Report on Pitfall Trapping of Ants at the Biospecies Sites in the Nature Reserve of Orange County, California

Prepared for:

Nature Reserve of Orange County
and
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INTRODUCTION: In conjunction with ongoing biospecies richness monitoring at the Nature Reserve of Orange County (NROC), ant sampling began in October 1999. We quantitatively sampled for all ant species in the central and coastal portions of NROC at long-term study sites. Ant pitfall traps (Majer 1978) were used at current reptile and amphibian pitfall trap sites, and samples were collected and analyzed from winter 1999, summer 2000, and winter 2000. Summer 2001 samples were recently retrieved, and are presently being identified. Ants serve many roles on different ecosystem levels, and can serve as sensitive indicators of change for a variety of factors. Data gathered from these samples provide the beginning of three years of baseline data, on which long-term land management plans can be based.

MONITORING OBJECTIVES: The California Floristic Province, which includes southern California, is considered one of the 25 global biodiversity hotspots (Myers et al. 2000). The habitat of this region is rapidly changing due to pressure from urban and agricultural development. The Scientific Review Panel of the State of California's Natural Community Conservation Planning Program (NCCP) has identified preserve design parameters as one of the six basic research needs for making informed long term conservation planning decisions. The NCCP Core Group also labeled inventorying and monitoring as priority research needs. Through long term monitoring programs we can measure and report the health of species and communities within the region.

The goal of this research is to establish quantifiable information on the impacts of various preserve parameters, including edge effect, fragment size, corridors and fragment isolation, that can be used in maintaining species richness and population viability for many species. Baseline species richness and abundance will be determined directly from data gathered in this study, and will then be incorporated into adaptive management, monitoring and reserve design decisions. This project will quantitatively assess the reserve design parameters for coastal ant species in southern California.

Exotic ant species are a potentially serious problem to native ant species, and may result in their local extinction (Suarez et al. 1998). Studies have also indicated negative impacts by exotic ants on native vertebrates in other parts of the United States (Mount 1981, Mount et al. 1981, Freed and Neitman 1988). However, little is known about how resident exotic ant species continually invade California (Holway 1995). This study will help gather data useful in understanding exotic invasions by ant species, as well as determining proper management procedures to check their distributional spread. The timing of this study is particularly appropriate since a non-native fire ant (*Solenopsis invicta*), also called the red imported fire ant, has recently invaded several areas of Orange County. Red imported fire ants were first reported in Orange County in fall 1998. The invasion of this ant threatens existing reserve ecosystems as its range and impacts expand (http://pi.cdfa.ca.gov/rifa/).

The objectives of this ant monitoring study are: 1) Determine baseline species richness and abundance of ants within reserve biodiversity sites (edge, core and fragment), 2) Monitor and compare changes in species richness and abundance at these fixed sites over time, and 3) Identify management needs resulting from reserve changes.

BIOSPECIES RICHNESS MONITORING HYPOTHESES:

Reserve Design

Hypothesis 1: Species richness and abundance of ants will be impacted by changes in reserve landscapes over time.

Hypothesis 2: There is a relationship between changes in habitat, and ant species richness and abundance.

Hypothesis 3: Ant species richness is related to fragmentation and size of reserve lands.

Hypothesis 4: Exotic ant species affect native ant species richness and abundance.

Management Practices

Hypothesis 5: Fires (prescribed or natural) will result in changes in ant species richness and abundance, specifically through changing vegetative communities (since many ant species are seed harvesters).

Hypothesis 6: Habitat enhancement will result in changes in ant species richness and abundance.

Ant-Specific Questions

1. On average across the first three years of study (baseline), does overall species composition differ among core, edge and fragment sites?
2. On average across the first three years of study (baseline), does the composition of priority species (i.e. species that move seeds, or play other important ecosystem processes) or exotic ant species differ among core, edge and fragment sites?
3. Do data from the first three years of study (baseline) show different net trends in species composition among core, edge and fragment sites?

PRODUCTS: The results thus far have provided initial information on species richness and abundance for one and one half years. The remaining hypotheses and questions will be addressed over the remaining one and one half years through data collection and analysis. These studies do and will provide specific information on baseline diversity of ant species that can be incorporated into reserve design and management programs within NROC. The diversity estimates and trends will be covariant with other diversity estimates for the biospecies sites. Comparisons of diversity across taxa will help determine how preserve design and management activities are affecting overall diversity.

MATERIALS AND METHODS: Ant pitfall traps were installed at fourteen herpetofaunal monitoring pitfall trap sites, each with multiple sampling locations. At each location, five ant pitfall traps (50mL tubes) were used. The five traps overlaid the existing herpetofaunal array in the shape of the "5" on a die. The four corners of the "5" were approximately 20m apart from each other. Holes were made in the soil using a metal stake. A polyvinyl chloride sleeve constructed from a 1" class pipe was inserted into each hole, and an ant pitfall trap was inserted into the sleeve so that it became flush with the ground. Each pitfall trap was left open for ten consecutive days and contained approximately 25mL of Sierra™ brand antifreeze. This product preserves the specimens while remaining environmentally safe (Suarez et al. 1998). The sleeves were closed between sampling visits. Samples were then sorted, identified and counted at the US Geological Survey, San Diego Field Station. The five tubes from each array were combined for analysis. These data were used to estimate abundance and diversity by sampling location. Hypogeic, or belowground foraging, and arboreal ants may be under-sampled using this technique, since the pitfall trap design is geared toward the collection of epigeic, or aboveground foraging ants. An evaluation of pitfall traps as a sampling method for ground-dwelling ants found that most epigeic ants are well represented, especially in open habitats (Bestelmeyer et al. 2000). Also, Suarez (1998) found reasonable epigeic diversity estimates using the proposed sampling technique in coastal sage scrub habitat. Winged queens and males were noted but not used in analysis since they may have originated from outside the sites. Other incidental captures of invertebrates and small vertebrates were saved for future use in additional diversity estimates.

RESULTS and DISCUSSION: The following data were taken during the sampling efforts in winter 1999, summer 2000 and winter 2000. Ant pitfall traps were obtained from the fourteen herpetofaunal sites, which are abbreviated as follows: Agua Chinon (Agua), Aliso-Woods Canyons (AWC), Chino Hills (Chino), Edison (Edison), Limestone Canyon (Lime), Orange Hills (OH), Peters Canyon (Peters), Puente Hills (Puente), Rattlesnake Canyon (Rattle), San Joaquin Hills West (SJHW), Starr Ranch (Starr), U C Irvine (UCI), Unocal (Unocal), Weir Canyon (Weir). However, Agua Chinon was not included in the winter 1999 sample period, as the traps were not yet installed. All ants were counted and identified to genus, and some were identified to species as resources permitted (Table 1). Only genus level comparisons have been made in this report because not all ants have been identified to species yet. The following tables present sampling data from winter 1999, summer 2000 and winter 2000 in summation (Tables 2 - 4). Table 5 gives total individual counts per site by combining the three sample periods. In Tables 2 – 5, arrays were pooled by site and sites were grouped by site type: core, edge, fragment or other sites near NROC. The "other" site type defines the sites that were not originally included in the Orange County monitoring plan, but were subsequently added. Sites had between zero and sixteen native ant genera present.

Table 1. List of ant genera/species detected. **Bold** implies exotic species.

Subfamily	Code	Genus/species	Common Name
Dolichoderinae	DO	Dorymyrmex	Pyramid Ant
	FO	Forelius	
	LIHU	**Linepithema humile**	**Argentine Ant**
	LI	Liometopum	
	TA	Tapinoma	Maloderous House Ant
Ecitoninae	NECA	Neivamyrmex californicus	Army Ant
	NENI	Neivamyrmex nigrescens	Army Ant
	NEOP	Neivamyrmex opacithorax	Army Ant
Formicinae	BRDE	Brachymyrmex depelis	
	CA	Camponotus	Carpenter Ant
	CAVI	Camponotus vicinus	Carpenter Ant
	FMFR	Formica francoueri	Wood Ant
	FMMO	Formica moki	Wood Ant
	FMXE	Formica xerophila	Wood Ant
	MY	Myrmecocystus	Honey Pot Ant
	MYMI	Myrmecocystus mimicus	Honey Pot Ant
	MYTE	Myrmecocystus testaceus	Honey Pot Ant
	PA	Paratrechina	Crazy Ant
	POBR	Polyergus breviceps	
	PRIM	Prenolepis imparis	Winter Ant
Myrmicinae	**CD**	**Cardiocondyla**	
	CDEC	**Cardiocondyla ectopia**	
	CR	Crematogaster	Acrobat Ant
	CRCA	Crematogaster californica	Acrobat Ant
	CRMA	Crematogaster marioni	Acrobat Ant
	CYWH	Cyphomyrmex wheeleri	Fungus-growing Ant
	LE	Leptothorax	
	LEAN	Leptothorax andrei	
	ME	Messor	Harvester Ant
	MO	Monomorium	
	MOER	Monomorium ergatogyna	
	MRAM	Myrmecina americana	
	PH	Pheidole	
	PHCE	Pheidole cerebrosior	
	PHHY	Pheidole hyatti	
	PO	Pogonomyrmex	Harvester Ant
	SO	Solenopsis	Native Fire Ant
	SOAM	Solenopsis amblychila	Native Fire Ant
	SOMO	Solenopsis molesta	Thief Ant
	SOXY	Solenopsis xyloni	Native Fire Ant
	ST	Stenamma	
	STCA	Stenamma californicum	
	STDI	Stenamma diecki	

Table 2. Orange County Winter 1999 ant data with arrays pooled for each site. **Bold** signifies exotic species.

Winter 1999	Site Types and Sites. ( ) = Total Arrays.													Total Individuals	% Site Occurrence
	Core				Edge		Fragment			Other Sites Near NROC					
	AWC (17)	Lime (19)	SJHW (21)	Weir (12)	Edison (5)	Rattle (5)	OH (5)	Peters (5)	UCI (5)	Chino (19)	Puente (19)	Starr (17)	Unocal (3)		
Genus/species															
Subfamily Dolichoderinae															
Dorymyrmex sp.		8	5	5	2			4		9		1		34	54
Pyramid Ant															
Forelius sp.		5		43	10					7		139		204	38
Linepithema humile	**28**		**484**			**47**	**51**	**64**	**1093**		**2671**		**46**	**4484**	**62**
Argentine Ant															
Tapinoma sp.	5	1	26	1	4				4	75	7	12		135	69
Maloderous House Ant															
Subfamily Ecitoninae															
Neivamyrmex opacithorax												10		10	8
Army Ant															
Subfamily Formicinae															
Camponotus vicinus		1												1	8
Carpenter Ant															
Formica francoueri	622									59				681	15
Wood Ant															
Formica moki	7	2	6						15	12	18	40		100	54
Wood Ant															
Formica sp.					8					1282		16		1306	23
Wood Ant															
Myrmecocystus mimicus										3				3	8
Honey Pot Ant															
Myrmecocystus testaceus		3												3	8
Honey Pot Ant															
Myrmecocystus sp.					3			1						4	15
Honey Pot Ant															
Paratrechina sp.	1									1		2		4	23
Crazy Ant															
Prenolepis imparis	112	143	170	19						3	76	24		547	54
Winter Ant															
Subfamily Myrmicinae															
Cardiocondyla ectopia	**6**													**6**	**8**
Crematogaster sp.	5	16	40	5	9				2	19	1	54		151	69
Acrobat Ant															
Cyphomyrmex wheeleri				1										1	8
Fungus-growing Ant															
Leptothorax sp.				1	1			1	10	7	10	14		44	54
Messor sp.		2										7		9	15
Harvester Ant															
Monomorium ergatogyna											1	1		2	15
Monomorium sp.					1				1					2	15
Myrmecina americana			1											1	8
Pheidole sp.	3	97	14	153	64			3		101	30	210		675	69
Pogonomyrmex sp.		3								7				10	15
Harvester Ant															
Solenopsis molesta											1			1	8
Thief Ant															
Solenopsis xyloni					8									8	8
Native Fire Ant															
Solenopsis sp.	2	9		9		5		5	1	26	14	64		135	69
Native Fire Ant															
Stenamma diecki	6		1											7	15
Total Individuals	815	291	747	237	110	52	51	78	1126	1612	2829	594	46	8588	
Total Genera	10	12	9	9	10	2	1	6	7	12	9	13	1	21	

Table 3. Orange County Summer 2000 ant data with arrays pooled for each site. **Bold** signifies exotic species.

Summer 2000	Site Types and Sites. ( ) = Total Arrays.														Total Individuals	% Site Occurrence
	Core				Edge			Fragment			Other Sites Near NROC					
	AWC (17)	Lime (19)	SJHW (21)	Weir (12)	Agua (7)	Edison (5)	Rattle (5)	OH (5)	Peters (5)	UCI (5)	Chino (19)	Puente (19)	Starr (17)	Unocal (3)		
Genus/species																
Subfamily Dolichoderinae																
Dorymyrmex sp. Pyramid Ant		6	9	25	3	7			1		473	2			526	57
Forelius sp.		11		439		1671					12		1008		3141	36
Linepithema humile **Argentine Ant**	**26**		**76**		**2**		**61**	**50**	**13**	**75**	**1**	**1431**		**27**	**1762**	**71**
Liometopum sp.	1			41											42	14
Tapinoma sp. Maloderous House Ant	19	37	34	30	3	8					18		30		179	57
Subfamily Ecitoninae																
Neivamyrmex californicus Army Ant	2	2	1	2		1							6		14	43
Neivamyrmex nigrescens Army Ant		1	27	5	47						82	1	32		195	50
Neivamyrmex opacithorax Army Ant			3			1							26		30	21
Subfamily Formicinae																
Brachymyrmex depelis		2													2	7
Camponotus sp. Carpenter Ant	2	1		1		1						2	21		28	43
Formica francoueri Wood Ant	204										151				355	14
Formica moki Wood Ant	57	29	85	39	1	59			12	25	3	16	215		541	79
Formica xerophila Wood Ant						4									4	7
Formica sp. Wood Ant						4									4	7
Myrmecocystus mimicus Honey Pot Ant											1				1	7
Myrmecocystus sp. Honey Pot Ant	1	15	6	26		167			10		1	16	24		266	64
Polyergus breviceps						1									1	7
Prenolepis imparis Winter Ant	4	1										14	1		20	29
Subfamily Myrmicinae																
Cardiocondyla sp.	**6**	**13**													**19**	**14**
Crematogaster marioni Acrobat Ant	1														1	7
Crematogaster sp. Acrobat Ant	31	107	310	107	4	77	1		11	1	26	7	231		913	86
Leptothorax andrei									1						1	7
Leptothorax sp.	7	5	19	6	1		5		1	13	7	1	6		71	79
Messor sp. Harvester Ant		53	2	8		1							199		263	36
Monomorium sp.	1	2	5	3		3						1	8		23	50
Myrmecina americana		1		1									2		4	21
Pheidole sp.	11	131	75	130	4	23			2		250	28	119		773	71
Pogonomyrmex sp. Harvester Ant	12			265	4						14	8			303	36
Solenopsis amblychila Native Fire Ant						2									2	7
Solenopsis molesta Thief Ant						14	1								15	14
Solenopsis xyloni Native Fire Ant				6		11			18						35	21
Solenopsis sp. Native Fire Ant	631	26	3	59	3			1		3	22	16	433		1197	71
Stenamma sp.													3		3	7
Undescribed genus													3		3	7
Total Individuals	1016	444	658	1193	72	2055	68	51	72	118	1062	1547	2367	27	10750	
Total Genera	15	17	12	16	10	13	4	2	8	5	12	13	16	1	23	

Table 4. Orange County Winter 2000 ant data with arrays pooled for each site. **Bold** signifies exotic species.

Winter 2000	Site Types and Sites. ( ) = Total Arrays.														Total Individuals	% Array Occurrence
	Core				Edge			Fragment			Other Sites Near NROC					
	AWC (17)	Lime (19)	SJHW (21)	Weir (12)	Agua (7)	Edison (5)	Rattle (5)	OH (5)	Peters (5)	UCI (5)	Chino (19)	Puente (19)	Starr (17)	Unocal (3)		
Genus/species																
Subfamily Dolichoderinae																
Dorymyrmex sp.			7	4	1						1	1		1	15	43
Pyramid Ant																
Forelius sp.						1					1		3		5	21
Linepithema humile	**16**		**42**		**5**		**31**	**68**	**69**	**48**	**1**	**12486**		**70**	**12836**	**71**
Argentine Ant																
Tapinoma sp.	2	5	6	8	11	2					218	2	10		264	64
Maloderous House Ant																
Subfamily Ecitoninae																
Neivamyrmex sp.		1		1											2	14
Army Ant																
Subfamily Formicinae																
Formica francoueri	1054				15						317				1386	21
Wood Ant																
Formica moki			11	6	1	21			6	1	7	9	36		98	64
Wood Ant																
Myrmecocystus sp.		9	1	5					5		238				258	36
Honey Pot Ant																
Paratrechina sp.													1		1	7
Crazy Ant																
Prenolepis imparis	64	190	108	40							21	224	157	2	806	57
Subfamily Myrmicinae																
Crematogaster sp.		19	24	9	2	3			11		31	11	23		133	64
Acrobat Ant																
Leptothorax sp.	2	1			1			1			2	1			8	43
Messor sp.		1	1	1											3	21
Harvester Ant																
Monomorium sp.		2		1								2			5	21
Pheidole sp.	4	72	38	27	9	16					113	84	26		389	64
Pogonomyrmex sp.											9				9	7
Harvester Ant																
Solenopsis amblychila		1			1						1				3	21
Native Fire Ant																
Solenopsis molesta											3	3			6	14
Thief Ant																
Solenopsis xyloni				7		1					6	9	4		27	36
Native Fire Ant																
Stenamma sp.	7	4		1								1	1		14	36
Total Individuals	1152	306	238	110	46	44	31	69	91	50	972	12944	264	75	16392	
Total Genera	7	11	9	12	8	6	1	2	4	2	12	11	9	3	17	

Table 5. Orange County summary ant data for Winter 1999, Summer 2000 and Winter 2000 with arrays pooled for each site. **Bold** signifies exotic species.

Winter 1999, Summer 2000, Winter 2000	Site Types and Sites. ( ) = Total Arrays.														Total Individuals	% Site Occurrence
	Core				Edge			Fragment			Other Sites Near NROC					
Genus/species	AWC (17)	Lime (19)	SJHW (21)	Weir (12)	Agua (7)	Edison (5)	Rattle (5)	OH (5)	Peters (5)	UCI (5)	Chino (19)	Puente (19)	Starr (17)	Unocal (3)		
Subfamily Dolichoderinae																
Dorymyrmex sp. Pyramid Ant		14	21	34	4	9			5		483	3		1	575	64
Forelius sp.		16		482		1682					20		1150		3350	36
Linepithema humile **Argentine Ant**	**70**		**602**		**7**		**139**	**169**	**146**	**1216**	**2**	**16588**		**143**	**19082**	**71**
Liometopum sp.	1			41											42	14
Tapinoma sp. Maloderous House Ant	26	43	66	39	14	14				4	311	9	52		578	71
Subfamily Ecitoninae																
Neivamyrmex californicus Army Ant	2	2	1	2		1							6		14	43
Neivamyrmex nigrescens Army Ant		1	27	5	47						82	1	32		195	50
Neivamyrmex opacithorax Army Ant			3			1							36		40	21
Neivamyrmex sp. Army Ant		1		1											2	14
Subfamily Formicinae																
Brachymyrmex depelis		2													2	7
Camponotus vicinus Carpenter Ant		1													1	7
Camponotus sp. Carpenter Ant	2	1		1		1						2	21		28	43
Formica francoueri Wood Ant	1880				15						527				2422	21
Formica moki Wood Ant	64	31	102	45	2	80			18	41	22	33	291		739	79
Formica xerophila Wood Ant						4									4	7
Formica sp. Wood Ant						12					1282		16		1310	21
Myrmecocystus mimicus Honey Pot Ant											4				4	7
Myrmecocystus testaceus Honey Pot Ant		3													3	7
Myrmecocystus sp. Honey Pot Ant	1	24	7	31		170			16		239	16	24		528	64
Paratrechina sp. Crazy Ant	1										1		3		5	21
Polyergus breviceps						1									1	7
Prenolepis imparis Winter Ant	180	334	278	59							24	314	182	2	1373	57
Subfamily Myrmicinae																
Cardiocondyla ectopia	**6**														**6**	**7**
Cardiocondyla sp.	**6**	**13**													**19**	**14**
Crematogaster marioni Acrobat Ant	1														1	7
Crematogaster sp. Acrobat Ant	36	142	374	121	6	89	1		22	3	76	19	308		1197	86
Cyphomyrmex wheeleri Fungus-growing Ant				1											1	7
Leptothorax andrei									1						1	7
Leptothorax sp.	9	6	19	7	2	1	5	1	2	23	16	12	20		123	93
Messor sp. Harvester Ant		56	3	9		1							206		275	36
Monomorium ergatogyna												1	1		2	14
Monomorium sp.	1	4	5	4		4				1		3	8		30	57
Myrmecina americana		1	1	1									2		5	29
Pheidole cerebrosior											1				1	7
Pheidole sp.	18	300	127	310	13	103			5		463	142	355		1836	71
Pogonomyrmex sp. Harvester Ant	12	3		265	4						30	8			322	43
Solenopsis amblychila Native Fire Ant		1			1	2					1				5	29
Solenopsis molesta Thief Ant						14	1				3	4			22	29
Solenopsis xyloni Native Fire Ant				13		20			18		6	9	4		70	43
Solenopsis sp. Native Fire Ant	633	35	3	68	3		5	1	5	4	48	30	497		1332	86
Stenamma diecki	6		1												7	14
Stenamma sp.	7	4		1								1	4		17	36
Undescribed genus													3		3	7
Total Individuals	2983	1041	1643	1540	118	2209	151	171	241	1294	3646	17320	3225	148	35730	
Total Genera	17	19	15	19	10	14	4	3	8	7	14	15	17	3	25	

The viability of a site for native ant populations can be determined using the following criteria: surrounding landscape, existing habitat, exotic ant presence, and species diversity and abundance. The three site types are defined as follows: 1) Fragmented from other native habitat and usually surrounded by native habitat (fragment), 2) On the edge of a piece of native habitat (edge) and 3) Completely surrounded by native habitat (core). Descriptions of site habitat will be reported along with future baseline data.

Minor changes can be seen over the past three sample periods, though statistical analysis will not be implemented until data is collected from all three years. Two exotic ant species were detected, however the aforementioned red imported fire ant (*Solenopsis invicta*) was not found in any of our sites. The Orange County Fire Ant Authority (http://www.ocfireant.com) has been monitoring the spread of the red imported fire ant, which to this date has been restricted to developed urban and agricultural land. Continued monitoring will be essential to ascertain if the red imported fire ant will invade native habitat and affect natural Orange County systems.

Of the two detected exotic species, little attention is usually paid to *Cardiocondyla ectopia*, which is a tramp species and not considered invasive. *C. ectopia* was found in only two sites in very small numbers. But *Linepithema humile*, the Argentine ant, was trapped throughout ten of our fourteen sites. Argentine ant presence is negatively correlated with native ant species diversity, and helps to cause local native ant extinction (Suarez et al. 1998). Argentine ants were found in all of the fragment sites regardless of sample date. They were also detected in two of three edge sites, and two of four core sites. One change to note and closely monitor is the detection of *L. humile* in summer 2000 and winter 2000 in Chino Hills, where it was not detected by the winter 1999 sample. Future samples will reveal if Argentine ants become established along the edge of Chino Hills. Figure 1 shows a graph plotting the relationship between the number of Argentine ant individuals and the number of native ant genera averaged over the arrays. As the abundance of Argentine ants increases, one will find decreasing generic diversity in native ants. This supports the findings of Suarez et al. 1998.

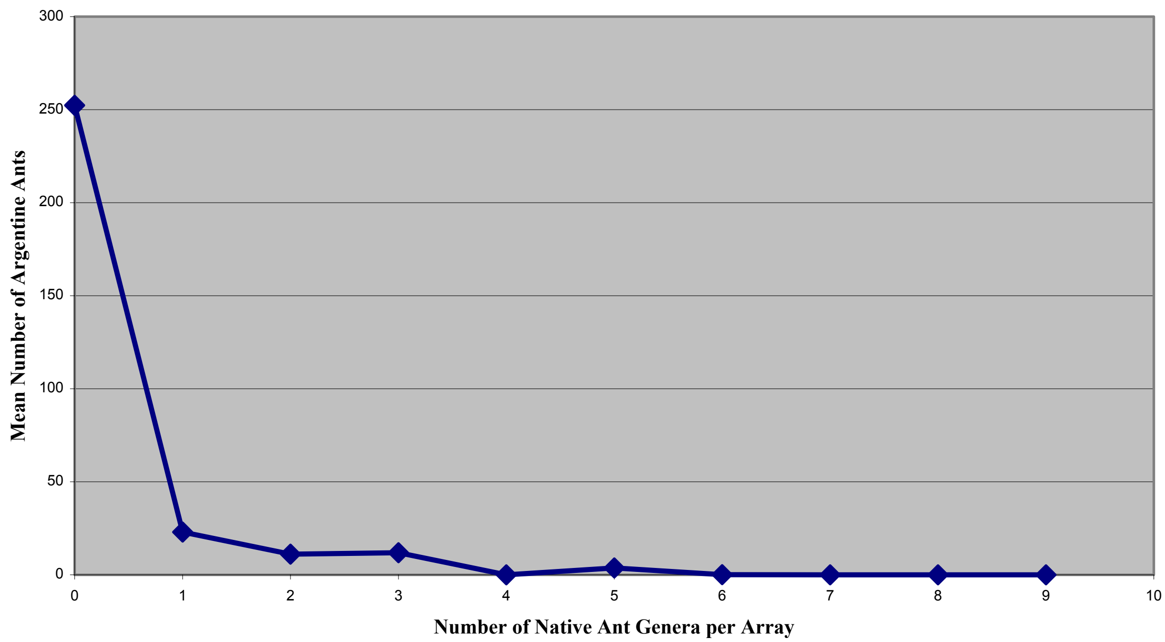

Figure 1. Results of the comparison of mean number of Argentine ants and number of native ant genera averaged across all arrays. The negative relationship suggests that increased abundance of Argentine ants causes declines in native ant generic diversity.

The general trend during the first year and a half of sampling is a decrease in native ant generic diversity as sites become more isolated from continuous areas of native habitat. That is, for each sample date, the average number of total genera detected is largest in core sites, smaller in edge sites, and smallest in fragment sites. The increased fragmentation of a site imposes greater vulnerability to invasions of exotic vegetation and ants along its edge. Another way to understand the impact of Argentine ants on native ant diversity is by comparing the average number of native ant genera at sites with and without Argentine ant presence. At sites without

Argentine ants, the average number of native ant genera over all three sample periods is 12. But at sites with Argentine ants, the average number of native ant genera is 6, which signifies the loss of half of the potential native ant diversity.

The measure of ant abundance is also useful in determining exotic ant impacts. Table 5 demonstrates this in comparing exotic to native abundance in percentages across site types. Previous studies have shown the dependence of Argentine ants on a constant water source (Holway 1999, Suarez et al. 1998). Thus, it is not surprising to find Argentine ants in greatest abundance in fragment sites. These fragment sites have the largest amount of urban and/or agricultural edge, which provides constant moisture to sustain Argentine ant populations.

Table 5. Abundance of exotic and native ants in percentages compared across site type.

	% exotic	% native
Core	5	95
Edge	6	94
Fragment	96	4

The completion of three years of monitoring will allow for a thorough analysis of the stability and health of ant communities in Orange County. Concerns to be addressed include the role of distance to edge for each site and arrays within each site, the size of reserves in Orange County, including the amount of urban/agricultural edge they provide, and habitat differences within and across all sites. All of these factors will indicate expected future trends in ant communities. Using ants as sensitive indicators of habitat health will provide a greater understanding for effective management practices to preserve remaining native ant diversity, and through a cascading effect, local native biodiversity.

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