

GLWESS Drain cost study progress report
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June 30, 2014

1. Introduction

In this portion of the GLWESS project we aim to estimate the total number of miles of agricultural drains in Michigan and the total cost of sediment removal from these drains in an effort to determine the potential efficiency gains if drain assessments could be better targeted toward those land users who are responsible for sediment loading to the drains. Our tasks include the following:

1. Calculate statewide budget for drain management activities (based on information from drain commissioners)
2. Determine portion of the total budget allocated for sediment removal
3. Calculate the monetary value per ton of sediment
4. Develop recommendations for efficiency gains
5. Present findings to Michigan Association of County Drain Commissioners

Our deliverable for June 30, 2014 is to address only the first item on this list but we address the first three items. In this report we document the steps we have taken and explaining the reasons for proceeding as we did; we report our findings and discuss their implications and our proposed next steps under the project

In February 2014, we began contacting drain commissioners in Southwest Michigan, Southeast Michigan, and in the Saginaw Bay watershed region. We asked them for information on the total number of miles of drains in their county and on their annual budget for drain management. (To extrapolate the cost of removing sediment from the total budget requires knowing the number of miles of drains.)

This exercise proved to be rather futile, partly because many drain commissioners do not have these figures readily at hand and partly because many of them are not inclined to share it, even if it is meant to be publicly accessible information. After meeting with knowledgeable people – particularly Larry Protasiewicz of Spicer Engineering, a prominent firm that contracts with drain commissioners – we developed an approach that will give us a rough estimate of the number of miles of drains and the total statewide budget for drain maintenance. We explain all of this below.

2. Initial effort to collect information from drain commissioners

As mentioned above, we contacted numerous drain commissioners to request budget and other information, and did not receive a great deal of useful feedback. One drain commissioner, Evan Pratt of Washtenaw County, took great interest in our work and explained to us that the task we were pursuing was not likely to work as we were doing it. He referred us to Larry Protasiewicz, who provided a lot of helpful ideas and estimates of information we were seeking.

Estimating the number of miles of drains is not easy for drain commissioners because accurate records are not kept. We learned from Larry Protasiewicz that Ingham County, which has one of

the better funded and managed drain commissioner's offices in the state, recently undertook an effort to count the number of miles of drains in the county. They thought they had 1,179 county drains but after an inventory that took several years to complete they realized they only had 487 drains – this gives a clear signal that counting drains and miles of drains is more difficult than we had expected. We also learned from Michael Gregg, the Director of Intercounty Drains for the Michigan Department of Agriculture and Rural Development, that although he believes there are about 35,000 miles of county and intercounty drains in Michigan, these numbers are only a rough estimate and in his words there is a desperate need to conduct an inventory. This is a complex process, and he said that the Michigan Association of County Drain Commissioners has or is about to receive a grant from the US Geological Service not to conduct this inventory but merely to determine what it would take to conduct such an inventory. So clearly it is beyond our capability to undertake this task.

We also learned from Larry Protasiewicz and Mike Gregg that drain commissioners are not always inclined to share information about their budget, and that it is very difficult for them to disaggregate the numbers into what is used for drain maintenance as opposed to other things. They do not maintain their records in this way, so they do not necessarily have records they can share even if they are inclined to do so. As a result, our inquiry to drain commissioner offices yielded a lot of blank spots in our table, as can be seen below in Attachment 3.

3. Alternative approach that we pursued

Larry Protasiewicz suggested approaches for estimating the number of miles of drains and the cost of removing sediment.

3.1. Budget for drain maintenance

The budget for drain maintenance – our actual deliverable for this period – is not feasible to obtain for reasons mentioned above. Larry Protasiewicz advised us that we are much better off using a rough estimate from knowledgeable people like himself. He manages so many drain maintenance and construction projects that he has a good sense of the average costs attributable to drain maintenance, sediment removal, construction, replacement of infrastructure, etc.

For maintenance projects, costs can vary from about \$5,000 to \$35,000 per mile, but the latter is for drains that have not been maintained in decades and contain trees and other debris that must be removed. He estimated that if maintenance is done approximately every 20 years, then the figure of \$5000/mile is appropriate for maintenance costs. In such maintenance projects, the costs will likely be divided into one half for sediment removal and one half for brush and vegetation removal.

If sediment control accounts for one half of this cost, this implies a cost specifically for sediment control of about \$2500 per mile every 20 years, or around \$125/mile annually if costs are not discounted. His estimate of the amount of soil that this accounts for is about one cubic yard of soil for every three feet of drain length (the base of the drain is about 7 feet and the depth of sediment is about 1.5 feet, so 10.5 cubic feet per foot, close to a yard (27 cubic feet) for three feet of length. One yard of sediment weighs about 1.5 tons (dry), so the weight of sediment removed

from a mile of drain is around 2600 tons per mile. This means that a ton of sediment costs about \$1 to remove (around \$2500 for around 2600 tons).

These are obviously rough estimates, and we plan to ask other knowledgeable people for their estimate as we proceed.

3.2. Counting the miles of drains

Larry Protasiewicz suggested that the best way to gain a rough estimate of the number of miles of drains in the state is using GIS, because surface drains show up on maps and in fact work has already been done to identify them on readily available GIS images. It is not possible using this approach to distinguish county and intercounty drains from private drains, but it is possible to distinguish drains running through agricultural land from those running through urban areas. This distinction will always be rough because of the large area of peri-urban land where agricultural and residential lands are interspersed.

Jason Piwarski of the Institute of Water Research at MSU has undertaken an initial effort on this GIS work.

Data sources:

Data sources for this exercise are as follows:

- The stream network data that was used was the USGS National Hydrography Dataset (NHD) High Resolution Dataset, 2013, specifically features that were assigned the value "Canal/Ditch" in their attribute table.
- The landcover dataset was the USGS National Landcover Dataset (NLCD) for 2011.
- Drain selection criteria: canals/ditches with 25% or more cultivated crops within a 100m buffer of the feature. All other landcover classes were ignored, including pasture.
- Urban areas were excluded by using Census Urban Boundaries. (This dataset was found to better represent urban areas than political boundaries, which we also considered using.)

The count of drain features does not necessarily represent the number of drains in a county; the number might be close to the actual number of drains in the county, but it really represents how the drains were digitized when the dataset was being created. Also, the GIS analysis cannot distinguish county and intercounty drains from private drains. County and intercounty drains are the only ones that drain commissioners have jurisdiction over.

We have some concern that some features that are actually drains appear to have been classified as streams, so the number of miles of agricultural drains presented here may be an underestimate.

Findings:

The map of the GIS output (Attachment 1) shows that the vast majority of agricultural drains are

located in western Lake Erie, southwestern Michigan, Saginaw Bay and the Thumb.

Attachment 2 shows that the total number of miles of drains in the GIS estimate is 15,102. In our conversation with Mike Gregg, he said that the total length of county and intercounty drains in the state is believed to be about 35,000. This number includes drains in urban areas, which we intentionally excluded, and it also includes subsurface drains that GIS cannot detect and that were not part of what we were examining in this task. We do not know the breakdown of surface and subsurface drains in Mike Gregg's estimate. Accordingly it is difficult to compare Mike Gregg's estimate of 35,000 miles of total surface and subsurface drains with our estimate of 15,102 miles of agricultural surface drains.

If we apply the estimate of \$125/mile for annual sediment removal (\$2500 over 20 years), it yields the total statewide annual cost of \$1,887,750 for 15,102 miles of drains, and \$4,375,000 for 35,000 miles of drains. These numbers are rather low considering that many county drain commission offices have annual budgets exceeding \$2,000,000. It implies that even if it were possible to double the efficiency of drain assessments through better targeting, the total savings would only be a few million dollars. This is unlikely to be sufficient to gain the attention of policymakers.

On the other hand, these are initial estimates and we need to explore these issues further. One issue that raises questions is that drain commission offices have very large annual budgets, much larger than our initial estimate of maintaining drains in agricultural areas. Can it really be the case that the budget for drain maintenance is only a small fraction of the overall budget of any given Office of the Drain Commissioner? Our investigation does not include urban areas and it does not include construction of new drains, and it assumes that the drains that are being maintained have only been unmaintained for 20 years. In actual fact, managing urban drains and constructing new drains are extremely expensive, as is maintaining agricultural drains that have not been maintained for much longer than 20 years. From this perspective it might be that our numbers are reasonable. But certainly we should be careful before we draw too many conclusions from our work so far.

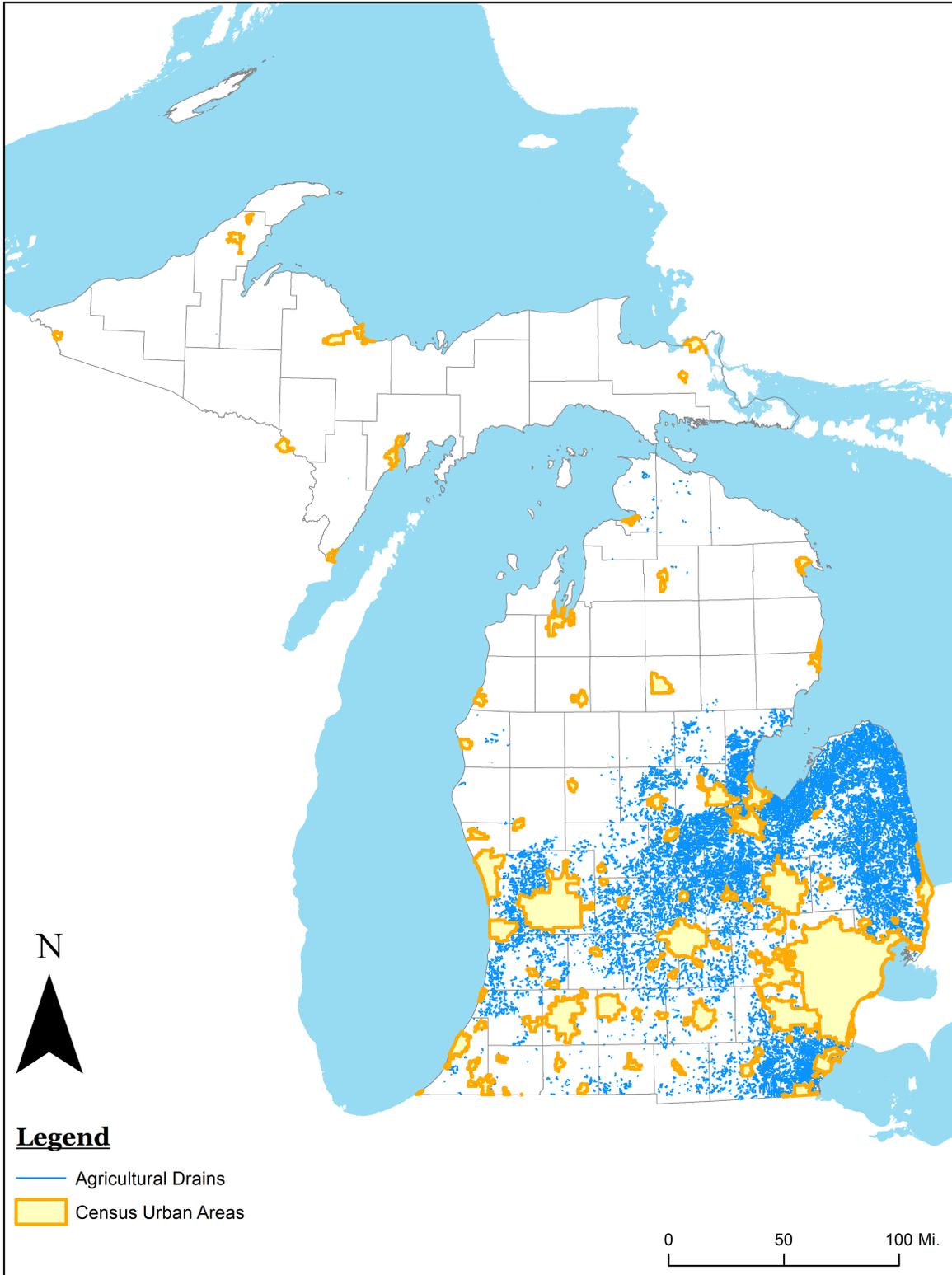
Proposed next steps

Although our findings are rough, it does not appear that there would be a large monetary gain from improved targeting of drain assessments. Savings from more efficient assessments probably would have to be vastly greater to stimulate serious debate about changing the Drain Code. The job of drain commissioners is to maintain drains so that they remove excess water from agricultural fields, and this is the perspective from which they would view the potential efficiency gains from better targeting assessments. Many county drain commission offices have annual budgets in the millions of dollars, so an increase in efficiency in the tens of thousands or even hundreds of thousands of dollars may not be very significant to them. This is particularly the case since the office of the county drain commissioner is an elected position. Several drain commissioners have made it clear to us that the way they manage drain maintenance in their county is to do a solid job of maintaining drains in a way that is consistent with 1) the technology they have at their disposal, and 2) the political climate of their district. Changing the system of drain assessments would be a very politically contentious issue that would not certainly not gain support of all drain commissioners. We do not have a good sense of what proportion of drain commissioners would be interested in developing assessment arrangements that better reward

conservation behavior, and we do not have a good basis for knowing whether it is an issue that could gain the support of farmers.

On the other hand, we did receive a lot of interest in our work from at least one drain commissioner (Evan Pratt in Washtenaw County) and from Michael Gregg, the Director of Intercounty Drains. In addition, Joe Parman in Van Buren County is already testing an approach in which drain assessments reward farmers who pursue conservation measures. This project still remains a good opportunity to further explore drain commissioners' interest in establishing more efficient assessment protocols in which they reward landowners for good practices and make them bear more of the cost of maintaining drains if they are responsible for more of the sedimentation that enters a drain. We will have a good opportunity to explore these issues in meetings with drain commissioners that we are planning for fall 2014, possibly at the regional drain commissioner meetings that take place in October, will be a good opportunity to explore these issues.

Attachment 1. Map display of agricultural drains identified through the initial GIS analysis



Attachment 2. Rough estimate of number miles of drains in Michigan, by county, based on GIS analysis

County Name	Total Ag Drain Length (miles)	Number of Ag Drain Features in Non-Urban Areas
Alcona	0	0
Alger	0	0
Allegan	421	507
Alpena	0	0
Antrim	0	0
Arenac	173	235
Baraga	0	0
Barry	190	261
Bay	689	790
Benzie	0	1
Berrien	22	27
Branch	56	83
Calhoun	89	106
Cass	9	12
Charlevoix	1	1
Cheboygan	11	19
Chippewa	0	0
Clare	36	55
Clinton	522	525
Crawford	0	0
Delta	0	0
Dickinson	0	0
Eaton	254	267
Emmet	21	34
Genesee	190	187
Gladwin	90	107
Gogebic	0	0
Grand Traverse	0	0
Gratiot	727	747
Hillsdale	76	82
Houghton	0	1
Huron	1,645	1,818
Ingham	230	273
Ionia	370	357
Iosco	2	3
Iron	0	0
Isabella	270	273
Jackson	95	138
Kalamazoo	19	34
Kalkaska	0	0
Kent	179	241
Keweenaw	0	0

Lake	0	0
Lapeer	461	588
Leelanau	0	0
Lenawee	495	380
Livingston	107	197
Luce	0	0
Mackinac	0	0
Macomb	225	219
Manistee	0	2
Marquette	0	0
Mason	19	57
Mecosta	12	24
Menominee	0	1
Midland	251	207
Missaukee	0	0
Monroe	679	479
Montcalm	207	223
Montmorency	0	0
Muskegon	116	170
Newaygo	41	90
Oakland	4	6
Oceana	5	9
Ogemaw	5	9
Ontonagon	0	0
Osceola	1	2
Oscoda	0	0
Otsego	3	3
Ottawa	369	430
Presque Isle	1	0
Roscommon	0	0
Saginaw	1,122	1,161
St. Clair	866	960
St. Joseph	39	76
Sanilac	1,691	1,793
Schoolcraft	0	0
Shiawassee	497	613
Tuscola	1,065	1,268
Van Buren	203	328
Washtenaw	212	198
Wayne	16	36
Wexford	0	0
Michigan total	15,102	16,713

Attachment 3. Data collection table based on communication with drain commissioners, February-April 2014

County	Ag land area (acres)	% of area	Phone Number	Person You Talked to	Total miles of drains maint. in the fiscal year (2012/2013)	Total miles of agricultural drains maintained	Approx. Avg. Expenditure per mile of ag. drain maintained	Overall budget for Office of Drain Commissioner (actually spent)	% or amount of total budget spent on drain maintenance	% or amount of total spent on agricultural drain maintenance	What % of maintenance goes to sediment removal?	Other Notes:
Allegan	275,120	52	(269) 673-0440	Denise Medemar	2012	2012	2012	2012: \$1,260,130.43	2012	2012		4/1 sent email again
Arenac	94,604	41	989-846-2011	Nancy Selle								Said most of the information asked for wasn't compiled, but would like to meet in person to go over records
Barry	168,172	48			2012:00:00	2012:00:00	2012:00:00	2012: \$405,067	2012:00:00	2012:00:00		
Bay	186,256	66	989-895-4290	Joseph Rivet	2012:00:00	2012:00:00	2012:00:00	2012:00:00	2012:00:00	2012:00:00		Seemed somewhat overwhelmed, but said he could put the data together and email what he could get

						2013:00:00	2013:00:00	2013:00:00	2013:00:00	2013:00:00		
Berrien	169,016	46	(269) 983- 7111		2013:00:00	2013:00:00	2013:00:00	2012: \$2,463,865 2013:00:00	2012: \$2,096,405 2013:00:00	2013:00:00		4/4 found info online Drain commissioner returns on Tuesday
Branch	250,134	77	(517) 279- 4310	Mike Hard	2013: 20 mi	2013: 19 mi	2013: \$10,000	2013:00:00	2013: \$329,000	2013: 98%	33-50%	Mike was super nice and very wiling to help. Will help in future if need be.
Calhoun	227,994	50	(269) 781- 0790						2012: \$511,318			not available on Fridays
Cass	190,330	61	(269) 445- 4428	Bruce Campbell	2013:00:00	2013:00:00	2013:00:00	2013:00:00	2013:00:00	2013:00:00		County so small they didn't have a maintenance program
Eaton	222,215	60	(517) 543- 3809	John Perry	2013: 25 mi	33:23.7	2013: \$13,000		2013: \$350,000	2013: 95%	33-66%	John was very willing to help.
Gratiot	286,937	79	989- 875520 7	Brian Denman	1900							Is putting together information, will try to email it next week

Huron	440,967	82										
Ionia	238,435	65	(616) 527- 5373	Bruce Mulnix	2013: 23.3 mi	2013:00:00	2013: \$3,000	2013:00:00	2013: \$68,421	2013:00:00	33%	Emailed me data
Iosco	47,731	13										
Jackson	182,345	41	(517) 788- 4398	Leabra White	2012:00:00	2012:00:00	2012:00:00	2012: \$176,054 2013: \$195,982	2012:00:00	2012:00:00		wanted emails!; called (3/21) said she would forward again and have completed when convenient
Kalamazoo	144,873	40	(269) 384- 8117	Patricia Crowley					2012:00:00			Said she would look into it, reports are not exactly what we're looking for

Kent	170,117	32	(616) 336- 3688	Doug Sporte	2013: 30 mi	2013: 22.5 mi	2013: \$7,000	2013:00:00	2013: \$223,293	2013: 80%	No idea	
Lenaw ee	348,61 1	73	(517)264 -4696	Dave Mitchel	2012: 192 2013: 222	2012: ~192 2013: ~222	2012: \$1,313,000 2013: \$1,217,000				2012: 52 miles 2013: 37	
Livingsto n	96,419	27	(517) 546- 0040	Debbie								sent email; responded with info; 3/24 appt. 2pm with DC

Macomb	61,994	20	(586) 469- 5325	DeAnna								sent email to Bill Misterovich; left voicemail too; emailed Lynne Seymour
Mason	76,466	24			2012:00:00	2012:00:00	2012:00:00	2012: \$159,625.97	2012:00:00	2012:00:00		
Monroe	169,792	59	(734) 240- 3101	Shelly Wenzel (email too)				2012: \$312,422 2013: \$341,947				sent email; sent email again; received email of reports

Muskegon	79,663	25	(231) 724- 6319	Stephanie Barrett (deputy)	32:13.9 2013: no mntce program	2012:00:00 2013:00:00	2012:00:00 2013:00:00	2012: \$82,947.84 2013:00:00	2012: \$53,278.86 2013:00:00	2012:00:00 2013:00:00	56%	some info online, drain commissioner died, didn't keep records
Oakland	32,504	6	(248) 858- 0958	Craig Covey; email from Bette;				2012: \$364,621,336 2013: \$410,840,781	2012: 17.8% 2013: ~20%			sent email; spoke with Craig; check website.
Ottawa	170,539	47	(616) 994- 4530	Joe Bush	2012:00:00	2012:00:00	2012:00:00	2012:00:00	2012: \$2,946,280.69	2012:00:00		3/28 sent email, found some info online

St Joseph	215,425	67	(269) 467- 5600	Jeffery Wenzel	2013: 194.3			2012: \$94,373.298	2012:00:00			3/27 land resource center yielded no data
Shiawassee	226,509	67	989- 743239 8	Jenna Jullie								Trying to compile info
Tuscola	342,729	67	989- 672- 3820	Robert Mantey	1350 miles (over 550 drains)	90%		over \$1.6 million	\$500,000 (\$150,000 spent on spraying)	~\$5,000- 10,000 per mile as needed (typically every few years)	20-30%	
Van Buren	185,343	48	(269) 657- 8241	Joe Parman				2013:\$1,005,5 79.26				3/27 sent email with clarifications, will respond soon.
Washtenaw	166,811	37	(734) 222- 6860	Evan Pratt				2012: \$2,740,102 2013: \$2,828,758				emails; \$1.7M in grants; talking with Director of MDEQ

Wayne			(313) 224- 8116	Elmeka Steele								sent email; said request is being processed; try again in 2 weeks
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