



PLSS LOST CORNER RE-ESTABLISHMENT

NW Chapter WLSL Continuing Education Seminar
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I. OVERVIEW

- A. General Observations; Statutory Provision
- B. Original plat and field notes; Instructions
- C. Corner Disposition
- D. Lost Corner Restoration Methods

PLSS LOST CORNER RE-ESTABLISHMENT

A. GENERAL OBSERVATIONS; STATUTORY PROVISIONS

Wis Stat Sec 59.73(2)
 Subdividing sections. Whenever a surveyor is required to subdivide a Section or smaller subdivision of land established by the United States survey, the surveyor shall proceed according to the statutes of the United States and the rules and regulations made by the secretary of the interior in conformity to the federal statutes. While so engaged a surveyor and the surveyor's assistants shall not be liable as a trespasser and shall be liable only for any actual damage done to land or property.

Detailed in the *Manual of Instructions*
 – 2009 (and previous editions)



I. OVERVIEW

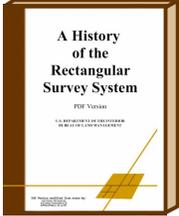
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B. ORIGINAL PLAT AND FIELD NOTES; INSTRUCTIONS

3. Original Instructions

Instructions: Procedure, mon type/marking, record keeping, etc.
A History of the Rectangular Survey System, C. A. White
 Includes almost all the instructions issued



Available as digital download from
 Central Valley Chap, CA Land Surveyors
 Assoc.

Link is in seminar handout & website.

I. OVERVIEW

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B. ORIGINAL PLAT AND FIELD NOTES; INSTRUCTIONS

4. A Package Deal

Why bother with original notes, plat, Instructions?
 All that stuff is 150+ years old
 We can measure *much* better today.



I. OVERVIEW

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B. ORIGINAL PLAT AND FIELD NOTES; INSTRUCTIONS

4. A Package Deal

Why bother with original notes, plat, Instructions?
 All that stuff is 150+ years old
 We can measure *much* better today.

Where the corner was originally est'd
 is where it belongs today.
 → recreate the original situation.



I. OVERVIEW

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D. LOST CORNER RESTORATION METHODS

1. Introduction

Lost – no credible evidence
Re-establish by connecting to other original locations

Best attempt to re-create original intent & location

- Direction
- Distance
- Corner relationships

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D. LOST CORNER RESTORATION METHODS

2. Restoration Methods

a. Primary; Manual page 166

Double Proportionate Measurement (DPM)	Sec 7-8
Single Proportionate Measurement (SPM)	Sec 7-16
3 Point Control (3PC)	Sec 7-13
2 Point Control (2PC)	Sec 7-14
Modified SPM (MSPM)	Sec 7-44

b. Secondary Methods; Manual page 173

Irregular Boundary Adjustment (IRR)	Sec 7-51
Grant Boundary (GB)	Sec 7-54
One Point Control (1PC)	Sec 7-58
Mixed & Miscellaneous	Sec 7-58 & 59

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D. LOST CORNER RESTORATION METHODS

3. Line Hierarchy

The general order of line creation:

- Principal Meridian and Base Line
- Correction lines
- Township lines
- Section Lines

Defines priority at intersections

4. It's a Guess at Best

Restoring a lost corner is a best guess of original location & dependencies using only measurements

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II. WHAT ONCE WAS LOST

General Legal Background

- A. There's North and Then There's North
- B. Proportionate Measurement Techniques
- C. Corner Types
- D. Limited Control
- E. Other Methods?

PLSS Lost Corner Re-establishment

GENERAL LEGAL BACKGROUND

Basic rules for lost PLSS corners re-establishment are same as for a subdivision lot resurvey:

- One or more accepted original corner locations are needed
- Original corners cannot be disturbed.
- Any discrepancies between original corner positions must be managed between those positions and cannot extend beyond them.

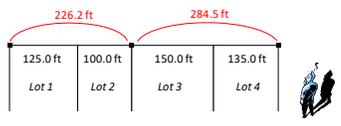


Diagram showing four lots (Lot 1, Lot 2, Lot 3, Lot 4) with dimensions: Lot 1 (125.0 ft), Lot 2 (100.0 ft), Lot 3 (150.0 ft), Lot 4 (135.0 ft). Distances between corners are 226.2 ft and 284.5 ft.

II. What Once Was Lost

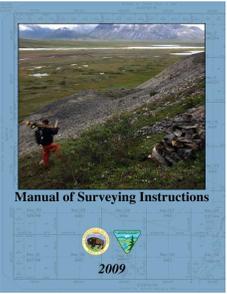
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GENERAL LEGAL BACKGROUND

Difference
Restoration procedures defined in *Manual*.

Effect
Statutory Law
Consistency across jurisdiction (well, kinda...)



II. What Once Was Lost

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A. THERE'S NORTH AND THEN THERE'S NORTH

1. PLSS Direction Reference

PLSS lines run in True directions

Astro observations to determine True N

Variation – angle from True N to Magnetic N



II. What Once Was Lost

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A. THERE'S NORTH AND THEN THERE'S NORTH

1. PLSS Direction Reference



II. What Once Was Lost

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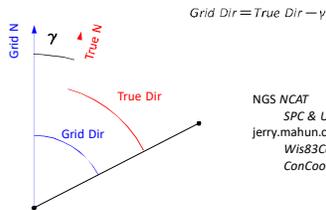
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A. THERE'S NORTH AND THEN THERE'S NORTH

1. PLSS Direction Reference

PLSS lines run in True directions

Today – Grid systems



NGS NCAT
 SPC & UTM
 jerry.mahun.com
 Wis83CoordConv1-5.xlsm
 ConCoord



II. What Once Was Lost

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A. THERE'S NORTH AND THEN THERE'S NORTH

2. Cardinal Equivalents

$$dN = Lat = L \times \cos(Brng)$$

$$dE = Dep = L \times \sin(Brng)$$

II. What Once Was Lost

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

1. General
2. Primary Methods

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

1. General

Township: 36 Sections created simultaneously
 All have equal standing
 Excess deficiency cannot extend outside Township

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

II. What Once Was Lost

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

1. General

Proportioning establishes ratio between current & record distance between *same* corners

- original or accepted replacements
- Corner hierarchy
- Dependency

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Nearest related corners

- Cannot proportion across accepted corner position.

Emphasis on distance over direction

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

1. General

Dependency between the lost and adjacent corners.

4	3	2	1	6	5	4
9	10	11	12	7	8	9
16	15	14	13	18	17	16
21	22	23	24	19	20	21

T3NR11W | T3NR10W

S1/4 S7 T3N R10W is lost.

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

1. General

Dependency between the lost and adjacent corners.

4	3	2	1	6	5	4
9	10	11	12	7	8	9
16	15	14	13	18	17	16
21	22	23	24	19	20	21

T3NR11W | T3NR10W

S1/4 S7 T3N R10W is lost.

Found:

- SW S12 T3N R11W
- SE S7 T3N R10W

II. What Once Was Lost

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

1. General
Dependency between the lost and adjacent corners.

4	3	2	1	6	5	4
9	10	11	12	7	8	9
16	15	14	13	18	17	16
21	22	23	24	19	20	21

T3NR11W T3NR10W

S1/4 S7 T3N R10W is lost.
Found:
SW S12 T3N R11W
SE S7 T3N R10W

SE S7 can be used to re-est S1/4 S7

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

1. General
Dependency between the lost and adjacent corners.

4	3	2	1	6	5	4
9	10	11	12	7	8	9
16	15	14	13	18	17	16
21	22	23	24	19	20	21

T3NR11W T3NR10W

S1/4 S7 T3N R10W is lost.
Found:
SW S12 T3N R11W
SE S7 T3N R10W

SE S7 can be used to re-est S1/4 S7

SW S12 can't be used to re-est S1/4 S7

SW S12 & S1/4 S7 were not originally connected – different townships.

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

2. Primary Methods

a. Single Proportionate Method (SPM)
Used to restore corner that is
on a single line
at intersection of two lines, along the higher weighted line

Re-Establishment Steps
Step (1) Compute appropriate record cardinal equivalents
Step (2) Compute measured cardinal equivalents
Step (3) Set up and solve proportion(s)
Step (4) Use proportion(s) to determine lost corner location

II. What Once Was Lost

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

2. Primary Methods

a. Single Proportionate Method (SPM)

Record
N 89°10'W
38.42 ch 40.00 ch
SW S1/4 SE
5183.60 ft N 87°30'10"W
Measured

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

2. Primary Methods

a. Single Proportionate Method (SPM)

(1) & (2) Cardinal equivalents

Record
N 89°10'W
SW 38.42 ch S1/4 40.00 ch SE
78.41 ch

Measured
SW 5183.60 ft N 87°30'10"W S1/4 SE
78.41 ch
5178.68 ft

$dE = 40.00 \times \sin(89^\circ 10') = 40.00 \text{ ch}$
 $dE = (40.00 + 38.42) \times \sin(89^\circ 10') = 78.41 \text{ ch}$

$dE = 5183.60 \times \sin(87^\circ 30' 10'') = 5178.68 \text{ ft}$

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

2. Primary Methods

a. Single Proportionate Method (SPM)

(3) Cardinal proportion

SW S1/4 SE
78.41 ch 40.00 ch
5178.68 ft y

$\frac{40.00 \text{ ch}}{(40.00 \text{ ch} + 38.42 \text{ ch})} = \frac{y}{5178.68 \text{ ft}}$
 $\Rightarrow y = 5178.68 \text{ ft} \times \left[\frac{40.00 \text{ ch}}{78.41 \text{ ch}} \right] = 2641.85 \text{ ft}$

II. What Once Was Lost

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

2. Primary Methods

a. Single Proportionate Method (SPM)

(4) Re-set lost corner

$b = Lat = 5183.60 \times \cos(87^{\circ}30'10'') = 225.85 \text{ ft}$
 $\frac{a}{225.85} = \frac{2641.85}{5178.68}$
 $\Rightarrow a = 225.85 \times \left[\frac{2641.85}{5178.68} \right] = 115.22 \text{ ft}$

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

2. Primary Methods

b. Double Proportionate Method (DPM)

Corner is at intersection of two equal weight lines.

SPM N/S
Set temp pt

SPM E/W
Set temp pt

II. What Once Was Lost

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

2. Primary Methods

b. Double Proportionate Method (DPM)

Corner is at intersection of two equal weight lines.

(c) Extend cardinal lines through each temp point

(d) Re-est corner at intersection of cardinals.

II. What Once Was Lost

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

2. Primary Methods

c. Proportionate Concerns

What are the controlling corners?
Which is the applicable method, SPM or DPM?

S1/4 Sec 1?

● Found Corner
○ Lost Corner

II. What Once Was Lost

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

2. Primary Methods

c. Proportionate Concerns

What are the controlling corners?
Which is the applicable method, SPM or DPM?

S1/4 Sec 1?
SPM SE & SW Sec 1

● Found Corner
○ Lost Corner

II. What Once Was Lost

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

2. Primary Methods

c. Proportionate Concerns

What are the controlling corners?
Which is the applicable method, SPM or DPM?

W1/4 Sec 13?

● Found Corner
○ Lost Corner

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

2. Primary Methods

c. Proportionate Concerns

What are the controlling corners?
Which is the applicable method, SPM or DPM?

W1/4 Sec 13?
(1) S1/4 Sec 7
(2) SE Sec 11
(3) W1/4 Sec 13

■ Re-Est'd Corner
● Found Corner
○ Lost Corner

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

2. Primary Methods

d. Modified SPM (MSPM)

Section line originally bent at a quarter corner

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Quarter corner lost.
Re-est corner keeping Section line bent.

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B. PROPORTIONATE MEASUREMENT TECHNIQUES

2. Primary Methods

d. Modified SPM (MSPM)

Record and Measured Distances

Record and Measured Cardinal Equivalents

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3. PROPORTIONING METHODS

2. Primary Methods

d. DPM or SPM? Pop Quiz

Cor	SPM or DPM	SPM Dir
A		
B		
C		
D		
E		
F		
G		
H		

II. What Once Was Lost

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3. PROPORTIONING METHODS

2. Primary Methods

d. DPM or SPM? Pop Quiz

Cor	SPM or DPM	SPM Dir
A	SPM	E/W
B	DPM	
C	DPM	
D	SPM	N/S
E	SPM	E/W
F	SPM	N/S
G	SPM	E/W
H	SPM	E/W

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C. CORNER TYPES

1. Regular
2. Closing
3. Witness
4. Meander
5. Curved lines

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C. CORNER TYPES

1. Regular
 Section
 Quarter Section

Can be used for
 Distance
 Direction
 control

II. What Once Was Lost

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C. CORNER TYPES

2. Closing Corners (CC)
 Section line from south intersects north township boundary inside of
 Section corner (aka Standard Corner, SC)

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C. CORNER TYPES

2. Closing Corners (CC)
 CC was intended to be on the closing line.
 Surveyor recorded distance and direction to corresponding SC.

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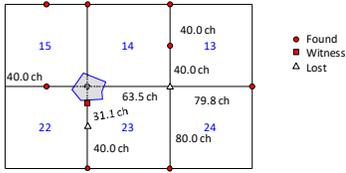
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C. CORNER TYPES

3. Witness Corner (WC)

b. Use in Corner Restoration

If online: can stand in place of or define a regular corner



- W1/4 23 SPM between SW 23 & WC
- NE 23 Compute NW 23 by continuing 8.9 ch past the MC
- Re-set NE 23 by DPM
- NW 23 to NE 24 E/W
- SE 23 to E11/4 14 N/S

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C. CORNER TYPES

4. Meander Corner (WC)

a. What

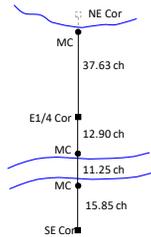
Set where:

PLSS line intersected a meanderable waterbody

In place of a regular corner that fell in a meanderable waterway.

Distance to a MC along the line was recorded

Marking & accessory req same as for a regular corner.



II. What Once Was Lost

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C. CORNER TYPES

4. Meander Corner (WC)

b. Use in Corner Restoration

Section 6-30 of the 2009 Manual:

"When recovered, meander corners normally control both alignment and proportionate measurement along the line, as any corner of first order."

Wis Attorney General's opinion 66 Wis. Op. Atty. Gen. 261, 1977 (OAG 74-77):

"According to Wis case law, a meander corner is considered inferior to a regular corner and would control only direction."

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C. CORNER TYPES

4. Meander Corner (WC)

c. Bottom line

Which method to use?

Atty Gen Opinion is not a binding law
 BUT
 His opinion does cite case law which supports direction only role of MCs.

Should use Wisconsin Method.



II. What Once Was Lost

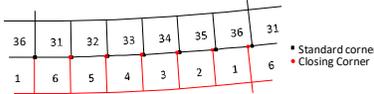
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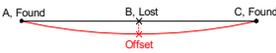
C. CORNER TYPES

5. Curved Lines

Some E/W lines laid out as curves



Should offset re-est'd corner to south if applicable.



II. What Once Was Lost

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C. CORNER TYPES

5. Curved Lines

How much to offset?

Depends on:

- dist between SPM control corners
- dist along the line between the control corners
- latitude of the line



Offset	Dist, ft
O ₁	3.4
O ₂	5.4
O ₃	6.1
O ₄	5.4
O ₅	3.4

Excel workbook to compute offset is seminar webpage

II. What Once Was Lost

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D. LIMITED CONTROL

1. Three-Point Control
2. Two-Point Control
3. One-Point Control
4. Meanwhile, Back in Wisconsin

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D. LIMITED CONTROL

Limited Control?
 Lost corner originally tied to fewer corners than needed to re-est it by SPM or DPM
 or
 All controlling corners are lost on one side of needed control.
 Must use record information to re-est corner

II. What Once Was Lost

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D. LIMITED CONTROL

1. Three-Point Control (3PC)
 DPM situation; control lacking to one side
 SPM in direction of sufficient control, set temp pt
 In other direction use cardinal record to set second temp pt
 Re-est corner at intersection of True E/W & N/S lines thru temp pts.

II. What Once Was Lost

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D. LIMITED CONTROL

2. Two-Point Control (2PC)
 DPM situation; control lacking on one N/S and one E/W side
 In both directions use cardinal record to set temp pts.
 Re-est corner at intersection of True E/W & N/S lines thru temp pts.

(c)

II. What Once Was Lost

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D. LIMITED CONTROL

3. One-Point Control (1PC)
 Lost corner only connected to one control corner.
 Lacks control on other three sides.
 Re-est at record distance and direction.

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D. LIMITED CONTROL

4. Meanwhile, Back in Wisconsin
 Because MC can't control distance proportioning what could happen:
 3PC --> 2PC
 2PC --> 1PC

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E. OTHER METHODS?

1. Irregular Boundary Adjustment
2. Combination

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E. OTHER METHODS?

Secondary

The *Manual* describes a few specialized methods. These generally evolve from specific problems encountered re-establishing lost corners.

Public Lands Surveying – A Casebook covers specific PLSS resurvey situations.

One or two may be applicable in Wis:

- Irregular Boundary Adjustment
- Combination



II. What Once Was Lost

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E. OTHER METHODS?

1. Irregular Boundary Adjustment

Applies only to Township exteriors.
Exterior line(s) is not straight *per record*

Procedure

Traverse between control corners using record dimensions.
Reduce misclosure to cardinal equivalents.
SPM in dir pf Township line
Use "Compass Rule" to determine offsets (basically, this is just a proportion).

30	29	28	27	26	25
31	32	33	34	35	36



II. What Once Was Lost

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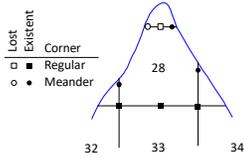
E. OTHER METHODS?

2. Combination

Basically, left to the surveyor's discretion.
If one of the other methods can't be used, maybe a combination would.

Want to re-est lost corner in a *reasonable* location.

Example: N1/4 Sec 28?



- Lost
- Existing
- Corner
- Regular
- Meander

II. What Once Was Lost

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III. PERPETUATION

A. Monumentation

B. Documentation

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A. MONUMENTATION

Physical evidence

Placement of new or additional reference marks set.

Wis Stats 60.84 Monuments (3)(c)

- Where monuments will be placed (original corners)
- Physical attributes
- Markings
- Placement depth

Wis Stats 59.74 Perpetuation of section corners, landmarks (2)(a) which describes witness monument requirements

III. DOCUMENTATION

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B. DOCUMENTATION

Written evidence

Public record of corner, accessories, how corner was re-est'd or verified.

Wis Admin Code A-E 7.08 U.S. public land survey monument record

- Under what conditions a written record must be filed.
- Approved format and required content.
- Addendum requirements

Should be sufficient information so subsequent user knows:
what the physical marker is and how to find it,
corner lineage

III. DOCUMENTATION

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B. DOCUMENTATION

Written evidence

Wis Admin Code A-E 7.08 U.S. public land survey monument record

(b) A description of any record evidence, monument evidence, occupational evidence, testimonial evidence or any other material evidence considered by the surveyor, and whether the monument was found or placed.

(c) Reference ties to at least 4 witness monuments ...

(d) A plan view drawing depicting the relevant monuments and reference ties which is sufficient in detail to enable accurate relocation of the corner monument if the corner monument is disturbed.

III. DOCUMENTATION

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B. DOCUMENTATION

Written evidence

Wis Admin Code A-E 7.08 U.S. public land survey monument record

(f) Whether the corner was restored through acceptance of an obliterated evidence location or a found perpetuated location.

(g) Whether the corner was re-established through lost-corner-proportionate methods.

(h) The directions and distances to other public land survey corners which were used as evidence or used for proportioning in determining the corner location.

Pretty much covers it all, huh?

III. DOCUMENTATION

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