Supplemental material for:

Do insect outbreaks reduce the severity of subsequent forest fires?

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Table S1 (page 1 of 3). Key attributes and sequential autoregression (SAR) model accuracy for fire events with prior mountain pine beetle (MPB) or western spruce budworm (WSB) activity.

Fire name[a]	Fire year[a]	Fire extent (ha)[a]	Prefire insect[b]	SAR model R^2[c]
Cabot Creek	1987	1235	WSB	0.668
Ryder Creek	1987	6584	WSB	0.631
Paulina	1988	5420	MPB	0.376
Canal	1989	7525	WSB	0.849
Dooley Mt	1989	7587	WSB	0.648
Little Baldy Mt	1989	3966	WSB	0.888
Monument Rock	1989	4609	WSB	0.719
Tanner Gulch	1989	1786	WSB	0.721
90991235	1990	402	MPB	0.221
Finley Butte	1990	525	MPB	0.513
Sheep Mt	1990	4044	WSB	0.655
Bannon	1994	676	WSB	0.491
Boundary	1994	4486	WSB	0.861
Four Corners	1994	653	MPB	0.480
Fox Point	1994	872	WSB	0.807
Indian Rock	1994	628	WSB	0.529
Lakebeds	1994	1153	WSB	0.869
Little Malheur Complex (Ironside)	1994	4031	WSB	0.773
Reed	1994	1114	WSB	0.806
Road 135	1994	943	WSB	0.845
Thunder	1994	4338	MPB	0.924
Yedlick	1994	1749	WSB	0.757
Miller Cr PNF 848	1995	580	WSB	0.608
Bull Complex (Bull)	1996	3576	WSB	0.799
Bull Complex (Summit)	1996	14698	WSB	0.801
Jefferson	1996	1587	WSB	0.672
Skeleton-Evans West (Evans West)	1996	1710	MPB	0.579

Table continues on next page.

Table S1, continued (page 2 of 3).

Fire name[a]	Fire year[a]	Fire extent (ha)[a]	Prefire insect[b]	SAR model R^2[c]
Tower	1996	20569	WSB	0.809
Wheeler Point	1996	9174	WSB	0.678
Wildcat Complex (Wildcat)	1996	4320	WSB	0.892
Mile Post 248	1997	442	WSB	0.405
Carrol Creek	2000	1397	WSB	0.635
Hash Rock	2000	6945	WSB	0.742
Range	2000	4601	WSB	0.617
Tamarack Creek	2000	3155	WSB	0.407
Dark Lake	2001	1102	WSB	0.561
Unnamed	2001	2712	MPB	0.398
747 Complex (747)	2002	6475	WSB	0.491
Cache Mt	2002	1596	WSB	0.704
Easy	2002	2590	WSB	0.678
Eyerly Complex (Eyerly)	2002	9048	WSB	0.463
Flagtail	2002	3234	WSB	0.663
Grizzly Complex (Winter)	2002	11197	MPB	0.480
Monoment-Malheur Complex (Monument)	2002	9656	WSB	0.751
B&B Complex (Booth)	2003	36940	WSB	0.846
Bull Springs 2	2003	515	WSB	0.816
Davis	2003	8370	MPB	0.689
Fawn Peak Complex (Farewell)	2003	31340	MPB	0.797
Isabel	2003	2328	MPB	0.846
Link	2003	1400	WSB	0.716
Burnt Cabin	2005	871	WSB	0.745
Mule Peak	2005	404	WSB	0.689
Cascade Crest Complex (Black Crater)	2006	3841	WSB	0.733
Cascade Crest Complex (Puzzle)	2006	2115	WSB	0.894

Table continues on next page.

Table S1, continued (page 3 of 3).

Fire name[a]	Fire year[a]	Fire extent (ha)[a]	Prefire insect[b]	SAR model R^2[c]
Cedar Creek	2006	493	MPB	0.735
Maxwell	2006	2944	WSB	0.833
Mt Hood Complex	2006	733	WSB	0.824
Pollalie	2006	433	WSB	0.673
Sharps Ridge	2006	2246	WSB	0.903
Tatoosh Complex	2006	13995	MPB	0.822
Thorn Creek	2006	4321	WSB	0.835
Tinpan	2006	3660	WSB	0.800
Tripod Complex (Spur Peak)	2006	46589	MPB	0.801
Tripod Complex (Tripod)	2006	24165	MPB	0.856
Van Peak	2006	577	MPB	0.894
Boomer	2007	1451	WSB	0.227
Calamity Complex (Grapple)	2007	519	WSB	0.793
Domke Lake Complex	2007	4079	MPB	0.380
GW Fire	2007	2880	WSB	0.794
Otter Creek	2007	1217	WSB	0.890
Shelton	2007	1102	WSB	0.528
Trout Meadows	2007	1637	WSB	0.864
Bridge Creek	2008	2098	WSB	0.868
Ochoco Fire Use WFU	2008	637	WSB	0.771
Wizard	2008	870	WSB	0.806
Big Sheep	2009	1605	WSB	0.802
Discovery	2009	1716	MPB	0.787
North Fork Complex	2009	6662	WSB	0.840
OR-MAF-149	2009	454	WSB	0.567
Pyramid	2010	602	MPB	0.633
Dollar Lake	2011	2456	WSB	0.868

[a] Fire name, year, and extent from http://mtbs.gov.
[b] Insect type from Landsat time series atlas (Meigs *et al* 2015b).
[c] SAR modeling described in detail in Methods section.

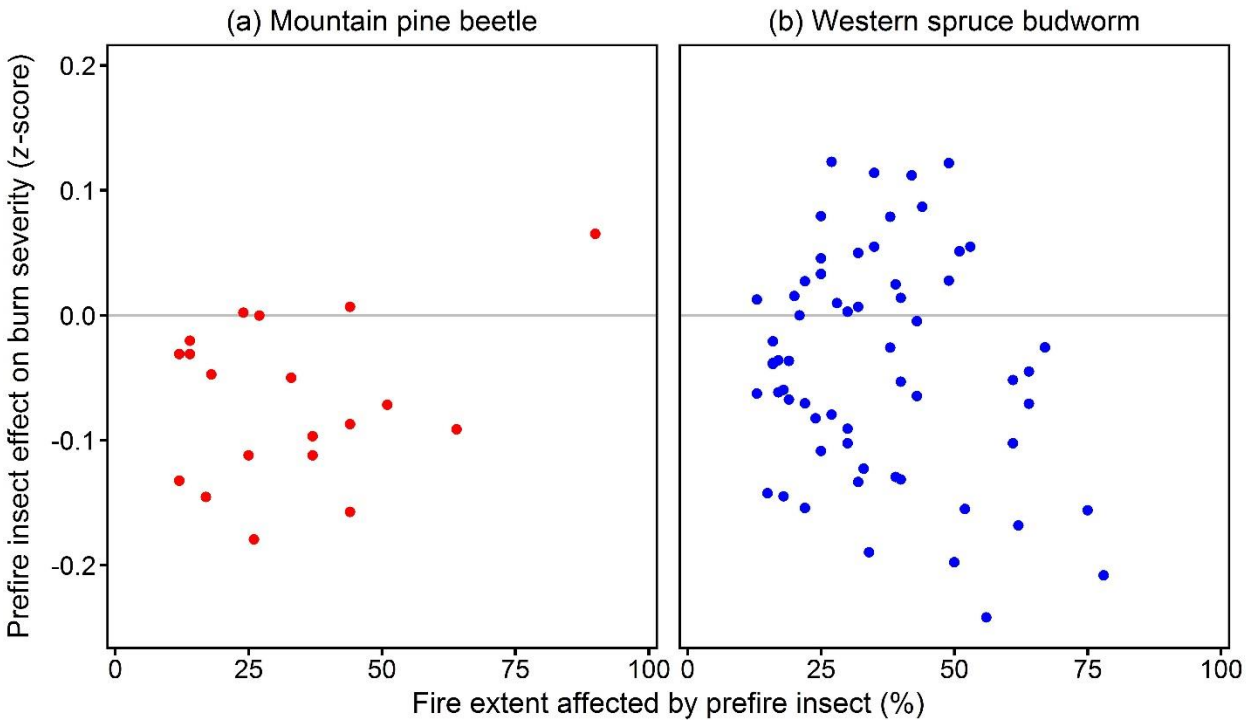

Figure S1. Relationship between cumulative prefire insect extent (% of fire perimeter) and prefire insect effect on burn severity (RdNBR spectral index) across fire events (individual points). The relationship does not vary with the proportion of fire extent affected by either mountain pine beetle (a, $R^2 = 0.07$, $P = 0.26$, $n = 19$) or western spruce budworm (b, $R^2 = 0.04$, $P = 0.14$, $n = 62$).

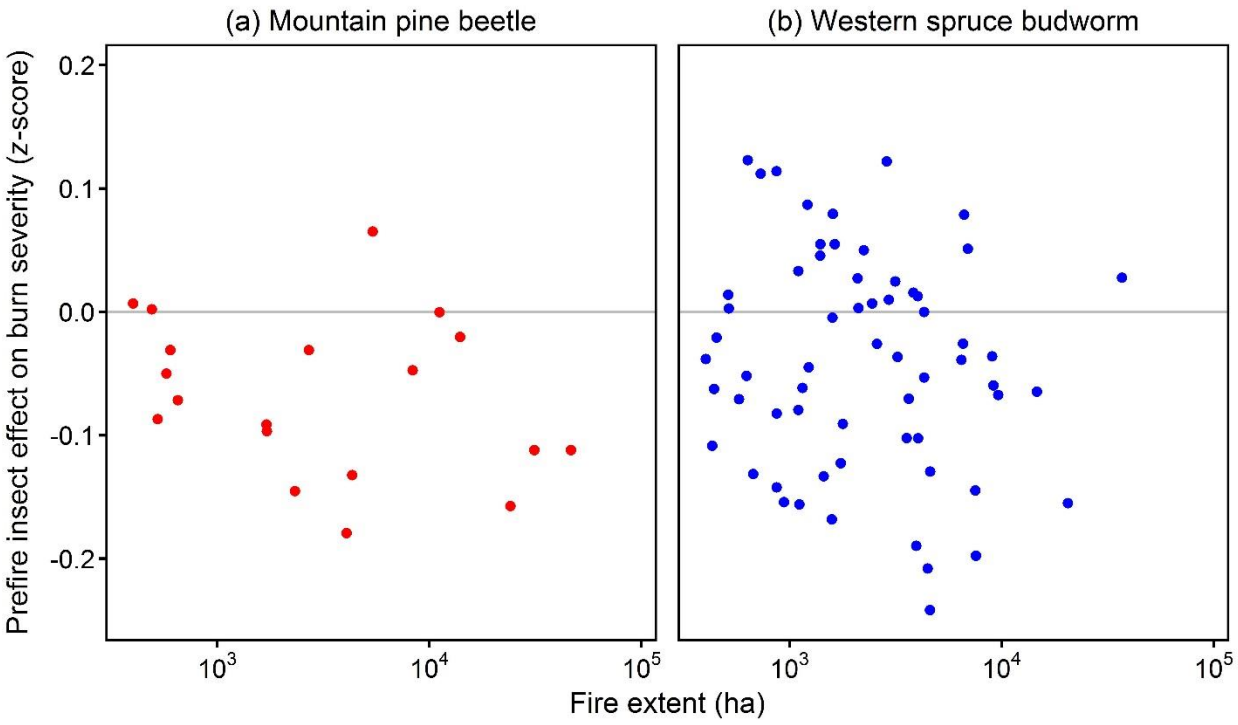

Figure S2. Relationship between fire extent (ha) and prefire insect effect on burn severity (RdNBR spectral index) across fire events (individual points). The relationship does not vary with fire event size for either mountain pine beetle (a, $R^2 = 0.08$, $P = 0.25$, $n = 19$) or western spruce budworm (b, $R^2 = 0.02$, $P = 0.27$, $n = 62$). Note logarithmic scale of x-axis.

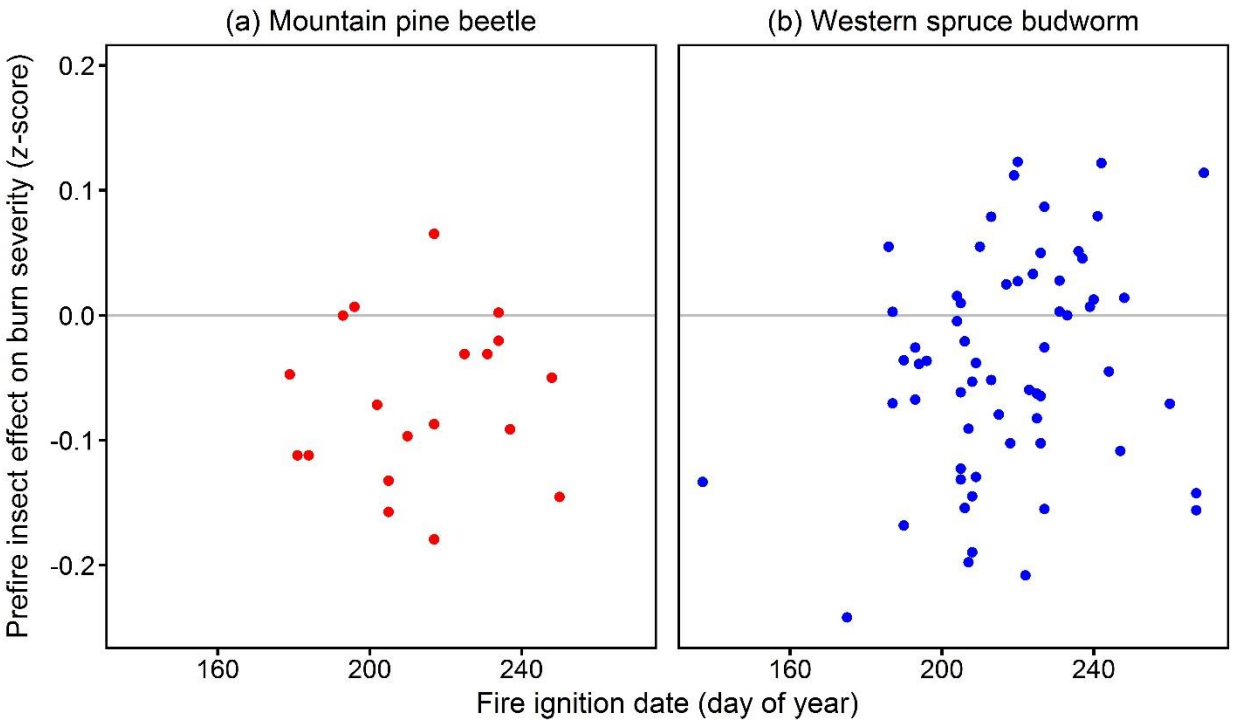

Figure S3. Relationship between fire season (ignition day of year) and prefire insect effect on burn severity (RdNBR spectral index) across fire events (individual points). The relationship does not vary strongly with fire season (based on ignition date) for either mountain pine beetle (a, $R^2 = 0.00$, $P = 0.81$, $n = 19$) or western spruce budworm (b, $R^2 = 0.07$, $P = 0.04$, $n = 62$).

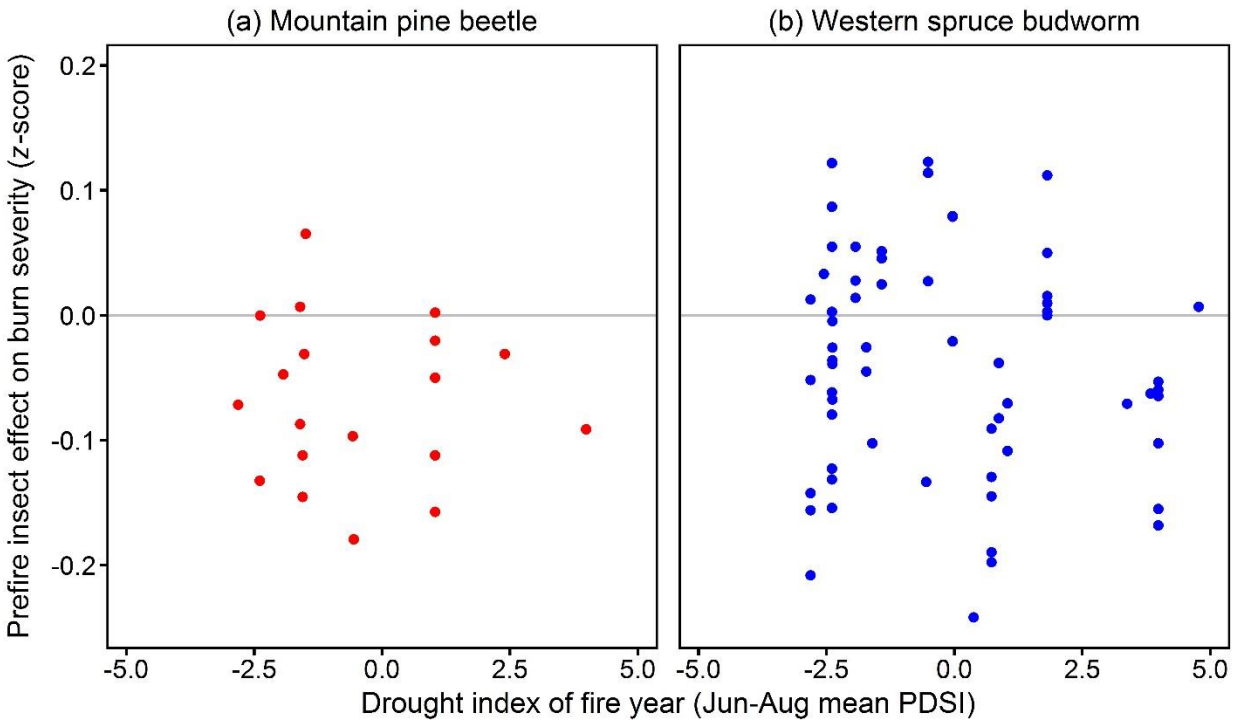

Figure S4. Relationship between drought condition of each fire year (Palmer Drought Severity Index; PDSI; state-level monthly values averaged for June to August) and prefire insect effect on burn severity (RdNBR spectral index) across fire events (individual points). The relationship does not vary across a range of warm-dry to cool-wet conditions (negative to positive PDSI values; Heyerdahl *et al* 2008) for either mountain pine beetle (a, $R^2 = 0.00$, $P = 0.82$, $n = 19$) or western spruce budworm (b, $R^2 = 0.02$, $P = 0.33$, $n = 62$).

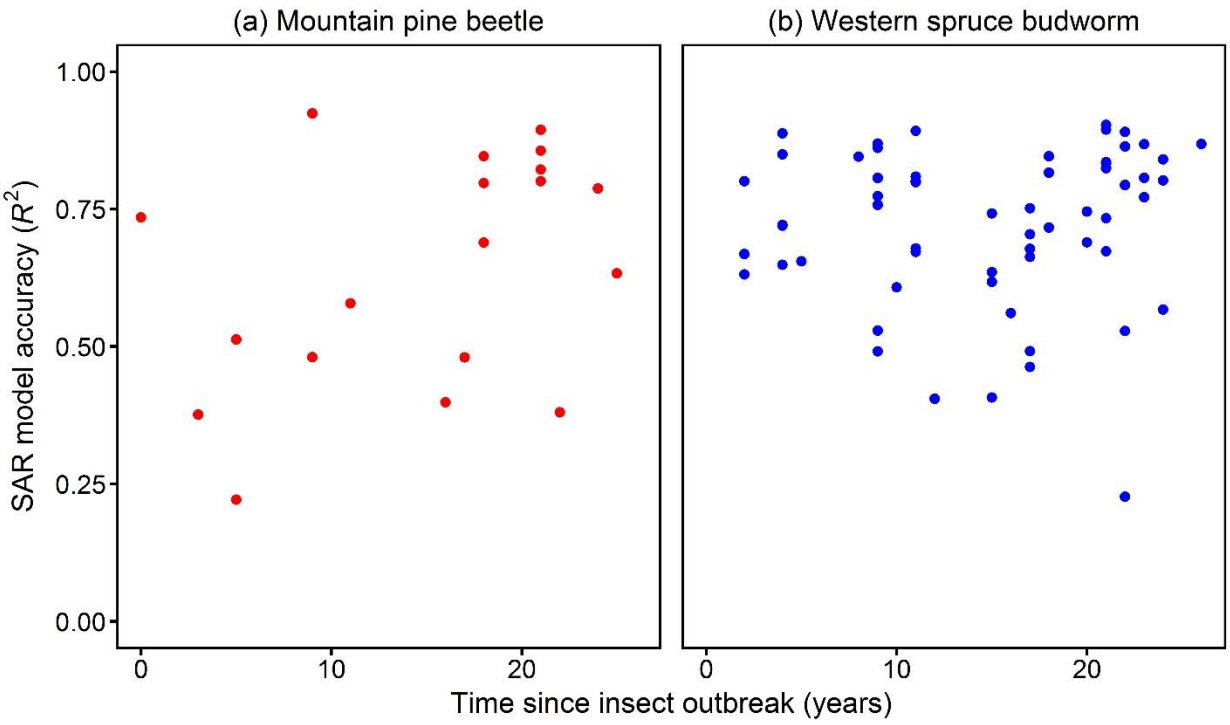

Figure S5. Relationship between years since onset of insect outbreak and SAR model accuracy (R^2) across fire events (individual points). The relationship does not vary strongly with time since outbreak for either mountain pine beetle (a, $R^2 = 0.16$, $P = 0.08$, $n = 19$) or western spruce budworm (b, $R^2 = 0.00$, $P = 0.65$, $n = 62$).

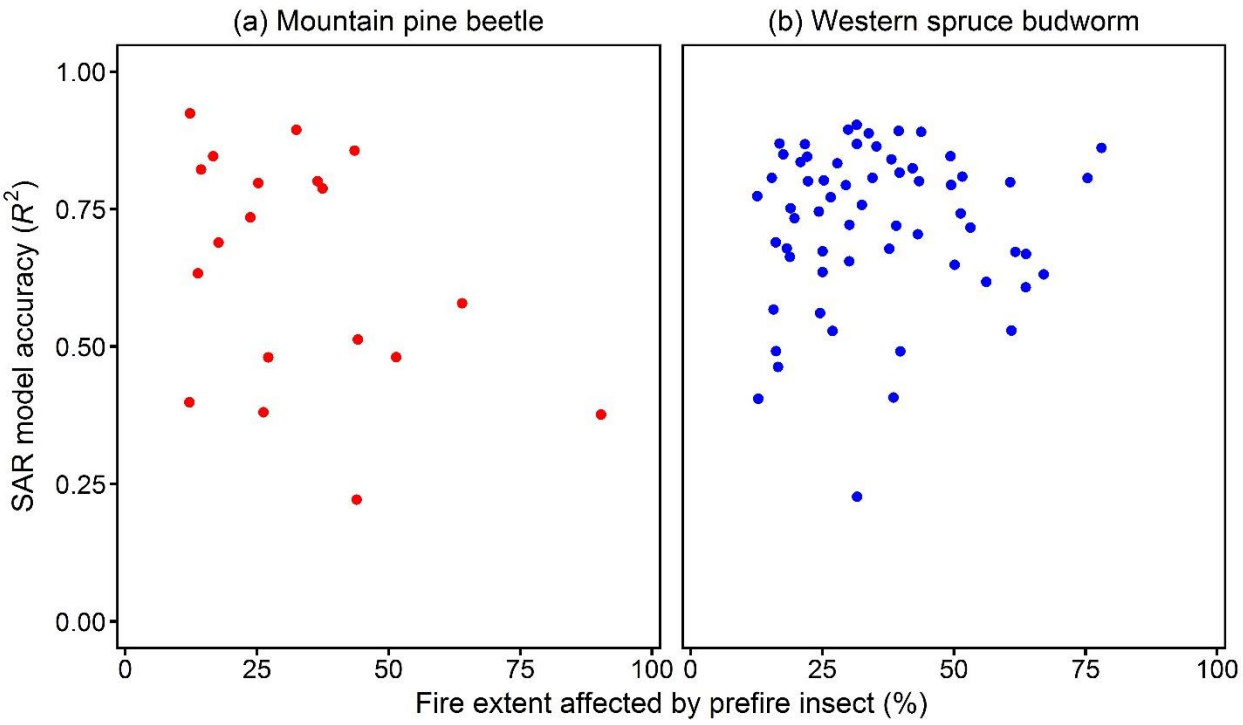

Figure S6. Relationship between cumulative insect extent (% of fire perimeter) and SAR model accuracy (R^2) across fire events (individual points). The relationship does not vary strongly with the proportion of fire extent affected by either mountain pine beetle (a, $R^2 = 0.16$, $P = 0.09$, $n = 19$) or western spruce budworm (b, $R^2 = 0.00$, $P = 0.63$, $n = 62$).

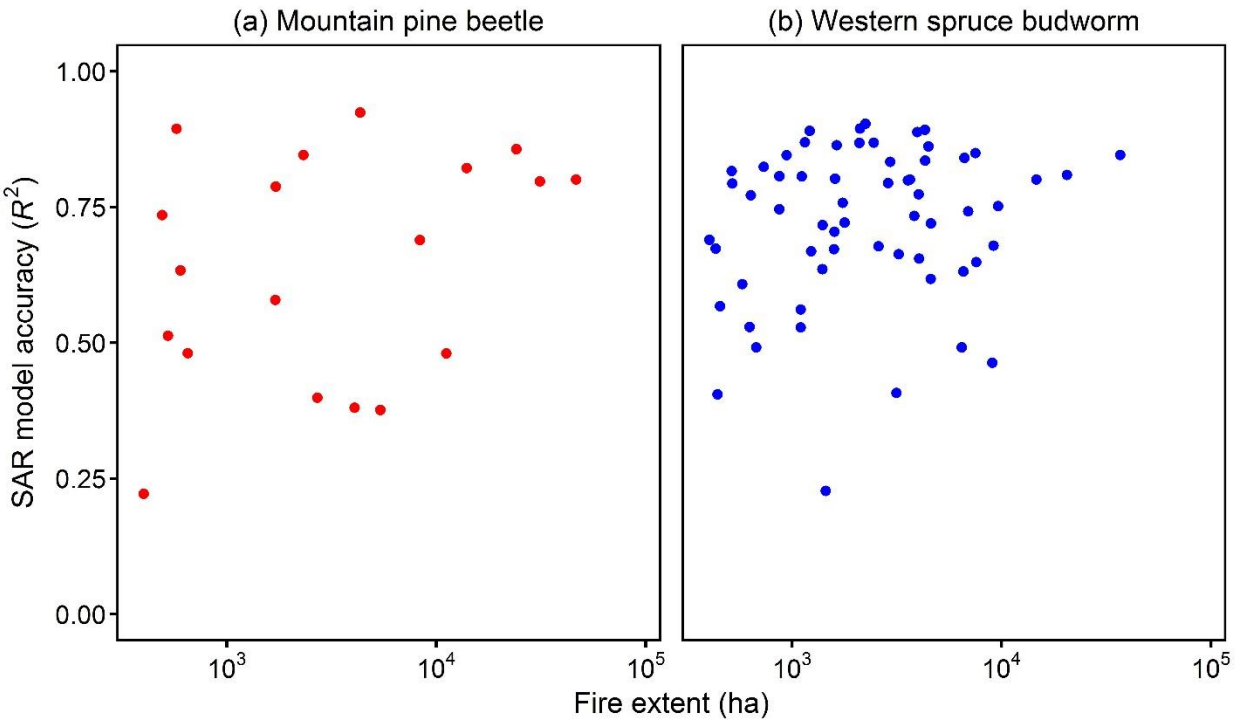

Figure S7. Relationship between fire extent (ha) and SAR model accuracy (R^2) across fire events (individual points). The relationship does not vary with fire event size for either mountain pine beetle (a, $R^2 = 0.11$, $P = 0.17$, $n = 19$) or western spruce budworm (b, $R^2 = 0.03$, $P = 0.18$, $n = 62$). Note logarithmic scale of *x*-axis.

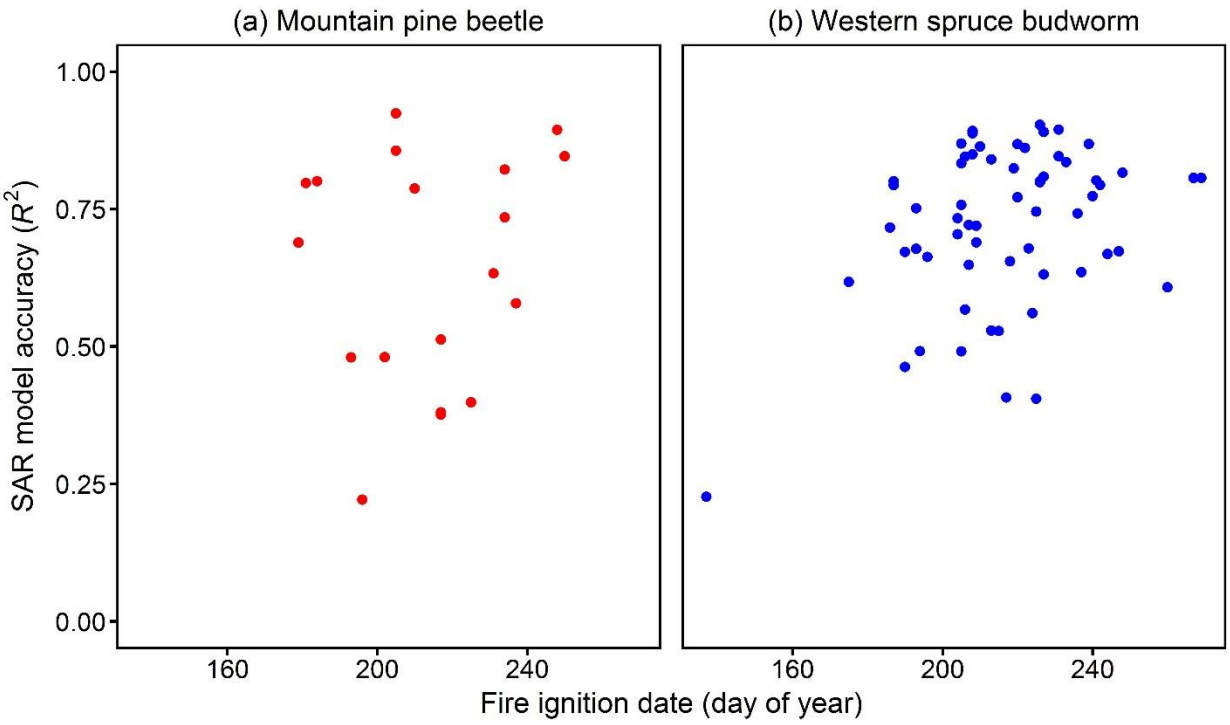

Figure S8. Relationship between fire season (ignition day of year) and SAR model accuracy (R^2) across fire events (individual points). The relationship does not vary with fire season for either mountain pine beetle (a, $R^2 = 0.02$, $P = 0.57$, $n = 19$) or western spruce budworm (b, $R^2 = 0.04$, $P = 0.11$, $n = 62$; fit statistics exclude clear outlier).

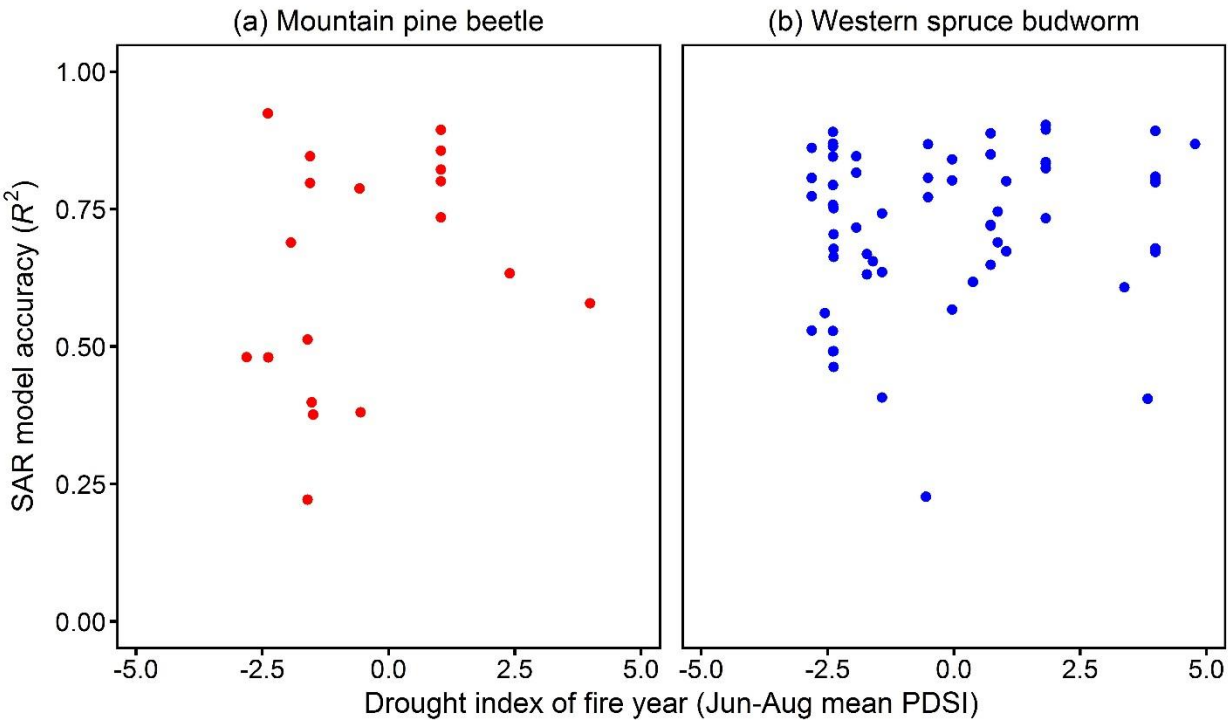

Figure S9. Relationship between drought condition of each fire year (Palmer Drought Severity Index; PDSI; state-level monthly values averaged for June to August) and SAR model accuracy (R^2) across fire events (individual points). The relationship does not vary across a range of warm-dry to cool-wet conditions (negative to positive PDSI values; Heyerdahl *et al* 2008) for either mountain pine beetle (a, $R^2 = 0.07$, $P = 0.26$, $n = 19$) or western spruce budworm (b, $R^2 = 0.02$, $P = 0.26$, $n = 62$).