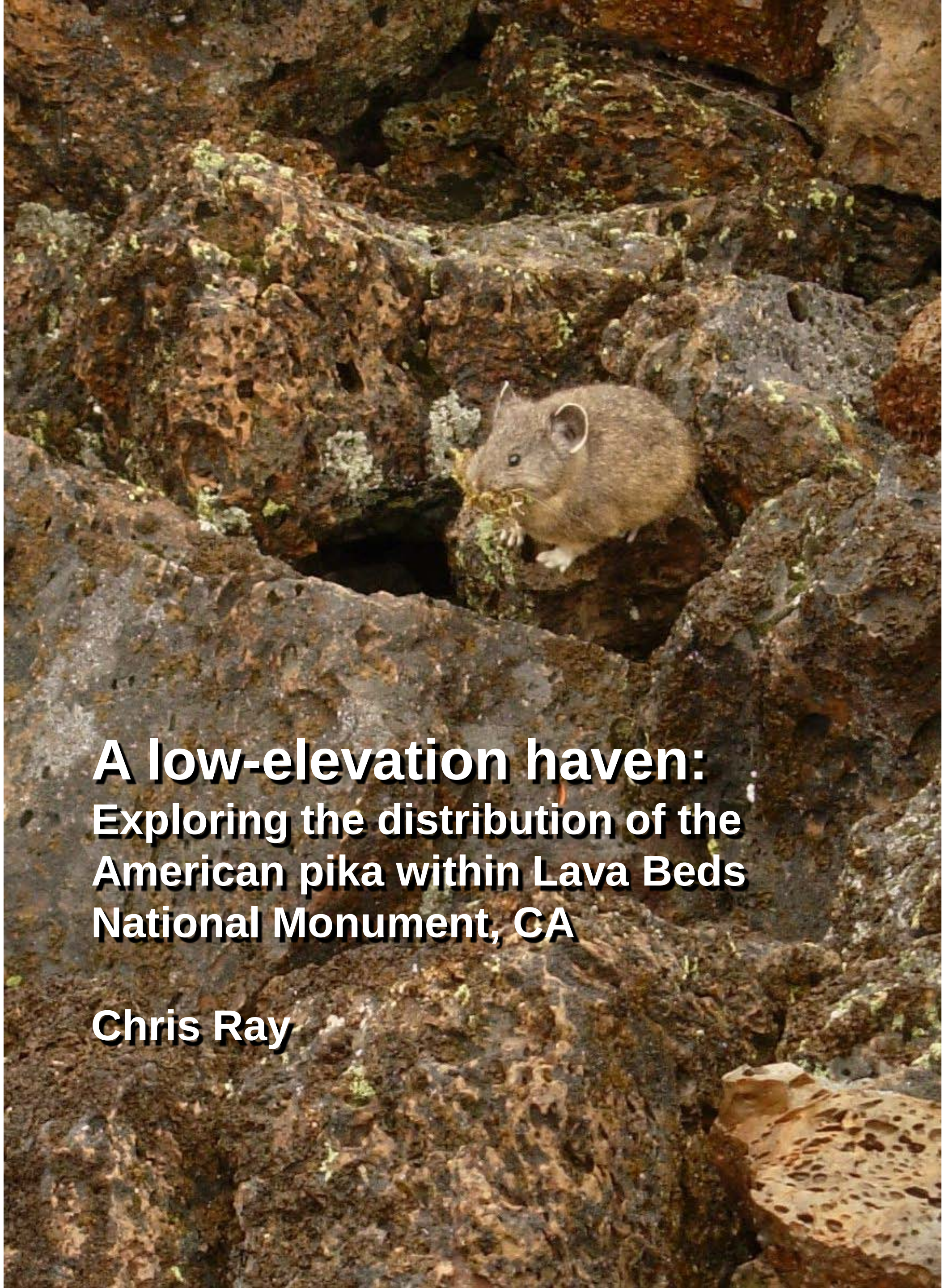

A low-elevation haven:

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

Chris Ray

FINAL REPORT

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

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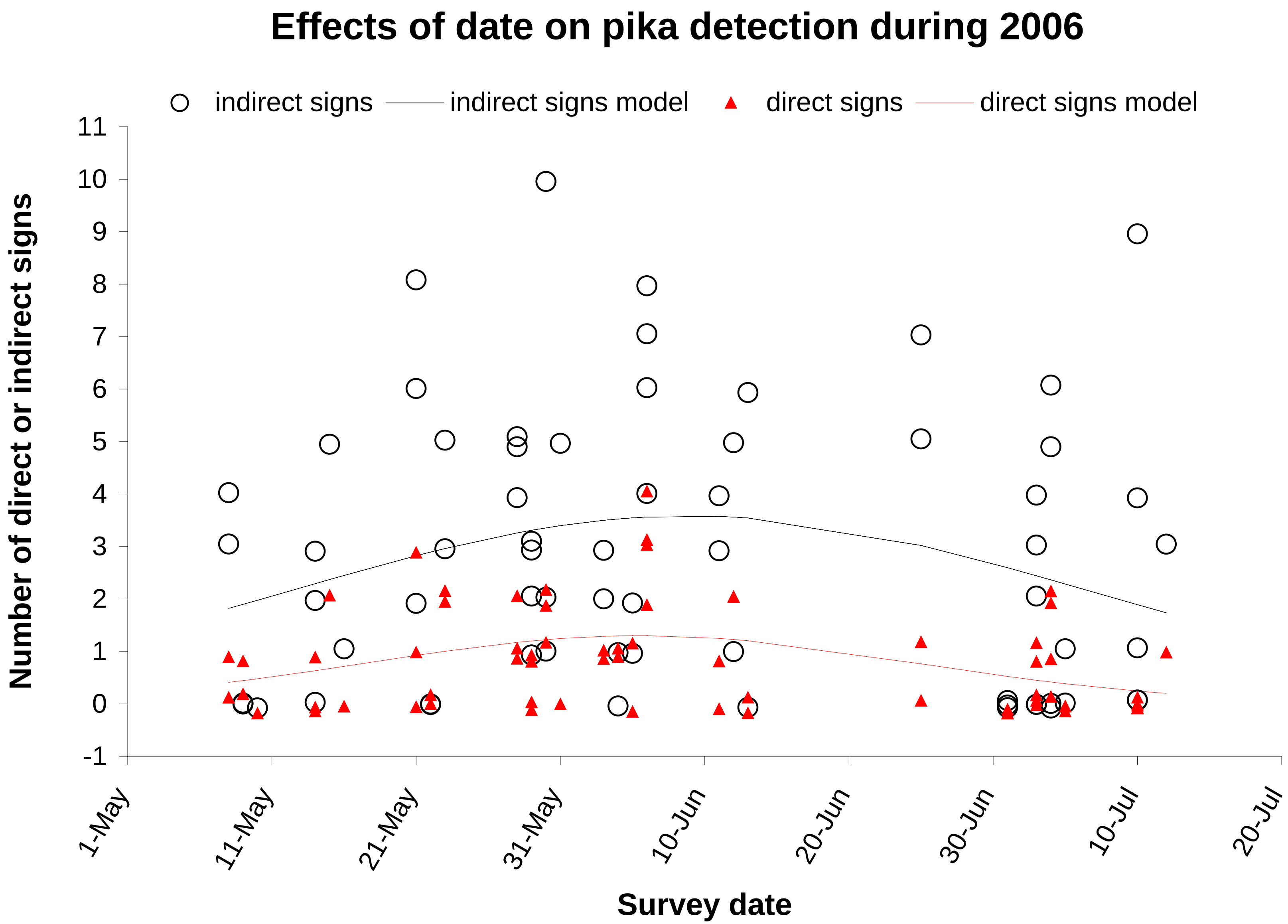
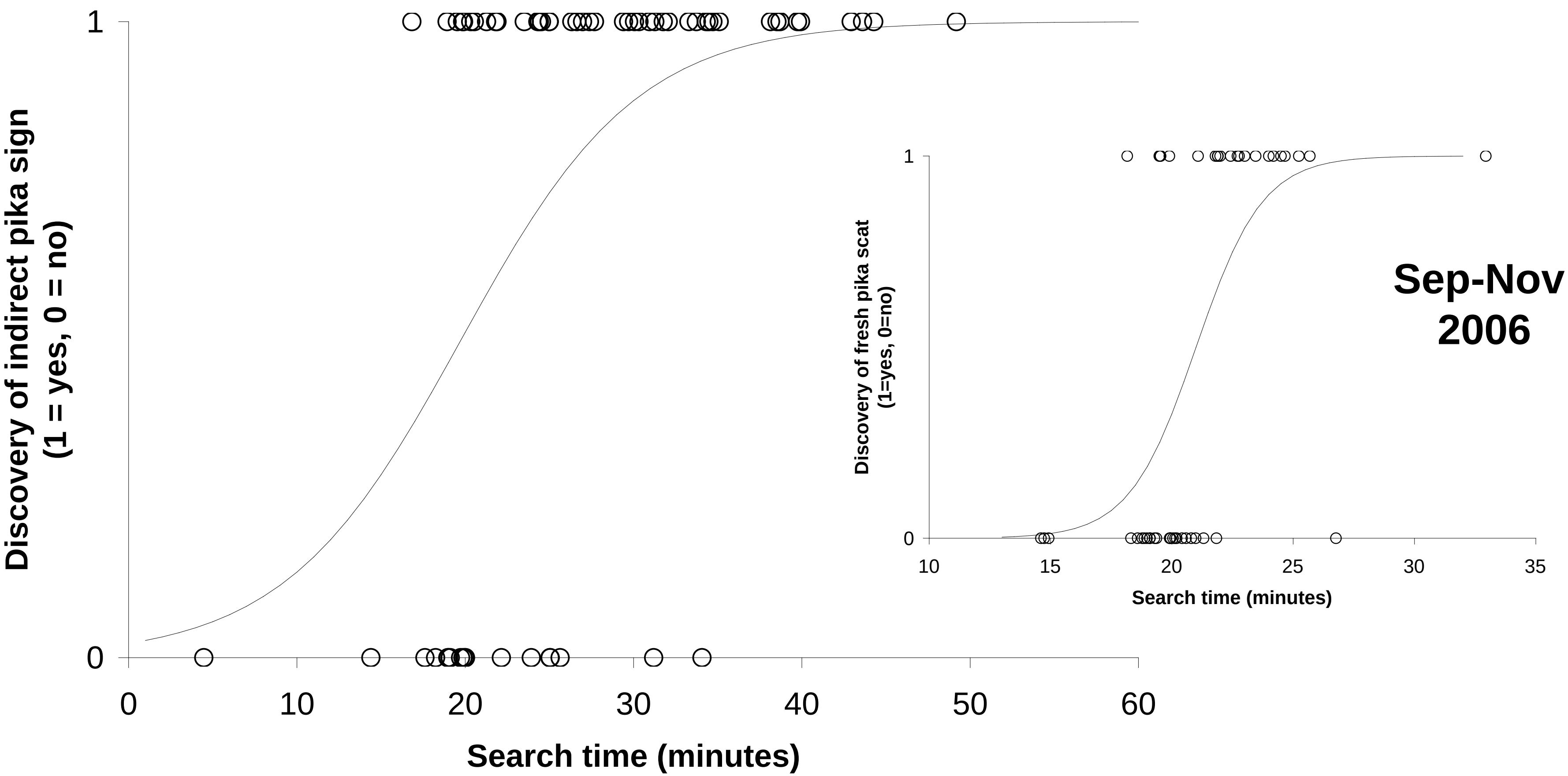
Executive summary

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).



The models with best support included both a linear and a nonlinear (quadratic) effect of date on the detection of sign, with errors following either a Poisson distribution (direct signs) or a negative binomial distribution (indirect signs). However, for indirect signs, the null model exhibited similar support (ΔAICc = 0.91), and a model based on search effort garnered much higher support. In contrast, for direct signs, the null model was not supported by the data (ΔAICc = 11.06). These analyses were limited to direct (visual and aural) signs detected within 100 m of the survey site, and indirect signs (caches and scat) within 12 m of the site center.

Effect of search time on detection of indirect signs during May-July 2006



For data from May-July, ΔAICc = 15.03 for the null model. The threshold is near 20 minutes: at 15 minutes, the probability of finding indirect sign was about 0.25; at 25 minutes, about 0.75. Of 22 searches that exceeded 30 minutes, only two failed to find caches or scat. A relationship with similar threshold (inset) was also very well supported by data from re-surveys conducted when the survey crew was familiar with sites and survey methods (ΔAICc = 14.64 for the null model). Caveat: These 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. Data from 2005 upheld these patterns: discovery of indirect signs was strongly related to search time (n = 87sites with appropriate data, ΔAICc = 4.49 for the null model); direct detection of pikas was not (n = 81 sites, ΔAICc = 0.69 for the model based on effort, relative to the null model).

Site use by pika in Lava Beds National Park
after omitting sites with insufficient search time

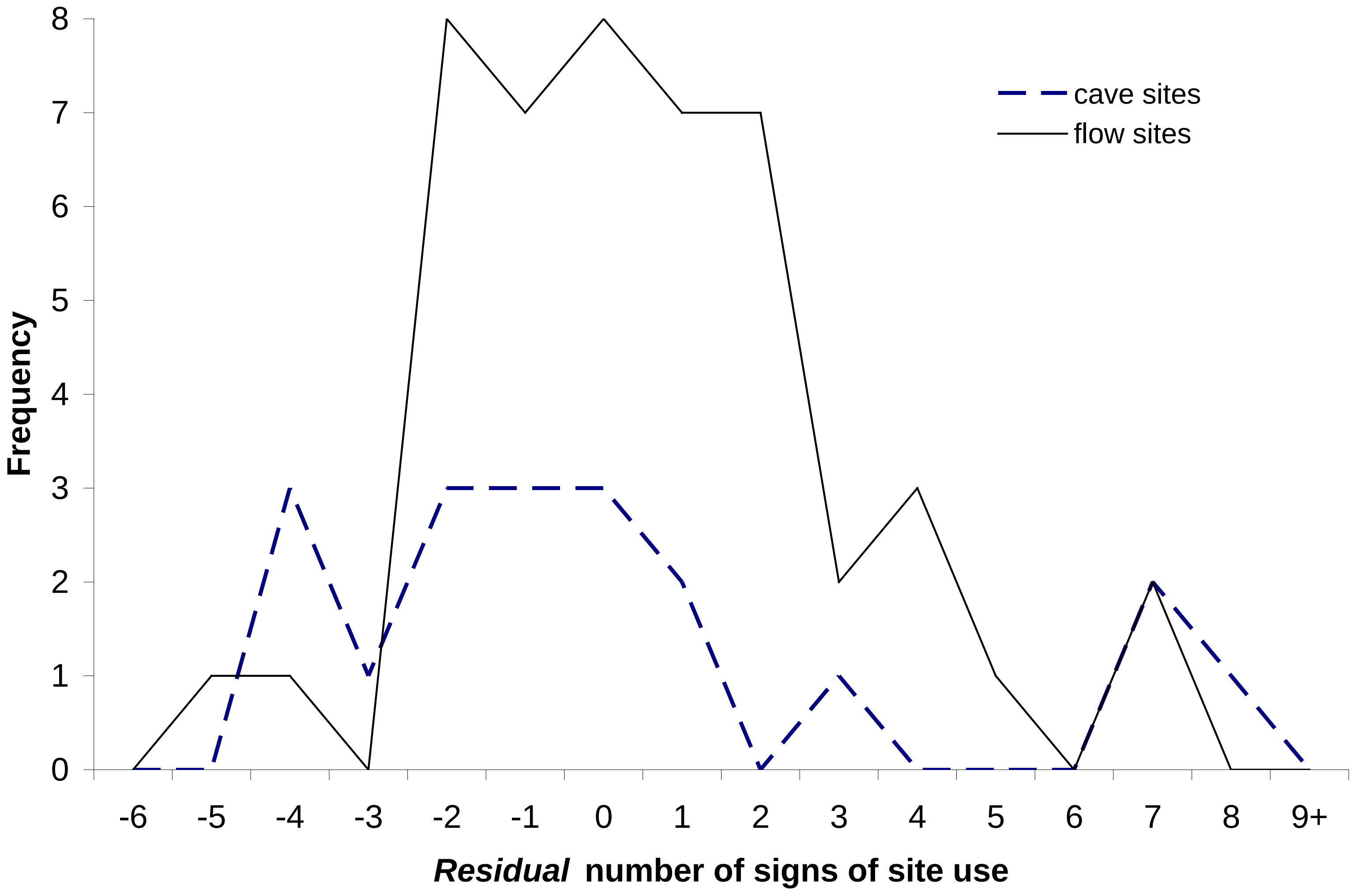
	Summer 2005		Summer 2006		Fall 2006	
	% site use	# sites	% site use	# sites	% site use	# sites
Randomly selected						
Cave sites	26	47	79	14	42	19
Flow sites	39	18	77	44	62	21

Conclusions
1) Pika do not prefer cave microclimates
2) Pika are extremely common within these lava beds
3) Density of use varies rapidly

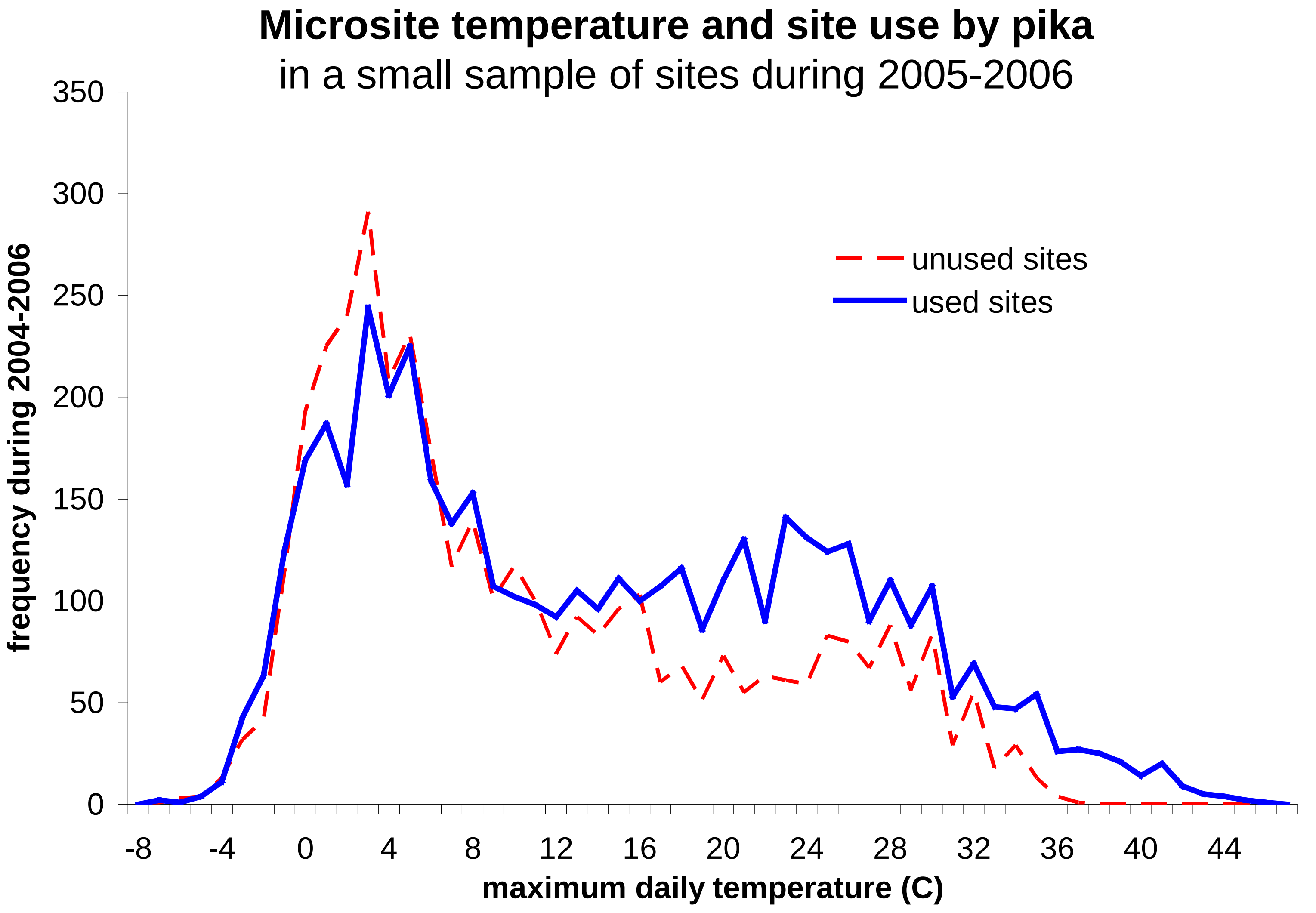
Signs of site use were: 1) a pika (detected by sight or sound) within the site (within 12 m of the site center); 2) fresh pika scat within the site; or 3) any pair of signs including a) old scat within the site, b) old hay within the site, and c) a pika within less than 100 m of the site. In summer 2006, 66 site surveys included full counts of the number of different types of pika sign encountered. Some form of direct or indirect sign was detected in 80% of these 66 site surveys. Old scat was reported within 32% of all sites, fresh scat within 65%, and old food caches within 24%. Fresh caches were not reported within any site. Only 3% of site surveys reported old scat in the absence of other signs, whereas the vast majority (77%) reported signs of site use other than (or in addition to) old scat. Of 67 sites surveyed for *direct* sign, pikas were seen or heard in 54% of sites. Direct detections occurred within 12 m of the site center in 9% of surveys, and within 100 m in 34% of surveys. A reassuring combination of both direct and indirect sign was observed in 46% of these 67 site surveys. Counting only those sites that had signs of recent use by pikas, pikas were seen or heard during the vast majority of site surveys—64% in 2005 and 81% in 2006.

Use of cave vs. flow sites by pika during May-July 2006

after correcting for search-effort and date



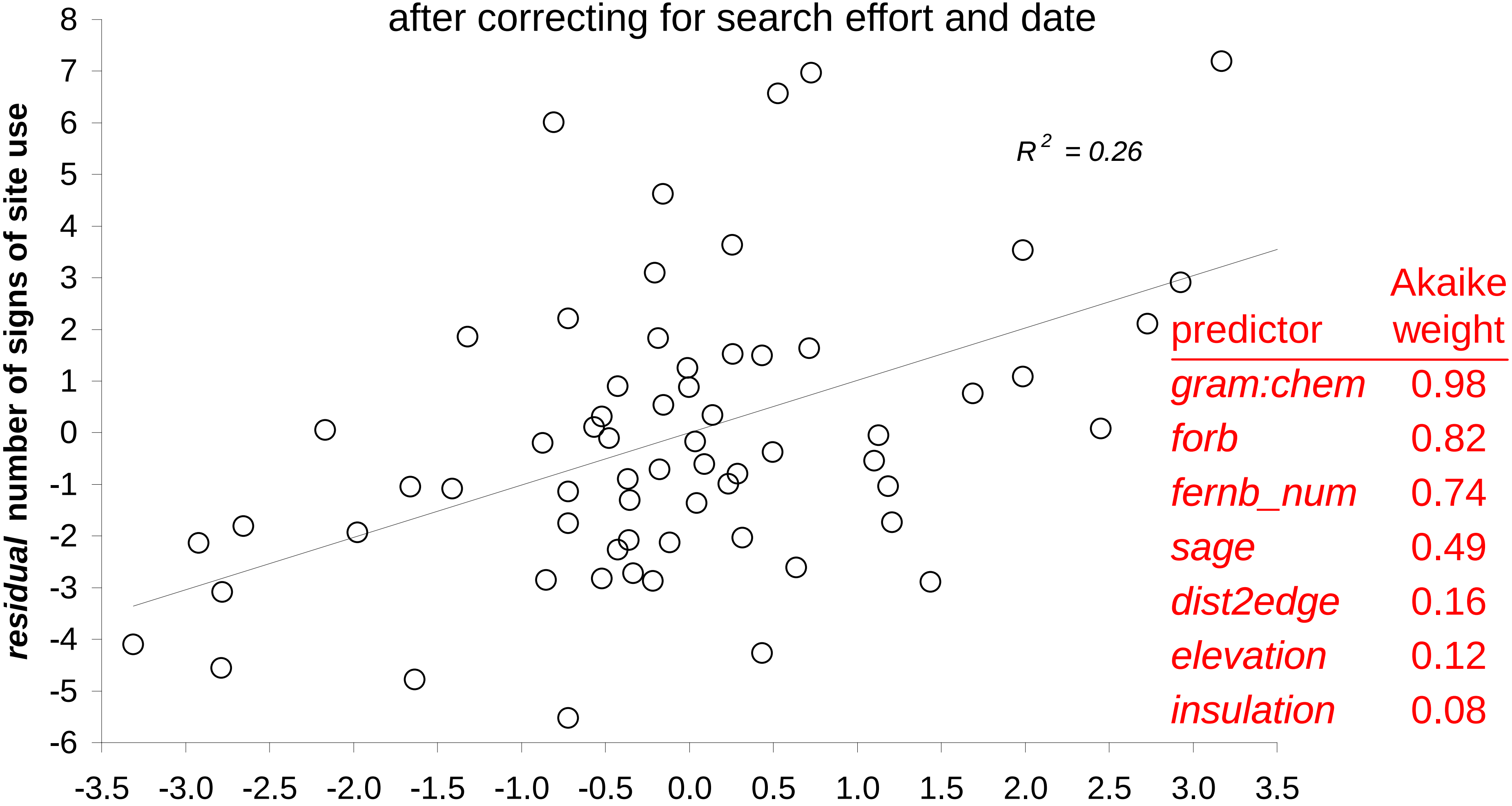
Signs of site use were significantly more variable at cave sites (P=0.03 by two-sample F-test), but did not differ significantly in number between cave sites and other lava features (P=0.13 by one-tailed Wilcoxon two-sample test). Results were supported by a model-selection analysis using PRESENCE (v. 2.0) to estimate site use and detection probability (p=0.97 0.03) based on data from all primary surveys (n=67) and re-surveys (n=24) conducted in 2006: The model with best support included no effects of site type (cave or flow), and there was good support (ΔAICc<2) for models in which cave sites were used *less* than flow sites.



A total of 13 sites (n=7 used and n=6 unused) were monitored from 9/14/2004 through 9/8/2006. Temperatures were recorded by automated data loggers placed in fully shaded locations within the talus at each site. 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).

Forage-based model of site use by pika during May-July 2006

after correcting for search effort and date



log-linear predictor:

1.655 + 6.158***forb** - 0.257***gram:chem** + 0.037***fb_num**

ΔAICc>18 for the null model. Positive effects of forb cover (forb) and the number of fernbushes within the site (fb_num), 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. Across all models, forage-related predictors were supported better than geographic ones (see inset table of Akaike weights > 0.01).