Table A5. Fuzzy analysis for Sn–W prospectivity

Critical processes	*Appendix figure number*	*Input predictors map*	*Fuzzy-membership value map weight*	*Confidence factor*	*Rationale for expert-knowledge based weight (fuzzy membership values)*	*Rationale for confidence factor*
The link between granitic magmatism and Sn-W mineralization is well established (e. g. Ferguson and Bateman, 1912; Taylor, 1979; Eugster, 1985). Sn-W mineralization typically situated toward the apical regions of granitic cupolas within pegmatites, quartz veins , stockworks, or as disseminations (Lehmann, 1990). Most of Australia's tin–tungsten deposits are associated with granites that formed former magmatic arcs. Most of Australia's past tungsten production has been from pipes and skarns associated with tungsten–molybdenum-bearing post-orogenic, subduction-related granitoids (Solomon and Groves 1994). The nature and timing of Sn-W formation suggest a complex magmatic-hydrothermal continuum during the mineralizing process (Landis and Rye, 1974; Taylor, 1979; Pollard and Taylor, 1986; Heinrich, 1990, 1995; Roberts et al., 1998). Field studies, supported by geochemical and geomechanical analysis, suggest that the generation of substantive vein-hosted Sn-W mineralization requires a sensitive balance between the mechanical and geochemical controls on the system.						
Predictor map for source						
An efficient source of tin (ilmenite-series, fractionated granite). Source is associated with highly evolved and crustal melts						
	A63	Distance to tin granite (felsic, highly fractionated, reduced S- or I-types)	9	7	Granites carry some special signature indicative of their source	Queried from GSWA (2010) 10km buffer
Predictor maps for active pathways						
A major fluid pathway, which underwent repeated hydraulic opening. Existing structures may be reactivated during granite emplacement. Structural controls on localization of pluton emplacement and fluid egress. Interplay of reactivated older structures and evolving magmatic-hydrothermal system can be important.						
	A64	Distance to late Giles Events 1 and 2 structures (LGE1 and LGE2)	9	9	These structures might be the main pathway for metal transport or are likely to create suitable geometries for stress driven fluid flow. The late Giles 1 Event is associated with northwest-southeast extension while the late Giles 2 Event is associated with northeast-southwest extension. This change of direction could induce flow of mineralizing fluids.	Large-scale faults were extracted from the interpreted bed rock geology data and buffered to 5 km.
	A4	Distance to crustal-scale fault	9	8.5	These crustal-scale faults were probably active during Giles events. Crustal scale features are the most important faults as they drive most of the mineralized fluid (McCuaig et al., 2010; Joly et al., 2010)	Crustal-scale faults were extracted from the interpreted structural geology data and buffered to 10 km. They were identified by 2D gravity and magnetic modeling
	A65	Distance to other Giles Event structures	8.5	9	Deep-penetrating permeable structures that have been reactivated through time	Large-scale faults were extracted from the interpreted bed rock geology data and buffered to 5 km.
	A7	Distance to Petermann (PO) + Alice Springs orogeny (ASO) structures	8.5	9	Deep-penetrating permeable structures that have been reactivated through time	Large-scale faults were extracted from the interpreted bed rock geology data and buffered to 5 km.
	A8	Distance to Mount West Orogeny (MWO) + Musgrave Orogeny (MO) structures	8	9	These structures were probably inactive during the Giles Event.	Large-scale faults were extracted from the interpreted bed rock geology data and buffered to 5 km.
Predictor maps for physical traps						
Most tin and tungsten deposits are located at the apical regions of granitic cupolas (Lehmann, 1990), where exsolved magmatic fluids have evolved, been focused, and/or ponded. To be most prospective, these 'tin' granites should be either shallowly buried or, if exposed, have preserved roof zones. However, petrophysical data do not allow buried granites to be distinguished from eroded granites (e.g. the density of the bedrocks is very similar to the density of the 'tin' granite). To avoid repetition, the granite predictor map has not been added in the physical trap.						
Predictor maps for chemical traps						
The geochemistry of fluid-rock interaction controls mineral precipitation (Heinrich, 1990, 1995; Halter et al., 1995, 1996; Wood and Samson, 2000). Permeability in host dolomite because of the presence of anastomosing microfractures, and the presence of an efficient chemical trap in the dolomites. Carbonate or other reactive units (basalts) are amenable for skarn formation (e.g. Red Dome, Lucky Draw). Reduced host rocks can provide reductant traps for hydrothermal fluids.						
	A59	Distance to skarn	9	6	Sn-W mineralization can occur in skarn (contact-metamorphic rocks; e.g. Red Dome, Queensland, Australia)	Skarn units were extracted using spatial query from GSWA (2010b). They are located in the basement (Wirku and Piti Palya Metamorphics units). 1 km buffer applied. CF is low because not all locations in the Wirku Metamorphics are associated with skarns.
	A66	Distance to dolomite	9	6	Dolomites typically are amenable for skarn formation	Dolomite units from were extracted using spatial query from GSWA (2010b). 1 km buffer applied. CF is low because the units we queried contained dolomite, but also other lithologies
	A54	Distance to mafic and ultramafic rocks	8	8	Mafic and ultramafic rocks typically are amenable for skarn formation (e.g. Lucky Draw in NSW)	Mafic and ultramafic units were extracted using spatial query from GSWA (2010b), and interpreted magnetic datasets datasets. 1 km buffer
	A9	Distance to dyke	8	8	The deposits can have a close relationship with sills and dykes (e.g. Red Dome, Kidsaton in Queensland); they are high chemical reactivity rock	Query from interpreted magnetic datasets + GSWA dataset (2010b). 1 km buffer

Critical processes	*Appendix figure number*	*Input predictors map*	*Fuzzy-membership value map weight*	*Confidence factor*	*Rationale for expert-knowledge based weight (fuzzy membership values)*	*Rationale for confidence factor*
	A67	Sn content	9	7.5	Positive Sn content is a direct proxy for Sn-W mineralization (typical of lithophile mineralization)	Sn values from GSWA state geochemistry (GSWA, 2010a) and GA Ozchem (GA, 2007) datasets were transformed to standardized Z scores (Singer and Kouda, 2001) and interpolated. The Z scores at which studentized contrast maximized were used as the anomaly thresholds (see Cheng, 2007 for details). CF low because we have interpolated the data in the whole study and some values are not known
	A68	W content	9	7.5	Positive W content is a direct proxy for Sn-W mineralization (typical of lithophile mineralization)	W values from GSWA state geochemistry (GSWA, 2010a) and GA Ozchem (GA, 2007) datasets were transformed to standardized Z scores (Singer and Kouda, 2001) and interpolated. The Z scores at which studentized contrast maximized were used as the anomaly thresholds (see Cheng, 2007 for details). CF low because we have interpolated the data in the whole study and some values are not known
	A69	Mo content	8	7.5	Positive Mo content is a good proxy for Sn-W mineralization (typical of lithophile mineralization)	Mo values from GSWA state geochemistry (GSWA, 2010a) and GA Ozchem (GA, 2007) datasets were transformed to standardized Z scores (Singer and Kouda, 2001) and interpolated. The Z scores at which studentized contrast maximized were used as the anomaly thresholds (see Cheng, 2007 for details). CF low because we have interpolated the data in the whole study and some values are not known.
Undefinable predictor maps						
		Hydrothermal breccia/stockworks	9	9	e.g.Breccia Porphyry Kidston (QLD)	One tourmaline breccia has been described on Mt Eveline geological map, and tiny breccia faults were located into but this is not enough to make a whole predictor map.