Table S1. Precipitation and temperature data for Big Sandy, MT, USA.

	Total Precipitation (mm)				Mean Temperature Maximum (C)				Mean Temperature Minimum (C)			
Months	**2013**	**2014**	**2015**	**LTA**[***]	**2013**	**2014**	**2015**	**LTA**	**2013**	**2014**	**2015**	**LTA**
Oct -April[*]	87	95	87	103	6.7	4.9	7.94	6.0	-5.7	-8.0	-4.8	-8.0
May	135	38	33	55	21.4	20.8	19.7	21.3	6.0	4.9	5.2	4.7
June	105	82	53	68	25.2	22.5	28.4	25.3	10.3	8.5	10.8	8.8
July	43	84	82	35	29.4	30.9	29.9	31.2	13.3	13.7	13.1	11.8
August	36	78	10	32	30.4	28.7	29.5	30.1	13.0	13.7	12.4	10.4
September	43	25	40	32	25.3	22.4	23.2	23.7	9.8	7.0	5.9	5.2
Annual[**]	426	342	301	325	14.4	13.7	15.7	14.8	0.2	0.2	1.3	-1.2

[*] Oct - April period includes data from October through December of the previous year and January through April of current year.
[**] Annual includes January through December of the same year.
[***] LTA (Long Term Average of 94 years) is from 09/01/1921 to 01/16/2015
Source: Western Regional Climate Center, Desert Research Institute, Reno, NV, USA (http://www.wrcc.dri.edu).

Table S2. Crop rotation in conventional (C) and organic (O) spring wheat fields between 2013 and 2015. All fields were sampled in 'Year 5' of the crop phases.

Year	Systems	Fields	Crop rotation phases				
			Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
2013	Conventional	C1-C3	Spring wheat (*Triticum aestivum* L.)	Chemical fallow	Spring wheat	Chemical fallow	Spring wheat
	Organic	O1	Buckwheat (*Fagopyrum esculentum* Moench)	Spring pea	Barley (*Hordeum vulgare* L.)	Safflower (*Carthamus tinctorius* L.)	Kamut (*Triticum turanicum* Jakubz. (var. Kamut)
		O2	Pea (*Pisum sativum* L.)	Kamut wheat	Spring pea	Safflower	Kamut wheat
		O3	Alfalfa (*Medicago sativa* L.)	Alfalfa	Winter wheat (*Triticum aestivum* L.)	Spring pea	Kamut wheat
2014	Conventional	C4-C6	Spring wheat	Chemical fallow	Spring wheat	Chemical fallow	Spring wheat
	Organic	O4	Pea	Kamut wheat	Spring pea	Safflower	Kamut wheat
		O5	Pea	Kamut wheat	Spring pea	Safflower	Kamut wheat
		O6	Safflower	Pea	Barley/alfalfa	Spring pea/alfalfa	Kamut wheat
2015	Conventional	C7	Spring wheat	Chemical fallow	Spring wheat	Chemical fallow	Spring wheat
		C8	CRP land [‡]	CRP land	CRP land (terminated)	Chemical fallow	Spring wheat
		C9	CRP land	CRP land	CRP land (terminated)	Chemical fallow	Spring wheat

	O7	Alfalfa	Alfalfa	Alfalfa	Spelt (*Triticum spelta* L.)	Kamut wheat
Organic	O8	Alfalfa	Alfalfa	Alfalfa	Spelt	Kamut wheat
	O9	Barley/alfalfa	Alfalfa	Winter wheat	Spring pea	Kamut wheat

Sources: Organic farm manager: Seth Goodman, 2013-2015*; Conventional farmers: Mark/Patti Gasvoda, JR Labuda, and Frank/Lis Maxwell,* 2013-2015. ǂCRP = Conservation Reserve Program.

Table S3. Agronomic management details for conventional and organic spring wheat fields between 2013 and 2015.

Year	Farming system	Field	Pesticide name	Pesticide rate (g ai ha^{-1})	Adjuvants (% in tank mix)	Fertilizer (kg ha^{-1})	Wheat cultivar	Row spacing seeding density [yield (kg/ha)]	Years of cropping regime
2013	Conventional	C1-C3	Iimazamox Propiconazole Glyphosate Octanoic acid ester of bromoxynil + 2-ethylhexyl ester of MCPA	336 269 1682 1121	Non-ionic surfactant (1%)	160 (55N-20P-0K-5S)	Clearfield-Jedd	30cm drill 15kg/ha [2,355]	Chemical fallow/cropping for >20 years
	Organic	O1-O3	-	-	-	Pea/alfalfa	Kamut wheat	18cm chisel plow 28kg/ha [1,211]	24 years
2014	Conventional	C4-C6	Glyphosate 2,4-D LV6	1121 841	N/A	78 (20N-20P-10K-5S)	Clearfield Jedd	30cm drill 15kg/ha N/A	Since 1919
	Organic	O4-O6	-	-	-	Pea/alfalfa	Kamut wheat	18cm chisel plow 28kg/ha [808]	25 years
2015	Conventional	C7-C8	Triasulfuron 2,4-D Propiconazole	22 701 175	-	181 (55N-20P-0K-0S)	Vida	30cm drill 15kg/ha [808] ǂ	C7-C8: CRP for 20 years until 2014 C9: same as in C1:C3
		C9	Glyphosate	1121	N/A	78 (20N-20P-10K-5S)	Vida	30cm drill 15kg/ha [N/A]	Chemical fallow/cropping for >20 years
	Organic	O7-O8	-	-	-	Alfalfa	Kamut wheat	18cm chisel plow	26 years

O9	-	-	-	Pea/alfalfa	Kamut wheat	28kg/ha [336] 18cm chisel plow [28] ᵝ	3 years

Note: All of our conventional fields were chemical fallow the season prior to our study except for C7 and C8, which were CRP (Conservation Reserve Program) for the previous 20 years. To break CRP, these fields were treated with glyphosate (Roundup®) at a rate of 3,786g of active ingredient ha^{-1} in 2014 fall with cultivator that had front row of twisted spikes on it. The producer disked each field twice in the fall of 2014 and prior to seeding in the spring of 2015. All organic fields were cultivated with a chisel plow for seeding and for weed management but a disk plow was also used occasionally to manage the high density weeds. ǂ Low yield was due to hail, drier year, and being a first crop out of CRP. ᵝ Due to hail and drier year.

Sources: Organic farm manager: Seth Goodman (2013-2015)*; Conventional farmers: Mark/Patti Gasvoda (2013, 2015), JR Labuda, (2015) and Frank/Lis Maxwell (2014).*

Table S4. Complete list of weeds (grasses* and forbs) with their relative proportions observed in organic and conventional wheat fields between 2013 and 2015.

	Percent composition (overall)	
Weed taxa	Conventional	Organic
Amaranthus blitoides S. Watson	<0.01	<0.01
Amaranthus retroflexus L.	<0.01	0.47
Arabidopsis thaliana (L.) Heynh.	-	<0.01
Artemisia frigida Willd.	-	<0.01
Avena fatua L.*	4.71	4.70
Bassia scoparia (L.) A.J. Scott	0.07	0.14
Brassicaceae sp.	-	0.04
Bromus arvensis L.*	0.08	<0.01
Bromus tectorum L.*	8.40	0.20
Buglossoides arvensis (L.) I.M. Johnst.	-	<0.01
Carthamus tinctorius L.	-	0.69
Chenopodium album L.	-	7.43
Chenopodium murale L.	-	<0.01
Cirsium arvense (L.) Scop.	2.55	<0.01
Descurainia pinnata (Walter) Britton	<0.01	0.03
Descurainia sophia (L.) Webb ex Prantl	-	0.01
Fabaceae sp.	-	<0.01
Fagopyrum esculentum Moench	-	0.03
Helianthus annuus L.	<0.01	2.72

Hordeum jubatum L.*	5.03	0.04
Lactuca serriola L.	0.12	0.43
Lens culinaris Medik.	-	0.15
Leptochloa fusca (L.) Kunth *	<0.01	-
Medicago lupulina L.	-	0.01
Medicago sativa L.	0.89	3.50
Melilotus officinalis (L.) Lam.	-	0.07
Monolepis nuttalliana (Schult.) Greene	-	<0.01
Pisum sativum L.	-	1.08
Poa annua L.*	<0.01	-
Polygonum aviculare L.	0.01	0.14
Polygonum convolvulus L.	0.13	6.70
Pseudoroegneria spicata (Pursh)*	0.81	-
Salsola kali L.	2.72	36.15
Salvia reflexa Hornem.	0.10	0.01
Setaria viridis (L.) P. Beauv. *	0.13	0.05
Silene latifolia Poir.	-	<0.01
Sinapis arvensis L.	-	2.23
Sisymbrium altissimum L.	-	0.04
Solanum triflorum Nutt.	-	<0.01
Taraxacum officinale F.H. Wigg.	0.34	0.04
Thlaspi arvense L.	-	1.31
Tragopogon dubius Scop.	<0.01	-
Trifolium sp.	-	<0.01
Triticum aestivum L. *	-	3.50
Unknown (dicot) sp.	<0.01	0.81
Unknown (grass) sp.*	<0.01	0.03
Vaccaria hispanica (Mill.) Rauschert	-	0.63
Vicia americana Muhl. ex Willd.	<0.01	0.43

Source for verification of scientific names and authorities: http://plants.usda.gov/

Table S5. Complete list of ground beetle species and their activity densities at organic and conventional fields, Big Sandy, MT between 2013 and 2015.

	2013		2014		2015			
Carabid species	Conventional	Organic	Conventional	Organic	Conventional	Organic	Total	Percent
Agonum errans (Say)	0	3	0	0	0	0	3	0.2
Agonum sp. (Bonelli)	0	0	1	0	0	0	1	0.07
Amara apricaria (Paykull)	0	0	5	0	0	1	6	0.39
Amara avida (Say)	0	0	1	0	0	0	1	0.07
Amara confusa (LeConte)	0	0	0	0	0	1	1	0.07
Amara discors (Kirby)	0	0	1	2	0	1	4	0.26
Amara emancipata (Lindroth)	0	0	1	1	0	1	3	0.2
Amara farcta (LeConte)	0	0	4	1	2	2	9	0.59
Amara latior (Kirby)	0	5	0	0	0	1	6	0.39
Amara obesa (Say)	2	4	7	0	1	2	16	1.05
Amara patruelis (Dejean)	0	2	0	2	0	0	4	0.26
Amara quenseli (Schönherr)	3	9	9	11	3	8	43	2.83
Amara sinuosa (Casey)	0	0	1	0	0	2	3	0.2
Amara thoracica (Hayward)	0	1	13	6	0	7	27	1.78
Apristus pugetanus (Casey)	0	0	0	0	1	2	3	0.2
Bembidion concretum (Casey)	0	0	0	1	0	0	1	0.07
Bembidion nitidum (Kirby)	0	0	1	9	0	2	12	0.79
Bradycellus congener (LeConte)	0	0	0	2	0	0	2	0.13
Calosoma lepidum (LeConte)	1	0	0	0	0	0	1	0.07
Calosoma luxatum (Say)	8	10	4	2	1	11	36	2.37
Calosoma obsoletum (Say)	4	0	0	1	0	3	8	0.53
Cicindela punctulata (Bates)	1	0	0	3	2	18	24	1.58
Cicindela purpurea (LeConte)	0	1	0	0	0	5	6	0.39
Cratacanthus dubius (Palisot de Beauvois)	0	0	77	45	0	19	141	9.28

Euryderus grossus (Say)	0	0	0	0	1	0	1	0.07
Harpalus affinis (Schrank)	0	1	0	0	0	0	1	0.07
Harpalus amputatus (Say)	0	10	21	25	0	15	71	4.67
Harpalus animosus (Casey)	0	0	0	0	6	4	10	0.66
Harpalus desertus (LeConte)	0	0	0	0	0	2	2	0.13
Harpalus fraternus (LeConte)	1	74	0	2	2	9	88	5.79
Harpalus herbivagus (Say)	0	0	0	0	0	3	3	0.2
Harpalus innocuus (LeConte)	0	0	0	0	2	0	2	0.13
Harpalus opacipennis (Haldeman)	0	1	0	0	0	2	3	0.2
Harpalus reversus (Casey)	0	8	0	2	0	0	10	0.66
Harpalus ventralis (LeConte)	0	2	0	2	3	3	10	0.66
Notiophilus borealis (Harris)	0	0	0	1	0	0	1	0.07
Pasimachus elongatus (LeConte)	10	47	15	2	5	7	86	5.66
Poecilus corvus (LeConte)	8	47	4	13	0	1	73	4.8
Poecilus cursitor (LeConte)	6	14	8	4	1	3	36	2.37
Poecilus lucublandus (Say)	0	11	0	0	0	0	11	0.72
Poecilus scitulus (LeConte)	106	182	111	296	7	40	742	48.82
Pterostichus femoralis (Kirby)	0	0	5	4	0	0	9	0.59
Total	**150**	**432**	**289**	**437**	**37**	**175**	**1520**	**100**

Figure S1. Study area map showing nine conventional and nine organic fields across three years in Big Sandy, MT, United States.

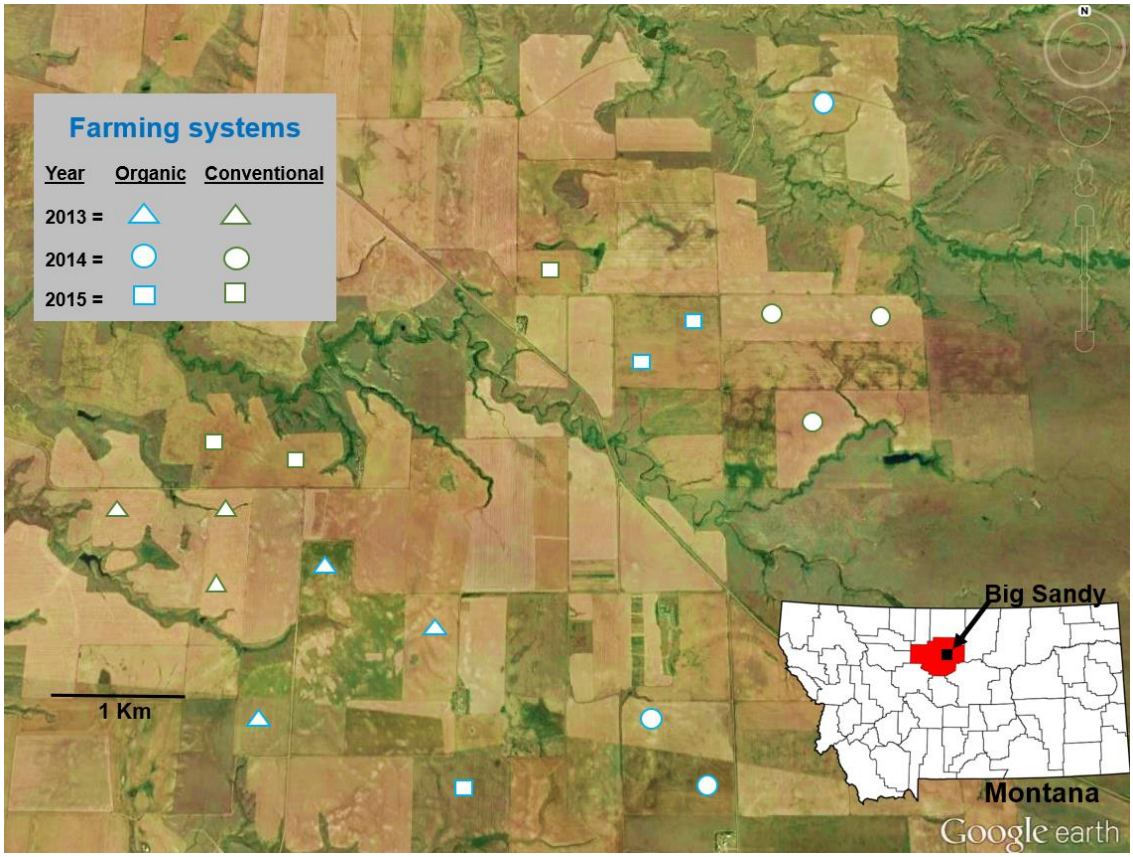

Figure S2. Schematic diagram of one of the fields in Big Sandy, MT, United States used to assess weed and ground beetle communities in conventional and organic cropping systems. The solid black line at the center of field represents the main transect (55m), three orthogonal dotted lines represent sub-transects (25m) used to assed weed communities, and black circles represent pitfall traps used for beetle sampling (A). An example of pitfall traps (B).

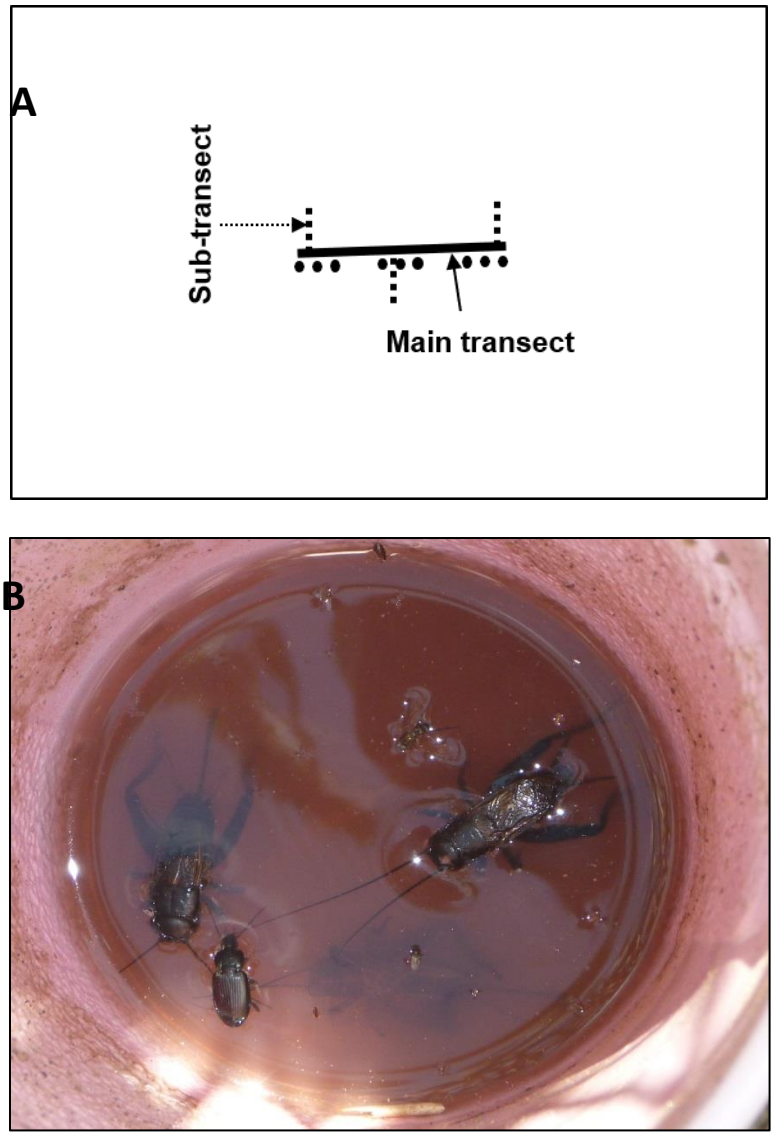

Figure S3. Principal component analysis plot showing the associations of different weed species with conventional or organic systems.