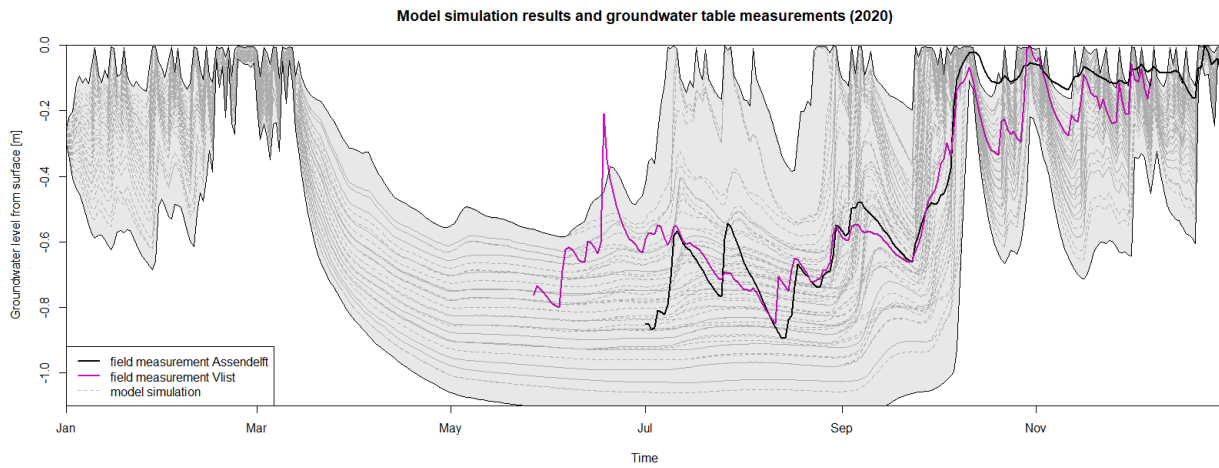


Supplementary information

S1 – Short term groundwater dynamics



5

Figure S1.1 – Groundwater table height below surface [m] for our model simulations and field measurements of 2020.

S2 - WFPS curve correlations and R_{eco}

10 The correlations of the measured R_{eco} and the simulated respiration rate for the ensemble WFPS respiration rate curves in Fig. 4 and for each meadow are presented in Table S2.1. In Fig. S2.1 the simulated respiration rate and measured R_{eco} are plotted with simulated WFPS and WTD for both research locations.

15 **Table S2.1 – Correlations between R_{eco} and estimated potential respiration rate for research sites, using WFPS optimum curves presented in Fig. 4.**

model site curve	192 ASD RF corr	177 ASD MP corr	191 VLI RF corr	191 VLI MS Corr	mean
1	0.67	0.48	0.54	0.45	0.533
2	0.60	0.19	0.46	0.39	0.410
3	0.00	-0.08	-0.09	0.05	-0.030
4	0.61	0.29	0.49	0.43	0.452
5	0.44	-0.05	0.34	0.33	0.265
6	0.69	0.40	0.58	0.53	0.550
7	0.69	0.48	0.57	0.48	0.553
8	<i>0.74</i>	<i>0.43</i>	<i>0.61</i>	<i>0.57</i>	<i>0.590</i>
9	<i>0.68</i>	<i>0.23</i>	<i>0.53</i>	<i>0.48</i>	<i>0.480</i>
10	0.65	0.25	0.53	0.51	0.484
11	0.59	0.12	0.44	0.38	0.383
12	0.71	0.48	0.58	0.51	0.569
13	0.67	-0.01	0.54	0.56	0.442
14	0.61	0.16	0.48	0.44	0.424
15	0.71	0.48	0.59	0.53	0.579
16	<i>0.73</i>	<i>0.47</i>	<i>0.61</i>	<i>0.56</i>	<i>0.591</i>
17	0.72	0.36	0.60	0.55	0.556
18	-0.10	-0.10	-0.18	0.01	-0.093

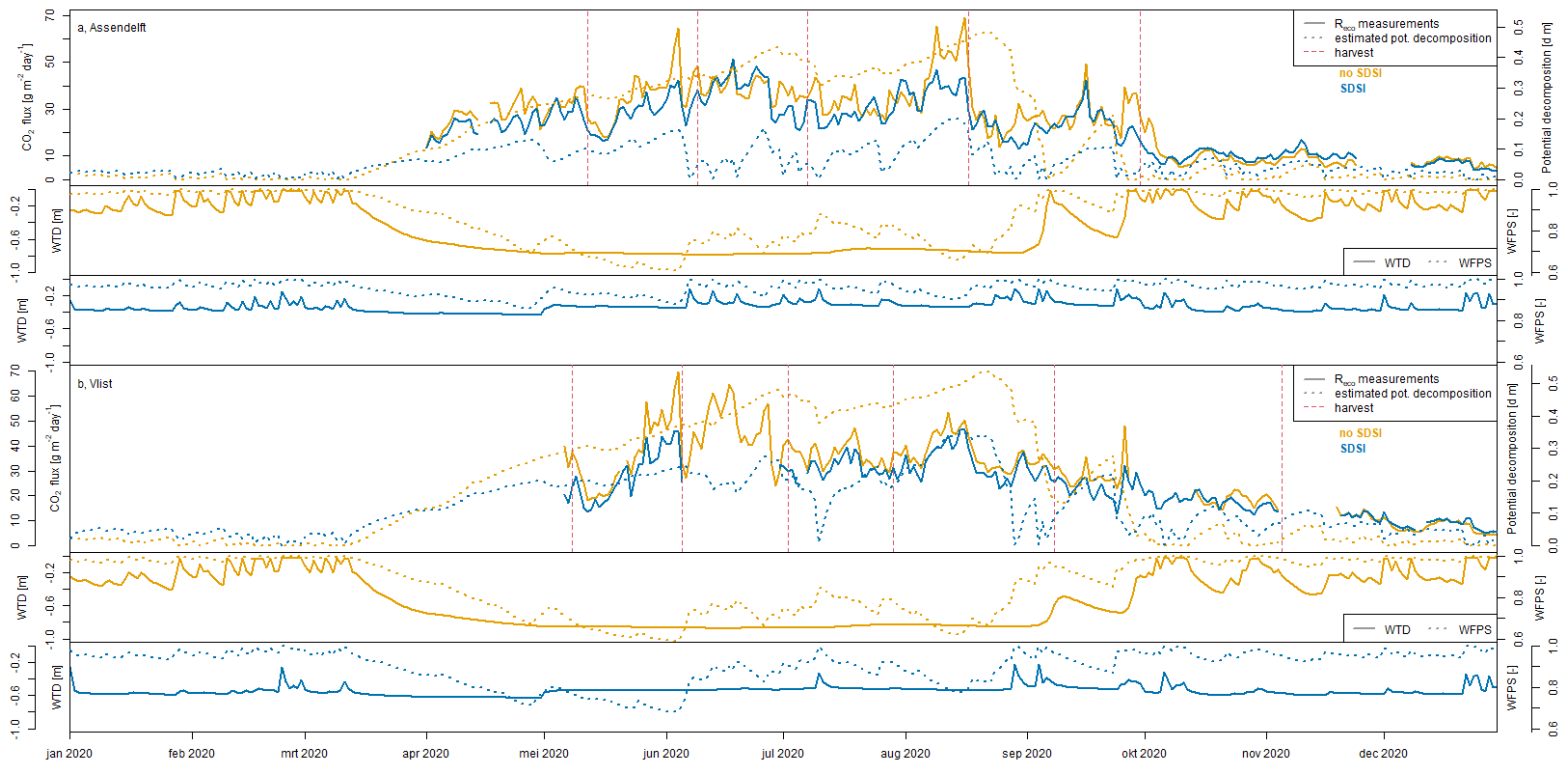


Figure S2.1 – Modeled potential respiration rate [d m yr⁻¹] and measured nocturnal Reco [g CO₂ m⁻² d⁻¹], and modelled WTD [m] and mean WFPS [-] in top 0.3 m of the soil profile in (a) Assendelft, and (b) Vlist with and without SDSI.

S3 – Additional harvest and chamber measurement details

Harvesting data

Here we present the yield estimations for each harvesting event.

25

Table S3.1 – Timeframe of chamber measurements, harvest and statistics of the measuring period.

	<i>Assendelft</i>	<i>Vlist</i>
	<i>Control - SDSI</i>	<i>Control -SDSI</i>
Chamber installation	1-4-2020	6-5-2020
First harvest	12-5-2020	8-5-2020
Last harvest	30-9-2020	4-11-2020

Table S3.2 – Average yield estimations for each harvesting event.

Assendelft			Vlist		
	Control	SDSI		Control	SDSI
Date	[g c m ⁻²]	[g c m ⁻²]	Date	[g c m ⁻²]	[g c m ⁻²]
12-5-2020	219.7	159.5	08-05-2020	167.7	154.4
8-6-2020	92.9	95.5	05-06-2020	123.7	86.4
7-7-2020	170.1	140.8	03-07-2020	86.1	84.4
17-8-2020	87.7	124.1	29-07-2020	96.5	119.8
29-9-2020	101.1	74.5	08-09-2020	90.1	88.8
			04-11-2020	69.1	52.0
Extra yield in chambers [factor]	1.29	1.11		1.18	1.20
Total after correction	865.1	660.9		746.8	701.5
Total [kg CO ₂ m ⁻² yr ⁻¹]	3.17	2.42		2.74	2.57

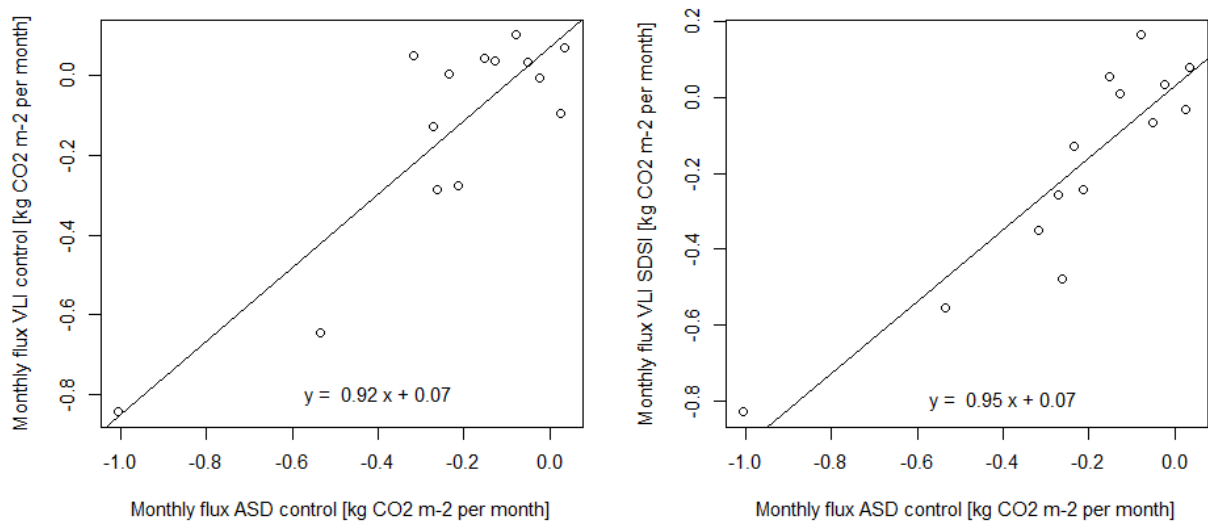
30

NEE interpolation

We used linear interpolation to derive monthly NEE values of April 2020 for Vlist. The relations of NEE estimations for Assendelft control with Vlist -both control and SDSI- were found to be most powerful for the interpolation. The estimated linear relations are visualized in Fig. S3.1 and the interpolated values can be found in table S3.3.

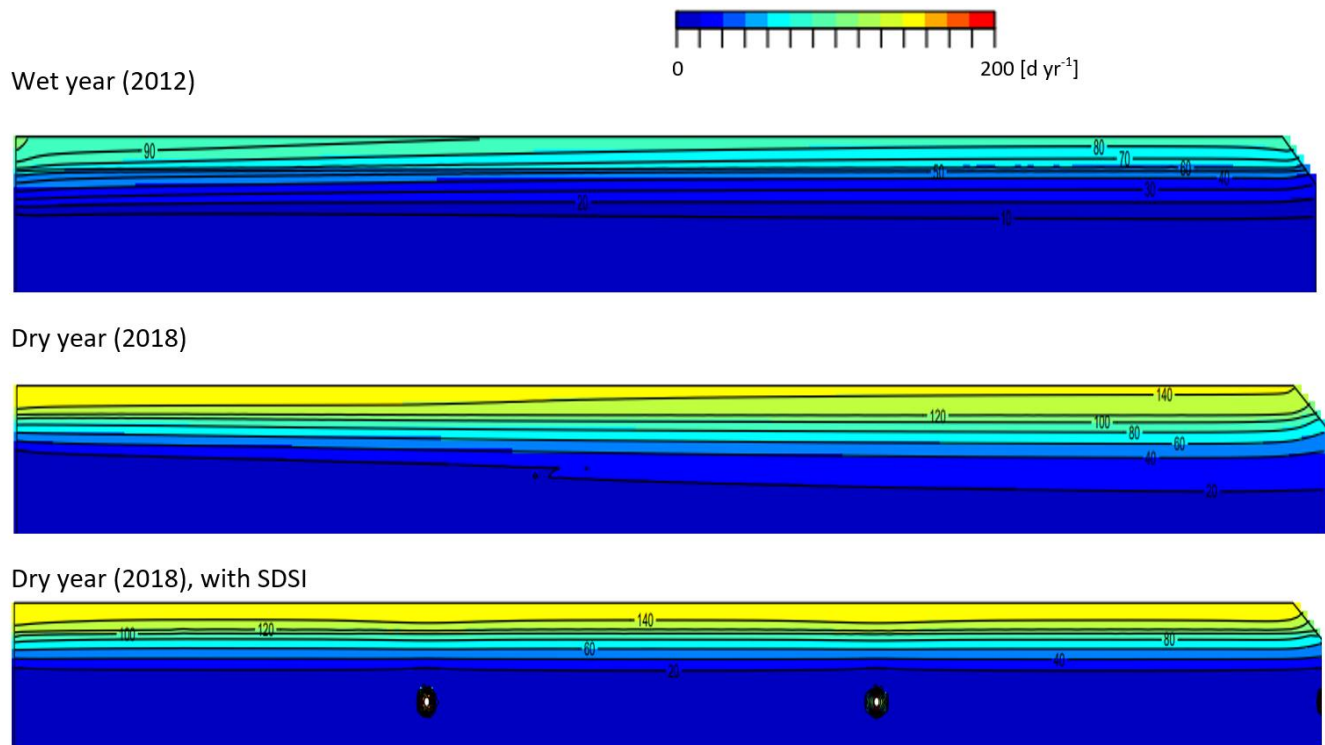
Table S3.3 – Monthly chamber NEE averages [kg CO₂ m⁻² yr⁻¹]. Cursive values were interpolated using relations depicted in Fig. S3.1.

ASD control						ASD SDSI					
date	C1	C2	C3	C4	mean	date	C1	C2	C3	C4	mean
1-4-2020	-0.23	-0.35	-0.22	-0.33	-0.28	1-4-2020	-0.18	-0.29	-0.25	-0.18	-0.23
1-5-2020	-0.45	-0.35	-0.26	-0.21	-0.32	1-5-2020	-0.43	-0.49	-0.46	-0.32	-0.42
1-6-2020	-0.18	-0.34	-0.15	-0.19	-0.21	1-6-2020	-0.48	-0.48	-0.25	-0.20	-0.36
1-7-2020	-0.10	-0.44	-0.29	-0.21	-0.26	1-7-2020	-0.40	-0.42	-0.40	-0.41	-0.41
1-8-2020	0.04	-0.25	-0.13	-0.20	-0.13	1-8-2020	-0.15	-0.13	-0.13	0.02	-0.10
1-9-2020	-0.10	-0.21	-0.03	-0.36	-0.15	1-9-2020	-0.39	-0.47	-0.34	-0.32	-0.37
1-10-2020	0.01	0.03	0.06	-0.17	0.03	1-10-2020	-0.03	-0.01	0.04	0.05	0.01
1-11-2020	-0.15	-0.06	-0.03	NA	-0.08	1-11-2020	-0.09	-0.03	-0.04	0.01	-0.04
1-12-2020	0.04	0.06	0.03	0.01	0.03	1-12-2020	0.03	0.07	0.01	0.01	0.03
1-1-2021	0.00	-0.01	-0.05	-0.04	-0.02	1-1-2021	-0.04	0.00	-0.06	-0.04	-0.04
1-2-2021	-0.03	-0.03	-0.07	-0.07	-0.05	1-2-2021	-0.08	-0.04	-0.13	-0.10	-0.09
1-3-2021	-0.20	-0.27	-0.27	-0.34	-0.27	1-3-2021	-0.21	-0.19	-0.28	-0.26	-0.24
VLI control						VLI SDSI					
date	C1	C2	C3	C4	mean	date	C1	C2	C3	C4	mean
1-4-2020					-0.19	1-4-2020					-0.23
1-5-2020	0.08	0.06	0.07	-0.01	0.05	1-5-2020	-0.48	-0.40	-0.12	-0.41	-0.35
1-6-2020	-0.10	-0.36	-0.33	-0.32	-0.28	1-6-2020	-0.20	-0.39	-0.19	-0.20	-0.24
1-7-2020	-0.16	-0.24	-0.59	-0.22	-0.29	1-7-2020	-0.38	-0.37	-0.45	-0.87	-0.48
1-8-2020	0.26	0.04	-0.09	-0.13	0.04	1-8-2020	0.15	-0.11	0.07	-0.49	0.01
1-9-2020	0.10	-0.08	0.08	0.06	0.04	1-9-2020	0.04	0.04	0.16	-0.03	0.06
1-10-2020	-0.14	-0.02	-0.20	0.00	-0.10	1-10-2020	-0.02	-0.06	-0.03	0.07	-0.03
1-11-2020	0.06	0.10	0.08	0.16	0.10	1-11-2020	0.17	0.14	0.15	0.21	0.17
1-12-2020	0.07	0.06	0.05	0.11	0.07	1-12-2020	0.08	0.06	0.11	0.08	0.08
1-1-2021	-0.02	0.00	-0.02	0.01	-0.01	1-1-2021	0.05	0.03	0.02	0.04	0.03
1-2-2021	0.01	0.05	0.02	0.04	0.03	1-2-2021	-0.05	-0.09	-0.06	-0.06	-0.07
1-3-2021	-0.15	-0.22	-0.13	-0.01	-0.13	1-3-2021	-0.28	-0.25	-0.22	-0.25	-0.26



40 **Figure S3.1 – Relations between monthly NEE fluxes [kg CO₂ m⁻²] measured in Assendelft control and Vlist control (left) and Vlist SDSI (right).**

1.1 S4 – Potential respiration rate cross-sections



45 **Figure S4.1 - Cross-sections from ditch to trench of estimation of yearly respiration rate [d yr^{-1}] in the upper meter of the model domain in the modelled wet year (above), dry year (middle) and in a dry year with SDSI (bottom).**

S5 – Simulated potential respiration rate

Table S5.1 - Results of potential respiration rate (scenarios with normal hydraulic conductivity of intact sedge peat layers).

Potential respiration rate		[d m yr ⁻¹]										
<i>climate seepage</i>	<i>ditch</i>	wet	wet	wet	wet	wet	dry	dry	dry	dry	dry	dry
		1	0.5	0	-0.5	-1	1	0.5	0	-0.5	-1	
control	-20	3	7	12	19	29	23	30	37	44	51	
	-30	8	11	14	19	26	29	34	41	47	55	
	-40	12	15	18	24	30	34	39	45	53	61	
	-50	16	19	24	30	37	40	46	52	60	70	
	-60	20	25	31	38	46	47	53	60	69	81	
SDSI	-20	12	13	13	14	14	17	18	19	21	22	
	-30	19	19	20	20	21	29	30	31	32	33	
	-40	24	24	25	25	26	38	39	39	40	41	
	-50	28	29	29	29	30	43	44	44	45	46	
	-60	36	36	37	37	38	53	54	54	55	56	

Absolute differences [d m yr⁻¹] when comparing with a base scenario consisting of a ditch water level of -50 cm

control	-20	-12	-12	-12	-11	-7	-17	-16	-15	-17	-18
	-30	-8	-8	-10	-11	-11	-11	-11	-12	-13	-14
	-40	-4	-5	-6	-6	-7	-6	-6	-7	-8	-9
	-50	0	0	0	0	0	0	0	0	0	0
	-60	5	6	7	7	9	6	7	8	9	11
SDSI	-20	-4	-7	-11	-17	-22	-23	-27	-33	-40	-48
	-30	3	0	-5	-10	-16	-11	-15	-21	-28	-36
	-40	8	5	1	-5	-11	-2	-7	-13	-20	-29
	-50	12	9	4	-1	-7	3	-2	-8	-15	-24
	-60	20	17	12	7	1	12	8	2	-5	-14

Percentual differences [%]

control	-20	-78	-63	-50	-37	-20	-42	-34	-30	-27	-26
	-30	-50	-43	-43	-37	-29	-28	-25	-22	-21	-20
	-40	-25	-24	-25	-21	-18	-15	-14	-14	-13	-13
	-50	0	0	0	0	0	0	0	0	0	0
	-60	30	32	28	24	24	16	16	16	15	16
SDSI	-20	-24	-35	-46	-55	-61	-57	-60	-63	-66	-69
	-30	20	1	-19	-33	-43	-27	-33	-40	-46	-52
	-40	53	27	2	-16	-30	-6	-15	-25	-33	-41
	-50	79	49	18	-3	-19	7	-4	-15	-25	-34
	-60	127	90	50	22	3	31	18	4	-9	-20

Table S5.2 - Absolute differences [d m yr⁻¹] when comparing no SDSI with SDSI results

<i>climate</i>		wet	wet	wet	wet	wet	dry	dry	dry	dry	dry
<i>seepage</i>		1	0.5	0	-0.5	-1	1	0.5	0	-0.5	-1
<i>ditch</i>											
control	-20	0	0	0	0	0	0	0	0	0	0
	-30	0	0	0	0	0	0	0	0	0	0
	-40	0	0	0	0	0	0	0	0	0	0
	-50	0	0	0	0	0	0	0	0	0	0
	-60	0	0	0	0	0	0	0	0	0	0
SDSI	-20	8	5	1	-5	-15	-6	-12	-17	-23	-30
	-30	11	8	6	1	-5	0	-4	-9	-15	-22
	-40	12	10	7	1	-4	3	0	-6	-12	-20
	-50	12	9	4	-1	-7	3	-2	-8	-15	-24
	-60	15	11	5	-1	-8	6	1	-6	-14	-25

Percentual differences [%]

control	-20	0	0	0	0	0	0	0	0	0	0
	-30	0	0	0	0	0	0	0	0	0	0
	-40	0	0	0	0	0	0	0	0	0	0
	-50	0	0	0	0	0	0	0	0	0	0
	-60	0	0	0	0	0	0	0	0	0	0
SDSI	-20	242	76	9	-28	-51	-26	-38	-47	-53	-58
	-30	141	76	42	6	-19	2	-11	-23	-32	-40
	-40	103	67	36	6	-14	10	-1	-13	-24	-33
	-50	79	49	18	-3	-19	7	-4	-15	-25	-34
	-60	75	43	17	-1	-17	13	2	-10	-21	-31

Table S3 - Difference [factor] between absolute effectivity of SDSI when comparing results for the full width and results for the middle of the parcel (positive factors indicate higher effectivity in the middle of the parcel).

<i>climate</i>	<i>we</i>											2020	2020	2020	2020	2020
	t	wet	wet	wet	wet	dry	dry	dry	dry	dry	dry					
<i>flow</i>	1	0.5	0	-0.5	-1	1	0.5	0	-0.5	-1	1	0.5	0	-0.5	-1	
<i>ditch</i>																
	-20	0.4	-0.2	-7.5	3.2	2.2	3.2	2.4	2.1	2.0	1.9	3.7	2.4	2.1	1.9	1.9
	-30	0.6	0.3	-0.1	-6.7	3.4	-25.3	4.6	2.7	2.3	2.1	300.2	3.6	2.5	2.1	2.0
	-40	0.9	0.8	0.5	-3.3	3.1	-1.2	19.2	3.0	2.2	2.0	-3.2	4.0	2.4	2.0	1.9
	-50	1.2	1.2	1.0	3.4	1.8	0.5	2.8	1.8	1.6	1.6	-6.9	2.0	1.7	1.6	1.6
	-60	1.2	1.2	1.0	5.5	1.7	0.9	-2.2	2.0	1.7	1.6	0.5	2.9	1.8	1.6	1.6

60 Table S4 - Difference [d m yr^{-1}] between absolute effectivity of SDSI when comparing results for the highest (0.46 m d^{-1}) and lowest (0.11 m d^{-1}) saturated hydraulic conductivity. Positive numbers indicate lower respiration rate with the low saturated hydraulic conductivity.

<i>climate</i>		wet	wet	wet	wet	wet	dry	dry	dry	dry	dry
<i>flow</i>		1	0.5	0	-0.5	-1	1	0.5	0	-0.5	
<i>ditch</i>											
	-20	0.4	-0.2	-7.5	3.2	2.2	3.2	2.4	2.1	2.0	
	-30	0.6	0.3	-0.1	-6.7	3.4	-25.3	4.6	2.7	2.3	
	-40	0.9	0.8	0.5	-3.3	3.1	-1.2	19.2	3.0	2.2	
	-50	1.2	1.2	1.0	3.4	1.8	0.5	2.8	1.8	1.6	
	-60	1.2	1.2	1.0	5.5	1.7	0.9	-2.2	2.0	1.7	
<i>climate</i>		wet	wet	wet	wet	wet	dry	dry	dry	dry	dry
<i>flow</i>		1	0.5	0	-0.5	-1	1	0.5	0	-0.5	-1
<i>ditch</i>											
control	-20	0	-1	-3	-7	-12	-2	-4	-6	-7	-8
	-30	0	0	-1	-2	-4	-1	-2	-3	-4	-4
	-40	1	0	0	-1	-1	0	0	-1	-1	-2
	-50	2	1	0	0	0	0	0	-1	-1	-2
	-60	3	3	1	0	-1	0	0	-1	-1	-2
SDSI	-20	0	0	0	0	0	0	0	0	0	0
	-30	0	0	0	0	0	0	0	0	0	0
	-40	0	0	0	0	0	0	0	0	0	0
	-50	0	0	0	0	0	0	0	0	0	0
	-60	0	0	0	0	0	0	0	0	0	0

65