2016

6TH ANNUAL

ROCKY MOUNTAIN Surveyors Summit

Wednesday, March 2, 2016

Speaker: Dennis Mouland

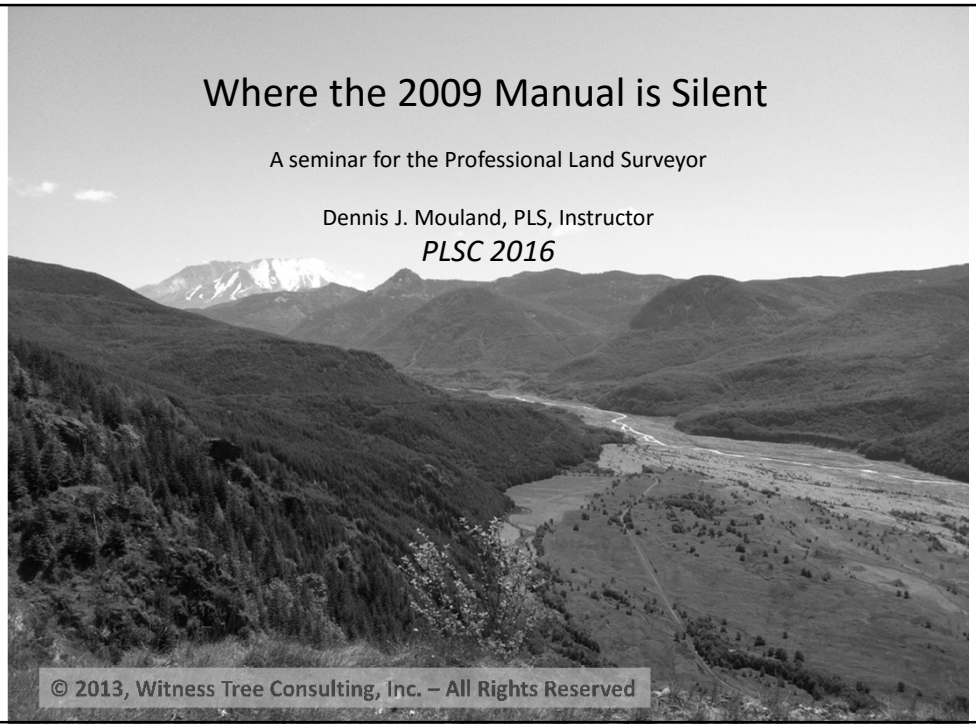
Where the Manual is Silent

Where the 2009 Manual is Silent

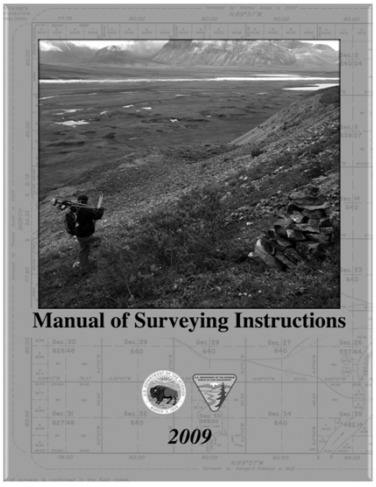
A seminar for the Professional Land Surveyor

Dennis J. Mouland, PLS, Instructor

PLSC 2016



Be up to date……..



http://www.blmsurveymanual.org/errata.asp

Course Goals

- Identify survey issues where the Manual is silent, leaving solutions in all or part to the professional.
- Discuss possible solutions for each
- Recognize the need for thorough documentation

Items to be Discussed

1. Controlling lines in weighted mean bearings
2. Local evidence inside a section
3. Lost corners in:
   a) Mineral surveys
   b) Other NRE's
   c) Inside sections
4. Multiple WC's for section corners
5. Latitudinal curve issues
6. Control for lost CC's and corners of minimum control
7. "Limits" on lines in trees (LT or BT)

Is it *Really* Silent?

- In some cases, YES
- In many cases, the principles are elsewhere in the book, and we need to properly apply them to our cases

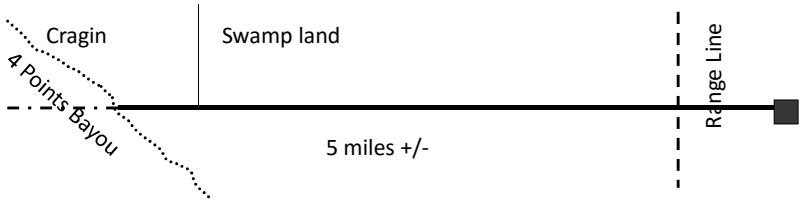
5-31--Occasionally, after a dependent resurvey has commenced, complications develop that make the methods described in the special instructions inapplicable. Provision should always be made in the special instructions calling for the surveyor to report such facts to the supervising office.

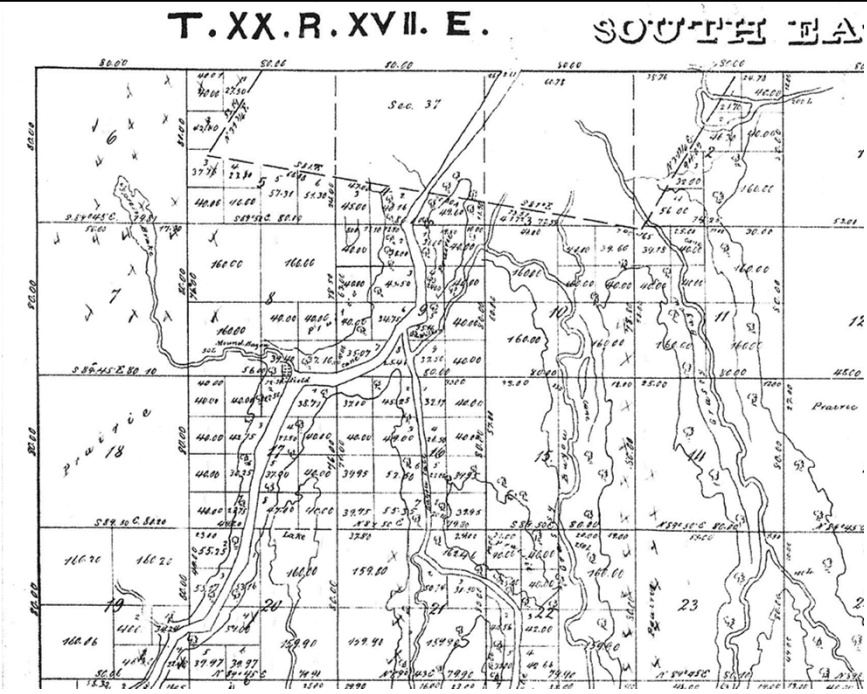
Why does all this matter?

- "Protect the plat" is a concept GLO/BLM always held. Basics of protecting bona fide rights granted by patents.
- It comes from U.S. Supreme Court direction
- Means to uphold the factors given on the plat, including topography, intent, ratios and equities
- Our slogan will be:
- ***"Always let the PLAT tell you what to do"***

Cragin v. Powell
128 U.S. 691 (1888)

- What is a resurvey?
- Chaos with erroneous resurveys
- A major issue for the modern surveyor
- How apply to the 1320 Club's actions?
- Use of topography ok
- "Protect the plat" not "running the record"



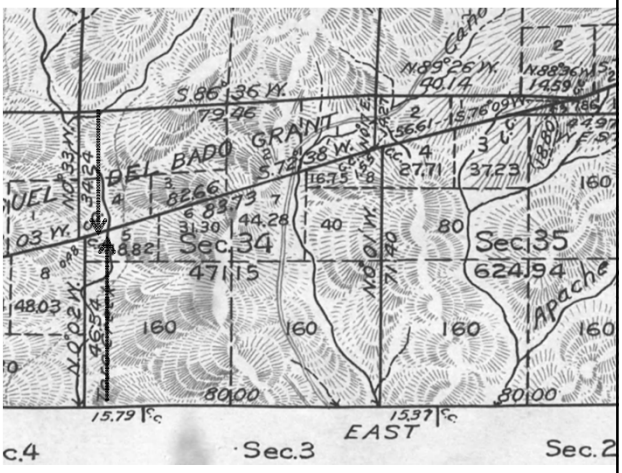


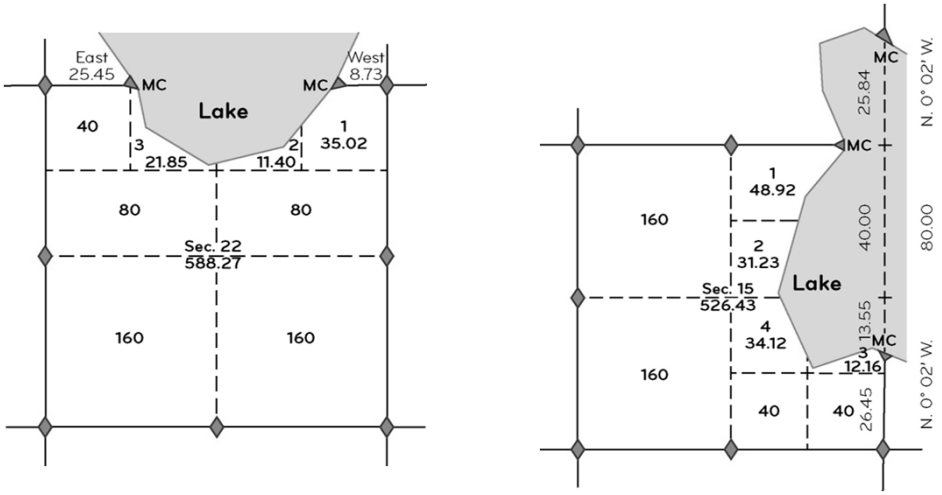
Subdivisional Corners created?

- Yes, but not monumented:
- Not synonymous terms
- Corner is a point on the surface of the earth, a location
- Monument is a physical object claiming to be at a corner point

Issue No. 1: Controlling Lines in Fractional Sections

- 3-118. By law a fractional section is (1) a section containing outlying areas protracted as surveyed, or
- (2) an invaded section in which at least one quarter section corner has not been or cannot be fixed. The method of subdivision by survey is outlined in 43 U.S.C. 752(2)(cl. 3) and 753(c1s. 2 and 4). By rule the procedure for subdivision of the fractional section is to be as nearly as possible in conformity with the official survey.
- 3-119. The law presumes that a corner has not been fixed when: (1) the section line on each side of the corner position has not been actually run (figure 3-44), or, (2) the section line has been actually run but at least one corner on either side, on the section line at issue, has not been monumented (figure 3-45). The rule presumes that a section line has been actually run when a bearing and distance of the line is returned in the official survey record

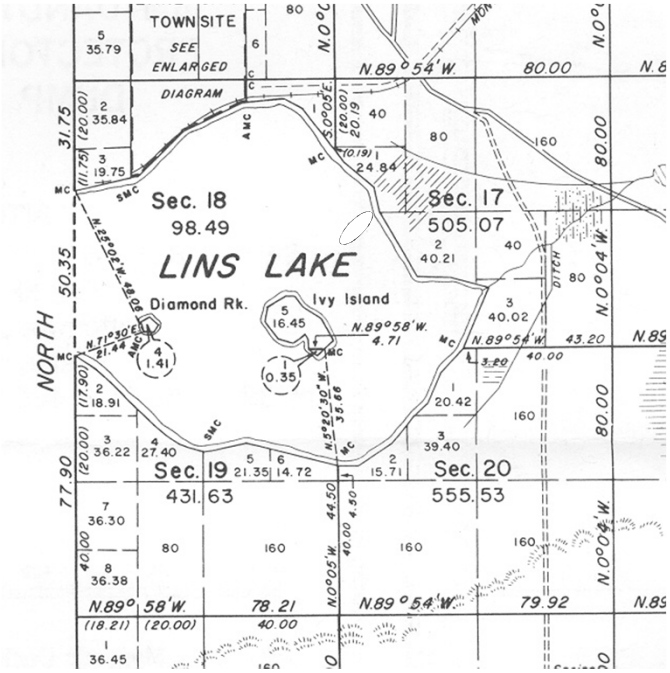




Fractional Sections

- Our definition:
  - "A section with one or more of it's controlling corners never fixed"
  - Fixed? Was a return published on the distances controlling it?
- Sometimes a section may not be fractional but a quarter section of it is fractional
- Beware using "fractional" term just because a deed or patent uses it; fractional is a term for title issues when a parcel is less than 40 acres. This often does not trigger the survey definition of fractional.

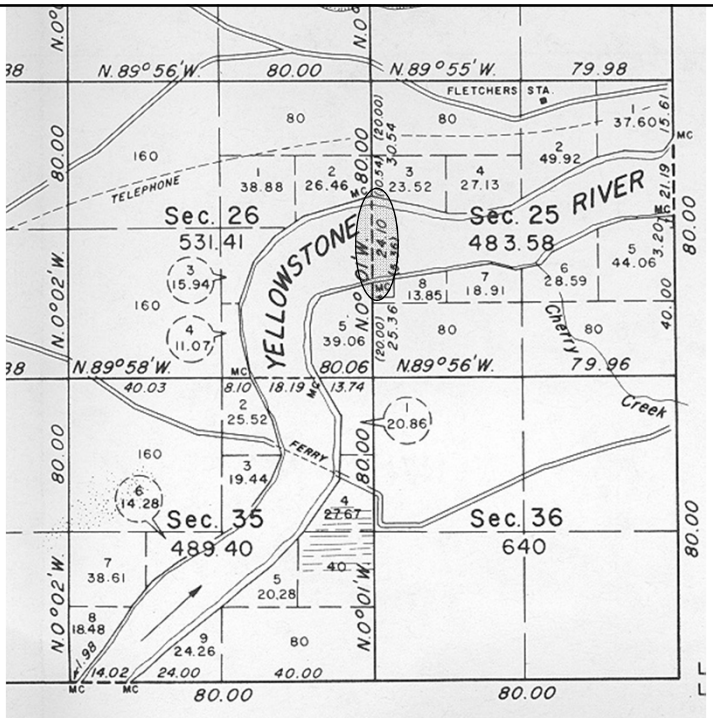
Sections 17, 18, and 19 are all fractional.
They have no returns across the lake.
Those lines were not run nor approved by the GLO.
Section 20 has a fractional NW1/4. Ties to islands are not approved PLSS lines and should not be used in retracements.



Are these sections Fractional?

Note the returns.

These can all be subdivided normally

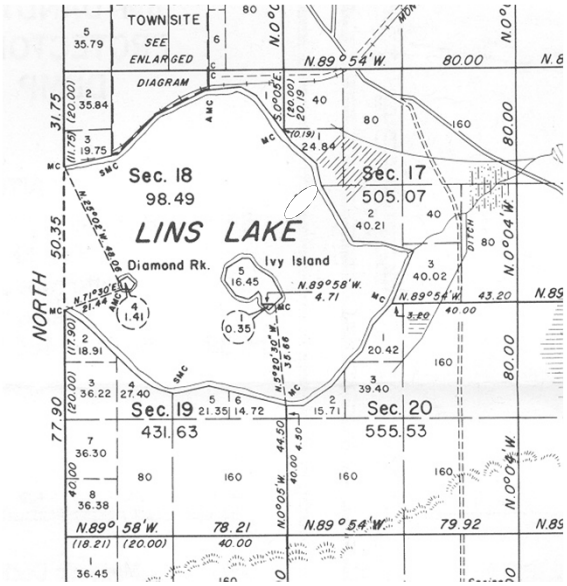


EXAMPLE: Section 17--
E/W centerline What bearing?

Congress addressed this in the 1805 Act.

"Regarding fractional sections, the subdivisional lines shall be run in cardinal directions."

Mansfield immediately interpreted this to require mean bearings. We now use weighted mean or parallel lines as the facts dictate

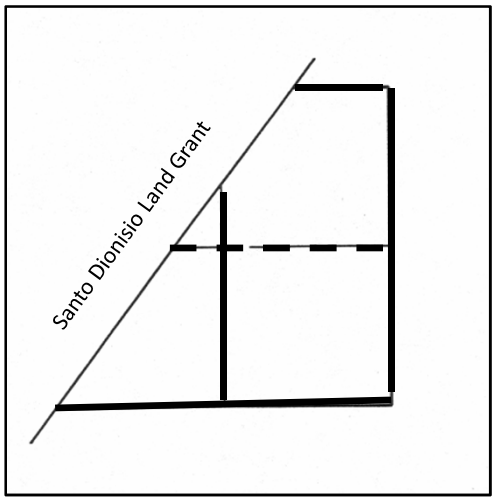


Application of Fractional Rules

- Weighted Mean Bearing if:
- You have two or more lines to weight against; the longer lines control the mean more than the shorter.

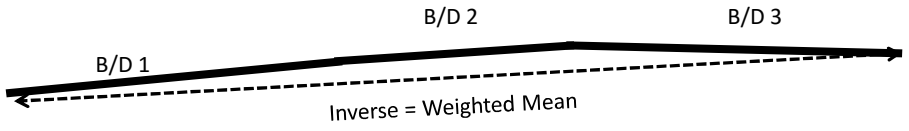
- Run Parallel Lines if:
- You only have one sideline to which you can apply the intent of the plat.
- Used where no other section line exists or if the plat indicates not to spread adjustment through the entire section.

Parallel line and Weighted Mean Example



How do you compute a weighted mean?

- In COGO, connect all the lines you are using in the calc end to end with your *measured data*.
- Inverse between the two end points and the result is a perfectly weighted mean.

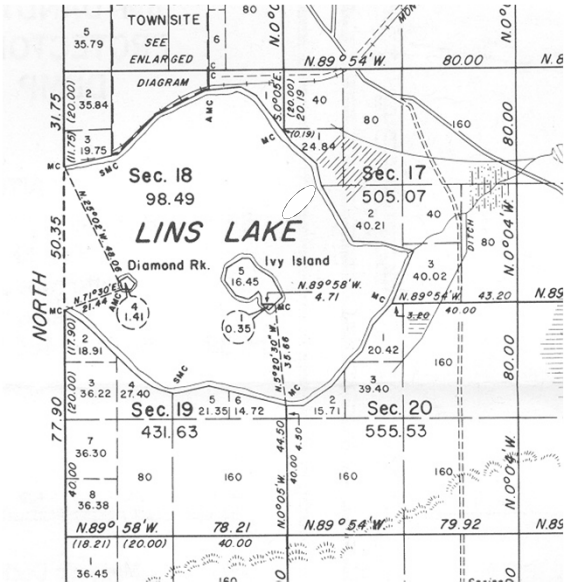


EXAMPLE: Section 17--
E/W centerline weighted mean using all 4 lines:

NE Cor S17 to N1/4 S17 =
N89W 40.25
N1/4 S17 to NW Cor S17=
N88W 40.33
SE Cor S17 to S1/4 S17=
S89-30W 39.89
S1/4 S17 to MC S17/S20=
N84W 3.18

Place these end to end in a traverse routine. Inverse for answer:

N89°01'45"W



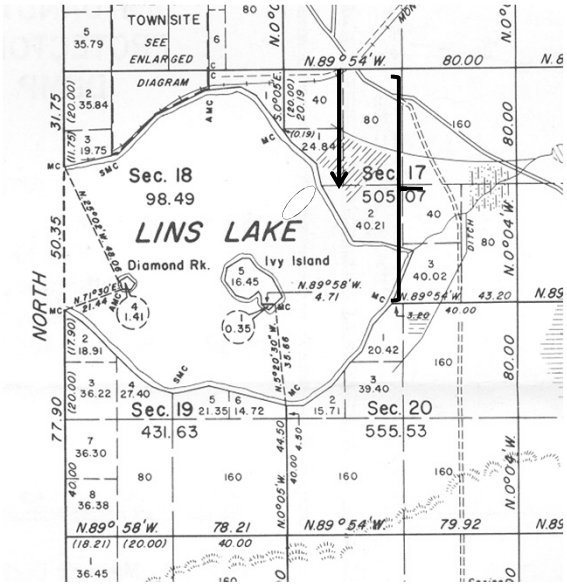
What about the CW 1/16th of S17?

Subdivisional lines are all included in the law.

Assume the following measurements made:
NW Cor S17 to MC= S1W 20.15
N1/4 to C1/4 = S0-30E 40.45
C1/4 to S1/4= S0-30E 40.98

Solution with all of N/S centerline= S0-12-09E
With northern part of centerline= S0-05E

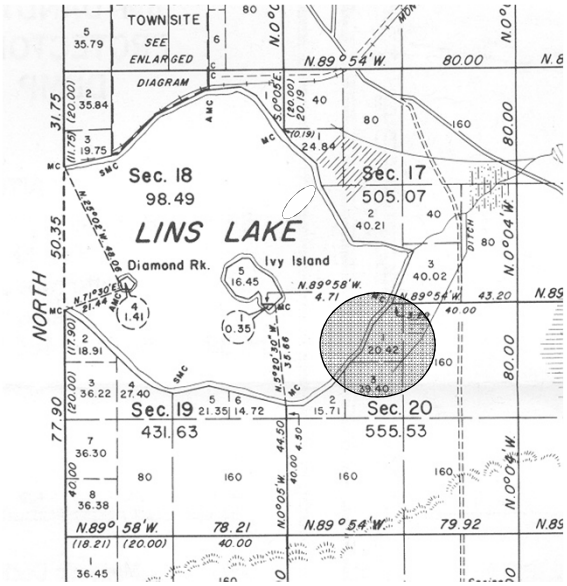
Δ = 5.55 feet on the ground in eastings



What about the NW1/4 of S20?

Assume you are surveying Lot 1:
Measured data=
N1/4 to MC = N89W 3.22chs
W1/4 to C1/4= S89-45W 40.66
C1/4 to W1/4 = S89-45W 40.61

Solution with all of Centerline = S89-47-51W
Solution with West part only = S89-50-31W
Δ at meander line (SMC)= .97 ft



Rarely a reason to do this

Definitely NOT over a gray area difference like fractional sections……..the Manual is silent

Document!

- When in a gray area, tell the *whole world* what you did and why via:
- Report
- Plat Notes
- Field Notes
- Other internal documents

SURVEY REPORT

- To: World AG project file, Strickland Surveying and Mapping (SSM)
- From: Dennis Mouland, Witness Tree Consulting (WTC)
- Date: June 20, 2012
-
- WTC was contracted for consulting work on behalf of SSM on May 10, 2012 for a project involving the re-establishment of the line between Ranges 8 and 9 West, of Township 13 North, Choctaw Meridian, Issaquena County, Mississippi and re-establishment of adjoining sections. The World Ag project was a dispute over title and boundaries in a relatively small area along the range line. Adjoining township data was also utilized to resolve corner positions.
- SSM provided plats of other private surveys in the area, USGS quads, as well as field notes from the original GLO surveys, and pertinent deeds. WTC acquired GLO plats and Google Earth images with PLSS overlays from BLM Eastern States Office.
- SSM field crews searched and tied in all available evidence in the area. Due to the nature of the area (flooding and river movement) it was agreed the project needed to be on a larger scale. Many of the private surveys in the area were narrowly focused and did not in any way correlate with one another. Further, the area is plagued with multiple monuments at corner positions, proving little effort had been made by previous surveyors to faithfully retrace and relate the area together. A large scale retracement and harmony of the best available evidence was to be the foundation of the balance of the work in the project area.
- After comparing the reading and analysis of the GLO plats and notes between SSM and WTC, SSM provided coordinate data from all evidence found. WTC computed and prorated the situation independently of SSM. Comparisons were made between these results and discussion ensued over possible solutions using the found evidence. Three presumptions were made to arrive at a mutually agreeable solution. They are:

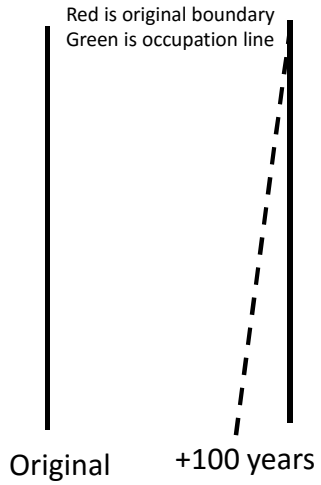
Issue Nos. 2 and 3: Local/Lost Corners inside a Section

- Includes subdivisional corners along the section and other controlling lines
- Can you accept/reject?
- *Yes, it is your job.*
- What effect if accepted?
- *See 6-45 in the 2009*
- *Manual.*

Local Points of Control
6-45. Once a local point of control is accepted in an official survey it has all the authority and significance of an original corner. The influence of such points is combined with that of the previously identified original corners in making final adjustments of the temporary points.

Boundary v. Property Line

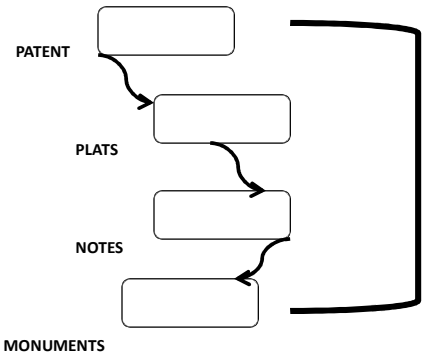
- Sometimes these terms are confused
- For our purposes;
  - Boundaries are original lines created by GLO
  - Property lines start on these
  - Property lines can move away from boundaries by actions or inactions of landowners or courts
  - Boundaries stay fixed
- So what can the courts actually do?
  - Fix the property line between the parties named



The *Legal Pathway* of Evidence

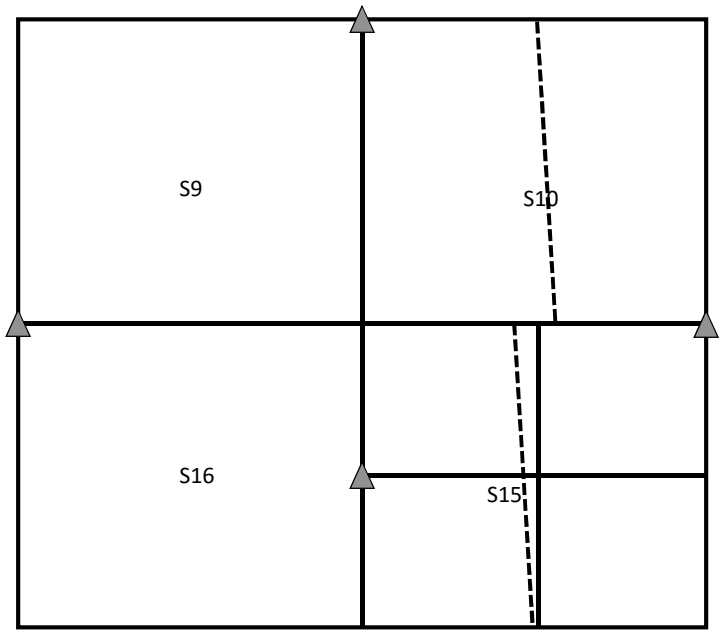
- Patent calls for the plat
- Plat calls for the notes
- Notes call for measurements and evidence on the ground
- Thus, every patent calls for monuments and other evidence on the ground to control its location
- ***How could you do a real survey without these records?***

Pathway



Often not the same

Every PLSS parcel ultimately calls for monuments in the ground!



What we are looking for is the original position

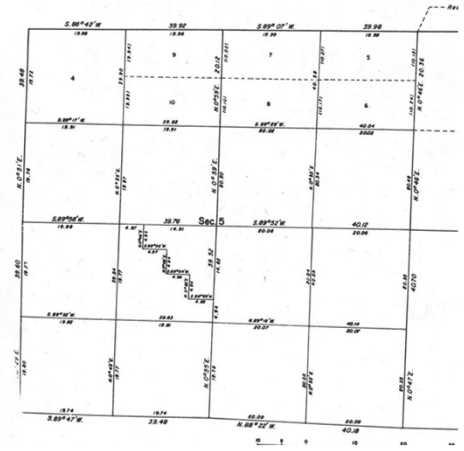
- The original position inside a section is a function of
  - evidence on the exterior
  - math principles
  - the protection of bona fide rights
  - Professionalism on acceptance/rejection of evidence of prior efforts

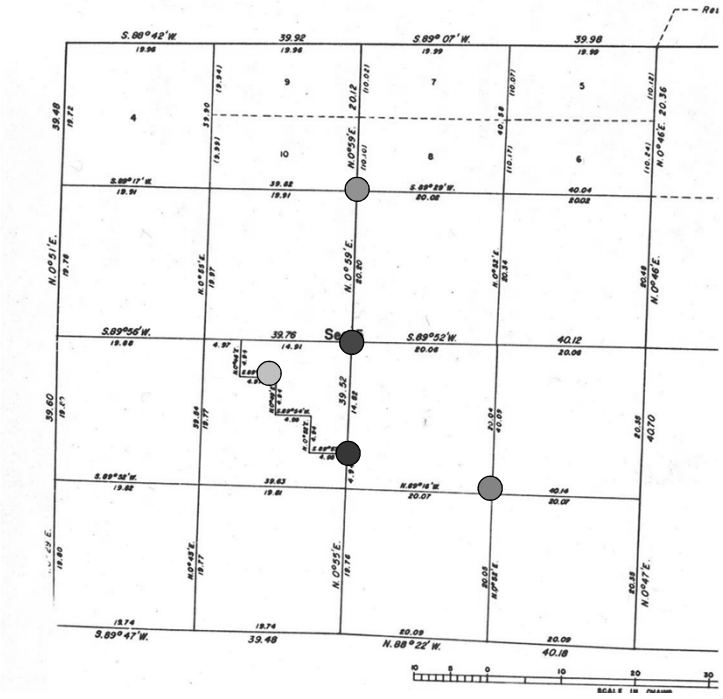
Things to consider

- Intent of the parties
  - What did they intend for precision/accuracy?
  - Process used to protect rights?
  - Or slopped in?
  - Power of words, but…..
- Reality of the profession's capabilities
  - Equipment limits
  - Not best possible solutions
  - Actual practice
  - Standards at the time, *if any*

What about lost corners inside the section?

- Consider the Manual's process for other corners:
  - Senior corners first
  - Double props next
  - Single props next
  - Secondary methods
- Is the goal to re-create a perfect secsub?





Lost Corners on Mineral Claims

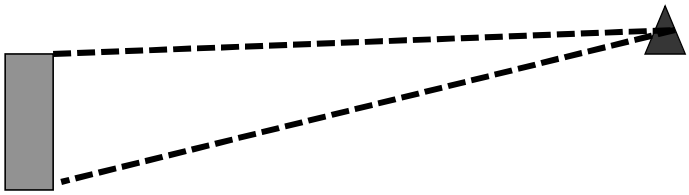
- See 10-101- Manual does discuss it, but…… Serious issues with existing adjoining corners
- Leaves things quite open on lost corners
- Compass rule if all measured
- GBM if all measured

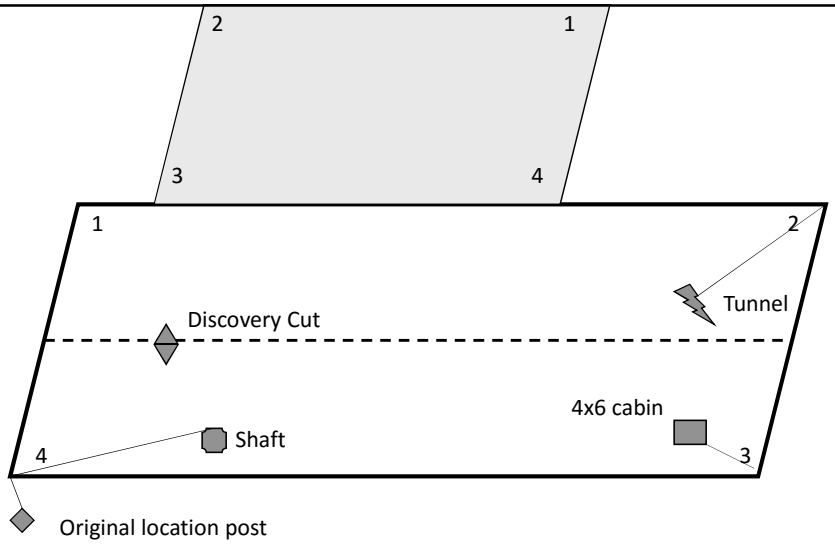
Other issues with Patented Minerals

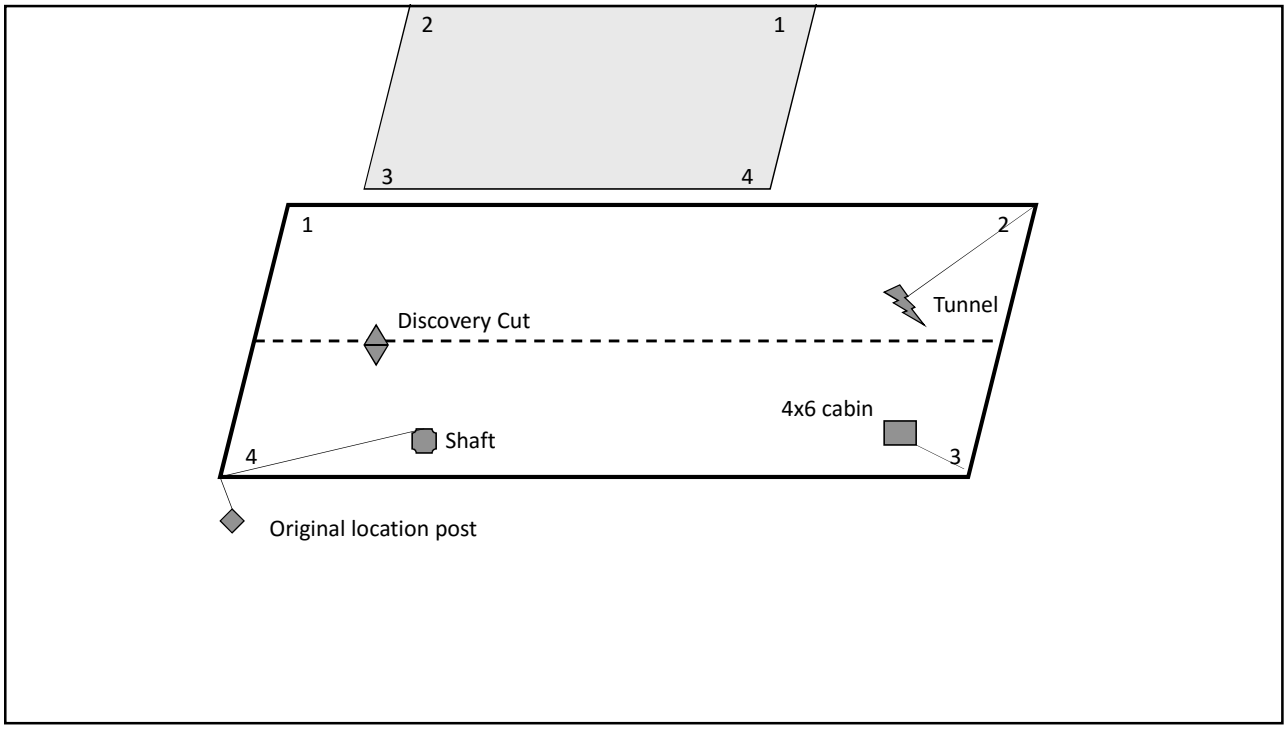
- Caution with ties to USLM's, etc
- Ties to previous/later claims
- Ties to improvements
- GBM if isolated only
- Other solutions?
- Not PLSS, so be careful applying PLSS rules
- Misc. Control (7-59)

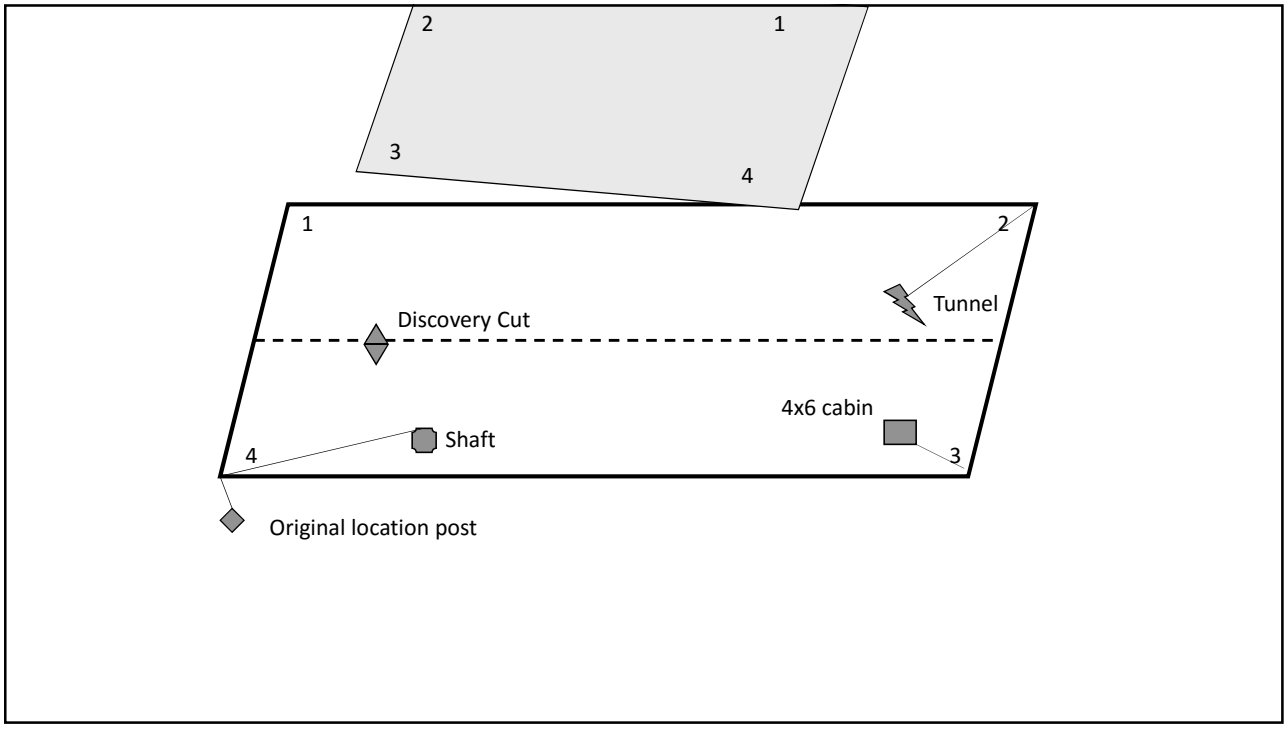
Common Shortcuts

- Perimeters not actually traversed
- Centerlines run and stubbed out end lines
- Ties to PLSS/USLM/USMM not measured
- Ties to improvements not done



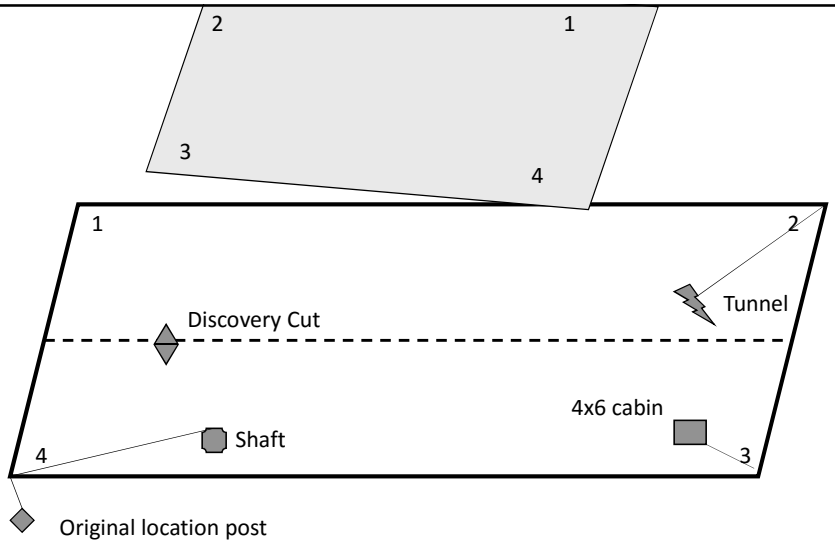


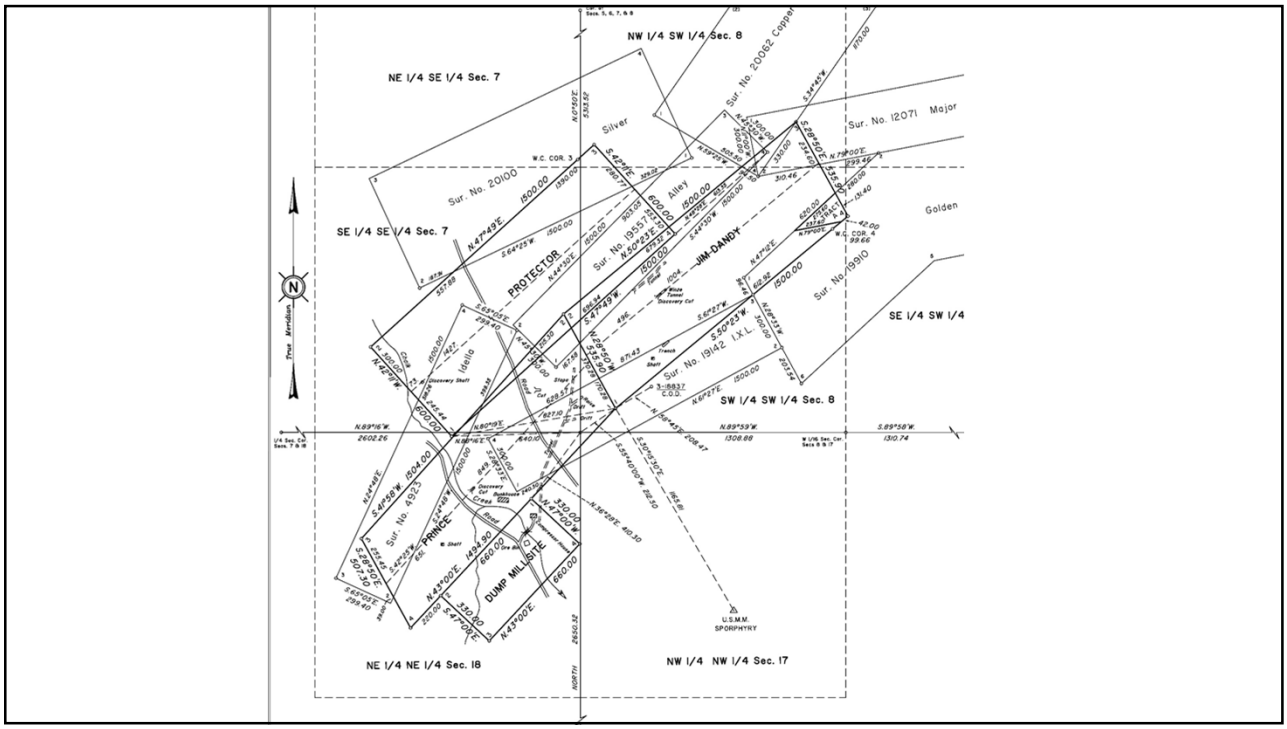

2
1
3
4
1
2
Tunnel
Discovery Cut
4x6 cabin
Shaft
4
3
Original location post


2
1
3
4
1
2
Tunnel
Discovery Cut
4x6 cabin
Shaft
4
3
Original location post

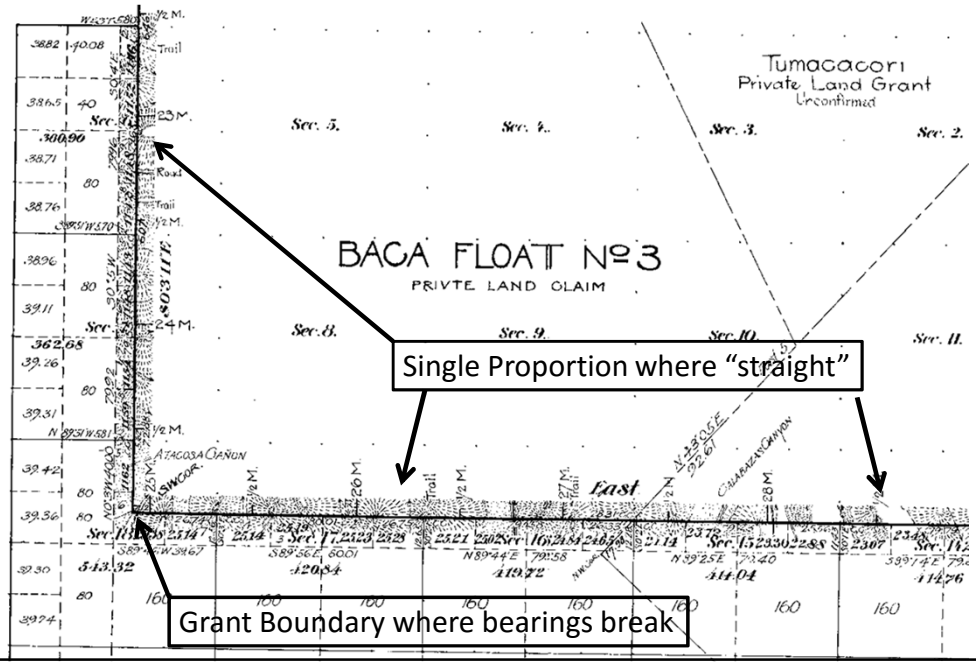
Manual Direction at 10-224-227

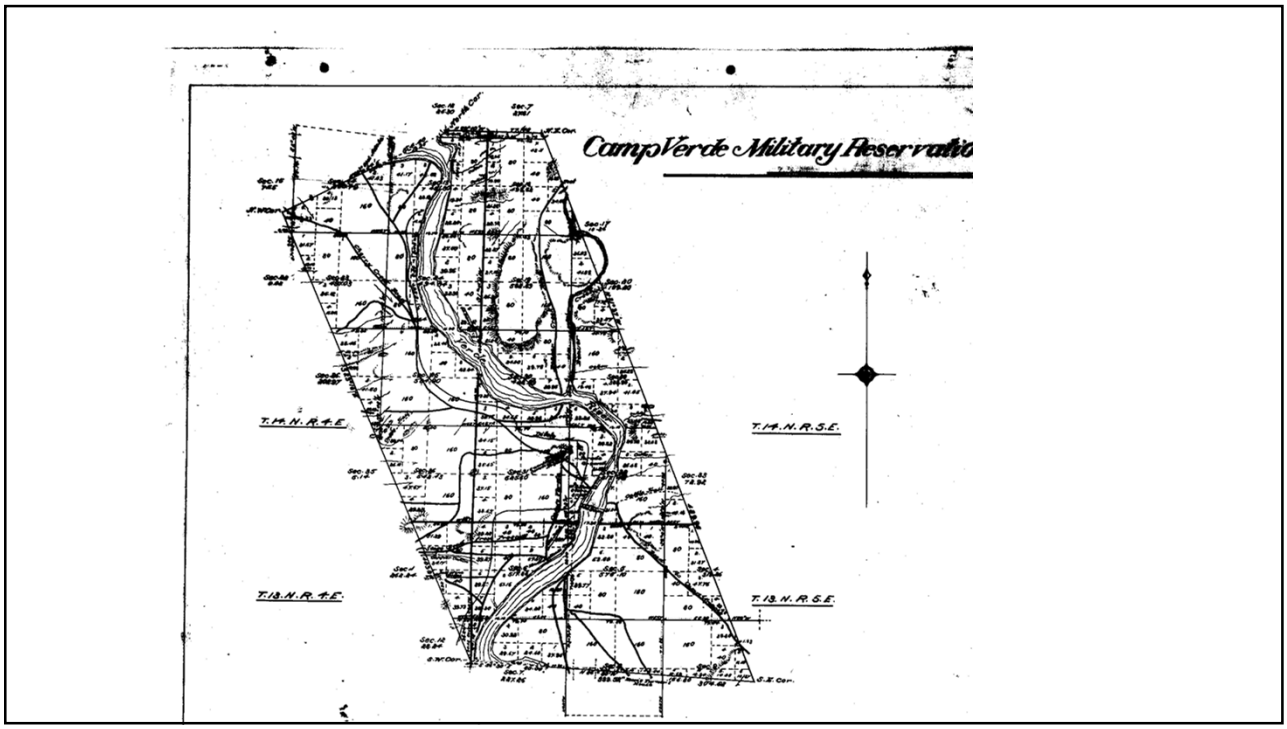
- What do the notes say?
- What are the conditions on the ground?
- Any controlling corners restored by proportionate measure?
- Manual implies bending the senior line
- Be sure this does not impact any bona fide rights

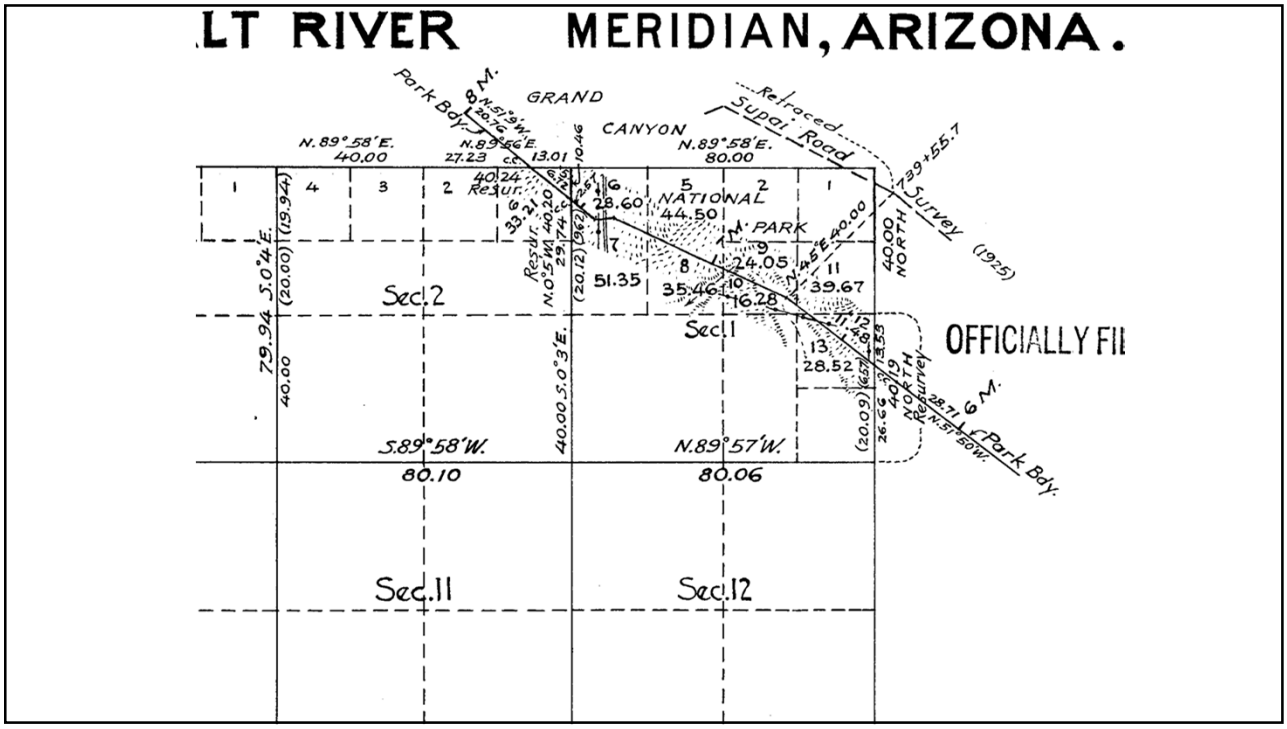


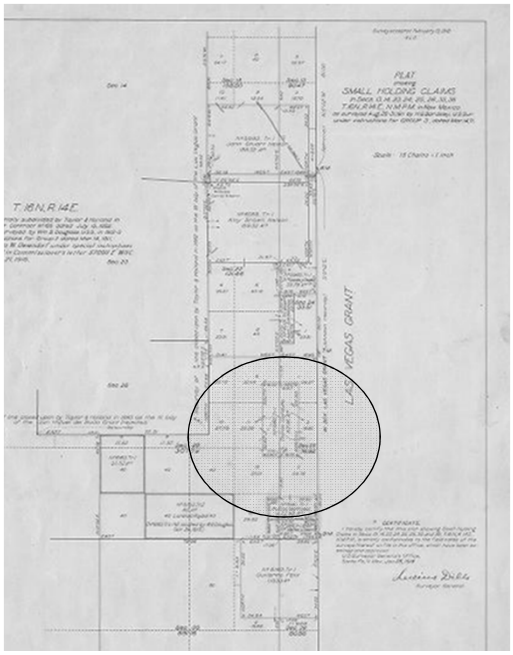


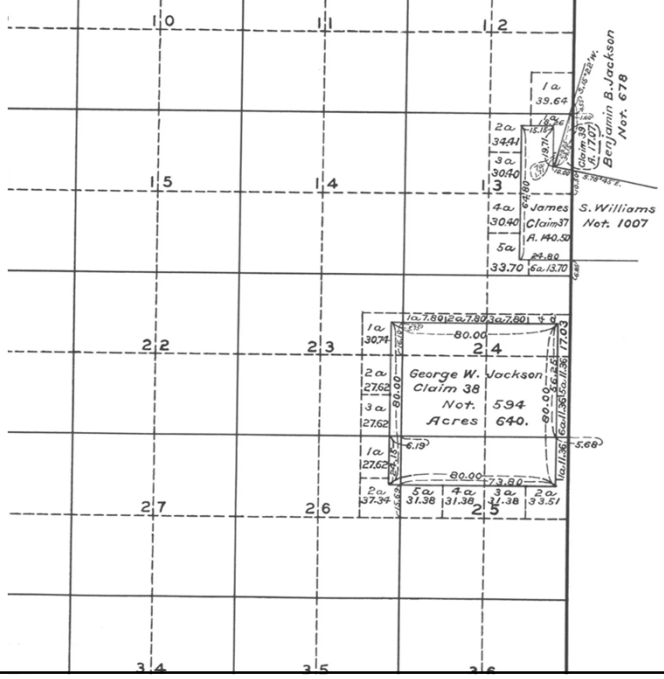
Most Land Grants and Private Land Claims

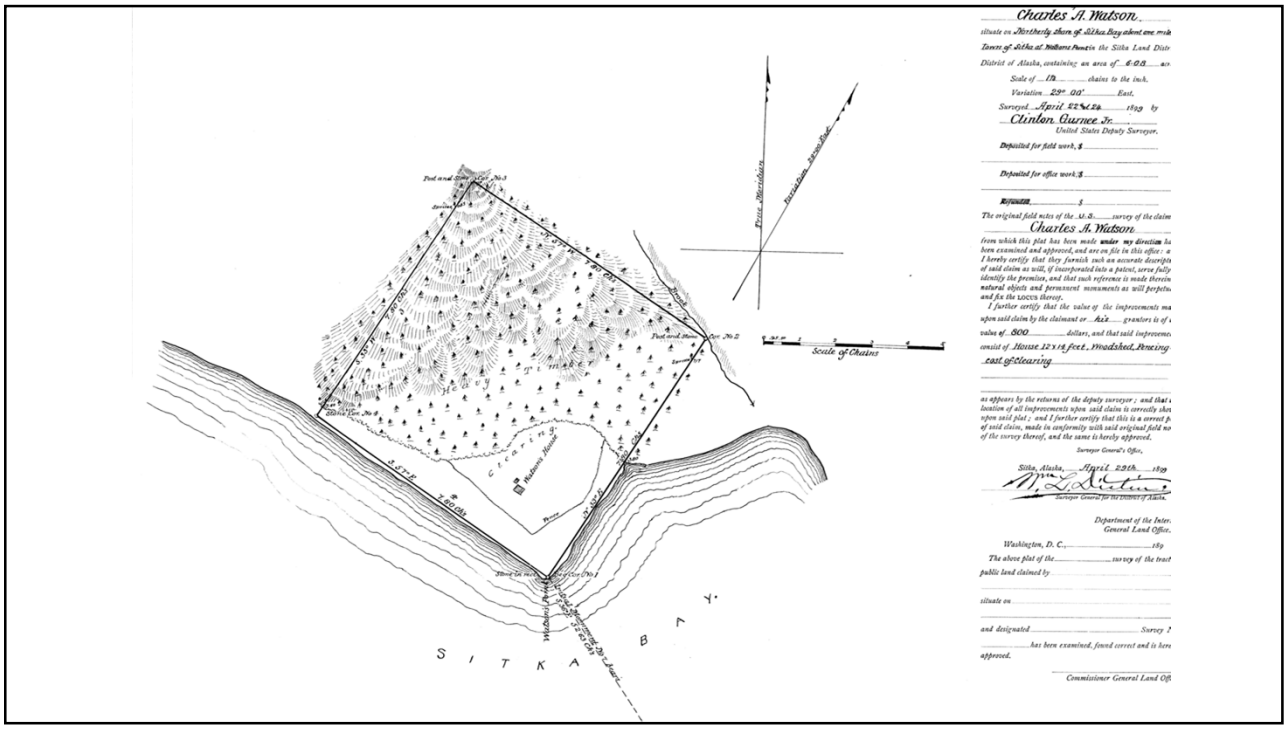



Camp Verde Military Reservation
T.14.N.R.4.E.
T.14.N.R.5.E.
T.13.N.R.4.E.
T.13.N.R.5.E.


LT RIVER MERIDIAN, ARIZONA.
GRAND CANYON
Park Bdy.
Relocated Supai Road
NATIONAL PARK
Survey (1925)
OFFICIALLY FIL
Park Bdy.
Sec. 2
Sec. 1
Sec. 11
Sec. 12
N.89°58'E. 40.00
N.89°58'E. 80.00
S.89°58'W. 80.10
N.89°57'W. 80.06
40.00 NORTH
79.94 S.0°4'E.
40.00 S.0°3'E.


PLAT
SMALL HOLDING CLAIMS
T.8N.R.14E.
T.8N.R.14E.
LAS VEGAS GRANT


George W. Jackson
Claim 38
Not. 594
Acres 640.
James S. Williams
Claim 37
A. 140.50
Not. 1007
Benjamin B. Jackson
A. 17.20
Not. 678



Charles A. Watson.

situate on Northerly shore of Sitka Bay about one mile
Town of Sitka at Williams Point in the Sitka Land Distr
District of Alaska, containing an area of 6.08 ac

Scale of 17 chains to the inch.

Variation 29° 00' East.

Surveyed April 22 & 24 1899 by

Clinton Garnee Jr.
United States Deputy Surveyor.

Deputized for field work, $

Deputized for office work, $

Expended $

The original field notes of the U.S. survey of the claim

Charles A. Watson.

from which this plat has been made under my direction ha
been examined and approved, and are on file in this office: a
I hereby certify that they furnish such an accurate descripti
of said claim as will, if unexpurgated into a patent, serve fully
identify the premises, and that such reference is made therein
natural objects and permanent monuments as will perpetu
and fix the LOCUS thereof.

I further certify that the value of the improvements ma
upon said claim by the claimant or Ass grantors is of
value of 800 dollars, and that said improvemen
consist of House 12 x 16 feet, Woodshed, Fencing
cost of clearing

as appears by the returns of the deputy surveyor; and that
location of all improvements upon said claim is correctly sho
upon said plat; and I further certify that this is a correct p
of said claim, made in conformity with said original field no
of the survey thereof, and the same is hereby approved.

Surveyor General's Office,

Sitka, Alaska, April 29th 1899

Surveyor General for the District of Alaska.

Department of the Inter
General Land Office.

Washington, D. C. 189

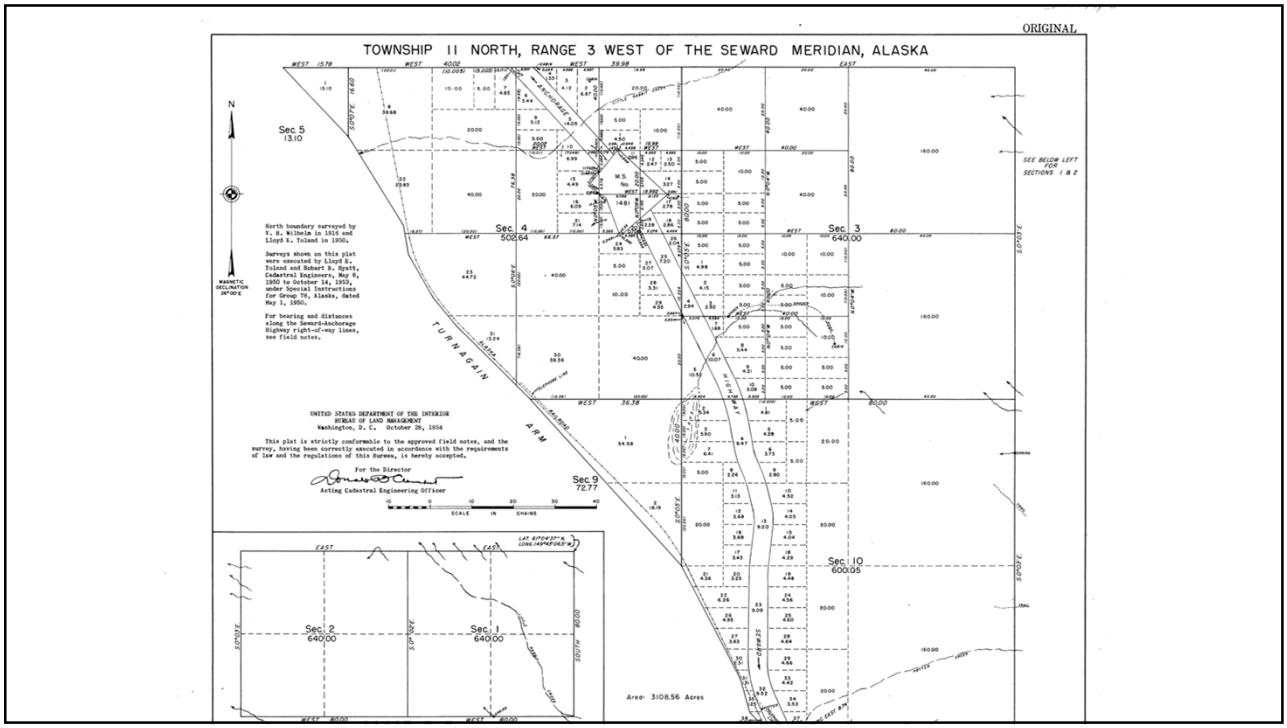
The above plat of the survey of the tract
public land claimed by

situate on

and designated Survey

has been examined, found correct and is here
approved.

Commissioner General Land Off



Item 4: Multiple Witness Corners

Remember: Two types of WC's

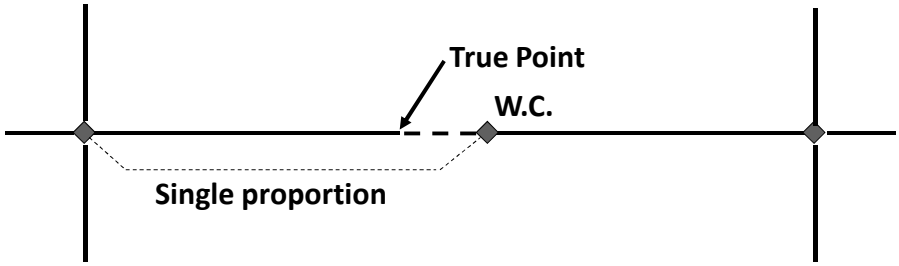
- Off-line are treated as RM's
- Artificial Bearing Trees

- On-line are Controlling Intermediate Corners, and therefore require special application based on what type of corner they are referencing.

Witness Corners (6-27)

- **For corners that would be reestablished by *single proportionate measurement*, the true point for the corner will be determined by single proportionate measurement between the witness corner and the opposite controlling corner.**

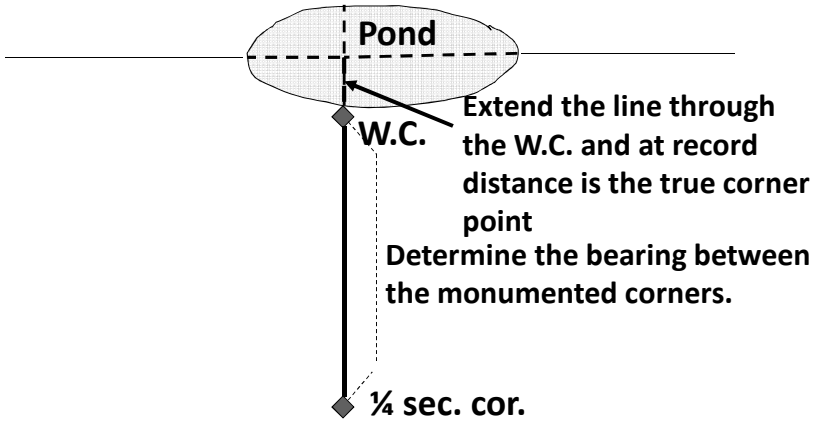
Witness Corners



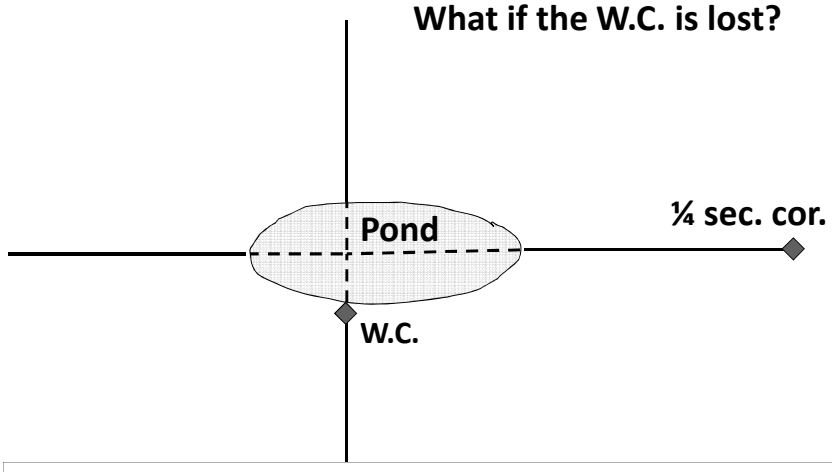
Witness Corners (6-27)

- **For corners that would be reestablished by *double proportionate measurement*, the true point for the corner will be determined by extending the line through the witness corner at record distance.**

The true point will be established at record distance where the bearing of the original surveyed line upon which the witness corner was placed is utilized to determine true, record bearing.

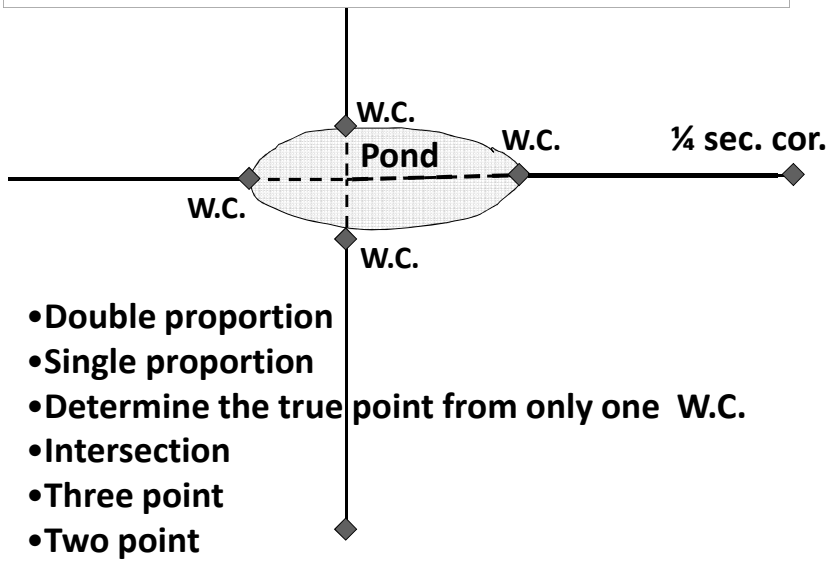


What if the W.C. is lost?



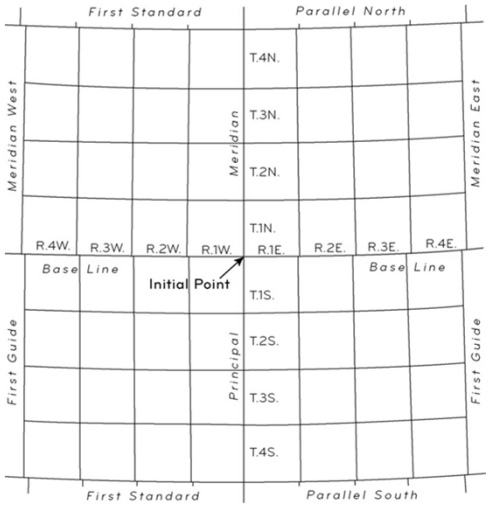
Since the true point for the corner will usually be of major importance, the surveyor will proceed directly to its determination by the applicable methods if the witness corner is lost.

- What if there is more than one W.C. ?



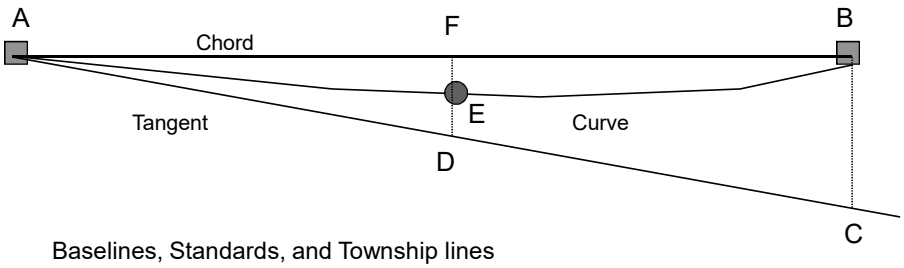
- **Double proportion**
- **Single proportion**
- **Determine the true point from only one W.C.**
- **Intersection**
- **Three point**
- **Two point**

Item 5: Latitudinal Curve Issues



Single Proportions on the Curve

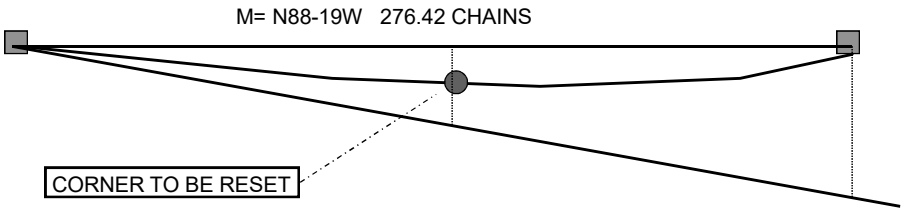
The line we work on in COGO is a *chord* of the line monumented. The GLO ran a tangent line (or secant) and then adjusted to the curve.



Baselines, Standards, and Township lines

Single Proportion on the Curve

4TH STANDARD PARALLEL NORTH R= WEST 280 CHAINS LAT=34*



COMPUTE SINGLE PROPORTION ON THE CHORD
USE TABLE TO COMPUTE OFFSETS FROM TANGENT TO CURVE.
COMPUTE CHORD TO TANGENT AT LOST POINT.
SUBTRACT DIFFERENCE AND MOVE POINT SOUTH TO RESTORED POSITION ON CURVE.

Curve Table

OFFSET (IN LINKS) FROM TANGENT TO PARALLEL

Lat.	Chains 40	80	120	160	200	240	280	320	360	400	440	480
28	0	1	1	2	3	5	7	9	11	13	16	19
29	0	1	1	2	3	5	7	9	11	14	17	20
30	0	1	1	2	4	5	7	9	12	15	18	21
31	0	1	1	2	4	5	7	10	12	15	18	22
32	0	1	1	3	4	6	8	10	13	16	19	23
33	0	1	1	3	4	6	8	10	13	16	20	24
34	0	1	2	3	4	6	8	11	14	17	21	25
35	0	1	2	3	4	6	8	11	14	18	21	25
36	0	1	2	3	5	7	9	12	15	18	22	26
37	0	1	2	3	5	7	9	12	15	19	23	27
38	0	1	2	3	5	7	10	13	16	20	24	28
39	0	1	2	3	5	7	10	13	17	20	25	29
40	0	1	2	3	5	8	10	14	17	21	26	30
41	0	1	2	4	5	8	11	14	18	22	27	32
42	0	1	2	4	6	8	11	15	18	23	27	33
43	0	1	2	4	6	8	11	15	19	24	28	34
44	0	1	2	4	6	9	12	16	20	24	29	35
45	0	1	2	4	6	9	12	16	20	25	30	36
46	0	1	2	4	7	9	13	17	21	26	32	38
47	0	1	2	4	7	10	13	17	22	27	33	39
48	0	1	3	4	7	10	14	18	23	28	34	40

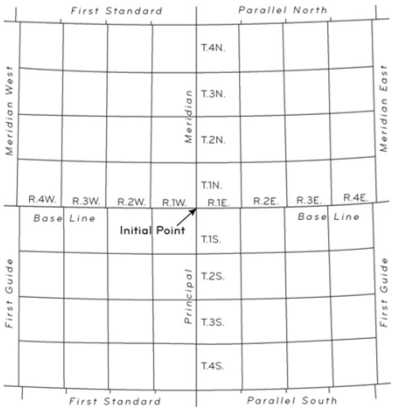
For Alaska, refer to BLM Standard Field Table #13.

TABLE 13.—OFFSETS, IN LINKS, FROM THE TANGENT TO THE PARALLEL.

Lat.	¼ mi.	1 mi.	1¼ mi.	2 mi.	2¼ mi.	3 mi.	3¼ mi.	4 mi.	4¼ mi.	5 mi.	5¼ mi.	6 mi.
°												
25	0	0	1	2	3	4	6	8	10	12	14	17
26	0	0	1	2	3	4	6	8	10	12	15	18
27	0	1	1	2	3	5	6	8	10	13	16	18
28	0	1	1	2	3	5	7	9	11	13	16	19
29	0	1	1	2	3	5	7	9	11	14	17	20
30	0	1	1	2	4	5	7	9	12	15	18	21
31	0	1	1	2	4	5	7	10	12	15	18	22
32	0	1	1	3	4	6	8	10	13	16	19	23
33	0	1	1	3	4	6	8	10	13	16	20	24
34	0	1	2	3	4	6	8	11	14	17	21	25
35	0	1	2	3	4	6	8	11	14	18	21	25
36	0	1	2	3	5	7	9	12	15	18	22	26
37	0	1	2	3	5	7	9	12	15	19	23	27
38	0	1	2	3	5	7	10	13	16	20	24	28
39	0	1	2	3	5	7	10	13	17	20	25	29
40	0	1	2	4	5	8	10	14	17	21	26	30
41	0	1	2	4	5	8	11	14	18	22	27	32
42	0	1	2	4	6	8	11	15	18	23	27	33
43	0	1	2	4	6	8	11	15	19	24	28	34
44	0	1	2	4	6	9	12	16	20	24	29	35
45	0	1	2	4	6	9	12	16	20	25	30	36
46	0	1	2	4	7	9	13	17	21	26	32	38
47	0	1	2	4	7	10	13	17	22	27	33	39
48	0	1	3	4	7	10	14	18	23	28	34	40
49	0	1	3	5	7	10	14	19	23	29	35	42
50	0	1	3	5	8	11	15	19	24	30	36	43
51	0	1	3	5	8	11	15	20	25	31	38	45
52	0	1	3	5	8	12	16	21	26	32	39	46
53	0	1	3	5	8	12	16	21	27	33	40	48
54	0	1	3	6	9	12	17	22	28	35	42	50
55	0	1	3	6	9	13	18	23	29	36	43	52
56	0	1	3	6	9	13	18	24	30	37	45	54
57	0	2	3	6	10	14	19	25	31	39	47	56
58	0	2	4	6	10	14	20	26	33	40	49	58
59	0	2	4	7	10	15	20	27	34	42	51	60
60	0	2	4	7	11	16	21	28	35	44	53	63
61	0	2	4	7	11	16	22	29	37	45	55	65
62	0	2	4	8	12	17	23	30	38	47	57	68
63	0	2	4	8	12	18	24	32	40	49	60	71
64	1	2	5	8	13	19	25	33	42	52	62	74
65	1	2	5	9	13	19	26	34	44	54	65	78
66	1	2	5	9	14	20	28	36	46	57	68	81
67	1	2	5	9	15	21	29	38	48	59	72	85
68	1	2	6	10	16	22	30	40	50	62	75	90
69	1	3	6	10	16	24	32	42	53	66	79	94
70	**1**	**3**	**6**	**11**	**17**	**25**	**34**	**44**	**56**	**69**	**84**	**100**

So, does it *matter*?

- True restorations or not?
- Why did you miss another LS's corner?
- At 33° of latitude does not matter until 80 chains
- You decide…longer proportions will be noticeable

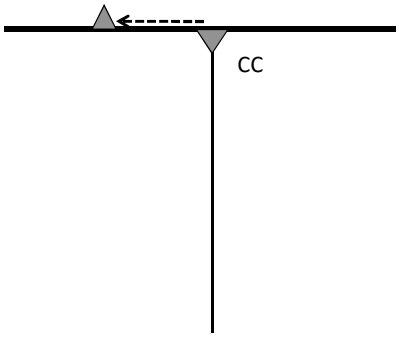


Issue No. 6: Control for Lost CC and ¼ of minimum control

Closing Corners (2009—7-45)

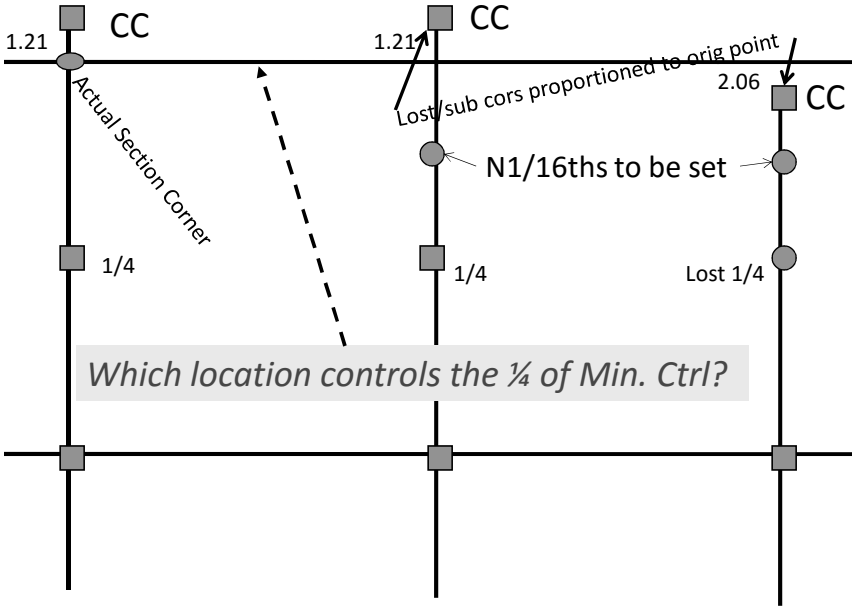
- When an original closing corner is recovered off the line closed upon and the new monument is established at the true point of intersection, the *original* position will control in the proportionate restoration of lost corners dependent upon the closing corner. In a like manner the positioning of sixteenth-section corner(s) or lot corner(s) on the closing line, between the quarter-section corner and the closing corner, will be based on the measurement to the *original* position of the closing corner.

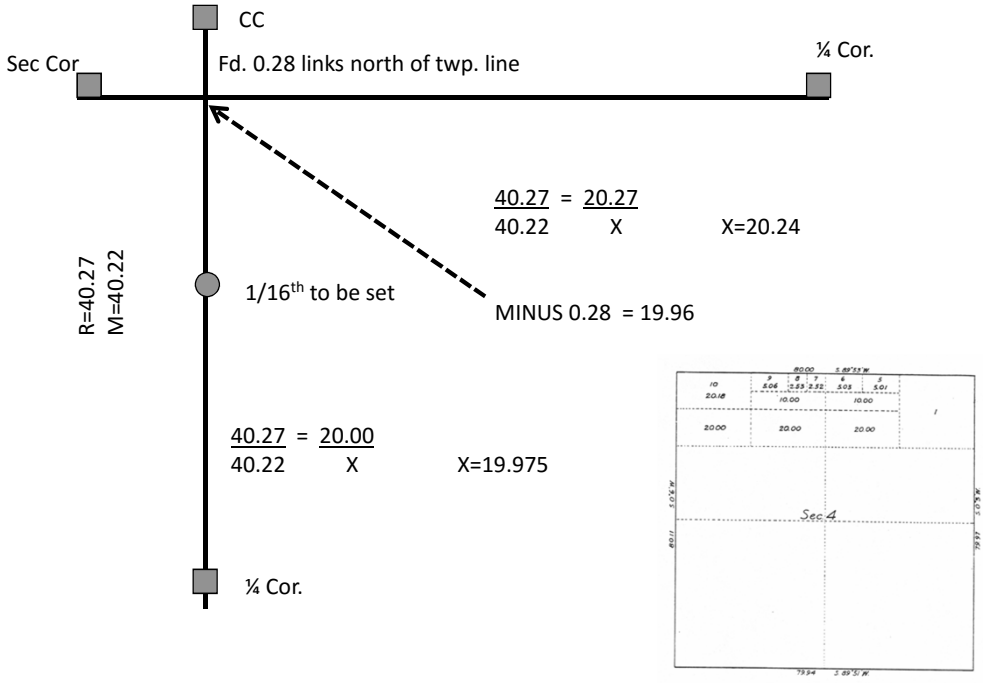
Closing Corners



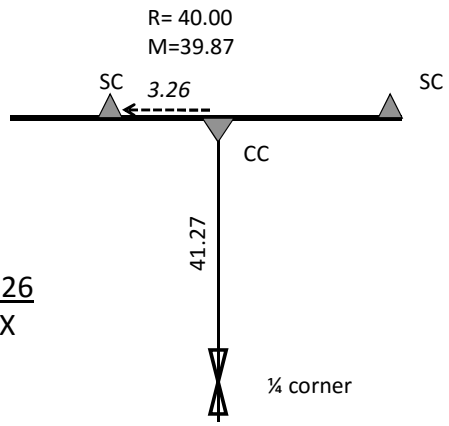
- Found at 7-41 thru 7-49 in the 2009 Manual
- Remember how they were established
- Remember what they represented
- Although out-of-synch with proportioning rules, we single proportion on the senior line unless we have a special case

True section corners at intersection points: Proportions go to *original* CC positions





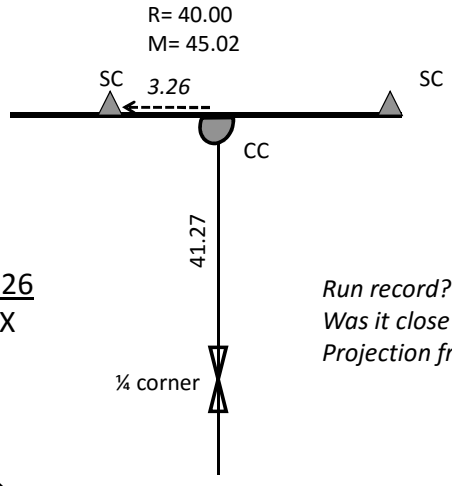
Closing Corner Computation Example



$\frac{R\ 40.00}{M\ 39.87} = \frac{3.26}{X}$

X = 3.249

Special Case Closing Corner Computation Example



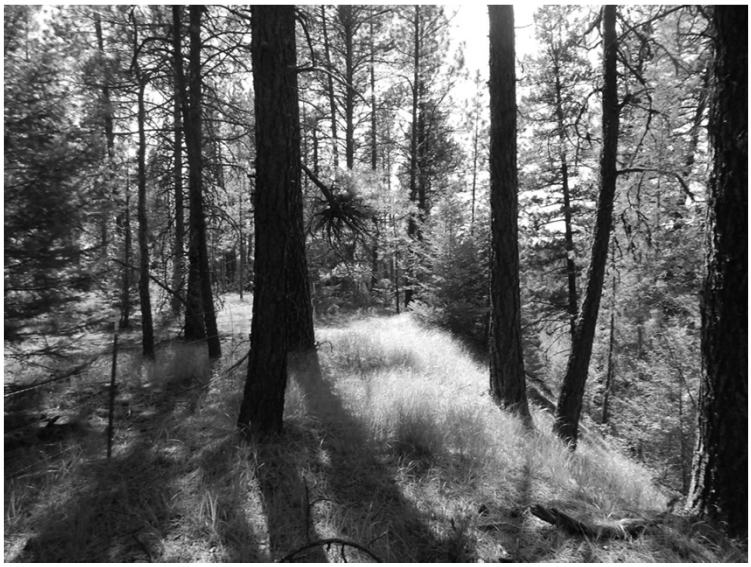
$\frac{R\ 40.00}{M\ 45.02} = \frac{3.26}{X}$

X = 3.669

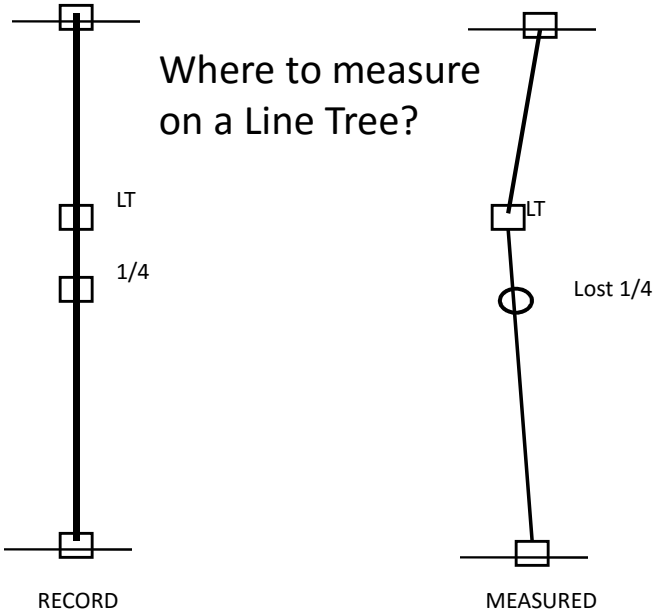
Run record?
Was it close to the senior line?
Projection from south?

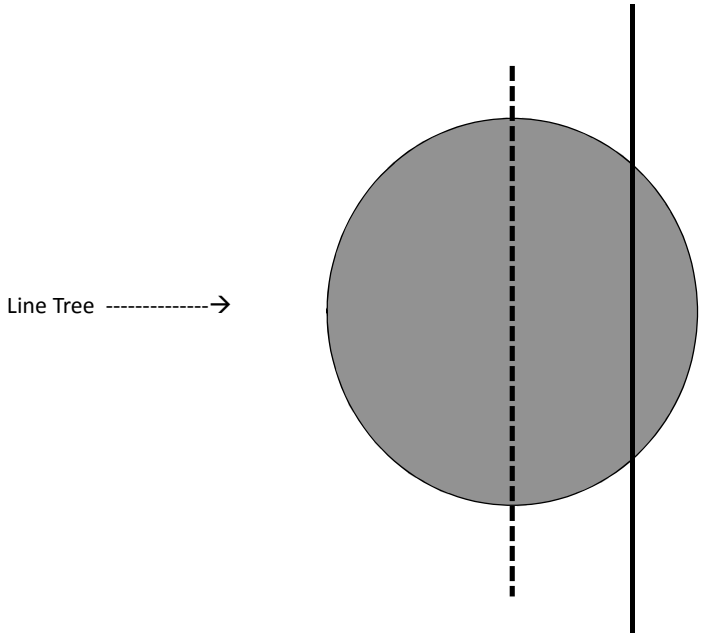
Not an acceptable solution

Issue No. 7: “Limits” on lines in trees



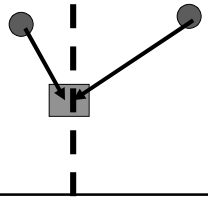
Where to measure on a Line Tree?

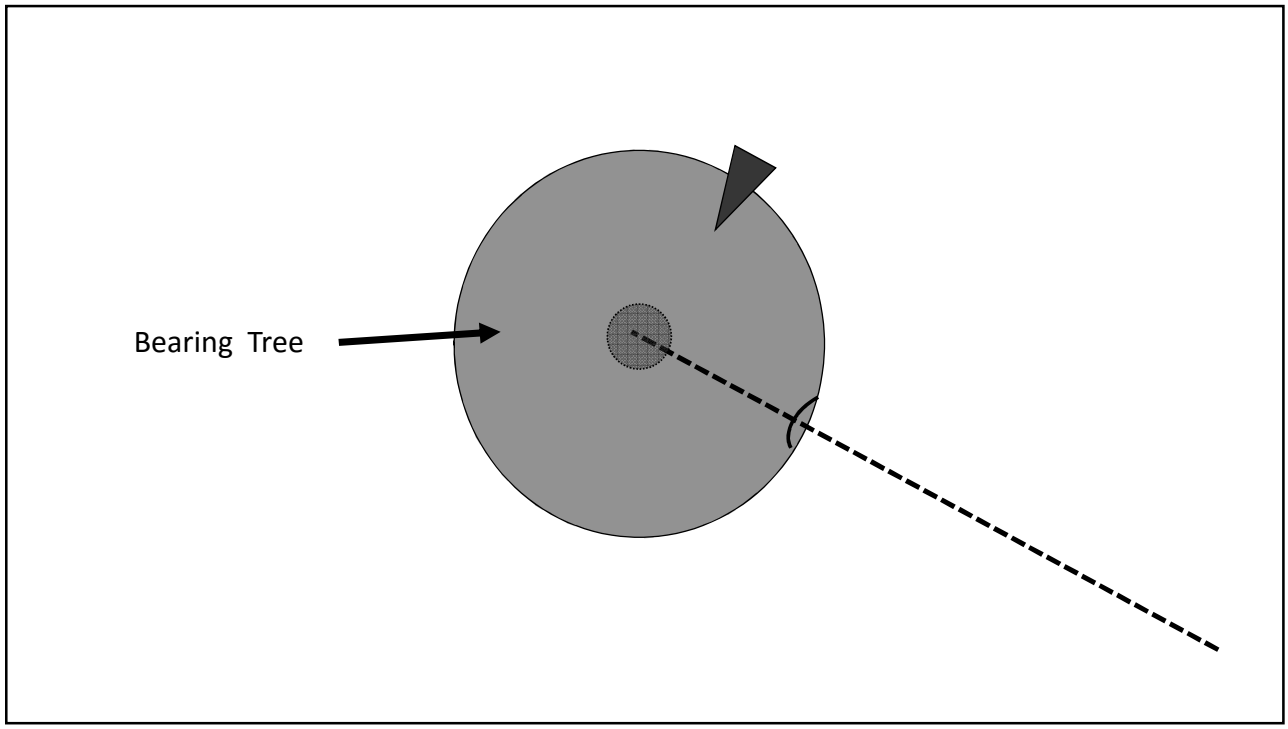




Accessories

- Fixed physical objects tied by bearing and distance to a corner point
- Used as a system of RM‘s for the preservation of the corner location
- Includes memorials under a monument
- Includes some cultural feature ties made by the original surveyor
- Use = D-D unless only one, then go record B&D




Bearing Tree

It is best to NOT cut down the BT

Conclusion

Thank you for your Commitment to this GREAT PROFESSION