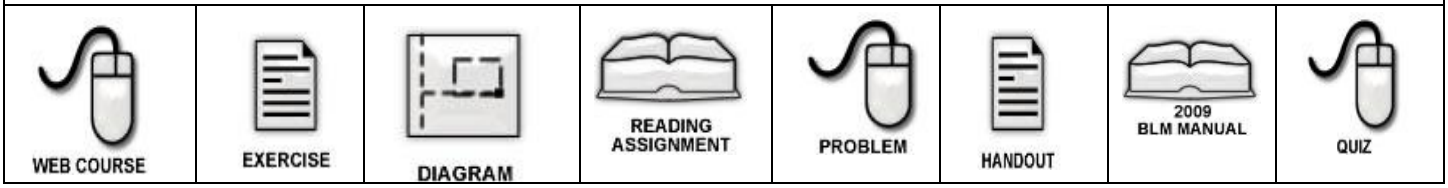
Course 4: Restoration of Lost Corners Study Guide

COURSE DESCRIPTION:	This course consists of four videos, some reading, and three exercises, on the "Restoration of Lost Corners". The legal, mathematical, and practical applications of the methods of proportioning, as found in the Manual of Surveying Instructions, are presented. Students will be able to address what corners control in most situations, how to proportion properly, what legal principles are involved when proportioning, and how to deal with the latitudinal curve. A lengthy discussion of convergence and curvature in the PLSS is also included.
COURSE OBJECTIVES:	Upon completion of this course, students will be able to: • Define the three corner conditions listed in the Manual of Surveying Instructions • Describe, identify applicability, and compute proportions using all methods • Demonstrate an understanding of curvature in the PLSS
COURSE INSTRUCTOR(S):	Dennis Mouland, Bureau of Land Management Ron Scherler, Bureau of Land Management
VIDEO LECTURE TITLE:	Restoration of Lost Corners – Part 4 (76 minutes)

ICON LEGEND



RESTORATION OF LOST CORNERS – PART 4

Introduction

Welcome back to this time Video Lecture 4 of the Restoration of Lost Corners course. A lot of information here, isn't there? And we are moving along as quickly as we dare go. We have been talking about things, single and double proportions and various modifications of those in the Public Land System.

We are now going to take a step away from the PLSS and talk about the **grant boundary method**. It is a method which is applied to what we call the non-rectangular entities. Things that were created outside of the public domain but are not part of the Public Land Survey System in other words exceptions to the rectangular grid that came about in the 1785 Act.

And of course some of those are because they existed even before the 1785 Act or they existed at least before the Public Land Survey System got there like the Spanish Land Grants and others were things because Congress created sales and exchange authorities that had certain limitations on where the boundaries could and so because of those limitations, we have boundaries that don't follow the Public Land System.

Good example for those of you in the western third of this country is mining claims, you know lode mining claims by law follow the vein of the load or the vein of ore and those don't go down the section lines or the 16^{th} lines or anything else. They are an odd shape. So we have this method that was designed, I don't know if it was designed, it has evolved over time I am sure but it is what we used to address these.

Now I might mention, before we go on, I just might mention you know there are a lot of non-rectangular parcels especially in the colonial states, it all is, the government, or the Indians, the tribes have acquired and I would not be real quick to apply the grant boundary method because I think in some of those states you may have regulation on that but on most of them I would think the compass rule might be a better deal but I am going to show you the grant boundary method because that is the recommended method and then Ron is going to discuss for a few minutes comparing the grant boundary method and the compass rule and I

RESTORATION OF LOST CORNERS – PART 4

think that discussion will help you a little bit more in deciding sometimes when one of those might be better than the other even though the Manual calls for one.

So we'll get to that here in a few minutes.

But the grant boundary method let's take a look at this slide and see what is going on with it. It protects angular relationships at lost corners that is its goal. It applies to corners of most metes and bounds parcels that are within the Public Land System or what we call **non-rectangular entities**.

It is not applicable to straight line proportions on such parcels. In other words you may have a non-rectangular entity but it's got a five mile straight line and there is a point every 40 chains on that straight line you would use regular single proportion there this is only for where we have angular relationships in these non-rectangular entities.

Grant Boundary Method

- Protects angular relationships at lost corners
- Applies to corners of most metes and bounds parcels within the PLSS
- Not applicable to straight line proportions on such parcels (use regular single proportions)

And let me give you a few ideas of some of the things in the public domain that you probably would use the grant boundary method on.

Here's a list. Indian Reservation boundaries, that's the exterior boundaries. Now obviously if that reservation boundary goes down a township line or follows a creek or river or something well than it is probably a different circumstance but if it's a surveyed boundary you know than that would be it. A military reservations.

A lot of those in the west and the mid-west, odd shaped parcels usually. Homestead entry surveys in the western states on National Forest System lands. Small holdings claims which exist primarily in New Mexico. Donation Land Claims which exist in Oregon, a little bit in Washington and I believe some in Florida. The Spanish Land Grants are the Mexican ranchos. They are the same thing but they called them ranchos out in California but they are large parcels of land, usually large that had been deeded by a former government. Some national park boundaries, not all of them, appear in the northern Arizona, the Grand Canyon National Park. Some of it follows section lines, some of it follows mid

Applications of GBM

- Indian Reservations
- Military Reservations
- Homestead Entry Surveys
- SHC/DLC
- Spanish/Mexican land grants (Ranchos)
- National Park Bdys
- Townsite Surveys
- Lighthouse tracts
- U.S. Surveys
- Isolated Mineral Claims
- Independent Resurvey Tracts

RESTORATION OF LOST CORNERS – PART 4

section lines, some of it follows canyon rims, and other places it follows odd shaped surveyed lines which are actually monumented. So you just have to look at your situation.

Townsites, some of them. This is under the Townsite Act which allowed the government to sell land for certain community purposes, lighthouse tracks, US surveys, most US surveys are in Alaska. We do have some elsewhere by they are metes and bounds surveys. You can apply the Grant Boundary Method to mineral claims but only when they are isolated and they are not our subject today, we are not talking about these non-rectangular entities all that much especially mineral claims but understand Grant Boundary may not be the best unless it is just an isolated claim.

And independent resurvey tracts you will remember from course 2, we talked about independent tract resurveys and how they tracted out land and that sort of thing to protect it in their original position so those are some of the places that you would apply the Grant Boundary. Now here let's list here the order in which we do one of these Grant Boundaries.

First of all as with everything, locate your existing corners, find what you do have, tie them in by a traverse and the main reason for this is that you are going to inverse between the two controlling corners that you have found and see their relationship.

Your survey should be based on true bearing, as always. We are going to compute a rotation and a scale based on what the Manual calls a connecting line. You and I would call that an inverse. And I'll show you that here in a minute. Apply the rotation to the bearings and the scale to the distances and then if you have another set of corners that are lost somewhere else on the parcel, that would be a completely separate set of calculations so that is what we are talking about here now.

If you look at 7-54 in the Manual you will see the discussion of the Grant Boundary Method and Figure 7-10 in the Manual there is a diagram there and it is pretty self explanatory but I want to just mention a couple of things that are kind of unique to BLM at least the way the Manual says it. Notice again see point A and point B are the two existing corners that they found in this example, Figure

Grant Boundary Method

- Locate existing corners
- Make ties by traverse
- Survey should be based on true bearing
- Compute rotation and scale on connecting line
- Apply rotation to bearings, and scale to distances.
- Separate calcs for next lost set

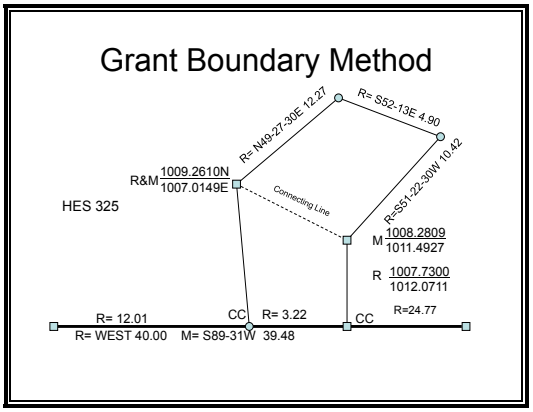
RESTORATION OF LOST CORNERS – PART 4

7-10 in your Manual. Those are the ones that they found.

You can run the record data which you have to do to compute corners of where they should be for search and that is all of these sub T corners here, B sub T, J sub T, whatever and then and on, and then you see is where they actually found B is different from where is should have been as far as the B sub T, that is the temporary based on the record. Now what they do is inverse from point A to the real point B and from point A to where point B was in the record, B sub T, in other words. You get two different inverses.

Again the Manual calls these **connecting lines** as you can see here. And notice also that the Manual refers to record which you and I would refer to but you and I call it **measured**, the Manual here refers to it as **actual**. So just so that helps you understand this drawing you are looking at there on page 143 so and that is basically a list of things we just saw as to what it is we are going to do to make one of these happen

Now we are going to then let's do one and talk about it here, we are going to look at a Grant Boundary Method on a **Homestead Entry Survey**. This **HES** has got, that's a Homestead Entry Survey that, those are in the National Forest, but don't worry about it, I am just using an HES as an example, this could be a small Indian Reservation for that matter or whatever. But we found this corner and we found this corner, but these two are lost.



So this is a non-rectangular entity in the public domain so we are going to use the Grant Boundary Method to proportion this. So the way the Manual says to do it, you would start at an existing corner and you would run record bearing and distance, set a temp; record bearing and distance, set a temp; record bearing and distance, set a temp and then it wouldn't hit this unless just by miracle, right?

So what you would do is then measure, you would, from the record point you would inverse over to here and then from the point that you actually found you would inverse so you would have two different inverses and that is those two connecting lines that the Manual was talking about. And you are going to take the data on those two connecting lines and you are going to compare

RESTORATION OF LOST CORNERS – PART 4

them.

You are going to compare what it is between the record and the measured. And if the measured is longer than the record than you are going to come up with a scale factor that is greater than one. And if you come up with a measured that is shorter than the record, then you are going to come up with something that is less than one, 0.9 that's just a scale factor.

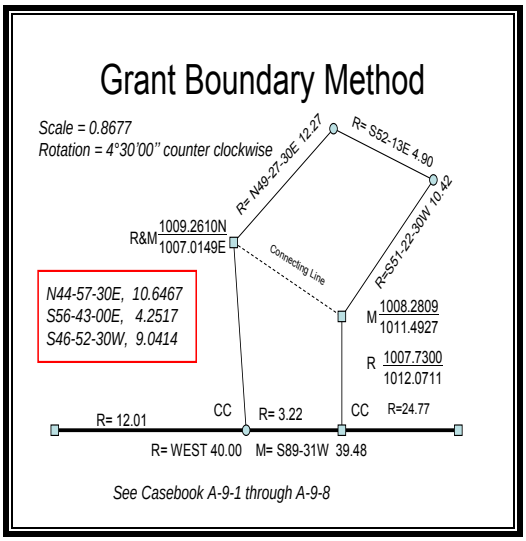
In reality folks, this is just a rotate and scale which many of you even have software that will do that and what I have done is in coordinates, you just pick one that you are going to hold that's what point A is in that corresponding diagram in the Manual and that becomes your record and your measured coordinates. And then I just put in the record and sees where it comes, inverse back, then I have shot this with GPS or whatever, you know traverse and I inverse that and those are my two that I compare.

And so that is why in this diagram you have here there are two coordinates on this point, there's one that is the record, that is where the point was supposed to be in the record but this is where you actually found the evidence on the ground, so we just rotate and scale here, and the scale I have already explained how this distance of this line is what establishes that and the rotation is also what establishes that.

If the measured goes this way and the record goes this way, there is going to be a rotation here. And remember that you are always going to go from record to measured. So if you are going from record to measured, that helps you realize which way you have to rotate.

RESTORATION OF LOST CORNERS – PART 4

Now this is that exact same HES that we were looking at on the previous slide. But here I have gone ahead and put in the information.



Now I had already given you your record bearings and distances and a record measured coordinate there and record measured coordinates, so you have all of that information. So I have essentially done the record traverse around here for you by providing you with that coordinate.

So what we want to do here is, we make the inverses and when you do that you are going to find out that the measured line is considerably shorter than the record line and so when you divide those that is going to come out less than one, so it gives us the scale factor of 0.8677. Now if you are doing this by hand, now again software might do it for you, but if you are doing it by hand, you are going to apply that factor to each of these distances, to the 12.27 here, 4.9 chains there, 10.42 chains there.

So you have now shrunk, if you will, because the scale factor is less than one. You have now shrunk that and all of the distances on there and now we are going to rotate the bearings. Now in this example the bearings are rotating 4 degrees and 30 minutes counter clockwise, so that way. And so you have to pay attention to that right, because we are working in quadrants. So let's look at that then so what you would then do is take the record bearing, north 49 27 30 here and you are going to counter clockwise rotate it so it's going to be less than that 4 degrees and 30 minutes. So what you have down here in this red box are the adjusted bearings and distances using the Grant Boundary Method.

All of the bearings have rotated counter clockwise, all of the distances have been reduced using the scale factor up there. So that is the Grant Boundary Method. Really it is quite simple. It seems odd at first why they would even do it but it is the scale and rotate what you and I would call in the private sector. Now there are two other things that we want to look at on this slide just for the moment. You notice that these two corners down here are closing corners. We are going to talk about how to deal with closing corners on a non-rectangular entity like this a little later after we actually talk about closing corners themselves. So but I wanted you to notice that there because if see, as you can see here

RESTORATION OF LOST CORNERS – PART 4

on this drawing that we have got one of them that's lost, this one is found, but the other one is lost.

You would not want to use the Grant Boundary Method on these and I will show you why later after we talk about closing corners themselves. Also at the very bottom of that slide there is a reference there for you in the case book. You have the case book on your resource CD. The case book folks is just a fabulous reference, an educational thing. We are going to use it for more of our advanced courses and our continuing ed, but we put it into your resource package so that you would have it.

This makes reference to page 89-1 through 89-8 and you might want to take a look there because it is comparison of the Grant Boundary and Compass Rule on an HES just like one of these and it fits in with what Ron is going to talk about here in a minute. But I wanted to let you know that that reference is there but also to make sure that you realize that the case book is a fabulous tool you can go a lot further into some subjects with it.

We just rarely make reference to it here in this course because we just wanted you to have it and we'll use it later on in some other things. So that is the Grant Boundary Method of and by itself. Now where we are going to go here now is that Ron is going to discuss for a few minutes the difference between, as I told you what was going to happen, the difference between the Grant Boundary and the Compass Rule and some of the situations you may want to really think about which one you are going to use and where you might apply it under different situations.

Compass Rule v. Grant Boundary Method

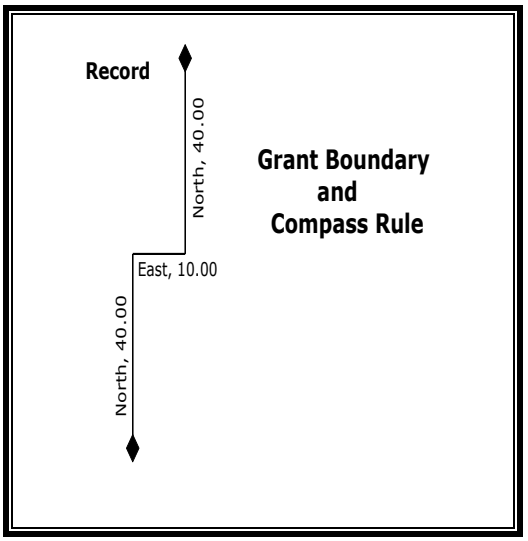
There are just a couple of things about the Compass Rule and the Grant Boundary that I would like to talk about. You have explained how we do them and what they are used for but there are a couple of issues maybe we need to talk about. First of all, the Manual gives us direction on to use the Grant Boundary for lost corners on a reservation or a Grant Boundary where we have some kind of an irregular type boundary, we have angle points, boundary breaks and really that applies to any kind of boundary that is a non-rectangular boundary, such as mining claims, maybe

RESTORATION OF LOST CORNERS – PART 4

US surveys, Homestead Entry Surveys, some of those kinds of things.

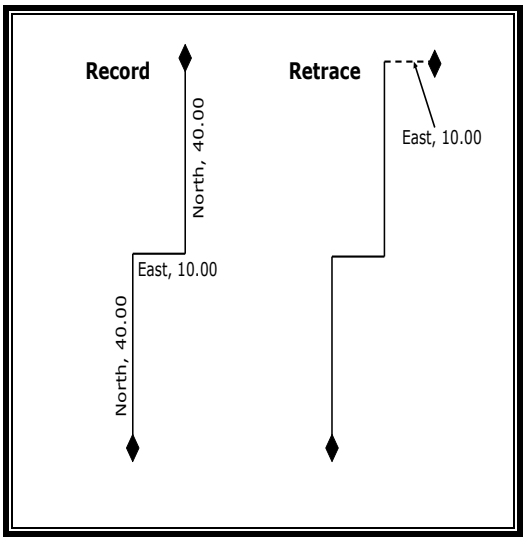
So generally, we are going to use the Grant Boundary in those situations but I want to take just a little time to compare what a Grant Boundary does compared to what a Compass Rule does and see maybe that there is some application there for the Compass Rule. In practice in the BLM normally we will compute corners, lost corners, along these kind of broken boundaries, irregular boundaries. We will compute those using both the Grant Boundary and the Compass Rule and then determine which method may apply or give us the best correction. So let's look at that a minute.

What I have here are just a few diagrams. They are graphic. There are not many numbers but let's take a situation where this is the record and we have a line that goes north 40 chains, then east 10 chains, then north 40 and we have two missing corners in there. So the original record is what you see here. We have a couple of lost corners. Let's see what happens when we use a Grant Boundary and a Compass Rule to do some adjustments here.

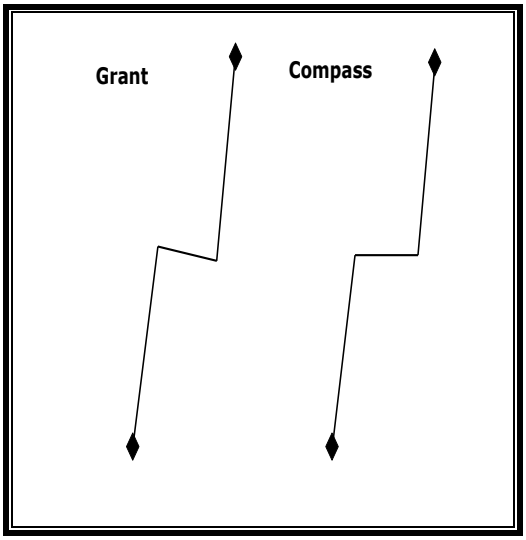


RESTORATION OF LOST CORNERS – PART 4

So let's first look and say that we find that original corner, so we have both original corners, but there is an error of ten chains in easting between these two corners. An error of ten chains in easting. North south they are perfect. Now of course we are not going to find that in practice. But let's just look at that.



Now let's see what happens when we adjust these with a Grant Boundary and a Compass Rule.

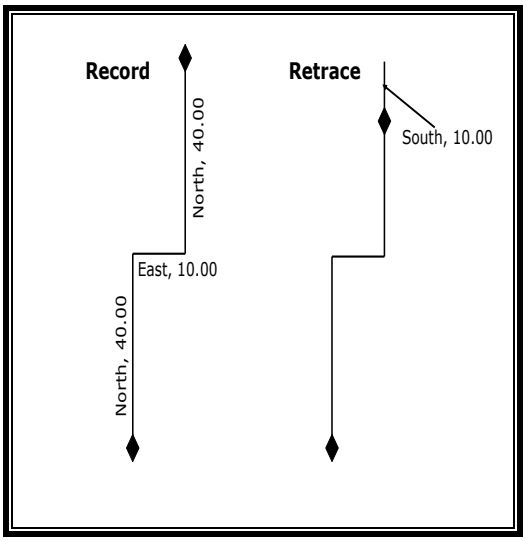


Remember the Grant Boundary holds the angles so your record angles do not change and what we see here is, look at what happens to that east west line, it now has a fairly significant bearing change along with of course the north and south lines. But look at the Compass Rule remember that there was no north south error, so there is no north south correction to that east west line in the compass adjustment, therefore, it ends up being exactly east west.

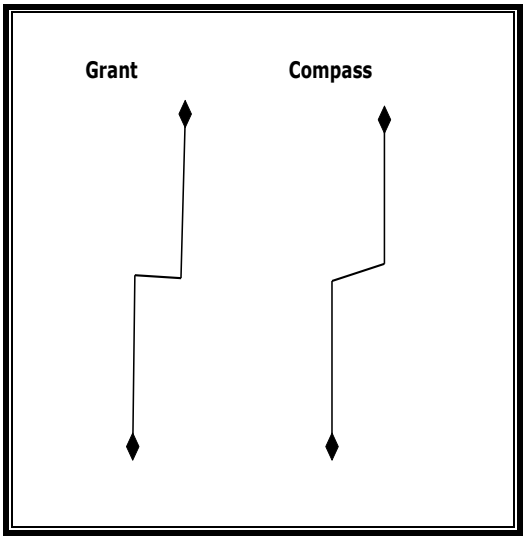
It adjusts the angles and the distances and so you end up with a different shape and sometimes it can be significant. There is an example in the case book that is just a real great example. And we haven't talked about the case book a lot in this study but or in this course but it is a book of survey examples done by the Bureau that just give all kind of great information and insight and in the book there is a great example of reestablishing a Grant Boundary where the Grant Boundary and the Compass Rule give significantly different answers, significantly different answers. And it is very very clear that one answer is much better than the other, based on information on the ground.

RESTORATION OF LOST CORNERS – PART 4

Now here we have a situation where the error is exactly north south, there is no east west error. The error is exactly north south.



And when we do these two adjustments look what happens. The Grant Boundary appears to give us a fairly good adjustment. It holds the angles. That east west line has a pretty minor bearing and I believe that when I actually calculated this it came out within a degree of east and west. Whereas the Compass Rule because is has all north south error, it applies a fairly significant north south correction to that east west line. So we get a significantly different shape whether we use the Grant Boundary or the Compass Rule. Now what we need to do, so how do we choose which one is best? Well sometimes you can't.



Sometimes you can't. But often you will find old fences and maybe you don't have fence corners, but you have some old occupation lines or fences or roads or something and one method the lines appear to follow those roads or fence lines or lines of occupation and the other method doesn't. So you may have topography that fit better with one method than the other, you know, you may have a corner out there and you really don't know where it came from, you don't know whether you can accept it or not accept and one method seems to fit that and one doesn't so you may end up actually accepting the corner once you have done all of this adjusting.

But what I want you to see is that these two methods can give you fairly significantly different answers depending on the shape, the magnitude of the error and the direction of the error and normally within BLM at least we will calculate it both ways and then look

RESTORATION OF LOST CORNERS – PART 4

at all the evidence on the ground, any other evidence we have and then decide which method is best. Now because the Manual says the Grant Boundary is the prescribed method, that is the method that we are going to start with and we are going to have to document why we would go with a Compass Rule rather than a Grant Boundary. But I think that this, it is important to know this and to approach these kinds of surveys in this way. So Dennis with that, we will continue on with your session. Well thank you, Ron, that was a good discussion on that subject.

EXERCISE **Before moving on to the next topic, complete the "Grant Boundary & Compass Rule Exercise" which can be found in the Exercise section at the end of this study guide.**

Meander Lines

Now we are going to change gears again and we are going to go to something else that is in the Public Land System but is used to help identify water boundaries, usually, and that is the meander lines. Now you will remember, I hope you do, I hope that you will recall that in course number 2 I talked about meander lines a little bit. And I want to remind you that meander lines are not fixed and limiting boundaries with few exceptions.

Now you find meander lines mostly along water boundaries. That doesn't mean that they are automatically navigatable or any of that. We talked about that in course 2. But you find them there, occasionally you will find them at the base of rugged mountains that sort of things where they wanted to limit the area that was patented and that would not include stuff up a cliff or up some big you know face of a mountain or something, so occasionally you do see those. And that is really one of the questions that comes along.

RESTORATION OF LOST CORNERS – PART 4

A meander line was never meant to be a boundary. But there are certain situations where it does become one.

Because just ask the question, how can you have non-riparian meander lines? And really there is a couple of ways. One is it was never riparian to begin with. It is the edge of wastelands and that they were meandered and you will find that. The first time I ever saw that was on a job against the mountains down just south of Albuquerque, New Mexico. But there is another way and that is that it was riparian but the **mean high water line** has moved away.

Non-riparian Meander Lines

- Never meant to be a boundary
- How can you have non-riparian meander lines?
- 1. Edge of waste lands meandered
- 2. MHWL has moved away
- Found at 7-53 in BLM Manual
- Actually the compass rule, using an "open ended traverse" approach

Now you will learn in the water boundaries course as well as you put that together with what you heard in course 2, and you realize the mean high water line is if it is a navigatable body of water, the mean high water line is probably the boundary, not the meander line. And so if the mean high water line has moved away to a different place either by erosion or accretion, then what we have is the old original meander line is no longer riparian. That is the best way that I can explain it.

Frankly, in the Manual, you will find this at 7-53 and it is sometimes called the **broken boundary method**. That is not really a great name for it. I understand why they did it but if you read that third paragraph there, which I won't read to you now, but if you read it you will realize that this is the Compass Rule. This is the Compass Rule exactly. No modifications to it at all. This is exactly how you and I have learned to do the Compass Rule in the past. And so that is basically what they do. Now the strange thing is this says angle points of non-riparian meander lines, and yet you know most meander lines are riparian or at least began that way. And I don't know the whole history of this, I just know that we use this method to adjust any kind of a meander line, whether it is water related or not and again most meander lines are water related.

Let's just realize that here at 7-53 that is what they are talking about. It is the **Compass Rule**. If you have a Compass Rule software, you want to use an open-ended traverse approach or application on your software because some software has to know if you are coming back to the same point or not. Now without going into too much, again your water boundary course is still

RESTORATION OF LOST CORNERS – PART 4

ahead of you. You know I just want to say that here is the problem when you have meander corners that you have reestablished which would be almost always single proportioned on the section line or if they were stubbed out single point controlled and then you or you found them, either way, you reestablished them or found them.

Then when you connect them, you know the old riparian or non-riparian; the meander lines were often not run with near the precision that the rest of the survey was done. In fact, there are some old references to reading steady for the distances in some areas of the country. So you know, of course think about it, where were most riparian meander lines, they were run down right near the high water and some of the heaviest brush and surveyors took shortcuts and they were kind of sloppy and then chains kind of zig zagging through the brush or whatever or even if they are guessing the distance. But here is the problem, you have a meander corner that hits the river here and another one hits the river here and they've got ten bearings and distances along the edge of that river or lake, whatever and when you connect these two, it will not close.

It is usually going to be, I won't say disastrous, but usually a significant amount of difference between the record and the measured. And so before you can use that meander line, you have to adjust it to force it to close. And the Compass Rule is what we use and the reason you might be doing that is because you might have a mid-section line coming in, well I shouldn't if that's the river, a mid-section line coming in that is going to hit that and you have to compute where it hits the unjusted meander line. More about all that later.

But now let's understand that if you have a meander line that you have to restore, you are going to use the Compass Rule between existing found meander corners, okay, or reestablished meander corners. So the Compass Rule. And that is all it really is. A very simple process. And again, you've got software for that. If you don't know how to do the Compass Rule or don't understand it, we are not going to teach that here.

That is in our minds something that was in elementary surveying and so if you are not familiar with it, get yourself familiar with it.

RESTORATION OF LOST CORNERS – PART 4

But most of you have software that will do that. So that is for adjusting meander lines, Compass Rule. And that makes a lot of sense if you understand how the Compass Rule works. Now I promised you a little earlier that we would talk about lost closing corners and we are going to do that now. What do you do with a **closing corner**?

Closing Corners

Well we want to remind ourselves what a closing corner is for to begin with. 7-41 thru 7-49 in the Manual talks about closing corners and let's review what their purpose and their origin is.

What about lost CC's?

- BLM Manual 7-41 thru 7-49 discusses CC's
- Review purpose and origin of CC's
- Single proportion on senior line (do you see how this violates the principle of proportioning?)
- Even on a NRE, the CC should not be replaced with grant boundary method, as it creates a gap not in the record (See HES 401, AZ)

In fact, let's just read it. 7-41 thru 7-49. It's kind of funny because you know Chapter 5 and 6 of the Manual are about lost or obliterated corners, right, and yet 7-41 thru 7-49 which is talking about lost closing corners is also where you find the information on what to do with a found closing corner, it is an identified closing corner. So in 7-49 the third paragraph, a recovered closing corner not actually located on the line that was closed upon and if you remember from course 2 that is almost always, will determine the direction of the closing line but not its legal terminance. It only identifies the direction of the line see so the correct position is at the true point of intersection of the two lines and we talked about that in the previous, a couple of courses ago.

However, this is just to remind you that the purpose and origin of closing corners was to not set the actual point, not to go to the trouble and expense of running the **senior line** but to just make a guess as to where that was and we'll come back and adjust it so most closing corners are either across the senior line or short of the senior line. It is very rare that they got it right on. So it is short or long and what the Manual says well when you have a found existing closing corner, recovered one as they say here, then you use that for the bearing of your junior line, but the true point, in other words, the true section corner, if this were a section corner, closing corner, is at where the two lines actually meet. Now that is just to review what they do.

When you have a closing corner that is lost, you don't know where, it is gone. You have evidence perhaps on the senior line, well you're going to have to determine it somehow. You've got

RESTORATION OF LOST CORNERS – PART 4

evidence on the senior line but you don't have, you may the quarter corner to the south but you don't have the closing corner. How do we re-establish that? That is the first paragraph of 7-41 which says, "A lost closing corner will be reestablished on the true line that it was closed upon," so that is what you and I call the senior line. "And at the proper personal interval between the nearest regular corners to the right and left." So single proportion on the senior line, now I've got a question.

Do you see how that kind of violates a principal of proportioning? Think about it folks. When you have a lost closing corner, it was one chain that came up from the south that set the closing corner and measured the offset to one of those senior corners, but you have a completely different chain that measured between the senior corners on the senior line and the whole concept of proportioning is to lay your chain down against their chain and unfortunately the way closing corners are designed and the way they work, and I am not saying this is not the way to do it I am just saying that it is an odd situation because it violates the basic principal of proportioning and that is to lay your chain down against their chain. Because you lay your chain down to the wrong chain. If you are not familiar with what I am saying there, I'll show you here in just a minute.

Now as I made reference a few minutes ago, even on a non-rectangular entity, if you have a closing corner you should not replace it with the Grant Boundary Method rather you should do just what we are talking about here because it will because a gap or an overlap in the record.

RESTORATION OF LOST CORNERS – PART 4

Now I want to just show you. Remember, here is a Homestead Entry Survey, this is a real one. A real plat. This is a piece of private land up at the Grand Canyon that is known as the Community of Tusean. And these corners down here are all just regular old HES corners, you know, they're, it is a non-rectangular entity, yet the ones up here both, and I even after I blew this up it is kind of hard to see it, but the letter cc right there and another letter cc right there meaning that they are closing corners. Now what does a closing corner telling you? It is telling you that the intent is that this line is junior.

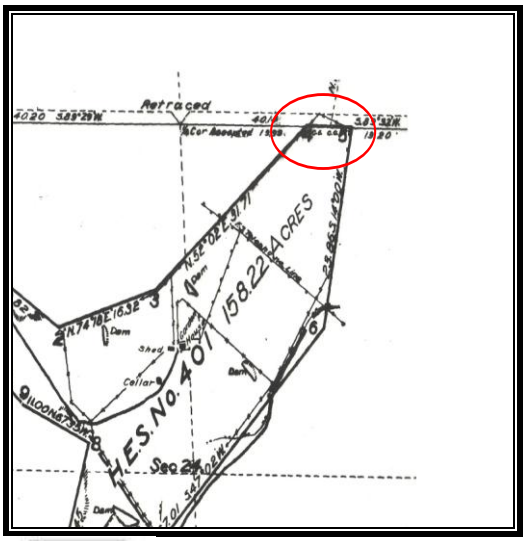
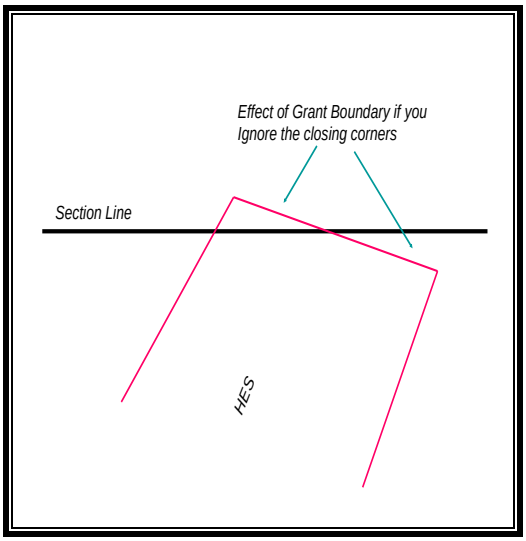


DIAGRAM **A full size version can be found in the Diagram section at the end of this study guide.**

And the intent is to have it abut the senior line, to be right on the senior line, not across it, not short of it. It is a closing corner. It may not have actually been set on the line but they are telling you their intent was. You see the problem is if one or both of these became lost, then and you do a Grant Boundary Method. The Grant Boundary doesn't know anything about the senior line. The Grant Boundary Method is just going to do its thing and so what happens is that you will end up with this.



Where they specifically told you that this was a cc, a closing corner, and this was a closing corner, they wanted to be on the senior line, yet if they're both lost, if you do the Grant Boundary, you are going to do this as it shows here or it might turn up like this, or it might turn up like this.

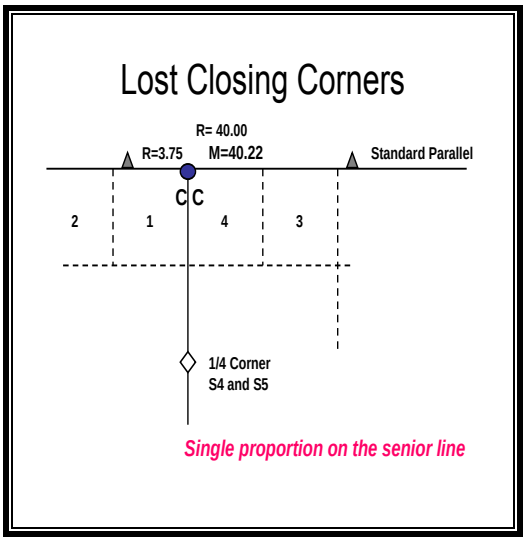
You know it just depends on how you find the corners or it might turn up the opposite of the way I've drawn it here like that. There is you know an infinite number of ways it might show up. Notice that the whole purpose of them telling us that there was a closing corner was so that there would not be a gap or an overlap.

So if you use the Grant Boundary Method even on a non-rectangular entity to proportion in a closing corner, you are going to violate the intent of the plat. And then here with this and that previous example, the intent was very obvious that they wanted to close against that section line so if you can't find those two corners or one or both, whatever, you are going to have to proportion on the senior line to put it in and make sure that they land on the senior line. In other words, don't use any data down here or here to put that in because you would be doing a Grant

RESTORATION OF LOST CORNERS – PART 4

Boundary, same thing would happen with a Compass Rule by the way, so you don't want to use either one of those, when you have a non-rectangular entity that has a closing corner.

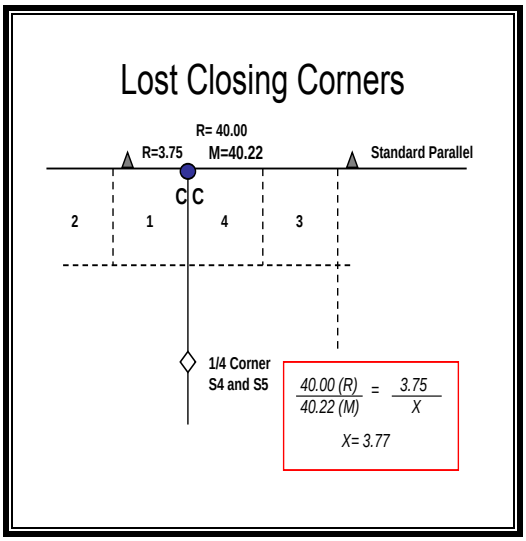
Now so let's do a lost closing corner situation. You see on the slide there, lost closing corner, single proportion on the senior line. That is what is said to do. So here is our situation. We found this quarter corner down here. We found a standard corner on a standard parallel. We found another one over here. They in the old plat said they were 40 chains apart. I have measured them and found them to be 40.22. So it is a little bit long. I've got to put in this lost closing corner. And if it is truly lost, then I have no idea where it should be here. So what did the book say?



It said you got to put it on the senior line which will be defined by those two corners and you are going to have to proportion it between the nearest corners to the left and to the right which of course is on the senior line. So what I am going to do is set up a proportion between the 40 and the 40.22 and compare that to the 3.75. Now you see why what I was mentioning earlier how this violates proportioning because the chain that measured the 40 is not the one that measured the 3.75, yet we are going to use the 3.75 to set this back and we are going to use the 40.

The chain that measured the 3.75 was the chain that came up this line by a completely different surveyor and completely different survey, usually. But that's what the Manual says, that's how we do it. Closing corners have always been a pain in the neck and always will be. Wish we'd just eliminate them. But even if we did eliminate them, you would still have to deal with all the thousands and thousands and thousands of them that already exist. So there's my ratio, even though it is to the wrong chain, I am going to compare my 40.22 to that chain that said 40 chains across there. So the formula is going to be 40 is to 40.22 as 3.75, because see that is my record for the short distance, so as 3.75 is to "X".

RESTORATION OF LOST CORNERS – PART 4



So take a look one more time, I've got that solution on the slide now 40 chains record is to 40.22 in the measured as 3.75 is in the record, all right, is to "X". "X" equals 3.77. Obviously, "X" is going to get bigger because 3.75 see the measured here was larger than the record so this 3.75 is going to proportionately go up. So that is what that 3.77 is. And that is how you would set that corner based upon what the book and the law says. On this line, single proportioned on that line, but you adjust your tie that was made by the surveyor to the south. You adjust it based on those pieces of information. And that is a lost closing corner in a nutshell.

So it is a, you know, when you find a closing corner it is more complicated than if you had ever lost one. Frankly, you know you find one, you have to adjust the, you know, get the true intersection to come up with it as we just read there in 7-41.

Whereas, when you don't have one while it is just a single proportion, it is not the greatest solution, frankly, as far as the principles go but it is the solution that we use and I don't know one that would be better. I don't know that it would be all that better to go the 3.75 if you look back on that slide you know. This is something that a lot of people mention. They say well why don't we just put it on the line but we'll just go the 3.75.

Well, you know, the smaller that distance is the safer that probably is. But you know if that distance is a lot longer, say it was 13 chains, well then you know you are going a record distance with that on adjustment. Another thing to remember is that 3.75, you know, I get a little nervous about it, because you see the closing corner was either up here too long or too short. Right? Now I am exaggerating for scale here but understand that whether he was short or long, the 3.75 is actually a hypotenuse that he measured there. So if you go the 3.75 you are probably going to move the corner further east than it really was unless it is a really short distance or the closing corners extremely close to the line.

You know just running the record distance there is not a really good solution unless it is really small. But when we get to the special cases discussion, we will point out one situation where even with the closing corner you would step away from what 7-41 thru 7-49 says and perhaps do it that way that I was just talking about. So there are always exceptions. Right? That is why this is

RESTORATION OF LOST CORNERS – PART 4

such a great profession. That is why we are doing this training for you. That is why you are taking the training.

Interiors of Sections

Now the next portion of the course we are going to discuss the setting of lost corners on the interior of a sub-divided section, a section that has already been sub-divided. Ron is going to join me in that discussion.

The idea of and there are a lot of places where BLM has been in or even private surveyors for that matter, have been inside a section, they have sub-divided the section properly, you know as far as computation, method and all that. But some or all of the corners inside of the section have become lost. What does the Manual say about that?

Well, you know the Manual really doesn't give us any direction.

We have some principles laid out in the Manual about how to reestablish corners and it talks a little bit about you know to find out what, how, what method was used to set it. But if we just look at the center quarter of a normal section that was established at intersection of center lines and that corner is lost, there is no prescribed method. And you know you might argue that it should be reestablished at intersection and I could argue that it should be reestablished at double proportion. And if you argue double proportion, I could argue intersection. There really is no prescribed method. But if you step back and think about what is our purpose.

Our purpose is to put the corner back where it was originally. What this really does is give us some leeway I think in determining, looking at all the evidence and deciding which method is the best method. Of course, if it is more recent surveys, hopefully the record information is very accurate. And we are going to get, no matter which method we use, we are going to get a very good solution. Some of the older ones we may not. And we also have to be careful how the corner was set you know because of the **three mile method**. That's right. We have to be aware of that. That is a single proportion situation. But we have a real mixed bag. For those of you who don't know what a three

Interior of a Subdivided Section

- Manual does not directly address this
- Two possibilities to consider:
  1. Section subdvd per Manual (notes reflect the process used to set it)
  2. Section subdvd as a traverse (compass rule, D-D, GBM, 2-point)
- Within a section, obliteration may be more likely than a lost corner - Think!

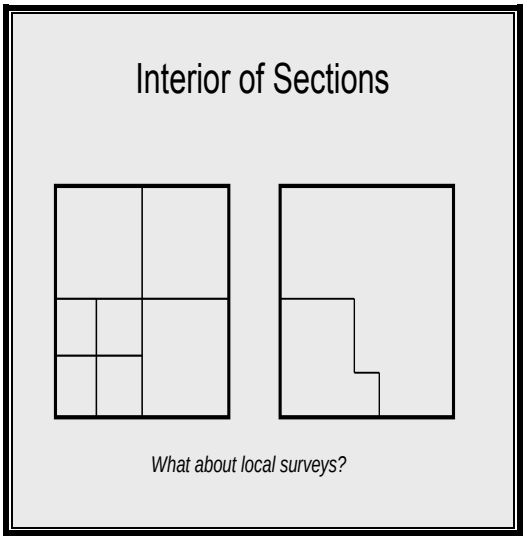
RESTORATION OF LOST CORNERS – PART 4

mile is, you will get that in the section subdivision course that comes later.

But just a point that there are a lot of exceptions to things so here we have the leeway, yet you still have to pay attention to what the record says. Yes, yes, we really have to look at the record. So the bottom line here the Manual doesn't address this directly but let's go to the slides to see that there are really two possibilities of how we, at least the Bureau, has does this. And neither one of them gives you an absolute answer anyway.

But one the section was subdivided per the Manual and in fact you know the center lines were run, and the center lines of the quarter sections were run or whatever and the notes would show you how that was done. And the other possibility is that the section was subdivided, they went around the outside of it. But then they subdivided as a traverse. They did not leave all of the controlling points. And there is where you may use the Compass Rule, or distance distance, or Grant Boundary or two point to help solve those. Now you know the bottom line here with many things you are within a section it may be more obliterated than it is lost especially if the corners that they set are really close.

Let's take a look at these examples here. As you can see here on the left, this is the first of those two examples, where this is one section all right and where they have run the center lines of the section just like they are supposed to and set the, you know in a normal section I should say, and they have set the center quarter and then let's assume that this is a normal unlotted section so these were all placed at midpoint. And then this was set at bearing bearing intersection. Now what we are saying here though is what will happen if one of those becomes lost? What if this became lost? The center south 1/16th.



We have the center of the section, we have this. Well, it was set at midpoint to begin with and you may want to just proceed with that again as it is lost. But remember that you also have a distance that was going out here that was done at the exact same time by the same surveyor that measured this and set it. So you have additional information that you may want to consider. The same thing here. Let's just use the west 1/16th. It was set, we hope, at bearing bearing intersection between those points. Right? Now

RESTORATION OF LOST CORNERS – PART 4

how are you going to reset it if it is truly lost? Do you want to do bearing bearing again? Or as Ron was mentioning with center sections, the same thing could happen here you know.

A **double proportion** considers all four of these lengths here in a computation that relatively weights the line. So we don't set a center of section the first time by double proportion or this one in a normal section. But what we are talking about is that one or more of these interior corners have become lost. And Dennis, really we don't set section corners by double proportion. That's right. We don't. One of the things that I would like to point out is that on that south 1/16th. Many of our prescribed methods look at sort of a higher anarchy of lines where the north south center line takes precedence over the lower subdivision lines. So it might very well be appropriate that the initial method here or the prescribed method would be single proportion along the north south center line.

Always making sure that that is a good answer given the position of that south west 1/16th. But like we said, there isn't a prescribed method. Now what would you say, and maybe we can go back to the slide for a second, Ron, given the same circumstances, I'm just curious now, let's say the center section is there, south quarter corner is there. This is lost, but there is a 1/64th corner or a 1/256th corner, does that start to change how you might consider these possibilities? I think it does because I believe the closer the control, then there's less likely to veer. So if we have something very close I mean a 1/256th corner, you are talking as close as some bearing trees.

Yes, I think the locations of those other corners have to be looked at and I think that is why we don't have a prescribed method here it is because there are so many variables. We have a prescribed goal and that is put the corner back where it was originally based on the evidence.

Now then considering this other possibility, and looking again at the slide here, this is where the Bureau or a private surveyor for that matter, the quarter corners are in, you know we'll assume that they are all there or can be reestablished, and although they computed it this way. I didn't draw it very well, sorry. They did not monument a center section. They didn't monument the 1/16th

RESTORATION OF LOST CORNERS – PART 4

corners out here on the section line and all that was actually left was this series of corners that just went down this line.
Let me show you all an example of that, here is a plat, this is a section here in Arizona. Now they did set the 16ths and the center section here, all right. But look at these little corners zigging and zagging down through here.

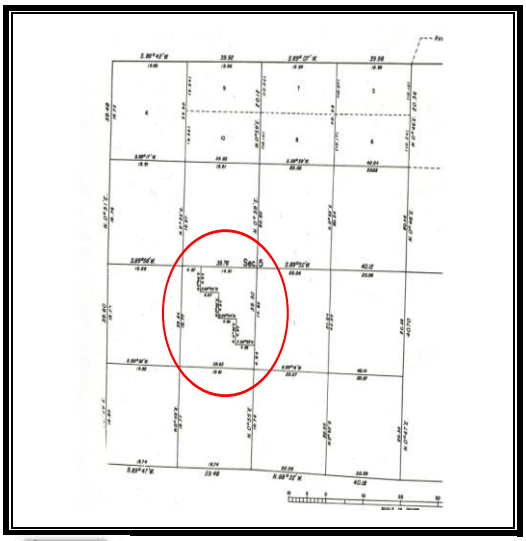


DIAGRAM **A full size version can be found in the Diagrams section at the end of this study guide.**

That was a traverse down and my point being you don't have these other points out here in order to do some kind of a you know let's say bearing bearing to if that corner, that would be what the north east south west 1/64th, if it was missing, and so this is kind of the other situation we are talking about. And maybe this is even more so what you are saying about how close the control is. Yes. And again. What is our goal? Our goal isn't to put it where It should have been, our goal is to put it back where it was so we need to find the closest control, the best control, weigh that with evidence on the ground, fences, use lines, all of those kinds of things and determine what method is going to put it back where it was and what method is best.

Here you know a two point might very well work, you might end up with a **Grant Boundary**, a **Compass Rule** could work, you have a lot of options to look at to decide what is going to do the best job of putting that back where it was originally. Yeah and I've seen some of these that were stair-stepped like this that were actually 10/24th corners. So now you've got these corners that are just a hundred, 200 hundred feet apart and maybe you just go **distance distance** again you know like you said. If they were

RESTORATION OF LOST CORNERS – PART 4

bearing trees that's what you would do. Yes. Yes. Just swing those in and put it there. And I think hopefully in these kind of situations, we have very little error that we are working with.

These are newer surveys. Newer surveys, yes. And the corners are closer together and so hopefully we are not dealing with a lot of error out there. I could see even a situation like this if we did find one corner, you know one of our control corners were significantly out of position, it might not be very good control for putting a corner back so, yeah, judgment, gathering all of the evidence I think is really important and looking carefully at the record.

And one more thing then going back to the slide you know the bottom line of what we are saying with this kind of things is that it is almost crazy for you to go out and set that $1/64^{th}$ corner and that one which the BLM never set and that one and that one and to then to try to force this to be at that, because you know there is a different set of error, if you will, or issues as they stair step down through there, so really the bottom line with this second situation when the normal control wasn't set that you really think about what is the best, you don't say this corner is missing, what's the best way, I doubt now there may be, it might be tight enough here that its fine, but I doubt that going from here to here, from here to here, bearing bearing intersecting it and then putting that at midpoint.

I really doubt that and I think you to need to use the distances that are actually returned on the plat so if this one was lost, I would be looking at ways for those two to somehow give me a good solution. Yeah, and when you think about all the other reestablishments that we do, they are all based on measurements between monuments. That's right. That is a principle to hold here, measurement between monuments. Not where it should have been, where it was based on the measurements reported in the record between the monuments. Yeah, it is an interesting issue, it's an interesting issue and you have to approach it with the same principles that we use on restoring other corners, I think. I think that's right.

RESTORATION OF LOST CORNERS – PART 4

Special Cases

With that we are now going to switch gears to really our last segment or last sub-topic here under restoration of lost corners and that is special cases. When you look at 7-60 in the Manual and let's just read a couple of sentences there. It is actually a poorly worded sentence, or paragraph, it almost says the opposite of what it wants to say.

Experiences through asserting good judgment are indispensable for the successful retracement and recovery of any survey when it reaches a stage of extensive obliteration. It is an axiom among experience Cadastral surveyors that the true location of the original lines and corners can be restored if or as long as the original survey was made faithfully and was supported by a reasonably good field note record. I think you'd agree with that. That is the condition for which the basic principles have been outlined and for which the rules have been laid down.

Now what they are saying here is the rules that we have just gone through, these different methods of proportioning corners, all of those are laid down with the assumption that the original survey was made faithfully, that doesn't mean perfectly and that doesn't even mean without some fraud or cheating, but it was made faithfully and was supported by a reasonably good field note record. We at least have some record of what he said he did, how, what he measured, where he crossed this, that or the other, whatever, the usual things in a set of field notes. So that is the assumption that the rules are made on. Now the last sentence, I don't care for. It says, the rules cannot be elaborated to reconstruct a grossly erroneous survey or a survey having fictitious field notes. Now what they are saying is there really is that if it is so far out of whack that you, there is no evidence in the township, well you know, you probably going to stick with proportioning the whole think or whatever.

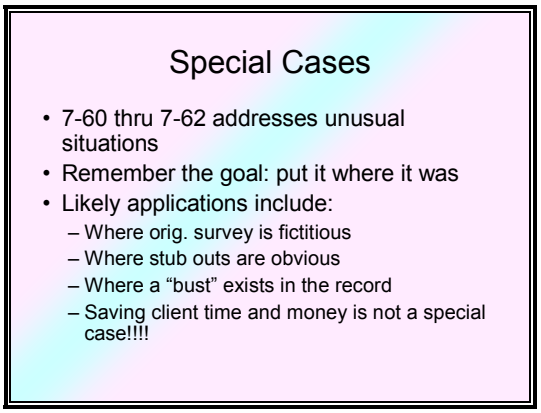
But what 7-60 thru 7-62 is actually trying to tell us is that there are special cases, there are situations where you might step back from the method described in the Manual to try to put the corner back in its most likely original position. Now on the slide then, let me show you this, special cases, 7-60 thru 7-62, just read that.

RESTORATION OF LOST CORNERS – PART 4

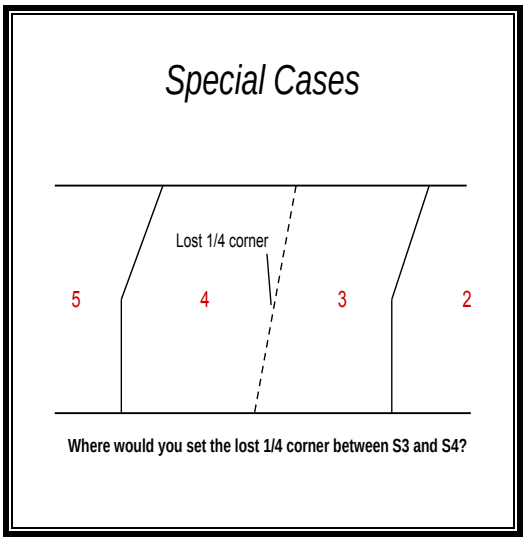
Remember what your goal is, to put it where it was or as best as you can, put it where it was. This is important as opposed to put it where it should have been. And I will show you an example of that here in a second.

Here is some likely applications where a special case would be. If the original survey is fictitious. Now if the whole township is fictitious, you've got a real problem. If there is just portions of it, I've dealt with some where it is fictitious where he just made up stuff, it is not downright fraud, you see we kind of deal with those differently at times, fraud where he was never there at all, that is different. But where there are some fictitious elements in the survey where stub outs are obvious, which is where he lied in his survey, or where there is a bust in the record, a significant drop of you know usually one or five chains depending on how they were tallying or counting the chain, the pulls of the chain.

But please notice the last line here, saving your client time and money is not a special case. I can't tell you how many thousands of those I have seen. That is not a special case. So now let's understand that in a normal township with an honest surveyor, what are you supposed to be doing up in sections one through six? Well you just run you know whatever your north or real close to north is, right, and you set your quarter corner 40 chains then you go on into the township line and you either tie into the corners that are already there or you set closing corners depending on the vintage of surveys and the situation you've got, what kind of line you are tying into. So fine, that is what they were supposed to do.



RESTORATION OF LOST CORNERS – PART 4



Take a look at this slide and see a different situation. That is what the notes said for this township. This, I've redrawn it, but it is from a case up in northern Arizona here up near the town of Ashfork, right along I-40 and the surveyor said in his notes said you know I ran up this line 40 chains, put the quarter corner in, I continued up that bearing and I hit right on the corner that is up here on the township line. Now when we get up there on the ground, what do we find?

We find that he set the section corner here, he set the quarter corner here, but he never ran this line. And the reason we know that is because 20 chains away over here is where these corners are that he said he hit. In the record you see he said he hit those, so we're not going to, we can't change that and put it where it should have been. The fact of the matter is he didn't run these lines. He faked these lines in coming in on up there. Right? Why do you suppose he did that? Well I can tell you for sure here because there is a canyon that ran down right through there and he wasn't going to cross that canyon. So he faked his notes.

And what happened was, he had a bust in his survey way down here somewhere, you know a few miles south of here and in this township and didn't realize that he ran the whole township 20 chains west of where it should have been. So somewhere that's got to give. Now had he run these up straight, he would have realized that oh oh something is wrong. And maybe he did that but then he wasn't going to go back and redo you know two or three weeks of work in rough country out in the middle of nowhere. So he just let it go. But actually know on the ground now that these corners are sitting like this. That one is found, that one is found.

Now here is the situation, we are surveying the line between sections three and four here, this line, because, in fact I was on this case, there is a, in that canyon there is a steel, a solid steel dam and a lake behind it, and they are trying to figure out, the railroad built this back in the 1880s for water for the old cross country you know Transcontinental Railroad so they are trying to decide whether this thing is trespassing on federal land or not. And so we go out there, and some surveyor had been in there, they had hired a surveyor and he had gone and found that corner and he had

RESTORATION OF LOST CORNERS – PART 4

found that one, and he couldn't find the quarter corner.

And so what did he do, well he looked in the Manual and the Manual said well single proportion on a straight line. So he single proportioned that thing on this line and ended up putting the quarter corner, you know not at midpoint, but close to it, there at that position. Now I am here to tell you that that is the last place on the planet that that quarter corner is ever going to be found is there. He either stubbed it from this way or stubbed it from that way, but there is no way that he ran that off on a 15 degree bearing and didn't know it and especially when we have this and this to determine it. So that is our special case.

Do you see what's going on here? This survey has some fictitious records. He was stubbing these corners out and you know, the fact that I didn't show all the others but the corners off that way and off the other way, they are all stubbed out too just like that except in section six it was really screwed up. So what are we going to do? Our goal is not to put it where is should have been, which is on line, our goal is to put it where it was, which is going to be over here somewhere. So I had a special case. And I thought about this for a while and I knew that that is not where I would ever say the corner was, but of course that is what you know what all the dispute was based on was whether this thing was trespassing was because of that guy's corner, well you know the Manual doesn't tell you what to do with this except 7-60 thru 7-62.

Now here is what I said it would do and after you take course number 6 on fractional sections, and I am not saying that these are fractional sections but after you take that course you'll see where I got this idea. I just said, you know what, I've got his bearing and distance here and I've got his bearing and distance here. I am going to mean those and I'm going to come up there and put that at that point. So in other words this is going to zig and zag just like the other ones it is just going to be a kind of mean of that. Because the corner is lost, the quarter corner is lost but I know that it was never set over here.

So that is what I did and so we went up here we went up the mean of those two measurements and we set, we started setting a federal monument in the ground there and as we are picking up rocks to build a mound of stones, about six feet away, we find a rock with a

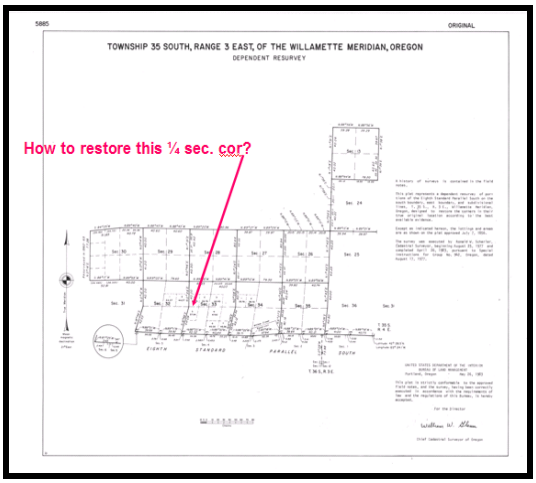
RESTORATION OF LOST CORNERS – PART 4

nice big one slash four on it that was face down. In other words, I was saved by the bell. I now found the original corner so I didn't have to proportion it any more but notice that my method of saying I am in a special case and I am going to come up with something that's equitable of how I am going to use those to come up with this, put me within six feet of the original corner. And actually I had looked all over the place you see I don't know how we missed that, but we had.

But now I had the original stone but you see it is because I was willing to understand and admit that I was in a special case and started thinking about equitable solution to it that had actually got me in the right neighborhood. You know and the other surveyor, I mean I understand what he did, because he was just purely following the book but he didn't pay attention to what was going on around him in that township and realize that, hey, and by the way, the USGS quadrangle showed with it with these big angle points because the USGS had gone out and found corners and they knew something was goofed up out there and when they mapped it they found enough to know that we had these big jogs.

So it wasn't like it was some big secret you know that that problem was out there. So that is one example of a special case. You know there is probably an infinite number but that is one that I wanted to share now I've got another one here that I want you to take a look at, oh I'm sorry, this is a real case of just what we were just talking about.

You see here this is a plat of a survey up in Oregon. And notice this is where the BLM found all of these like this. So you know this is the real thing and we used this plat earlier in the course to talk about setting these quarter corner if they became lost using the modified single proportion to put them there. But that is what we are talking about, is this, is that sort of thing so understand that if the original plat said these were straight, the BLM has come in and done a dependent re-survey and said, no, it's like that, and then that becomes lost well then you are now going to use the modified single proportion to put that in, not the true single proportion which would have put it midpoint on a straight line.



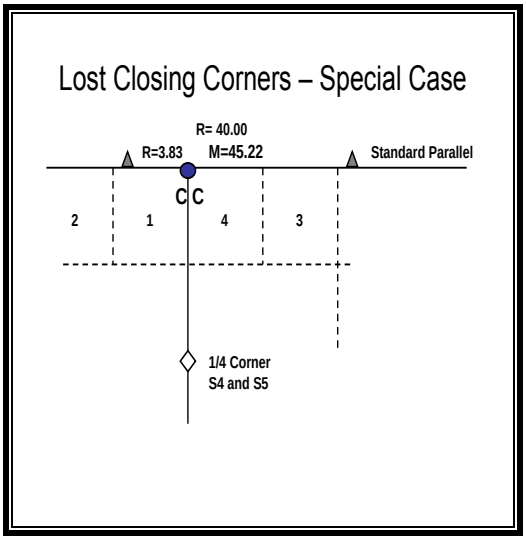
RESTORATION OF LOST CORNERS – PART 4

So just showing you how this can happen when you are retracing a retracement. That is really what is going on there. Now, we talked about closing corners a few minutes ago and now I want to talk about a special case with a closing corner. You will recall that one of the basic principles that we talked about the first few minutes of this course was laying your chain down to their chain and I explained in closing corners how really the process that we are given, really the only process that we have violates that principle. And it is because closing corners are an odd ball situation I mean let's face it folks, the whole fundamental idea of boundary surveying is that corners don't move, right?

DIAGRAM **A full size version can be found in the Diagram section at the end of this study guide.**

And it is the whole idea of the Public Land System where you come out with this grid and it is going to be there before anybody gets a patent. So the land boundaries are all fixed and nothing moves. And then they go and invent a closing corner and by definition, it moves. So you see that is why it doesn't fit very well in the system. Now here is a situation where I would back off from what 7-41 thru 7-99 in the Manual said about closing corners.

Take a look at this one, I think I changed some numbers here, yeah, now see here is our closing corner, it's lost.



We got to put it back in and remember the original surveyor came up set the quarter corner, came up set his closing corner, measured 3.83. But of course the problem is that in the 7-41 it says well you have to go from this corner to this one, you know not only for line but also for distance. But notice what I have added here. The record says 40 chains but let's say that you get out there on the ground and you find that there is a bust in there. I find my measurement between those two standard corners is 45.22. Now

RESTORATION OF LOST CORNERS – PART 4

what that means is the 22 links is just regular old chain you know was short or long right kind of stuff, you know record and measure.

But that extra 5 chains in there, they miscounted how far they went that day or that line. They miscounted. So notice I don't want, that is a hugh difference between the record and the measured. And I don't want to apply that to this 3.83. That is going to make this 450 or something I don't know what it will do, but I mean what it's going to do is end up making that section line go off like this and that is not where it was.

So you know here is sort of situation where if I am sure about my evidence on either end and you have this much of a bust and you'd be surprised at how often you are going to come across busts in the Public Land System, especially in more remote areas. Given those factors, I think I will just go the 3.83 here, I don't think I will proportion it at all. Or maybe I have measured some other stuff down here by this surveyor enough that I could index that if I really am worried about it, but I tell you I think I just feel far more comfortable going the 3.83 than doing the proportion which expands 40 chains into 5 chains, well that is about ten percent so that would add 50 links to that, right, roughly? So you know but that is going to move it 30 feet, 40 feet, right? So I would be real cautious. So that is another example of a special case.

In this case where we got a closing corner and we want to follow the rules that they gave us but there is a bust in that senior line. So now I am going to have to come up with a different way to do this survey and let's not forget, what is our goal? It is to put it in its most likely original position, not where it should have been or where some like this, totally bogus information would put it, no, we don't want to do that.

Now I have one more special case. I mean there is probably a million possibilities. But I've got one more I want to mention to you. It is at 7-34 in the Manual. And I will just read. It's funny, it is not in 7-60 thru 7-62 course. 7-60 thru 7-62 doesn't' go into any details we're just giving you some examples. But 7-34 in the Manual is actually a place where they specifically tell you here is a special case, you know. 7-34 says another exception to the usual, wait, wait a minute, we are talking about the proportioning, single

RESTORATION OF LOST CORNERS – PART 4

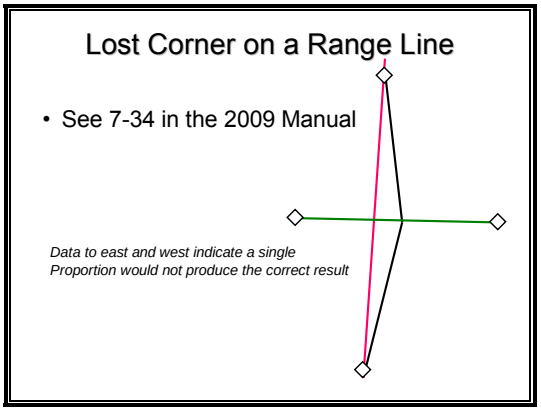
proportions here is what we are talking about. We are talking about some situations where you might have a special situation.

Another exception to the usual application of single proportion of measurement is occasionally important. There may be persuasive proof of a deflection in the alignment of the exterior of a township although the record shows the line to be straight. For example, measurements east and west across a range line or north and south across a latitudinal township line counting from a straight line exterior adjustment may show distances to the nearest subdivisional corners. Now what are they talking about here?

Well they go on to talk about hey you may have to modify this. Now you've already learned that because the line was run a single proportion, no a range line, it was set and a range line was established and approved by them going 40, 80, 40, 80, 40, 80, so when a corner becomes lost on that range line because the way it was done was north and south on that, you only single proportion out of it, you don't do a double proportion or some other thing, you do single proportion because that is the way the corner was established. And that is one of the basic rules of proportioning by the way is how was the corner established.

You know what measurements and what chain created that and that is usually independent, not always, but usually independent of other chains that may close into it later. But here they are showing us an exception. Now let's take a look at the slide.

Let's say that you are, this is a range line just like they said and that the record says it is straight all the way for six miles, okay, but let's say you discover, you go out there and you found this corner but you can't find this corner and you found this corner. If you do a single proportion on this, which is what the book said to do, then you are going to put a corner over here somewhere.



That is where you will end up setting it, just roughly over there. But what they are talking about here is, hey, here is an exception to the single proportion on a range line. Perhaps you are going to look at the fact that when you come from this quarter corner back, it puts it way over here and when you come from this quarter corner, which by the way is a separate survey here from here. Usually. And it also puts you over here now you've got some

RESTORATION OF LOST CORNERS – PART 4

pretty conclusive proof that he did not in fact run a straight line through there but in fact had abandoned it. That is what this slide is showing you is a special case. So the rule is you single proportion on the straight line on a range line or a township line, well I say a straight line on a township, the north and south boundary of a township would be on the longitudinal curve but you know it's a single proportion.

But here is a place where the Manual 7-34 says you know what you might want to double proportion this instead of single proportioning it using these distances, all four of them you see, because your side distances agree that that corner must have been way over there. Now understand, if I was in here doing this and 40 chains from here put me here but 40 chains from here put me over here. I wouldn't do this. What we are talking about is really this survey and this survey which are separate from each other and separate from this survey, if they agree at some place that looks like you know within a few feet looks like boy its way off from where we are looking or where the single proportion is that is what 7-34 is talking about.

And that is just another example of a special case that we would want to look at. So you know there can be an infinite number of special cases I suppose or circumstances. I haven't found too many, I have probably proportioned in corners, lost corners, in my whole career may I don't know five, six, seven times where I did it differently than the Manual says to do it because I had a special case.

So special cases don't come along always and as we said at the beginning of this course, you really can't understand the exceptions to the rules until you understand the rules like the back of your hand. Right? So we've given you all the rules and we then we've have given you here three examples of some special cases just so that you can kind of see, we still try to stay within, we still try to use one of the other rules, we still try to in any way we can to make it something in the book in a sense of I just you know didn't pull some new solution out of somewhere and say hey here is my new theory on how to proportion corners when something is screwed up.

No, we are careful here. And try to make it make sense and you

RESTORATION OF LOST CORNERS – PART 4

know that is something that I can justify. Now I will mention you know if you are ever really dealing with a special case, you need to write that up, you need to document that and I believe on your survey document especially if it ends up being an actual plat or notes, or whatever you need to have an explanation as to why you differed from the Manual method. Because every surveyor after you that comes along and sees that for the next thousand years is going to wonder why and if you give them a good explanation, they may not even agree with you, but they will understand what you did.

They won't have to guess, they don't have to think that you just blew it, or you didn't know what you were doing. They'll realize that you addressed the issue and you tried to figure it out. Well Ron, between the two of us we have just about beat them over the head with restoration of lost corners. I think we have. And we have tried to show you all of the methods that are in the Manual and the correct way to do those and we've shown you special cases and we have also given you some guidance I hope on some other things with your curvature discussion, and the Grant Boundary which I found that real interesting because I have never actually seen that discussed. So we've given you a lot of different things here.

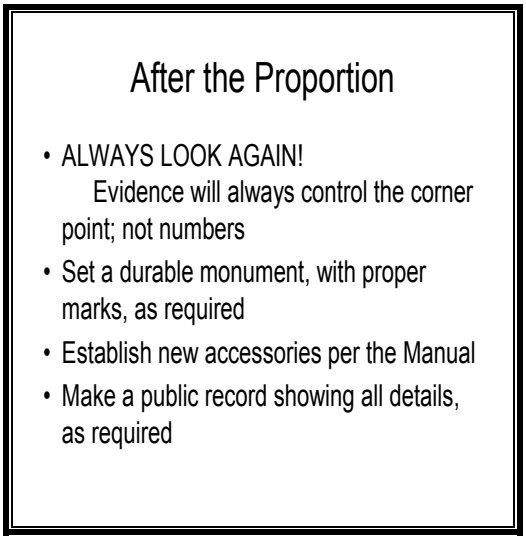
Well and you know I think that this is one of the very most important parts of this training, learning to properly reestablish corners, the Manual can be difficult to comprehend and understand sometimes in those sections about the restoration methods and so hopefully we have presented them in a method that is a little more understandable not only in how to do it but when, when to do it and why. So you know now that we have shown you all the proper math and those things, you will recall that in the very beginning of this course we told you we hope you hate proportioning.

And Ken Witts quote you know, **"Proportioning is an admission that our profession has failed somewhere."** And really we want to keep that in mind because we have shown you exactly how to do it by the book, by the law, and some guidance on special cases, whatever. But let's talk about for a moment now that you have done your proportion, you've used the right math, the right basis of bearings, the right control, all of those things, now you are

RESTORATION OF LOST CORNERS – PART 4

ready to set that corner point.

Let's just review on the slide what you really should do after the proportion. That is, always look again. Remember that no matter how perfectly you computing the position and no matter how perfect your measurements or your control is, evidence is always going to control the corner point, not the numbers. I can't tell you how many times I've done a proportion and then looked again and found evidence that I had missed before. And so you know as we saw in a couple of examples I showed you earlier in the course, sometimes just doing the proportion or really thinking about what I've got led me to the evidence because it got me into the right neighborhood and got me to paying attention to things that I should and got me you know a few feet different from where I had been looking and thinking where this corner was really going to be.



So evidence is always going to control that. You are going to have to set durable monument depending upon what kind of surveys you are doing, if it is Federal survey, we've got our requirements. If it is just something you are doing, I encourage you to still set a durable monument.

Put the proper marks on it even if its just you out there, not on Indian country or Public Domain but you're setting a center south 16th, I encourage you to mark it just like chapter 4 of the Manual says. That is the way that it has been done for a hundred years and really that is the real true sign of a real professional someone who really knows what they're doing in the Public Land System and then establish some new accessories. Do it like the Manual says at a minimum, one per section, or at least two on some of these interior corners or other things.

That may be **bearing trees** or just swing ties or one thing or another to more permanent objects or reference monuments that you set but the whole idea of this is that if we had to proportion because the profession failed, let's not fail the profession again, let's not set it up where we did all this computation and did this great job and used the right control and everything and then didn't set enough evidence that it will be found ten years or fifty years from now. So let's not fail it again, so you want to establish those

RESTORATION OF LOST CORNERS – PART 4

accessories and then whether your state law says it or not I strongly encourage you to make a public record of everything you did and of course if you are doing CFedS and that sort of thing, we've got standards and guidelines on that but just any kind of survey.

Make a **public record** showing where everything is, telling us how you did it, why you did it. You know, I'll say it again, when we see your record, when I say we you know me and any other surveyor, when I see your record, I may not agree with what you did, but its really best if there is no question in my mind what you did, in other words, now help me understand, you know what I think that for you and your client's sake whoever it is, you greatly increase the possibilities that future surveyors will accept your position. The more information you give that we don't have to guess what you did or think that you don't know how to do this right, you have actually given us the information that tells us how you did it and explains it and we may say well that's probably not how I would have done it, but Ron did that ten years ago, and I'm going to leave it, you know it looks good to me.

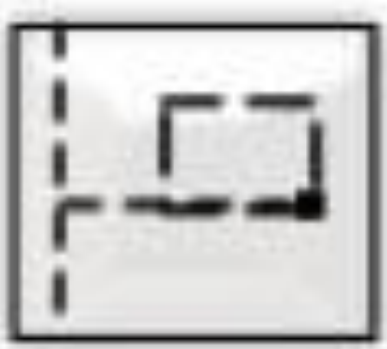
So after the proportion, here's the point, yeah you did the math, go look again, then either way whether you find something or not, set a durable monument, mark it, take accessories, make a public record. Well that is kind of our prepared comments here, Ron do you have any closing comments. Well, no, I think that we have got this covered and hopefully it is been a good session for you. I think Dennis did a great job on this and hopefully this will be helpful for you in your career in the future as you progress. So I've got one more piece of advice for you, no matter what you do, no matter what method of proportioning or whatever you do, there is one thing that I would rather you did and that is just find the corner, okay just find the corner.

That is better to any kind of a proportion, to any kind of an adjustment, any kind of control network, anything it is best to just find the evidence and as you heard in the course previous to this one, that is the heart and soul of Cadastral Survey and so I hope you got something out of this and your next module, your next course will be on water boundaries and we'll run into you later in the program.

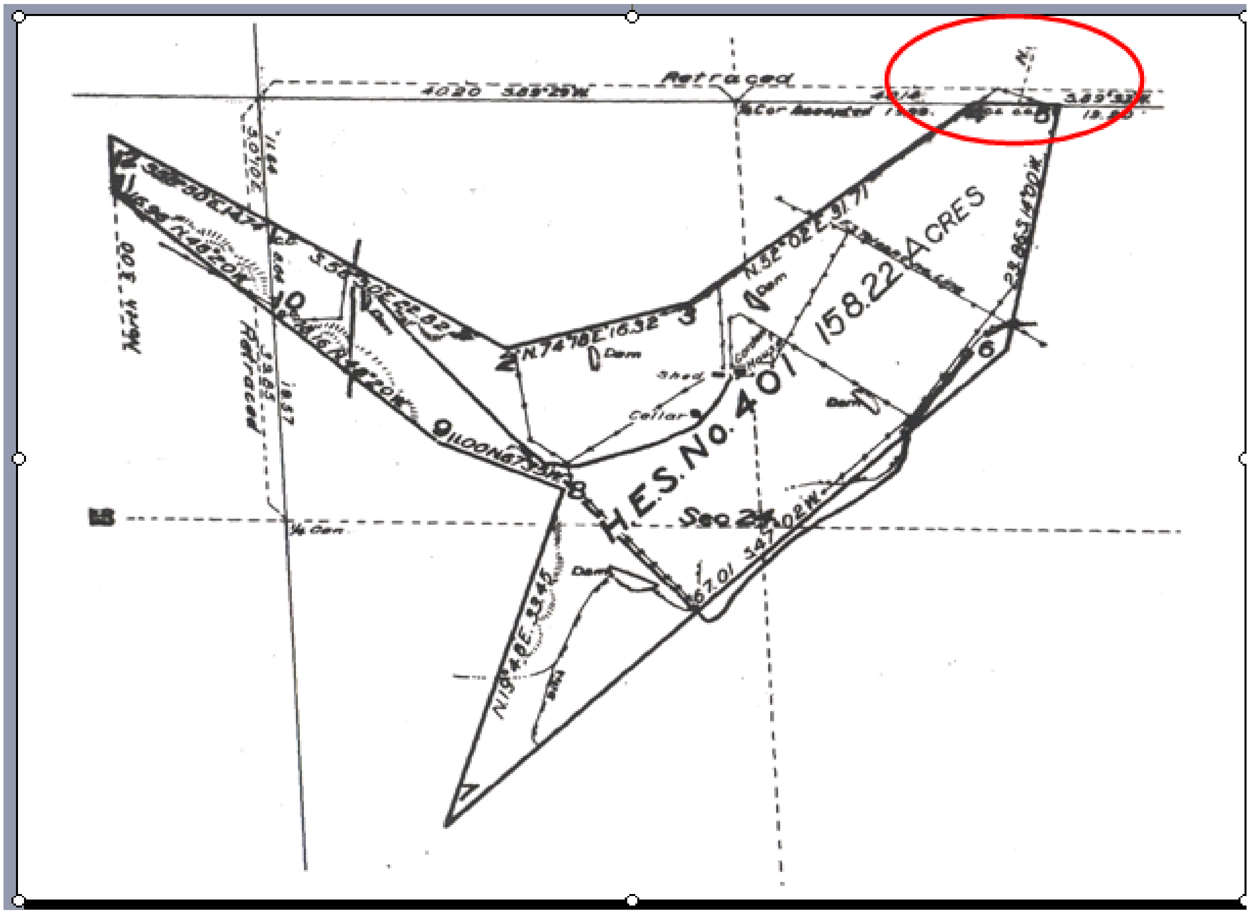
RESTORATION OF LOST CORNERS – PART 4

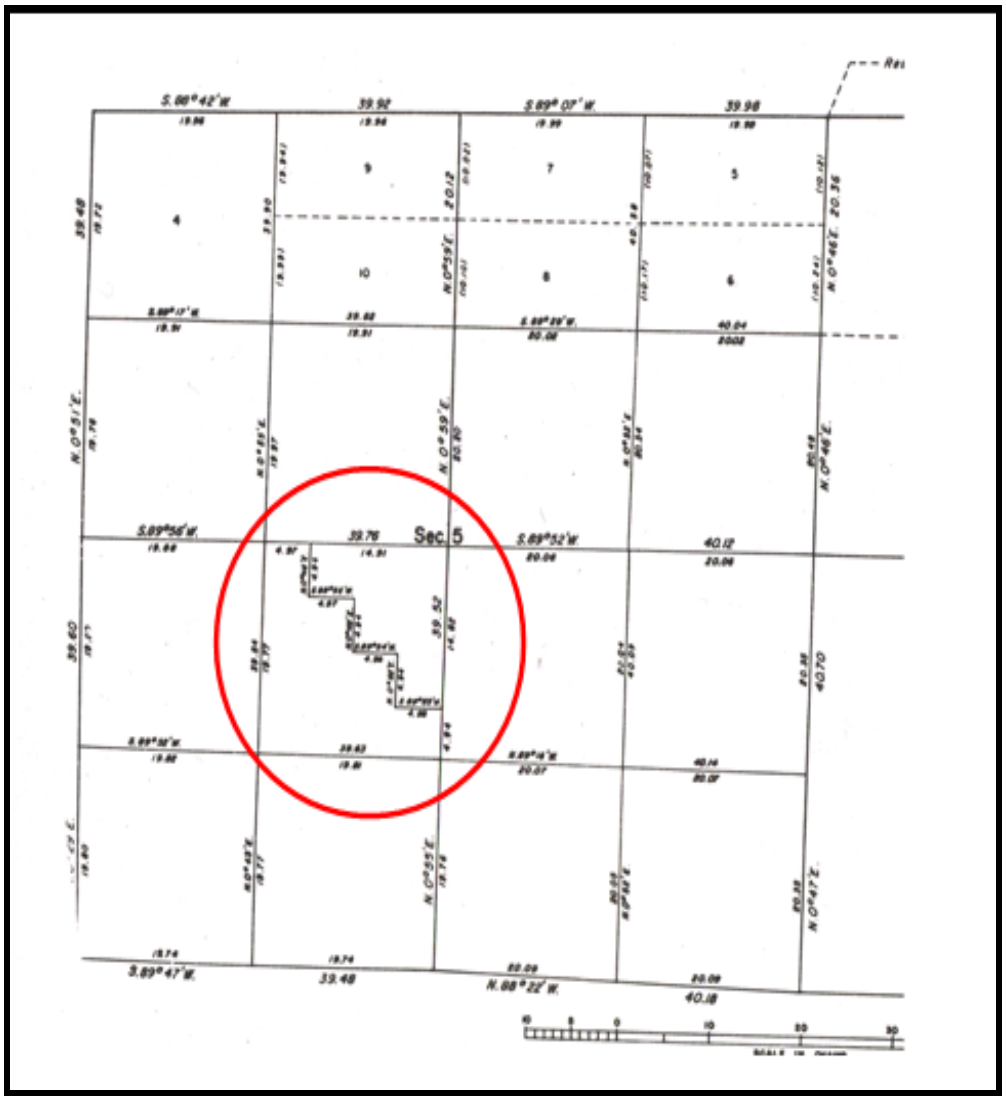
Before moving on to the next topic, complete the "Calculate Proportionate Positions of Corners & Adjust Meander Line" which you can access from the course description page.

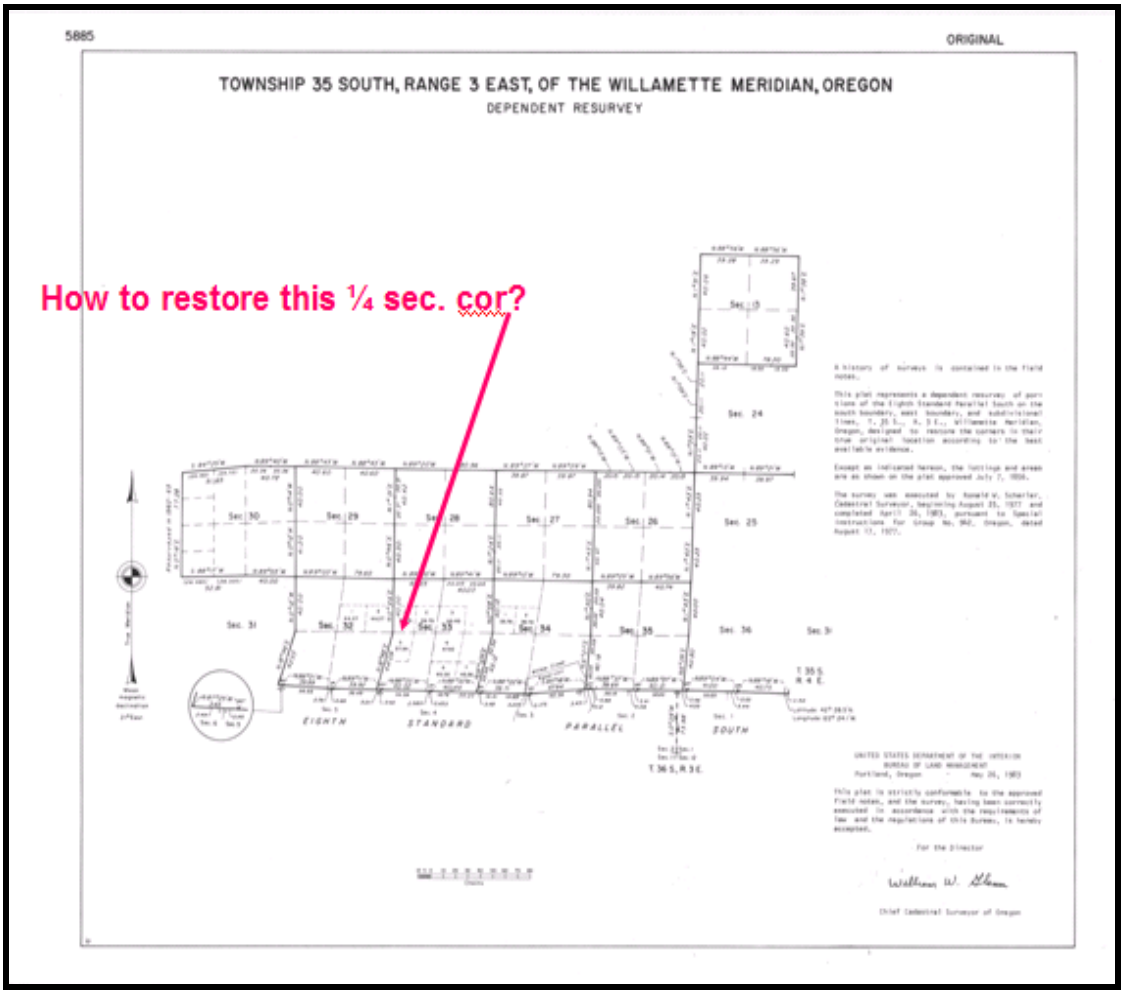
It's time to take the Course 4 Quiz. You can access the quiz from the CFedS website.



DIAGRAM

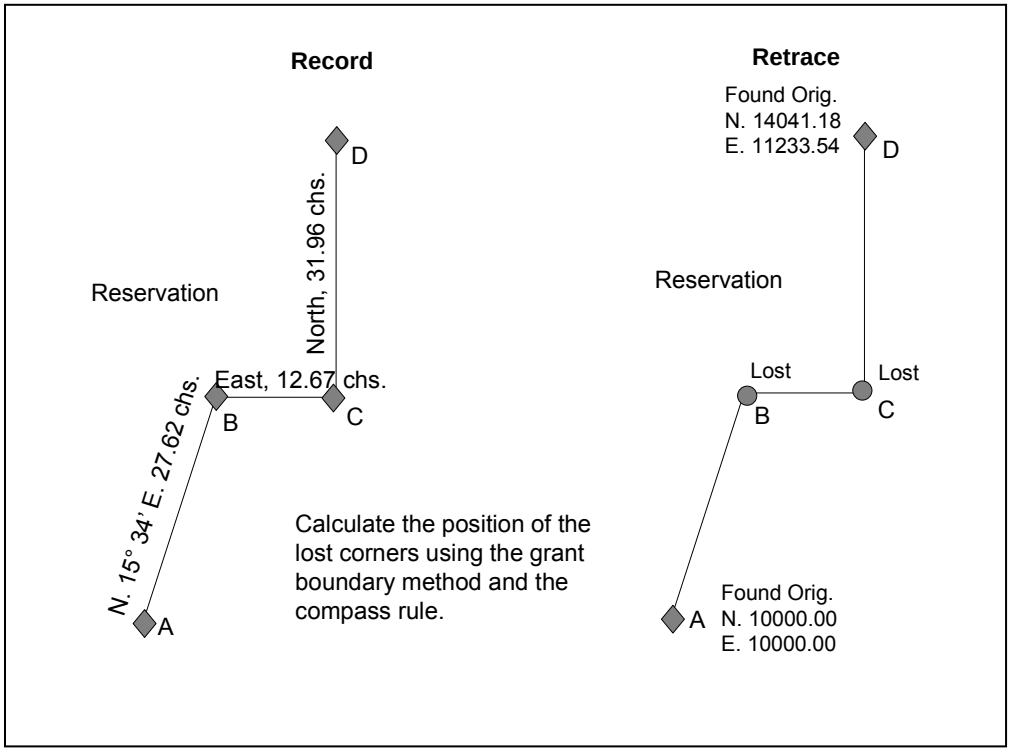

Retraced
H.E.S. No. 401
158.22 ACRES
Sec 24


Sec. 5
S.89°42'W.
39.92
S.89°07'W.
39.98
S.89°56'W.
39.76
S.89°52'W.
40.12
S.89°47'W.
39.48
N.88°22'W.
40.18


5885
ORIGINAL
TOWNSHIP 35 SOUTH, RANGE 3 EAST, OF THE WILLAMETTE MERIDIAN, OREGON
DEPENDENT RESURVEY
How to restore this ¼ sec. cor?
EIGHTH
STANDARD
PARALLEL
SOUTH

EXERCISE

Grant Boundary and Compass Rule



Grant Boundary Calculation

Inverse between controlling corners: **Record** = N. 3865.42 ft., E.1325.41 ft.
N. 18° 55' 35" E., 4086.33 ft.
Retrace = N. 4041.18 ft., E. 1233.54 ft.
N. 16° 58' 28" E., 4225.25 ft.

Angular rotation: 1° 57' 07" counter-clockwise (from record to retrace)
Line A-B: N. 15° 34' E. - 1° 57' 07" = **N. 13° 36' 50" E.**
Line B-C: N. 90° 00' E. - 1° 57' 07" = **N. 88° 02' 53" E.**
Line C-D: N. 0° 00' W. - 1° 57' 07" = **N. 1° 57' 07" W.**

Proportion: 4225.25 ft.(retrace) ÷ 4086.33 ft.(record) = 1.033996
1.033996 x 1822.92 ft. (27.62 chs.) = **1884.89 ft.**
" x 836.22 ft. (12.67 chs.) = **864.65 ft.**
" x 2109.36 ft. (31.96 chs.) = **2181.07 ft.**

Lat. and Dep. of each course:

Line A-B:	N. 13° 36' 50" E., 1884.89 ft	N.1831.93 ft.,	E.443.66 ft.
Line B-C:	N. 88° 02' 53" E., 864.65 ft.	N.29.45 ft.	E.864.15 ft.
Line C-D:	N. 1° 57' 07" W., 2181.07 ft.	N.2179.80 ft.	W.74.29 ft.

Proportionate Position Corners B and C

Corner B: N.10000.00 + 1831.93 ft. = **N.11831.93** E.10000.00 + 443.66 ft. = **E.10443.66**

Corner C: N. 11831.93 + 29.45 ft. = **N. 11861.38** E.10443.66 + 864.15 ft. = **E.11307.81**

Compass Rule Calculation

Misclosure Record vs. Retrace

Record coordinates at D: Lat. N. 3865.41 ft., Dep. E. 1325.42 ft.
Retrace coordinates at D: Lat. N. 4041.18 ft. Dep. E. 1233.54 ft.
N. 175.77 E.-91.88

Length of all the courses: 4768.50 ft.

Correction to course AB: 1822.92 ft. (27.62 chs.) ÷ 4768.50 = 0.382284
0.382284 x N.175.77 = N.67.19
0.382284 x E. -91.88 = E. -35.12

Correction to course BC: 836.22 ft. (12.67 chs.) ÷ 4768.50 = 0.175363
0.175363 x N.175.77 = N.30.83

0.175363 x E. -91.88 = E.-16.11

Correction to course CD: 2109.36 ft. (31.96 chs.) ÷ 4768.50 = 0.442353
0.442353 x N. 175.77 = N. 77.75
0.442353 x E. -91.88 = E.-40.64

Record Lat and Dep. of each course plus correction

Course A-B: N.1756.05 + 67.19 = **N. 1823.24** E. 489.20 - 35.12 = **E.454.08**
N. 13° 59' 06" E., 1878.93 ft.

Course B-C: N. 0.00 + 30.83 = **N. 30.83** E.836.22 - 16.11 = **E.820.11**
N. 87° 50' 50" E., 820.69 ft.

Course C-D: N.2109.36 + 77.75 = **N.2187.11** E.0.00 - 40.64 = **E.-40.64**
N. 1° 03' 52" W., 2187.49 ft.

Proportionate Position Corners B and C

Corner B: N.10000.00 + 1823.24 ft. = **N.11823.24** E.10000.00 + 454.08 ft. = **E.10454.08**

Corner C: N. 11823.24 + 30.83 ft. = **N. 11854.07** E.10454.08 + 820.11 ft. = **E.11274.19**