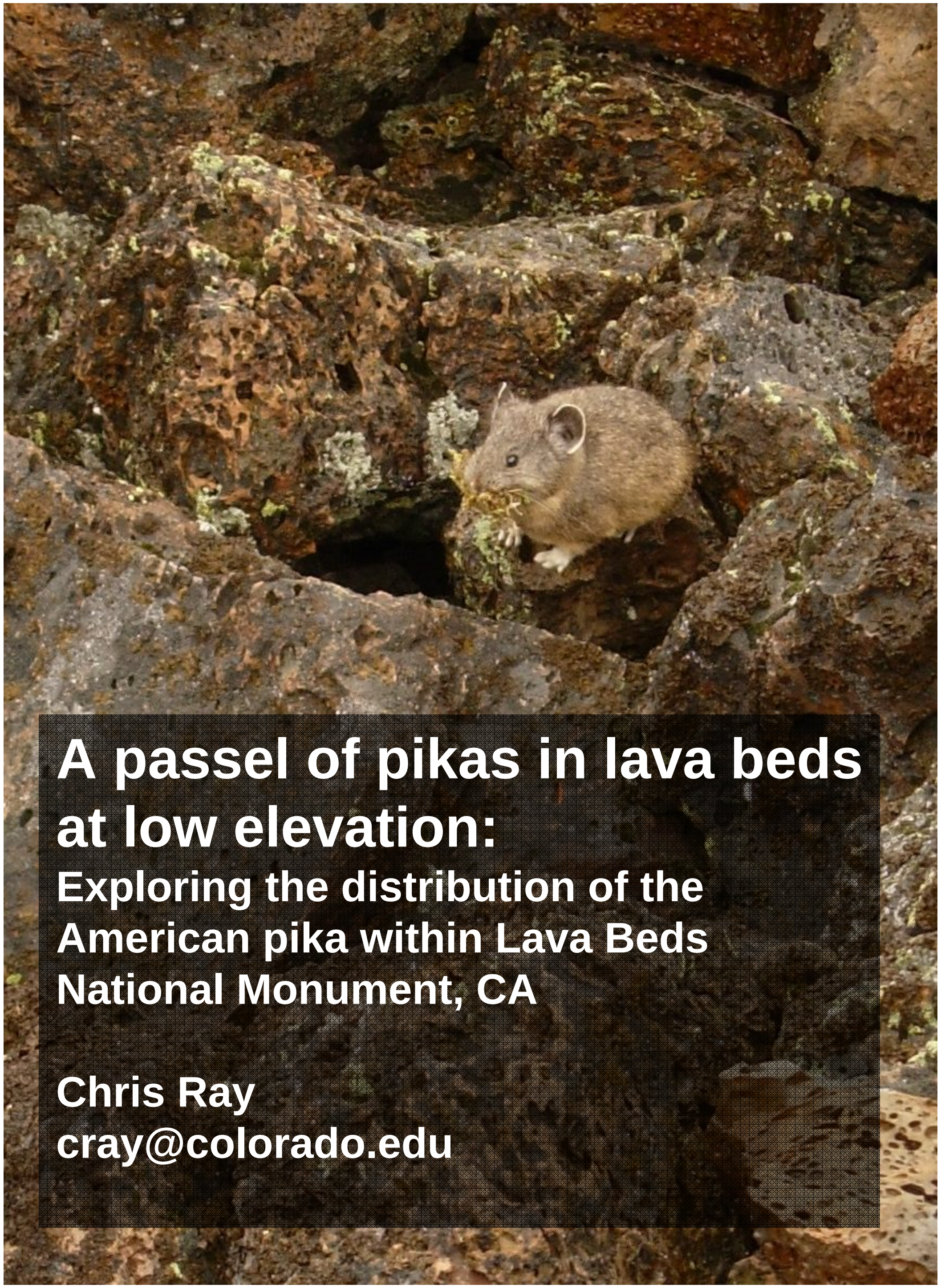
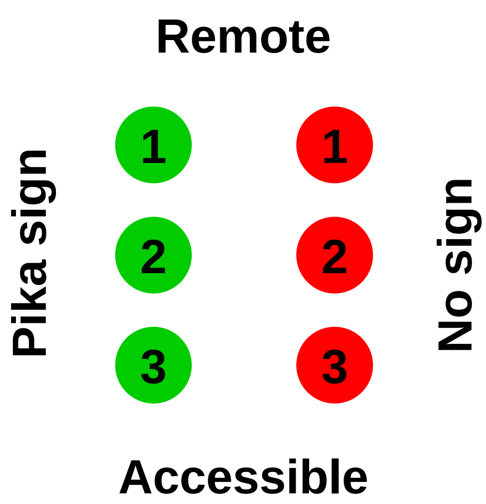


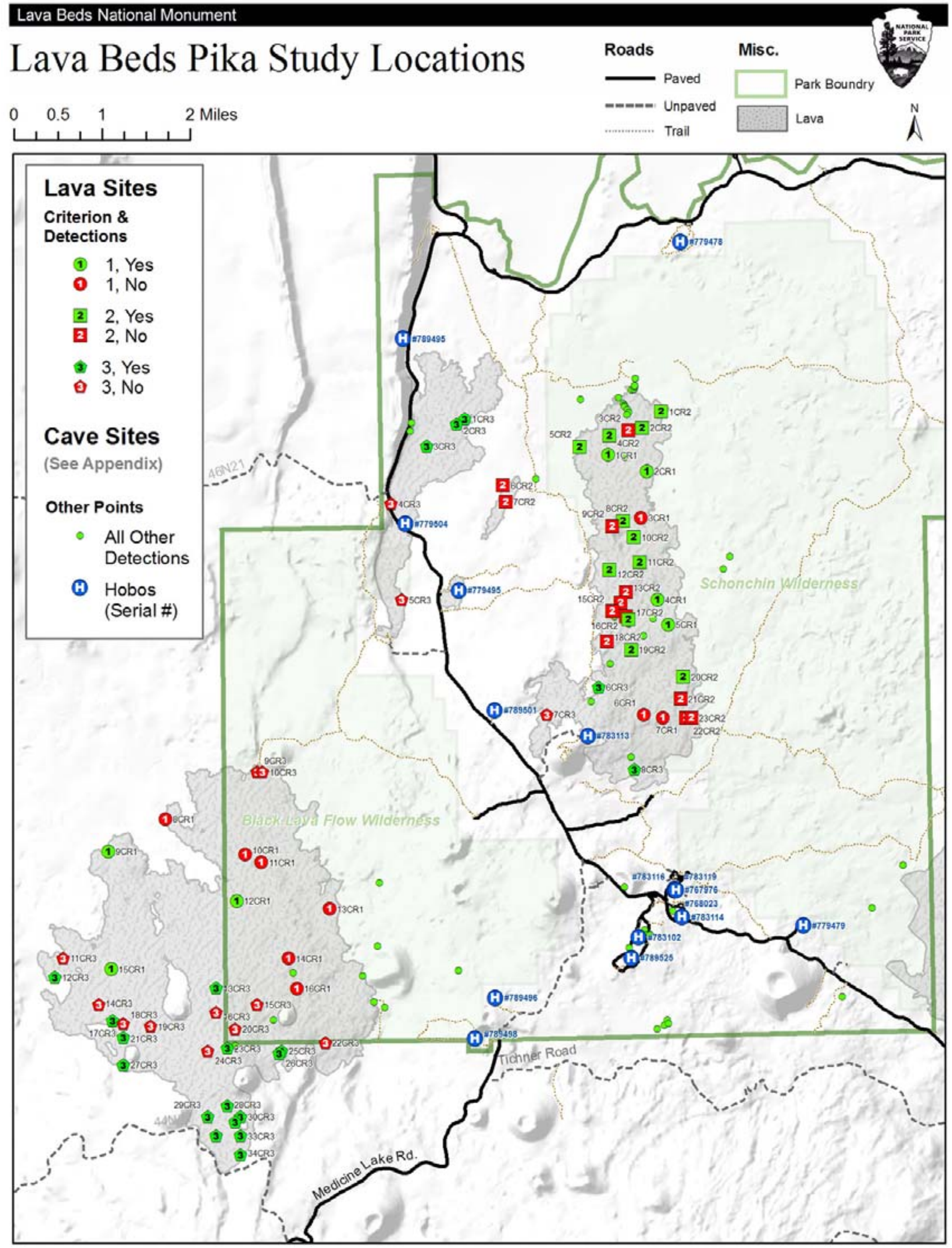
A passel of pikas in lava beds at low elevation:

Exploring the distribution of the American pika within Lava Beds National Monument, CA

Chris Ray
cray@colorado.edu

Do pikas prefer ice caves?


Remote
Pika sign
No sign
Accessible
1
2
3
1
2
3


Lava Beds National Monument
Lava Beds Pika Study Locations
0 0.5 1 2 Miles
Roads
Paved
Unpaved
Trail
Misc.
Park Boundry
Lava
Lava Sites
Criterion & Detections
1, Yes
1, No
2, Yes
2, No
3, Yes
3, No
Cave Sites
(See Appendix)
Other Points
All Other Detections
Hobos (Serial #)
Schonchin Wilderness
Black Lava Flow Wilderness
Tichner Road
Medicine Lake Rd.

FINAL REPORT

Distribution and abundance of the American pika (*Ochotona princeps*) within Lava Beds National Monument

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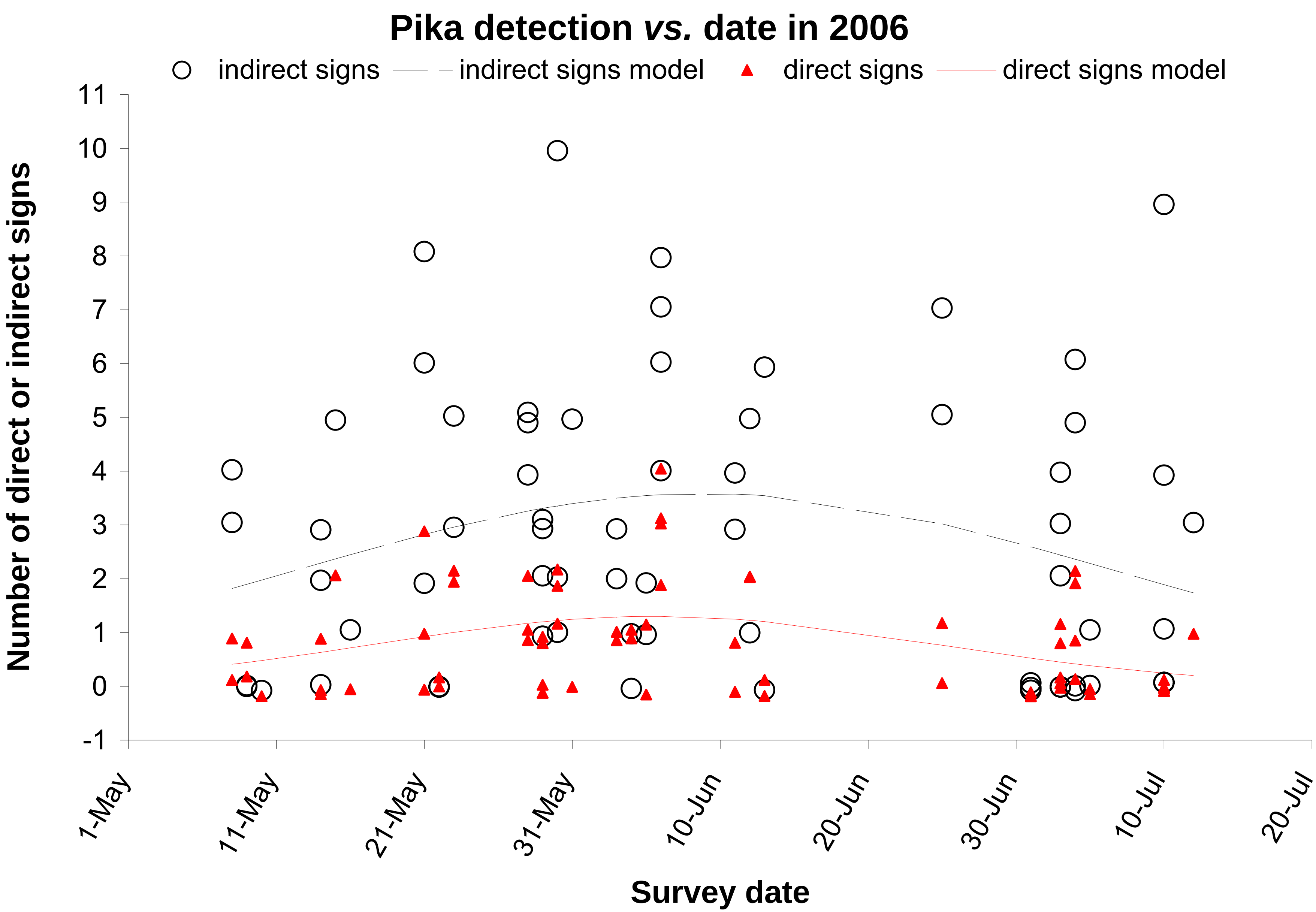
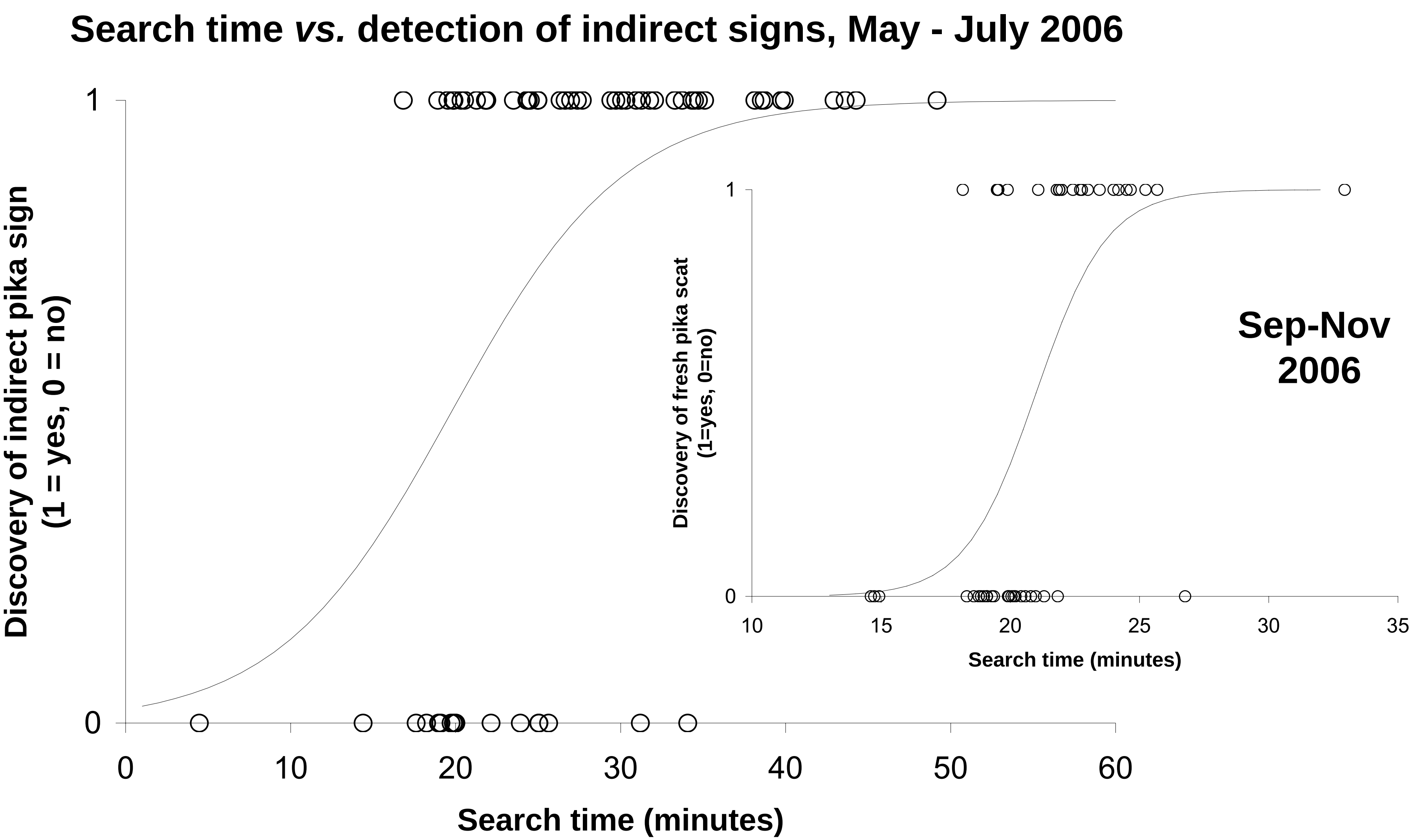
Executive summary

In response to recent evidence that populations of the American pika (*Ochotona princeps*) are disappearing from lower elevation habitats throughout the western US, Lava Beds National Monument and research partners conducted surveys during 2005 and 2006 in order to establish the current distribution of pikas throughout the Monument. These surveys were designed to reveal the detection probability and local habitat preferences of the species. Surveys were conducted within rocky habitats associated either with cave features (cave sites) or with lava flows of various ages (flow sites).



Direct (visual/aural) sign w/in 100 m and indirect sign (caches/scat) w/in 12 m, modeled by date. Models with best support included both a linear and a nonlinear (quadratic) effect of date, with errors being Poisson (direct signs) or negative binomial (indirect signs). For indirect signs only, the null model was supported (ΔAICc = 0.91), and a model based on search effort garnered much higher support. For direct signs, the null model was not supported (ΔAICc = 11.06).



For data from May-July, ΔAICc = 15.03 for the null model. Of 22 searches >30 mins., only 2 (9%) failed to find caches or scat. At 15 mins., detection rate = 0.25; at 25 mins., 0.75. Results were similar for re-surveys conducted when the survey crew was familiar with sites and survey methods (ΔAICc = 14.64 for the null model). Caveat: Results could represent an effect of early discovery or apparent habitat suitability on search time. Contrast: Total time spent at a site was not related to the direct detection of pikas, nor was it highly correlated with the number of times that a pika was seen or heard. Conclusion: Search time may only be important when detection is based on indirect signs. Upheld by 2005 data: discovery of indirect signs was strongly related to search time (n = 87 sites with appropriate data, ΔAICc = 4.49 for the null model); direct detection was not (n = 81, ΔAICc = 0.69 for the model based on effort).

Site use by pikas in Lava Beds National Park
after omitting sites with low search time

	Summer 2005		Summer 2006		Fall 2006	
	% of sites used	# sites	% of sites used	# sites	% of sites used	# sites
Randomly selected						
Ice-cave sites	**26**	**47**	**79**	**14**	**42**	**19**
Flow sites	**39**	**18**	**77**	**44**	**62**	**21**

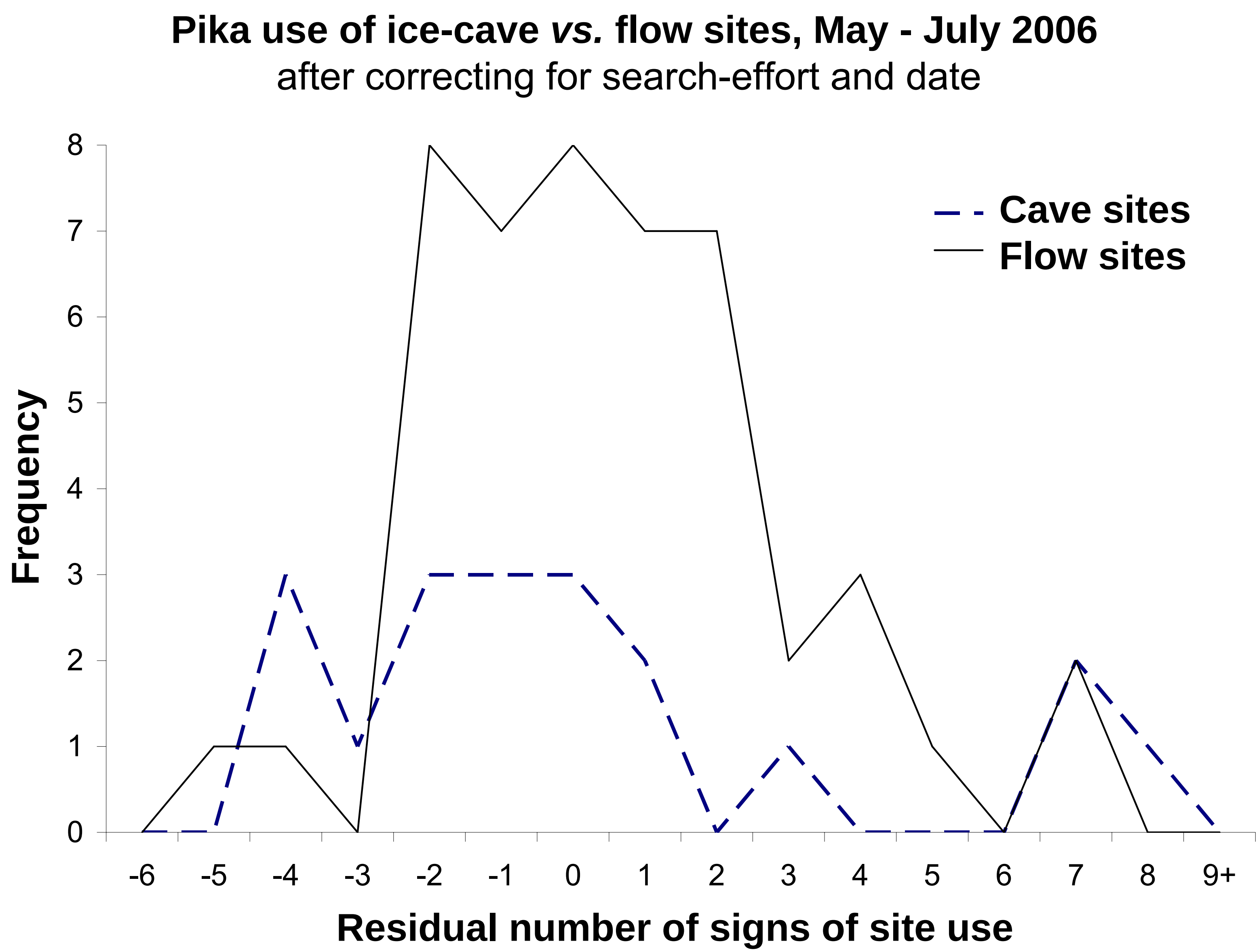
Conclusions

1) Pikas do not prefer cave microclimates

2) Pikas are extremely common within these lava beds

3) Density of use varies rapidly

Site use criteria: 1) a pika (detected by sight or sound) within the site (within 12 m of the site center); 2) fresh pika scat within the site; or 3) any pair of signs including a) old scat within the site, b) old hay within the site, and c) a pika within less than 100 m of the site. In summer 2006, direct or indirect sign was detected in 80% of n=66 site surveys in which all signs were noted, including old scat (in 32% of sites), fresh scat(65%), and old food caches (24%). Fresh caches were not found. Old scat in the absence of other signs was rare (3%), but signs of site use other than (or in addition to) old scat were common (77%). Pikas were seen or heard in 54% of n=67 sites surveyed for *direct* sign, either w/in 12m (9%), w/in 100 m (34%) or at greater distances. Both direct and indirect sign was observed in 46% of n=67 surveys. In sites w/pika sign, pikas were seen or heard during 64% (2005) and 81% (2006) of surveys.



Signs of site use were significantly more variable at cave sites (P=0.03, two-sample F-test), but did not differ significantly in number between cave sites and other lava features (P=0.13, one-tailed Wilcoxon two-sample test). Using PRESENCE (v. 2.0) to analyze n=67 primary surveys and n=24 re-surveys in 2006, the best model of site use included no effects of site type (cave/flow), and there was good support (ΔAICc<2) for models in which cave sites were used *less* than flow sites.

Site use (0,1) by pikas in Lava Beds National Park, 2006

ψ = site use, p = detection probability

Model	k	ΔAIC_c	Akaike weight	Estimated p *(SE)*	Estimated ψ *(SE)*
ψ, p	2	0.00	1.00	0.97 *(0.03)*	0.70 *(0.06)*
ψ(cave), p	3	0.62	0.73	0.97 *(0.03)*	0.59, 0.74 *(0.12, 0.07)*
ψ(class), p	3	1.94	0.38	0.97 *(0.03)*	0.72, 0.70, 0.69 *(0.11, 0.06, 0.08)*
ψ(cave,class), p	4	2.49	0.29	0.97 *(0.03)*	0.56-0.77 *(0.07-0.15)*
ψ, p(effort)	3	34.45	0.00	1.00 *(0.00)*	0.67 *(0.06)*

Model-selection analysis using PRESENCE (v. 2.0) to estimate site use (ψ) and detection probability (p) based on data from all primary surveys (n=67) and re-surveys (n=24) conducted in 2006 (n=67 for all models). ψ and p were estimated either as constants or as functions of site type, site class, or search effort (e.g., model "ψ(cave), p" estimates ψ as a function of site type and p as a constant). The model with best support included no effects of site covariates or search effor, but there was good support (ΔAIC_c<2) for models with effects of site type (cave sites used less than flow sites) or site class (accessible sites used less than remote sites).

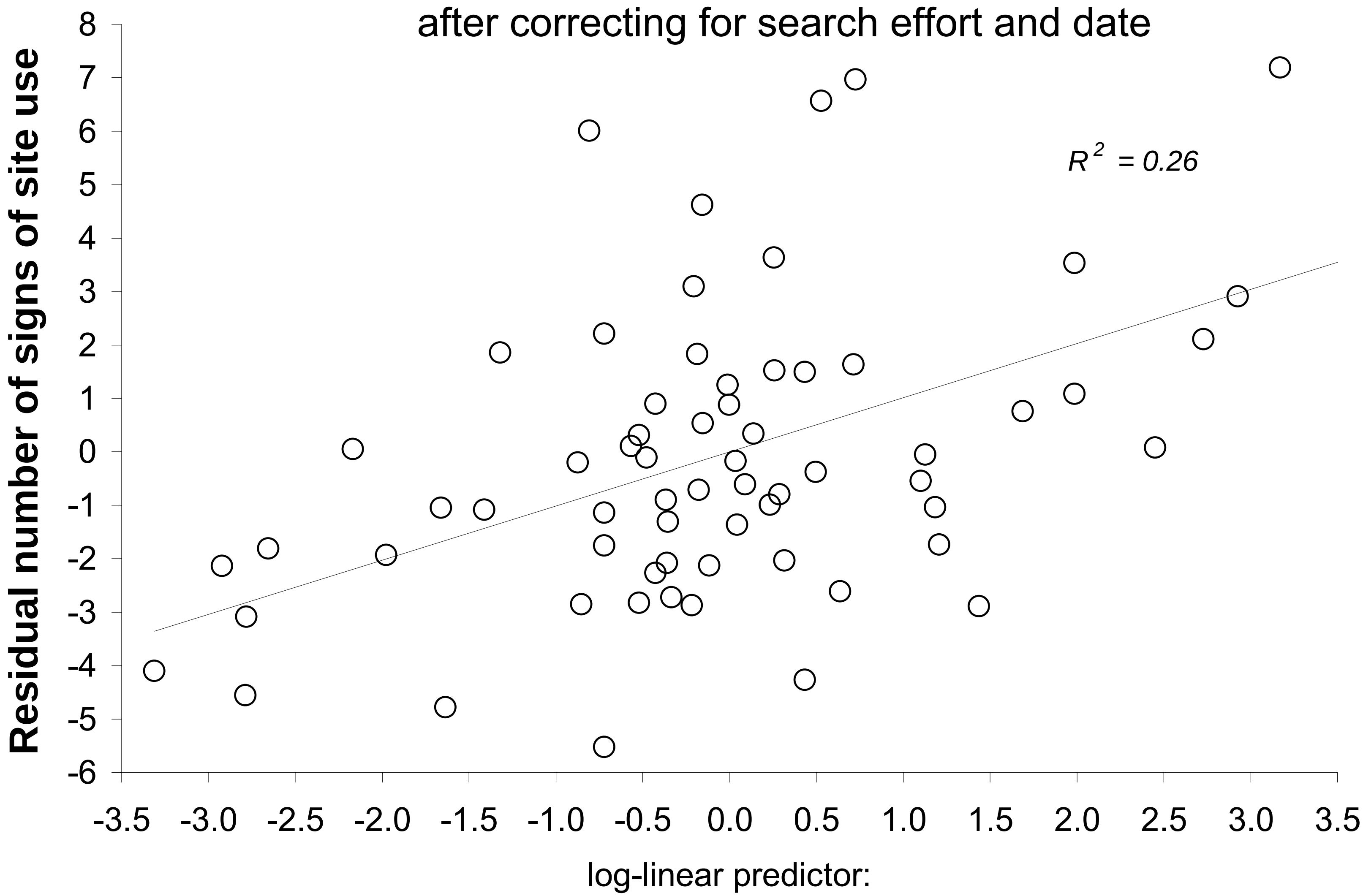
Best predictors of site use by pikas, May - July 2006

(relative support = Akaike weight,
red = negative effect, blue = positive effect)

Predictor	Akaike weight
gram:chem	0.98
forb	0.82
fernbush	0.74
sage	0.49
dist2edge	0.16
elevation	0.12
insulation	0.08

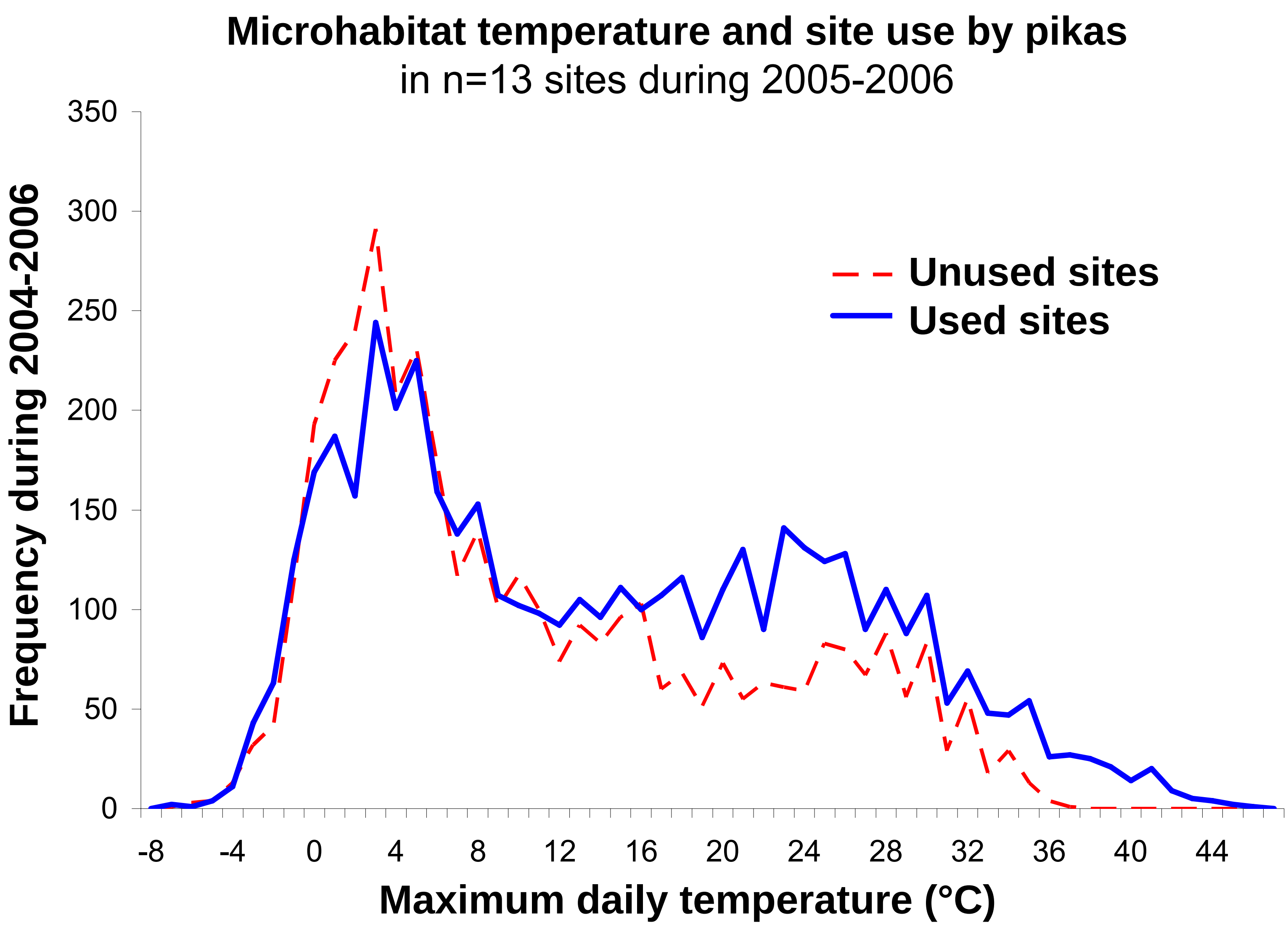
Across all models, forage-related predictors were supported better than geographic ones (see inset table of Akaike weights > 0.01).

Forage-based model of site use by pikas, May - July 2006



1.655 + 6.158×**forb** – 0.257×**gram:chem** + 0.037×**fernbush**

ΔAICc>18 for the null model. Positive effects of forb cover (forb) and the number of fernbushes within the site (fernbush), and negative effects of the ratio of grass cover to cover of all other plants (gram:chem) were consistent across alternative models. Predicted values (x axis) generated via log-linear regression assuming Poisson variance. R^2 is a rough metric of model fit.



N=13 sites (7 used, 6 unused by pikas), monitored 9/14/2004-9/8/2006 using HOBO Temps placed in fully shaded locations within the talus. Each line represents a histogram of temperatures recorded during the monitoring period. Contrast: Cave sites were cooler and less variable in temperature than flow sites. The negative effects of caves on average daily temperature and overall maximum temperature were marginal (by t-test, $P<0.10$), but the moderating effects of caves on overall minimum temperature and number of days above 28˚C and below -5˚C were significant ($P<0.03$). By Poisson regression (re-scaled due to significant overdispersion), there were significant, negative effects of caves on the number of days above 28˚C ($P=0.04$, n=12) and below -5˚C ($P=0.01$, n=13).