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HUC12_2008_existing	Modeled Spring TP load per HUC12 in Maumee Basin
HUC12_target	Target Spring TP load per HUC12 (per DAP) in Maumee Basin
HUC12s_LU_summary	Detailed land use breakdown (agriculture / developed / natural / barren) by HUC12 in Maumee Basin
Other Resources >>>	<i>Sub-section tracker - internal and external data sources (excl. MNB) informing baseline and/or cost curve inputs</i>
HUC12_To_County_OH	Mapping of counties to HUC12 to distribute baseline load and targets
Bottom Up Calculations >>>	<i>Sub-section tracker - internally-developed backup calculations beyond typical process flow</i>
M_CC Input Backup_livestock	Development of cost curve inputs for 'improved manure application timing' (by species)
M_decomposition of funding need	Hypothesized decomposition of 'one-time' and 'recurring' funding by prioritized BMP ('top 10' only) and by player (i.e., State, farmers, private)

Line Item	Description	2023			2022			2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964	1963	1962	1961	1960	1959	1958	1957	1956	1955	1954	1953	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911	1910	1909	1908	1907	1906	1905	1904	1903	1902	1901	1900	1899	1898	1897	1896	1895	1894	1893	1892	1891	1890	1889	1888	1887	1886	1885	1884	1883	1882	1881	1880	1879	1878	1877	1876	1875	1874	1873	1872	1871	1870	1869	1868	1867	1866	1865	1864	1863	1862	1861	1860	1859	1858	1857	1856	1855	1854	1853	1852	1851	1850	1849	1848	1847	1846	1845	1844	1843	1842	1841	1840	1839	1838	1837	1836	1835	1834	1833	1832	1831	1830	1829	1828	1827	1826	1825	1824	1823	1822	1821	1820	1819	1818	1817	1816	1815	1814	1813	1812	1811	1810	1809	1808	1807	1806	1805	1804	1803	1802	1801	1800	1799	1798	1797	1796	1795	1794	1793	1792	1791	1790	1789	1788	1787	1786	1785	1784	1783	1782	1781	1780	1779	1778	1777	1776	1775	1774	1773	1772	1771	1770	1769	1768	1767	1766	1765	1764	1763	1762	1761	1760	1759	1758	1757	1756	1755	1754	1753	1752	1751	1750	1749	1748	1747	1746	1745	1744	1743	1742	1741	1740	1739	1738	1737	1736	1735	1734	1733	1732	1731	1730	1729	1728	1727	1726	1725	1724	1723	1722	1721	1720	1719	1718	1717	1716	1715	1714	1713	1712	1711	1710	1709	1708	1707	1706	1705	1704	1703	1702	1701	1700	1699	1698	1697	1696	1695	1694	1693	1692	1691	1690	1689	1688	1687	1686	1685	1684	1683	1682	1681	1680	1679	1678	1677	1676	1675	1674	1673	1672	1671	1670	1669	1668	1667	1666	1665	1664	1663	1662	1661	1660	1659	1658	1657	1656	1655	1654	1653	1652	1651	1650	1649	1648	1647	1646	1645	1644	1643	1642	1641	1640	1639	1638	1637	1636	1635	1634	1633	1632	1631	1630	1629	1628	1627	1626	1625	1624	1623	1622	1621	1620	1619	1618	1617	1616	1615	1614	1613	1612	1611	1610	1609	1608	1607	1606	1605	1604	1603	1602	1601	1600	1599	1598	1597	1596	1595	1594	1593	1592	1591	1590	1589	1588	1587	1586	1585	1584	1583	1582	1581	1580	1579	1578	1577	1576	1575	1574	1573	1572	1571	1570	1569	1568	1567	1566	1565	1564	1563	1562	1561	1560	1559	1558	1557	1556	1555	1554	1553	1552	1551	1550	1549	1548	1547	1546	1545	1544	1543	1542	1541	1540	1539	1538	1537	1536	1535	1534	1533	1532	1531	1530	1529	1528	1527	1526	1525	1524	1523	1522	1521	1520	1519	1518	1517	1516	1515	1514	1513	1512	1511	1510	1509	1508	1507	1506	1505	1504	1503	1502	1501	1500	1499	1498	1497	1496	1495	1494	1493	1492	1491	1490	1489	1488	1487	1486	1485	1484	1483	1482	1481	1480	1479	1478	1477	1476	1475	1474	1473	1472	1471	1470	1469	1468	1467	1466	1465	1464	1463	1462	1461	1460	1459	1458	1457	1456	1455	1454	1453	1452	1451	1450	1449	1448	1447	1446	1445	1444	1443	1442	1441	1440	1439	1438	1437	1436	1435	1434	1433	1432	1431	1430	1429	1428	1427	1426	1425	1424	1423	1422	1421	1420	1419	1418	1417	1416	1415	1414	1413	1412	1411	1410	1409	1408	1407	1406	1405	1404	1403	1402	1401	1400	1399	1398	1397	1396	1395	1394	1393	1392	1391	1390	1389	1388	1387	1386	1385	1384	1383	1382	1381	1380	1379	1378	1377	1376	1375	1374	1373	1372	1371	1370	1369	1368	1367	1366	1365	1364	1363	1362	1361	1360	1359	1358	1357	1356	1355	1354	1353	1352	1351	1350	1349	1348	1347	1346	1345	1344	1343	1342	1341	1340	1339	1338	1337	1336	1335	1334	1333	1332	1331	1330	1329	1328	1327	1326	1325	1324	1323	1322	1321	1320	1319	1318	1317	1316	1315	1314	1313	1312	1311	1310	1309	1308	1307	1306	1305	1304	1303	1302	1301	1300	1299	1298	1297	1296	1295	1294	1293	1292	1291	1290	1289	1288	1287	1286	1285	1284	1283	1282	1281	1280	1279	1278	1277	1276	1275	1274	1273	1272	1271	1270	1269	1268	1267	1266	1265	1264	1263	1262	1261	1260	1259	1258	1257	1256	1255	1254	1253	1252	1251	1250	1249	1248	1247	1246	1245	1244	1243	1242	1241	1240	1239	1238	1237	1236	1235	1234	1233	1232	1231	1230	1229	1228	1227	1226	1225	1224	1223	1222	1221	1220	1219	1218	1217	1216	1215	1214	1213	1212	1211	1210	1209	1208	1207	1206	1205	1204	1203	1202	1201	1200	1199	1198	1197	1196	1195	1194	1193	1192	1191	1190	1189	1188	1187	1186	1185	1184	1183	1182	1181	1180	1179	1178	1177	1176	1175	1174	1173	1172	1171	1170	1169	1168	1167	1166	1165	1164	1163	1162	1161	1160	1159	1158	1157	1156	1155	1154	1153	1152	1151	1150	1149	1148	1147	1146	1145	1144	1143	1142	1141	1140	1139	1138	1137	1136	1135	1134	1133	1132	1131	1130	1129	1128	1127	1126	1125	1124	1123	1122	1121	1120	1119	1118	1117	1116	1115	1114	1113	1112	1111	1110	1109	1108	1107	1106	1105	1104	1103	1102	1101	1100	1099	1098	1097	1096	1095	1094	1093	1092	1091	1090	1089	1088	1087	1086	1085	1084	1083	1082	1081	1080	1079	1078	1077	1076	1075	1074	1073	1072	1071	1070	1069	1068	1067	1066	1065	1064	1063	1062	1061	1060	1059	1058	1057	1056	1055	1054	1053	1052	1051	1050	1049	1048	1047	1046	1045	1044	1043	1042	1041	1040	1039	1038	1037	1036	1035	1034	1033	1032	1031	1030	1029	1028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M_Baseline and Target

Maumee Basin level baseline and target decomposition (i.e., by loading 'source')

Overall Baseline

Metric	Unit	Value
2008 Spring (March-July) TP Load	M lbs	2.49
Target (40% reduction from 2008)	M lbs	1.49
2018 Spring (March-July) TP load 5yr trailing AVG	M lbs	2.43
Gap to Target	M lbs	0.94

Disaggregation of baseline

By source	M lbs	% of Total	Units	# Units	lb / unit
2018 Spring (March-July) TP load 5yr trailing AVG	2.43	100%			
Total Point Source	0.19	8.0%			
HSTS	0.06	2.3%		HSTS 90,000	0.62
On-grid	0.05	2.1%		HSTS 85,500	0.59
Off-grid	0.00	0.2%		HSTS 4,500	0.89
NPDES	0.14	5.7%		facilities TBD	
Top permitted discharger	0.04	1.7%		facilities 1	40,870
Remaining major WWTPs (#2-4)	0.03	1.4%		facilities 3	11,527
Non-limited NPDES of significance (B)	0.01	0.5%		facilities 8	1,472
Other NPDES	0.05	2.1%		TBD TBD	TBD
Total NPS	2.24	92%		acres 3,078,025	0.73
NPS Ag	2.06	84.7%		acres 2,481,180	0.83
NPS Developed	0.15	6.2%		acres 333,417	0.45
NPS Natural	0.03	1.2%		acres 263,428	0.11

Historical Spring TP load in Maumee Basin

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Water Year ==>	2.49	2.42	2.32	4.03	0.72	2.21	2.04	3.57	1.34	3.31	1.88
5-year trailing average ==>					2.40	2.34	2.27	2.52	1.98	2.50	2.43

Table 1: Summary of the data set

Variable	Mean	Standard Deviation	Minimum	Maximum
Age	35.2	12.5	18	65
Gender	0.48	0.50	0	1
Income	45000	15000	20000	80000
Education	12.5	1.5	9	16
Marital Status	0.65	0.48	0	1
Occupation	1.2	0.8	0	3
Health Status	0.75	0.42	0	1
Smoking Status	0.25	0.44	0	1
Alcohol Consumption	0.15	0.36	0	1
Exercise Frequency	0.35	0.48	0	1
Stress Level	4.5	1.2	1	7
Life Satisfaction	5.8	1.5	3	9
Depression Score	2.5	1.8	0	5
Loneliness Score	3.2	1.6	1	6
Resilience Score	4.8	1.4	2	7
Optimism Score	5.5	1.3	3	7
Self-Efficacy Score	4.2	1.5	2	6
Emotional Stability	5.0	1.4	3	7
Psychological Well-being	5.2	1.5	3	7
Quality of Life	6.0	1.6	4	8
Overall Health	5.5	1.5	3	7

Legend:
● Blue: Mean
● Red: Standard Deviation
● Green: Minimum
● Yellow: Maximum



M_BMP Tracker

Tracker for BMP data coverage (in 'M_Raw Data')

Legend:

- green fill indicates 'data covered in [M_BMP Tracker]', and incorporated into model'
- yellow fill indicates 'data covered in [M_BMP Tracker]', but not incorporated into model (i.e., b/c we are not detailing 'reduction factor', or because we have not yet included a 'full assessment' per BMP)

Source	Land type	BMP type	BMP	Include / Exclude	Data Coverage				Practical application potential
					TP load reduction factor	DRP load reduction factor	Cost	Treatment Ratio	
Point sources	Urban / Residential	Home sewage treatment systems	Addressing failing septic systems	Out					
Point sources	Urban / Residential	Home sewage treatment systems	Bring off-line sewage systems on-grid	In					
Nonpoint sources	Agriculture	Edge-of-field buffers	Bioreactors	Out					
Nonpoint sources	Agriculture	Edge-of-field buffers	Riparian forest buffers	In					
Nonpoint sources	Agriculture	Edge-of-field buffers	Filter strips	In					
Nonpoint sources	Agriculture	Edge-of-field buffers	Filter areas	In					
Nonpoint sources	Agriculture	Edge-of-field buffers	Retire marginal and highly vulnerable lands	Out					
Nonpoint sources	Agriculture	Edge-of-field buffers	Contour farming	Out					
Nonpoint sources	Agriculture	Edge-of-field buffers	Sorbing ditches	Out					
Nonpoint sources	Agriculture	Edge-of-field buffers	Field windbreaks	Out					
Nonpoint sources	Agriculture	Edge-of-field buffers	Grading	Out					
Nonpoint sources	Agriculture	Edge-of-field buffers	Terraces	Out					
Nonpoint sources	Agriculture	Edge-of-field buffers	Buffer strips	Out					
Nonpoint sources	Agriculture	Edge-of-field buffers	Saturated buffer	Out					
Nonpoint sources	Agriculture	Erosion management	Grassed waterways	In					
Nonpoint sources	Agriculture	Erosion management	Conservation crop rotation	In					
Nonpoint sources	Agriculture	Erosion management	Conservation tillage	In					
Nonpoint sources	Agriculture	Erosion management	Cover crops	In					
Nonpoint sources	Agriculture	Erosion management	Cascading waterways	In					
Nonpoint sources	Agriculture	Hydraulic retention / detention	Blind inlet	In					
Nonpoint sources	Agriculture	Hydraulic retention / detention	Tile drainage redesign	Out					
Nonpoint sources	Agriculture	Hydraulic retention / detention	WASCOB	In					
Nonpoint sources	Agriculture	Hydraulic retention / detention	Drainage water management	In					
Nonpoint sources	Agriculture	Livestock management	Livestock exclusion fencing	Out					
Nonpoint sources	Agriculture	Livestock management	Prescribed grazing	Out					
Nonpoint sources	Agriculture	Livestock management	Chemical treatment for manure	Out					
Nonpoint sources	Agriculture	Livestock management	Reduce phosphorus content in animal feed	Out					
Nonpoint sources	Agriculture	Livestock management	Low-disturbance manure application equipment	Out					
Nonpoint sources	Agriculture	Livestock management	Spring development	Out					
Nonpoint sources	Agriculture	Livestock management	Water well	Out					
Nonpoint sources	Agriculture	Livestock management	Watering facility	Out					
Nonpoint sources	Agriculture	Livestock management	Biological treatment of manure	Out					
Nonpoint sources	Agriculture	Livestock management	Compost / pelletize manure for alternative use	Out					
Nonpoint sources	Agriculture	Livestock management	Install and maintain milkhouse waste filtering systems	Out					
Nonpoint sources	Agriculture	Livestock management	Waste treatment lagoons	Out					
Nonpoint sources	Agriculture	Livestock management	Liquid-solid manure separation systems	Out					
Nonpoint sources	Agriculture	Livestock management	Heavy use area protection	Out					
Nonpoint sources	Agriculture	Livestock management	Roof runoff structure	Out					
Nonpoint sources	Agriculture	Livestock management	Roofed feedlots	Out					
Nonpoint sources	Agriculture	Livestock management	Precision feeding	Out					
Nonpoint sources	Agriculture	Livestock management	Critical area planting	Out					
Nonpoint sources	Agriculture	Nutrient management	Apply P absorbive soil amendments	Out					
Nonpoint sources	Agriculture	Nutrient management	Replace manure with synthetic fertilizer	Out					
Nonpoint sources	Agriculture	Nutrient management	Soil testing & nutrient management planning	In					
Nonpoint sources	Agriculture	Nutrient management	Sub-surface fertilizer placement	In					
Nonpoint sources	Agriculture	Nutrient management	Calibrate fertilizer and manure spreaders	Out					
Nonpoint sources	Agriculture	Nutrient management	Compost blanket	Out					
Nonpoint sources	Agriculture	Nutrient management	Manure incorporation	Out					
Nonpoint sources	Agriculture	Nutrient management	Replace synthetic fertilizer with manure	In					
Nonpoint sources	Agriculture	Nutrient management	Variable rate fertilization	In					
Nonpoint sources	Agriculture	Nutrient management	Improved fertilization timing	Out					
Nonpoint sources	Agriculture	Nutrient management	Phosphorus filters	In					
Nonpoint sources	Agriculture	Wetlands	Wetlands creation (inland)	In					
Nonpoint sources	Agriculture	Wetlands	Wetlands restoration (inland)	In					
Nonpoint sources	Agriculture	Wetlands	Wetlands creation (inland) (inland)	Out					
Nonpoint sources	Agriculture	Wetlands	Living shorelines	Out					
Nonpoint sources	Natural land	Natural land management	Upland wildlife habitat improvement	Out					
Nonpoint sources	Natural land	Natural land management	Wildlife habitat planning	Out					
Nonpoint sources	Natural land	Natural land management	Check dams	Out					
Nonpoint sources	Natural land	Natural land management	Forest Harvesting Practices	Out					
Nonpoint sources	Urban / Residential	Edge-of-field buffers	Urban forest buffers	Out					
Nonpoint sources	Urban / Residential	Erosion management	Geotextiles	Out					
Nonpoint sources	Urban / Residential	Erosion management	Escarpment areas	Out					
Nonpoint sources	Urban / Residential	Erosion management	Permanent slope diversions	Out					
Nonpoint sources	Urban / Residential	Erosion management	Seeding	Out					
Nonpoint sources	Urban / Residential	Erosion management	Sodding	Out					
Nonpoint sources	Urban / Residential	Erosion management	Filter berms, organic berms, barriers, and socks	Out					
Nonpoint sources	Urban / Residential	Erosion management	Silt fence and straw bales	Out					
Nonpoint sources	Urban / Residential	Green infrastructure	Porous concrete and asphalt	Out					
Nonpoint sources	Urban / Residential	Green infrastructure	Sediment traps	Out					
Nonpoint sources	Urban / Residential	Green infrastructure	Green parking lots	Out					
Nonpoint sources	Urban / Residential	Green infrastructure	Green roofs	Out					
Nonpoint sources	Urban / Residential	Green infrastructure	Replacement of curbs and gutters with grass swales	Out					
Nonpoint sources	Urban / Residential	Green infrastructure	Bio-retention / rain gardens	In					
Nonpoint sources	Urban / Residential	Green infrastructure	Advanced sweeping technology	Out					
Nonpoint sources	Urban / Residential	Green infrastructure	Impervious disconnection to amended soils	Out					
Nonpoint sources	Urban / Residential	Green infrastructure	Oil/glyt separator	Out					
Nonpoint sources	Urban / Residential	Green infrastructure	Sand filter	Out					
Nonpoint sources	Urban / Residential	Stream management	Streambank stabilization	In					
Nonpoint sources	Urban / Residential	Green infrastructure	Wet detention ponds	Out					
Nonpoint sources	Urban / Residential	Green infrastructure	Stream restoration	Out					
Nonpoint sources	Urban / Residential	Hydraulic retention / detention	Discharge ponds	Out					
Nonpoint sources	Urban / Residential	Hydraulic retention / detention	Sediment Basin	Out					
Nonpoint sources	Urban / Residential	Hydraulic retention / detention	Earthen perimeter control structures	Out					
Nonpoint sources	Urban / Residential	Hydraulic retention / detention	Storm drain inlet protection	Out					
Nonpoint sources	Urban / Residential	Hydraulic retention / detention	Dry detention ponds	Out					
Nonpoint sources	Urban / Residential	Hydraulic retention / detention	Wet ponds	Out					
Nonpoint sources	Urban / Residential	Hydraulic retention / detention	Infiltration basin	Out					
Nonpoint sources	Urban / Residential	Hydraulic retention / detention	Storm water wetlands	Out					
Nonpoint sources	Urban / Residential	Hydraulic retention / detention	Vegetated open channels	Out					
Nonpoint sources	Urban / Residential	Nutrient management	Lawn fertilization programs	Out					
Point sources	Urban / Residential	Permitted discharge facilities	Municipal filtering of P from wastewater	Out					
Point sources	Urban / Residential	Permitted discharge facilities	Nutrient filtration at top discharge	In					
Point sources	Urban / Residential	Permitted discharge facilities	Chemical addition at major WWTPls	In					
Point sources	Urban / Residential	Permitted discharge facilities	Chemical addition on non-limited municipal dischargers	In					
Nonpoint sources	Water	Aquatic management	Enhance vegetative growth in littoral zones	Out					
Nonpoint sources	Water	Aquatic management	Harvest aquatic vegetation	Out					
Nonpoint sources	Water	Aquatic management	Stimulate aerobic conditions	Out					
Nonpoint sources	Water	Direct water treatment	Spot treatment	Out					
Nonpoint sources	Water	Direct water treatment	Inactivate sedimentary P (alum and staw)	Out					
Nonpoint sources	Water	Direct water treatment	Remove sediment from water bodies	Out					
Nonpoint sources	Agriculture	Wetlands	Coastal flow-through wetlands (created)	In					
Nonpoint sources	Agriculture	Wetlands	Coastal reconnection wetlands (enhancement)	In					
Nonpoint sources	Agriculture	Wetlands	Coastal in-water wetlands (restoration)	In					
Nonpoint sources	Urban / Residential	Stream management	Two-stage ditch construction	In					
Nonpoint sources	Agriculture	Livestock management	Improved timing of manure application from dairies	In					
Nonpoint sources	Agriculture	Livestock management	Improved timing of manure application from feedlots	In					
Nonpoint sources	Agriculture	Livestock management	Improved timing of manure application on poultry farms	In					
Nonpoint sources	Agriculture	Livestock management	Improved timing of manure application from hog farms	In					

C. Baseline and Targets

County-level baseline and target decomposition (i.e., 'gap to target' as determined by current load and DAP-established targets) [excl. NPDES, currently]

FLAG: FX SOURCE

2.20462

Units: M lbs TP

Acreage, by land use type

County	2008 Baseline Load (lbs Spring TP)	Implied 'current' baseline load (lbs Spring TP, as denoted from DAP)	Target load (lbs Spring TP, as denoted from DAP)	Implied 'gap to target' (lbs Spring TP [implied 'current' - target])	Agriculture	Developed	Natural	Baseline unit load (across land use types; lb Spring TP / acre)
Williams	161461	162,914	96292	66621	193717	21469	28699	0.66
Fulton	149631	150,978	89649	61329	177861	19605	20001	0.69
Lucas	54048	54,534	35867	18666	42855	38354	24624	0.51
Defiance	185571	187,240	110954	76286	206247	23295	29432	0.72
Henry	204146	205,983	120473	85510	231940	21573	15184	0.76
Wood	83546	84,298	50652	33646	87395	20484	8220	0.72
Paulding	199955	201,754	117830	83924	212861	18540	16650	0.81
Putnam	243005	245,191	143813	101378	267799	24904	17191	0.78
Hancock	181248	182,879	108143	74736	198089	31216	20962	0.72
Van Wert	222662	224,665	131162	93503	223221	21322	10598	0.87
Allen	194277	196,024	118180	77845	187601	45652	24822	0.75
Hardin	82560	83,303	48867	34436	87768	8346	9562	0.78
Mercer	109018	109,998	64190	45808	107516	9588	7810	0.87
Auglaize	162167	163,626	96758	66868	156627	21099	18926	0.82
Wyandot	21386	21,578	12605	8973	23263	2097	1964	0.78
Seneca	4489	4,530	2645	1885	4952	406	418	0.78
Shelby	13343	13,463	7902	5561	13101	1060	1712	0.84
Total	2272514	2,292,958	1355983	936975	2422813	329012	256775	

C_SWCD Inputs

Raw data to be drawn from regular SWCD data requests (for current and 'practical' BMP application)

Legend - Red text indicates 'direct input' (potentially hard-coded data / formulas) to be drawn from discussion with SWCDs

County	BMP	Baseline Unit	Baseline unit load (lb Spring TP / ac)	Applicable units (# units)	Treatment Ratio	Current application		Practical application	
						(% applicable units)	potential (% applicable units)		
Williams	Two-stage ditch construction	Linear Ft (Capped for max ag acreage)	0.83	204,456	1.9	0%	0%	4%	4%
Williams	Conservation crop rotation	Acres	0.83	66,621	1	70%	95%	95%	95%
Williams	Soil testing & nutrient management planning	Acres	0.83	66,621	1	70%	95%	95%	95%
Williams	Coastal flow-through wetlands (created)	% of Maumee River flow	24904.23	-	1	0%	4%	4%	4%
Williams	Manure incorporation	Acres	0.83	66,621	1	6%	20%	20%	20%
Williams	Sub-surface fertilizer placement	Acres	0.83	66,621	1	1%	20%	20%	20%
Williams	Variable rate fertilization	Acres	0.83	66,621	1	30%	70%	70%	70%
Williams	Cover crops	Acres	0.83	66,621	1	10%	40%	40%	40%
Williams	Riparian forest buffers	Acres	0.83	66,621	10	1%	2%	2%	2%
Williams	Drainage water management	Acres	0.83	66,621	20	0%	1%	1%	1%
Williams	Wetlands restoration (inland)	Acres	0.83	66,621	50	0%	0%	0%	0%
Fulton	Two-stage ditch construction	Linear Ft (Capped for max ag acreage)	0.83	204,456	1.9	0%	4%	4%	4%
Fulton	Conservation crop rotation	Acres	0.83	61,329	1	5%	30%	30%	30%
Fulton	Soil testing & nutrient management planning	Acres	0.83	61,329	1	70%	95%	95%	95%
Fulton	Coastal flow-through wetlands (created)	% of Maumee River flow	24904.23	-	1	0%	4%	4%	4%
Fulton	Manure incorporation	Acres	0.83	61,329	1	6%	20%	20%	20%
Fulton	Sub-surface fertilizer placement	Acres	0.83	61,329	1	1%	20%	20%	20%
Fulton	Variable rate fertilization	Acres	0.83	61,329	1	30%	70%	70%	70%
Fulton	Cover crops	Acres	0.83	61,329	1	10%	40%	40%	40%
Fulton	Riparian forest buffers	Acres	0.83	61,329	10	1%	2%	2%	2%
Fulton	Drainage water management	Acres	0.83	61,329	20	0%	1%	1%	1%
Fulton	Wetlands restoration (inland)	Acres	0.83	61,329	50	0%	0%	0%	0%
Lucas	Two-stage ditch construction	Linear Ft (Capped for max ag acreage)	0.83	204,456	1.9	0%	4%	4%	4%
Lucas	Conservation crop rotation	Acres	0.83	18,666	1	5%	30%	30%	30%
Lucas	Soil testing & nutrient management planning	Acres	0.83	18,666	1	70%	95%	95%	95%
Lucas	Coastal flow-through wetlands (created)	% of Maumee River flow	24904.23	200	1	0%	4%	4%	4%
Lucas	Manure incorporation	Acres	0.83	18,666	1	6%	20%	20%	20%
Lucas	Sub-surface fertilizer placement	Acres	0.83	18,666	1	1%	20%	20%	20%
Lucas	Variable rate fertilization	Acres	0.83	18,666	1	30%	70%	70%	70%
Lucas	Cover crops	Acres	0.83	18,666	1	10%	40%	40%	40%
Lucas	Riparian forest buffers	Acres	0.83	18,666	10	1%	2%	2%	2%
Lucas	Drainage water management	Acres	0.83	18,666	20	0%	1%	1%	1%
Lucas	Wetlands restoration (inland)	Acres	0.83	18,666	50	0%	0%	0%	0%
Defiance	Two-stage ditch construction	Linear Ft (Capped for max ag acreage)	0.83	204,456	1.9	0%	4%	4%	4%
Defiance	Conservation crop rotation	Acres	0.83	76,286	1	5%	30%	30%	30%
Defiance	Soil testing & nutrient management planning	Acres	0.83	76,286	1	70%	95%	95%	95%
Defiance	Coastal flow-through wetlands (created)	% of Maumee River flow	24904.23	76,286	1	0%	4%	4%	4%
Defiance	Manure incorporation	Acres	0.83	76,286	1	6%	20%	20%	20%
Defiance	Sub-surface fertilizer placement	Acres	0.83	76,286	1	1%	20%	20%	20%
Defiance	Variable rate fertilization	Acres	0.83	76,286	1	30%	70%	70%	70%
Defiance	Cover crops	Acres	0.83	76,286	1	10%	40%	40%	40%
Defiance	Riparian forest buffers	Acres	0.83	76,286	10	1%	2%	2%	2%
Defiance	Drainage water management	Acres	0.83	76,286	20	0%	1%	1%	1%
Defiance	Wetlands restoration (inland)	Acres	0.83	76,286	50	0%	0%	0%	0%
Henry	Two-stage ditch construction	Linear Ft (Capped for max ag acreage)	0.83	204,456	1.9	0%	4%	4%	4%
Henry	Conservation crop rotation	Acres	0.83	85,510	1	5%	30%	30%	30%
Henry	Soil testing & nutrient management planning	Acres	0.83	85,510	1	70%	95%	95%	95%
Henry	Coastal flow-through wetlands (created)	% of Maumee River flow	24904.23	85,510	1	0%	4%	4%	4%
Henry	Manure incorporation	Acres	0.83	85,510	1	6%	20%	20%	20%
Henry	Sub-surface fertilizer placement	Acres	0.83	85,510	1	1%	20%	20%	20%
Henry	Variable rate fertilization	Acres	0.83	85,510	1	30%	70%	70%	70%
Henry	Cover crops	Acres	0.83	85,510	10	1%	2%	2%	2%
Henry	Riparian forest buffers	Acres	0.83	85,510	10	1%	2%	2%	2%
Henry	Drainage water management	Acres	0.83	85,510	20	0%	1%	1%	1%
Henry	Wetlands restoration (inland)	Acres	0.83	85,510	50	0%	0%	0%	0%
Wood	Two-stage ditch construction	Linear Ft (Capped for max ag acreage)	0.83	204,456	1.9	0%	4%	4%	4%
Wood	Conservation crop rotation	Acres	0.83	33,646	1	5%	30%	30%	30%
Wood	Soil testing & nutrient management planning	Acres	0.83	33,646	1	70%	95%	95%	95%
Wood	Coastal flow-through wetlands (created)	% of Maumee River flow	24904.23	33,646	1	0%	4%	4%	4%
Wood	Manure incorporation	Acres	0.83	33,646	1	6%	20%	20%	20%
Wood	Sub-surface fertilizer placement	Acres	0.83	33,646	1	1%	20%	20%	20%
Wood	Variable rate fertilization	Acres	0.83	33,646	1	30%	70%	70%	70%
Wood	Cover crops	Acres	0.83	33,646	1	10%	40%	40%	40%
Wood	Riparian forest buffers	Acres	0.83	33,646	10	1%	2%	2%	2%
Wood	Drainage water management	Acres	0.83	33,646	20	0%	1%	1%	1%
Wood	Wetlands restoration (inland)	Acres	0.83	33,646	50	0%	0%	0%	0%
Paulding	Two-stage ditch construction	Linear Ft (Capped for max ag acreage)	0.83	204,456	1.9	0%	4%	4%	4%
Paulding	Conservation crop rotation	Acres	0.83	83,924	1	5%	30%	30%	30%
Paulding	Soil testing & nutrient management planning	Acres	0.83	83,924	1	70%	95%	95%	95%
Paulding	Coastal flow-through wetlands (created)	% of Maumee River flow	24904.23	83,924	1	0%	4%	4%	4%
Paulding	Manure incorporation	Acres	0.83	83,924	1	6%	20%	20%	20%
Paulding	Sub-surface fertilizer placement	Acres	0.83	83,924	1	1%	20%	20%	20%
Paulding	Variable rate fertilization	Acres	0.83	83,924	1	30%	70%	70%	70%
Paulding	Cover crops	Acres	0.83	83,924	10	1%	2%	2%	2%
Paulding	Riparian forest buffers	Acres	0.83	83,924	10	1%	2%	2%	2%
Paulding	Drainage water management	Acres	0.83	83,924	20	0%	1%	1%	1%
Paulding	Wetlands restoration (inland)	Acres	0.83	83,924	50	0%	0%	0%	0%
Putnam	Two-stage ditch construction	Linear Ft (Capped for max ag acreage)	0.83	204,456	1.9	0%	4%	4%	4%
Putnam	Conservation crop rotation	Acres	0.83	101,178	1	5%	30%	30%	30%
Putnam	Soil testing & nutrient management planning	Acres	0.83	101,178	1	70%	95%	95%	95%
Putnam	Coastal flow-through wetlands (created)	% of Maumee River flow	24904.23	101,178	1	0%	4%	4%	4%
Putnam	Manure incorporation	Acres	0.83	101,178	1	6%	20%	20%	20%
Putnam	Sub-surface fertilizer placement	Acres	0.83	101,178	1	1%	20%	20%	20%
Putnam	Variable rate fertilization	Acres	0.83	101,178	1	30%	70%	70%	70%
Putnam	Cover crops	Acres	0.83	101,178	1	10%	40%	40%	40%
Putnam	Riparian forest buffers	Acres	0.83	101,178	10	1%	2%	2%	2%
Putnam	Drainage water management	Acres	0.83	101,178	20	0%	1%	1%	1%
Putnam	Wetlands restoration (inland)	Acres	0.83	101,178	50	0%	0%	0%	0%
Hancock	Two-stage ditch construction	Linear Ft (Capped for max ag acreage)	0.83	204,456	1.9	0%	4%	4%	4%
Hancock	Conservation crop rotation	Acres	0.83	74,736	1	5%	30%	30%	30%
Hancock	Soil testing & nutrient management planning	Acres	0.83	74,736	1	70%	95%	95%	95%
Hancock	Coastal flow-through wetlands (created)	% of Maumee River flow	24904.23	74,736	1	0%	4%	4%	4%
Hancock	Manure incorporation	Acres	0.83	74,736	1	6%	20%	20%	20%
Hancock	Sub-surface fertilizer placement	Acres	0.83	74,736	1	1%	20%	20%	20%
Hancock	Variable rate fertilization	Acres	0.83	74,736	1	30%	70%	70%	70%
Hancock	Cover crops	Acres	0.83	74,736	1	10%	40%	40%	40%
Hancock	Riparian forest buffers	Acres	0.83	74,736	10	1%	2%	2%	2%
Hancock	Drainage water management	Acres	0.83	74,736	20	0%	1%	1%	1%
Hancock	Wetlands restoration (inland)	Acres	0.83	74,736	50	0%	0%	0%	0%
Van Wert	Two-stage ditch construction	Linear Ft (Capped for max ag acreage)	0.83	204,456	1.9	0%	4%	4%	4%
Van Wert	Conservation crop rotation	Acres	0.83	93,503	1	5%	30%	30%	30%
Van Wert	Soil testing & nutrient management planning	Acres	0.83	93,503	1	70%	95%	95%	95%
Van Wert	Coastal flow-through wetlands (created)	% of Maumee River flow	24904.23	93,503	1	0%	4%	4%	4%
Van Wert	Manure incorporation	Acres	0.83	93,503	1	6%	20%	20%	20%
Van Wert	Sub-surface fertilizer placement	Acres	0.83	93,503	1	1%	20%	20%	20%
Van Wert	Variable rate fertilization	Acres	0.83	93,503	1	30%	70%	70%	70%
Van Wert	Cover crops	Acres	0.83	93,503	10	1%	2%	2%	2%
Van Wert	Riparian forest buffers	Acres	0.83	93,503	10	1%	2%	2%	2%
Van Wert	Drainage water management	Acres	0.83	93,503	20	0%	1%	1%	1%
Van Wert	Wetlands restoration (inland)	Acres	0.83	93,503	50	0%	0%	0%	0%
Allen	Two-stage ditch construction	Linear Ft (Capped for max ag acreage)	0.83	204,456	1.9	0%	4%	4%	4%
Allen	Conservation crop rotation	Acres	0.83	77,845	1	5%	30%	30%	30%
Allen	Soil testing & nutrient management planning	Acres	0.83	77,845	1	70%	95%	95%	95%
Allen	Coastal flow-through wetlands (created)	% of Maumee River flow	24904.23	77,845	1	0%	4%	4%	4%
Allen	Manure incorporation	Acres	0.83	77,845	1	6%	20%	20%	20%
Allen	Sub-surface fertilizer placement	Acres	0.83	77,845	1	1%	20%	20%	20%
Allen	Variable rate fertilization	Acres	0.83	77,845	1	30%	70%	70%	70%
Allen	Cover crops	Acres	0.83	77,845	1	10%	40%	40%	40%
Allen	Riparian forest buffers	Acres	0.83	77,845	10	1%	2%	2%	2%
Allen	Drainage water management	Acres	0.83	77,845	20	0%	1%	1%	1%
Allen	Wetlands restoration (inland)	Acres	0.83	77,845	50	0%	0%	0%	0%
Hardin	Two-stage ditch construction	Linear Ft (Capped for max ag acreage)	0.83	204,456	1.9	0%	4%	4%	4%
Hardin	Conservation crop rotation	Acres	0.83	34,436	1	5%	30%	30%	30%
Hardin	Soil testing & nutrient management planning	Acres	0.83	34,436	1	70%	95%	95%	95%
Hardin	Coastal flow-through wetlands (created)	% of Maumee River flow	24904.23	34,436	1	0%	4%	4%	4%
Hardin	Manure incorporation	Acres	0.83	34,436	1	6%	20%	20%	20%
Hardin	Sub-surface fertilizer placement	Acres	0.83	34,436	1	1%	20%	20%	20%
Hardin	Variable rate fertilization	Acres	0.83	34,436					

C_(Sub)Surface Load Split

Raw data detailing share of P load from 'surface' and 'sub-surface' flows (to be tested with academics)

Legend:

- **Red text** indicates 'direct input' (potentially hard-coded data / formulas) to be drawn from discussion with relevant academics

Share of load from subsurface

County	<i>Low</i>	<i>High</i>	<i>Average</i>
Williams	40%	60%	50%
Fulton	40%	60%	50%
Lucas	40%	60%	50%
Defiance	40%	60%	50%
Henry	40%	60%	50%
Wood	40%	60%	50%
Paulding	40%	60%	50%
Putnam	40%	60%	50%
Hancock	40%	60%	50%
Van Wert	40%	60%	50%
Allen	40%	60%	50%
Hardin	40%	60%	50%
Mercer	40%	60%	50%
Auglaize	40%	60%	50%
Wyandot	40%	60%	50%
Shelby	40%	60%	50%

C. Bundles

Calculated cost curve inputs - load reduction factor (impact) and cost (one-time and recurring) for all potential BMP 'bundles'

County:

BMP ID	BMP	TP Reduction Factor (%)	1 Source Addressed	Bundle ID	Bundle Components	BMP ID1	BMP ID2	BMP ID3	BMP ID4	TP Reduction Factor (%)	Total 1-year cost (\$/acre)	One-off cost (\$/acre)	Recurring cost (\$/acre)	1/2 TN reduction	Direct/indirect TP reduction factor (%/unit treated)	Implied relative impact of burning (%/unit treated)
1	soil testing & nutrient management planning	15%	Both	1	soil testing & nutrient management planning + conservation crop rotation	1				15%	20	5	15	5.115	43%	-4%
2	variable rate fertilization	20%	Both	1	soil testing & nutrient management planning	1				18%	12	5	7	66.57	18%	0%
3	sub-surface fertilizer placement	30%	Both	1	soil testing & nutrient management planning + conservation crop rotation + manure incorporation	1	4	8		47%	35	30	30	72.78	18%	10%
4	conservation crop rotation	25%	Both	1	soil testing & nutrient management planning + manure incorporation	1	8			30%	27	5	22	90.38	33%	3%
5	cover crops	28%	Both	1	soil testing & nutrient management planning + sub-surface fertilizer placement + conservation crop rotation	1	3	4		42%	32	17	17	109.37	73%	16%
6	drainage water management	25%	Subsurface	111	soil testing & nutrient management planning + sub-surface fertilizer placement + conservation crop rotation + manure incorporation	1	3	4	8	63%	77	5	72	121.87	88%	-24%
7	riparian forest buffers	70%	Surface	40	soil testing & nutrient management planning + cover crops + manure incorporation	1	5	8		49%	100	5	95	202.40	60%	0%
8	manure incorporation	15%	Both	47	soil testing & nutrient management planning + sub-surface fertilizer placement + manure incorporation	1	3	8		51%	70	5	65	116.51	61%	-12%
9	riparian forest buffers	70%	Surface	48	soil testing & nutrient management planning + conservation crop rotation + cover crops	1	4	5		55%	92	5	87	166.85	70%	-15%
10	riparian forest buffers	70%	Surface	120	soil testing & nutrient management planning + conservation crop rotation + cover crops + riparian forest buffers	1	4	5	8	62%	107	5	102	172.64	82%	-23%
11	riparian forest buffers	70%	Surface	100	soil testing & nutrient management planning + sub-surface fertilizer placement + conservation crop rotation + cover crops	1	3	4	5	69%	135	5	130	196.07	100%	-13%
12	riparian forest buffers	70%	Surface	54	soil testing & nutrient management planning + cover crops + manure incorporation	1	5	8		49%	100	5	95	202.40	60%	0%
13	riparian forest buffers	70%	Surface	32	soil testing & nutrient management planning + cover crops	1	5			40%	85	5	80	210.26	45%	-5%
14	riparian forest buffers	70%	Surface	44	soil testing & nutrient management planning + sub-surface fertilizer placement + cover crops	1	3	5		58%	117	5	112	212.67	67%	-17%
15	riparian forest buffers	70%	Surface	114	soil testing & nutrient management planning + sub-surface fertilizer placement + cover crops + manure incorporation	1	3	5	8	64%	142	5	137	220.46	90%	-26%
16	riparian forest buffers	70%	Surface	105	soil testing & nutrient management planning + conservation crop rotation + cover crops + manure incorporation	1	2	4	8	58%	145	105	40	245.46	78%	-20%
17	riparian forest buffers	70%	Surface	38	soil testing & nutrient management planning + variable rate fertilization + conservation crop rotation	1	2	4		51%	110	105	25	214.44	61%	-12%
18	riparian forest buffers	70%	Surface	93	soil testing & nutrient management planning + variable rate fertilization + sub-surface fertilizer placement + conservation crop rotation	1	2	3	4	65%	112	105	67	263.20	98%	-17%
19	riparian forest buffers	70%	Surface	97	soil testing & nutrient management planning + variable rate fertilization + sub-surface fertilizer placement + manure incorporation	1	2	3	8	62%	180	105	75	295.57	83%	-22%
20	riparian forest buffers	70%	Surface	37	soil testing & nutrient management planning + variable rate fertilization + sub-surface fertilizer placement	1	2	3		54%	105	60	60	305.76	68%	-24%
21	riparian forest buffers	70%	Surface	40	soil testing & nutrient management planning + variable rate fertilization + manure incorporation	1	2	8		44%	117	105	12	312.07	53%	-6%
22	riparian forest buffers	70%	Surface	98	soil testing & nutrient management planning + variable rate fertilization + conservation crop rotation + cover crops	1	2	4	5	64%	202	105	97	315.07	90%	-26%
23	riparian forest buffers	70%	Surface	104	soil testing & nutrient management planning + variable rate fertilization + cover crops + manure incorporation	1	2	5	8	59%	110	105	105	351.12	80%	-17%
24	riparian forest buffers	70%	Surface	94	soil testing & nutrient management planning + variable rate fertilization + sub-surface fertilizer placement + cover crops	1	2	3	5	67%	217	105	112	354.36	91%	-26%
25	riparian forest buffers	70%	Surface	39	soil testing & nutrient management planning + variable rate fertilization	1	2			54%	112	105	17	316.82	58%	-6%
26	riparian forest buffers	70%	Surface	109	soil testing & nutrient management planning + variable rate fertilization + cover crops	1	2	5		52%	116	105	10	372.06	58%	-6%
27	riparian forest buffers	70%	Surface	100	soil testing & nutrient management planning + sub-surface fertilizer placement + conservation crop rotation + drainage water management	1	3	4	6	62%	232	2305	277	479.76	85%	-23%
28	riparian forest buffers	70%	Surface	112	soil testing & nutrient management planning + sub-surface fertilizer placement + cover crops + drainage water management	1	3	5	6	63%	247	2305	342	449.11	88%	-24%
29	riparian forest buffers	70%	Surface	118	soil testing & nutrient management planning + conservation crop rotation + cover crops + drainage water management	1	4	5	6	61%	242	2305	307	428.96	83%	-22%
30	riparian forest buffers	70%	Surface	90	soil testing & nutrient management planning + variable rate fertilization + sub-surface fertilizer placement + drainage water management	1	2	3	6	60%	248%	2305	280	484.80	80%	-20%
31	riparian forest buffers	70%	Surface	116	soil testing & nutrient management planning + sub-surface fertilizer placement + drainage water management + manure incorporation	1	3	6	8	57%	270	2305	285	488.70	73%	-18%
32	riparian forest buffers	70%	Surface	102	soil testing & nutrient management planning + variable rate fertilization + sub-surface fertilizer placement + drainage water management	1	2	3	6	60%	235%	2305	310	512.65	78%	-19%
33	riparian forest buffers	70%	Surface	99	soil testing & nutrient management planning + variable rate fertilization + conservation crop rotation + drainage water management	1	2	4	6	57%	240	2305	245	510.68	75%	-18%
34	riparian forest buffers	70%	Surface	120	soil testing & nutrient management planning + cover crops + drainage water management + manure incorporation	1	5	6	8	56%	240	2305	315	510.86	73%	-17%
35	riparian forest buffers	70%	Surface	122	soil testing & nutrient management planning + conservation crop rotation + drainage water management + riparian forest buffers	1	4	6	8	54%	275%	2305	250	510.77	70%	-16%
36	riparian forest buffers	70%	Surface	45	soil testing & nutrient management planning + sub-surface fertilizer placement + drainage water management	1	3	6		49%	275%	2305	270	510.59	60%	-10%
37	riparian forest buffers	70%	Surface	105	soil testing & nutrient management planning + variable rate fertilization + drainage water management + manure incorporation	1	2	6	8	52%	287	2305	252	511.59	65%	-14%
38	riparian forest buffers	70%	Surface	52	soil testing & nutrient management planning + cover crops + drainage water management	1	5	6		48%	280%	2305	300	518.89	58%	-10%
39	riparian forest buffers	70%	Surface	49	soil testing & nutrient management planning + conservation crop rotation + drainage water management	1	4	6		46%	274%	2305	215	517.30	55%	-9%
40	riparian forest buffers	70%	Surface	40	soil testing & nutrient management planning + variable rate fertilization + drainage water management	1	2	6		42%	242	2305	217	472.63	50%	-8%
41	riparian forest buffers	70%	Surface	56	soil testing & nutrient management planning + drainage water management + manure incorporation	1	6	8		39%	274%	2305	242	510.00	45%	-6%
42	riparian forest buffers	70%	Surface	113	soil testing & nutrient management planning + sub-surface fertilizer placement + cover crops + riparian forest buffers	1	3	5	7	73%	427	600%	422	630.08	110%	-37%
43	riparian forest buffers	70%	Surface	110	soil testing & nutrient management planning + sub-surface fertilizer placement + conservation crop rotation + riparian forest buffers	1	3	4	7	72%	462	600%	367	634.94	108%	-36%
44	riparian forest buffers	70%	Surface	120	soil testing & nutrient management planning + conservation crop rotation + cover crops + riparian forest buffers	1	4	5	7	71%	492	600%	387	632.07	105%	-34%
45	riparian forest buffers	70%	Surface	99	soil testing & nutrient management planning + variable rate fertilization + sub-surface fertilizer placement + riparian forest buffers	1	2	3	7	70%	446%	610%	360	628.96	101%	-33%
46	riparian forest buffers	70%	Surface	117	soil testing & nutrient management planning + sub-surface fertilizer placement + riparian forest buffers + manure incorporation	1	3	7	8	68%	610%	600%	365	626.10	98%	-30%
47	riparian forest buffers	70%	Surface	103	soil testing & nutrient management planning + variable rate fertilization + cover crops + riparian forest buffers	1	2	5	7	69%	649%	610%	390	626.32	100%	-31%
48	riparian forest buffers	70%	Surface	200	soil testing & nutrient management planning + variable rate fertilization + conservation crop rotation + riparian forest buffers	1	2	4	7	68%	630%	610%	315	647.54	98%	-30%
49	riparian forest buffers	70%	Surface	126	soil testing & nutrient management planning + cover crops + riparian forest buffers + manure incorporation	1	5	7	8	67%	600%	600%	395	655.81	95%	-28%
50	riparian forest buffers	70%	Surface	121	soil testing & nutrient management planning + conservation crop rotation + riparian forest buffers + manure incorporation	1	4	7		66%	635%	600%	380	656.84	93%	-27%
51	riparian forest buffers	70%	Surface	107	soil testing & nutrient management planning + drainage water management	1	6			78%	250%	610%	27	982.02	100%	-2%
52	riparian forest buffers	70%	Surface	101	soil testing & nutrient management planning + variable rate fertilization + riparian forest buffers + manure incorporation	1	2	7	8	64%	637	610%	312	1013.42	88%	-24%
53	riparian forest buffers	70%	Surface	46	soil testing & nutrient management planning + sub-surface fertilizer placement + riparian forest buffers	1	3	7		62%	635%	600%	350	1017.10	83%	-20%
54	riparian forest buffers	70%	Surface	53	soil testing & nutrient management planning + cover crops + riparian forest buffers	1	5	7		61%	638%	600%	380	1045.52	80%	-19%
55	riparian forest buffers	70%	Surface	50	soil testing & nutrient management planning + variable rate fertilization + riparian forest buffers	1	6	7		60%	630%	600%	315	1037.04	78%	-18%
56	riparian forest buffers	70%	Surface	41	soil testing & nutrient management planning + drainage water management + riparian forest buffers	1	2	7		57%	622	610%	317	1124.94	73%	-15%
57	riparian forest buffers	70%	Surface	115	soil testing & nutrient management planning + riparian forest buffers + manure incorporation	1	7	8		54%	637	600%	322	1126.51	68%	-13%
58	riparian forest buffers	70%	Surface	114	soil testing & nutrient management planning + cover crops + drainage water management + riparian forest buffers	1	3	6	7	69%	920%	850%	600	1127.17	91%	-24%
59	riparian forest buffers	70%	Surface	121	soil testing & nutrient management planning + conservation crop rotation + drainage water management + riparian forest buffers	1	4	6	7	68%	940%	850%	515	1138.76	87%	-22%
60	riparian forest buffers	70%	Surface	54	soil testing & nutrient management planning + riparian forest buffers	1	7			46%	612	600%	307	1161.78	55%	-8%
61	riparian forest buffers	70%	Surface	109	soil testing & nutrient management planning + variable rate fertilization + drainage water management + riparian forest buffers	1	2	6	8	65%	942	840%	517	1198.29	80%	-20%
62	riparian forest buffers	70%	Surface	127	soil testing & nutrient management planning + drainage water management + riparian forest buffers + manure incorporation	1	6	7	8	63%	947	850%	542	1433.41	80%	-17%
63	riparian forest buffers	70%	Surface	50	soil testing & nutrient management planning + drainage water management + riparian forest buffers	1	6	7		57%	933	850%	511	1513.97	65%	-8%
64	riparian forest buffers	70%	Surface	2	variable rate fertilization	2				20%	110	100	10	550.00	20%	0%
65	riparian forest buffers	70%	Surface	3	sub-surface fertilizer placement	3				30%	41	-	41	144.67	30%	0%
66	riparian forest buffers	70%	Surface	4	conservation crop rotation	4				2%	8	-	8	50.00	2%	0%
67	riparian forest buffers	70%	Surface	5	cover crops	5				28%	73	-	73	263.68	28%	0%
68	riparian forest buffers	70%	Surface	6	drainage water management	6				1%	270	2300	20	21246.00	1%	0%
69	riparian forest buffers	70%	Surface	7	riparian forest buffers	7				35%	6300	6000	300	18,000.00	35%	0%
70	riparian forest buffers	70%	Surface	8	manure incorporation	8				15%	15	-	15	500.00	15%	0%

BasinMassBalance_Current

Altered version of 'BasinMassBalance_[yyyy]' from regional MNB report (incl. breakdown of 'Ohio' versus 'out of state' load contribution) in Maumee Basin

NOTE: added rows (61:64) decompose Ohio-specific portion of load

		Agriculture (± Developed (± Natural (acre Barren (acre: Total (acres) %Ag									
Total		3,271,293	479,214	450,938	4,921	4,206,367	77.8%				
UPSTpp		3,177,042	421,815	415,034	4,114	4,018,005	79.1%				
1,391,251 DSTpp		94,251	57,399	35,904	807	188,362	50.0%				
Maumee											
Spring TP Load (kg)											
Source	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Upstream Pour Point											
Ohio NPDES - Final Outfalls	36,706	32,563	31,995	31,264	25,658	31,964	33,420	35,103	32,176	34,612	33,247
Ohio NPDES - Wet Weather	1,720	1,362	1,634	2,105	289	1,962	1,841	2,963	1,498	2,468	0
OOS NPDES - Final Outfalls	19,487	19,487	19,487	19,487	19,487	13,765	14,538	17,793	18,382	19,487	19,487
OOS NPDES - Wet Weather	4,183	4,183	4,183	4,183	4,183	3,232	3,858	4,183	1,626	3,007	3,007
Total NPDES	62,096	57,594	57,298	57,038	49,617	50,923	53,657	60,041	53,682	59,573	55,741
Ohio HSTS	22,020	22,020	22,020	22,020	22,020	22,020	22,020	22,020	22,020	22,020	22,020
OOS HSTS	9,605	9,605	9,605	9,605	9,605	9,605	9,605	9,605	9,605	9,605	9,605
Load @ Pour Point	1,414,109	1,369,736	1,307,354	2,317,991	393,061	1,249,498	1,155,229	2,060,000	755,000	1,905,000	1,079,000
NPS	1,320,388	1,280,516	1,218,430	2,229,328	311,819	1,166,950	1,069,947	1,968,333	669,693	1,813,801	991,634
Non-Point Source Breakdown											
Unit Area NPS UPST (kg/ha)	0.81	0.79	0.75	1.37	0.19	0.72	0.66	1.21	0.41	1.12	0.61
Ag Yield (kg/ha)	0.9514	0.9227	0.8779	1.6063	0.2247	0.8408	0.7709	1.4183	0.4825	1.3069	0.7145
Developed Yield (kg/ha)	0.4757	0.4613	0.4390	0.8032	0.1123	0.4204	0.3855	0.7091	0.2413	0.6535	0.3573
Natural Yield (kg/ha)	0.0951	0.0923	0.0878	0.1606	0.0225	0.0841	0.0771	0.1418	0.0483	0.1307	0.0715
NPS - Ag	1,223,206	1,186,269	1,128,752	2,065,247	288,868	1,081,061	991,197	1,823,462	620,403	1,680,304	918,649
NPS - Developed	81,202	78,750	74,932	137,101	19,177	71,766	65,801	121,050	41,185	111,547	60,984
NPS - Natural	15,979	15,497	14,746	26,979	3,774	14,122	12,949	23,821	8,105	21,951	12,001
DST Pour Point											
Ohio NPDES - Final Outfalls	35,043	36,950	43,977	31,125	30,881	33,047	31,058	22,177	27,915	26,371	22,115
Ohio NPDES - Wet Weather	2,309	1,949	1,525	1,861	583	1,640	1,468	1,786	451	776	0
Total NPDES	37,352	38,899	45,503	32,986	31,464	34,688	32,526	23,963	28,366	27,146	22,115
Ohio HSTS	3,449	3,449	3,449	3,449	3,449	3,449	3,449	3,449	3,449	3,449	3,449
NPS - Ag	36,288	35,192	33,486	61,268	8,570	32,071	29,405	54,096	18,405	49,849	27,253
NPS - Developed	11,050	10,716	10,197	18,656	2,609	9,766	8,954	16,472	5,604	15,179	8,299
NPS - Natural	1,382	1,341	1,276	2,334	326	1,222	1,120	2,061	701	1,899	1,038
Basin Totals											
Ohio HSTS	25,469	25,469	25,469	25,469	25,469	25,469	25,469	25,469	25,469	25,469	25,469
OOS HSTS	9,605	9,605	9,605	9,605	9,605	9,605	9,605	9,605	9,605	9,605	9,605
Total HSTS	35,074	35,074	35,074	35,074	35,074	35,074	35,074	35,074	35,074	35,074	35,074
% HSTS	2%	2%	3%	1%	8%	3%	3%	2%	4%	2%	3%
Ohio NPDES	75,778	72,824	79,132	66,354	57,412	68,614	67,786	62,029	62,040	64,226	55,361
OOS NPDES	23,669	23,669	23,669	23,669	23,669	16,997	18,397	21,976	20,008	22,494	22,494
Total NPDES	99,448	96,493	102,801	90,024	81,081	85,611	86,183	84,004	82,048	86,720	77,855
% NPDES	7%	7%	7%	4%	18%	6%	7%	4%	10%	4%	7%
% NPDES+HSTS	9%	9%	10%	5%	26%	9%	10%	6%	14%	6%	10%
NPS - Ag	1,259,494	1,221,461	1,162,238	2,126,515	297,438	1,113,132	1,020,603	1,877,558	638,808	1,730,152	945,902
% Ag	84%	84%	83%	87%	68%	84%	83%	87%	79%	86%	83%
NPS - Developed	92,252	89,466	85,129	155,757	21,786	81,532	74,754	137,522	46,790	126,726	69,283
	6%	6%	6%	6%	5%	6%	6%	6%	6%	6%	6%
NPS - Natural	17,362	16,837	16,021	29,313	4,100	15,344	14,069	25,882	8,806	23,850	13,039
	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
NPS Total	1,369,108	1,327,765	1,263,388	2,311,586	323,324	1,210,009	1,109,426	2,040,962	694,403	1,880,728	1,028,224
%NPS	91%	91%	90%	95%	74%	91%	90%	94%	86%	94%	90%
Total Load	1,503,630	1,459,332	1,401,263	2,436,684	439,480	1,330,694	1,230,683	2,160,040	811,525	2,002,522	1,141,153
Yield UPST Pour Point (lb/acre)	0.72	0.70	0.67	1.22	0.17	0.64	0.59	1.08	0.37	1.00	0.54
HSTS+NPDES Load/Population (lb)	0.21	0.21	0.22	0.20	0.18	0.19	0.19	0.19	0.19	0.19	0.18
Total Load (Ohio portion) kg	1,129,638	1,095,629	1,053,581	1,828,147	325,742	1,002,968	926,589	1,620,545	609,103	1,502,384	853,170
Total Load (MI/IN portion) kg	373,992	363,703	347,682	608,537	113,737	327,726	304,094	539,496	202,422	500,138	287,983
Checks with row 52?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Resulting Ohio % of total.	75.1%	75.1%	75.2%	75.0%	74.1%	75.4%	75.3%	75.0%	75.1%	75.0%	74.8%

Sheet1

Project Name: 1.000.00

Task ID	Task Name	Start	End	Duration	Predecessors
1	Task 1	0	1	1	
2	Task 2	0	2	2	
3	Task 3	0	3	3	
4	Task 4	1	4	3	1
5	Task 5	2	5	3	2
6	Task 6	3	6	3	3
7	Task 7	4	7	3	4
8	Task 8	5	8	3	5
9	Task 9	6	9	3	6
10	Task 10	7	10	3	7
11	Task 11	8	11	3	8
12	Task 12	9	12	3	9
13	Task 13	10	13	3	10
14	Task 14	11	14	3	11
15	Task 15	12	15	3	12
16	Task 16	13	16	3	13
17	Task 17	14	17	3	14
18	Task 18	15	18	3	15
19	Task 19	16	19	3	16
20	Task 20	17	20	3	17
21	Task 21	18	21	3	18
22	Task 22	19	22	3	19
23	Task 23	20	23	3	20
24	Task 24	21	24	3	21
25	Task 25	22	25	3	22
26	Task 26	23	26	3	23
27	Task 27	24	27	3	24
28	Task 28	25	28	3	25
29	Task 29	26	29	3	26
30	Task 30	27	30	3	27
31	Task 31	28	31	3	28
32	Task 32	29	32	3	29
33	Task 33	30	33	3	30
34	Task 34	31	34	3	31
35	Task 35	32	35	3	32
36	Task 36	33	36	3	33
37	Task 37	34	37	3	34
38	Task 38	35	38	3	35
39	Task 39	36	39	3	36
40	Task 40	37	40	3	37
41	Task 41	38	41	3	38
42	Task 42	39	42	3	39
43	Task 43	40	43	3	40
44	Task 44	41	44	3	41
45	Task 45	42	45	3	42
46	Task 46	43	46	3	43
47	Task 47	44	47	3	44
48	Task 48	45	48	3	45
49	Task 49	46	49	3	46
50	Task 50	47	50	3	47
51	Task 51	48	51	3	48
52	Task 52	49	52	3	49
53	Task 53	50	53	3	50
54	Task 54	51	54	3	51
55	Task 55	52	55	3	52
56	Task 56	53	56	3	53
57	Task 57	54	57	3	54
58	Task 58	55	58	3	55
59	Task 59	56	59	3	56
60	Task 60	57	60	3	57
61	Task 61	58	61	3	58
62	Task 62	59	62	3	59
63	Task 63	60	63	3	60
64	Task 64	61	64	3	61
65	Task 65	62	65	3	62
66	Task 66	63	66	3	63
67	Task 67	64	67	3	64
68	Task 68	65	68	3	65
69	Task 69	66	69	3	66
70	Task 70	67	70	3	67
71	Task 71	68	71	3	68
72	Task 72	69	72	3	69
73	Task 73	70	73	3	70
74	Task 74	71	74	3	71
75	Task 75	72	75	3	72
76	Task 76	73	76	3	73
77	Task 77	74	77	3	74
78	Task 78	75	78	3	75
79	Task 79	76	79	3	76
80	Task 80	77	80	3	77
81	Task 81	78	81	3	78
82	Task 82	79	82	3	79
83	Task 83	80	83	3	80
84	Task 84	81	84	3	81
85	Task 85	82	85	3	82
86	Task 86	83	86	3	83
87	Task 87	84	87	3	84
88	Task 88	85	88	3	85
89	Task 89	86	89	3	86
90	Task 90	87	90	3	87
91	Task 91	88	91	3	88
92	Task 92	89	92	3	89
93	Task 93	90	93	3	90
94	Task 94	91	94	3	91
95	Task 95	92	95	3	92
96	Task 96	93	96	3	93
97	Task 97	94	97	3	94
98	Task 98	95	98	3	95
99	Task 99	96	99	3	96
100	Task 100	97	100	3	97

Task 1
Task 2
Task 3
Task 4
Task 5
Task 6
Task 7
Task 8
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Sheet2

Project Name: 1.000.00

Task ID	Task Name	Start	End	Duration	Predecessors
1	Task 1	0	1	1	
2	Task 2	0	2	2	
3	Task 3	0	3	3	
4	Task 4	1	4	3	1
5	Task 5	2	5	3	2
6	Task 6	3	6	3	3
7	Task 7	4	7	3	4
8	Task 8	5	8	3	5
9	Task 9	6	9	3	6
10	Task 10	7	10	3	7
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12	Task 12	9	12	3	9
13	Task 13	10	13	3	10
14	Task 14	11	14	3	11
15	Task 15	12	15	3	12
16	Task 16	13	16	3	13
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100	Task 100	97	100	3	97

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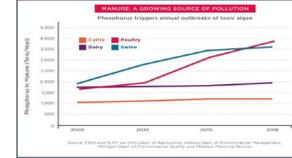
M_CC Input Backup_livestock

Development of cost curve inputs for "improved manure application timing" (by species)

\$/ cu ft	Dairy			Beef			Poultry			Swine			Source
	Earthen Structure			Dry Stack Facility			Dry Stack Facility			Concrete Tank			
	Low	High	Average	Low	High	Average	Low	High	Average	Low	High	Average	
	0.1	0.2	0.15	1.6	2.2	1.9	1.6	2.2	1.9	1.2	1.9	1.55	USDA NRCS, Cost Scenarios
gal / cu ft	5.5	7.5	6.5	5.5	7.5	6.5	5.5	7.5	6.5	5.5	7.5	6.5	ISU manure management manual
lbs P / 1000 gal	5	10	7.5	15	20	17.5	30	40	35	15	20	17.5	University extension resources
lbs P / acre	45	55	50	45	55	50	45	55	50	45	55	50	ODA estimate
\$/ acre	60	400	154	480	1,467	835	240	733	418	360	1,267	681	
% TP load reduction / acre	5%	15%	10%	5%	15%	10%	5%	15%	10%	5%	15%	10%	Grand Lake St. Marys research
Baseline unit load	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	Maumee basin baseline
lbs Spring TP / acre	0.04	0.12	0.08	0.04	0.12	0.08	0.04	0.12	0.08	0.04	0.12	0.08	
Total agricultural acres (M acres)	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	Maumee basin baseline
'Manure-applied' acres (% ag acres)	15%	25%	20%	15%	25%	20%	15%	25%	20%	15%	25%	20%	ODA
Animal type acres (% 'MA' acres)	19%	19%	19%	12%	12%	12%	37%	37%	37%	33%	33%	33%	EWG and ELPC via DOA
Current application (% applicable acres)	60%	40%	50%	60%	40%	50%	60%	40%	50%	60%	40%	50%	ODA estimate (accounting for where manure waste storage exists today)
Incremental acres ('000 acres)	42	46	46	16	29	29	83	92	92	73	81	81	
Total load reduction (lbs Spring TP)	1,723	5,742	3735	1,077	3,589	2335	3,445	11,485	7465	3,015	10,049	6530	
Cost (\$ / lb Spring TP)	1,447	3,215	2330	11,576	11,790	11685	5,788	5,895	5840	8,682	10,182	9430	

Animal	P from manure in Maumee basin	Share of P from manure in Maumee basin
Poultry	4	37%
Swine	3.5	33%
Beef	1.25	12%
Dairy	2	19%

Source:



Date	Time	Location	Activity	Personnel		Equipment		Status		Remarks		Signature		Date		Initials		
				Name	ID	Type	Serial	Operational	Storage	Remarks	Signature	Date	Signature	Date	Signature	Date	Signature	Date
2023-10-27	08:00	Control Room	System Check	John Doe	12345	Control Panel	CP-001	Operational	Storage	System check completed successfully.	John Doe	2023-10-27						
2023-10-27	09:00	Control Room	Monitoring	Jane Smith	67890	Control Panel	CP-001	Operational	Storage	Monitoring system active.	Jane Smith	2023-10-27						
2023-10-27	10:00	Control Room	Reporting	Mike Johnson	11111	Control Panel	CP-001	Operational	Storage	Reporting system updated.	Mike Johnson	2023-10-27						
2023-10-27	11:00	Control Room	System Check	Emily White	22222	Control Panel	CP-001	Operational	Storage	System check completed.	Emily White	2023-10-27						
2023-10-27	12:00	Control Room	Monitoring	David Brown	33333	Control Panel	CP-001	Operational	Storage	Monitoring system active.	David Brown	2023-10-27						
2023-10-27	13:00	Control Room	Reporting	Sarah Green	44444	Control Panel	CP-001	Operational	Storage	Reporting system updated.	Sarah Green	2023-10-27						
2023-10-27	14:00	Control Room	System Check	Chris Black	55555	Control Panel	CP-001	Operational	Storage	System check completed.	Chris Black	2023-10-27						
2023-10-27	15:00	Control Room	Monitoring	Alexander Grey	66666	Control Panel	CP-001	Operational	Storage	Monitoring system active.	Alexander Grey	2023-10-27						
2023-10-27	16:00	Control Room	Reporting	Mia Blue	77777	Control Panel	CP-001	Operational	Storage	Reporting system updated.	Mia Blue	2023-10-27						
2023-10-27	17:00	Control Room	System Check	Noah Yellow	88888	Control Panel	CP-001	Operational	Storage	System check completed.	Noah Yellow	2023-10-27						
2023-10-27	18:00	Control Room	Monitoring	Olivia Purple	99999	Control Panel	CP-001	Operational	Storage	Monitoring system active.	Olivia Purple	2023-10-27						
2023-10-27	19:00	Control Room	Reporting	Liam Pink	00000	Control Panel	CP-001	Operational	Storage	Reporting system updated.	Liam Pink	2023-10-27						
2023-10-27	20:00	Control Room	System Check	Isabella Orange	11111	Control Panel	CP-001	Operational	Storage	System check completed.	Isabella Orange	2023-10-27						
2023-10-27	21:00	Control Room	Monitoring	Ethan Green	22222	Control Panel	CP-001	Operational	Storage	Monitoring system active.	Ethan Green	2023-10-27						
2023-10-27	22:00	Control Room	Reporting	Ava Blue	33333	Control Panel	CP-001	Operational	Storage	Reporting system updated.	Ava Blue	2023-10-27						
2023-10-27	23:00	Control Room	System Check	Lucas Yellow	44444	Control Panel	CP-001	Operational	Storage	System check completed.	Lucas Yellow	2023-10-27						

Signature	Date
John Doe	2023-10-27
Jane Smith	2023-10-27
Mike Johnson	2023-10-27
Emily White	2023-10-27
David Brown	2023-10-27
Sarah Green	2023-10-27
Chris Black	2023-10-27
Alexander Grey	2023-10-27
Mia Blue	2023-10-27
Noah Yellow	2023-10-27
Olivia Purple	2023-10-27
Liam Pink	2023-10-27
Isabella Orange	2023-10-27
Ethan Green	2023-10-27
Ava Blue	2023-10-27
Lucas Yellow	2023-10-27

