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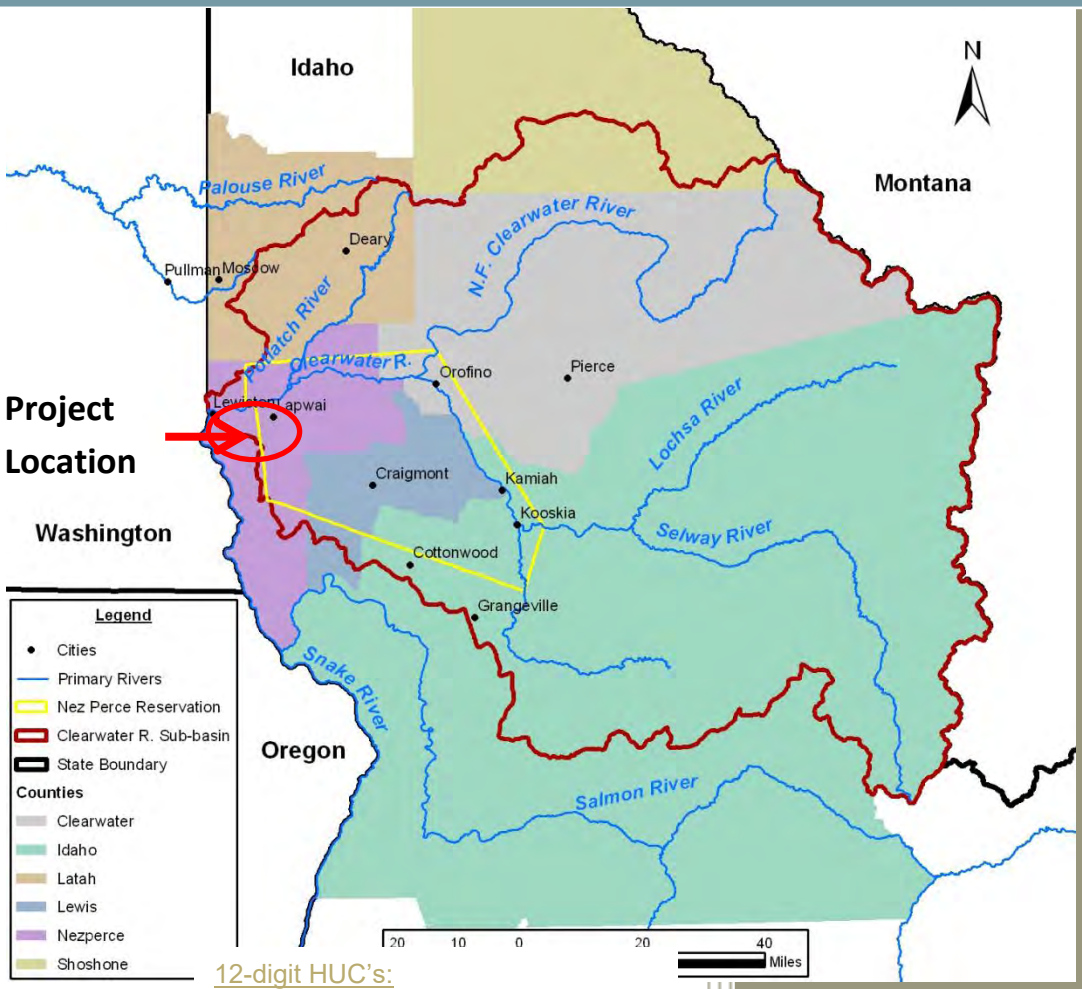
Tammany Creek Watershed Assessment Report
Appendix 2 – NSERL-WEPP Surface Erosion Estimates



12-digit HUC's:
170601030306 (Tammany Creek),
1706010305 (Ten Mile Canyon),
170603061307 (Lindsay Creek),
1706013061308 (Hidden Canyon),
170603061308 (unnamed tributary)

Nez Perce Soil and Water Conservation District

Tammany Creek
Watershed Assessment Report
Appendix 2 – NSERL-WEPP Surface Erosion Estimates

Prepared for the:
National Water Quality Initiative
USDA Natural Resources Conservation Service
Boise, Idaho

Prepared by:

Nez Perce Soil and Water Conservation District
PO Box 131
Culdesac, Idaho 83524
www.nezperceswcd.org
npswcd@co.nezperce.id.us
208-843-2931

Gregg N. Teasdale, PhD, PE
District Conservation Engineer

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NEZ PERCE
SOIL & WATER CONSERVATION DISTRICT

1. NSERL WEPP-GIS

Surface erosion was computed for selected subbasins in the Tammany Creek watershed with the online GIS implementation of the Water Erosion Prediction Project (WEPP) model by the Laboratory National Soil Erosion Research (NSERL) [1].

The WEPP model computes daily runoff and erosion throughout the year using simulated weather and precipitation. Erosion can be computed over long periods (100 years) to show the year-to-year variability and generate long-term erosion statistics. WEPP has been used to upland and roadway erosion for several previous NPSWCD projects.

1.1 WEPP Model Parameters

The WEPP hillslope model requires information about climate, soil type, surface cover type, cover density, surface rock cover, slope lengths, and slope gradients.

Climate Data

A custom climate file was developed for the NWQI project area with parameters from the climate file for Moscow, ID adjusted by the standard elevation lapse rate and with Prism [2] precipitation and temperature data for the NWQI watersheds. The adjustments are performed by the NSERL web interface.

Soil Data

Soil data for the WEPP watershed models were obtained from the WEPP databased for the soils identified in the

[1] https://milford.nserl.purdue.edu/ol/wepp/index.php

[2] http://www.prism.oregonstate.edu/

SSURGO soil layer discussed in Section 2.4. of the main report.

Slope Gradient and Length

Slope lengths and gradient were determined by the NSERL interface from the 30-meter USGS DEM

Crop Cover and Tillage

Landcover was determined by the NSERL interface from the 2001 USGS National Land Cover Data (NLCD). Three cropping and tillage scenarios included in the WEPP database were selected to represent the expect range of conservation tillage practices: 1) winter wheat continuous no-till, 2) winter wheat mulch till (reduced-till) and 3) fallow.

Channels

To minimize the effect of channel erosion based on the 30-meter DEM, all channels were set to “on rock” in the NSERL interface.

Subbasins

The entire Tammany Creek watershed cannot be evaluated in one project with the NSERL WEPP interface. The thirteen, predominately cultivated, subbasins shown in Figure 1 were evaluated separately. The minimum source channel length was 60 meters, and the critical source area was 4 hectares.

1.2 Results

The 100-year average surface erosion rates for the subbasins are summarized in Table 1. Subbasin average computed surface erosion rates for continuous no-till winter wheat ranged from 0.002 to 0.06 U.S. tons per acre per year (ton/ac/yr) and averaged 0.014 ton/ac/yr. Mulch till erosion rates averaged 0.31 ton/ac/yr and fallow erosion averaged 2.94 ton/ac/yr. On rock channels, sediment delivery ratios

ranged from 0.06 to 1.0, and averaged 0.74 for continuous no-till, 0.61 for mulch till, and 0.43 for fallow.

The NSERL WEPP-GIS estimates are compared to the RUSLE2-GIS estimates in Table 2. The RUSLE2-GIS estimate of annual average surface erosion for no-till winter wheat with fallow averages are many times the WEPP-GIS estimate for continuous no-till winter wheat without fallow. Assuming that 56 percent of the areas of the subbasins are fallow each year, the average difference reduces to about 1 percent. Considering the lower resolution of the DEM and 20-year-old land cover data used in the analysis, the WEPP-GIS erosion estimates agree reasonably well with the RUSLE2-GIS estimates when adjusted for fallow.

1.3 Return Period Analysis

The NSERL-WEPP software summarizes return period statistics derived from the daily sediment yield data. Return period statistics expressed as a multiple of the 2-year annual sediment yield are summarized in Table 3. The 5-year sediment yield averages about 7 times the 2-year sediment yield. The 25-year sediment yield is up to 85 times the 2-year sediment yield and averages 16.5 times.

1.4 Use of NSERL-WEPP

The NSERL WEPP-GIS interface is an efficient way to compute initial estimates of surface soil erosion for small and medium sized agricultural subbasins with WEPP technology. Currently, the built-in low-resolution DEM and landcover data limits its use in this project. Documentation and guidance for use of the interface is minimal.

Tammany Creek Watershed NSERL-WEPP GIS Average Annual Surface Erosion										
		Continuous No-Till			Mulch Till			Fallow		
Subbasin	Area_ac	ton/yr	ton/ac/yr	SDR	ton/yr	ton/ac/yr	SDR	ton/yr	ton/ac/yr	SDR
2	4,543	129.7	0.029	0.240	3,627	0.80	0.122	25,153	5.54	0.058
3	534	1.3	0.002	0.892	21	0.04	0.837	579	1.09	0.54
4	1,172	12.2	0.010	0.519	603	0.51	0.453	4,773	4.07	0.331
5	717	2.5	0.004	0.996	57	0.08	0.529	1,197	1.67	0.431
6	2,559	107.4	0.042	0.274	1,930	0.75	0.229	19,169	7.49	0.119
7	3,687	10.7	0.003	0.346	300	0.08	0.345	4,064	1.1	0.508
8	469	2.8	0.006	0.990	150	0.32	0.662	1,583	3.37	0.379
9	357	0.6	0.002	1.000	22	0.06	0.8	293	0.82	0.547
10	289	0.8	0.003	0.823	7	0.03	0.785	223	0.77	0.58
11	260	15.3	0.059	0.528	198	0.76	0.375	1,546	5.96	0.341
12	225	2.4	0.011	1.000	79	0.35	0.895	711	3.17	0.452
13	213	1.2	0.006	1.000	49	0.23	0.836	602	2.82	0.417
14	130	0.2	0.002	1.000	1	0.01	1.000	50	0.38	0.861

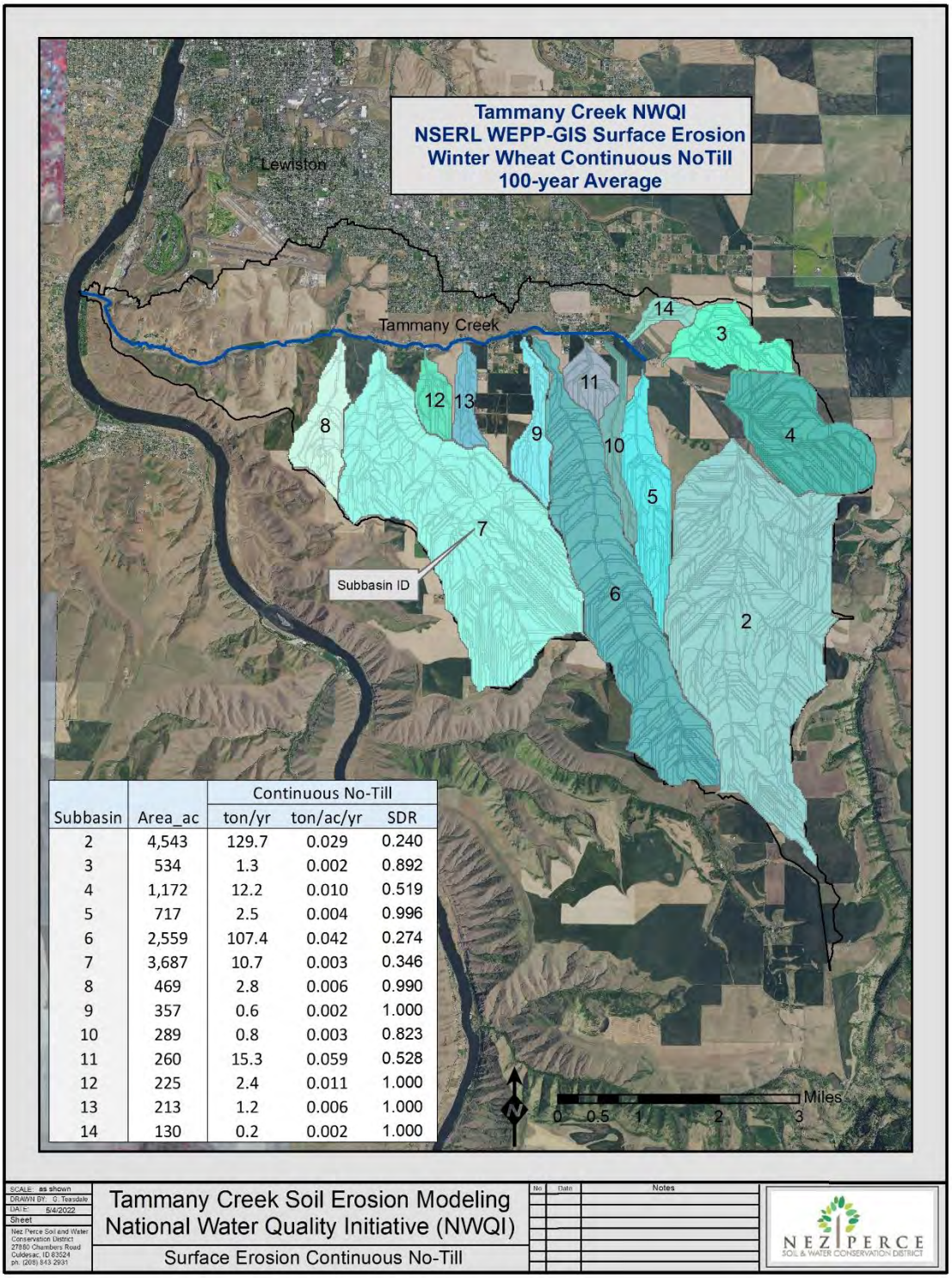
Table 1. Tammany Creek watershed NSERL-WEPP GIS average annual surface erosion.

Comparison of NSERL-WEPP with RUSLE2-GIS Erosion Estimates					
Subbasin	Area_ac	WEPP No-Till ton/ac/yr	WEPP Fallow ton/ac/yr	WEPP No-Till With Fallow ton/ac/yr	RUSLE2-GIS Notill ton/ac/yr
2	4,543	0.03	5.54	3.11	1.12
3	534	0.00	1.09	0.61	0.72
4	1,172	0.01	4.07	2.28	1.08
5	717	0.00	1.67	0.94	0.83
6	2,559	0.04	7.49	4.21	1.03
7	3,687	0.00	1.10	0.6	0.90
8	469	0.01	3.37	1.89	0.93
9	357	0.00	0.82	0.46	0.91
10	289	0.00	0.77	0.43	0.84
11	260	0.06	5.96	3.36	0.70
12	225	0.01	3.17	1.78	1.13
13	213	0.01	2.82	1.58	1.12
14	130	0.00	0.38	0.22	0.56

Table 2. Comparison of NSERL WEPP-GIS erosion with RUSLE2-GIS erosion.

Return Period of Tammany Creek WEPP-GIS Subbasins Annual Sediment Yield														
Return Period Years	Multiple of the 2-year Annual Sediment Yield													
	Subbasin													
	2	3	4	5	6	7	8	9	10	11	12	13	14	Average
2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5	5.1	2.6	8.6	2.9	34.5	18.4	3.0	3.1	3.3	3.2	2.8	3.0	2.8	7.2
10	7.9	3.7	13.6	4.1	56.6	30.1	4.3	4.5	4.7	4.6	4.0	4.4	4.1	11.3
20	10.5	4.8	18.4	5.3	77.9	41.2	5.6	5.8	6.2	6.0	5.2	5.7	5.2	15.2
25	11.4	5.1	20.0	5.7	84.6	44.7	6.0	6.2	6.7	6.4	5.6	6.1	5.6	16.5

Table 3. Return period of Tammany Creek WEPP-GIS subbasins annual sediment yield.



Subbasin	Area_ac	Continuous No-Till ton/yr	ton/ac/yr	SDR
2	4,543	129.7	0.029	0.240
3	534	1.3	0.002	0.892
4	1,172	12.2	0.010	0.519
5	717	2.5	0.004	0.996
6	2,559	107.4	0.042	0.274
7	3,687	10.7	0.003	0.346
8	469	2.8	0.006	0.990
9	357	0.6	0.002	1.000
10	289	0.8	0.003	0.823
11	260	15.3	0.059	0.528
12	225	2.4	0.011	1.000
13	213	1.2	0.006	1.000
14	130	0.2	0.002	1.000

Figure 1. Tammany Creek WEPP-GIS subbasins.