North Dakota's Bridge Health

North Dakota Local Technical Assistance Program

March 10, 2021 – TSP2 Bridge Preservation

NORTH Dakota | Transportation
Be Legendary.

U.S. Department of Transportation
Federal Highway Administration

Dale C. Heglund, North Dakota LTAP Director
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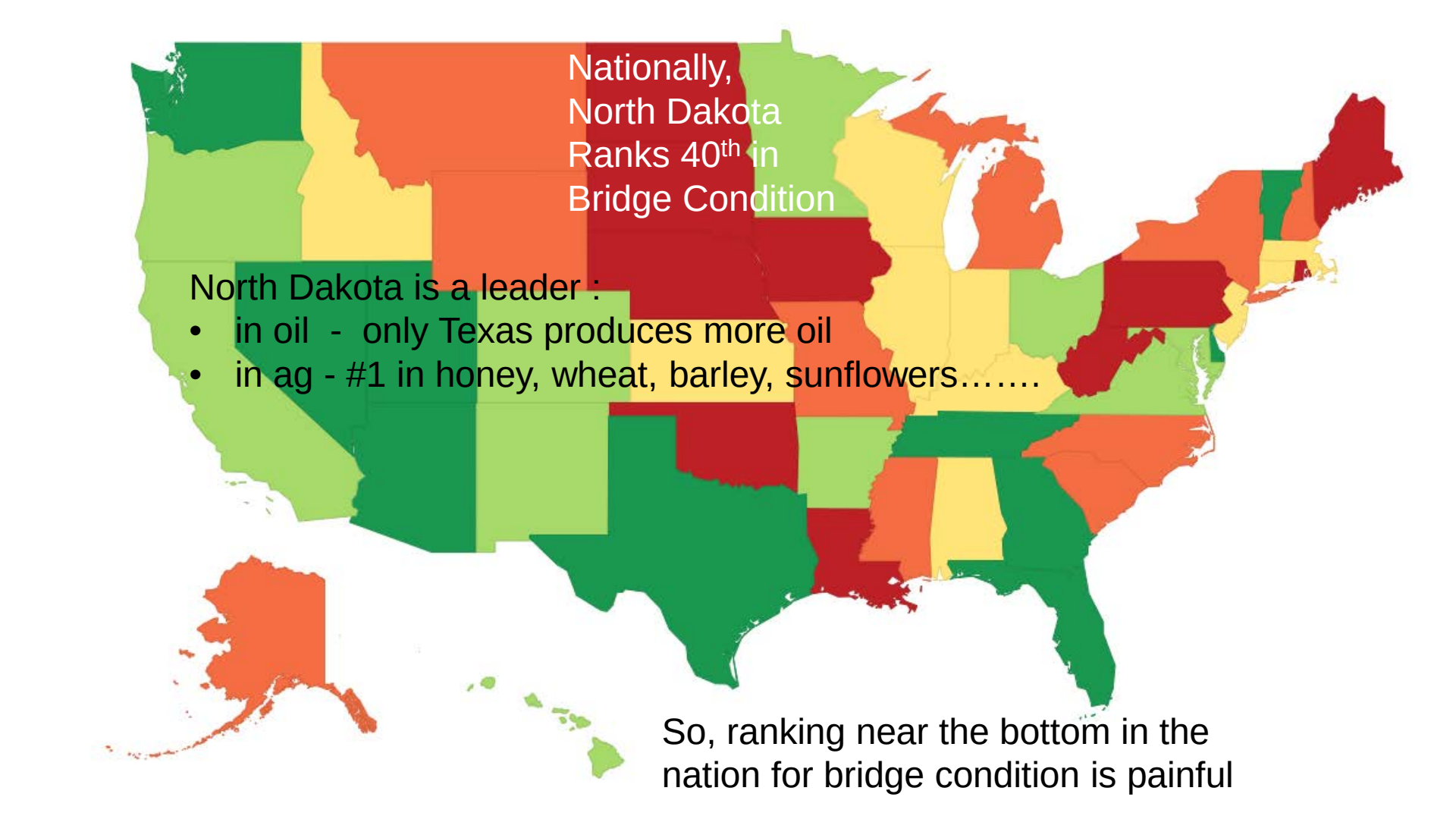
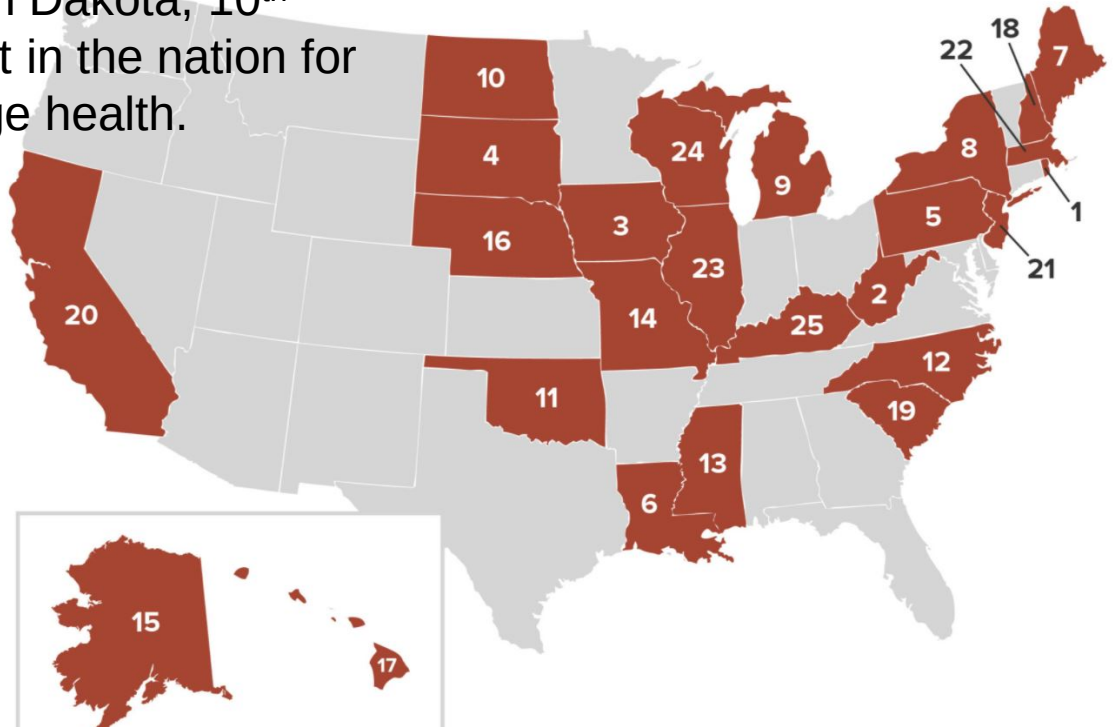
NDSU
UPPER GREAT PLAINS TRANSPORTATION INSTITUTE
NORTH DAKOTA LOCAL TECHNICAL ASSISTANCE PROGRAM


Nationally,
North Dakota
Ranks 40th in
Bridge Condition
North Dakota is a leader :
• in oil - only Texas produces more oil
• in ag - #1 in honey, wheat, barley, sunflowers…….
So, ranking near the bottom in the
nation for bridge condition is painful

TOP 25 STATES WITH HIGHEST PERCENTAGE OF POOR/STRUCTURALLY DEFICIENT RURAL BRIDGES

North Dakota, 10th worst in the nation for bridge health.



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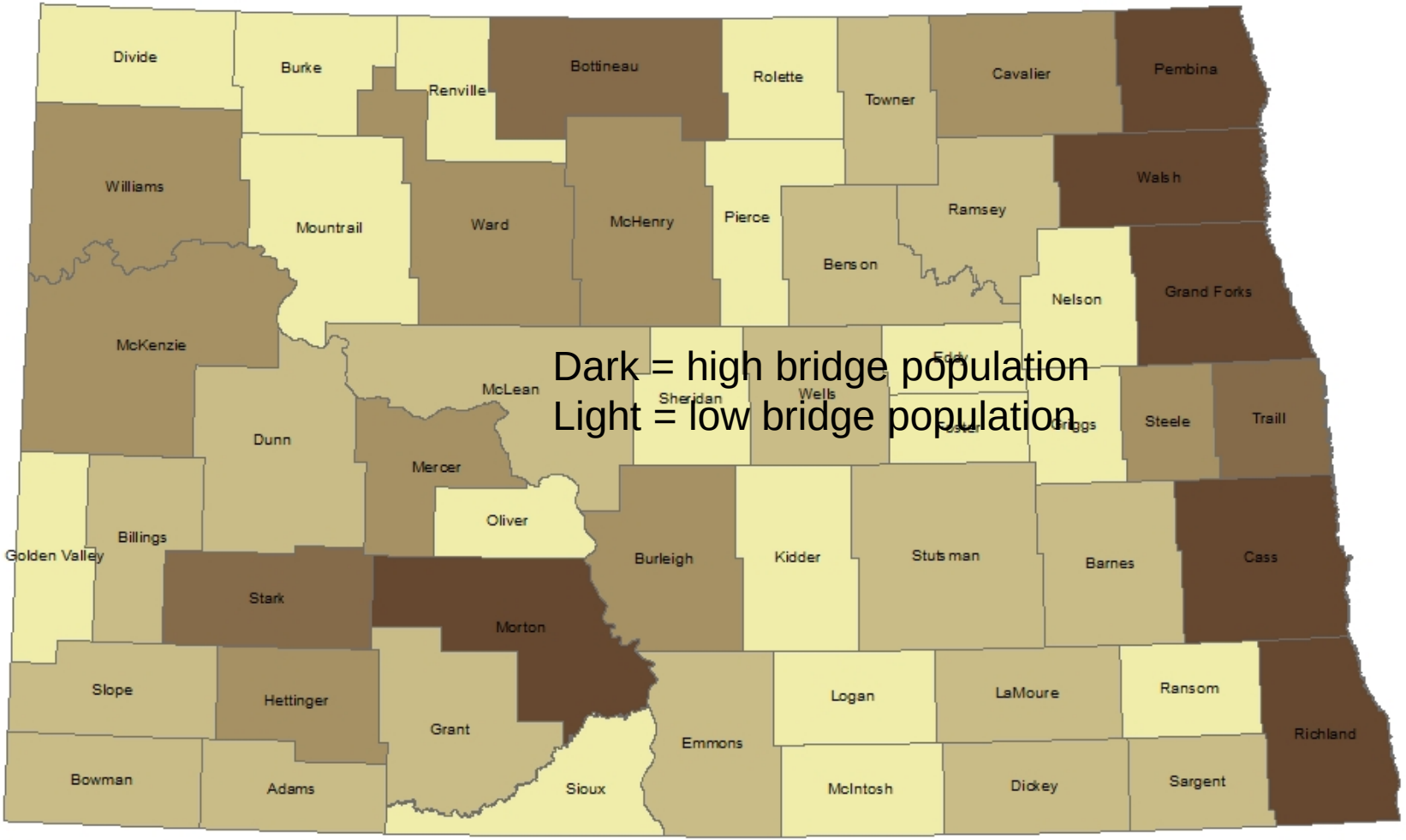
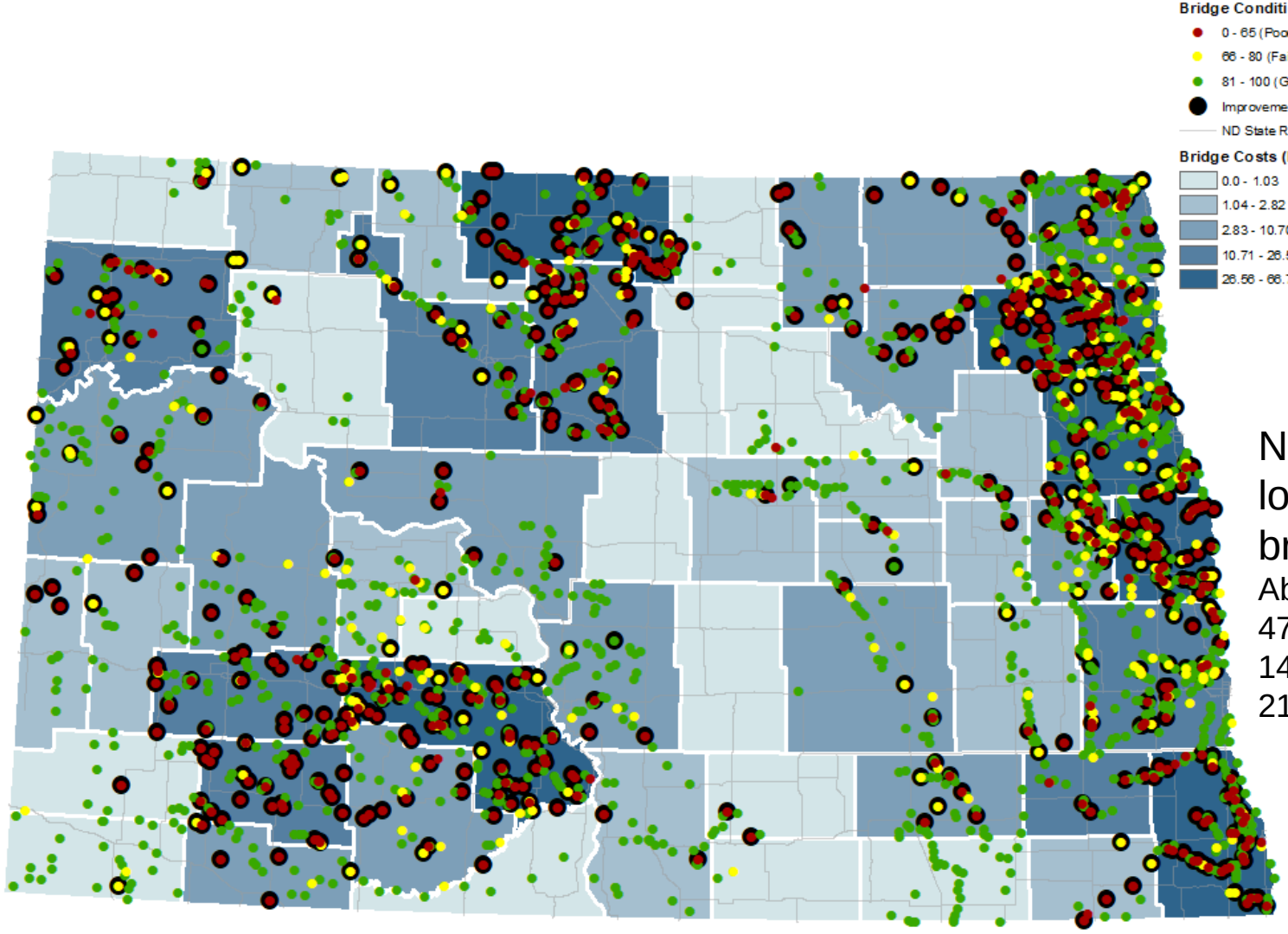

Divide
Burke
Renville
Bottineau
Rolette
Towner
Cavalier
Pembina
Williams
Mountrail
Ward
McHenry
Pierce
Ramsey
Walsh
Benson
Nelson
Grand Forks
McKenzie
McLean
Sheridan
Wells
Eddy
Foster
Griggs
Steele
Traill
Dunn
Mercer
Oliver
Billings
Golden Valley
Burleigh
Kidder
Stutsman
Barnes
Cass
Stark
Morton
Slope
Hettinger
Grant
Emmons
Logan
LaMoure
Ransom
Richland
Bowman
Adams
Sioux
McIntosh
Dickey
Sargent
Dark = high bridge population
Light = low bridge population



North Dakota local roadway bridge info:

About 3,100 bridges

47% good

14% poor

21% posted

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TRANSPORTATION LEARNING NETWORK

A partnership with MDT•NDDOT•SDDOT•WYDOT
and the Mountain-Plains Consortium Universities

Safety Inspection of In-Service Bridges - Pre-Season Tips and Advice

Presented by:

Drew Garceau, P.E., CWI, Steven Miller, P.E. &
Terry Browne, PE, CSP

COLLINS ENGINEERS INC.

Our partners:

MOUNTAIN-PLAINS CONSORTIUM

MONTANA MDT DEPARTMENT OF TRANSPORTATION

NORTH Dakota Be Legendary. | Transportation

South Dakota DOT Connecting South Dakota and the Nation

WYOMING TRANSPORTATION DEPARTMENT

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TRANSPORTATION LEARNING NETWORK

Information for this class was provided in part by the NDDOT, UGPTI, NDLTAP, MDOT, MnDOT and TRB.
With contributions from Nancy Huether, NDDOT, Nick West, Grand Forks County, and Andrew Wrucke, West Fargo.

Bridge 201

Devils Lake – Jun 22, 2021
Watford City – June 24, 2021

Bryon Fuchs, PE
Local Government, NDDOT

Dale C. Heglund, PE/PLS
Program Director, NDLTAP

Join Us!

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Innovative Bridge Design & Repair Concepts Project

- Sponsored by the US Soybean Transportation Coalition
- Based in Ankeny, Iowa
- Administrative Director, Mike Steenhoak

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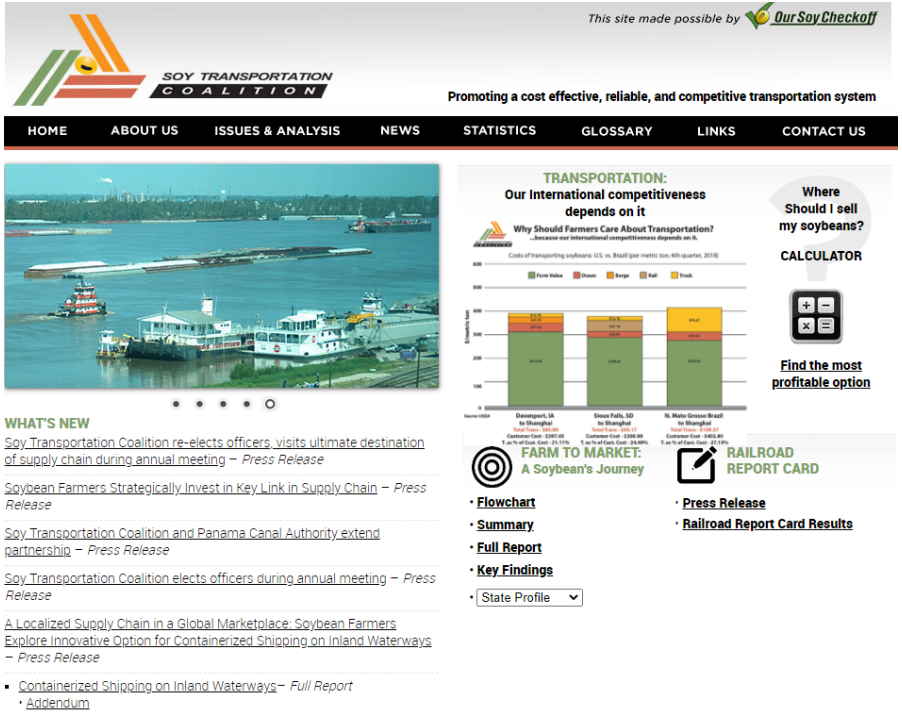
soytransportation.org



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Reasons for this study

- US Rural Roads & Bridges - $211 B backlog
- Reduce the number of bridges with load limits
- Provide options for rehab and reconstruction

Goals

- Highlight current concepts that work
- ‘Top 20 List’ of design and repair concepts
- Encourage innovative solutions

Bridge Brainstorming Team

Study group members:

- Brian Keierleber, Buchanan, Co. – Iowa
- Pat Conner – Indiana LTAP, Purdue Univ.
- Kelly Bengtson – NDSU UGPTI/NDLTAP
- Andrew Peterson - SDLTAP

SOY TRANSPORTATION COALITION

NEWS RELEASE

1255 SW Prairie Trail Parkway • Ankeny, Iowa 50023
515-727-0665 • www.soytransportation.org
Funded by the soybean checkoff

Date: January 22, 2021
Contact: Mike Steenhoek,
Executive Director
515-727-0665
msteenhoek@soytransportation.org

Iowa Soybean Farmers Partner with Bridge Engineers to Enhance Rural Bridge Evaluation and Management

Ankeny, Iowa – Iowa farmers depend upon rural bridges to efficiently deliver their soybeans or other commodities to the local elevator or processing facility. The structural integrity of this infrastructure is essential to farmer profitability. Unfortunately, a significant number of rural bridges in Iowa are load restricted, requiring vehicles transporting

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The bridge innovations report

Railroad Flat Car Bridges

Railroad flatcars can be an attractive option for bridge superstructures – particularly for lower volume roads. Railroad flatcar bridges are quick and easy to install; can be placed on existing abutments; are available in a variety of lengths; require minimal maintenance; and are very economical. The availability of retired railroad flat cars can fluctuate and should be considered. Railroad flatcars utilized for bridges should be designed to accommodate 80 or more tons per car. Railroad flatcar bridges do not require more frequent inspection.

Cost Savings: 50% – 60%

COST PER BRIDGE:
$120,000
vs. $275,000 – $350,000 (prevailing method)

APPLICABLE:
Low volume roads throughout rural America

STRUCTURAL INTEGRITY:
Can support loads far in excess of legal loads

CONSTRUCTION TIME:
15% – 25% faster

TIME TO CONSTRUCT:
6 weeks
vs. 7 – 8 weeks (prevailing method)

Research source(s): Iowa State University Bridge Engineering Center; https://bec.iastate.edu/research/completed/field-testing-of-railroad-flatcar-bridges-tr-498/

SOY TRANSPORTATION COALITION

Railroad Flatcars

(picture Brian Kierleber)

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Innovations in construction

Vibratory H-Piling Drivers

Cost Savings: 90%
Cost per bridge (to drive 10 piling, e.g.): $2,000 vs. $25,000 – $40,000 (prevailing method)
Applicable: Most types of soils, including sands and clays
Structural Integrity: Equal to prevailing method
Construction time: 50% faster
Time to construct (to drive 10 piling, e.g.): 4-6 hours vs. two days (prevailing method) (picture – Buchanan Co.)

Top 10 Bridge Design Concepts

- Rail Flat Car Bridges:https://iowadot.gov/research/reports/Year/2007/abstracts/tr498%20Tech%20Transfer.pdf; http://www.operationsresearch.dot.state.ia.us/reports/ihrb_by_number/tr400plus.html
- Vibratory H-Piling Drivers: https://www.hindawi.com/journals/sv/2017/7236956/#abstract; https://iowaltap.iastate.edu/bridge-innovation-and-demo-days-webinar-day-2/
- Buried Soil Structures: http://onlinepubs.trb.org/onlinepubs/webinars/160623.pdf
- GRS-IBS (Fabric Abutments): https://www.fhwa.dot.gov/engineering/geotech/grs_ibs.cfm
- All Steel Piers: https://journals.sagepub.com/doi/full/10.1177/1687814017709936
- Galvanized H-Piling: https://galvan-ize.com/2018/05/23/galvan-delivers-galvanized-h-piles-to-eastern-western-nc/
- Press Brake Tub Girders: ftp://ftp.mtri.org/pub/MDOT_BigBridges/Proceedings%20of%20the%207th%20NYC%20Bridge%20Conference%20-%20Durability%20of%20Bridge%20Structures/Part%202%20-%20Bridge%20Analysis%20&%20Design%20-%20Chapter%206-11/Chapter%208%20-%20Development%20of%20a%20shallow%20press%20brake%20formed%20tub%20girder.pdf
- Galvanized Steel Beams: https://www.fhwa.dot.gov/bridge/steel/pubs/hif16002/volume19.pdf
- Pre-stressed Deck Panels (see attachment)
- Inverted T Beam

Top 10 Bridge Repairs

- Bridge Repair Innovations
- Piling Encasements: https://intrans.iastate.edu/app/uploads/2018/09/pile_assessment_tool_t2.pdf
- Concrete Pier Piling Repairs: https://www.goodreads.com/book/show/50213190-underwater-bridge-repair-rehabilitation-and-countermeasures---marine-c
- Driving Piling Through Decks: https://www.fhwa.dot.gov/engineering/geotech/pubs/hif17044.pdf
- Epoxy Deck Injections: https://intrans.iastate.edu/app/uploads/2019/02/bridge_deck_epoxy_injection_process_w_cvr.pdf
- Deck Overlays with Type O Concrete and Plasticizers: https://www.fhwa.dot.gov/publications/research/infrastructure/bridge/17097/17097.pdf
- Deck Patching: https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=3106&context=jtrp
- Thin Polymer Concrete Overlays: https://wisconsindot.gov/documents2/research/12-06-2nd-final-report.pdf
- Penetrating Concrete Sealers: https://docs.lib.purdue.edu/jtrp/1628/
- Spot Cleaning Painting Steel Beams: https://www.nap.edu/read/25089/chapter/5
- Concrete Overlay on Adjacent Box Beams: https://www.fhwa.dot.gov/publications/research/infrastructure/structures/bridge/17093/001.cfm; https://docs.lib.purdue.edu/jtrp/1720/

South Dakota
LTAP
Local Transportation Assistance Program

Greg Vavra

SDLTAP Program Manager

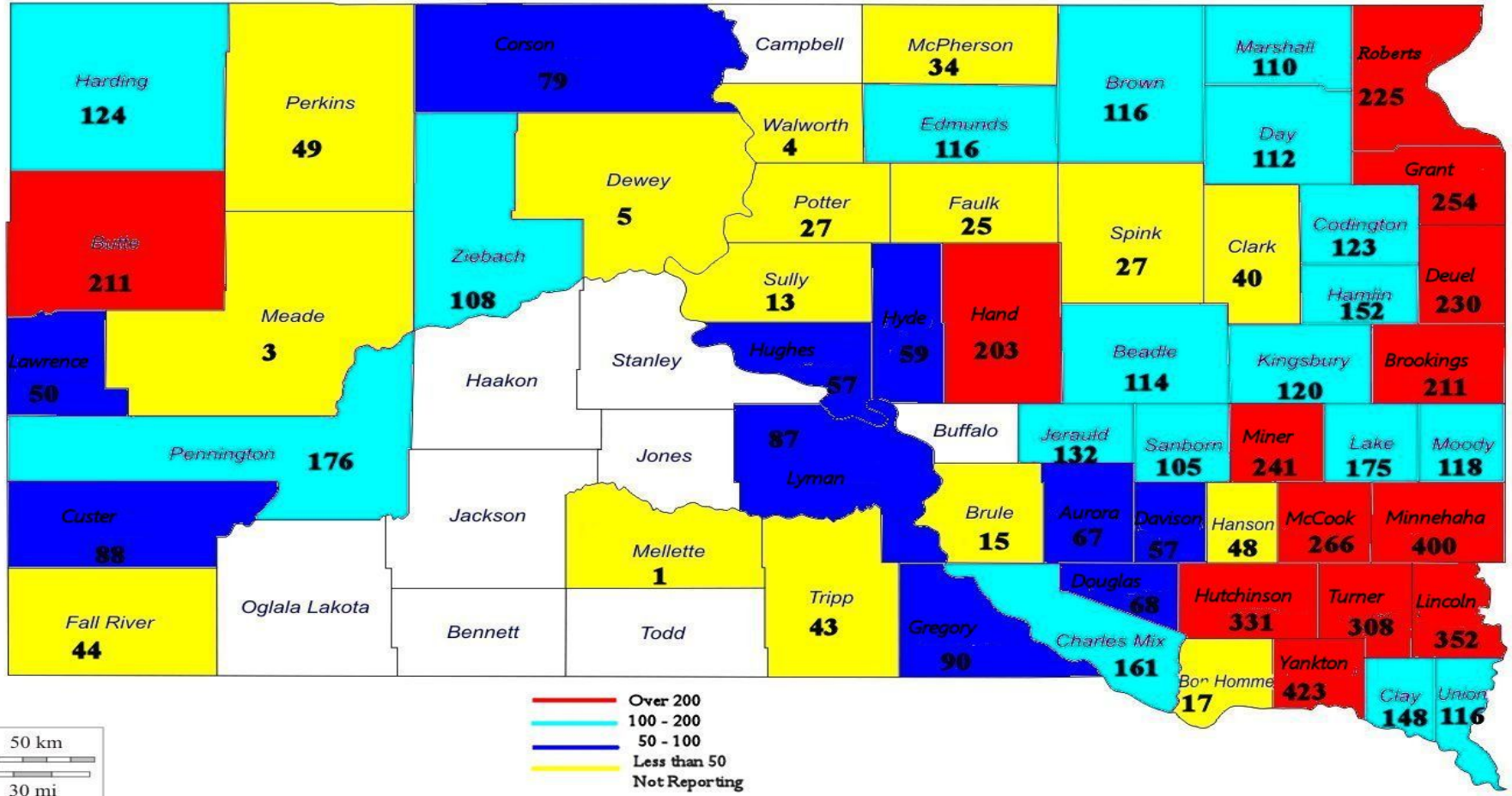
605-688-5601

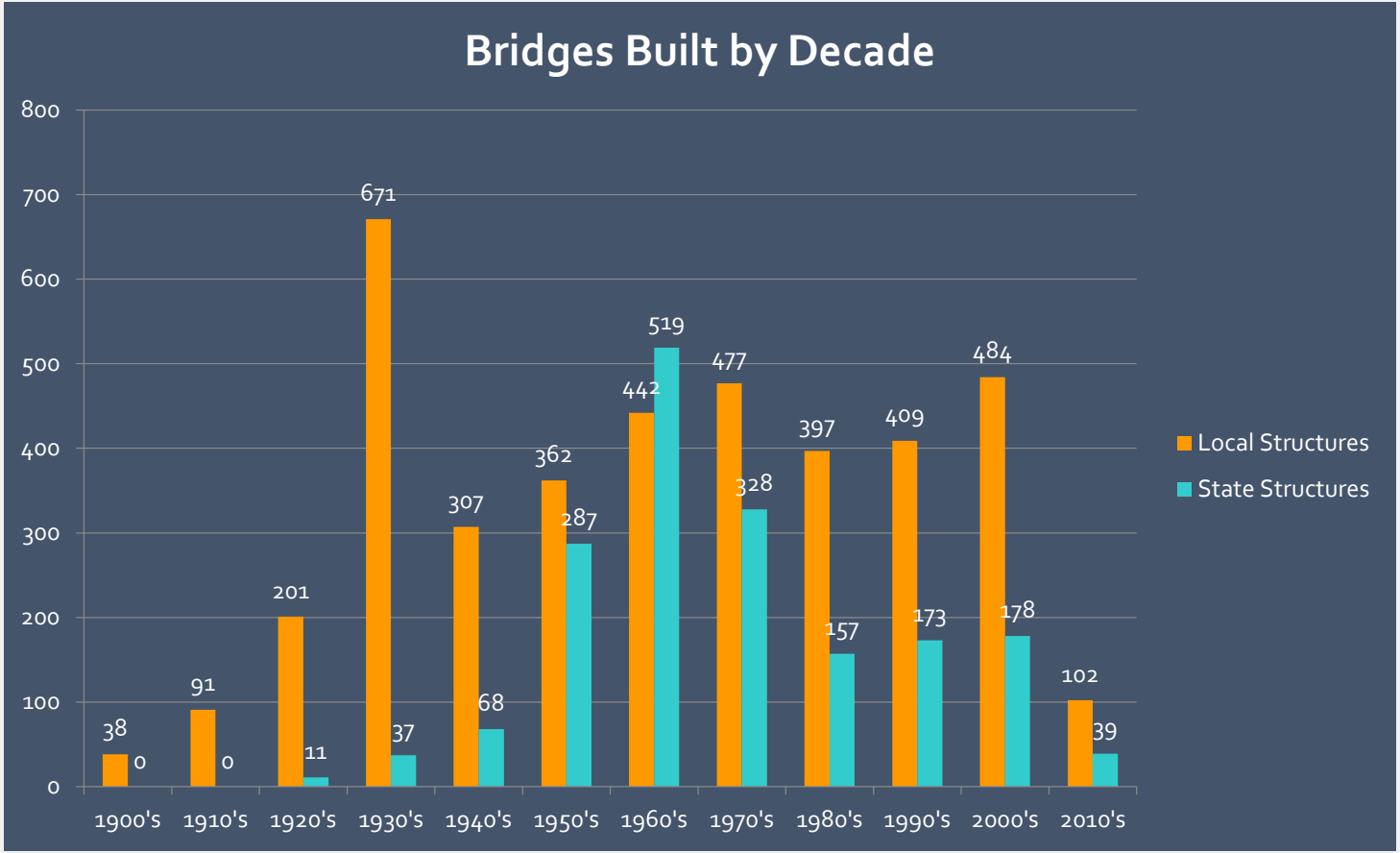
gregory.vavra@sdstate.edu

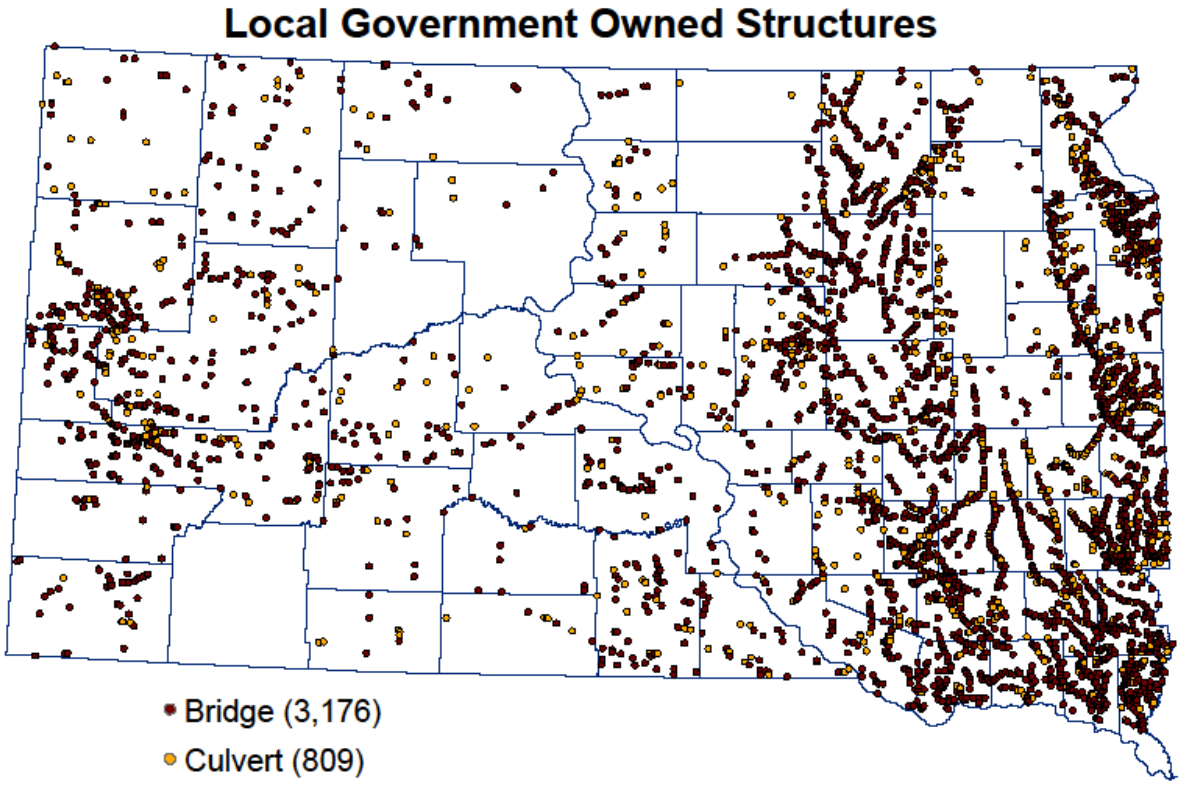
Local Structures on Primary

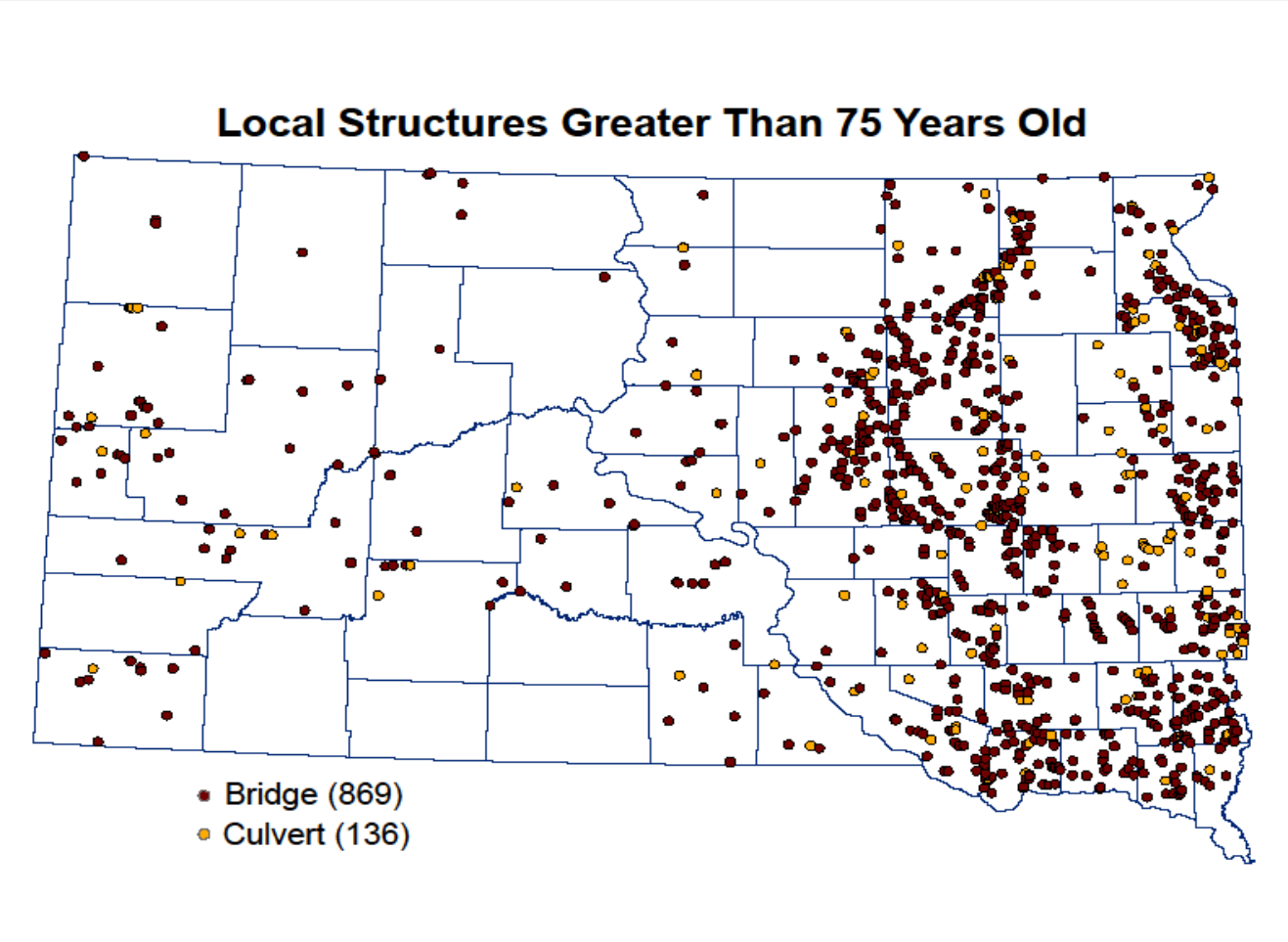
- Total structures 3923
- Poor condition (Replacement eligible) 959
- Total closed 93
- Posted for weight 978
- New structures (past 5 years) 235
- Greater than 75 years 1050
- Greater than 100 144

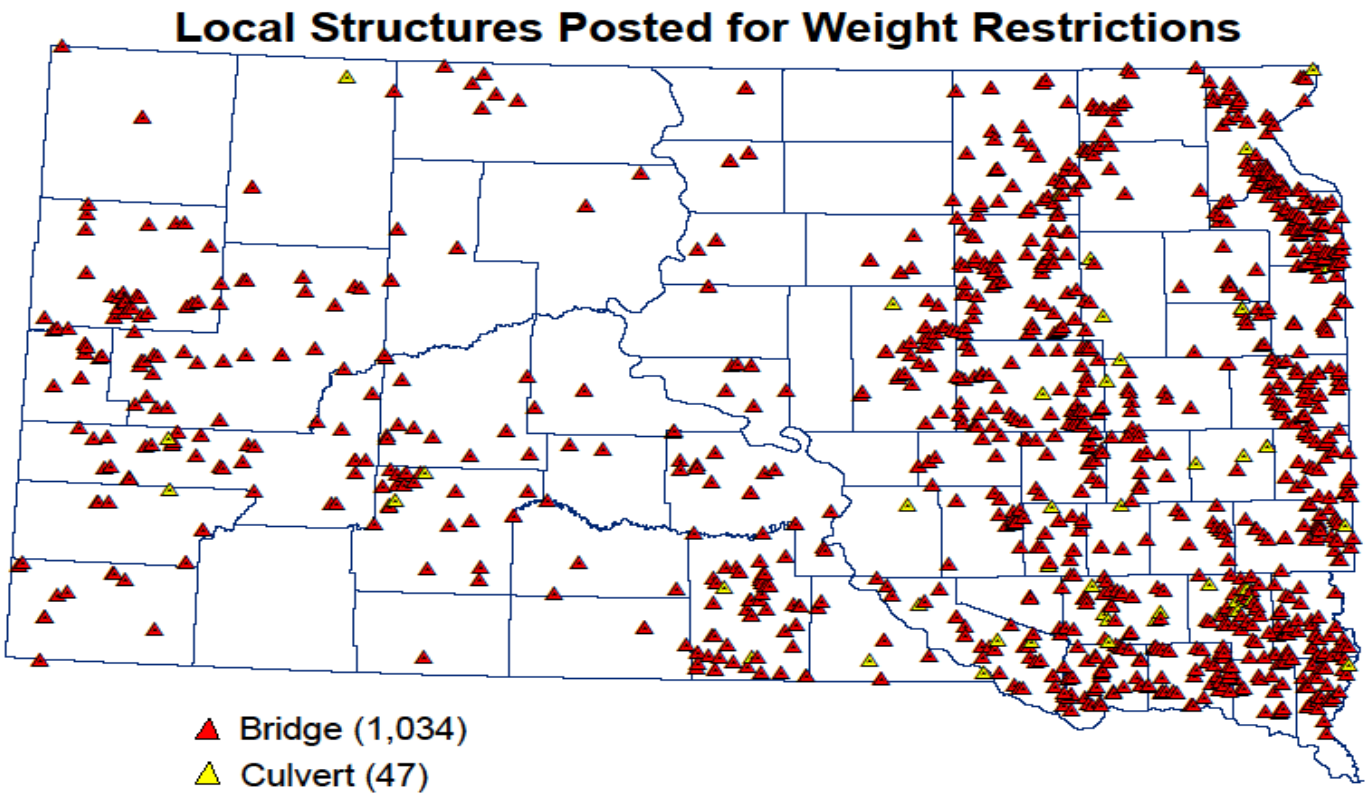
2016 INVENTORY OF SMALL STRUCTURES AND LARGE CULVERTS ON TOWNSHIP AND COUNTY SECONDARY ROADS



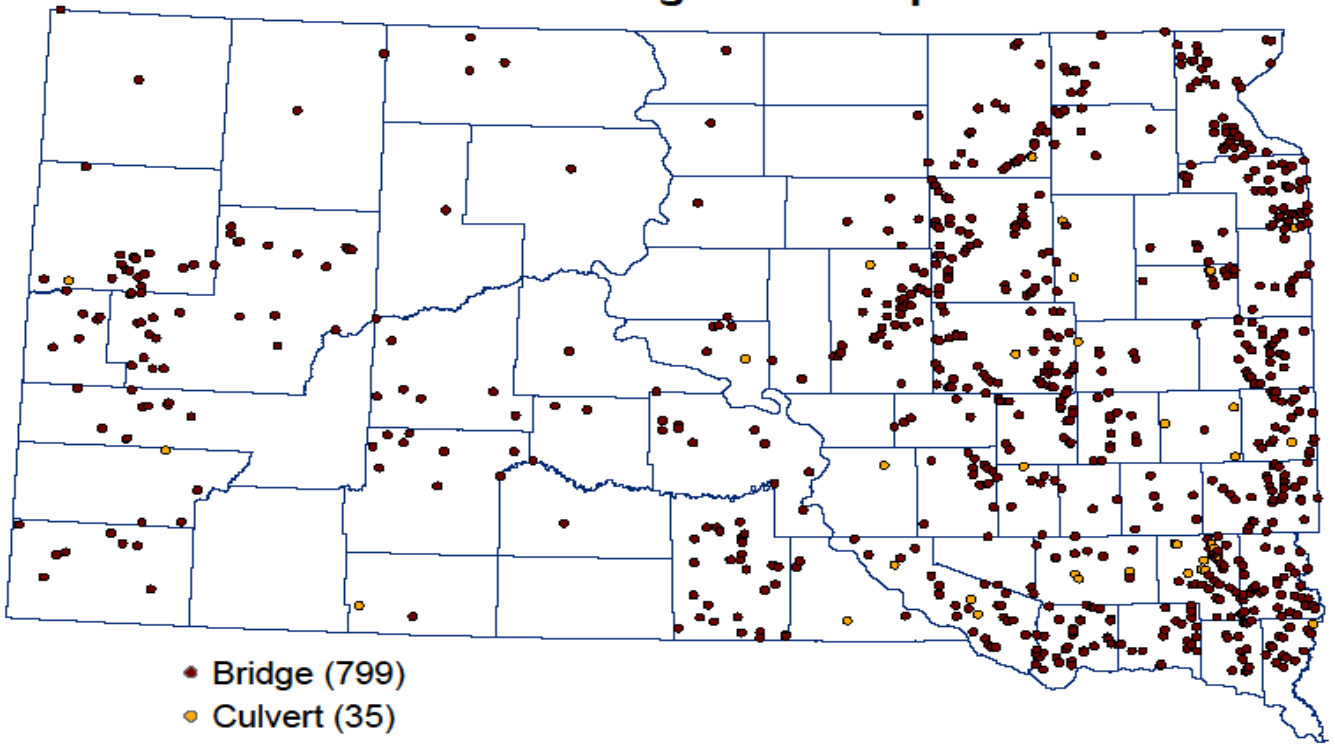

Bridges Built by Decade
800
700
600
500
400
300
200
100
0
1900's
1910's
1920's
1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
38
0
91
0
201
11
671
37
307
68
362
287
442
519
477
328
397
157
409
173
484
178
102
39
Local Structures
State Structures

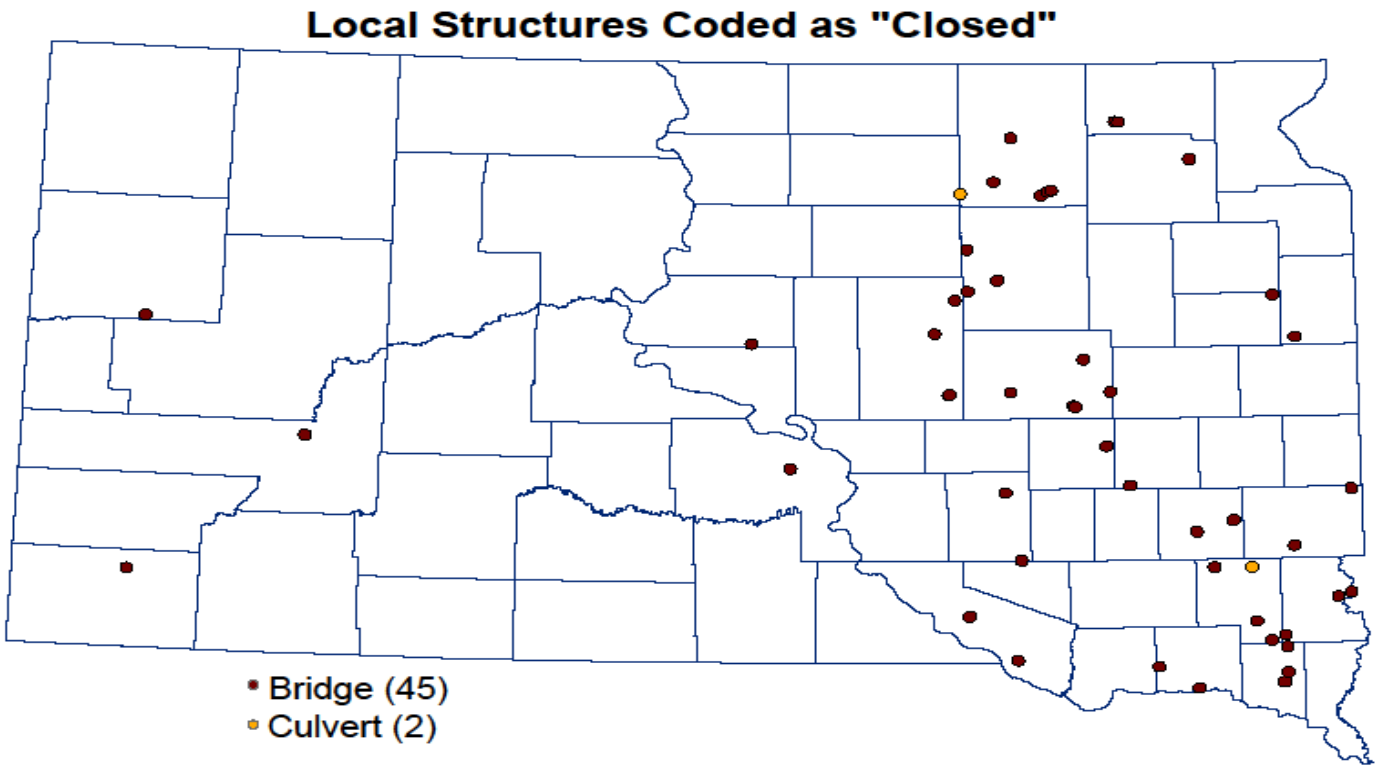

Local Government Owned Structures
Bridge (3,176)
Culvert (809)


Local Structures Greater Than 75 Years Old
Bridge (869)
Culvert (136)


Local Structures Posted for Weight Restrictions
Bridge (1,034)
Culvert (47)

Local Structures Eligible for Replacement




Local Structures Coded as "Closed"
Bridge (45)
Culvert (2)

SMALL STRUCTURE/LARGE CULVERT INVENTORY

Ranking Based on Number of Structures

October 11, 2016 Data

Counties (66)	Ranking by # of Structure	Structure Total	Reporting TWPS
Aurora	37	67	20
Beadle	27	114	16
Bon Homme	51	17	12
Brookings	11	211	9
Brown	24	116	44
Brule	52	15	9
Butte	12	211	
Charles Mix	16	161	21
Clark	46	40	10
Clay	18	148	12
Codington	21	123	12
Corson	35	79	
Custer	33	88	
Davison	39	57	7
Day	28	112	27
Deuel	9	230	12
Dewey	54	5	
Douglas	36	68	7
Edmunds	25	116	18
Fall River	44	44	
Faulk	50	25	9
Grant	7	254	17
Gregory	32	90	22
Hamlin	17	152	12
Hand	13	203	31
Hanson	43	48	5
Harding	20	124	
Hughes	40	57	
Hutchinson	4	331	14
Hyde	38	59	15
Jerauld	19	132	15
Kingsbury	22	120	7
Lake	15	175	15
Lawrence	41	50	
Lincoln	3	352	13
Lyman	34	87	15
Marshall	29	110	13
McCook	6	266	16
McPherson	47	34	4
Meade	56	3	2
Mellette	57	1	1

Counties (Continued)	Ranking by # of Structures	Structure Total	Reporting TWPS
Miner	8	241	16
Minnehaha	2	400	23
Moody	23	118	9
Pennington	14	176	10
Perkins	42	49	15
Potter	48	27	
Roberts	10	225	28
Sanborn	31	105	8
Spink	49	27	7
Sully	53	13	
Tripp	45	43	12
Turner	5	308	19
Union	26	116	9
Walworth	55	4	
Yankton	1	423	15
Ziebach	30	108	
		7078	633

Counties Not Reporting:
(9)

Bennett
Buffalo
Campbell
Haakon
Jackson
Jones
Oglala Lakota
Stanley
Todd