

# OSU Surveying Workshop

**NSRS2007 in Minnesota and Oregon**

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# NSRS2007 in MN and OR

- NGS completed National Adjustment on Feb 10, 2007
- Utilized 302171 unique vectors in USA
- Utilized 67693 unique stations in USA
- Utilized 31000 unique vectors in MN
- Utilized 7094 unique stations in MN
- Utilized 3462 unique vectors in OR
- Utilized 751 unique stations in OR

# NSRS2007 in Minnesota

- National Adjustment
  - Revealed problem areas
  - Improved overall consistency
  - Removed state-to-state biases
  - Relaxed project-to-project biases

# NSRS2007 in Minnesota

- Overall results in MN
  - Small shifts overall
- See Table on next slide
  - 3 cm in SW MN
  - 1 cm in NW MN
- OR shifts (last slide)

# NSRS2007 in Minnesota

Horiz Shift Meters	
Amount	Number
0.00	12
0.01	2494
0.02	2707
0.03	1514
0.04	156
0.05	58
0.06	13
0.07	3
0.08	2

Horiz Shift Meters	
Amount	Number
0.09	5
0.10	0
0.11	3
0.12	0
0.13	1
0.14	1
0.15	2
0.16	2
0.17	0

Horiz Shift Meters	
Amount	Number
0.18	0
0.19	0
0.20	0
0.21	0
0.22	0
0.23	0
0.24	0
0.25	1
0.26	0

# NSRS2007 in Minnesota

- Picture tells the story
  - Green is Good
  - Red is Less Good



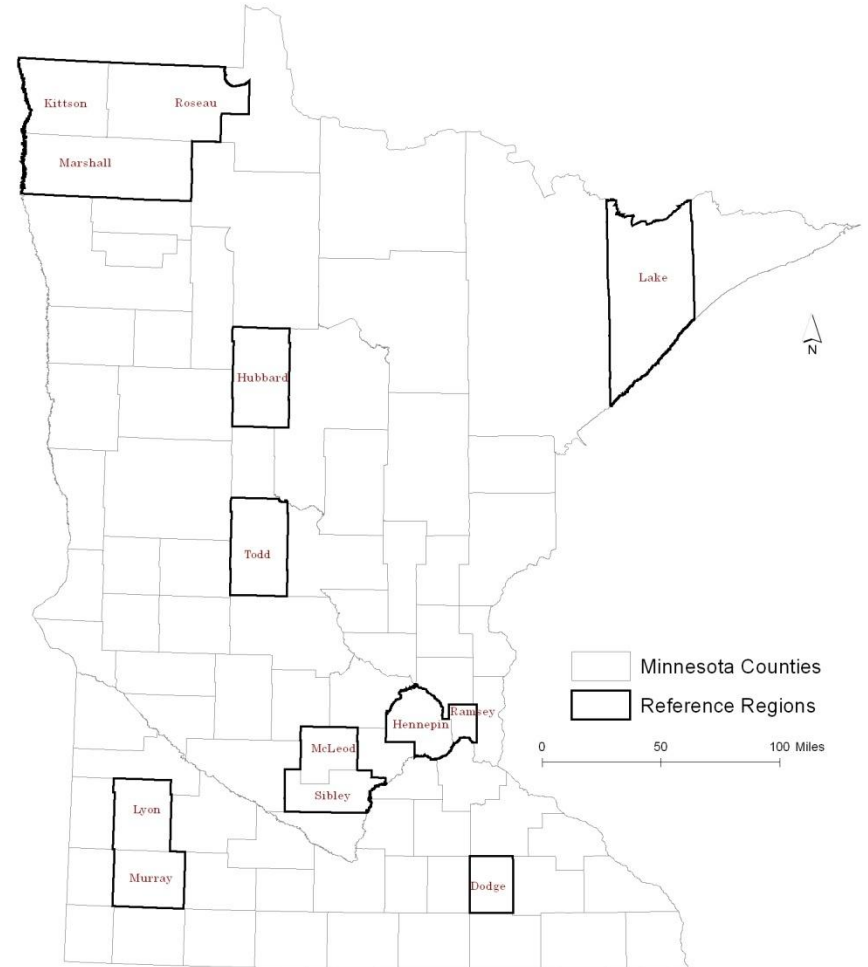
●	0.000 - 0.020	5213
○	0.021 - 0.040	1670
●	0.041 - 0.060	71
●	0.061 - 0.248	21

# NSRS2007 in Minnesota

- Some “Aberrant” Shifts
- Due to inadequate control prior to HARN
- Even these are small shifts (see individual county)
- Detailed Graphic Portrayals

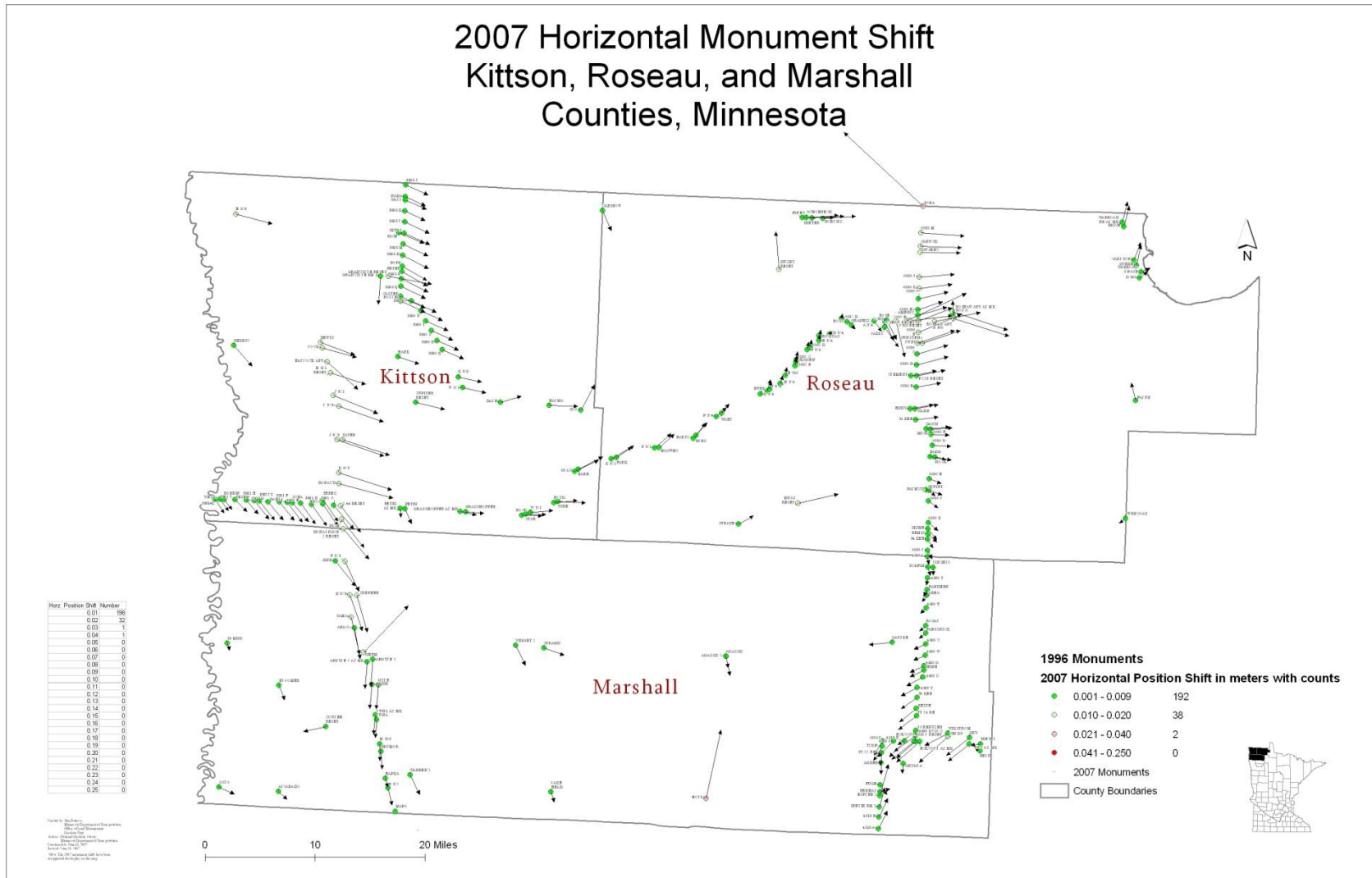
# NSRS2007 in Minnesota – Detail Reference Map

## 2007 Horizontal Monument Shift Reference Map



# NSRS2007 in Minnesota – Kittson, Roseau, Marshall Counties

2007 Horizontal Monument Shift  
Kittson, Roseau, and Marshall  
Counties, Minnesota

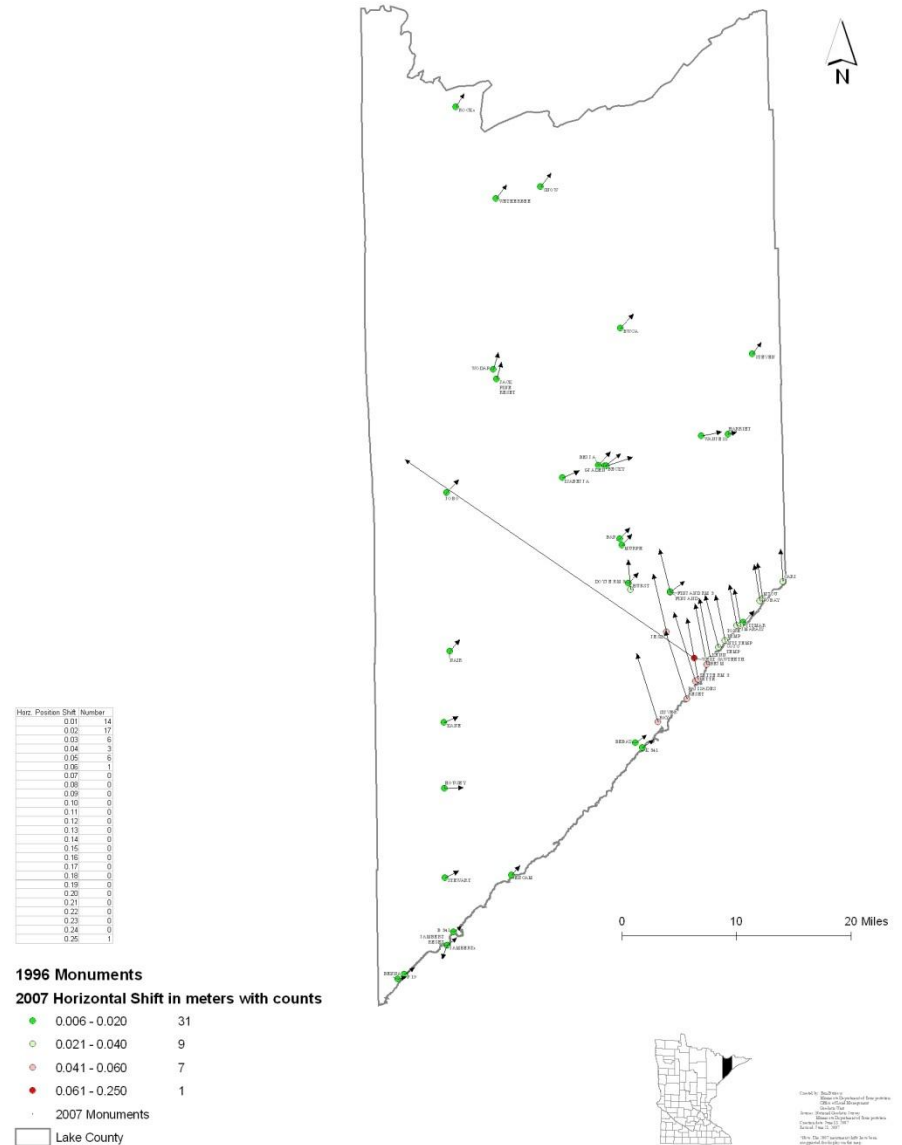


Horz. Position Shift Number	Count
0.01	986
0.02	32
0.03	1
0.04	1
0.05	0
0.06	0
0.07	0
0.08	0
0.09	0
0.10	0
0.11	0
0.12	0
0.13	0
0.14	0
0.15	0
0.16	0
0.17	0
0.18	0
0.19	0
0.20	0
0.21	0
0.22	0
0.23	0
0.24	0
0.25	0

# NSRS2007 in Minnesota - Lake County

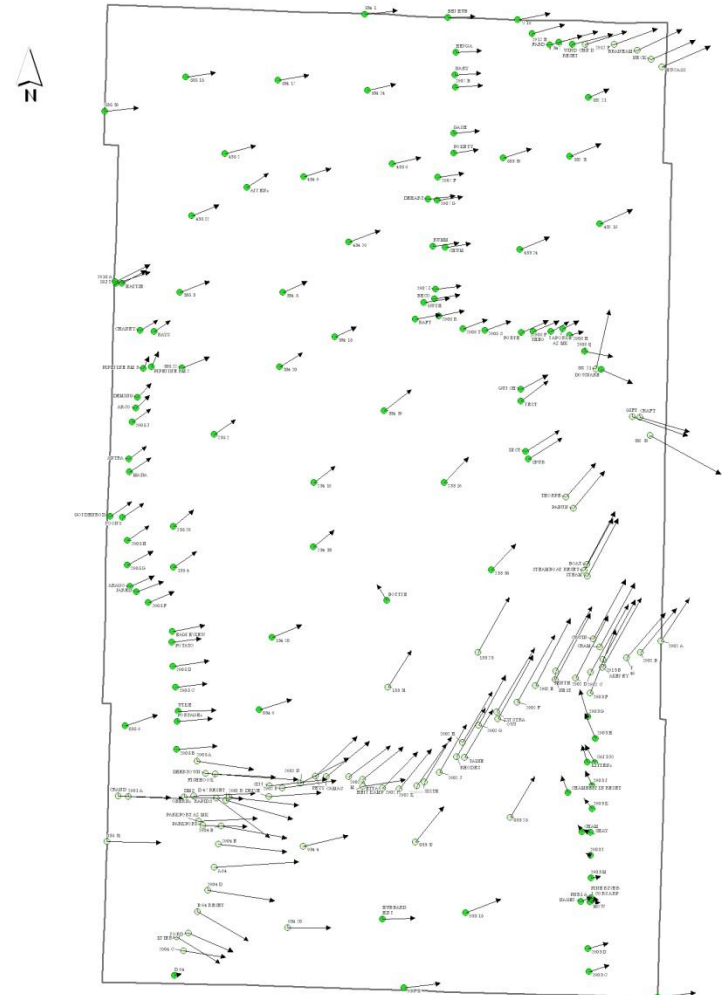


## 2007 Horizontal Monuments Shifts Lake County, Minnesota

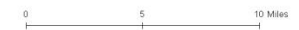


# NSRS2007 in Minnesota - Hubbard County

## 2007 Horizontal Monument Shift Hubbard County, Minnesota



- 1996 Monuments**
- 2007 Horizontal Position Shift in meters with counts**
- 0.000 - 0.009 115
  - 0.010 - 0.020 75
  - 0.021 - 0.040 0
  - 0.041 - 0.250 0
- 2007 Monuments
- ▭ Hubbard County



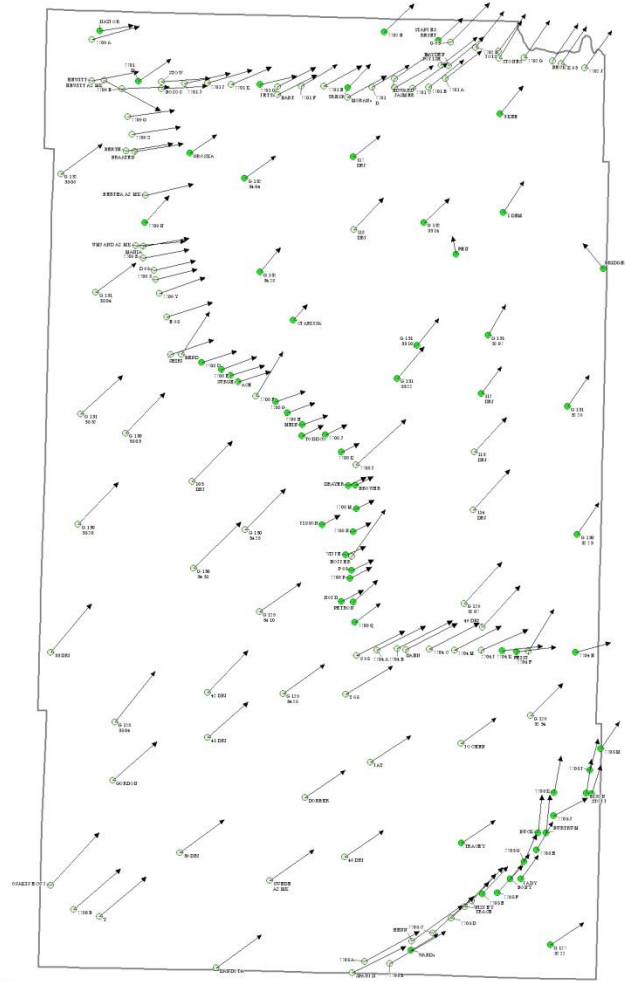
Horiz. Position Shift	Number
0.01	125
0.02	66
0.03	0
0.04	0
0.05	0
0.06	0
0.07	0
0.08	0
0.09	0
0.10	0
0.11	0
0.12	0
0.13	0
0.14	0
0.15	0
0.16	0
0.17	0
0.18	0
0.19	0
0.20	0
0.21	0
0.22	0
0.23	0
0.24	0
0.25	0



Created by: Buckwalter  
 Name of the Department of the project:  
 National Geodetic Survey  
 Title: National Geodetic Survey  
 Author: National Geodetic Survey  
 Date: 2007-08-10  
 Version: 1.0  
 Note: The 2007 horizontal shift data is from  
 unprocessed GNSS observations.

# NSRS2007 in Minnesota – Todd County

## 2007 Horizontal Monument Shifts Todd County, Minnesota



1996 Monuments

2007 Horizontal Position Shift in meters with counts

- 0.004 - 0.009 64
- 0.010 - 0.016 95
- 0.017 - 0.040 0
- 0.041 - 0.250 0
- 2007 Monuments

Todd County

0 5 10 Miles

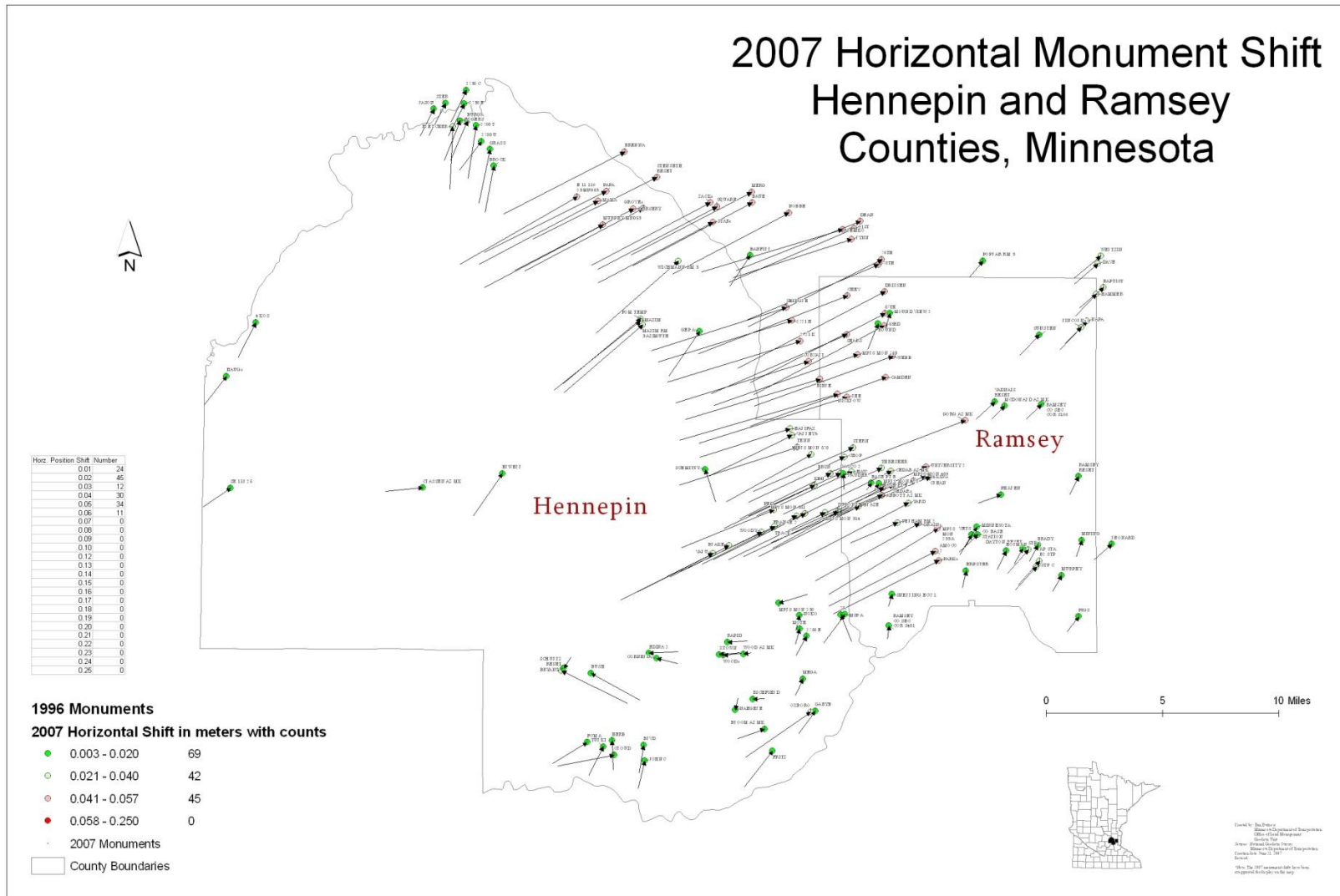


Horizontal Position Shift Number	Count
0.01	89
0.02	70
0.03	0
0.04	0
0.05	0
0.06	0
0.07	0
0.08	0
0.09	0
0.10	0
0.11	0
0.12	0
0.13	0
0.14	0
0.15	0
0.16	0
0.17	0
0.18	0
0.19	0
0.20	0
0.21	0
0.22	0
0.23	0
0.24	0



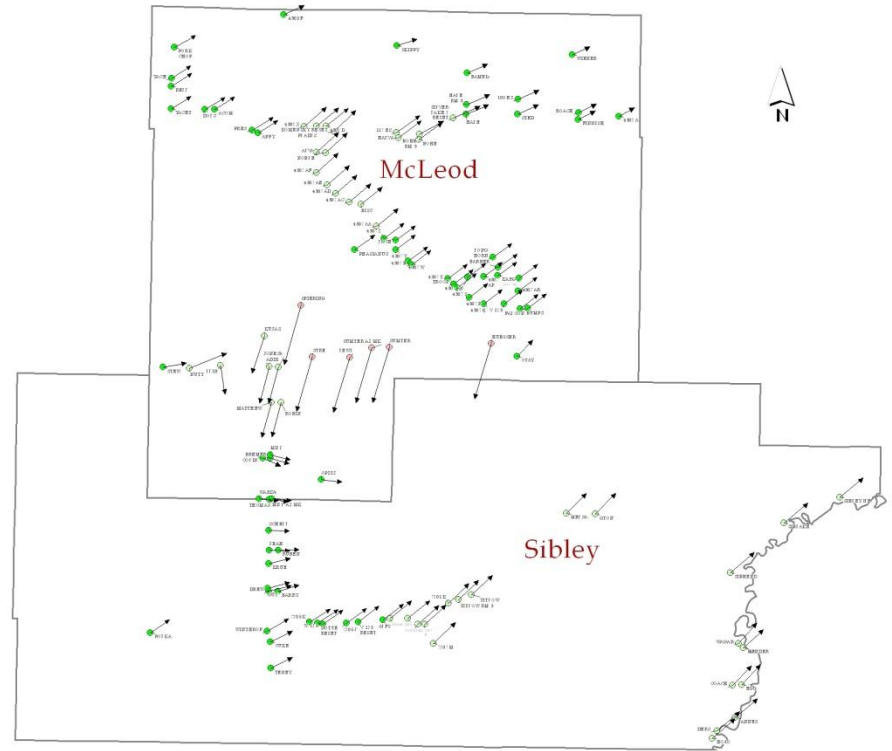
# NSRS2007 in Minnesota – Hennepin, Ramsey Counties

## 2007 Horizontal Monument Shift Hennepin and Ramsey Counties, Minnesota



# NSRS2007 in Minnesota – McLeod, Sibley Counties

## 2007 Horizontal Monument Shifts McLeod County and Sibley County, Minnesota



**1996 Monuments**

**2007 Horizontal Position Shift in meters with counts**

- 0.014 - 0.020 66
- 0.021 - 0.031 44
- 0.032 - 0.048 6
- 0.049 - 0.250 0

- 2007 Monuments
- Sibley and McLeod Counties

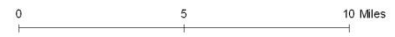
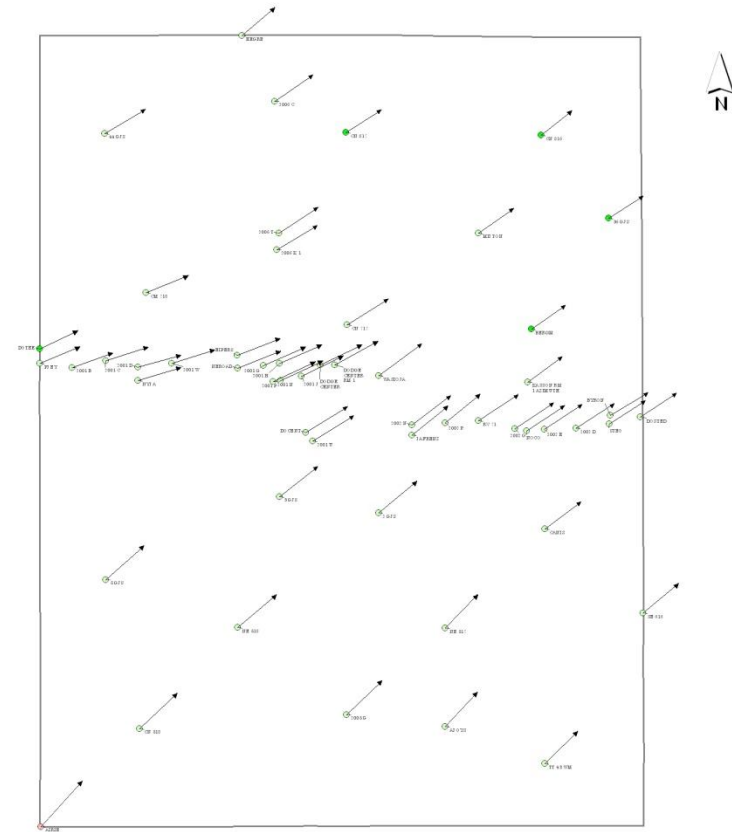
Horz. Position Shift	Number
0.01	0
0.02	66
0.03	42
0.04	2
0.05	6
0.06	0
0.07	0
0.08	0
0.09	0
0.10	0
0.11	0
0.12	0
0.13	0
0.14	0
0.15	0
0.16	0
0.17	0
0.18	0
0.19	0
0.20	0
0.21	0
0.22	0
0.23	0
0.24	0
0.25	0



Created by: Bob Moxley  
 Revised to incorporate data updates  
 Date: 01/20/2008  
 Author: Bob Moxley  
 Contact: Bob Moxley, 202555-5000  
 Email: Bob.Moxley@noaa.gov  
 Note: The 2007 horizontal shift data is from  
 unprocessed GNSS observations.

# NSRS2007 in Minnesota - Dodge County

## 2007 Horizontal Monument Shifts Dodge County, Minnesota



**1996 Monuments**

**2007 Horizontal Position Shifts in meters with counts**

- 0.019 - 0.020 5
- 0.021 - 0.026 49
- 0.027 - 0.040 1
- 0.041 - 0.250 0

○ 2007 Monuments

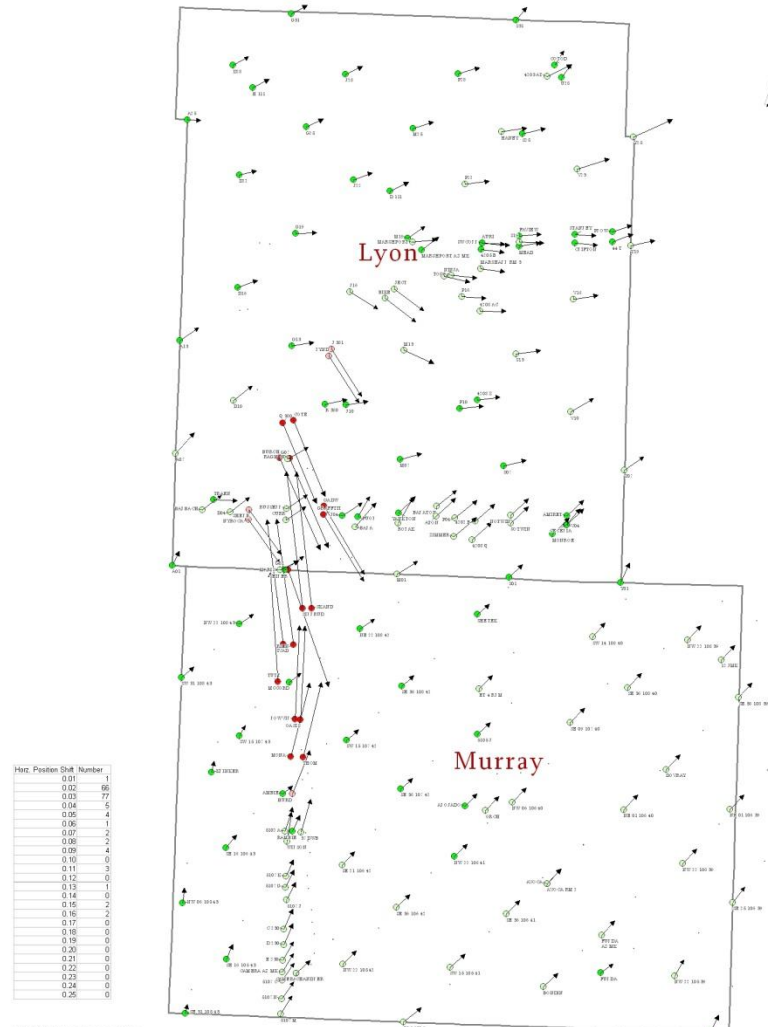
□ Dodge County

Horiz. Position Shift Number	Count
0.01	0
0.02	5
0.03	50
0.04	0
0.05	0
0.06	0
0.07	0
0.08	0
0.09	0
0.10	0
0.11	0
0.12	0
0.13	0
0.14	0
0.15	0
0.16	0
0.17	0
0.18	0
0.19	0
0.20	0
0.21	0
0.22	0
0.23	0
0.24	0
0.25	0



# NSRS2007 in Minnesota - Lyon, Murray Counties

## 2007 Horizontal Monument Shifts Lyon and Murray Counties, Minnesota



1996 Monuments	
Horiz. Position Shift	Number
0.01	1
0.02	66
0.03	77
0.04	5
0.05	4
0.06	1
0.07	2
0.08	2
0.09	4
0.10	0
0.11	3
0.12	0
0.13	1
0.14	0
0.15	2
0.16	0
0.17	0
0.18	0
0.19	0
0.20	0
0.21	0
0.22	0
0.23	0
0.24	0
0.25	0

2007 Horizontal Shift in meters with counts	
● 0.010 - 0.020	67
○ 0.021 - 0.040	82
○ 0.041 - 0.060	5
● 0.061 - 0.250	16
○ 2007 Monuments	
□ County Boundaries	



Created by: Rick Hertz  
 Revised by: geodetic@noaa.gov  
 Date: 08/20/2008  
 Contact: Rick Hertz  
 Email: geodetic@noaa.gov  
 Phone: 301-713-3333  
 Note: The 2007 horizontal shift data is from  
 geodetic@noaa.gov

# NSRS2007 in Minnesota

- Overall NE'ly shift caused by removal of state-to-state bias in National Adjustment
- Internal Aberrant shifts caused by legacy control prior to HARN (isolated cases)
- Only 21 shifts exceed 0.06 meters

# NSRS2007 in Minnesota

- How to Implement?
  - Do not 'mix' the 1996 with 2007
    - Mixing will 'add' 2-3 cm of uncertainty to an otherwise good survey!
  - If low-accuracy survey, then maybe 'mixing' is OK, but now metadata issues arise
  - Both adjustments are still NAD83 Datum and shifts are small, so the real question of 'mixing' is whether the shift is within the acceptable accuracy tolerance of the survey

# What About Shifts in OREGON

- I can't analyze the complete set of shifts for Oregon
- I can summarize a few scattered around the State
- OR situation is probably similar to MN
- Only 751 comparisons are possible

PID	DESIGNATION	COUNTY	D_LAT (m)	D_LON (m)
QE2269	E 141	BENTON	0.094	-0.036
QE2614	E 324	LINCOLN	0.114	-0.074
RD1617	EPF 10	CLACKAMAS	0.065	-0.035
DF9366	FAIRVIEW PARK	KLAMATH	0.063	-0.008
NX0131	G 118	LAKE	0.054	0.008

# Questions

- Download
  - NSRS Shift Maps
  - Geodetic History In MN
  - Other useful items
- <http://www.olmweb.dot.state.mn.us/tech/technology.html>
- David Zenk
- 651-366-3523
- dave.zenk@noaa.gov