

Appendix 10

Simulated Habitat Improvement Measures

Pomperaug River Simulation Corrections

The results of assessment methods are integrated into a GIS model that can be used to test alternative management scenarios. Based on known habitat needs of aquatic species geomorphologic setting, and historical information, we can simulate river channel improvements due to flow or other habitat manipulations (e.g. bank stabilization, or connecting side arms). This creates a limited synthetic model of the base-line habitat conditions and when coupled with hydrologic data, identifies flow related habitat fluctuations. The GIS model allows for improved visualization and computation of flow-habitat relationships at various scales, which will be of value when assessing the habitat needs of resident fauna and devising flow rules that are protective of instream needs.

The potential of these measures can be analyzed by simulation of the gain in fish habitat. This step will assist in the evaluation of potential water management vs. restoration trade-off options in the water management plan. The water management plan will build upon simulation results and determine how water can be allocated in order to satisfy the above flow recommendations.

After completing our mapping surveys, it was clear that there was a lack of woody debris, riffles, and microlithal choriotoxes in the river. Our simulation efforts were therefore geared toward restoration of woody debris and the presumed shift to Riffle prominent hydromorphology. Our model modifications investigate a minimally invasive and low-cost restoration option for the Pomperaug River, with the potential for some additional modifications to reconnect floodplains. A site-by-site listing of all attribute and HMU modifications follows below:

SITE 1 at 0.1 CFMSM

- Changed HMU number 10108(Riffle) in Access database (HMU) from Mesolithal to Microlithal.
- Changed HMU number 10111(Riffle) in Access database (HMU) from Mesolithal to Microlithal.
- Changed HMU number 10133(Riffle) in Access database (HMU) from Mesolithal to Microlithal.
- Created HMU number 10135(Run), HMU & TSE Values from 10516(Run), Depth decreased by 8 for each and TSE decreased by 4 for each.
- Created HMU number 10137(Run), HMU & TSE Values from 10519(Run), Depth decreased by 8 for each and TSE decreased by 4 for each.
- Created HMU number 10140(Riffle), HMU & TSE Values from 10525(Riffle), Depth decreased by 6 for each and TSE decreased by 2 for each.
- Created HMU number 10136(Riffle), HMU & TSE Values from 10520(Riffle), Depth decreased by 6 for each and TSE decreased by 2 for each.
- Created HMU number 10141(Pool), HMU & TSE Values from 10522(Pool), Depth increased by 14 for each and TSE decreased by 2 for each.
- Created HMU number 10139(Run), HMU & TSE Values from 10524(Run), Depth decreased by 8 for each and TSE decreased by 4 for each.
- Created HMU number 10140(Riffle), HMU & TSE Values from 10525(Riffle), Depth decreased by 6 for each and TSE decreased by 2 for each.

- Created HMU number 10138(Glide), HMU & TSE Values from 10527(Glide), Depth decreased by 8 for each and TSE decreased by 2 for each.
- Woody debris maximized in all HMUs.
- Used Riffle 10117 to replace 10105 and 10112, Used Riffle 10122 to replace 10130, 10132, and 10138.

SITE 1 at 0.3 CFSM

- Created HMU number 10340(Run), HMU & TSE Values from 10506(Run), Depth decreased by 5 for each and TSE decreased by 2 for each.
- Created HMU number 10342(Run), HMU & TSE Values from 10519(Run), Depth decreased by 5 for each and TSE decreased by 2 for each.
- Created HMU number 10345(Riffle), HMU & TSE Values from 10525(Riffle), Depth decreased by 3 for each and TSE decreased by 1 for each.
- Created HMU number 10341(Riffle), HMU & TSE Values from 10520(Riffle), Depth decreased by 3 for each and TSE decreased by 1 for each.
- Created HMU number 10344(Pool), HMU & TSE Values from 10522(Pool), Depth increased by 8 for each and TSE decreased by 1 for each.
- Created HMU number 10346(Run), HMU & TSE Values from 10524(Run), Depth decreased by 5 for each and TSE decreased by 2 for each.
- Created HMU number 10347(Riffle), HMU & TSE Values from 10525(Riffle), Depth decreased by 3 for each and TSE decreased by 1 for each.
- Created HMU number 10343(Glide), HMU & TSE Values from 10527(Glide), Depth decreased by 4 for each and TSE decreased by 1 for each.
- Woody debris maximized in all HMUs.
- Used Riffle 10307 to replace 10301, 10305, 10310, 10312, and 10314, Used Riffle 10332 to replace 10323, 10326, 10329, 10331 and 10338.

SITE 1 at 0.5 CFSM

- Changed HMU number 10503(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Changed HMU number 10507(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Created HMU number 10530(Run), HMU & TSE Values from 10506(RUN) at 0.5 CFSM.
- Created HMU number 10532(Run), HMU & TSE Values from 10519(RUN) at 0.5 CFSM.
- Created HMU number 10535(Riffle), HMU & TSE Values from 10525(Riffle) at 0.5 CFSM.
- Created HMU number 10531(Riffle), HMU & TSE Values from 10520(Riffle) at 0.5 CFSM.
- Created HMU number 10534(Pool), HMU & TSE Values from 10522(Pool) at 0.5 CFSM.
- Created HMU number 10536(Run), HMU & TSE Values from 10524(Run) at 0.5 CFSM.

- Created HMU number 10537(Riffle), HMU & TSE Values from 10525(Riffle) at 0.5 CFSM.
- Created HMU number 10533(Glide), HMU & TSE Values from 10527(Glide) at 0.5 CFSM.
- Woody debris maximized in all HMUs.
- Used Riffle 10507 to replace 10505, 10512, 10514, and 10518, Used Riffle 10525 to replace 10527 and 10533.

SITE 1 at 0.75 CFSM

- Changed HMU number 10734(Riffle) in Access database from Mesolithic to Microlithal.
- Changed HMU number 10715(Riffle) in Access database from Mesolithic to Microlithal.
- Changed HMU number 10713(Riffle) in Access database from Akal to Microlithal.
- Created HMU number 10723(Run), HMU & TSE Values from 10506(RUN), Depth increased by 10 for each and TSE increased by 5 for each.
- Created HMU number 10725(Run), HMU & TSE Values from 10519(RUN), Depth increased by 10 for each and TSE increased by 5 for each.
- Created HMU number 10727(Riffle), HMU & TSE Values from 10525(Riffle), Depth increased by 5 for each and TSE increased by 3 for each.
- Created HMU number 10729(Riffle), HMU & TSE Values from 10520(Riffle), Depth increased by 5 for each and TSE increased by 3 for each.
- Created HMU number 10726(Pool), HMU & TSE Values from 10522(Pool), Depth increased by 13 for each and TSE increased by 1 for each.
- Created HMU number 10728(Run), HMU & TSE Values from 10524(Run), Depth increase by 10 for each and TSE increased by 5 for each.
- Created HMU number 10730(Riffle), HMU & TSE Values from 10525(Riffle), Depth increased by 5 for each and TSE increased by 3 for each.
- Created HMU number 10724(Glide), HMU & TSE Values from 10527(Glide), Depth increased by 5 for each and TSE increased by 1 for each.
- Woody debris maximized in all HMUs.
- Used Riffle 10706 to replace 10702, 10704, 10707, 10709, 10711 and 10714, Used Riffle 10734 to replace 10720, 10722, 10724 and 10733.

SITE 1 at 1.0 CFSM

- Deleted HMU number 11063(Sidearm).
- Deleted HMU number 11064(Sidearm).
- Created HMU number 11045(Run), HMU & TSE Values from 10506(RUN), Depth increased by 15 for each and TSE increased by 8 for each.
- Created HMU number 11046(Run), HMU & TSE Values from 10519(RUN), Depth increased by 15 for each and TSE increased by 8 for each.
- Created HMU number 11050(Riffle), HMU & TSE Values from 10525(Riffle), Depth increased by 8 for each and TSE increased by 6 for each.

- Created HMU number 11048(Riffle), HMU & TSE Values from 10520(Riffle), Depth increased by 8 for each and TSE increased by 6 for each.
- Created HMU number 11049(Pool), HMU & TSE Values from 10522(Pool), Depth increased by 20 for each and TSE increased by 2 for each.
- Created HMU number 11051(Run), HMU & TSE Values from 10524(Run), Depth increase by 15 for each and TSE increased by 8 for each.
- Created HMU number 11052(Riffle), HMU & TSE Values from 10525(Riffle), Depth increased by 8 for each and TSE increased by 6 for each.
- Created HMU number 11047(Glide), HMU & TSE Values from 10527(Glide), Depth increased by 9 for each and TSE increased by 2 for each.
- Woody debris maximized in all HMUs.
- Used Riffle 11021 to replace 11001, 11003, 11009, 11019, 11022, and 11025, Used Riffle 11031 to replace 11028, 11036, 11044, 11047, 11054, and 11059.

SITE 2 at 0.1 CFMSM

- Changed HMU number 20102(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Changed HMU number 20109(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Changed HMU number 20116(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Created HMU number 20102111(Riffle), HMU & TSE Values from 20102 (Riffle).
- Created HMU number 20110111(Run), HMU & TSE Values from 20110(Run)
- Woody debris increased by one level. If they are not present they become present, if present become abundant.
- Used Riffle 20103 to replace 20104, 20116, and 20131.

SITE 2 at 0.3 CFMSM

- Created HMU number 20341(Riffle), HMU & TSE Values from 20102 (Riffle), Depth Increased by 5 and TSE increased by 3 for each.
- Created HMU number 20340(Run), HMU & TSE Values from 20110(Run), Depth Increased by 8 and TSE increased by 5 for each.
- Woody debris increased by one level. If they are not present they become present, if present become abundant.
- Used Riffle 20313 to replace 20302, 20304, 20306, 20307, 20312, 20314, 20320, 20322, 20324, 20329, and 20332.

SITE 2 at 0.5 CFMSM

- Changed HMU number 20507(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Created HMU number 20540(Riffle), HMU & TSE Values from 20102 (Riffle), Depth Increased by 9 and TSE increased by 5 for each.
- Created HMU number 20541(Run), HMU & TSE Values from 20110(Run), Depth Increased by 13 and TSE increased by 9 for each.

- Woody debris increased by one level. If they are not present they become present, if present become abundant.
- Used Riffle 20513 to replace 20514.

SITE 2 at 0.75 CFSM

- Changed HMU number 20703(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Created HMU number 20711(Riffle), HMU & TSE Values from 20102 (Riffle), Depth Increased by 12 and TSE increased by 8 for each.
- Created HMU number 20710(Run), HMU & TSE Values from 20110(Run), Depth Increased by 17 and TSE increased by 14 for each.
- Created HMU number 20719(Backwater), HMU & TSE Values from 20124 (Backwater), Depth Increased by 5.
- Woody debris increased by one level. If they are not present they become present, if present become abundant.

SITE 2 at 1.0 CFSM

- Created HMU number 21012(Riffle), HMU & TSE Values from 20102 (Riffle), Depth Increased by 16 and TSE increased by 12 for each.
- Created HMU number 21011(Run), HMU & TSE Values from 20110(Run) Depth Increased by 23 and TSE increased by 16 for each
- Created HMU number 21019(Backwater), HMU & TSE Values from 20124 (Backwater) ,Depth Increased by 10.
- Woody debris increased by one level. If they are not present they become present, if present become abundant.
- Used Riffle 21021 to replace 21001, 21003, 21006, 21010, 21014, and 21020.

SITE 3 at 0.1 CFSM

- Changed HMU number 30128(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Changed HMU number 30105(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Changed HMU number 30124(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Changed HMU number 30116(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 30103 to replace 30110, 30120, and 30141.

SITE 3 at 0.3 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 30322 to replace 30303, 30306, 30308, 30310, 30315, 30317, 30319, 30321, 30323, and 30325. Used Riffle 30330 to replace 30327, 30329, 30331, 30333, 30335, 30337, 30342, 30347, and 30354.

SITE 3 at 0.5 CFSM

- Changed HMU number 303(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 30525 to replace 30507, 30526, 30529, 30532, 30535, and 30544.

SITE 3 at 0.75 CFSM

- Changed HMU number 7014(Riffle) in Access database (HMU) from Psammal to Microlithal.
- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 30712 to replace 30704, 30706, 30707, 30716, and 30718. Used Riffle 30730 to replace 30722, 30726, 30727, and 30735.

SITE 3 at 1.0 CFSM

- Woody debris set to present if not there but left alone if abundant.

SITE 4 at 0.1 CFSM

- Changed HMU number 40112(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 40103 to replace 40102, 40117, and 40121.

SITE 4 at 0.3 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 40316 to replace 40302, 40305, 40307, 40309, 40312, 40314, 40317, 40320, and 40328.

SITE 4 at 0.5 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 40509 to replace 40512.

SITE 4 at 0.75 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 40705 to replace 40703, 40706, 40708, and 40711.

SITE 4 at 1.0 CFSM

- Woody debris set to present if not there but left alone if abundant.

SITE 5 at 0.1 CFSM

- Changed HMU number 50101(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Changed HMU number 50140(Riffle) in Access database (HMU) from Macrolithal to Microlithal.

- Changed HMU number 50158(Riffle) in Access database (HMU) from Mesolithic to Microlithal.
- Woody debris increased by one level. If they are not present they become present, if present become abundant.
- Used Riffle 50137 to replace 50165.

SITE 5 at 0.3 CFSM

- Woody debris increased by one level. If they are not present they become present, if present become abundant.
- Used Riffle 50319 to replace 50303, 50305, 50310, 50312, 50316, 50318, 50321, 50323, 50336, 50345, 50348, 50354, 50356, 50358, 50362, 50364, 50366, 50370, and 50374.

SITE 5 at 0.5 CFSM

- Woody debris increased by one level. If they are not present they become present, if present become abundant.
- Used Riffle 50504 to replace 50521, and 50537.

SITE 5 at 0.75 CFSM

- Woody debris increased by one level. If they are not present they become present, if present become abundant.
- Used Riffle 50715 to replace 50707, and 50717.

SITE 5 at 1.0 CFSM

- Woody debris increased by one level. If they are not present they become present, if present become abundant.
- Used Riffle 51024 to replace 51001, 51005, 51026, 51043, 51045, 51053, and 51078.

SITE 6 at 0.1 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 60125 to replace 60106, 60113, 60116, 60118, and 60127.

SITE 6 at 0.3 CFSM

- Woody debris set to present if not there but left alone if abundant.

SITE 6 at 0.5 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 60518 to replace 60509, 60511, 60515, 60517, 60526, 60528, 60530, 60532, 60536, and 60538.

SITE 6 at 0.75 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 60720 to replace 60706, 60711, 60713, 60715, 60731, 60735, and 60751.

SITE 6 at 1.0 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 61030 to replace 61009, 61011, 61015, 61022, 61024, 61031, 61033, 61037, 61039, 61041, 61044, and 61050.

SITE 7 at 0.1 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 70107 to replace 70104.

SITE 7 at 0.3 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 70332 to replace 70303, 70305, 70309, 70311, 70314, 70318, 70321, 70323, and 70331.

SITE 7 at 0.5 CFSM

- Woody debris set to present if not there but left alone if abundant.

SITE 7 at 0.75 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 70723 to replace 70714, 70717, and 70719.

SITE 7 at 1.0 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 71004 to replace 71005, 71012, 71018, and 71020.

SITE 9 at 0.1 CFSM

- Woody debris increased by one level. If they are not present they become present, if present become abundant.

SITE 9 at 0.3 CFSM

- Woody debris increased by one level. If they are not present they become present, if present become abundant.
- Used Riffle 90313 to replace 90321, 90327, and 90338.

SITE 9 at 0.5 CFSM

- Woody debris increased by one level. If they are not present they become present, if present become abundant.
- Used Riffle 90523 to replace 90513, 90520, and 90541.

SITE 9 at 0.75 CFSM

- Woody debris increased by one level. If they are not present they become present, if present become abundant.
- Used Riffle 90744 to replace 90713, 90731, and 90750.

SITE 9 at 1.0 CFSM

- Woody debris increased by one level. If they are not present they become present, if present become abundant.
- Used Riffle 91019 to replace 91005, 91007, 91018, 91020, and 91039.

SITE 10 at 0.1 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 100121 to replace 100128, 100130, and 100150.

SITE 10 at 0.3 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 100321 to replace 100326.

SITE 10 at 0.5 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 100528 to replace 100511 and 100521.

SITE 10 at 0.75 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 100723 to replace 100731 and 100733.

SITE 10 at 1.0 CFSM

- Woody debris set to present if not there but left alone if abundant.
- Used Riffle 101041 to replace 101014, 101016, 101032, and 101048.