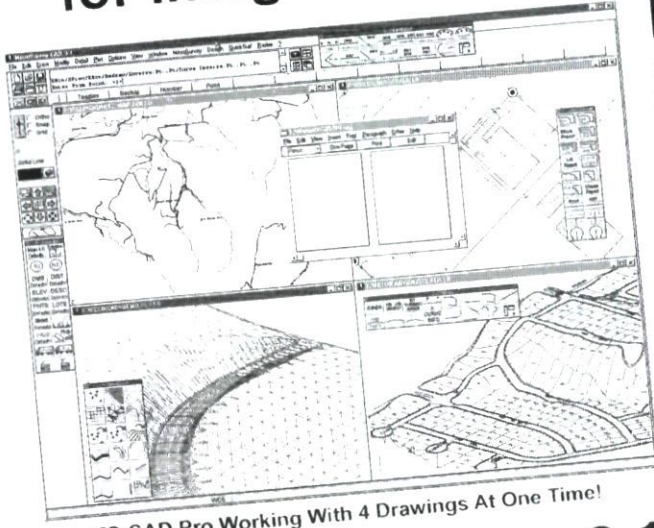
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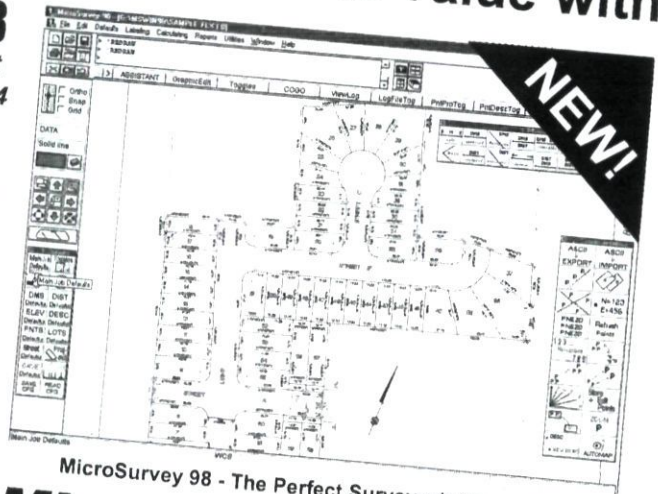
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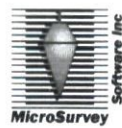
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Joe Bell, L.S. Professional Surveyor Magazine Review Nov. 97



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Letter to the Editor

■ PARASITIC SURVEYORS?

In response to a letter to the editor titled "Faulty Logic" appearing in your winter 1998 issue of the California Surveyor, I am appalled by the unprofessional attitude of Mr. Black.

As professional Land Surveyors we are all responsible for accurately establishing the position of a boundary, and reporting our findings to the client. If the line we are establishing does not appear on a map of record it is our duty to perpetuate that line and file a record of survey to make public our survey. If we find a material discrepancy with the information shown on another map of record it is also our duty to record our findings.

In addition to it being state law to prepare this map, it indeed does serve the client who is paying for your work. He has the right to have a legal record of what you did. In 20 years will the monuments still be there? If not the record of survey will assist the next surveyor in retracing your steps and recovering or re-establishing the boundary in the same location thus costing the client less. I don't think this is being parasitic.

I hope there aren't too many surveyors out there that think like Mr. Black, and feel that their work should be top secret. I feel his letter was unprofessional and followed the likes of someone who looks for ways to cut every possible corner to get the job done because he is afraid he'll price himself too high, or is unable to convey the importance of record information. How many times have you found monuments that were not of record and wondered how they were established? How much additional work did you have to perform to verify the accuracy of those monuments? Did the client pay for the additional work?

If every surveyor filed their corner records and record of surveys when required, our work would become easier as time passed, thus reducing the cost to the client and increasing our own profits.

We all need to take a close look at how each of us conducts our business. We need to abide by a higher standard of conduct, obey the law and inform the public on the importance of the product of our work if we want to be considered true professionals.

Mark P. Pfeiler, P.L.S.

Sun Track Diagrams

By: Robert Lee McComb, PLS

The seed of this article is based upon a contract I received to provide the amount of sunlight falling on a specific day of the year, at a specific place on the earth, at a specific height above the existing ground. Most CAD applications now have simple sun angle calculators that are useful in architectural design or for rendering solid models, but my particular scenario was obscure enough to evade being solved by merely purchasing an application.

For years I have searched for a low-cost astronomy application that would make sun track diagrams for solar duration models. Without going to the extreme of contacting observatories about what software they use to generate their sky diagrams, as they appear in astronomy magazines and calendars, alternatively I have found generic solutions through readily available software that can facilitate the steps involved.

SOLAR TRACK DIAGRAM

Vault of heaven shown based upon sky projection is azimuthal equidistant, polar case. Application software is *Expert Astronomer*, 1992, and verified with *Distant Suns 2.0*, 1992. Test points were generated with *Expert Astronomer* and reformatted to the CAD application (*MiniCAD 7*) against the horizon line, as shown. The intersections of the apparent solar arcs for the typical station with the horizon line produce times of day for the earliest and latest sunlight on two dates, as shown, November 21, 1997, and December 21, 1997. Sunrises and sunsets, and total length of the diurnal period, as shown.

Stated accuracies: Angular field measurements are $\pm 1^\circ$ of arc. Grid plotting onto the vault of heaven projection are $\pm 0.5^\circ$. Estimated accuracy of times given are ± 15 minutes with a bias toward worst case scenario (expected sun exposure may be greater). See cover letter dated September 16, 1997 for further information.

Date of Survey: September 12, 1997, 10 AM
Date of Plat: September 16, 1997

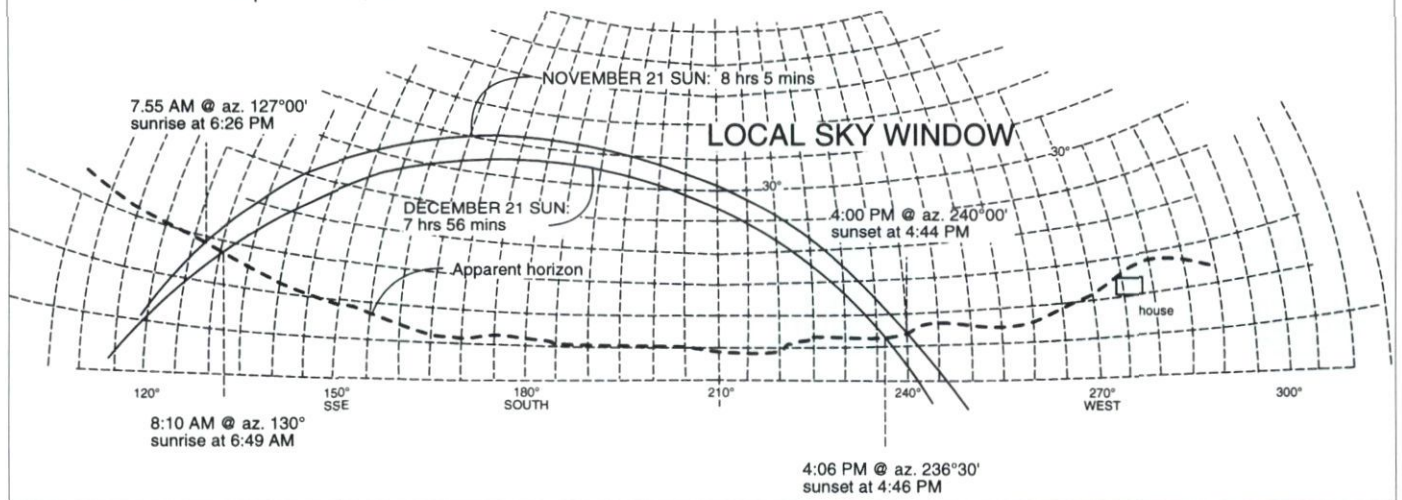


Figure 1: A portion of survey report made for a solar lighting manufacturer to provide information about the theoretical availability of sunlight at a given location on the earth, expressed in hours and minutes (the transient diurnal period). The curvilinear coordinate lines are typical of the sky grid used in popular astronomy software packages. The shape of the sky thus suggested approximates the psychologically perceived vault of heaven. The solar arcs for two months are shown, along with their intersections to the apparent horizon made up of a continuous line of brushy slopes, distant mountains, orchards and homes.

It is usually better to synthesize a solution from the basic tools one already has, than to look for a specific commercial product that already does the job for you. As an astronomy hobbyist, this situation arises all too often for me. For example, a few years ago, in conjunction with an article I prepared for POB Magazine that had to do with the occultations of stars as observed by the explorer-surveyor J. C. Fremont, I tried to render a sketch showing the intersection of the earth's surface with a projection of the moon's disk by a distant star, as seen from an orbital position above the Pacific (essentially, a three dimensional intersection of a sphere with a cylinder in oblique view). No doubt certain government agencies and many universities have the occultation software needed to simulate this kind of prediction, but the work and expense needed to obtain a result by their means is almost never warranted by the occasional practitioner, especially for pictorial approximations or situations where the client has no need for exact tolerances. The client in my own case

was a solar lighting manufacturer who required an accuracy to about five minutes of time—better, if possible—but not expected. With this in mind, this surveyor, armed with generic software, thought he could do the job expeditiously. That turned out to be an understatement, but where there was a will there came a way.

A sun track diagram is a pictorialization of the sun's apparent arc across the southern sky from daybreak to sunset. Figures 1 and 2 show arcs of this type. The apparent positions of the visible terrain against the sky, the "apparent horizon," which includes hills, trees and manmade improvements, are depicted with the arc as a single object often in silhouette, cutting out the "local sky window." The points where the arc intersects the apparent horizon marks the positions where the sun's rays will break in morning and fade in afternoon. The sun reaches its highest point on the arc at local noon at a bearing of due

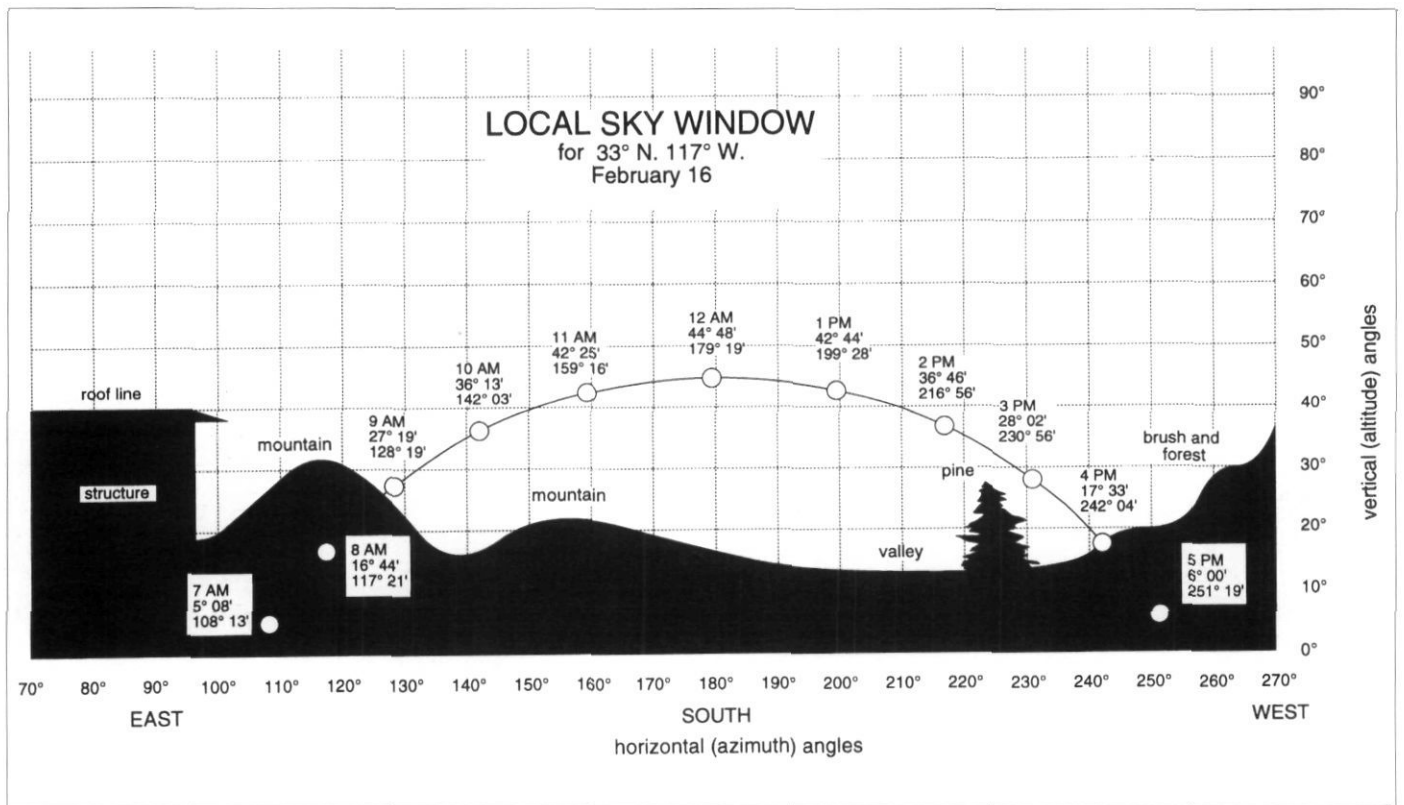


Figure 2: Sun images at various hours of the day on February 16 at the geographic location of 33°N, 117° W. The silhouette delimits the local apparent horizon consisting of a continuous line of house improvements, mountains, valley, tree and distant tree-covered slope. Local altitude and azimuth shown for the sun at the top of each hour. The projection used is a modified Mercator, called a Cassini. The grid is made up of equally spaced vertical and horizontal angles, designed for easy plotting of vertical and horizontal angle data. By interpolation, the sun emerges from the mountain at approximately 8:45 AM and sets in the forest at 4 PM, for a little over 7 hours of direct sunlight on February 16. For other days of the year, the sun track will vary.

south, and the height of local noon varies with latitude and time of year.

The immediate field task is to map the local sky window. The technique I use is by angular measurement with a theodolite or total station, picking off the vertical and horizontal angles of the principal corners of objects as they appear against the sky in sufficient detail to plot a reasonably similar shape on flat paper. This requires some projection method that can handle efficiently the horizontal and vertical measurements. Two methods seem the most useful. The first, which has been adopted by many commercially-available astronomy packages, is the azimuthal equidistant projection centered on the geographic position of the observer (see Fig. 1); and the second, a projection characterized by equal spacings of vertical and horizontal angles (see Fig. 2), i.e., a Cassini projection (a modified Mercator projection where the lines of latitude have been compressed). Neither projection is conformal or area-preserving; objects near the ground distort much the same way they would in a wide-angle photograph. The Cassini projection allows the plotting of horizontal and vertical angles as X and Y values, expressed in decimal degrees.

The client needed the sun track diagram to reflect what the sun's path would look like at a point about twenty feet above a setup where the apparent horizon actually could be observed. Without a raised platform, this was not possible. No easy solution to this problem could be found, but as an approximation I determined my vertical measurements to the apparent horizon objects by estimating vertical rays parallel to what would be measured if I were at the correct height. For distant horizon objects, this is a harmless approximation; however, for horizon objects closer than a few hundred feet, such estimations could produce very bad results if the sun track were to cross the object. Fortunately, the nearest object at the site was a brush-covered hill 600 feet to the southeast. I did not consider the estimations to be significant owing to the transparency of the brush and the relatively large angular diameter of the sun.

Measurement of geographic position and universal time is required, but these need not be highly accurate if ultimately the sun track diagram is merely going to be scaled as its primary use. I used a Magellan 2000 GPS receiver to determine my geographic coordinates, and verified these against a USGS map. I performed an approximate solar observation to determine a basis of bearings, using my wristwatch to observe the standard

time. The solar observation serves to calibrate the azimuth angles that were observed to measure the apparent horizon. Later, at the computer screen with the astronomy software active, I noted the direction of the apparent sun at the time of the observation at the measured geographical position. The observed standard time was calibrated to universal time by comparison to a world clock, but again, because the sun's diameter is some one-half degree of arc, high clock accuracy is not needed; a clock error of one or two minutes would not significantly affect the sun track diagram. For a step-by-step list of operations used in the making of the sun track diagram of Figure 1, see the recap at the end of this article.

The grid lines of Figure 1 were traced in a CAD environment from a screen image produced by an astronomy application called Expert Astronomer, which, like all astronomy packages, this software has a menu for showing the coordinate grid lines of celestial bodies in both equatorial and local horizon grid systems. Local horizon grid systems are based upon altitude and azimuth, the astronomer's terms for vertical and horizontal angles. The grid line image, as it appeared for the given geographic position of the observations was captured as a snapshot screen image in a PICT format (the native format for Macintosh) and imported into a CAD application as an uneditable PICT graphic. The alt-azimuth grid lines were then individually retraced as polylines in 5° increments in a new layer. The local sky window was compiled in another layer, by interpolating onto the grid the individual shots to the apparent horizon measured by horizontal and vertical angles. Next, the alt-azimuth coordinates of the sun's image at various times of the day were snapped from the astronomy software and interpolated onto the grid as a separate layer. The interpolations are not straightforward because of the curvilinear coordinate lines, but this method produces a more intuitive representation of the sky, and would be the preferred choice of projection were the operations as described here fully automated by software.

An easier approach—and one which does not give up very much of the esthetics of Figure 1—follows Figure 2, which shows a sun track for the day of February 16 at a conveniently assumed geographical location (33°N , 117°W). As discussed earlier, in this method the axes of projection are rectangular, using equal angle increments. The apparent horizon and solar positions are easily interpolated onto the grid by decimal degree plotting. Whereas the projection of Figure 1 produces sun tracks that are very nearly circular, the Mercator-like projection

of Figure 2 produces flatter curves that are close to the sinusoidal sun tracks of true Mercator projections, but in my mind they are no less intuitive than those of Figure 1. In any case, if Figure 1's projection is the desired goal, it may be easier to first draw the projection shown in Figure 2, then use a map transformation application like Azimuth (made by Graphsoft) to warp the grid lines from one projection onto another, and along with them the sun track. Bear in mind that the azimuthal equidistant projection is specifically designed for sky views; other projections that may be best for other mapping purposes usually don't work well for astronomy.

A footnote to the field measurement of the apparent horizon should be mentioned. An effective technique that might substitute for direct vertical and horizontal angle measurement is photography. However, fixed references such as story poles of known angular position will need to be placed within the scene (much like targets are used for standard photogrammetry to rectify true shape). Depending upon the projection method to depict the sun track, the horizon line as produced from a photograph will need to be stretched and shrunk with some kind of transformation software, such as a morphing application or a "rubber sheet" program.

The simple tools discussed in the foregoing can be used in other combinations to produce astronomical renderings that are occasional to the surveyor. As one example, a potential client once asked for a survey to determine where an observatory should be built, in conjunction with his proposed house footprint, to enable a maximum night sky, specifically a year-round view to the North Star and the ecliptic simultaneously. The same client inquired as to how to position a picture window in order to observe the sunset throughout the summer months through a particular forest opening.

To recapitulate the steps involved in the preparation of a sky track diagram:

1. Locate your position in geographic coordinates. Beware! If the position for the required sun angles is more than a few feet above your ground position, and the apparent horizon objects are close, you will need to consider making some approximations to reduce your measurements of the apparent horizon to how they would appear at the elevated position.
2. Determine universal time. It is useful to calibrate to the sun by making an observation to the center of the sun

(horizontal and vertical) while recording the standard time. Standard time can be converted to universal time later via your solar observation or by calling a universal time clock.

3. Measure the apparent horizon as a set of alt-azimuth coordinates (horizontal and vertical angles) to the objects that appear on the horizon. These include all objects that may block the sunlight on any day of the year. The coordinates will be used later to render a sketch of the apparent horizon.

4. Using an astronomy software package, set your view to local horizon, activate the alt-azimuth grid line display, and set your geographic position and time of your solar observation in Step 2 in the program. This will either verify the basis of bearings you used to tender your azimuth observations, or calibrate your azimuths to the horizon shots you made in Step 3 by employing your solar observation of Step 2.

5. If your astronomy application has a menu feature that allows you to capture the alt-azimuth projection grid, export it as a graphic object and import it into your CAD application. Choose autotrace or manually retrace the grid lines (if they are curvilinear) as polylines in a CAD layer; or,

6. You do not need to do Step 5 if you use the modified Mercator (Cassini) projection in your CAD application. Simply create a rectangular grid in a CAD layer for the purpose of plotting your vertical and horizontal angles observations you collected in Step 3.

7. Plot your apparent horizon measurements onto the grid of your choice as a layer in the CAD application. Connect the horizon shots as a continuous line.

8. Return to the astronomy application and snap to the alt-azimuth positions for the sun at selected times of the day, e.g., on the hour and/or half-hour. Plot each of these positions on the grid you created in the CAD application. Connect the solar positions into a continuous line. ❖

Robert Lee McComb

has been owner of Monument Peak Land Surveying in Julian, California for the past 17 years. He is the author of "Survey Puzzler" appearing in CLSA News.

The Trip of a Lifetime

*Surveying/Rafting the Colorado River
through the Grand Canyon*

By: Bryce Dilger, PLS With technical assistance from R. Chris Brod

Part I - April/May 1997

"The trip of a lifetime" I called it before I left. Later, I found a card my wife had packed in my gear that said "have fun on your trip of a lifetime". This opportunity was made possible by the surveying program at the Grand Canyon Monitoring & Research Center (GCMRC) of the U.S. Dept. of the Interior, based in Flagstaff, Arizona. The GCMRC program was established after the Glen Canyon Environmental Studies program, to monitor and track ongoing environmental issues in the Grand Canyon. The GCMRC Survey Department works cooperatively with several other agencies such as the National Park Service, U.S. Bureau of Reclamation, Arizona Game & Fish, the USGS and the local Native American Tribes, as well as educational institutions. Surveys are being conducted for all types of environmental details ranging from fish/wildlife habitats & vegetation, hydrology, erosion impact, archaeological significance and more. This data is then transferred into a large GIS database maintained in ARC/INFO format. A few very talented individuals head up the GCMRC Survey Department, especially Chris Brod, who is not only a competent land surveyor, but also an excellent whitewater boatman. I can't say enough good things about Chris, he is truly an amazing person. It was an honor to have worked with him.

The equipment we used was up to current standards and all functioned well under adverse environmental conditions (sand, wind, river water, rain, extreme heat, extreme cold, more rain, etc.). We used 2 Sokkia 1-second total stations with HP48 calculators using the TDS Survey cards (protected in an environmental case). We used Motorola radios for communication and all the equipment had the ability to be hooked to an external power source so we could use larger batteries w/DC adapters at the instrument setups. Batteries are re-charged as needed by a small portable generator. All of the topographic mapping & contouring is done by GCMRC in Terramodel, both in the field and back at the office. I was also fortunate enough to be allowed to participate in the mapping during and after the trip, by volunteer effort, of course.

The purpose of this survey trip was two-fold: To run & tie out geodetic control in specific areas along the river, and to map archaeological sites. We had three archaeologists with us to provide direction on the details of what they needed mapped. There are 475 identified archaeological sites in the zone effected by Glen Canyon Dam in Grand Canyon that are in danger of impact from erosion as a direct result of operations of the dam. Some

preservation measures are being implemented while other sites are being monitored and documented. For example, one site we mapped contained Indian ruins (rock walls, artifacts, pottery fragments, etc.) being threatened by a small drainage that was eroding into the hillside. For this site, rock check dams were built using traditional Native American methods in the flowline to trap and store sediment, and to dissipate energy from the eroding water, which is intermittent and mainly in large volumes from flash floods. Our job was to map the site topographically, locate the archaeological features and the erosion protection measures, along with enough data to create a DTM capable of generating 0.25 meter (10") contours. Some sites will be surveyed again at a later date and the DTM's will then be compared to generate an earthwork volume of the amount of soil displaced due to erosion, as well as to document any further impact to the archaeological features.

Geodetic survey control exists through about one third of Grand Canyon along the river. Some of this control has been perpetuated from earlier surveys, checked & densified by GPS and conventional methods, and



some of it set by GPS and conventional methods. All of the control work we did was by conventional methods. With the exception of some aluminum caps positioned by GPS, the control points we worked with were all "X"s scribed in rocks, following the wilderness ethic of "leave no trace", (well...as little trace as possible and still establishing recoverable control). When running control, we would measure to each point with two sets each of horizontal and vertical angles, while shooting at least five slope distances. We would also try to tie each sideshot point from at least two other points, then swap setups and turn angles to each other again. The redundancy was extreme, but sensible, since "the field" was an entire 225 mile, 2 week expedition away if you messed up. This also gives Chris a valid check of the measurements, since he works with so many different volunteer surveyors, all with different backgrounds.

Enough about surveying; the biggest whitewater in North America is what drew me to go on this trip. I need to get my story documented because the rapids and waves get bigger each time I tell it. We rafted the Colorado River, the entire length of Marble Canyon and the Grand Canyon for 226 miles from Lee's Ferry (just below Page, AZ. and Glen Canyon Dam at Lake Powell) down to Diamond Creek, which is the next place a road goes to the river. We spent 14 days on the river, about 5 of those just traveling. The time went by so fast, it seemed like only a few days.

We arrived at Lee's Ferry (River Mile 0) on Saturday in a van carrying personnel and a large truck/trailer carrying our equipment. We spent the afternoon/evening unloading our gear and rigging the two inflatable boats, a 22 foot snout pontoon raft with an aluminum frame and a smaller "mini-snout" which is a 17 foot pontoon raft with an aluminum frame. Both rafts were powered by outboard motors. We drove to a nearby restaurant, the "Cliff Dweller's Lodge" for a relaxing dinner and began getting to know one another. I had the pleasure of meeting some of the folks a day earlier, since I arrived in Flagstaff the day before. The crew consisted of 8 people, and I must honestly say I enjoyed meeting & working with every single one of them. Some of the finest around. We slept on the beach at Lee's Ferry that night under a glaring full moon, awaiting the next day with much anticipation.

Sunday morning we woke up about 5:30am and began to finish rigging the boats, which took most of the morning. About noon, the weather was clear and about 85°F as we pulled out into the current of the mighty Colorado. The river was running at 21,000 cfs \pm 1000 for the duration of the trip. This I was told was "high water", where "low water"



was about 8,000 cfs. I later asked a boatman with 28 years of experience (200-300 trips) what they called 40,000-90,000 cfs. He said "really high water". I had only heard stories and seen pictures (which cannot give the real perspective), and really didn't know what to expect ahead. We spent the entire afternoon traveling down river. We ran several smaller (Class 1-5) rapids. The Grand Canyon has its own river rating scale (1-10) where the rest of the world rates whitewater on a scale of 1 (flat) through 6 (unrunnable). We also passed many points of interest as we entered Marble Canyon. Chris, not only our survey and trip leader, was also our boatman on the 22 foot snout. Even though we were there to "work", he explained the history and features of the river as if he were our tour guide. We paused to witness the memorial inscription of F.M. Brown, left by his partners in 1889, below the rapid where he drowned during the Stanton/Brown expedition to evaluate putting a railroad through the Grand Canyon. We also pulled off momentarily under a rock overhang to see the carved outline of a rock hammer left in the rock wall by the 1923 Birdseye USGS Survey expedition. We passed spectacles like "Vasey's Paradise" where 3-4 cfs of water comes gushing out of a hole in the side of a barren rock cliff. We also passed "Redwall Cavern", a huge cavern cut into the rock wall by the river. John Wesley Powell estimated 50,000 people could fit into this natural overhang, but was somewhat prone to exaggeration. We finally pulled into a beach at dark, and made camp at river mile 38 \pm . After a dinner of catfish & rice, we settled down after a long day. It is impossible to explain or photograph the way the full moon illuminates the sheer rock cliffs and water, but it is so beautiful to see. I set up my tent because I am still not used to the blowing sand. By the 2nd day, no matter how



hard you try, the sand is in everything. By the 3rd day you give up trying and by the 4th day it doesn't bother you anymore.

Monday morning came, but it didn't feel like Monday. I was still overwhelmed by the sights of the first day. After breakfast we packed up and headed back out on the river. We traveled down to Nankoweap Creek at river mile 52, where we camped. We broke out the survey equipment and headed about 1300 meters back up river to our first site. The smaller raft with the larger motor has the ability to up-run smaller rapids when necessary. We had two crews working on topo for the afternoon, then we returned to camp. By this point I felt comfortable with all the people in the group, and we were really starting to have a good time. After all-you-can-eat cheeseburgers, a few hike up to some Indian granaries in the cliffs, but I hang out in camp to relax.

Early Tuesday morning, we were ready to go to work shooting topo at an arch site close to our camp. While we were working the others broke camp and got the boats loaded. By mid-morning we were headed down river and spent the rest of the day rafting. We stopped at the confluence of the Little Colorado River. It was very muddy due to a recent storm. Getting into the Colorado River voluntarily was not really an issue since the water was about 45-48°F and was cold enough to give you an instant "ice cream headache". Actually the water does not warm up much even at the lower end of the canyon. It is bizarre that water will stay so cold flowing through the middle of the desert. That night we camped at a place called Lava Chuar, at river mile 65½. The weather was holding warm & dry.

Wednesday morning storm clouds were floating over us. It rained briefly, then a windstorm sandblasted the camp

and my tent, with gear inside it, almost blowing it into the river. At this point I learned to anchor the unit to BIG rocks. We shot topo of a sandbar to monitor sediment transported since the controlled flooding last year. We had the afternoon off, while another crew finished their job down river. At 3:44pm the storm hit. Rain & wind, my tent felt like it was going to blow away with me in it. Eventually the storm blew by, and due to the 20% humidity, everything dried out in about 20 minutes, even with cool temperatures. Then I get bit by a spider or scorpion, I'm not sure. It left a little red dot, but really gave no pain.

Thursday morning we packed up camp and headed down river to Unkar Delta and river mile 72, where we camped for two nights. In the afternoon we shot another beach topo while it rained on & off, getting cold then hot, then cold, etc. While working I found a fragment of pottery that was a piece of a jar with the curled lip rim still on it. The archaeologist said it was probably made in about 100 AD by the Anasazi. I gently put it back down. We decide to hike back to camp, instead of taking the boat shuttle. After wearing sandals all day, when I got back to camp, I realized my foot was swollen to the size of a grapefruit from the insect bite the previous day. Everyone else seems worried, but I am having too much fun to care. I took some anti-histamine and the next morning it was back down again.

Friday morning we woke up, ate another excellent breakfast and got to work. We ran control and shoot a 1400 point topo in about 7½ hours. A quick note about the food on this trip: wonderful. We ate well at every meal, every day. The food quality was excellent as well as the preparation and quantity. There was no "roughing it" in the meal department.

Saturday morning is the half-way point of our trip. We woke up and packed camp with some anxiety, as this is where the real whitewater starts. This is where the "big boy" rapids are. Beginning with Hance, a rapid with 10-15 foot waves that form a train for several hundred meters. Then there is Sockdolager and Grapevine, equally qualified to make you pucker and hold on for your life. We ran all the rapids without incident and arrived safely at our next camp a few hundred meters up river from the Kaibab Bridge and Bright Angel Creek. That afternoon was our one chance to use a phone during the trip, so I called my wife, then hiked up to Phantom Ranch for souvenirs for the kids, then called my wife again on the way back, and shuttled back up river to camp. Here was the end of the trip for 3 of our crew who could only come for a week, and were hiking out the next day. Three new guys hiked in that afternoon to

replace them. We were now deep in Granite Gorge, having left Marble Canyon two days ago. The rocks are highly polished at the river level, but are jagged and rough cliffs all the way up both sides of the canyon. At this point I also found out that one of my "dry bags" leaks water.

Sunday morning we said "good-bye" to our friends hiking out and hit the river early. Some hikers at Phantom Ranch had given us a weather report to be dry for the next five days, so sure enough, here came the clouds. We spend the whole day traveling and running the biggest whitewater I have ever seen. We ran huge rapids like Granite, Hermit & Crystal with waves so big they cannot be described, only experienced. I rode in the smaller boat today, which at first seemed more dangerous, but actually was drier, because the boat is easier to control in big water. Due to the high water, we make great time and travel 49½ miles, camping just below Deer Creek Falls at river mile 136½. The water is getting slightly warmer, so I took my first real bath in the river and got a super ice-cream headache, but clean hair felt good.

Monday we spend traveling again and get to camp just above Lava Falls at river mile 179. I got to try my hand at driving the big boat. It takes a lot more work and skill than it would seem, so after a mile or so, I happily gave back the

controls. We got to stop at Havasu Creek, one of the most beautiful places in the canyon. This tributary had about 100± cfs of clear aqua-marine colored water that is about 75°F. To access the side canyon you must swim up the creek against the current a few hundred feet through a crevice in the rock wall. While swimming, you can look down and see the sandy bottom 10-15 feet below with fish swimming all around. Once the canyon opens up, it reveals a seemingly endless series of waterfalls, the sides green with vegetation in this desert wilderness. The water is loaded with calcium carbonate, so you get a white, dusty coating once you dry off, but it was well worth the swim. After making camp above Lava Falls, we hiked up to an overlook point to get my first view of the biggest rapid in the Canyon. It is about 200 feet across and forms a powerful wave train about a thousand feet long. The initial drop over the shelf is about 14 feet vertical. The roar of the water can be heard from far away.

Tuesday morning we spent running control. We traversed between two GPS points on either side of the Lava Falls rapid. Around noon, half the crew got into the larger raft and set off to run the rapid so that we could shoot ahead down below. As I watched them run from my instrument setup on a cliff 200 feet above the river, my stomach twisted as I saw them heading toward danger. They get caught in

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Geodimeter
Surveying Systems

Nikon
Surveying Systems

HP DesignJet
Plotters / Repairs

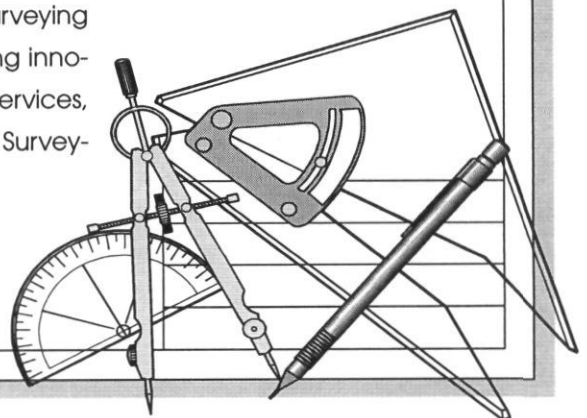
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the wave train (15 feet high) and go for the "big ride" but landed safely at a beach below without any major injuries. This left us in a great mental state, as four of us still had to run it in the small boat. We put nerves aside and finished our work. We were set to run the rapid just before dark. We sat in the raft, stomachs churning and a death grip on anything solid as we pulled out into the current. Our boatman, Pete Reznick, would probably have made a good brain surgeon with the precision he had in handling that raft in such violent water. We made a quick and clean run, although having a 10 foot wave break over our heads was still enough to produce major quantities of adrenaline. We hit camp seconds later and the "alive-after-Lava" party began.

Wednesday, I woke up wanting to get home and see my wife again, but dreading the fact our trip was almost over. We spent the day surveying and hit the river mid-afternoon traveling down to camp at river mile 202. Along the way, at river mile 198, we found one of the 2"x12" boards lost from the big raft in the infamous Lava Falls run the day before. The temperature is heating up, now in the 90's during the day. I am still having way too much fun to care. After a wonderful Mexican food buffet dinner, sleep comes easy.

Thursday, we started traveling early and I was presented with the opportunity to "swim" a rapid at river mile 217. It sounded like fun until the guidebook rated it as a Class 7, (remember 1-10?). As I was sliding down the tongue of the rapid and got my first real look at the waves in true perspective, I quickly changed my mind about wanting to do this, but it was waaaay too late. We camped about 3 miles upstream of Diamond Creek, our take-out and the end of our trip. We had a pretty good sandstorm that night, but we were all used to it by then.



Lava Falls



Friday we got up, ate breakfast and started surveying. We were running two crews shooting a topo that we knew we would not finish. It will have to be completed by another crew on the next trip. We pulled off early, about 3:00pm, and headed back to camp for our last night party. Someone said it was embarrassing to arrive at the take-out and still have beer left. The last two weeks have gone by like only a blur.

Saturday we got up early and threw everything and everyone onto the raft so we could reach Diamond Creek by 8:00am to meet the truck, which was an hour late. We de-rigged the boats in about 2 hours and drove 3 hours back to Flagstaff. The last two weeks had produced an incredible bond between complete strangers. I feel I now have new friends for life. With good-byes out of the way, I headed back to my hotel room to meet my wife coming in from California. I will remember my times in the Canyon forever. It truly was the "Trip of a Lifetime".

Part II - September 1997

I returned to Flagstaff only 4 months after the last river trip. Once the Canyon gets in your system, it seems there is no getting rid of it. This time I could say "No", when asked if this was my first canyon river trip, so I felt more like a veteran. Of course, it ended up there were no first-timers on this trip anyway. As I sat in my motel room the night before we left, it was raining. I kind of knew what to expect, but I also knew this trip would be different. Watching the local news on TV, I learned two hikers were missing from a flash flood in the Canyon that afternoon. August and September, historically known as the "Monsoon Season", deliver more rain than the other months. I decided

this would be better than July, when it gets so hot that things (cigarette lighters, boats, people) are known to explode from being left in direct sunlight.

Friday morning we had clear skies and were ready to go. We loaded the trucks and left Flagstaff on the 3 hour drive to Lee's Ferry. We spent the afternoon unloading gear and rigging the boats, and actually getting done by dark. That night we slept on the boat ramp. About 10:00pm large thunderclouds started rolling in from the south, illuminated by the moonlight. By 11:00pm it started raining and we ran for cover. Three of us slept in the van.

Saturday morning, about 10:30am, under a light rain, we pulled out onto the river. Once we got into the main current of the river, a strange feeling came over me, knowing we are now committed to this trip and the only way out is to keep going. We floated down through Marble Canyon at a pretty good speed, but otherwise uneventful, covering 56.5 miles before pulling into camp for the night below Kwagunt rapid. I decided to set up my tent because that would prevent it from raining for sure. The night sky cleared up revealing its millions of stars.

Sunday morning we packed camp and continued down the river. Mid-morning we passed a commercial river trip with 2 boats that had stopped to go for a hike up one of the side canyons. As we floated by, we noticed two rather large ravens plundering through all the goods on their boat. They had left bags & backpacks sitting out, and the birds were busy opening zippers and throwing everything about. We decided to pull in and intervene. As we tried to scare off the ravens, one tried challenging Chris's authority for a moment, ruffled feathers and all. But finally they relented. The funny thing was the German tourist sitting up on the beach. He really had no idea what we were doing and he didn't speak any English. He stayed behind because he was on crutches and couldn't hike. We tried to explain we were preventing his stuff from being strewn into the river. He just smiled & waved, so we left on our way. At the confluence of the Little Colorado River (LCR) we passed two guys from the USGS who were camped there for two weeks doing sediment transport studies. We pulled into our next camp just below "the Shoals" at river mile 73, late in the morning, and made our way up to an arch site to begin our topo survey. The sun came out and it got very hot, hot enough to melt a candle I had in my metal ammo box. The humidity however remained very high, and about 4:00 another thunderstorm moved in. It began to rain about dinnertime and continued all night. At this point everything was wet, either from the river, rain, or sweat, and nothing

Memoir of the Late Stanley Smith

by: *Stanley R. Smith L.S. 2265 1915-1997*
AKA dean of Santa Cruz County Surveys

As a consideration in the new Ollason agreement the City was to provide certain survey work on the Ollason boundary. I was then employed by Mr. Arnold Baldwin who had the surveying contract under City Engineer Kitchen. Mr. Baldwin picked me up at moon rise on May 4, 1935 and we proceeded to the Ollason farm. This was so early the deer had not yet come to feed at the Mann corral. Baldwin drove a spike in the road near Sal Licari's mailbox, put a flashlight behind it and took an observation on the North Star. This business out of the way we adjourned to breakfast at the West end of Montague's flume. Scraps of sycamore limbs provided a fire for the coffee and when only live coals remained Baldwin produced two large steaks which he threw upon the ashes.

French rolls which appeared from a gunny sack were opened with an axe. Thus fortified with bread, meat and coffee we began by the grey light of dawn, the survey of the Ollason boundary. The morning passed on a dusty swirl of dense brush, nettles, witness trees, poison oak, blackberry vines and ancient fences while noontide crawled toward us and as slowly receded into the forgotten past. I mentioned food and was reminded that I had dined on steak that morning, and this in the darkest year of the Roosevelt Depression. The valley echoed to the ringing of the axe and brushhook all through the afternoon and far into the evening.

Molinda Ollason arrived home from work at the laundry in her A-Ford and paused to view the battlefield. "Land sakes, Mr. Baldwin you folks sure do lay open a fine wide trail!" "Yes ma'am", said Mr. Baldwin, "A person needs room to work". We finished by the light of Baldwin's head-lamps and that day for the first time I saw a surveyor at work. There are some days you never forget.

Source: Matthew D. Ward, PLS

Smith continued on page 28

seems to dry. The river was a light brown from all the silt and debris brought in by the flash flooding. While rafting, it felt like surfing on chocolate milk. It took all the "white" out of the whitewater.

Monday morning we finished our topo from the previous day, only having to stop once, as lightning began to strike all around us. Actually it was slow getting started. Our TDS-48 data collectors refused to boot up and function in spite of their environmental cases. The humidity was so great, moisture condensed inside the calculators. After several drying attempts and some patience, Chris & I finally got them working. This is one place to really be nervous about losing data. While we worked, we watched storms roll in all around us on the canyon rims. The thunder is magnificent in the canyon. It seemed to roll on forever. You can hear it come rumbling up the canyon walls, then it goes by in stereo and keeps on going. Once the work was done, we packed camp and headed down the river into the Granite Gorge. The rain continued into the afternoon, causing flash floods to come pouring over the tops of the cliff walls in the gorge with red and brown waterfalls cascading down into the river. Every once in while, a rock would fall with a crashing noise just like thunder. As we entered Hance, a class 9 rapid, a sudden downpour doused us as wet as the rapid would have. This kind of weather is difficult to describe, but has to be lived to fully appreciate it. We camped at Cremation, river mile 87±, just upriver from the Kaibab suspension bridge and Phantom Ranch. This is the traditional "half-way" point for most river trips, and it felt really strange to already be here on the third day. This was our one chance to use a telephone to call home, and almost 2 weeks left in the lower canyon. The weather lightened up for us and we had a nice evening. We even got some of our gear to dry out.

Tuesday morning one of our archaeologists hiked out at



Phantom Ranch. We refilled our water containers at the Bright Angel Trail and took turns using the pay phone there to call home. As we pulled out onto the river again, a Park Service helicopter flew in and landed. This is the point where the missing hikers were flushed into the Colorado River from Phantom Creek, then Bright Angel Creek. The helicopter flew over us several times in the next few days searching for them. This helicopter flew about 100 feet above the river surface, with only a few hundred feet from wall to wall in the canyon. There were several people hanging out the doors looking as they went along. The boatmen say the NPS has better than a 90% recovery rate of missing persons, which seems pretty good considering the size of area and type of terrain they are dealing with. This is the day we run Horn Creek, Granite, Hermit and Crystal rapids, without any incidents. We are beginning to notice the river level rising. We figured it was due to the runoff from the rains, in conjunction with higher releases from the dam. We pulled into camp below Shinumo Creek at river mile 109±. The water is so high most of the camp and beach was gone, so we headed up to higher ground in the rocks. Of course, about 10:00pm that night, someone noticed our 5000 lb. boat sitting on the sand like a beached whale. It seems the water had gone back down for the time being. There isn't much that can be done except either de-rig the whole boat or wait for higher water.

By morning the water was back up and we were off to work. My crew traveled back up river a little way to do a topo, while another crew headed on down river to start another topo. While surveying an arch site about 150 feet above the river, I watched the NPS helicopter fly by. It was so low I was looking down on it. Our archaeologist recognized one of the search people inside. We finished our site in a couple of hours, so we headed down to begin another at Blacktail Canyon, river mile 120±. About the time we finished, our other crew caught up to us. It was then we found out we weren't supposed to be here until the next day. Now we were a day ahead of schedule. That may come in handy with the weather we've had. We traveled down to river mile 125.4 to make camp for the night. At camp, someone found a hiking boot washed up on shore. We thought it might have belonged to one of the missing hikers. This camp has an undercut rock shelf along it, which makes great shelter for several campers in case of rain.

Thursday morning we wake up to find the river level has dropped and once again our boat has been beached. The river level can fluctuate several feet in a period of only a few hours. With the help of a passing raft of Paiute

Indians, we got our raft pushed back into the water. Having help come along at the right time down there is a true blessing, since it is possible to go for days without seeing another party. Soon we made our way down river again. Specter rapid was a pretty big ride. With the high water, the second standing wave was about 10-12 feet high and we got just a little sideways. It really felt like we were going to flip, but we made it through. Probably the best adrenaline rush of the trip. As we passed by Tapeats Creek, a large private trip is camped there, and we discovered they have found one of the missing hikers, floating in an eddy, after being flushed over 46 miles down the Colorado River. The group had notified the NPS Helicopter and they would be coming back to retrieve the body. We pushed on down river. On a lighter note, I saw my first bighorn sheep (seeing none on the last trip) at the river's edge just above Kanab Creek. We camped at river mile 175.0 between Cove & Red Slide.

Friday morning we started early, running 2 crews on one site to shoot topo. Without the rain, temperatures in September easily reach the 100's, so we were pleased to find the narrow & high canyon walls providing us with shade until almost 11:00am and then shade again at about 3:00pm. That night a boat pulled into our camp. It was the two USGS guys from the LCR on their way home. They stopped to spend the night at our camp. The next morning they were heading straight for the take-out so they left us their extra water and fresh supplies. Their boat had only been on the river for three days and they were going home. We still had a week left.

Saturday morning we packed and rafted down to Froggy Fault at river mile 196.8, where we had ½ a day off to rest and dry out our stuff. I was too tired to rest. I got to try driving the smaller sport boat with the 50 horsepower outboard motor, and that was a blast! With one twist of the throttle, it feels like it's pulling the front wheels off the ground. Behind the propeller there is about a 2 foot deep trough in the water and the wake is incredible from the small raft as it planes across the water. Imagine travelling about 25 mph UPSTREAM against the current of the Colorado River, just gliding over the tops of riffles and waves. What a thrill!

Sunday morning Chris & I packed up and headed down to river mile 204¼ to finish up a previous topo, taking only a couple of hours. Then we went down to river mile 207 at Arroyo Grande to meet the others for camp. Here we had a nice big gravel bar/beach to camp on with plenty of room. I set up my tent and unloaded all my gear because we were going to layover for couple of days while we worked



Blacktail

on a really large topo site. It was a real luxury having all my stuff unpacked and easy to get to. After a quick bath in the cold and muddy river, I forgot how refreshing it was to be clean again. The 45-50°F water temperatures ensured that all bathing was done quickly.

Monday morning we get started quickly on our topo site. It is easy to get set up because all our control is already in place and tied into the GIS system on state plane coordinates. This site is called Arroyo Grande because of the huge arroyos that have been cut through a prehistoric sandbed left when the river flowed at much higher levels (100-300,000 cfs). Some of the drainages have been cut 3-4 meters deep. The site contained 2 arroyos with a total of eleven branches, most over 6 feet deep. It became quite a labyrinth trying to navigate through these channels. This site is of special concern to the archaeologists because these arroyos are carving into artifacts and impacting archaeological features. This site will be monitored closely in the future and based on our topo and future topos, earthwork quantities will be measured to track the amount and rate of soil displacement. The topographic map will also be studied to determine if any mitigative measures will be possible to preserve the site. If a feature becomes in eminent threat of being displaced, it may have to be excavated. After I had been walking the site for a couple of hours, 4 bighorn sheep came down from a nearby cliff to watch. They came down to about 50 meters from me and watched us for over an hour before they disappeared into the rocks again. At the end of the day, Al, another surveyor from Tucson, and myself have collected over 1200 points. We return to camp for dinner and spend the evening relaxing.

Tuesday, Al & I continue on with our topo. This site was also interesting because I got to work side by side with

Duane (Biff) Hubbard, an archeologist working for Northern Arizona University and the NPS. I actually discovered several new artifacts and features in the course of blanketing the site with topo shots. Duane found a broken knife or spear tip lying on the ground by one of our control points. To closely look at a piece like that gives you an appreciation for the amount of skill and time that the Indians put into making their tools, and how quickly those tools could be broken. This afternoon a film crew for the Discovery Channel comes by our site. They are doing a special program on the geology of the Canyon, and they asked Duane about the work we were doing. Later that afternoon, they brought in equipment, cameras, lights, even ladders, to film some of the features on our site as they interviewed Duane. That night, after filming, they invited our whole group to come down to their camp for a dinner party. Those guys traveled in style. They had commercial outfitters transporting them and preparing all of their meals, so we had full luxury dining along the river. After a while a USGS crew showed up also. There was much to talk about, especially the story of how Chris & Brian rescued an oar raft that had flipped in 209 mile rapid that morning, salvaging their people, paddles and most of their beer.

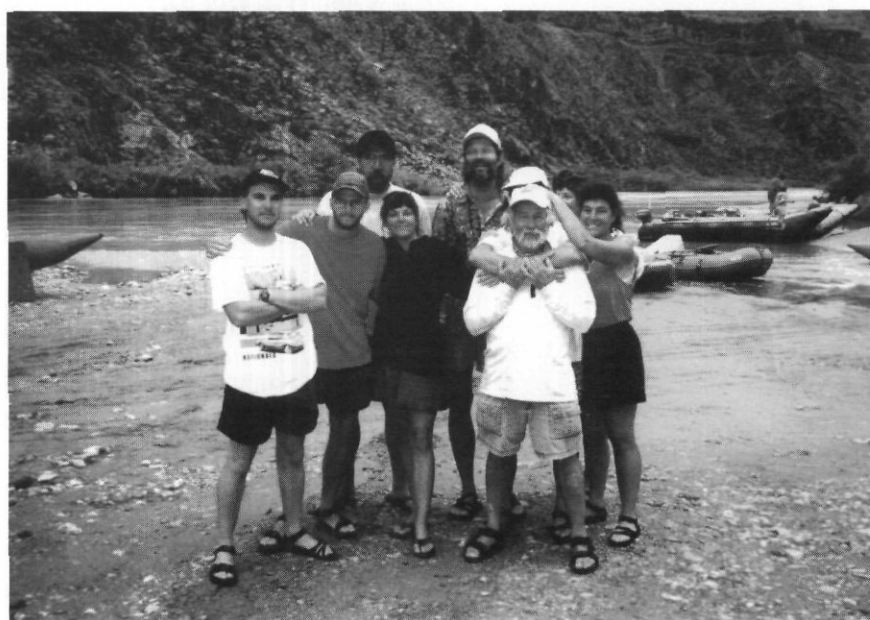
Wednesday we finished our surveying at Arroyo Grande. After three days, I was navigating the maze of arroyos pretty well. We shot over 3400 points, combined with 1900 points Chris had shot previously. After I was sure we had enough coverage for accurate mapping, we headed back to camp to download the data collectors. Just before dinner, a group of scientists from Arizona Game & Fish Department pulled in to camp with us. They had finished their work a day early and were taking out the same day

as us. We spent the evening talking with them and the weather is starting to get cloudy. It is threatening to rain again.

Thursday morning we got up early. As we packed camp, it began to rain fairly heavy. The dilemma is whether or not to put away the tent. If you leave it up, you can use it for shelter. If you take it down quickly enough, you can put it away dry. Wet tents are not much fun. I put it away and ended up sitting outside in the rain (with everyone else) for over an hour. It just goes with the territory and by now, I'm quite used to it. We leave camp and run 209 mile rapid. We spend most of the day travelling, stopping from time to time to check things out. Chris & I stop at river mile 224, just above our camp tonight, and just above Diamond Creek, our take-out point tomorrow morning, to finish a topo map we worked on together on my last trip and did not finish. No sooner than I got the instrument set up, it started to rain. Chris & Duane were on-site across the river, and found a cave to sit in. I covered the instrument with my dry jacket and sat down to enjoy the rain.

After about a ½ hour, it let up and we were able to continue for about 200 shots before it started raining again. At this point we packed it up and headed for camp. Maybe Chris can finish that site on his next trip. It was a pretty big storm coming in. It ended up raining all night long, until about 6:30am Friday morning.

We got up at 4:30am Friday to get camp packed up and travel a couple hundred yards down river to the take-out at Diamond Creek. Working together with the AZ Game & Fish group, we had all the boats de-rigged and the trucks loaded in about 2½ hours and we were on our way back. The trip back to Flagstaff consists of about an hour of bumpy dirt road and about 2 hours of interstate freeway. We are 6 hours driving distance from where we put-in two weeks ago. Once back at the warehouse, we unloaded the trucks and loaded our personal gear into our vehicles. I said goodbye to new friends and old ones and began the 10 hour trip back home, ending another two weeks that I will never forget. I have been lucky enough to have yet another "Trip of a Lifetime". ❖





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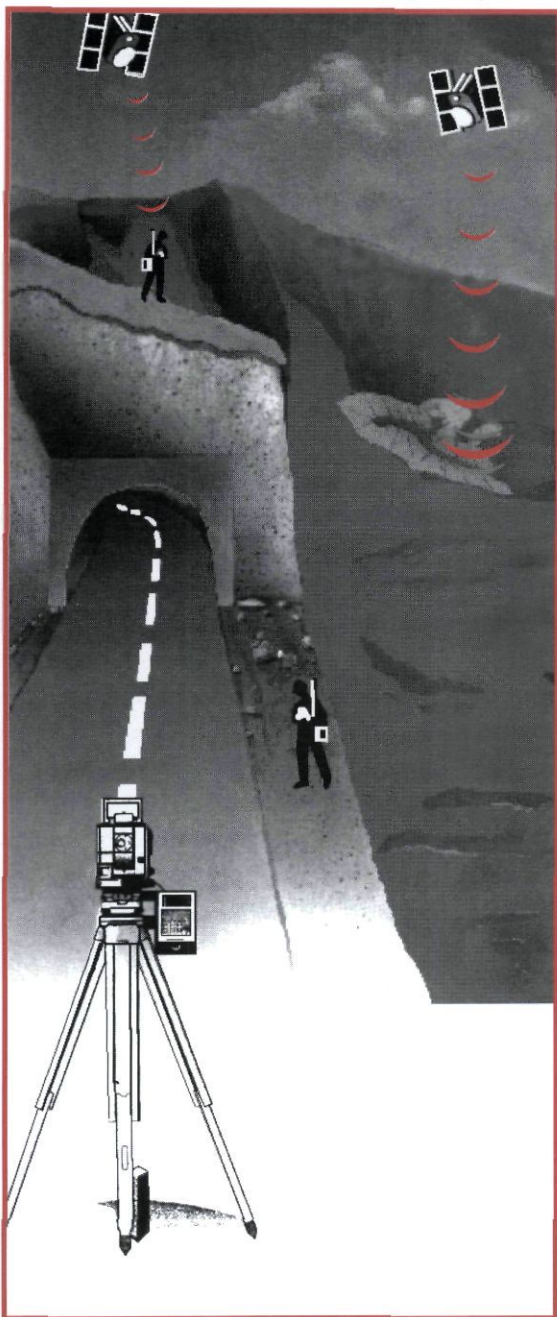
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My Confession

By: Dan Manion

Preface

Some coastal California Counties such as Santa Barbara and San Luis Obispo have no longer recognized lots shown on pre-1893 subdivision maps unless they were created by deed conveyance.

The author works in San Luis Obispo and has worked on the processing of Certificates of Compliance which have merged many of these antiquated lots into one new legal parcel.

January 12, 1998

On the subject of subdivision maps recorded prior to 1893, I am of the opinion that all lots shown are perfectly legal to be conveyed, surveyed and perhaps developed if within the reasonable limits of health and safety. California may have inherited certain laws governing title of real property from Mexico, but the basic principles were derived from England's Common Law. There were no recording laws under Spanish or Mexican governments. The new legislature of 1850 enacted the Constitution which adopted a recording system modeled after the original American Colonies. This creation of the office of the county recorder provided for protection of the rights of persons in relation to their personal and real property. The Recording Act of California provides that any instrument or judgement affecting real property may be recorded. The recorder was required to keep 21 individual and separate indexes to the recorded instruments in his office. Declarations of homesteads have been recorded since 1850. Deeds of trust had been filed since early times, without the statute referring to them as such. Since

1850 many additional types of instruments have been added to those now indexed in the office of the county recorder. Although maps of subdivisions, and of roads and easements across realty, have been filed since 1850 in the recorder's office, it was not until 1933 that the recorder was required to keep a separate book for State highway maps and other maps for Public Works.

In 1893, J. F. Fiedler, San Luis Obispo County Recorder, now aware of the latest statute, must have looked around his office, and nodded to himself thinking "yep, all is well; these maps are all recorded with the dates and times they were recorded. No use taking 'em out and bringing them back in to record them again." Could you just picture him lifting all those oversize parchments and carrying them out to the curb and walking back in.

Again in 1907 a similar occurrence took place except this time D. F. Mahoney was County Recorder and he looked around the room and gathered up all the maps in this corner and on that shelf and just as in the

irregular order in which they were last viewed, he compiled all the subdivision maps up and did his best to secure them in a book of maps by giving them each a book and a page. In San Luis Obispo County these are the books A and B. The maps are not in chronological order but in a sequence by area as if they were recently looked at. Post 1907 maps are filed in book one, two and so on. According to the book Ogden's Revised California Real Property Law by Arthur G. Bowman the map act (enacted in 1929), removed any prohibition against sales by reference to any map or plat recorded before 1929. The California Department of Real Estate Reference Book states the general purpose of recording statutes is to permit rather than to require the recordation of any instrument which affects the title to or the possession of real property. Also, early American cities were relatively compact by today's standards. Their land areas were limited primarily by how far people could walk in going about their daily activities. As an example, close at hand, Paso Robles in the upper Salinas Valley of San Luis Obispo County was planned by Drury Woodson in about 1869. Although Paso Robles is not one of the state's largest cities, its wide streets and general plan are a tribute to the foresight of this man.

On April 28, 1995 I attended a Subdivision Map Act seminar in Santa Maria which was sponsored by the local chapter of the California Land Surveyors Association. Guest speaker Andrew Gustafson, Assistant County Counsel of the County of Ventura spoke about legal lot determinations and at the end of the day he had copies of his work on sale. I bought one and was amused by his twisting of the meaning of words with respect to times past. After reading it, I confess I offered it to staff in the office of the

County Counsel of San Luis Obispo, and boy did I make a mistake. Although he was already leaning toward the idea of deeds create lots, he must have read Mr. Gustafson's "pure political fiction" and swallowed it hook line and sinker.

If the local agencies did everything exactly by the state statutes, nothing would get done. The local ordinances are also archaic and would tie everyone's hand if carried out to the extreme. What is important is the policy of each bureaucratic office which sets the interpretation of these laws to work. A local office may be directed by the elected politicians to change policy at any time. I was personally dismayed to hear local elected officials remark that perhaps the courts could straighten this interpretation out.

This whole episode reminds me of the story I learned as a child. "The Emperor's New Clothes." Everyone can see the recorded maps and uses them to locate wooden survey marks set in the field which delineate lot boundaries. How can the politicians ignore the evidence? Boy has someone got them snookered.

The local planners already have proceeded to address these antiquated subdivisions with general plans and minimum lot size rezoning, as in the Study Of Non-Conforming Subdivisions in Rural Areas by the San Luis Obispo County Planning Department in 1977; however, the politicians could not decide the issues and as they have come and gone, staff still continues to struggle with how to carry out policy established by each new set of politicians.

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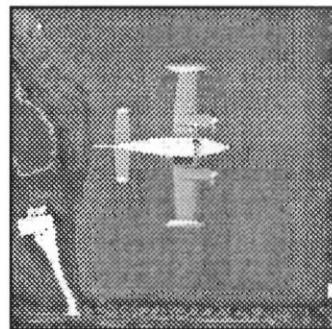
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Smith Continued from page 20

Stanley R. Smith, LS 2265

Lifelong Santa Cruz County resident and Land Surveyor Stanley R. Smith did at his Aptos home May 10, 1997. He was 82

Mr. Smith who graduated from Santa Cruz High School in 1932, was one of the county's first Eagle Scouts, and later a Boy Scout leader in Live Oak. During World War II he was a member of the 335th Engineer Regiment, serving in Africa, Italy, France and Germany.

During his 50-year surveying career, he worked for Arnold and Bob Baldwin, the city of Watsonville, Bowman Williams Civil Engineers, and later was self-employed.

Mr. Smith was known as the "dean of Santa Cruz County surveyors." He loved the surveying business and enjoyed telling stories about local history. In 1934, while "teaching himself to survey," as he put it, he placed a monument in Delaveaga Park at the intersection of the 37th latitude and 122th longitude. It is the only spot in the county where a latitude and longitude cross. There are only 30 such spots in the state. The monument still stands.

He is survived by his wife of 49 years, Santa Cruz native Carolyn Mae Smith (Thorp); his daughters, Susan Smith, of Redding and Carol Kerfoot of Corralitos; a son Stanley Smith of Hollister; and three grandsons.

Contributions may be made to Family Services Association of Pajaro Valley.

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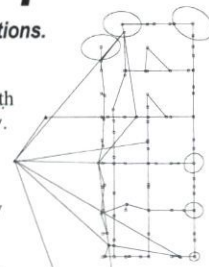
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The goal of the California Land Surveyors Association is to promote and enhance the profession of surveying, to promote the common good and welfare of its members, to promote and maintain the highest possible standards of professional ethics and practice, and to elevate the public's understanding of our profession. CLSA represents all Land Surveyors, whether they are employees or proprietors, whether in public or the private sector.

Representation

■ **LOCAL:** Your local chapter represents you in local issues. Through your chapter representative to the State Board of Directors, the individual member can direct the course CLSA will take. ■ **STATE:** The Surveyor is represented at the state level through an active legislative program, legislative advocate, and liaison with the State Board of Registration. ■ **REGIONAL:** CLSA is an active member of the Western Federation of Professional Surveyors. This Federation is composed of associations throughout the western United States and addresses regional issues. ■ **NATIONAL:** Through institutional affiliation with the National Society of Professional Surveyors and the American Congress on Surveying and Mapping, CLSA is represented at the national level.

Education Opportunities

CLSA presents annual conferences which provide technical and business programs, as well as exhibits of the latest in surveying and computing technology. Seminars and workshops are presented to assist in continuing education. CLSA publishes the California Surveyor magazine and the CLSA News to keep the membership abreast of changing legislation, legal opinions, and other items which affect our profession.

Business and Professional Services

CLSA provides a fully staffed central office which is available to answer questions or to provide up-to-date referrals concerning legislation, educational opportunities, job opportunities, or other issues concerning our membership. Health and professional liability insurance programs are available to members.

Join CLSA Today!

- **CORPORATE MEMBER:** Shall have a valid CA Professional Land Surveyor or Photogrammetric license * \$159.00 + Entrance Fee
- **AFFILIATE MEMBER:** Any person who, in their profession or vocation, relies upon the fundamentals of land surveying \$79.50 + Entrance Fee
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