

Supplemental Materials: Successful management of invasive rats across a fragmented landscape

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Figure S1. Map of kipuka in Upper Waiakea Forest Reserve on the Island of Hawai'i used in this study. (a) Untreated kipuka are unshaded and treated kipuka are shaded in black. (b) Example of tracking tunnel grid (only a subset of kipuka shown but all kipuka were sampled) demonstrating the distribution of tracking tunnels. (c) For two example kipuka, we demonstrate the distribution of snap traps in a small and medium sized treated kipuka.

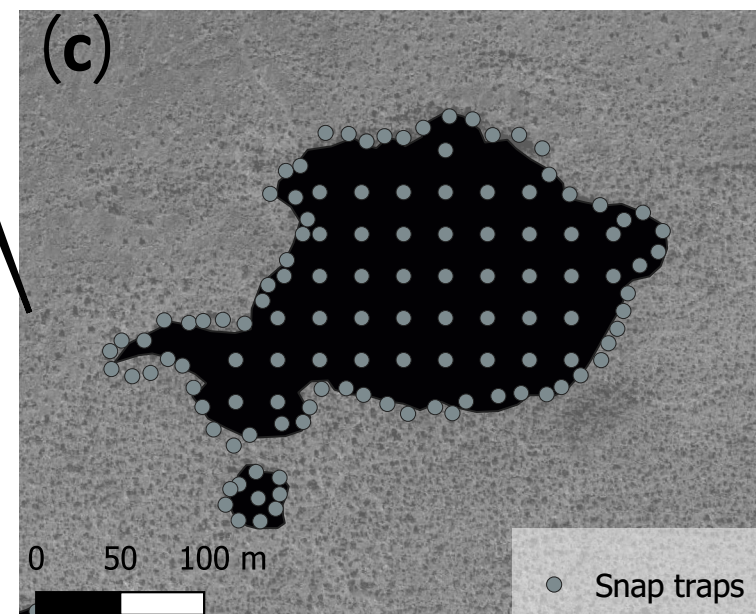
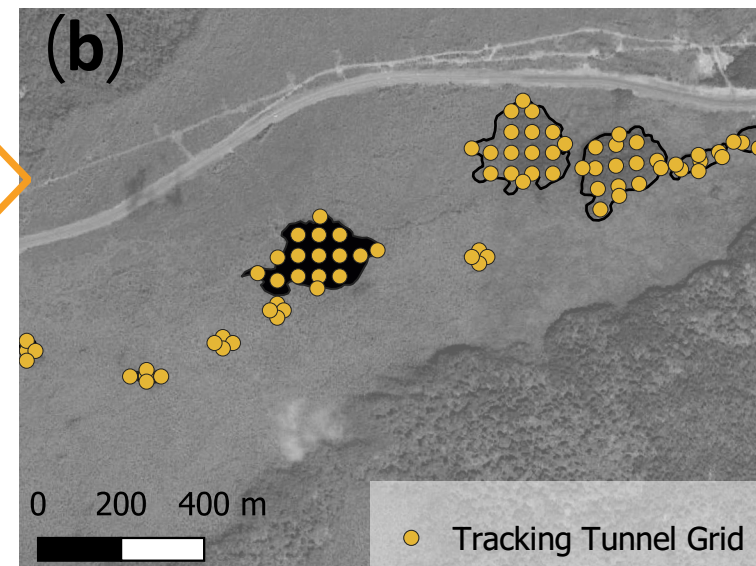
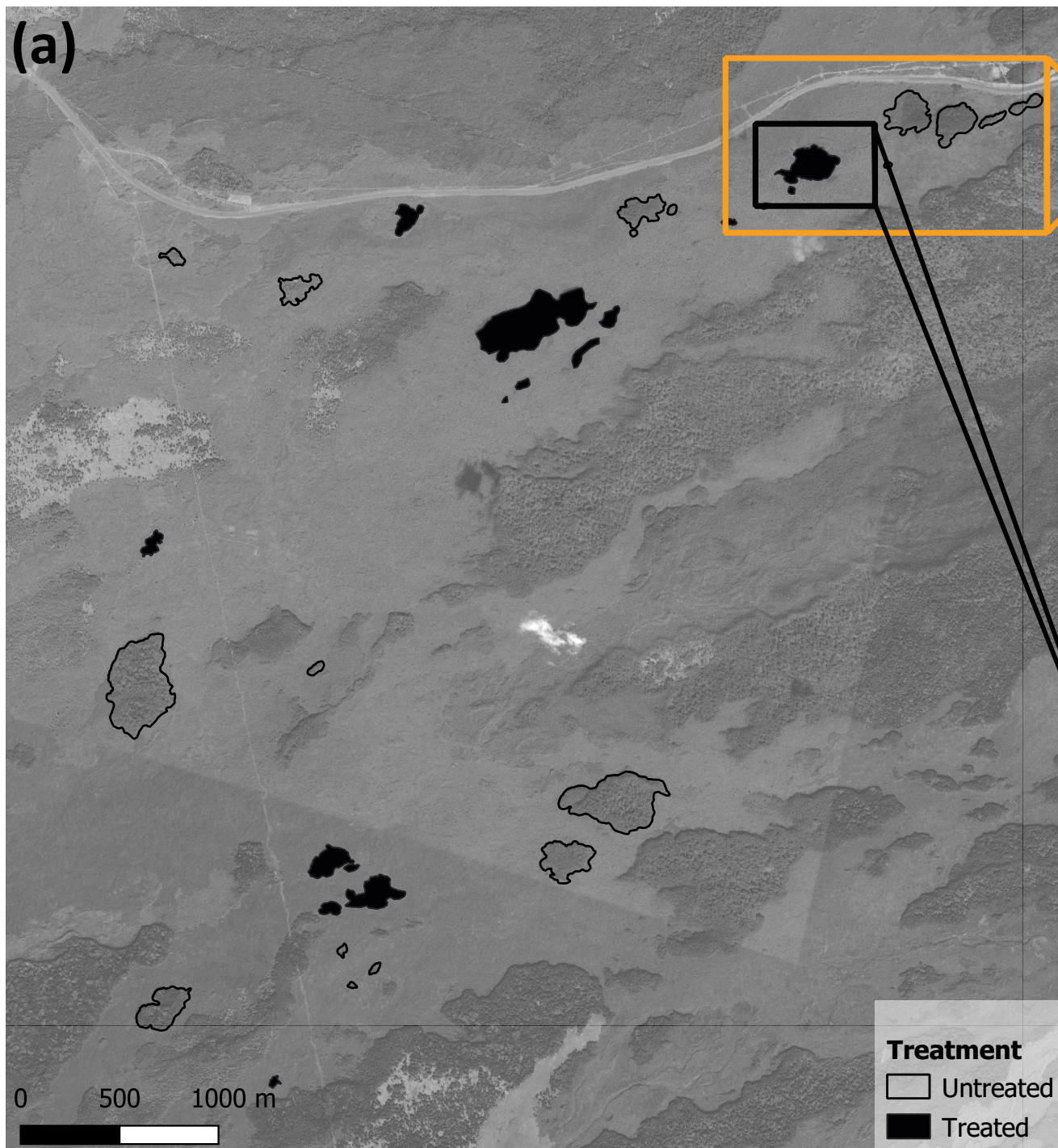


Figure S2. Trapping and monitoring devices used to assess rat populations. Snap trap with corrugated plastic covering (a) and a front view of the single, rat-sized opening to the trap (b). Tracking tunnel (c) on artificial branch (top) and (d) tracking card with bait being raised into the tunnel on a pulley system (bottom). Tracking cards with *Rattus* sp. tracks (e) and *Herpestes javanicus* tracks (f).

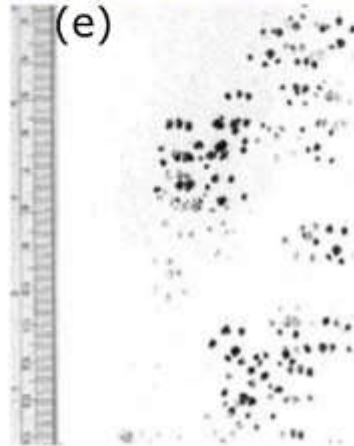


Table S1. Full model results from generalized linear mixed model analyses.

Snap trapping take (rats only)

Model: lmer(num.rats.trapped~time+rat.spp+log(Area_ha)+(1|Kipuka_ID))

	Sum Sq	Mean Sq	Num Df	Den DF	F value	P value	
time	94.93	94.93	1.00	367.00	14.97	0.00013	***
rat.spp	38.78	19.39	2.00	367.00	3.06	0.0482	*
log(Area_ha)	93.76	93.76	1.00	367.00	14.79	0.00014	***

Snap trapping bycatch

Model: lmer(num.individuals.trapped~presence.absence.of.rats+time+bycatch.spp+log(Area_ha)+(1|Kipuka_ID))

	Sum Sq	Mean Sq	Num Df	Den DF	F value	P value	
Presence.absence.of.rats	5.69	5.69	1	315.67	3.43	0.065	
time	17.76	17.76	1	310.54	10.71	0.0012	**
bycatch.spp	9.66	2.42	4	313.50	1.46	0.22	
log(Area_ha)	1.09	1.09	1	16.19	0.67	0.43	

Body length of rats from snap trapping

Model: lmer(Body_Len_cm~ rat.spp + Sex + time+ (1|Kipuka_ID))

	Sum Sq	Mean Sq	Num Df	Den DF	F value	P value	
rat.spp	175.56	87.78	2.00	437.99	11.52	0.000013	***
Sex	88.82	22.20	4.00	444.21	2.91	0.021	*
time	73.59	73.59	1.00	446.81	9.66	0.002	**

Tail length of rats from snap trapping

Model: lmer(Tail_Len_cm~ rat.spp + Sex + time+ (1|Kipuka_ID))

	Sum Sq	Mean Sq	Num Df	Den DF	F value	P value	
rat.spp	416.45	208.23	2.00	431.04	21.18	1.7 E-9	***
Sex	85.15	21.29	4.00	442.70	2.17	0.072	.
time	730.94	730.94	1.00	446.80	74.36	< 2.2e-16	***

Proportion of tracking tunnels hit by rats

Model: glmer(Prop.rat.hits~ rat_removal*tunnel_height +log(Area_ha) + time +(1|Kipuka_ID), weights=total.hits, family="binomial")

	Sum Sq	Num Df	Den DF	F value	P value	
rat_removal	26.25	1.00	29.48	26.25	1.80E-5	***
tunnel_height (ground, 6M, 12M)	368.05	2.00	41.86	184.02	< 2.2e-16	***
log(Area_ha)	4.17	1.00	29.53	4.17	0.0495	*
rat_removal:tunnel_height	15.51	2.00	42.81	7.76	0.001	***
time	0.001	1.00	42.00	0.0035	0.953	

2012 only: proportion of tracking tunnels in grid hit by rats (ground level only)

Model: glmer(Prop.rat.hits~ rat_removal*Location +Bait +log(Area_ha) +(1|Kipuka_ID), weights=total.hits, family="binomial")

	Sum Sq	Num Df	Den DF	F value	P value	
rat_removal	35.27	1.00	30.29	35.27	1.66E-06	***
Location (perimeter, interior grid)	18.29	1.00	105.69	18.29	4.20E-05	**
Bait (coconut, spam)	45.37	1.00	104.62	45.37	9.26E-10	***
log(Area_ha)	0.57	1.00	37.17	0.57	0.46	
rat_removal:Location	0.05	1.00	127.69	0.05	0.83	

Analysis on bycatch species

Model: glmer(Prop.hits~ rat.removal*non.rat.species * tunnel_height +Bait+ (type|Kipuka), weights=Total.hits, family="binomial"), where type indicates which dataset: either the monthly sampling or 2012 grid

	Sum Sq	Num Df	Den DF	F value	P value	
rat_removal	30.90	1.00	23.51	30.90	1.18E-05	***
non.rat.species	136.06	2.00	714.95	68.03	9.05E-28	***
tunnel_height	65.92	2.00	30.53	32.96	2.22E-14	***
Bait (coconut, spam)	58.83	1.00	758.10	58.83	5.29E-14	***
Non.rat.species:rat.removal	9.87	2.00	714.95	4.94	0.0074	**
Non.rat.species:tunnel_height	11.92	4.00	714.95	2.98	0.019	*
rat.removal: tunnel_height	13.19	2.00	668.63	6.60	0.0015	**