A Sediment Transport Modeling Workshop for the Grand River Basin

Sponsored by: U.S. Army Corps of Engineers
Facilitated by: Great Lakes Commission

P.J. Hoffmaster State Park
Muskegon, Michigan
September 18, 2003

Workshop Participants:
A total of 29 participants attended the Sediment Transport Modeling Workshop for the Grand River Basin, including representatives from the Grand Valley State University's (GVSU) Annis Water Resources Institute, City of Grand Haven, Clinton Soil and Water Conservation District (SWCD), Grand Haven-Spring Lake Sewer Authority, Great Lakes Commission (GLC), Kent County Drain Office, Michigan Department of Agriculture, Michigan Department of Environmental Quality (DEQ), Michigan Department of Natural Resources (DNR), Michigan State University's (MSU) Institute of Water Research, Michigan State University Extension, Ottawa County Drain Office, Ottawa County Planning Commission, Army Corps of Engineers (ACOE) Detroit District and Grand Haven Area Offices, U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS), U.S. Geological Survey (USGS) Lansing District Office, and Baird & Associates. A participant list is available in Appendix A.

Workshop Summary:
Tom Crane (GLC) opened the workshop by welcoming the participants and outlining the schedule for the day. An agenda for the workshop is available in Appendix B.

Jim Selegean (ACOE) introduced Section 516(e) of the Water Resources Development Act (WRDA) of 1996, the legislation outlining the Tributary Modeling project. Section 516(e) directs the ACOE to develop sediment transport models for all major Great Lakes tributaries contributing sediment to Federal navigation projects or Areas of Concern (AOCs). These models are to be used as tools by state and local agencies to target areas for preventative or rehabilitative measures to control sediment loadings. Long term benefits of the modeling project include applying a watershed approach to sediment management, supporting and enhancing measures that will reduce loadings of sediments and pollutants to tributaries, reducing the costs of navigation maintenance, and reducing the need for sediment remediation.

The tributaries where models will be developed were prioritized in cooperation with each state. The ACOE works with state and local stakeholders in the development of each model to identify and prioritize needs that the model can address to ensure that it will be a usable tool to support local watershed management efforts (Phase I - Scoping, Phase II - Model Development). However, ACOE modeling efforts must use existing data to develop each model. Once the model is complete, the ACOE then transfers the model to the state and local stakeholders (Phase III - Technology Transfer/User Workshop). Within the ACOE Detroit District's jurisdiction, the Nemadji, Menomonee, Saginaw, Clinton, St. Joseph, Dead, St. Louis, and Grand Rivers all have either ongoing or completed watershed studies. Previous studies have lasted approximately 1-1/2 to 2 years from start to finish, depending on the nature and detail of the study.

The following five objectives were presented to the participants to consider during the day's meeting as part of the initial scoping phase of the modeling effort:

- Identify sedimentation problems,
- Identify past sediment studies,

- Identify existing data sets (digital/paper),
- Identify appropriate modeling tools, and
- Identify local users/keepers of the model.

At this point, Selegean (ACOE) shared three examples of completed or ongoing modeling efforts under the authority of this program. The first example of a model that has been developed by the ACOE was the Saginaw River in Michigan. This particular watershed is approximately 6,000 square miles and is mostly agricultural and forested, with some urban areas. Sedimentation from this watershed occurs mostly due to agricultural runoff and has required extensive and costly dredging by the ACOE.

Using a watershed sediment production model component, Agricultural Nonpoint Source Model (AGNPS), a pilot study was conducted for the Cass River to examine the effects of changing land use in the watershed. These changes included the implementation of better crop management practices such as contour farming and crop residue cover. The results of this pilot study showed that by applying the AGNPS results to a typical year, an annual average reduction in sediment yield of 30-45 percent would occur. Therefore, the ACOE concluded that the deposition of sediment in the Federal channel can be significantly reduced by adopting agricultural best management practices (BMPs).

Using HEC-6 and MIKE 11 model sediment transport model components, the ACOE then developed a second model to show the effects of a sediment trap on the Saginaw River. This model was able to show that sands are being deposited in the channel, whereas clays and silts are being deposited elsewhere in the Saginaw Bay. These results suggest that a sediment trap in the Saginaw River may be effective at localizing the deposition of sand.

The second example shared was that of a completed model for the Nemadji River in Wisconsin and Minnesota. This watershed is mostly forested and contains highly erodable red clay. One major concern within the watershed was that the harvesting of the forests in the watershed would result in the scouring of the clays. Consequently, for this watershed, the ACOE used the MIKE 11 modeling tool to develop a model that breaks the stream reaches into valley polygons and is able to show the cumulative vertical erosion during one storm event. The completed model is currently being used by the NRCS and Carlton County to manage forestry practices within the watershed.

The final example that was shared was a model for the Clinton River in Michigan. This watershed has experienced many urban sprawl issues due to land use changes and other alterations to the watershed. The model for this watershed was created to study changes in sedimentation and scouring due to changes in land use. This model was also used to look at the buildup of sediment in the channel and to determine whether this buildup may have been exacerbated by an inflatable weir that had been installed within the watershed two or three years ago, and to determine whether different practices could be utilized to help the sediment flow through the channel.

Rob Nairn (Baird & Associates) then provided the group with an introduction to the Grand River basin and the modeling components and methodology. According to Nairn, the Grand River is the longest river in Michigan (256 miles), covers approximately 5572 square miles, and makes up 13 percent of the Lake Michigan watershed. The Grand River is the largest contributor of some contaminants to Lake Michigan and has large sediment and nutrient loadings due to its high (53 percent) agricultural usage. Possible sources for sedimentation in the watershed include the erosion of agricultural land, river bed and bank erosion, urban areas including combined sewer overflows (CSOs), and construction activities. These sediments are likely to accumulate upstream of dams, in stormwater detention facilities, flood plains, stream channels, wetlands, and buffer strips, and may contribute to sediments in the river mouth.

Nairn (Baird & Associates) also discussed the project's methodology, listing the following activities that will occur as part of the project:

- Define local issues and previous work
- Assemble data sets and site investigation
- Complete initial sediment budget
- Select model domain, models and setup with linkages in GIS user interface
- Calibrate and test models with available data
- Evaluate land use change and watershed/river management practice scenarios as demonstration
- Training of local community representatives

Following the initial presentations related to the Tributary Modeling Program and the Grand River modeling project, Selegean (ACOE) then fielded questions and comments from the participants. The dialog from this discussion, in detail, is available in Appendix C. From this discussion, the following erosion and sedimentation-related issues were listed as potential concerns for the Grand River watershed (priority issues in bold):

- Dams and other sediment traps in the upper watershed
- Data limitations (Total Suspended Solids data not readily available)
- Harbor structures may interrupt natural littoral drift
- No lakes acting as sediment traps in downstream end of watershed
- Agricultural land as a potential source of sediments (worst when land is frozen or no crops)
- Some tributaries and the main channel of the Grand River may be flashy at times
- **Bank erosion and downcutting in urban areas vs. agricultural erosion**
- Thornapple River, Maple River, and Deer Creek – more turbulent and darker in color
- Drainage in upper watershed as a significant contributor of flow and sediments
- **Development and increased impervious surfaces in lower Grand (urban sprawl issues)**
- Lack of construction site BMPs – may be a significant contributor
- Gravel mining along Grand River
- Some counties provide incentives for permanent agricultural BMPs (ex: Clinton Co.)
- Overall lack of incentives or economic benefit for implementation of BMPs
- Ottawa County greenway project – sediment reduction
- Varying accumulation of sediments based on river water levels and storm events
- Implications of backwater from Lake Michigan
- Ice flow in river – transports sediments
- **Blakely Creek, Maple River, Thornapple River, Deer Creek, and Sand Creek identified as having the most sedimentation problems**
- Dams exist at Deer Creek, Sand Creek, Blakely Creek, Coldwater River, Maple River, Thornapple River
- Leakage associated with Lyons' dam (junction of upper and lower Grand)
- Different issues and resources may exist in the upper Grand (agricultural vs. urban issues), less coordination
- Storage issues – water from agricultural drains in upper watershed impacting the lower Grand
- **Loss of fish habitat, especially in coldwater streams**
- Recreation and other uses of river (important to watershed community)
- **Sediment loadings for the Grand River and its tributaries**

During the remainder of the morning session, the workshop participants listed the relevant programs represented by their organizations as well as other programs or parties that were not represented at the workshop. These discussions also led to listing relevant data sources within the basin. A list of the existing programs, data, and data sources is available in Appendix D.

After a lunch break, the afternoon session was dedicated to wrapping up the discussion on potential sediment and erosion issues within the basin, existing data sources, and previous studies. The participants attempted to prioritize the main sedimentation issues within the watershed to help focus the goals for the model development and the draft scoping report. However, due to the size of the watershed and the possibility of different issues occurring in the upper than perhaps might in the lower Grand River watershed, the participants recommended that the ACOE consult with additional representatives from the upper watershed before prioritizing any issues. Lists of the information and other observations resulting from these discussions are available in Appendix D.

During the final session of the day, Selegean (ACOE) explained the process for the technology transfer at the end of the project and asked the workshop participants to consider potential housing entities for the completed model. Copies of the data sets and user manuals, as well as training to use the model, will be provided for all interested parties at the final technology transfer workshop. However, it is up to the watershed community to determine an entity or cooperative partnership of entities to take a leadership role for housing and maintaining the model. Based on the representatives present at the workshop (which did not include heavy representation from the upper watershed), preliminary discussions yielded the following potential housing entities:

- GVSU's Annis Water Resources Institute: Interested in housing model. Can act as a clearinghouse and be responsible for updates, etc.
- MSU's Institute of Water Research: Good contact within the upper Grand
- NRCS: Existing network of offices. Depends on the type of model, but would likely require staff to maintain the model. This may not be feasible.

Before adjourning for the day, Selegean (ACOE), Nairn (Baird & Associates), and Crane (GLC) provided the group with a brief summary of the next steps for the modeling effort for the Grand River. The Great Lakes Commission will compile minutes for the workshop and send them out to the participants via email. The ACOE will be following up with workshop participants and other contacts to obtain and evaluate any available data and to evaluate potential sediment issues within the watershed. This may involve conference calls or smaller meetings to coordinate the effort among multiple parties and to ensure the most complete data is obtained. If needed, additional meetings may occur with representatives from the upper Grand River watershed. A list of additional points of contact for the project staff to follow up with is listed in Appendix E.

The ACOE and Baird & Associates will be working on Phase I of this effort over the next five to six months. This phase will include the development of a preliminary scope of work for the project, several proposed models (and their pros and cons), and courses of recommended action based on the available data gathered during this phase. This draft scope of work is expected to be completed by February 1st. The ACOE will then provide this plan to the workshop participants and other interested parties for questions and comments, and then incorporate any comments by summer of 2004. Before this time, the watershed community can assist the ACOE in identifying organizations within the watershed that may be interested in assisting with some minor data collection, if needed.

The modeling phase (Phase II) will begin by the end of the summer and may require approximately one year for completion and then a second review period. Once the model has been completed, the ACOE will convene a technology transfer workshop to hand over the completed model and to train all interested users. The entire process will likely last approximately 1-1/2 to 2 years.

Any follow-up comments and/or online links to additional data may be submitted to Laura Kaminski at the Great Lakes Commission via email at laurak@glc.org, or to Jim Selegean at the ACOE Detroit District at James.P.Selegean@lre02.usace.army.mil.

Submitted By:

Laura E. Kaminski
Program Specialist, Resource Management
Great Lakes Commission

Appendix A

Sediment Transport Modeling Workshop for the Grand River Basin

P.J. Hoffmaster State Park
Gillette Sand Dune Visitor Center
September 18, 2003

Participants

Annis Water Resources Institute
Xuefeng Chu
Assistant Professor and
Research Scientist
Grand Valley State University
740 West Shoreline Drive
Muskegon, MI 49441
(616) 331-3987
Fax: (616) 331-3864
chux@gvsu.edu

Richard Rediske
Research Scientist
Grand Valley State University
740 West Shoreline Drive
Muskegon, MI 49441
(616) 331-3047
redisker@gvsu.edu

Baird & Associates
Bruce Halverson
Hydraulic Engineer
2981 Yarmouth Greenway
Madison, WI 53711
(608) 273-0592
Fax: (608) 273-2010
bhalverson@baird.com

Rob Nairn
Principal
627 Lyons Lane, Suite 200
Oakville, Ontario, Canada
L6J 5Z7
(905) 845-5385
Fax: (905) 845-0698
rnairn@baird.com

City of Grand Haven
Dan Czarnecki
Public Works Director
City of Grand Haven
519 Washington Avenue
Grand Haven, MI 49417
(616) 847-3493
Fax: (616) 847-3460
dczarnecki@grandhaven.org

Rich Tripp
Waterfront Supervisor
519 Washington Avenue
Grand Haven, MI 49417
(616) 847-3478
rtripp@grandhaven.org

Clinton Conservation District
Christine Corgan
Executive Director
2343 N. US-27
St. Johns, MI 48879
(989) 224-3720
chris-corgan@mi.nacdnet.org

Grand Haven-Spring Lake
Sewer Authority
John Stuparits
Superintendent
1525 Washington Avenue
Grand Haven, MI 49417
(616) 847-3486
Fax: (616) 847-1393
johnstuparits@chartermi.net

Dave Krohn
Environmental Compliance
Supervisor
1525 Washington Avenue
Grand Haven, MI 49417
(616) 847-3485
Fax: (616) 847-1393
dkrohn@chartermi.net

Great Lakes Commission
Tom Crane
Program Manger
Resource Management
2805 S. Industrial Hwy, Suite 100
Ann Arbor, MI 48104
(734) 971-9135
Fax: (734) 971-9150
tcrane@glc.org

Laura Kaminski
Program Specialist
Resource Management
2805 S. Industrial Hwy, Suite 100
Ann Arbor, MI 48104
(734) 971-9135
Fax: (734) 971-9150
laurak@glc.org

Kent County Drain Commission
Brad Boomstra
Senior Engineer
1500 Scribner Avenue NW
Grand Rapids, MI 49504
(616) 336-3688
Fax: (616) 336-3575
bradley.boomstra@kentcounty.org

Michigan Department of
Agriculture
Karl Hausler
Program Manager
525 W. Allegan Street
Lansing, MI 48933
(517) 373-9803
hauslerk@michigan.gov

Michigan Department of Environmental Quality
Dave Fongers
Environmental Engineer
Geological and Land Management Division
525 W. Allegan, P.O. Box 30458
Lansing, MI 48909
(517) 373-0210
Fax: (517) 373-9965
fongersd@michigan.gov

Ralph Reznick
Senior Nonpoint Source Engineer
Water Division
525 W. Allegan, P.O. Box 30273
Lansing, MI 48909
(517) 373-0340
REZNICKR@michigan.gov

Luis Saldivia
District Supervisor
Geological and Land Management Division
350 Ottawa NW, Unit 10
Grand Rapids, MI 49503
(616) 356-0208
saldivil@michigan.gov

Erik Sunday
Water Modeler
Water Division
525 W. Allegan, P.O. Box 30273
Lansing, MI 48909
Lansing, MI 48909
(517) 335-4120
sundaye@michigan.gov

Janice Tompkins
Project Administrator for 319 Lower Grand River Project
Water Division
350 Ottawa NW, Unit 10
Grand Rapids, MI 49503
tompkinj@michigan.gov

Michigan Department of Natural Resources
Amy Harrington
Fisheries Biologist
Comstock Park Field Office
195 Six Mile Rd. NE
Comstock Park, MI 49321
(616) 784-1808
harringa@michigan.gov

Michigan State University
Da Ouyang
Research Specialist
Institute of Water Research
115 Manly Miles Building
1405 S. Harrison Road
East Lansing, MI 48823
(517) 432-1189
ouyangda@msu.edu

Michigan State University Extension - Ottawa County
Chuck Pistis
Ottawa County Extension Director/ District Sea Grant Agent
Sea Grant Agent
333 Clinton Avenue
Grand Haven, MI 49417
(616) 846-8250
pistis@msue.msu.edu

Ottawa County Drain Office
Aaron Karg
Erosion Control Agent
414 Washington Street, Room 107
Grand Haven, MI 49417
(616) 846-8220
akarg@co.ottawa.mi.us

Mike Munch
Maintenance Coordinator
414 Washington Street, Room 107
Grand Haven, MI 49417
(616) 846-8246
mmunch@co.ottawa.mi.us

Ottawa County Planning Commission
Betty Gajewski
Chair
12220 Fillmore Street Room 170
West Olive, MI 49460
(616) 677-1643
bgajewski@usxchange.net

U.S. Army Corps of Engineers
Tracey Balint
Hydraulic Engineer
Detroit District
477 Michigan Avenue
Detroit, MI 48226
(313) 226-3398
Fax: (313) 226-2398
Tracey.A.Balint@usace.army.mil

Brian Bouwhuis
Civil Engineer
Grand Haven Area Office
307 South Harbor Avenue
P.O. Box 629
Grand Haven, MI 49417
(616) 842-5510 x.20
Fax: (616) 842-6141
Brian.J.Bouwhuis@usace.army.mil

Jim Selegean
Hydraulic Engineer
Detroit District
477 Michigan Avenue
Detroit, MI 48226
(313) 226-6791
Fax: (313) 226-2398
James.P.Selegean@usace.army.mil

U.S. Department of Agriculture – Natural Resources Conservation Service
Chris Johnson
Area Engineer
Southwest Lower Peninsula
3260 Eagle Park Drive, Suite 108
Grand Rapids, MI 49525
(616) 942-4111 x.144
Fax: (616) 940-1403
Christopher.johnson@mi.usda.gov

U.S. Geological Survey
Steve Blumer
Supervisory Hydrologist
Lansing District Office
6520 Mercantile Way, Suite 5
Lansing, MI 48911
(517) 887-8922
spblumer@usgs.gov

Appendix B

A Sediment Transport Modeling Workshop for the Grand River Basin

Thursday September 18, 2003

Sponsored by: U.S. Army Corps of Engineers
Assisted by: Great Lakes Commission

P.J. Hoffmaster State Park
Gillette Sand Dune Visitor Center
6585 Lake Harbor Road
Muskegon, Michigan 49441
Sponsored by: U.S. Army Corps of Engineers

9:30 a.m.	Welcome, Introductions and Workshop Objectives	Jim Selegean, ACOE Detroit, and Tom Crane, Great Lakes Commission
9:45 a.m.	Background and Methodology: Implementing Section 516(e), WRDA	Jim Selegean
10:00 a.m.	An Introduction to Previous Corps Sediment Studies	Jim Selegean, Rob Nairn and Bruce Halverson, W.F. Baird & Associates
10:30 a.m.	An Introduction to the Grand River Watershed	Rob Nairn and Bruce Halverson
10:45 a.m.	Present Sediment Issues and Problems in the Grand River Watershed	All Participants
12:00 p.m.	Lunch	(A buffet style lunch will be served)
1:00 p.m.	Past and Present Watershed Initiatives/Relevant Programs	All Participants
2:00 p.m.	Identifying Potential Data Sources	All Participants
2:30 p.m.	Break	
2:45 p.m.	Identification of Potential Housing Entity and Users	All Participants
3:30 p.m.	Next Steps	Jim Selegean
4:00 p.m.	Adjourn	

Appendix C

General Questions and Comments from the Participants (dialog from the workshop):

***The discussion below does not include all listings of relevant data sets that were mentioned. See Appendix D for additional information. Where possible, names of speakers have been provided.*

Q: What are the sediment issues within the watershed? (Selegean, ACOE))

Q: First of all, is the ACOE trying to de-emphasize the upper portion of the Grand River watershed? (Steve Blumer, USGS)
A: No, it's not being de-emphasized. On a lot of the watersheds that we've studied, we've actually worked in or near the headwaters. If there are issues in the headwaters of a watershed, we'd be interested in hearing about them today. (Selegean, ACOE)

Q: Are you going to try to contact watershed groups in the upper portion of the watershed or hold a second meeting to bring those groups into this effort? Based on the participant list and previous mailings, it just appeared as if the upper watershed was being de-emphasized. (Blumer, USGS)
A: If that was the outcome, that wasn't an intentional thing. We tried to identify those groups and individuals that were very obviously involved with issues in the watershed. If we need to plug in some more people from the upper watershed, then we can do that. (Crane, GLC)
A: That initial list of workshop invitees that was sent out was continuously added to and additional people were invited up until the last minute. So if you were one of the first rounds of people that received the invitation, you wouldn't have received the more extensive list of invitees. (Laura Kaminski, GLC)
A: And we did sort of the obvious things like trying to identify all of the drain commissioners for all counties in the watershed, the SWCDs, and any research projects that we knew of where we could identify individuals. So we tried to be methodical about it, but there may have been some people in some of those counties in the upper watershed that we didn't identify, but we certainly have time to bring those people into this process. (Crane, GLC)

Comment: Along those same lines, a couple of people asked why more of the SWCDs are not in attendance today. The Conservation Reserve Program was just authorized and applicants were selected about a week and a half ago. They now have until September 26th to get all of those contracts written and signed. So that's why none of those offices are here. They're working nights and weekends trying to get all of those completed. The southwest Lower Peninsula has 500 contracts in 19 counties, which covers most of the Grand River watershed. Along those same lines, the advantage of contacting some of those districts would be that they have short-term and long-term goals and plans which might be helpful for some of the issues discussed here today. These districts would be a good place to start. (Chris Johnson, NRCS)

Q: When you've done these (ACOE) studies, how much analysis are you doing in terms of specifically looking at sediment by texture class and where it's coming from in the watershed in terms of where it's ending up in the harbors and the areas that are being dredged? Has there been much research done on this? (participant)
A: We're doing that on the St. Joe. (Selegean, ACOE)
A: We've done it to different degrees in different watersheds. The one where we spent a lot of time on it was in the Menomonee in Milwaukee. And partly the issue there was that it was a watershed that has become very urban but still has agriculture in the upper watershed. And we've really struggled to understand how much is coming from bank erosion and how much is coming from agricultural land. And there, the bank erosion material was more clay and till-like, whereas it's sandy up in the upper part. So that was one approach that was helping us to understand the different grain size fractions that were moving in the water column and had been deposited in the Federal navigation area. This helped us to distinguish between the two sources. There are sedimentological approaches in looking at grain constituent analyses of the sediment in addition to grain size. We haven't done that, and it might be an idea to look at that. They do that a lot in coastal applications that we work with. (Nairn, Baird & Associates)

Comment: Because the system has quite a few dams on it, I would guess that most of what's being delivered from the upper reaches is going to be smaller grain sizes and some of is probably not even settling out in Lake Michigan. (participant)
Response: One of the biggest limitations is the data. Total suspended solids (TSS) data with grain size analysis is hard to come by. The 516(e) Program has been opened up a little bit so that you can do some strategic data collection. To me, that's very strategic data collection. (Nairn, Baird & Associates)

Comment: Along those same lines – and I know the Corp's had efforts to try to identify this – but the actual harbor structures have been thought to interrupt littoral drift and actually create the sediment that's removed. So there's a question of what portion of the material that has to be dredged originates from that aspect, which would be mostly sands. How much of that really originates from watershed activity? (participant)
Response: Usually that littoral material that falls out in the outer portion of the harbor is almost all sand usually. And when that material is dredged, it's placed on the downdrift side. On the St. Joe, one of our tasks has been to look at exactly that. On most of the lakes on the rivers on Lake Michigan you have a drowned river valley. So you have a lake right on the downstream end of almost all of the rivers coming in, which act as great sediment traps. And they keep many of the sandy materials, the beach-suitable material, from ever making it to the littoral system because it drops out in any one of the lakes along there. The St. Joe and the Grand are two rivers that don't have a lake or large sediment trap like that. With the St. Joe we wanted to figure out that number in cubic yards per year on average, which has been an unknown. It's probably a good idea to do that for the Grand. (Selegean, ACOE)

Comment: It's important to understand on a temporal basis how much sediment is coming down the Grand River. It's especially important when talking about BMPs as they relate to agriculture. If a lot of the sediment derived from agriculture comes during the springtime, I think implications are much different than if that's an evenly dispersed source of sediment. This is such a big river that it's hard to imagine that it's flashy, but some of the tributaries may be. A lot of this data that is generated will be important to understand how it relates on an annual basis and relating to rain events. (participant)
Response: That's an excellent point. One of the pieces of detective work on the Menomonee was specifically looking at that and comparing high discharge events on the agricultural lands when they're frozen or snow-covered to thunderstorms in the summer, and looking at sediment loads. We've been using that approach to look at how much is bank erosion versus agricultural erosion. (Nairn, Baird & Associates)

Comment: My experience has been that when there are crops in the field, the tendency for sedimentation is less than when they are not. So I would suspect that during those times when there are not crops in the field is when we're going to have the most sediment coming down from agricultural land. (participant)

Comment: I think one of the other issues to consider is when you look at the Lake Michigan mass balance data, the Grand River is quite flashy. The lower Grand has very large wetlands, bayous, and islands, and I think you're getting sediment being deposited in there during normal flow events. And then during the big flows, you see erosion of that. You can see sandbars that are there one time and then gone the next. I think it's not only the flow of suspended solids coming down the stream that's a concern, but that you also have major settling in the lower end that gets pushed down into the navigation channel during major storm events. I also think that when you look at two main branches of the Grand River, the Thornapple is usually darker in terms of coloration and seems to be more turbulent than the Grand River where they mix into each other. So I think the Thornapple might be a significant source of the Ag-related sediments for the Grand. (participant)

Comment: Same thing with the Maple River and Deer Creek. (participant)
Response: I think you'll find that most of the sources will be in the tributaries. (Selegean, ACOE)

Comment: Also, as you go further up the watershed, you have to consider drainage as a significant contribution of flow and sediment. A lot of that land is changing. The urbanized areas, where those flows and drains are changing, are where significant bank erosion and downcutting is occurring. (participant)

Comment: The amount of the pervious surfaces in the lower Grand is increasing significantly and there is a lot of development going on. We definitely have urban sprawl issues in the lower Grand. It may not be contributing suspended solids, per se, but it increases the water budget and causes more erosion of all that deposited material. (participant)
Response: That was definitely what we encountered in the Menomonee and the Nemadji Rivers; the Menomonee because of urbanization and the Nemadji because of foresting and the flashiness of the river. (Nairn, Baird & Associates)

Comment: Construction sites within this watershed tend to clear large areas all at once, as opposed to clearing a section of land at a time to work on it. I was just wondering if it had something to do with soil erosion/sediment control permits that are issued.

Comment: There is a lot of gravel mining taking place along the river - and where they mine it out they leave it.

Q: How well are people in the Grand River watershed applying agricultural BMPs, buffer strips, etc.? Is there a lot of resistance to this type of work? (Selegean, ACOE)
A: It depends on the county, but some counties (ex. Clinton Co.) actually give people a break on their drain assessments if they have permanent vegetative strips. But it's very much hit or miss. There are a lot of places where it could be better. (participant)

Q: Is there value to having a study that shows these sorts of things, whether it's tons per year in sediments that we're keeping on the land – or however we quantify it?
A: We do online reporting now that is available the public where we show certain miles of buffer strips and have goals for those practices. So that sort of information is readily available on the internet. (Johnson, NRCS)

Q: Do you also have information on conservation tillage, acreage, and trends? (Crane, GLC)
A: We do have that information available. (Johnson, NRCS)

Comment: When Da Ouyang was presenting some of the preliminary findings from the studies at MSU, it looked as if buffer strips are not always the best conservation treatment. But when combined with other things, such as conservation tillage, they can be very effective. It would be very interesting to know what those conservation tillage trends are because, basinwide (Great Lakes basin), it seems like we're starting to see a leveling off or a reduction in conservation tillage practices. (Crane, GLC)
Response: The way the farm prices are right now, it's harder to get landowners, even with cost-share dollars, to switch over to some of these conservation measures because that requires buying new equipment, etc. And so it's costing more to grow the crops with these types of measures than it would without them. These are the types of problems that should be considered in this effort. In order to get any model to work, you have to have some sort of goal in mind of how to get it to work. And without some sort of incentives (like drain commissioner incentives), it's going to be harder to get these landowners interested. (Johnson, NRCS)

Comment: That brings up the whole issue of expanding the CREP program (Conservation Reserve Enhancement Program) to cover some additional watersheds, where you're specifically raising those incentives to a point where it makes economic sense to the farmer. (participant)
Response: With the CREP program, for anyone who's not familiar with the Program, the payments were increased from the regular Conservation Reserve Program with additional incentives for putting in restored wetlands. The Saginaw Bay area was a CREP area, and over here there's the Macatawa. But they haven't done much with it over here. That may be due to the topography over here. (Johnson, NRCS)

Comment: In our Extension program, we had an agent for the last ten years that worked specifically with nutrient management. It's been a county-funded position. In addition, Ottawa County has provided cost-share in addition to what the district does on soil sampling, nitrogen, etc. and all sorts of issues like that. So

there has been a significant interest in this. Any kind of incentive that you can provide that puts dollars in the pocket of the farmer while protecting the environment at the same time – those are the best solutions. There are other aspects, such as feeding animals different types of feeds and composting wastes, to prevent a lot of that from being land-applied and then eventually getting into the system. So we need to be a little broader-speaking in terms of incentives. There's a group of farmers working on a co-generation project, which has implications with how nutrients get into the system and what sediments transport them. Ottawa County also has a greenway project which provides an interesting comparison of what nutrients have been introduced into the system compared to what they would have been without the greenway. These types of efforts may be playing an excellent role in sediment reduction. (Chuck Pistis, Sea Grant/MSU Extension)

Comment: The challenge is trying to get people to participate in the greenway, and especially the landowners. But one of the objectives of this program is to reduce the cost of dredging. One of the challenges is going to be to present what other benefits there are for individuals to want to participate, such as with the county's greenway projects. There's more to this, as far as benefits, than just reducing the cost of dredging. (participant)

Q: I know the Corps has worked on predicting shoreline impacts as they relate to different water levels. And I'm wondering how this is related. Is there a relationship between climatologically what is happening, or predicted to be happening, and sediment transport on the River? In this kind of low water situation, are we accumulating sediments only to be flushing them out during some peak events? Is there a low case scenario, high case scenario? How do you know that what we end up predicting is truly middle of the road? Or is it just characterizing the years that we look at? (participant)
A: The backwater from Lake Michigan only goes so far. (Selegean, ACOE)

Comment: When lake levels are low, it's typically reflective of the climate in the region. And usually the river flow is low too because you have long-term below average rainfall. And so what are the implications here? There are places that are accumulating sediments because we're not having those types of events where they would be flushed out. (participant)
Response: That's a good point. With the work that we've done on the lake, we've found a statistical relationship between high lake levels and the frequency of storm events. You go through cycles where the low pressure systems pass through different pathways latitude-wise. When you have more low pressure systems, the lake levels are high, but there are more storm events and waves, and also a lot higher river flows. Generally speaking, though, we treat the lake levels and the river flows as independent. Just because the lake levels are low doesn't mean you're not having rain storms. But the part that's more dependent is that the soils are not saturated and then because of that your flows are lower. (Nairn, Baird & Associates)

Comment: Let me give you an example - in the wintertime, if you have a mild winter you're going to have a lot more flow in that river. When the snow melts, the land that is not held down by a crop is going to erode. So if you have a series of mild winters, you're going to have much more sediment than if that land were frozen. These are important issues that you should consider here. Another aspect here too is that there are times of the year where we have a lot of ice flowing in that river. I suspect a lot of sediments move by ice. And shallowness of the river would also have implications related to that. (participant)

Q: Is there some need for having an agricultural model that's going to show the effect that these agricultural BMPs have? Ultimately, I want to figure out what we're going to be studying. And if there's value in that, that's what I'm trying to get at. (Selegean, ACOE)
A: There are all types of urban things going on as well. The urban population needs to understand their interactions with these issues just as much as the farming side. I don't think we can point to one thing at this point and say that's where we should focus on. Some of your modeling will help us with that endeavor. (participant)
Response: That's what we found with the Menomonee River after we had completed the sediment budget, which is in the beginning portions of the modeling phase. Things kind of sort themselves out, and we started to realize that bank erosion really isn't that big of an issue. When you try to balance your sediment budget and you start adding these other things, then you start to see the big picture of where the bulk of the

sediments are coming from and can refocus the modeling on that. So the initial phases of modeling will help sort some of this out. (Selegean, ACOE)

Comment: Another interesting aspect of that too is that with a combination of the conservation measures, we'll be detecting the benefits of keeping the soil in place. From a dredging point of view maybe you're trying to stop it from getting into the waterway. But from an agricultural point of view, you'll have better protection of your cropland if you keep these measures in place. So if you're trying to spread the word of keeping the soil in place it helps by providing an agricultural benefit as well as a benefit to the Corps for dredging. (Bruce Halverson, Baird & Associates)
Response: And for the fish that are trying to spawn in the bottom… (Selegean, ACOE)

Comment: It might be interesting to look at one farm. Let's say you know of a farm where they're considering putting in buffer strips over the next year or two. If we did some type of detailed analysis of just that farm - then after the farmer builds them you go back and monitor that area. And so now you have a model predicting what should be happening and you have field data verifying it. The Corps' involvement is sort of limited on these things. But perhaps this would be a good academic project to monitor and create some kind of validation data set at a farm. Or if you have a farm, and you know it's going to be developed into a single family residential community in the next year or two… It's the same sort of thing. You run your models and predict what should be happening. And then you go out after it's built and see how the predictions work out. (Selegean, ACOE)

Q: But you're looking at tremendous difference in scale here in what the Corps is going to do and what might be done on a single farm. This is something that you're suggesting someone else do the research on this small scale, right? (Blumer, USGS)
A: We could do modeling on a farm scale. (Selegean, ACOE)
A: The model we've been using most recently can be applied at that scale as a constructive tool to look at a much smaller scale as part of the big picture. (Nairn, Baird & Associates)

Q: But are you going to apply it at that scale and then use it for the whole watershed? (Blumer, USGS)
A: Not for the whole watershed, but you could have one of your applications or a pilot project on a very small area. But you couldn't do that scale on the whole watershed. (Nairn, Baird & Associates)

Q: Why would you do it, just as a demonstration? (participant)
A: Yes. (Nairn, Baird & Associates)

Comment: Well, I guess I'd say that's the kind of the thing that's been done many times. That's one of the reasons these are best management practices, because they've been determined to have positive influences on agriculture. I think that if the Corps finds out that they're spending a million dollars a year on the Grand River watershed for dredging and half of it is from agricultural sources, then I'd say take that $500,000 and put it into a cost-share program - if you want to really be innovative from that standpoint. And that really would be a lot cheaper than dredging. (participant)

Comment: There was the City of New York a couple of years ago in which they were evaluating for drinking water and were looking at constructing a new treatment plant. And instead what they did was look at the upper watershed where they had reservoirs for drinking water for the City of New York, and evaluated the costs between protecting the watershed and constructing this treatment plant. And they decided that they could invest and protect the watershed and it would be a lot cheaper. (participant)
Response: One thing that's important to note here is what the authorizing legislation says about this program and what the authority is under this program. Jim does not have the ability to take the money under this program and put it into a cost-share program. Nor does he have the ability to do on the land conservation treatment under this program. The authority does not allow him to do that. So when he was presenting this morning, his authority is exactly as he presented it. Now, one of the reasons that the Great Lakes Commission is involved with this is that we're working with the Corps to begin to develop partnerships with other federal and state agencies and any other partners that have the ability to piggy-back

on this program and that do have the authority to go in and do conservation treatment in watersheds. For instance, if we can begin to combine the power of these modeling tools, in terms of their ability to inform the placement and types of BMPs, and then can go into these watersheds and maybe involve the NRCS or state departments of agriculture or DEQ or whomever may have some ability to apply those dollars, we're going to start showing some real results. And one of the reasons why these meetings are so important is that the Corps understands that, over time, its ability to continue to sell this program to Congress is going to depend on actual results out in the field. So Jim and Bruce and Rob and others that are actually developing these tools understand that it's really the commitment and the involvement of the stakeholders that are going to help sell the program. Because we have to show that these models are actually being used for some real, measurable results out in the field. So I think that's an important thing to keep in mind. But the Corps is constrained by what the authority allows them to do. So that's why Jim is basically allowed to go in and develop models. But it's really up to the other partners who may be able to come together and combine their areas of expertise and their different authorities to where we're really going to be able to start seeing a difference. (Crane, GLC)

Q: Wasn't there a project on the Maumee where a model was developed and then was coupled with a cost-share program with agriculture? Was that a different authority? (participant)
A: That was actually a pre-curser to this program. And that was a partnership between the Buffalo district of the Corps and the NRCS, where the Corps provided some dollars to NRCS to begin to select pilot areas within the Maumee River watershed to begin to show how upland conservation treatment can influence the need for the Corps to go in and dredge the navigation channel. And that was a very innovative study, but it was really a bit before its time. Because unfortunately the money dried up after just a few years and there wasn't a long enough time period for the results of that to really begin to show that, yes, if we invest some significant dollars into erosion control, we're going to see some downstream results. But this program is really sort of an offshoot of that. And I think that over time, if we can begin to establish the partnerships, then we can begin to show those results. So one of the things that we're really interested in doing is to engage NRCS and others that may have some authority to go in and actually do some on the land conservation treatment. (Crane, GLC)

Comment: To me, that's the way you're going to have a real successful program. If that's a recommendation that comes out of this, then perhaps that's something that can be added that authority down the road - because we're dealing with nonpoint sources here. And then the ability to lessen these nonpoint sources are in the hands of many profiting persons. And that's how we're going to get to it. (participant)

Comment: The Division office in Cincinnati has an annual report that they do for Congress. And they put the information together and begin to provide the results of the Program, if you will. But over time we really do need to begin to build these partnerships. MSU did quite an interesting study under this Program. And Da is here, one of the researchers on that project, where they were looking at sedimentation rates in all of the major tributaries in the basin and beginning to determine which ones of those have the highest potential for delivering sediment into the Great Lakes. And as part of that there was also some evaluation of erosion control BMPs. I think that when the results of that study are published, and that's going to be sometime in the not too distant future, those of you that are here will be interested in seeing that and seeing how it can tie into the overall Program here. (Crane, GLC)

Q: Essentially, this model is going to show us down to some level, where the sediment inputs are coming from in the Grand and how they're moving through the system. Is that a short summary of what the product is going to be? (participant)
A: The product is a tool itself. It can be developed. It can be expanded to other areas to look at issues that come up associated with management alternatives. So, using this model, you can always fine-tune your management procedures in the future. You can evaluate, for example, where you might put stormwater management technology in urban areas or you could determine where to put buffer strips, and see where each one of those gives you the most value with respect to sediments. Now, that may not be your only decision factor in whether you do one or the other, but at least that allows you to quantify the gains or the value you get from the different measures. (Nairn, Baird & Associates)

Comment: But the point of my question, is that some of these other discussions that are going on, with that tool, there are a number of mechanisms like this in place already in organizations (either regulatory or incentive). (participant)
Response: If there are studies that people know of where that has been applied in this watershed, then that would be of interest to us as well, just to extrapolate. We've done that in the past, where we can extrapolate from a small-scale basis to a watershed level. So that's definitely a benefit to us. You can't use a best management study from some other part of the state or another state because the topography issues and soils are just too different. So if there are specific studies showing the benefits of some of these BMPs, we're definitely interested in that. And we would not focus our efforts on that, if it's already been done. But we will apply every bit of information that we can get our hands on. (Halverson, Baird & Associates)

Comment: Back in the 1970s, the USGS tried to establish a stage-discharge relationship up at Eastmanville. That's 19 or 20 miles upriver from Lake Michigan. And we could not establish a relationship between the stage of the river and the discharge that met accuracy standards to be able to use that as a tool to compute discharge. There is a backwater effect a long way up the river, and that's going to be an issue to deal with on the lower end of this particular watershed. You may not have encountered this with the St. Joe as much. But this will be an issue with velocities on this watershed. (Blumer, USGS)

Q: What would be the worst watershed, from a sediment point of view? Which one stands out as having the most sediment problems? (Selegean, ACOE)
A: Blakely Creek, but it's tiny. It's only one square mile. It's off of the Rogue River (participant)
A: I'd probably say the Maple River - just due to the geology of the Maple being a totally different soil type over there. (Johnson, NRCS)
A: Thornapple River is really heavily sediment-laden and has several dams on it. (Janice Tompkins, Michigan DEQ)
A: And the upper part of the Thornapple is heavily loam and clay-loam till. So you have some pretty heavy soils in the upper part and parts of the lower watershed. (participant)
A: On a creek level, because of the Ag-type of topography, you have Deer Creek, Sand Creek, and all of those watersheds next to each other. You're talking 2-3 feet of moving sand bedload coming down from those. (Tompkins, Michigan DEQ)
A: As far as dams are concerned, the Lyons dam is in bad condition. It actually had some leakage around it, near the existing fish ladder, which we repaired a couple of years ago. There's talk about possibly removing that dam. But I don't know how far they've gone on studies with that. (participant)

Q: When a dam like that is removed, are they typically required to remove the sediments that they have compounded upstream? (Selegean, ACOE)
A: Yes, depending on how much and what condition they're in. (participant)

Q: Since you're compiling a lot of information, will you be making this information available for everyone to share? (participant)
A: What we'll try to do is reorganize this information and send it back out to people. And then at that point if there are gaps in the information that we need to fill in that didn't get mentioned today, then you can just send us or Jim an email and let us know. (Crane, GLC)

Q: Will one of the outcomes of this project be a bibliography of sources of information for the Grand River watershed? (participant)
A: There will be a list of data sets that we've used or referenced in the reports. (Selegean, ACOE)
A: I think we tend to focus on subwatersheds. So the areas that aren't involved in the investigation – we don't tend to summarize all of those. (Nairn, Baird & Associates)

Q: There was a suggestion earlier that we might consider holding a second meeting in the upper watershed, since that seems to be under-represented here today. Are the issues of the upper watershed going to be different enough where that would be beneficial? Or do you think it would be enough to broaden the list of

individuals that we can identify as resource people for the upper watershed and make sure that they get all of the correspondence related to our discussions today? (Crane, GLC)
A: The resources are going to be different. There will be different types of data sets available for the upper Grand. And the issues – there will be some overlap, but there will be some differences as well. (participant)

Comment: Certainly we're very much aware of an urban impact from the City of Jackson, just like I would assume from any similarly-sized town. The two reaches that we've looked at also have the Portage River, which is almost like a maintained drain. I think it's dredged every now and then. But as opposed to the urban problem, we've got a purely agricultural problem. I wouldn't say I'm familiar enough to say that the challenges would be very different from what we're looking at in the lower region. I just know that the hydrodynamics would be much different. (participant)

Comment: The resources available in the upper and lower are very different. The amount of coordination that's going on in the lower versus the upper is very different. So you're going to have a lot more data layers and a lot more current information on many of the lower reaches than you're going to find in the agricultural upper watershed areas. (Tompkins, Michigan DEQ)

Comment: For the lower Grand River, I think the biggest issue is impervious surfaces and urbanization, which causes flashiness and flow variations for the Grand. When you start getting into the smaller subwatersheds, you run into the whole host of agricultural and urban impacts. But you're really kind of pushing the limits on fisheries habitat upsets. A lot of our streams, like the Rogue, are pretty good streams. But as we get more urbanization and sedimentation, we're starting to lose fisheries habitat. We have a lot of good coldwater streams in this area. But because of riparian problems and sedimentation, we're losing valuable fisheries habitat. (participant)
Response: Temperature, hydrology, sedimentation… many of the most urban of our coldwater streams are pretty much gone in the last 10-15 years. So now you have to go out into the next tier of municipalities where we're still trying to save these streams. (Tompkins, Michigan DEQ)
Response: And that's where a lot of the development is going too. (participant)

Comment: Looking at these issues hydrologically… we've had this same discussion with water and sediment control basins where we're holding water back in the watershed. People instantly think that when you hold that water back, you've just decreased flooding. But it depends on where you are in the watershed. If you hold the water back when it would have flushed down before the peak comes through, and are releasing it slowly, you're actually increasing the peak. Same thing with urbanization. If you're talking about urbanization in Grand Haven, you're actually reducing flooding because all of the water flashes through before the main peak comes through. There are a lot of different issues playing into these modeling scenarios. (Johnson, NRCS)
Response: The northern portion of the Menomonee was agricultural and the southern portion was urban sprawl. And one of the findings in the Menomonee study was that as you pave more of those farms, you decreased the sediment that got to the river. But you certainly don't want to start telling people to start paving the watershed to prevent sedimentation. (Selegean, ACOE)

Comment: What about recreational uses of the river, as far as boating? There are marinas along the river. (participant)
Response: Those channels have to be maintained. Especially during low water periods, there are issues of safety and access. (participant)

Comment: We really have been focusing on the sediment itself, and how much is in there. And we haven't really talked about what uses it curtails. One thing you have to remember is that with upland treatment, is that going to a no-till or minimum-till does not take your erosion to zero. There is natural erosion that occurs on even lawns and golf courses or anything that might be completely covered, that you can't recover. Going to a no-till situation doesn't solve the problem of dirty water. And a lot of times the water color is not a good indicator of how much sediment you have in the stream. A lot of times the Thornapple, for example, might be completely brown. And you'll have stretches of the Au Sable and the Manistee River

that have more sediment going down, but it's sand so it looks clean because it stays at bottom. But all of that sand is moving down through there. (Johnson, NRCS)

Comment: I understand that, historically, the river has always carried a sediment load. So even before there was development, per se, along the river banks, the river was still brown and had a sediment load. (participant)

Comment: They've had situations where they've put a sediment basin in and actually caused a problem downstream, because the sediment was required for that stream to create energy. (Johnson, NRCS)

Q: Are your models going to give us that piece of information? What is the sediment carrying capacity of the main branch and at least some of the main tributaries? (Tompkins, Michigan DEQ)
A: Yes. (Selegean, ACOE)

Comment: I would think that would be one of the main points of interest… that you would be able to look at the model and make a balanced decision. Especially if you're a local unit of government with zoning ordinance issues or land use issues. At local levels, they're pushing comprehensive land use planning. I would hope that this model will allow us to look at the big picture for some of these issues. Because if you're sustainable, you're looking at the big picture. All of the local components of smaller tributaries are equally important as the big one because it's all part of the same system. One thing I haven't heard mentioned today was the hydrology between surface and groundwater, interface and cycle. There must be some kind of data on that as well that would play into this. (Chris Corgan, Clinton County SWCD)
Response: The question will be where the model will be applied. Some decisions have to be made about which watersheds and subwatersheds it's applied to, because it won't be for the whole Grand River watershed. There isn't a budget to do that for the whole watershed. So that's why we're trying to get some idea of the priorities and problems and where data exists and where there is no data. And all of that goes into the mix to decide where best to apply the model. (Nairn, Baird & Associates)

Q: So is it fair to say that where the data is missing, you're going to shy away from? (Corgan, Clinton County SWCD)
A: If that's how big of a missing piece it is… The authority says we're not supposed to collect new data. We cannot set up a long-term data collection program, like a gauge put out in the river, that's going to collect data or samples over a long period of time. But if you need to collect a small amount of data, like cross sections at a dozen locations to make the model work, then we can go out and collect that. That's how the authority has been interpreted. So if it's a big missing piece, and there's no other agency that can collect that for us, then it's going to be difficult for us to address that issue. (Selegean, ACOE)

Q: But what if where the data is missing is where we determine we need it the most? (participant)
A: Well, I think the other way of looking at it is that, for example… the Nemadji River with Carlton County was able to use Skunk Creek as a test for developing their policies. So they developed some guidelines from the model being applied to representative areas. (Nairn, Baird & Associates)

Q: Is there time to get data collected for your use? And if that's the case, what data would you have a preference for? (Tompkins, Michigan DEQ)
A: By February, I'll have a scoping report that I can mail out to you folks and get comments. By the summer, we'd like to have those comments incorporated and have defined what we're going to study. Then I go to the Division office and get a budget for the modeling. And then we'll start the modeling, which sounds like it may be by the end of the summer. So if there's a key missing piece and someone at the county or state level can collect that data, we can put things on hold for six months or so, until that data is collected. (Selegean, ACOE)
A: One thing that is needed is TSS data and an understanding of the grain size distribution. (Nairn, Baird & Associates)

Comment: With this timeframe right now, identifying those parts of the watershed would be a good subject to keep afloat. We'll keep the dialog going with you. But if we know what you have in mind, then we can keep that in mind ourselves as we progress with the scoping report. (Halverson, Baird & Associates)

Comment: And spring is really the best time to be collecting a lot of information. (Nairn, Baird & Associates)

Comment: Since this is such a big watershed, and we're not organized as one big watershed, but more broken down into two majors and then the middle Grand – I would recommend targeting and meeting with the lower Grand group and finding out all they have. And then the middle and upper Grand. You'll draw more people, and I think come out with a better ability to institutionalize some of the results until down the road we may have an organizational structure that will cover the whole Grand watershed. (Tompkins, Michigan DEQ)

Q: When you say grain size, do you want the full distribution or just the sand break? (Blumer, USGS)
A: Well, preferably the full distribution, but usually it's as sand-silt-clay. Some idea of the median grain size within the fractions after the breakdown of sand-silt-clay would be good. And then if possible, the full hydrometer grain size analysis. (Nairn, Baird & Associates)

Comment: Has anybody studied the classification of the different reaches and tributaries as far as Rosgens or anything like that as far as what stage these rivers are evolving in? If you look at Michigan, the problem we have here, which is different from other states, is that when the Chicago fire went through, a lot of wood was taken from Michigan to rebuild the city. And that's when we had all of the wood floats. So we're taking a river system that's only 60 or 70 years old… it's not an old, slowly evolving river… we took this nice river and plowed logs down through it. And now it's just getting to a point where nature is starting to come back again. But 70 years isn't much. (Johnson, NRCS)
Response: That's an excellent point. In some cases we have had previous geomorphic studies as background for what we're doing. (Nairn, Baird & Associates)

Q: Just for clarification, when you've gone into some of these larger watersheds in the past and you've sort of focused in on a smaller geographic area, that doesn't then preclude you, at some point in the future, from going back in there for a second effort somewhere else under the Program? It would just be the identification of some additional need in the watershed and appropriating the funds through your Division office to do that? (Crane, GLC)
A: Right. On the Nemadji, we studied two subwatersheds. On the Clinton, we're studying two fairly good-sized subwatersheds. And not only are there the watershed models, but a lot of the times there's also a hydrodynamic sediment transport model of the river itself. So not just the water and sediment being delivered to the river, but also a fairly detailed multi-dimensional model down by the mouth where materials are being carried out – whether it's sand being fed into the littoral system or sediment dropping out in the navigation channel – they usually consist of that sort of component. There are kind of two schools of thought with that. One being that once the sediment gets into the river, eventually it's going to get down to the navigation channel and fall out. It may take a year or twenty years, but eventually it's going to get down there – so focus all of your efforts on things you can do in the uplands to keep the material there. The other thought is to try to quantify some of the transport mechanisms. We've sort of had a foot in both camps for most of these studies. There are folks who want both. (Selegean, ACOE)
A: And I think the important thing to remember is that it's not necessarily an either/or type of situation. In other words, if it makes sense to focus in on a smaller geographic area to provide benefit to that portion of the watershed, as opposed to doing something that might be less valuable for the entire watershed, then you need to sort of trade that off. For example, this effort might focus on some issues in the lower Grand. But two years later, Jim might be able to put together another proposal and come back and look at some issues in the upper Grand. I think it's important to look at this as not necessarily just a one-time only deal. And if this Program is successful and funds continue to be appropriated, over time, the Detroit district and other districts involved with this Program for the ACOE will begin to address issues and develop models for essentially all of the tributaries that have some sort of a federal navigation presence or are in an Area of

Concern. So if the Program continues for another ten or twenty years, there's going to be a whole lot of effort applied to these different tributaries. So even though some of you are representing those interests from all of the different subwatersheds, the trade-off might be that some benefit occurs first to the lower Grand and then the second effort comes in at some point in the future to address some issues in the upper part of the watershed. (Crane, GLC)

Q: Is this model going to be effective for the different camps, if you will, of people that are here? Some of the people here want to keep the sediment out of the stream for recreational uses, which is different from fish uses. And farmers might want to keep the sediment out of there so that the tile lines still run. Will this model be able to be used by different organizations with different levels of what constitutes too much sediment? (Johnson, NRCS)
A: There are probably a couple of things that influence the way it is used and who uses it. One is the type of outputs that are produced by it, and the other aspect is how user-friendly it is. And to some extent, that's why the earlier we identify the keepers of the model and the users, the better. It's good to have some idea of this as you go, so that you're setting up the model so that you're getting out what you want and it's at a level that's suitable. Based on the feedback we get from you, one of our tasks will be to develop five or six scenarios we'd like you to test with the model, but only to give an example of how the model works. And this would be built in to the training session at the end. But obviously the number of combinations and permutations is limitless and the users of the model would be able to apply the model for that. We're not being tasked to solve the problems, were being asked to develop a tool that will be used by others to solve the problems or make decisions. (Nairn, Baird & Associates)

Q: What kind of hardware are we going to need to run this? (Johnson, NRCS)
A: They all run on PCs. The very first model we put together, we used a proprietary European model that was really expensive. And when we handed it off, we handed off our only software licenses. And we've learned from that study that from now on we're only going to use models that are in the public domain. So you can go to the ACOE website and download HEC-6 or something like that. There may be some software that you'll need to purchase to make the model more user-friendly at the front end, but for the most part it will all be public domain. It depends on the users of the model. (Selegean, ACOE)

Appendix D

Existing Programs, Data, and Data Sources:

- National Weather Service – Flood forecast model for the Grand, have been modeling the Grand for many years, Contact: Mark Walton in Grand Rapids
- USGS – Stream gauging stations, Steve Blumer will provide to Corps an up-to-date table of sites operated in state
- Gravel mining, sites along river with lots of gravel extraction
- City of Jackson – Effort to remove sediments from along the river, looking at sedimentation issues
- Upper Grand River Watershed Group (or Management Council)
- Geoffrey Snyder, Jackson County Drain Commissioner - Important contact, examining sedimentation issues
- Michigan DNR – Grand River watershed assessment starting October 1, 2003, Contact: Amy Harrington, DNR, can pass along information from effort
- MSU, Institute of Water Research – Bacteria study group, have probably come across sediment issues
- County drain commissioners – Involved in upper Grand bacteria study
- DEQ – Several Clean Water Act Section 319 projects working closely with GVSU: Pigeon Creek, Crockery Creek, York Creek, Lower Grand River – a few models developed from these efforts
- DNR – Approved watershed plans within the watershed, Contact: Amy Harrington, DNR (can email list of watersheds)
- Macatawa (or Black) River TMDL, in general area, lots of data
- Grand River Watershed Council – Older studies
- ACOE – 1970s Grand River Basin study, navigation study
- Clean Water Act Section 208 studies, included Grand River (~20 years ago)
- Federal Energy Regulatory Commission (FERC) Licensee reports
- Public water supply intake records – Several downstream in the river, includes turbidity data, some of data set goes back over 100 years, Wyoming and Grand Rapids plant – down towards Holland)
- Rogue River at Rockford – Data related to drinking water intake and filtration, long string of data if it's still available
- NRCS – Floodplain management studies, in process of completing Thornapple, not sure when complete, maybe 2004, includes extensive cross sections, Contact: Chris Johnson, NRCS
- MSU Extension – Ottawa County nutrient studies (last 10 years), composting programs, alternate animal feeding programs
- Ottawa County greenways program
- West Michigan Strategic Alliance Organization – Studying benefits of preserving green infrastructure (greenways along the tributaries), compile that information with other projects from around the country to show benefits
- Grand Valley Metro Council – might have information, represents a variety of governments
- Michigan Dept. of Transportation – Bridge scour data, hydraulic data, replacement of 131 bridge in Grand Rapids related to scour
- Grand Rapids wastewater treatment plant – River run sampling, monitoring 7 or 8 places along Grand River for ~ 10+ years, phosphorous, e coli data, but no particle size data, interested in CSOs
- EPA, Great Lakes National Program Office website – Study on particle size, ~20 sites on lower Grand
- USGS – 1970s study on stage-discharge relationship at Eastmanville, 19 or 20 miles upriver from Lake Michigan, could not establish relationship
- MSU – Fisheries/wildlife, Survey of Ag Producers, Contact: Geoffrey Habron
- Dams at Deer Creek, Sand Creek, Blakely Creek, Coldwater River, Maple River, Thornapple River
- Deer creek, sand creek, large sand bedload in creeks

- Lyons Dam – (junction of upper and lower grand) repaired fish ladder, talk of possible removal of dam
- Dry dams located near Hudsonville
- DEQ – Matrix developed as a resource from Lower Grand 319 project, Map of all watersheds with approved 319 projects, local groups, areas with no activity (for lower grand: from Ionia to Grand Haven), Contact: Jason Buck, Fishbeck, Thompson, Carr & Huber
- Data layers based on impervious analysis and 2000 satellite imaging – Stored at Grand Valley Metro Council - Regis office (regional planning agency) and Annis Water Resources Institute, Contact: Andy Bowman at GVMC; John Koches at AWRI
- DEQ – Wetland monitoring near City of Jackson for TMDL, 2001-2002 (can provide reports), wet weather studies of sediment loads on Deer Creek and Crockery Creek
- MSU and GVSU – Wet weather sampling on Mill Creek in mid to late 1970s
- DEQ – Hydrology SWIM models (Soil and Water Integrated Model) – Buck Creek, Plaster Creek, Indian Mill Creek
- Drain commissioners offices – Modeling for several of the larger tributary systems (Bliss Creek)
- AWRI at GVSU – Digital GIS info and library of historic studies for Grand River
- AWRI – May have DEM better than 3 meter resolution
- DNR – Grand River watershed assessment
- DEQ – Resource library of info from Lower Grand 319 project, may be maintained at Grand Valley Metro Council or AWRI – developing framework for sustainable library
- USGS – Dave Holtschlag report on groundwater/surface water flow (may be on website), USGS staging records
- Paul Seelbach (Michigan DNR)– Lower peninsula Michigan Valley Segment Ecological Classification (VSEC) model database, looking at underlying glacial ties for water, John Koches integrating this information for the Grand River level
- DEQ – hydrodynamics of upper Grand are very different
- Political and resources available are different in upper and lower
- More current data layers in lower Grand than in agricultural upper watershed areas
- Upper Grand River Watershed Council – 250 page watershed plan, centered around sediment issues, product of 319 project for the upper Grand
- Drain Commissioners responsible for having efficient drains to service agricultural community, hydrology resulting from this comes down and creates problems for lower Grand, downstream impacts in higher topographic areas (ex. Kent County), waters cut into sandy banks
- Grand River Expedition 1990 and 2000 – Kayak/canoe sampling expedition from Jackson to Grand Haven, every 10 years, Contact: Doug Carter at MSU's Kellogg Biological Station (KBS)
- Looking Glass, Maple River, and Stony Creek watershed groups
- NRCS field offices – Have some very old maps/photos

Appendix E

Additional Points of Contact:

Annis Water Resources Institute
John Koches
Senior Program Manager for Information Services Center
Grand Valley State University
125 Lake Michigan Center
740 West Shoreline Drive
Muskegon, MI 49441
(616) 331-3749
kochesj@gvsu.edu
(involved with Lower Grand 319 project)

Fishbeck, Thompson, Carr & Huber
Jason Buck
Civil Department/Water Resources
1515 Arboretum Drive, SE
Grand Rapids, MI 49546
(616) 464-3919
jebuck@FTCH.com
(Contractor for Lower Grand 319 project)

Grand Valley Metropolitan Council
Andy Bowman
Planning Director
40 Pearl Street NW, Suite 410
Grand Rapids, MI 49503
(616) 776-7611
bowmana@gvmc.org
(Involved with Lower Grand 319 project)

Jackson County Drain Commission
Geoffrey Snyder
Drain Commissioner
120 W. Michigan Avenue
Jackson, MI 49201
(517) 788-4398
Fax: (517) 780-4728
(Fax is prefered method of communication)
GSnyder@co.jackson.mi.us
(Contact for Upper Grand)

Michigan DEQ
Megan McMahon
Nonpoint Source Program
525 W. Allegan, P.O. Box 30242
Lansing, MI 48909
(517) 335-6107
MCMAHMEG@michigan.gov
(Contact for Middle Grand)

Michigan DNR
Paul Seelbach
Research Biology Specialist
1109 N. University Avenue
212 Museums Annex Building
Ann Arbor, MI 48109
(734) 663-3554
SEELBACP@michigan.gov
(Coldwater fishes and GIS river specialist)

Michigan State University
Doug Carter
Land and Water Unit
W.K. Kellogg Biological Station
3700 East Gull Lake Drive
Hickory Corners, MI 49060
(269) 671-2412
Carterd@msue.msu.edu
(Contact for Grand River Expedition)

Geoffrey Habron
Assistant Professor
Dept. of Fisheries & Wildlife
13 Natural Resources Building
East Lansing, MI 48823
habrong@msu.edu
(517) 432-8086
(Survey of Ag producers)

NOAA – National Weather Service
Mark Walton
Grand Rapids Weather Forecast Office
4899 South Complex Drive SE
Grand Rapids, MI 49512
(616) 949-0643
Mark.Walton@noaa.gov
(Flood forecasting model)

U.S. Geological Survey
Dave Holtschlag
Hydrologist
Lansing District
6520 Mercantile Way, Suite 5
Lansing, MI 48911
(517) 887-8910
dholtschlag@usgs.gov
(USGS report on ground/surface water – data tables)