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SUPPORTING INFORMATION

Assimilation and Transport of Organic Bound Tritium in an Irrigated Pine Forest

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Fig. S1. The MWMF forest lies true north of the holding pond, which is used for the irrigation of the MWMF forest trees—Adapted from SRNS (2014).[1]

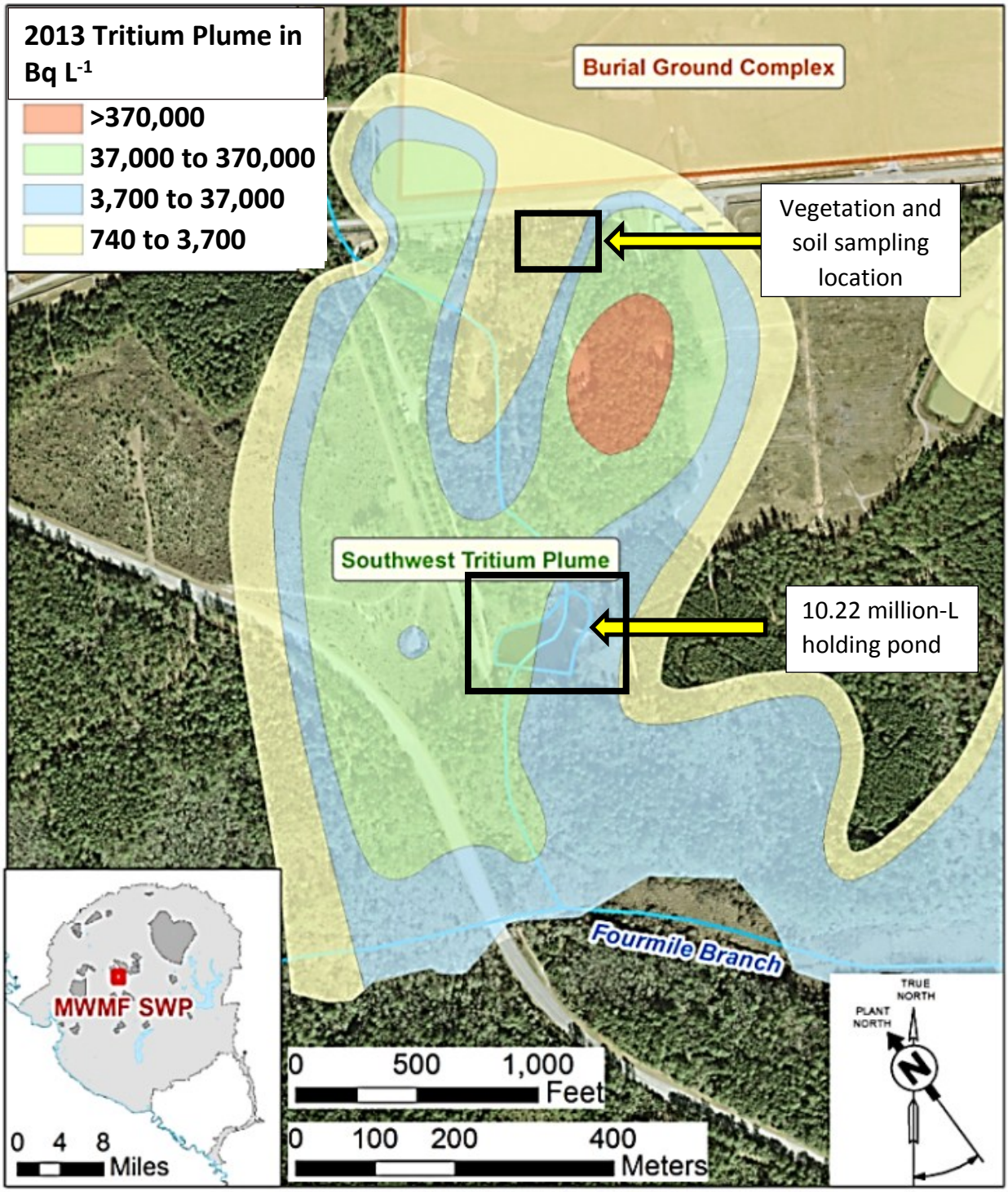

Table S1. Typical contaminant and water quality values for MWMF irrigation pond water.*

Component	Method	Range	Units	Comments
1,2-dichloroethylene	EPA8260B	0.29 to 20	µg L^{-1}	Most of these

1,4-dioxane		3.7 to 20		compounds are RCRA and CERCLA listed.
Acetone		2.3 to 9.21		
cis-1,2-dichloroethylene		2.5 to 20		
Tetrachloroethylene		0.057 to 1.1		
Trichloroethylene		0.89 to 10.0		
Ethylene	AM20GAX	0.048 to 0.12	$\mu g\ L^{-1}$	
Methane		$\leq$1,300		
Nitrate	EPA9056 & 300.0	0.30 to 0.38	$mg\ L^{-1}$	
Nitrate-nitrite as N	EPA353.1	0.08 to 0.31		
Redox potential (E_h)		+84 to +305	mV	
pH		4.6 to 9.5		Average: 6 to 6.5
Specific conductance		27 to 348	$\mu S\ cm^{-1}$	Average: 30 to 40
Total $CaCO_3$ alkalinity		0 to 80	$mg\ L^{-1}$	Average: 3 to 9
Total dissolved solids	EPA160.1	46 to 50		
Total organic carbon	EPA9060	9.4 to 10.0		
Total organic halogens	EPA9020B	0.023 to 0.042	$\mu g\ L^{-1}$	
Turbidity		0.9 to 48.8	NTU	
Temperature		4.3 to 34.8	^oC	
Aluminum	EPA6010B	36.4 to 37.8	$\mu g\ L^{-1}$	
Barium	EPA6020A	36.8 to 110		
Calcium	EPA6010B & 6020A	1,900 to 2,330		
Cobalt	EPA6010B, 6020A & B	2.00 to 2.04		
Copper	EPA6020A & B	$\leq$1.39		
Iron	EPA6010B & 6020A	2,520 to 6,380		
Magnesium	EPA6010B	1,270 to 1,600		
Manganese		29.8 to 323		
Nickel	EPA6010B, 6020A & B	0.854 to 1.86		
Potassium	EPA6010B	971 to 1,620		
Selenium		3.5 to 5.0		
Strontium	EPA6020A	$\leq$12.1		
^{14}C	LSC	Up to 40.7	$Bq\ L^{-1}$	
Gross alpha	Alpha counting	Up to 0.15		
^{129}I	LSC	0.02 to 0.31		
Non-volatile beta	LSC	0.01 to.0.73		
Total radium	EPA903.0MOD	0.04 to 0.09		
^{99}Tc	Radiometric counting	Up to 1.89		
Tritium	LSC	5,923 to 574,074		Average: ~54,000,000

*Data provided by the SRS ACP as part of their 2012 to 2017 monitoring studies. NTU: Nephelonic Turbidity Units.

[1] Savannah River Nuclear Solutions (SRNS), Mixed Waste Management Facility Groundwater Remediation. Fact Sheet. Updated on 09/22/2014, Aiken, SC 2014.

Table S2. Analysis protocols for various biological sample matrices. HTO, E-OBT and NE-OBT were extracted sequentially whereas total tritium was isolated in by complete sample combustion. Total OBT extraction (E-OBT plus NE-OBT) from water occurred via the NE-OBT step (only) on Whatman #10 filtrate.

<table>
<tr><th>Matrix</th><th>HTO</th><th>E-OBT</th><th>NE-OBT</th><th>Total Tritium from Complete Combustion</th></tr>
<tr><td>Bark, leaf litter</td><td rowspan="3">Heat to 150°C at a ramp rate of 2.5°C min^{-1} and hold for 30 min.</td><td rowspan="3">Rinse at room temp. with tritium-free water for 72 h.</td><td>Heat to 300°C at a ramp rate of 5°C min^{-1}; continue to 600°C at 7°C min^{-1} and hold 60 min collect tritium in 10 mL 0.1 M nitric acid (HNO_3) in bubbler trap.</td><td rowspan="2">Heat to 155°C at a ramp rate of 3.5°C min^{-1} and hold for 12 min at air flow of 0.2 L min^{-1}; Heat to 600°C at 5°C min^{-1} at oxygen (O_2) flow of 0.2 L min^{-1} to facilitate combustion and hold for 30 min collected in 10 mL 0.1 M HNO_3 in bubbler trap.</td></tr>
<tr><td>Tree cores</td><td>Heat to 600°C at 5°C min^{-1} and hold 60 min collect tritium in 10 mL 0.1 M HNO_3 in bubbler trap.</td></tr>
<tr><td>Soil</td><td>Heat to 300°C at 5°C min^{-1}; continue to 600°C at 7°C min^{-1} and hold 20 min; continue to 900°C at 10°C min^{-1} and hold 15 min; collect tritium in 10 mL 0.1 M HNO_3 in bubbler trap.</td><td>Heat to 155°C at 3.5°C min^{-1} and hold for 12 min at air flow of 0.2 L min^{-1}; Heat to 600°C at 5°C min^{-1} at O_2 flow of 0.2 L min^{-1} and hold for 30 min; Heat to 900°C at 8°C min^{-1} with a 20-min hold collect in 10 mL 0.1 M HNO_3 in bubbler trap.</td></tr>
<tr><th>Matrix</th><th colspan="4">Total ^{14}C as CO_2 by Complete Combustion</th></tr>
<tr><td>Any</td><td colspan="4">A second bubbler trap was used after tritium collection for $^{14}CO_2$ capture. The liberated $^{14}CO_2$ is trapped in Carbo Sorb E scintillation cocktail, which was counted after the addition of 10 mL of Permafluor E.</td></tr>
</table>

Table S3. FTIR assignments made for tree core material based on peak matching with reference databases and literature.

Wavelength (cm^{-1})	Band Assignment	Band Origin
805	Glucomannan[A]; vibration (vibr) of mannan in hemicellulose (hemiC), and C-H out-of-plane bending in phenyl rings[B]	Polysacchar-ide (polyS)[A,B]
825	C-H out-of-plane bending in guaiacyl units[B]	Lignin (lgn)[B]
853-860	C-H out-of-plane in position 2, 5 and 6 of guaiacyl units[A,B]	lgn[A,B]
892-900	Aromatic (arom) C-H out-of-plane deformation (deform)[C]; anomeric C-groups, C_1-H deform, ring valence vibr[C]; C-H deform of beta-glycosidic linkages in cellulose (cel)[B]; anti-symmetric out-of-phase stretching (strh) in pyranose ring[D]; C_1 vibr[E]	cel/hemiC/pectin[C], polyS[A,B]
945	O-H out-of-plane deform in carboxylic acid (R–COOH)[B]	Terpenoids[B]
960	C-H out-of-plane deform in lgn[B]	lgn[B]
985	C-O strh in cel[B]	polyS[B]
998-1005	C-O strh in cel[A,B] and hemiC[A]	polyS[A,B]
1024-1035	C-O strh[C]; C-O deform in primary alcohols (R-OH), unconjugated (unconj.) C=O strh, arom C-H in-plane deform in lgn, C-O and C-C strh and CH_2 rocking in cel[A]; C-O strh in primary R-OH in cel[B]; C-O-C deform[D]; C-O strh vibr[E]	hemiC[A,C,E], cel[A,C], lgn[A,B,E] polyS[A,B],
1055-1060	C-O strh vibr of cel and hemiC[A]; C-O strh of secondary ROH[B]; C-O strh vibr[E]	polyS[A,B], cel/hemiC[E]
1101-1106	Ring asymmetric (asym) valence vibr[C]; C-O and C-C strh and CH_2 rocking in cel[A]; C-O-C strh in cel and hemiC[B]	polyS[A-C]
1128	Syringyl lgn and C-O, C-H deform in syringyl lgn, C-O strh[D]	
1140	Guaiacyl lgn and C-O, C-H deform in guaiacyl lgn, C-O strh[D]	
1155-1160	C-O-C symmetric (sym) strh[C]; C-O-C asym strh vibr in cel and hemiC[A,B]; C-O-C asym strh in cel I and II[E]	cel/hemiC[C], polyS[A,B]
1185	C-O strh in cel[B]	polyS[B]
1200-1205	O-H in-plane bending in cel I and II[A]	polyS[A]
1221-1230	Syringyl ring and C-O strh[C]; C-C, C-O, and C=O strh, acetyl and carboxylic vibr in xylan[A]; O-H vibr in guaiacyl ring, C-C, C-O and C=O strh in lgn[B]	lgn[A,C], xylan[C], polyS[A]
1264-1270	Guaiacyl ring plus C=O strh[A,C]; acetyl and carboxylic vibr in xylan[A]; C-O vibr in guaiacyl rings[B]; syringyl ring breathing and C-O strh in lgn and xylan[E]	Guaiacyl-lgn[C], polyS[A], lgn[A,B]
1315-1317	CH_2 rocking vibr[C]; CH_2 wagging in crystalline cel[B]	cel[C], polyS[B]
1320-1330	Phenolic O-H, syringyl and guaiacyl (ring) condensed, C=H vibr in polyS[A]; C-H of methyl (Me) groups in methoxy of amorphous cel[B]; C_1-O vibr in syringyl derivatives, C-H in-plane bend in cel I and II[E]	lgn/polyS[A]
1360-1372	C-H deform vibr[C]; phenolic O-H, aliphatic C-H strh in CH_3, not in O-Me, C-H vibr in polyS[A]; C-H deform in cel and hemiC[B]; aliphatic C-H strh in Me and phenolic OH[E]	cel[C], lgn[A], polyS[A,C]
1385	C-O strh in cel and hemiC[B]	
1405	C=O in carboxylic groups in R–COOH and esters[B]	Terpenoids[B]
1420-1430	Arom skeletal (skl) vibr with C-H in-plane deform in lgn and polyS[A]; C-H asym deform in methoxyl, arom skl vibr, lgn[B]; arom ring and CH, benzene (benz) skl with C-H deform[D] and strh[E]	lgn[A,B], polyS[A]
1450-1453	C=C and C-H bond, O-H in-plane deform[C]	lgn, hemiC[C]

1460-1470	C-H deform, asym in -CH_3 and -CH_2-[A]; C-H asym deform in methoxyl for lgn, asym in -CH_3 and CH_2 in pyran for hemiC[B]; C-H deform[D]; CH_2 deform strh in lgn and xylan[E]	lgn[A,B], polyS[A]
1500-1515	C=C strh of arom skl vibr[C]; arom skl vibr[A,E]; C=C strh of arom ring, C=O bond vibr in extractants[B]; arom/benz ring strch vibr[D]	lgn[A-C]
1590	Skl vibrations from the C-C[B]	lgn[B]
1593-1610	Arom skl and C=O strh vibr[A,C]; C=O strh conjugated (conj) to arom ring and carboxylic groups of lgn, R–COOH, esters[B]; arom/benz ring strh vibr[D]	lgn[A,C]
1635	Absorbed O-H and conj C-O in polyS[B]	
1640	C=O strh vibr in conj carbonyl of lgn[E]	
1655-1675	C=O strh on conj *p*-subst aryl ketones[A]; absorbed O-H and conj C-O in polyS[B]	lgn[A]
1690	C=O vibr in carboxylic group in resin acid[B]	Terpenoids[B]
1709-1750	C=O strh of acetyl and carbonyl groups[C]; C=O strh in unconj ketones and ester groups (usually polyS origin), conj aldehydes and R–COOH absorb $\leq$1700 cm^{-1} [A]; C=O carbonyls in ester and acetyl groups in xylan[B]; in aldehydes and acids, unconj C=O and ketone strh[D,E]	hemiC[C], lgn[A], polyS[A,B]
2850-2970	C-H strh, CH_2, CH-, and CH_3[D]	
3400	O-H strh, O-H of R-OH, phenols, and acids[D]	

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