Table S1: Two-way permutational ANOVA results for litter quality. Litter treatments include herbivory (herb) by stem-boring herbivore or non-herbivore litter, nitrogen (N) additions of 0, 8, or 16 g/m2, and their interactions. Degrees of freedom (dfs), mean squared error (MS), *F*-ratios, and *p*-values presented and bold when significant at *alpha* = 0.05.

Response	**Factor**	**dfs**	**MS**	***F*-ratio**	***p* value**
% N	Herbivory	1, 17	0.15	2.435	0.0796*
	Nitrogen	2, 17	0.08	1.299	0.2159
	Herb*N	1, 17	0.01	0.162	0.6863
% C	Herbivory	1, 17	0.03	0.016	0.7843
	Nitrogen	2, 17	2.36	1.276	0.3422
	Herb*N	1, 17	0.13	0.070	0.7255
C:N	Herbivory	1, 17	298.81	1.175	0.1770
	Nitrogen	2, 17	90.02	0.354	0.7330
	Herb*N	1, 17	1.45	0.006	0.9412
CT	Herbivory	1, 17	8.97	0.397	0.4815
	Nitrogen	2, 17	0.00	0.00	0.9999
	Herb*N	1, 17	0.95	0.042	0.8235
% N	Herbivory	1, 18	0.30	4.849	0.0756*
	Added N	1, 18	0.09	1.455	0.3924
	Herb*AddN	1, 18	0.02	0.323	0.3961
% C	Herbivory	1, 18	0.12	0.068	0.6863
	Added N	1, 18	3.25	1.832	0.1560
	Herb*AddN	1, 18	0.04	0.023	0.8235
C:N	Herbivory	1, 18	896.73	3.585	0.05141*
	Added N	1, 18	24.79	0.099	0.9608
	Herb*AddN	1, 18	4.89	0.004	0.8824
CT	Herbivory	1, 18	9.78	0.433	0.5341
	Added N	1, 18	0.09	0.004	0.9412
	Herb*AddN	1, 18	1.53	0.068	0.8431

*Significant at $p < 0.1$

**Significant at $p < 0.05$

Table S2: Four-way permutational ANCOVA for mass remaining and three-way permutational ANOVA for decomposition (*k*) rates. Litter treatments include herbivory (herb) by stem-boring herbivore or non-herbivore litter, sex (male or female willow), nitrogen (N) additions of 0, 8, or 16 g/m2, and their interactions. Degrees of freedom (dfs), mean squared error (MS), *F*-ratios, and *p*-values presented and bold when significant at *alpha* = 0.05.

Model	**Factor**	**dfs**	**MS**	***F*-ratio**	***p* value**
4-way ANCOVA	Sex	1, 80	0.0120	0.9375	0.3750
	Herbivory	1, 80	0.0233	1.820	0.1868
	Sex*Herb	1, 80	0.0139	1.086	0.3529
	Nitrogen	2, 80	0.0023	0.179	0.8214
	Sex*N	2, 80	0.1717	13.414	**<0.0001*****
	Days	1, 80	0.6162	48.141	**<0.0001*****
	Sex*Days	1, 80	0.0004	0.031	0.7255
	Herb*Days	1, 80	0.0039	0.305	0.6230
	Sex*Herb*Days	1, 80	0.0000	0.000	0.8627
	N*Days	2, 80	0.0017	0.133	0.8030
	Sex*N*Days	2, 80	0.0261	2.039	**0.0992***
3-way ANOVA	Sex	1, 16	4.44 E-07	0.12	0.4737
	Herb	1, 16	9.73 E-06	2.64	0.1353
	Sex*Herb	1, 16	8.50 E-07	0.23	0.5275
	Nitrogen	2, 16	2.63 E-06	0.71	0.4541
	Sex*Nitrogen	2, 16	8.22 E-05	22.32	**0.0002*****

*Significant at p < 0.1

***Significant at p < 0.001

Table S3. Decomposition rates (*k* day^{-1}) for each treatment. Litter treatments (trt) include herbivory by stem-boring herbivore or non-herbivore litter, nitrogen additions of 0, 8, or 16 g/m2, and sex (male or female willow). Standard (Std) errors and *p*-values associated with regression lines are included and bold when significant at *alpha* = 0.05.

Herbivory Trt	**Nitrogen Trt**	**Sex**	***k* rate**	**Std error**	***p* value**
Herbivore	0	Female	0.010195	0.002558	**0.0282****
Herbivore	0	Female	0.009113	0.002444	**0.0336****
Herbivore	0	Female	0.008714	0.001802	**0.0169****
Herbivore	16	Male	0.011072	0.003235	**0.0418****
Herbivore	16	Male	0.010094	0.003264	0.0536*
Herbivore	16	Male	0.010185	0.003633	0.0681*
Non-herbivore	0	Female	0.007928	0.001886	**0.0246****
Non-herbivore	0	Female	0.007545	0.002009	**0.033****
Non-herbivore	0	Female	0.007245	0.003007	0.095*
Non-herbivore	0	Female	0.009414	0.002565	**0.035****
Non-herbivore	0	Male	0.015731	0.004605	**0.042****
Non-herbivore	0	Male	0.01501	0.004328	**0.0404****
Non-herbivore	8	Female	0.013483	0.003186	**0.0241****
Non-herbivore	8	Female	0.012168	0.003493	**0.0399****
Non-herbivore	8	Male	0.015239	0.003626	**0.0246****
Non-herbivore	8	Male	0.012138	0.004106	0.0597*
Non-herbivore	8	Male	0.010281	0.004789	0.1211
Non-herbivore	8	Male	0.015756	0.002635	**0.0094****
Non-herbivore	16	Female	0.018455	0.004850	**0.0319****
Non-herbivore	16	Female	0.018235	0.005535	**0.0459****
Non-herbivore	16	Female	0.011548	0.005408	0.1224
Non-herbivore	16	Female	0.017229	0.002530	**0.0065****
Non-herbivore	16	Male	0.008823	0.002189	**0.0274****
Non-herbivore	16	Male	0.007267	0.002612	0.0689*

*Significant at $p < 0.1$

**Significant at $p < 0.05$

***Significant at $p < 0.001$

Table S4: Three-way permutational ANOVAs for benthic macroinvertebrate abundances (total invertebrate abundance as well as the abundances of collector-gatherers, piercing-herbivores, and shredders) in litter bags. Litter treatments include herbivory (herbivore or non-herbivore litter), sex (male or female willow), nitrogen (N added or not), Harvest dates (dates 1, 2, or 3), and their interactions. Degrees of freedom (dfs), mean squared error (MS), *F*-ratios, and *p*-values presented and bold when significant at *alpha* = 0.05.

Model	**Factor**	**dfs**	**MS**	***F*-ratio**	***p* value**
Invert Abundance	Nitrogen	1, 58	35305	12.955	**< 0.0001*** **
	Herbivory	1, 58	13857	5.085	**0.02982** **
	N*Herb	1, 58	17093	6.273	**0.01240** **
	Harvest	2, 58	72741	26.694	**< 0.0001*** **
	N*Harvest	2, 58	18906	6.938	**0.00020*** **
	Herb*Harvest	2, 58	18193	6.676	**0.00120*** **
	N*Herb*Harvest	2, 58	44455	16.314	**< 0.0001*** **
Collector-gatherers	Sex	1, 58	3073.0	10.420	**< 0.0001*** **
	Herbivory	1, 58	488.2	1.655	0.1603
	Sex*Herb	1, 58	1856.2	6.294	**0.0136** **
	Harvest	2, 58	6338.8	21.495	**< 0.0001*** **
	Sex*Harvest	2, 58	1254.5	4.254	**0.0160** **
	Herb*Harvest	2, 58	1568.5	5.319	**0.0142** **
	Sex*Herb*Harvest	2, 58	2048.0	6.945	**0.0002*** **
Piercing-herbivores	Sex	1, 58	15798.1	11.323	**0.00040*** **
	Herbivory	1, 58	6159.2	4.414	**0.01987** **
	Sex*Herb	1, 58	7596.2	5.445	**0.03374** **
	Harvest	2, 58	28179.1	20.197	**< 0.0001*** **
	Sex*Harvest	2, 58	12320.0	8.830	**< 0.0001*** **
	Herb*Harvest	2, 58	10280.6	7.368	**0.00140** **
	Sex*Herb*Harvest	2, 58	18617.1	13.344	**< 0.0001*** **
Shredders	Sex	1, 58	20.37	0.992	0.1774
	Herbivory	1, 58	108.00	5.260	**0.0134** **
	Sex*Herb	1, 58	10.17	0.495	0.3827
	Harvest	2, 58	145.76	7.100	**0.0026*** **
	Sex*Harvest	2, 58	126.88	6.180	**0.0028*** **
	Herb*Harvest	2, 58	78.14	3.806	**0.0015** **
	Sex*Herb*Harvest	2, 58	134.47	6.550	**0.0010*** **

*Significant at $p < 0.1$

**Significant a $p < 0.05$

***Significant at $p < 0.001$