AN INVENTORY OF STREAMBANKS NEEDING CONSERVATION PRACTICES IN THE PORTAGE RIVER WATERSHED

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Ronald Hoffman
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Numerous studies by the Grand River Inter-County Drainage Board have identified significant sedimentation and other geomorphologic changes that have resulted in log jams and channel restrictions along the Portage River. A 1999 study concluded that a majority of the Portage River Inter-County Drain is affected by sedimentation (Hubbell et al. 1999). Sediment depths 3 - 7 feet were found at 15 of 60 sediment probes taken in a 21-mile stretch of the Portage River ending at the Grand River (ibid.). Abbey 1954, Anonymous 1954, USDA 1958, USDA 1968, etc. described substantial flooding that damaged crops and pasture. This inventory of riparian agricultural areas along 4 main watercourses of the Portage River Watershed was initiated to identify streambank areas that are contributing sediment.

PURPOSE

Reducing streambank erosion and sedimentation with riparian conservation practices will improve water quality and reduce agricultural flood losses. Identifying the sources of sediment is the first step of the process. Specific purposes of riparian conservation practices are to:

- Remove sediment runoff from croplands, grazing lands, and disturbed areas.
- Remove nitrogen, phosphorus, pesticide, and pathogen runoff from cropland, grazing land, and disturbed areas.
- Recharge groundwater and reduce flooding by increasing infiltration.
- Provide wildlife habitat.

OBJECTIVES

- Identify and prioritize riparian lands in agricultural production that may benefit from conservation practices (e.g. filter strips, riparian buffers, etc.).
- Contact landowners that might benefit from government programs that help with the cost of implementing conservation practices e.g. Conservation Reserve Program (CRP), Environmental Quality Incentives Program (EQIP).

PROCEDURE

An inventory of the need for riparian conservation practices in the Portage River Watershed focused on 1) farming activity near waterways, 2) unrestricted livestock access to waterways, and 3) streambank erosion from disturbed areas.

Agricultural activity within 180 ft. of a streambank was determined from USDA 1993-94 black and white aerial photographs (scale 1 in. = 660 ft.), USDA 2001 aerial color slides, and Portage River Inter-County Drain 2000 maps (scale 1 in. = 250 ft.). Four watercourses Orchard (Plum Orchard) Creek, Cahaogen Creek, Pickett and Jacobs Drain, and Wild Drain (Thornapple Creek) were chosen because they were at the headwaters of the Portage River and had the highest agricultural activity. Conditions were confirmed with field visits to 75% of the sites identified from aerial photos and maps.

A data-entry form (Table 1) was completed for each site and used to derive a prioritize list of those needing conservation practices.

The need for conservation practices was based on three factors within 180 ft. of the streambank: soil slope, erosion factor K (USDA 1980:78) and the width of vegetation. Soil characteristics affecting sedimentation were derived from county soil books (USDA. 1979, USDA. 1981). Two factors, percent slope (s) and soil erosion factor K, were placed in one of 4 categories and points assigned to each category as follows:

% Slope (s)	Points	K value	Points
0-3	1	0.00 - 0.17	1
4-5	2	0.20 - 0.24	2
6-12	3	0.28 - 0.32	3
13-18	4	0.37 - 0.43	4

An index of surface runoff for each soil type was based on a formula that included the degree of soil slope and erosion factor K:

$R = s + K$

R = index of surface runoff

s = soil slope class

K = soil erosion factor

Soil types and their surface runoff indices used in this inventory are listed in Table 2. For example, Spinks sand has a 6-12% slope and a K value of 0.17 so the surface runoff index is 4 (3 + 1). The width of vegetation (V) within 180 ft. of the waterway was also assigned index points:

Width of Streambank Vegetation	Index
>180 ft.	0
100 - 180 ft.	1
30 - 100 ft.	5
< 30 ft.	10

The need for riparian conservation practices (N) was calculated using the formula:

$N = R + V$

N = need for riparian conservation practices

R = surface runoff index

V = streambank vegetation index

The N value at sites could range from 0 to 17. The need for conservation practices based on the N values was classified as a very high need if the score was 14-17, high need if 10-13, medium need if 6-9, low need if 2-5; and very low need if 0-1.

Data from each site was entered into a geographic information system (ArcView) for digital presentation and data analysis. A copy of the data is available on a CD-ROM disk at the Jackson County Conservation District and the Jackson County Drain Commissioner Office.

Direct mailing will be used to advise landowners that have the highest need for riparian conservation practices. Information about conservation practices, cost-sharing programs, and agencies to contact for additional information will be included in the letter.

RESULTS

More than 30 miles (158,250 ft.) of agricultural land along streambanks were inventoried in 4 watercourses of the Portage River Watershed (Figure 1. Table 3). Areas with woody vegetation or wetlands made up most of the non-agricultural land along the ditches so these areas were not inventoried. About 2/3's of the inventoried area was in Ingham County. Ninety-four sites were identified with agricultural activity (Layouts 1-8). Beans, corn, sod, hay and idle fields were the most common agricultural uses. Only two sites were being used for pasture and a dooryard bordered a watercourse at two other inventoried locations. All of the watercourses were channeled ditches.

The areas with the highest risk of erosion (N = 14-17) extended along 31 % (50,300 ft.) of the inventoried area (Table 3). Sites 7 & 8 (Figure 2) were typical of areas with a very high need (N = 14) because the surface runoff index, R = 4, and permanent vegetation extended less than 30 ft from the streambank (V = 10). Even though these two sites bordered 4,800 ft. of the Cahaogen Creek (ditch), sediment entered the stream in only a few locations because a berm separated the fields from the ditch. Sediment depth was 4.2. ft downstream from these two sites (Hubbell, et al. 1999).

Areas with a high need (N = 10-13) extended along about 43% (67,554 ft.) of the inventoried area (Table 3). Figure 4 shows an example of a field with high need (N = 12) for conservation practices because corn was planted to within 30 ft. of the ditch (V = 10), but the soil, Palms Muck, has a Surface Runoff Index (R) of 2.

Nearly 75% (117,900 ft.) of the inventoried area has a very high or high need of conservation practices that would reduce erosion (Table 3). Most of these areas were in Ingham County where corn or beans were grown on muck soils within 30 ft. of the streambank. A berm often separated the fields from the stream so not all of the 117,900 ft. probably will need conservation practices.

Site 11 (Figure 4) is an example of a site (N = 8) with medium need of conservation practices because the Gilford-Colwood complex of soils hand a Surface Runoff Index equaled 3 and woody plants extended about 50 ft. from the edge of the stream (V = 5). About 12% (19,000 ft.) of the inventoried area scored in the medium category (N = 6-9) Table 3.

About 13% (21,300 ft) of the inventoried area had a low or very low need for conservation practices. A golf course, a site enrolled in the Conservation Reserve Program, and two idle fields made up the very low group. Areas of low need included 4 sites of idle fields and 5 sites with row crops but woody vegetation extended at least 100 ft. from the edge of the streambank.

RECOMENDATIONS

The recommendations presented here to reduce soil erosion and sedimentation are general in nature and apply to the 4 watercourses as a whole rather than for specific sites. This inventory identified potential sources of riparian erosion. A program to implement conservation practices for a specific site should follow this study. Those practices will depend on in-depth analysis of the conditions at each site and the landowner's wishes. It is recommended that:

- Landowners should to be informed of the extent and severity of soil erosion and sedimentation in the Portage River Watershed.

- Landowners should be encouraged to participate in riparian conservation practices that will control soil erosion and sedimentation.
- Soil Rental Rates approved for Conservation Reserve Program practices should be raised as an incentive for landowners to participate in cost-sharing practices. Soil Rental Rates are based on the average rental rate for cropland in a county. Then the rate is adjusted based on the productivity of the soil. Approved soil rental rates for similar soils in Jackson County are lower than the rates in the surrounding counties. Present rates for conservation practices can not compete with income earned from farming erosion prone areas.
- Designating the Grand River Watershed, or at least the Portage River portion, a Conservation Reserve Enhancement Program (CREP) area would increase payment rates for practices such as riparian buffers, filter strips, etc.
- Implementing conservation management practices (USDA 2001) such as those listed below will significantly reduce erosion and sedimentation. Some of these practices deal with the stream channel, others with streambank, and some with the area beyond the riparian zone; but all reduce soil erosion.
    - **Cover Crops** – Grasses, legumes, forbs or other herbaceous plants established for seasonal cover reduces erosion from wind and water.
    - **Conservation Crop Rotation** – Growing crops in a recurring sequence on the same field reduces sheet and rill erosion.
    - **Conservation Cover** – Establishing and maintaining perennial vegetation cover on land retired from agriculture reduces erosion and sedimentation and improves water quality.
    - **Critical Area Planting** – Planting vegetation such as trees, shrubs, vines, grasses or legumes on high erodible or critical areas stabilizes the soil and thereby reduces damage from sediment and runoff to downstream areas..
    - **Cross Wind Trap Strip–Filter** – Herbaceous cover resistant to wind erosion, established adjacent to surface drainage ditches across the prevailing wind erosion direction will entrap windborne sediment to improve water quality.
    - **Filter Strips** – Narrow bands of grass or other permanent vegetation adjacent and parallel to streams will intercept undesirable contaminants from runoff before they enter a waterbody preventing pollution of surface water and groundwater.
    - **Grade Stabilization Structure** – A structure (earth embankments and mechanical spillways and full-flow or detention-type structures) used to control the grade and head cutting in natural or artificial channels will stabilize the grade and control erosion and prevent the formation or advance of gullies.
    - **Grass Waterways** - Channels, usually constructed where natural watercourses occur, that are shaped and planted to suitable vegetation to protect soil from erosion, protect surface and groundwater, and improve wildlife habitat.
    - **Pasture And Hayland Planting** – Establishing and re-establishing long-term stands of adapted species of perennial, biennial, or reseeding forage plants will reduce erosion.
    - **Residue Management, -No-Till and Strip Till** – Managing the amount, orientation and distribution of crop and other plant residue on the soil surface year-round, while growing crops in previously untilled soil and residue will reduce sheet, rill and wind erosion.
    - **Residue Management, Mulch Till** - Managing the amount, orientation and distribution of crop and other plant residue on the soil surface year-round, while growing crops where the entire field is tilled prior to planting will reduce sheet, rill and wind erosion.

- **Residue Management, Seasonal** - Managing the amount, orientation and distribution of crop and other plant residue on the soil surface during part of the year, while growing crops in a clean tilled seedbed will reduce sheet, rill and wind erosion.
- **Riparian Forest Buffers** – Areas with trees and shrubs adjacent to water and up-gradient from watercourses will filter out pollutants, create shade, and provide wildlife habitat.
- **Riparian Herbaceous Cover** – Herbaceous cover will improve and protect water quality by reducing the amount of sediment and other pollutants, intercept solar radiation, create shade and increase the depth to width ratio of streams where it is not feasible or desirable to establish wood vegetation. Planting native grasses will provide long-term vegetative cover, but are slower to establish than introduced species. Native plants are usually better adapted to our local conditions, are more resistant to diseases and insect problems. Introduced grasses and legumes will live for 10-30 years, grow fairly fast and are usually easier to establish than native grasses. Introduced species should be used only when there are no alternative native species and the introduced species are not invasive.
- **Sediment Basin** – A basin constructed to collect and store debris or sediment will preserve the capacity of waterways, prevent undesirable deposition on bottom lands and developed areas, trap sediment originating from construction sites, and facilitate deposition and storage of silt, sand, gravel, stone, agricultural wastes and other detritus.
- **Side Inlet Structures (Bubble Filter Strips)** –, Rock riprap, grade stabilization structures, etc. trap pollutants before they can enter the stream where runoff is funneled into a waterbody by embankments, dikes, or spoil.
- **Streambank Protection** – Planting and maintaining trees, shrubs, and grasses, bank covers, riprap, etc. will help maintain the capacity of the channel, control channel meander that would adversely affect downstream facilities, and reduce sediment loads.
- **Stream Crossing and Livestock Access** – A constructed stable area extending either into or across streams will minimize sediment and nutrient delivery where livestock need access to streams.
- **Tree and Shrub Establishment** – Establishing woody plants by planting or seeding will provide erosion control.
- **Use Exclusion** – Excluding animal, people or vehicles from sensitive riparian areas will reduce erosion.
- **Vegetative Barrier** – Permanent strips of stiff, dense vegetation along the general contour of slopes or across concentrated flow areas will reduce sheet and rill erosion, reduce ephemeral gully erosion, mange water flow, stabilize steep slopes and trap sediment.
- **Water and Sediment Control Basin** – An earth embankment or combination ridge and channel generally constructed across the slope and minor watercourse to form a sediment trap and water detention basin will reduce watercourse and gully erosion, trap sediment reduce and mange onsite and downstream runoff and improve water quality.
- **Wetland Restoration** - Wetland acreage will improve ground and surface water quality, act as a flood control device by slowing water flow, and replenish groundwater and provide wildlife habitat.

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Table 1. Riparian Conservation Need Inventory Data Entry Form

Site Number:_____ Need Score_____ Investigator:_____
Determination Method: B&W Aerial Photo_____ Color Slide_____ Field_____
Status: Soil map_____ Sub-basin _____ Portage R. Evaluation Map_____
Designated Drain Y N _____
Location:
General:_____
Township Name_____ Twp. _____ Range _____ Sec._____
Township Name_____ Twp. _____ Range _____ Sec._____
Latitude_____ Longitude_____
Owner:
Name:_____ Farm Number_____ Tract Number_____
Addresses:_____
Phone:_____

Identification	Soil Type	Streambank Veg.	Streamside	Land	Length	Score
	Symbol : Pts.	Width (ft) : pts.	Cover Type[1]	Use[2]	(ft)	

Best Management Practice Recommendations (forest buffer, filter strips, fencing, wetland restoration, preservation, etc.):

Comments:

[1]H - Herbaceous
S - Shrub
T - Trees

[2] B - Bare ground
I - Idle
P - Pasture
R - Row crops

Table 3. Length (ft.) of riparian areas along 4 watercourses of the Portage River Watershed that need conservation practices.

Watercourse	Conservation Need Index (Score, Class)	Conservation Practice Need Index (score, class)				
	14-17 Very High	10-13 High	6-9 Medium	2-5 Low	0-1 Very Low	Total
Name, Subbasin Number	Length (ft.)	Length (ft.)	Length (ft.)	Length (ft.)	Length (ft.)	Length (ft.)
Cahaogen Creek, 1221	25,738	25,696	5,236	4,767	-	61,437
Pickett & Jacobs Drain, 1227	8,727	31,378	4,409	2,039	7,980	54,533
Wild Drain, 1262	13,007	5,603	1,127	480	-	20,217
Orchard Creek, 1294	2,902	4,877	8,249	6,039	-	22,067
Total	50,374	67,554	19,021	13,325	7,980	158,254

Table 4. Description of 94 riparian sites inventoried for the need (N) of riparian conservation practices.

Site	Layout Map	Subbasin*	N	Township	Range	Section	Length (ft.)
1	4	1262	14	1s	2e	12	3,153
2	3	1221	9	1s	1e	2	675
3	3	1221	9	1s	1e	2	1,521
4	3	1221	14	1s	1e	2	759
5	3	1221	14	1s	1e	2	562
6	3	1221	14	1s	1e	2	1,727
7	3, 4	1221	14	1s	1e	2, 11	1,877
8	3, 4	1221	14	1s	1e	2, 11	1,743
9	3	1221	14	1s	1e	2	1,996
10	4	1221	14	1s	1e	11	1,259
11	4	1221	9	1s	1e	11	716
12	4	1221	9	1s	1e	12, 13	2,099
13	4	1294	14	1s	1e	13	2,902
14	4	1294	8	1s	1e	13	1,360
15	4, 5	1294	13	1s	1e	13	1,360
16	4	1294	8	1s	1e	13	923
17	4, 5	1294	9	1s	1e	24	1,110
18	5	1294	12	1s	1e	24	3,517
19	5	1294	2	1s	1e	24	802
20	5	1294	2	1s	1e	24	2,801
21	5	1294	3	1s	1e	24	680
22	5	1294	3	1s	1e	24	1,056
23	5	1294	7	1s	1e	25	3,265
24	4	1294	2	1s	1e	13	700
25	5	1294	7	1s	1e	24	670
26	3	1221	14	1n	1e	35	1,070
27	3	1221	14	1n	1e	35	1,320
28	3	1221	5	1n	1e	35	200
29	3	1221	5	1n	1e	35	775
30	2, 3	1221	14	1n	1e	35	2,175
31	2, 3	1221	14	1n	1e	26	755
32	2	1221	14	1n	1e	26	3,025
33	2	1221	14	1n	1e	26	2,650
34	2, 3	1221	14	1n	1e	26	862
35	2	1221	14	1n	1e	26	775
36	1, 2	1221	12	1n	1e	23, 26	5,345
37	1, 2	1221	14	1n	1e	14, 23	1,245
38	1	1221	12	1n	1e	14	650
39	1	1221	12	1n	1e	14	2,095
40	1	1221	12	1n	1e	14	1,929
41	1	1221	12	1n	1e	14	2,725
42	1	1221	12	1n	1e	11, 14	4,437
43	1	1221	12	1n	1e	11	1,005

Site	Layout Map	Subbasin*	N	Township	Range	Section	Length (ft.)
44	1	1221	2	1n	1e	11	2,722
45	1	1221	12	1n	1e	11	876
46	5	1294	8	1s	1e	24	921
47	3	1221	14	1s	1e	2	279
48	3	1221	14	1s	1e	2	807
49	2	1221	12	1n	1e	23, 26	444
50	1	1221	12	1n	1e	11	1,766
51	1	1221	12	1n	1e	11, 14	2,671
52	2	1221	12	1n	1e	23, 26	1,753
53	3	1221	5	1n	1e	35	1,070
54	3	1221	9	1n	1e	35	225
55	3	1221	14	1n	1e	35	852
56	7	1227	0	1n	2e	29	1,245
57	7	1227	0	1n	2e	29	3,174
58	7	1227	12	1n	2e	29	1,628
59	7	1227	12	1n	2e	29	1,312
60	7	1227	3	1n	2e	29	1,312
61	8	1262	13	1n	2e	32	476
62	7	1227	7	1n	2e	28	2,406
63	8	1262	14	1s	2e	5, 6	1,866
64	8	1262	14	1s	2e	6	2,406
65	8	1262	5	1s	2e	6	480
66	8	1262	14	1s	2e	5, 6	5,582
67	8	1262	13	1n	2e	32	1,428
68	8	1262	12	1n	2e	32	1,676
69	8	1262	12	1n	2e	32	1,565
70	8	1262	13	1n	2e	32	458
71	6	1227	14	1n	2e	7	1,517
72	6	1227	9	1n	2e	7	291
73	6	1227	0	1n	2e	7	3,561
74	6	1227	4	1n	2e	7	727
75	6	1227	8	1n	2e	7	606
76	6	1227	14	1n	2e	18	2,670
77	6	1227	12	1n	2e	18	3,710
78	6, 7	1227	12	1n	2e	18	7,190
79	6	1227	14	1n	2e	18	600
80	7	1227	12	1n	2e	19	2,600
81	7	1227	15	1n	2e	19	1,885
82	7	1227	12	1n	2e	19	931
83	7	1227	12	1n	2e	30	1,980
84	7	1227	12	1n	2e	30	722
85	7	1227	12	1n	2e	29, 30	4,104
86	7	1227	12	1n	2e	19	387
87	7	1227	9	1n	2e	19	388
88	6	1227	9	1n	2e	7	718

Site	Layout Map	Subbasin*	N	Township	Range	Section	Length (ft.)
89	4	1262	9	1s	1e	12	1,127
90	7	1227	12	1n	2e	21	2,739
91	7	1227	12	12	2e	21	1,441
92	7	1227	12	1n	2e	21	2,634
93	7	1227	14	1n	2e	16	2,055
94	7, 8	1262	13	1n	2e	32	1681

*Subbasin

1221 Portage River (Cahaogen Creek)

1227 Pickett & Jacobs Drain (Thornapple Creek)

1262 Wild Drain (Orchard Creek

1294 Orchard Creek (Portage River)