REPORT OF ACTIVITIES CONDUCTED:
Permit TE168189-0

Black-capped vireo (*Vireo atricapilla*) color banding and surveying on the Balcones Canyonlands Preserve and the Balcones Canyonlands National Wildlife Refuge: Project Year 2

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ABSTRACT

This study was conducted to measure interpatch dispersal in the Black-capped vireo (*Vireo atricapilla,* BCVI) within a fragmented preserve network located in the Balcones Canyonlands region of central Texas. The field component of the project has involved locating and marking individual birds then resighting or recapturing those birds in subsequent breeding seasons. In 2009, four marked BCVI (one banded as an adult, and three as juveniles) were resighted off of the study site where they were banded in 2008. The mean natal dispersal distance was 11.02 km. Return rates for adult males were 58.3% for the BCP and 27. 6% for the BCNWR. Return rates for individual habitat patches ranged from 0-100%. Continued accumulation of data from sightings of marked BCVI will allow refinement of dispersal models and should provide useful information on population dynamics within and among colonies situated in the central Texas region.

INTRODUCTION

The Black-capped vireo (*Vireo atricapilla*, Woodhouse, henceforth BCVI), is an endangered neotropical songbird that breeds in areas of northern Mexico, Texas and Oklahoma (USFWS 1991). Over the last century, the amount of breeding habitat available to BCVI has been significantly reduced (USFWS 1991). Since being listed as endangered in 1987, considerable resources have been expended in acquiring and managing patches of occupied breeding habitat (USFWS 1991). The Balcones Canyonlands National Wildlife Refuge (BCNWR, operated by the USFWS) and the Balcones Canyonlands Preserve (BCP, managed jointly by the City of Austin and Travis County) were created for the purpose of providing habitat for several endangered and threatened species, including the Black-capped vireo. Whereas most nature preserves are comprised of large contiguous natural areas, the BCP and BCNWR are patchwork collections of discrete parcels embedded within a rapidly developing human landscape (i.e. northwest Austin and Travis county, TX). Within these parcels, territories of breeding BCVI usually adjoin one another, forming clusters corresponding to the 'habitat patches' of metapopulation theory (Grzybowski 1990, USFWS 1991). Intervening non-habitat matrix areas are composed of a diverse assortment of land-cover types ranging

from commercial, agricultural, and residential to naturally wooded, shrub, and open areas reflecting various levels of disturbance and succession.

In central Texas, BCVI breeding habitat has been characterized as an intermediate seral stage (Grzybowski et al. 1994, Grzybowski 1995, Bailey and Thompson 2007) which must be maintained by periodic disturbance (i.e. wildfire or prescribed burning). As occupied patches undergo secondary succession, habitat quality declines, eventually resulting in local extinction (USFWS 1991, Grzybowski et al. 1994). Likewise, areas which have been intentionally restored may become (re)colonized (USFWS 1991, Grzybowski et al. 1994). In order to ensure long-term population persistence, management must address the maintenance of both habitat suitability and landscape connectivity. However, detailed understanding of dispersal behavior in this species is limited (Grzybowski 1990, USFWS 1991), especially under the conditions of extreme fragmentation and landscape modification that accompany the rapid urban development typified by this study region. The study in progress addresses this informational need by 1) measuring exchange rates for occupied habitat patches in the Balcones Canyonlands region and 2) examining links between matrix structure and dispersal in BCVI through evaluation of cost-distance based dispersal models (Graham 2001, Adriaensen et al. 2003, Stevens 2006).

MATERIALS AND METHODS

The study region is a rectangle 38.9 km by 55.9 km (2176 km^2) located in central Texas encompassing seventeen study sites or 'habitat patches' situated in western Travis County and southern Burnet and Williamson Counties. The study sites are all located on the Balcones Canyonlands National Wildlife Refuge (BCNWR) or the Balcones Canyonlands Preserve (BCP). Sites were surveyed from mid-March through the first week of October 2009.

All study sites were visited (minimum four visits/site) in order to resight or recapture banded birds. Survey methodology borrowed from both presence / absence and territory mapping protocols. Singing males were located by sound, followed, and observed until their band status and identity could be ascertained. Pre-defined study routes helped guide surveys, but study sites were added or expanded if additional birds were detected in novel locations.

Recorded vocalizations were played sparingly in the latter part of the season both to elicit responses from potential males in newly surveyed areas and to draw out males inhabiting areas which were particularly problematic to negotiate on foot. Recordings were played for no more than 5 minutes and were used only once per bird or area (except on the Bohls and Vireo Preserve sites where BCVI were not detected in 2008). Dates when playback was performed are provided in the accompanying spreadsheet file 'TE168189 BCVI Survey Property Data 2009.xls'. Increased survey effort (more survey hours per acre) were expended in areas of greater apparent BCVI density as evidenced by countersong, aggressive encounters, presence of females, juveniles or nests (study sites, hours surveyed, and estimated number of males are provided in Table 1). BCVI were detected at 4 additional (i.e. unoccupied or unsurveyed in 2008) sites in 2009, establishing territories in at least two of those (Forest Ridge and Ribelin-Ivanhoe).

Adult and juvenile BCVI were banded in 2009 in an effort to maintain a marked population to provide additional dispersal data for this project and ongoing monitoring programs in the region. Attempts were made to recapture SY or 'second year' birds (BCVI banded as juveniles in 2008) in order to apply unique adult color combinations to these individuals (nestlings were marked with site-specific color combinations in 2008). In all, 32 male, seven female, and seven juvenile BCVI were banded in 2009. Three returning SYs were recaptured and rebanded. A complete list of all banded birds detected within the study region in 2009 is provided in Appendix B.

Several landowners with property adjoining the BCNWR volunteered access to their properties. Unbanded BCVI were documented on tracts to the south of the Simons South study site (several males and at least one female), to the north of the Eckhardt North and Eckhardt East sites (2-3 singing males), between these sites (1 male), and to the south of the Russell tract (1 male and 1 female).

RESULTS

Recapture Rates

Return rates (number of marked birds returning to the site where they were banded divided by number of birds banded at that site) for the complete study region are given in Table 2. Considered separately, return rates for adult males were 58.3% for the

BCP and 27. 6% for the BCNWR. Return rates for individual habitat patches ranged from 0-100%.

Dispersal Rates

In 2009, four marked BCVI (one banded as an adult, and three as juveniles aka 'hatch years' or HYs) were resighted off of the study site where they were banded in 2008. Table 3 gives the proportion of dispersing individuals for both adults (i.e. breeding dispersal) and juveniles (natal dispersal). All dispersing SYs observed in 2009 originated from the Vireo Ridge tract of the BCP. Figure 1 shows the dispersal profile for all banded juveniles resighted in 2009, including two individuals that were resighted on their natal patch. The mean natal dispersal distance was 11.02 km (dispersal distances were measured as the minimum linear distance between study sites). Of the three dispersing juveniles, one male (on the Rodgers tract of the BCNWR) was witnessed in the company of at least one fledgling and one female (on the Forest Ridge tract of the BCP) was associated with a nest that was found to contain 4 nestlings. Neither of these SY birds was recaptured. The dispersing SY male that was recaptured on the Cuevas East tract of the BCP did not establish a breeding territory at the location where he was detected and rebanded. Of the two marked SYs that returned to their natal patch, the female (on the Russell tract of the BCP) appeared to be paired with a banded male, at one point establishing a nest (which later failed), while the male (on the Vireo Ridge tract) is believed to have paired with a female (no nest or offspring were located).

Non-detections

BCVI were not detected at two surveyed sites in 2009—the Bohls and Vireo Preserve tracts of the BCP. Both sites were surveyed four times. Recorded vocalizations of BCVI song were played during each visit and at various locations within these survey sites in an attempt to provoke a response from any male BCVI present in the area. Because no BCVI were detected at these sites in either 2008 or 2009, they will be excluded from analysis in the dispersal study.

Miscellaneous Observations

A returning SY male (USFWS 2540-16136, banded as a HY in 2008) was discovered upon recapture to have suffered an injury or deformity to its right foot. The foot was lacking all digits and the lower of the two color bands on that leg was missing. The injury did not appear to be recent and the bird seemed in good health otherwise. It was successfully released with its USFWS numbered metal band and a single color band intact (the injured leg terminated in a stump which was large enough to prevent the remaining color band from slipping off).

Another male (USFWS 2580-48401), captured on the Rodgers East study site, was observed upon examination to have sustained an injury to its left leg (pre-existing and unrelated to capture or banding). Skin and scales were missing and the exact cause was not readily apparent, although the bander, subpermittee Juan Pablo Assmus, speculated that the damage may have been related to a recent storm. The bird received a USFWS numbered metal band on its uninjured leg and was successfully released.

On Thursday, 11 June 2009, an active BCVI nest was located on the Ivanhoe tract of the BCP by Bill Reiner, city of Austin biologist. The nest was observed at that time to contain three healthy nestlings. A major thunderstorm occurred that night. We approached the nest the following Saturday, 13 June 2009, in order to check the nest to assess whether the nestlings were old enough to band. We discovered that the nest contained the partially decomposed bodies of two of the three original nestlings and found no sign of the missing third. A similar occurrence took place in 2008 on the Gainer tract of the BCNWR when two (of three) nestlings were found dead in a nest one week after being banded. In that instance, a severe thunderstorm (accompanied by multiple tornadoes) struck the area during the night on the same day (13 May 2008) that banding had taken place (Simper 2008). In both years, nestlings were judged to be approximately 6-7 days old—suitable for banding but not sufficiently developed to make successful fledging a likely outcome . The exact cause of death and the fate of the missing nestlings remain a mystery in both cases; possibilities include parental abandonment, predation or drowning. The remains of the deceased nestlings were collected and retained by city of Austin BCP staff.

In 2009, BCVI males holding only USFWS numbered metal bands were sighted on the Eckhardt North and Eckhardt South study sites and in 2008 there were ‘metal-

only' males sighted on the Russell and Gainer tracts. Although efforts were made to recapture these individuals, we were unsuccessful in all but one instance; thus, these individuals were not included in calculations of return and dispersal since their individual identities and points of origin could not be determined.

DISCUSSION

The difference in return rates for adult males on the BCP and BCNWR (58.3% and 28.6% respectively) may result from several key differences in the non-habitat matrix landscapes within which these preserve systems are embedded. The BCNWR, situated in an area of relatively sparse urban development, is likely to adjoin a greater number of proximate but off-site sub-populations and areas of suitable BCVI habitat than the BCP, where both the amount of suitable habitat and number of birds constituting local populations are more limited. In addition, matrix landscapes within the BCNWR are more homogeneous both in terms of topography and landcover type than those associated with the BCP, which could result in greater interchange of individuals on the BCNWR from year to year. It should be noted that habitat restoration efforts in the form of extensive prescribed burning were performed on three tracts of the BCNWR containing BCVI populations in 2008 and 2009, and this may also have contributed to the lower return rates observed.

We recommend that future studies which involve the capture of adult BCVI for tissue samples should include provision for color banding in their protocols in order to facilitate the collection of dispersal and survivorship data from marked individuals.

Evaluation of dispersal models based on data collected in 2009 is ongoing and will be completed in 2010. A classified landcover map has been created and model outputs are being compared to field data via partial Mantel tests (Legendre and Legendre 1998). Continued acquisition of dispersal data from sightings of marked BCVI will allow refinement of such models and should provide useful information on population dynamics within and among colonies situated in the central Texas region.

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Figure 1.

Between season dispersal distances of one-year old Black-capped vireos

Travis County, Texas, 2009.

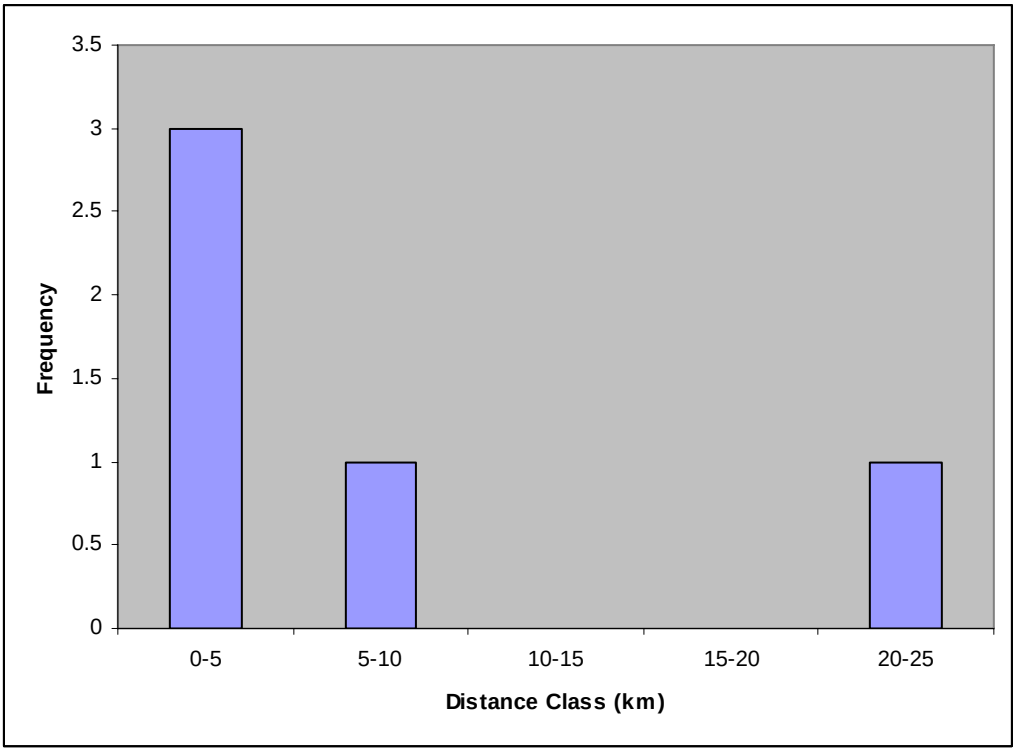


Table 1. Study site survey summary, 2009.

Study Site	Males Detected[1]	Acres	Visits	Survey Hours	hours per acre	males per acre	acres per male
Russell	8	64	23	25.5	0.40	0.13	8.00
Simons North	4-5	121	14	19	0.16	0.03	30.25
Simons South	1	19	6	3.75	0.20	0.05	19.00
Eckhardt North	6-7	109	18	17.25	0.16	0.06	18.17
Eckhardt East	2	29	9	7.5	0.26	0.07	14.50
Eckhardt South	10-11	267	8	23	0.09	0.04	26.70
Gainer	15	447	28	32.75	0.07	0.03	29.80
Rodgers West	7-8	209	12	9.75	0.05	0.03	29.86
Rodgers East	8-9	140	14	8.25	0.06	0.06	17.50
Vireo Ridge	11	275	27	49.5	0.18	0.04	25.00
Denali	1	37	9	12	0.32	0.03	37.00
Cuevas East	1	11	4	3.5	0.32	0.09	11.00
Forest Ridge	3	48	7	9.5	0.20	0.06	16.00
Ribelin-Ivanhoe	2	31	2	3	0.10	0.06	15.50
Cortana	4	95	3	2.25	0.02	0.04	23.75
Vireo Preserve	0	75	26	49.5	0.66	0.00	NA
Bohls	0	60	4	4	0.07	0.00	NA
Lake Perspectives	1	12	4	4.25	0.35	0.08	12.00

[1] Approximate total of distinct males detected at a site.

Table 2. Return rates calculated for the complete study region (all study sites), 2009.

Demographic category	Banded 2008	Return 2009	Return Rate (percent)
All Adult	48	15	31.3
Adult Male	41	15	36.6
Adult Female	7	0	0.0
Juvenile	31	2	6.5

Table 3. Dispersal rates for all marked BCVI, 2009.

Dispersal Type	Banded 2008	Dispersers 2009	Dispersal Rate (percent)
Natal	31	3	9.7
Breeding	48	1	2.1

APPENDICES

A. PERMIT INFORMATION

US Fish and Wildlife Service
Endangered Species Recovery Permit: **TE168189-0**

Federal Bird Banding Permit (USGS BBL): **23546, 23546-A**

Texas Parks and Wildlife Scientific Permit: **SPR-0106-005**

Texas State University
Institutional Animal Care and Use Committee: **0814_0304_16**

Balcones Canyonlands National Wildlife Refuge
USFWS Special Use Permit: **21561-75648**

Travis County Natural Resources and Environmental Quality Division
Scientific Research Permit: **03-2007**

City of Austin Balcones Canyonlands Preserve: **07-001**

B. BCVI BANDED OR RESIGHTED IN STUDY REGION IN 2009

Band Combination	Band No.	Site	Land Manager	Age in 2009	Sex	Year Banded	Return	Obs
GR/SI:WH/BK	2540-16102	Vireo Ridge	TC	A3Y	M	2008	Y	WS
DB/BL:PI/SI	2540-16113	Vireo Ridge	TC	3Y	M	2008	Y	WS
NB/SI:NB/BL	2540-16136	Vireo Ridge	TC	SY	M	2008	Y	WS
PI/SI:OR/BL	2540-16156	CueE	TC	SY	M	2008	IMM	WS
DG/DB:DG/SI	2540-16178	Vireo Ridge	TC	3Y	M	2008	Y	WS
YE/SI:GR/RD	2540-16183	Vireo Ridge	TC	A3Y	M	2008	Y	WS
BK/SI:YE/OR	2540-16188	Vireo Ridge	TC	SY	M	2009	NA	WS
DG/SI:RD/MV	2540-16189	Lake Perspectives	TC	SY	M	2009	NA	WS
DG/SI:YE/BL	2540-16192	Vireo Ridge	TC	SY	M	2009	NA	WS
WH/OR:OR/SI	2540-16193	Vireo Ridge	TC	ASY	M	2009	NA	WS
OR/GR:PI/SI	2540-16195	Denali	TC	ASY	F	2009	NA	WS
YE/PI:DG/SI	2540-16197	Vireo Ridge	TC	ASY	F	2009	NA	WS
BL/SI:YE/BK	2540-16114	Cortana	COA	3Y	M	2008	Y	WS
DB/SI:DB/GR	2540-16145	Cortana	COA	3Y	M	2008	Y	WS
RD/WH:BK/SI	2540-16146	Cortana	COA	A3Y	M	2008	Y	WS
DG/YE:BK/SI	2540-16186	Ivanhoe	COA	SY	M	2009	NA	WS
GR/SI:YE/YE	2540-16191	Forest Ridge	COA	SY	M	2009	NA	WS
OR/SI:RD/RD	2540-16194	Cortana	COA	SY	M	2009	NA	WS
OR/SI:BL/GR	2540-16196	Forest Ridge	COA	SY	M	2009	NA	WS
NB/SI:BL/RD	UNKNOWN	Forest Ridge	COA	SY	F	2008	IMM	WS
BK/SI:OR/BL	2540-16101	Russell	BCNWR	ASY	M	2008	Y	WS
OR/SI:GR/BK	2540-16103	Russell	BCNWR	A3Y	M	2008	Y	WS
RD/BL:YE/SI	2540-16104	Russell	BCNWR	3Y	M	2008	Y	WS
PI/PI:DG/SI	2540-16105	Eckardt North	BCNWR	A3Y	M	2008	Y	WS
RD/SI:OR/WH	2540-16106	Rodgers East	BCNWR	A3Y	M	2008	Y	WS
BK/BL:DB/SI	2540-16108	Rodgers East	BCNWR	3Y	M	2008	Y	WS
OR/GR:YE/SI	2540-16154	Gainer	BCNWR	3Y	M	2008	Y	WS
WH/SI:BL/PI	2540-16170	Russell	BCNWR	SY	F	2008	Y	WS
MV/SI:YE/DG	2540-16173	Eckhardt South	BCNWR	3Y	M	2008	IMM	WS
DB/SI:WH/YE	2540-16179	Gainer	BCNWR	3Y	M	2008	Y	WS
PI/SI:WH/YE	2540-16185	Eckhardt South	BCNWR	SY	F	2009	NA	WS
PI/BL:YE/SI	2540-16187	Simons North	BCNWR	SY	F	2009	NA	WS
MV/SI:BK/OR	2540-16190	Simons North	BCNWR	ASY	M	2009	NA	WS
NB/SI:RD/BK	2540-16200	Rodgers West	BCNWR	SY	M	2009	NA	WS
DB/SI:MV/DB	2540-16201	Rodgers West	BCNWR	ASY	M	2009	NA	WS
BL/PI:WH/SI	2540-16202	Rodgers West	BCNWR	SY	F	2009	NA	WS
NB/NB:NB/RR	2580-48401	Rodgers East	BCNWR	SY	M	2009	NA	JPA
BL/DB:DB/RR	2580-48651	Russell	BCNWR	SY	M	2009	NA	JPA
BK/GR:OR/RR	2580-48652	Eckardt North	BCNWR	ASY	M	2009	NA	JPA
DG/RR:BK/DB	2580-48653	Eckardt North	BCNWR	ASY	M	2009	NA	JPA
GR/RR:WH/BK	2580-48654	Rodgers East	BCNWR	SY	M	2009	NA	JPA
NB/RR:OR/WH	2580-48655	Gainer	BCNWR	SY	M	2009	NA	JPA
RD/RR:DG/DB	2580-48656	Gainer	BCNWR	ASY	M	2009	NA	JPA
MV/RR:OR/WH	2580-48657	Eckhardt East	BCNWR	SY	M	2009	NA	JPA

PI/DG:OR/RR	2580-48658	Eckhardt East	BCNWR	SY	M	2009	NA	JPA
YE/WH:GR/RR	2580-48659	Gainer	BCNWR	SY	M	2009	NA	JPA
BK/DG:DB/RR	2580-48660	Gainer	BCNWR	AHY	M	2009	NA	JPA
WH/WH:MV/RR	2580-48661	Gainer	BCNWR	ASY	M	2009	NA	JPA
DB/BK:YE/RR	2580-48662	Simons South	BCNWR	L	U	2009	NA	JPA
NB/RR:PI/PI	2580-48663	Simons South	BCNWR	L	U	2009	NA	JPA
DG/BK:BK/RR	2580-48664	Simons South	BCNWR	L	U	2009	NA	JPA
GR/RR:WH/MV	2580-48665	Simons South	BCNWR	L	U	2009	NA	JPA
NB/MV:OR/RR	2580-48666	Gainer	BCNWR	AHY	F	2009	NA	JPA
YE/RR:BL/BL	2580-48667	Gainer	BCNWR	ASY	M	2009	NA	JPA
DG/RR:YE/GR	2580-48668	Rodgers West	BCNWR	SY	M	2009	NA	JPA
YE/RR:YE/YE	2580-48669	Gainer	BCNWR	SY	M	2009	NA	JPA
OR/MV:RD/RR	2580-48670	Eckardt North	BCNWR	ASY	M	2009	NA	JPA
PI/RR:NB/DG	2580-48671	Russell	BCNWR	L	U	2009	NA	JPA
WH/BL:PI/RR	2580-48672	Russell	BCNWR	L	U	2009	NA	JPA
WH/YE:BK/RR	2580-48673	Russell	BCNWR	L	U	2009	NA	JPA
RD/RR:DG/WH	2580-48674	Gainer	BCNWR	SY	M	2009	NA	JPA
PI/RR:GR/YE	2580-48675	Gainer	BCNWR	AHY	F	2009	NA	JPA
DB/YE:DG/RR	2580-48676	Gainer	BCNWR	ASY	M	2009	NA	JPA
GR/RR:RD/OR	2580-48677	Eckhardt South	BCNWR	ASY	M	2009	NA	JPA
MV/RR:OR/RD	2580-48678	Eckhardt South	BCNWR	AHY	F	2009	NA	JPA
DG/RR:WH/YE	2580-48679	Eckhardt South	BCNWR	ASY	M	2009	NA	JPA
OR/RR:NB/RD	2580-48680	Eckhardt South	BCNWR	AHY	M	2009	NA	JPA
NB/SI:BL/RD	UNKNOWN	Rodgers West	BCNWR	SY	M	2008	IMM	WS

Legend / Codes

NB = no band	SY = Second Year
SI = Silver (USFWS aluminum band)	ASY = After Second Year
RR = Red metal (red anodized USFWS aluminum band)	A3Y = After Third Year
BK = Black	AHY = After Hatch Year
BL = Blue	L = Local
DB = Dark Blue	U = Unknown
DG = Dark Green	IMM = Immigrant
GR = Green	JPA = Juan Pablo Assmus
MV = Mauve	WS = William Simper
PI = Pink	TC = Travis County
OR = Orange	COA = City of Austin
RD = Red	BCNWR = Balcones Canyonlands National Wildlife Refuge
WH = White	
YE = Yellow	

C. NOTES CONCERNING ACCOMPANYING DIGITAL FILES

TE168189_BCVI_Survey_Property_2009.shp

TE168189_BCVI_Observations_2009.shp

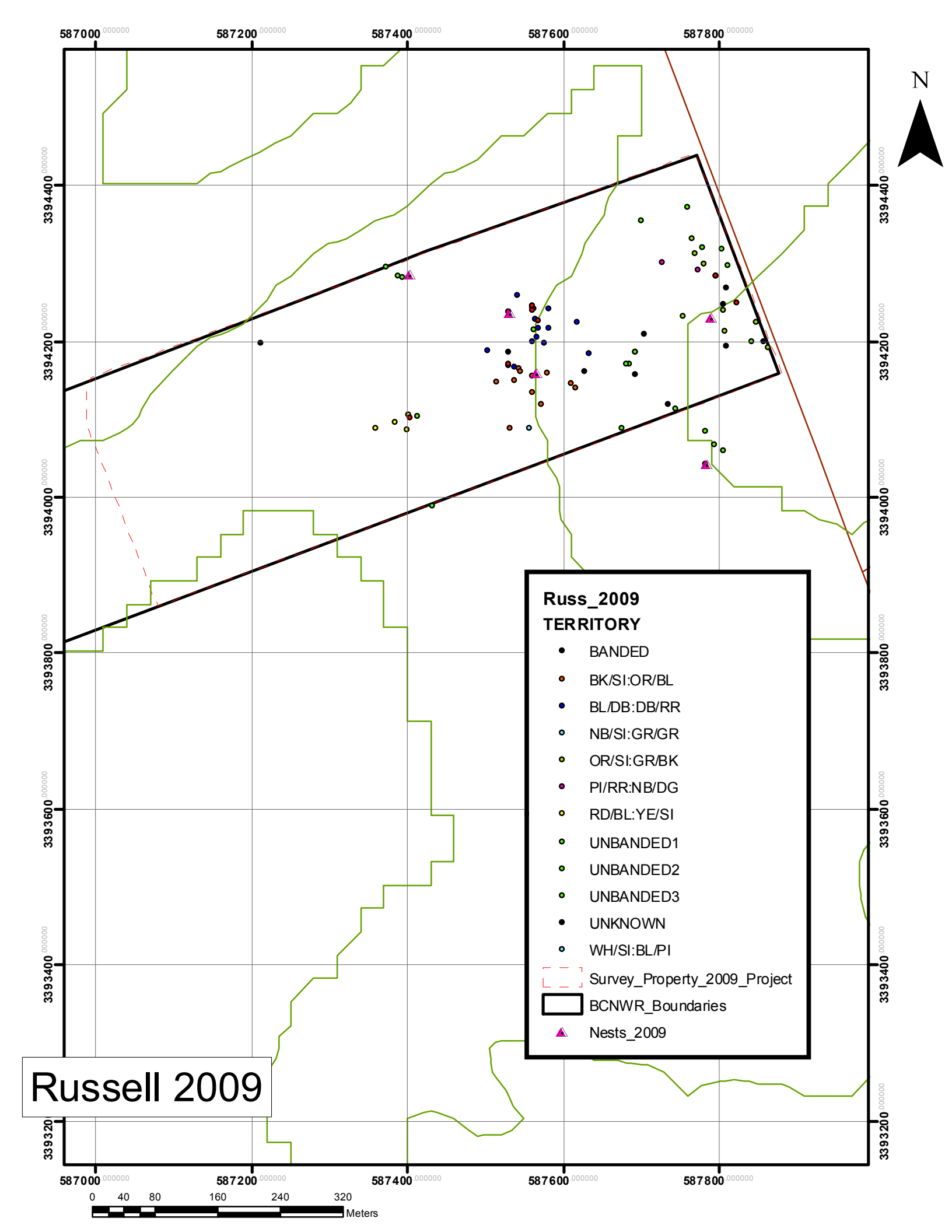
TE168189 BCVI Survey Property Data 2009.xls

Location data used for bird registrations, nests, and banding sites were originally recorded using handheld GPS receivers (Garmin eTrex Legend and Rino 120) configured for Universal Transverse Mercator projection, NAD 83, and with WAAS enabled. Most detections were initially auditory although visual confirmation was usually obtained (all records in the 'Obs_Type' data field were set to 'Visual' in the accompanying observation data file). Locations were usually 'actual' in the sense that the bird detected and associated with a given GPS location was generally within 20-50 m of the position recorded (all records in the 'Loc_Type' data field were set to 'Actual' in the accompanying observation data file).

The survey-property shapefile**,** TE168189_BCVI_Survey_Property_2009.shp, contains polygon features along with associated acreage values for each study site. All additional information fields pertaining to individual surveys are included in the accompanying Excel file, TE168189 BCVI Survey Property Data 2009.xls. Study site polygons were constructed by creating minimum convex polygons for all BCVI registrations recorded in the period 2007-2009, adding a 115m buffer and clipping them to refuge property boundaries (unclipped polygons were used for dispersal analysis). Recorded survey times are given when those records are available and are conservative (in some cases determined by the recorded time for the first and last waypoints taken that day). Start temperatures are provided for surveys when they were recorded.

C. MAPS

The maps provided on the following pages are arranged in approximate order proceeding from north to south across the study region. Gridlines on maps refer to the UTM coordinate system Zone 14N, NAD83 datum, except the Vireo Ridge (North Point), Vireo Ridge (Denali), and Cuevas East tract maps which show gridlines in the Geographic Coordinate System (latitude/longitude) , NAD83 datum.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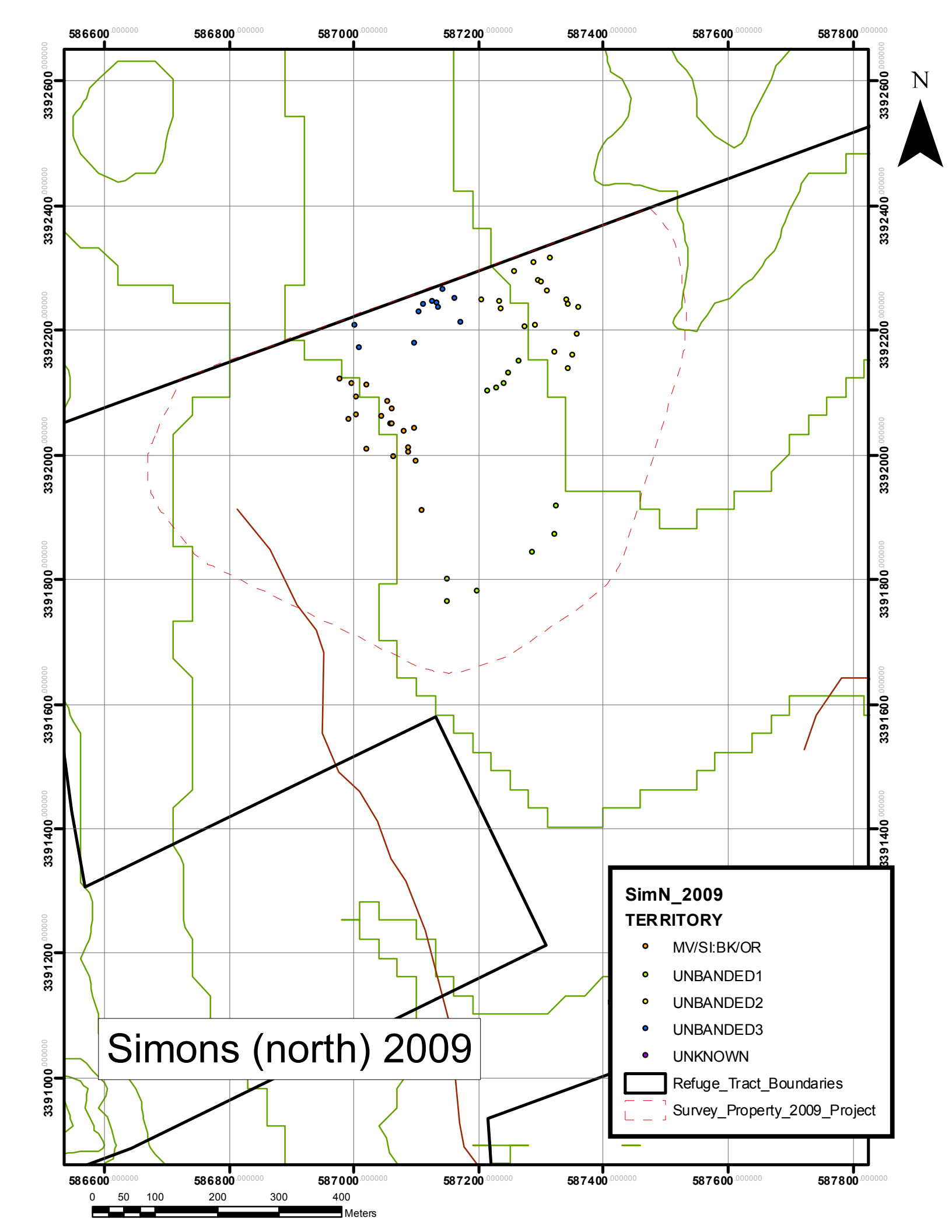
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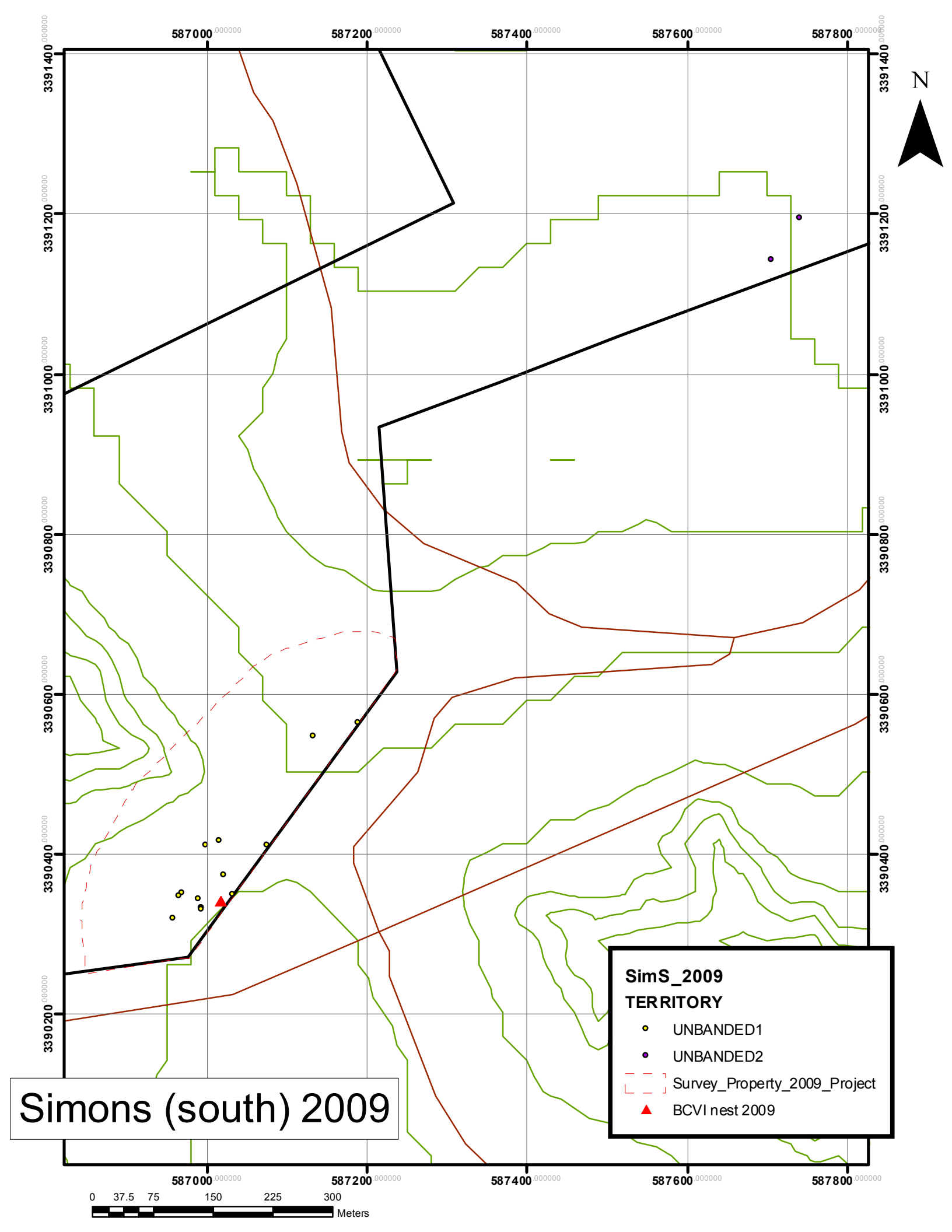
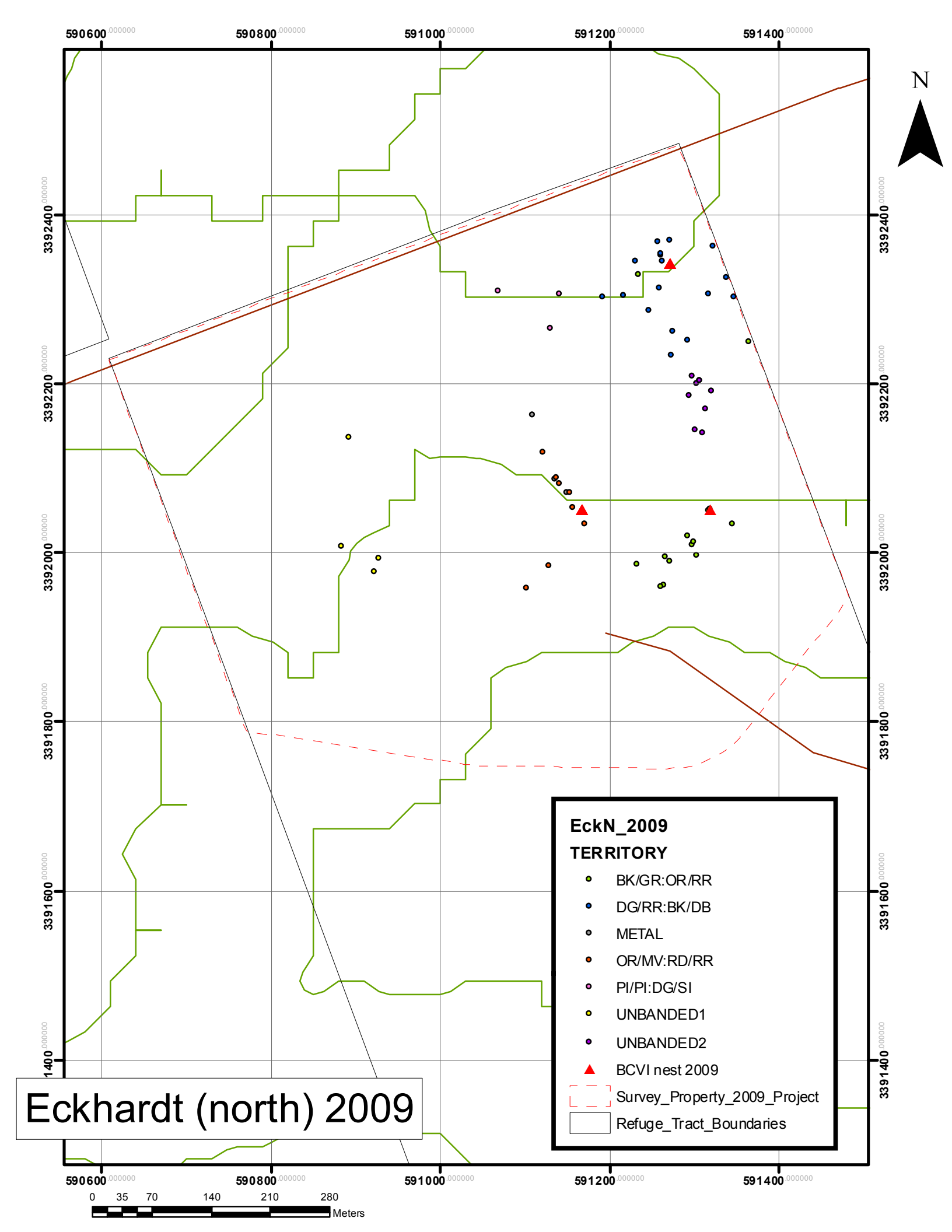
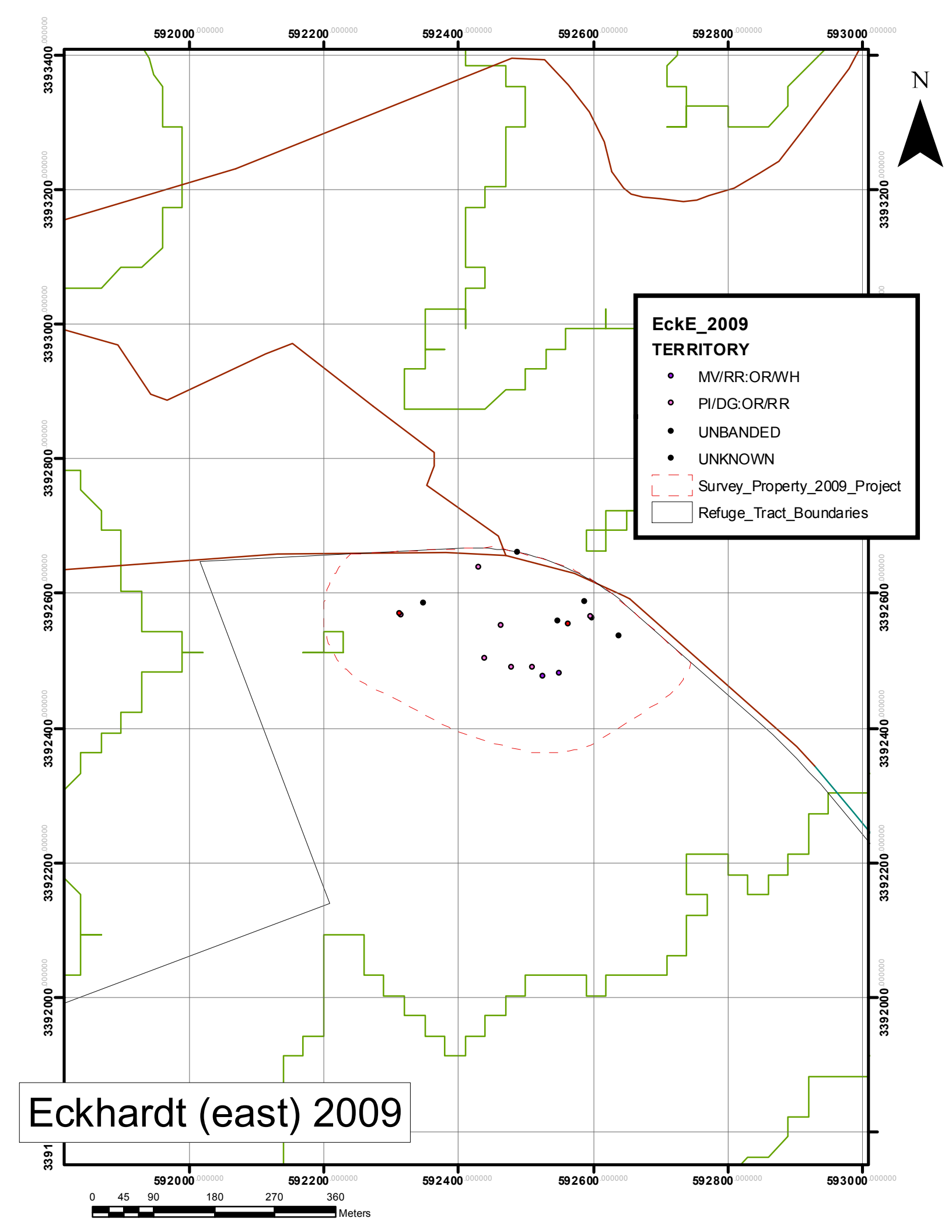
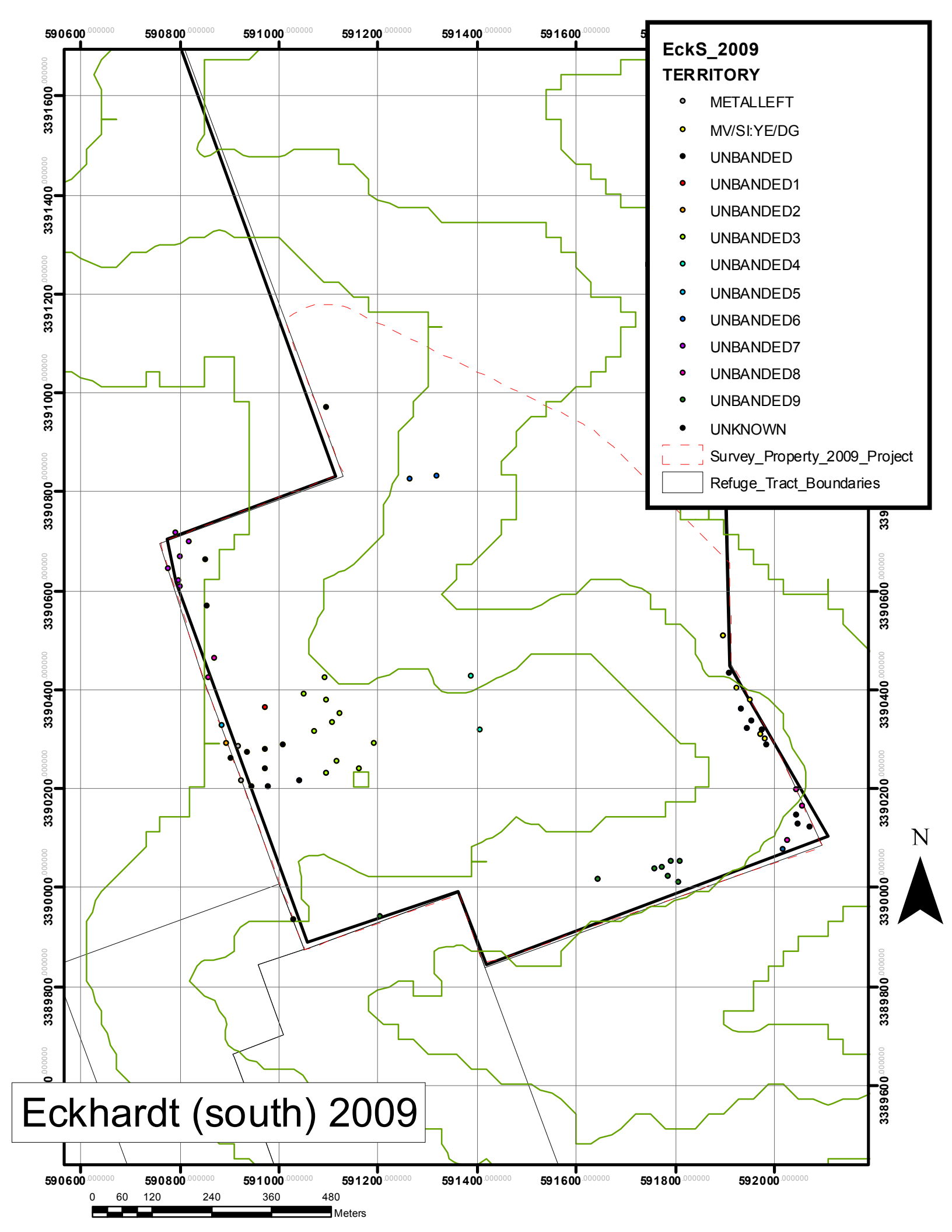
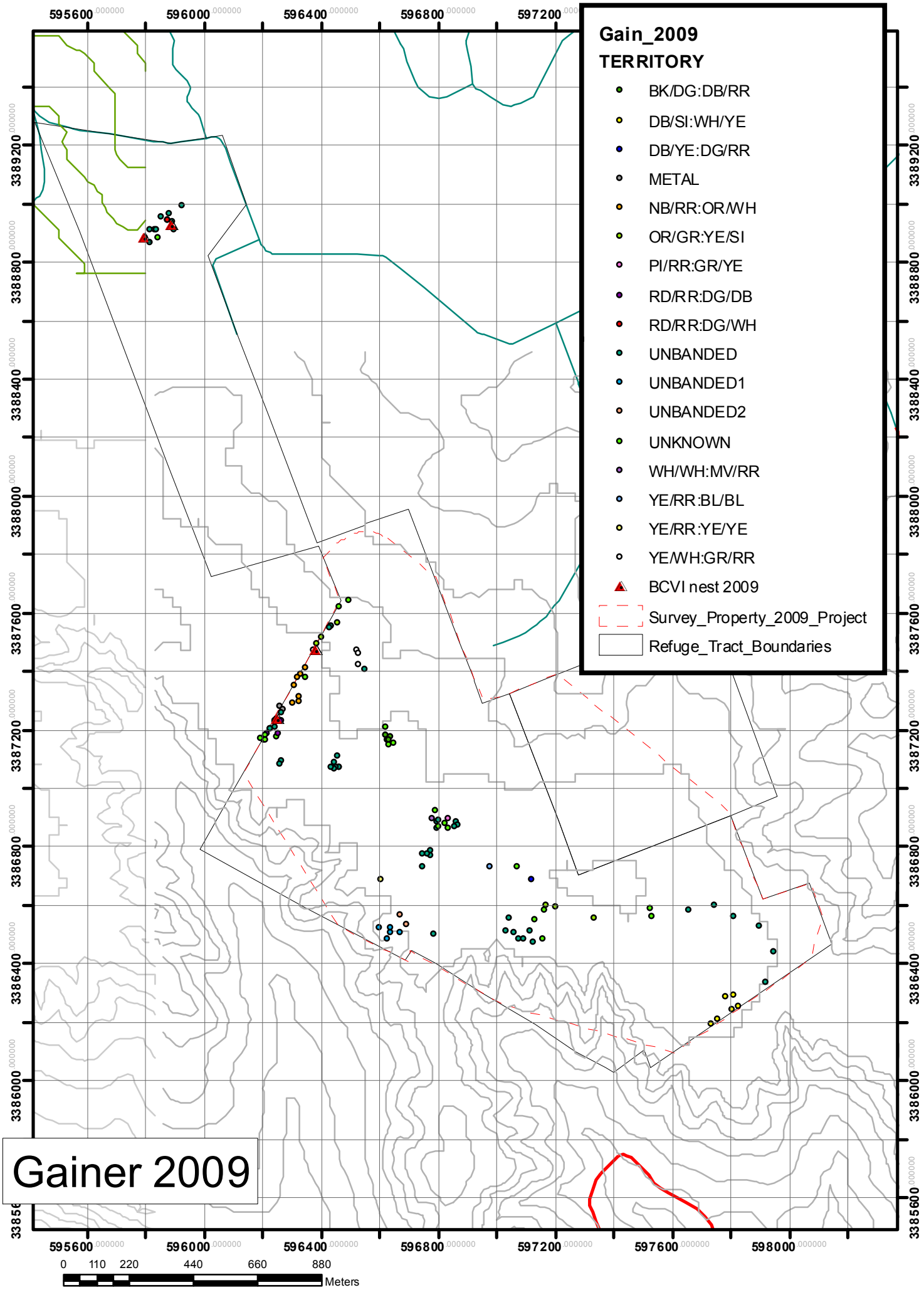
3391600.000000
3391400.000000
3391200.000000
3391000.000000
N
SimN_2009
TERRITORY
MV/SI:BK/OR
UNBANDED1
UNBANDED2
UNBANDED3
UNKNOWN
Refuge_Tract_Boundaries
Survey_Property_2009_Project
Simons (north) 2009
0 50 100 200 300 400
Meters

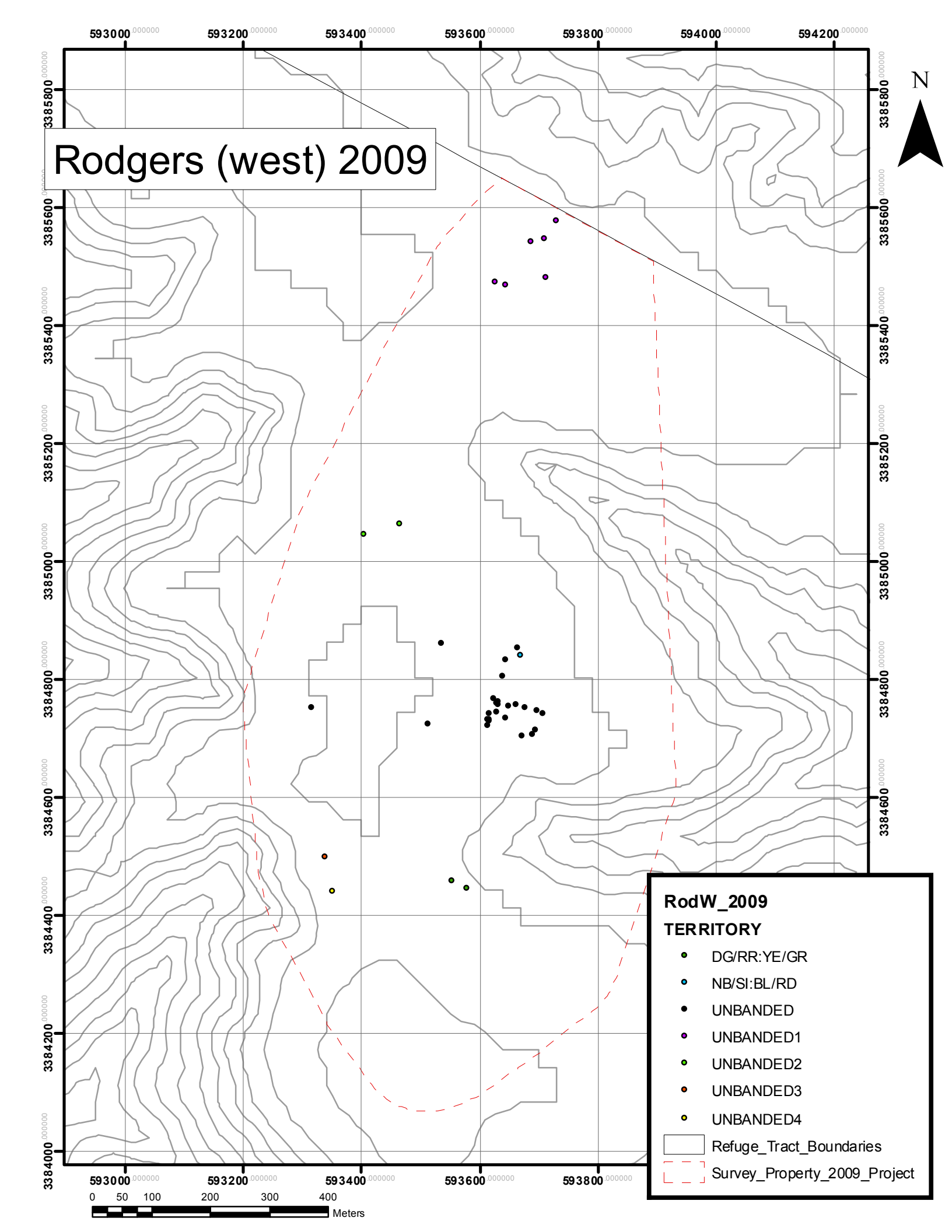

587000
587200
587400
587600
587800
3391400
3391200
3391000
3390800
3390600
3390400
3390200
N
SimS_2009
TERRITORY
UNBANDED1
UNBANDED2
Survey_Property_2009_Project
BCVI nest 2009
Simons (south) 2009
0
37.5
75
150
225
300
Meters

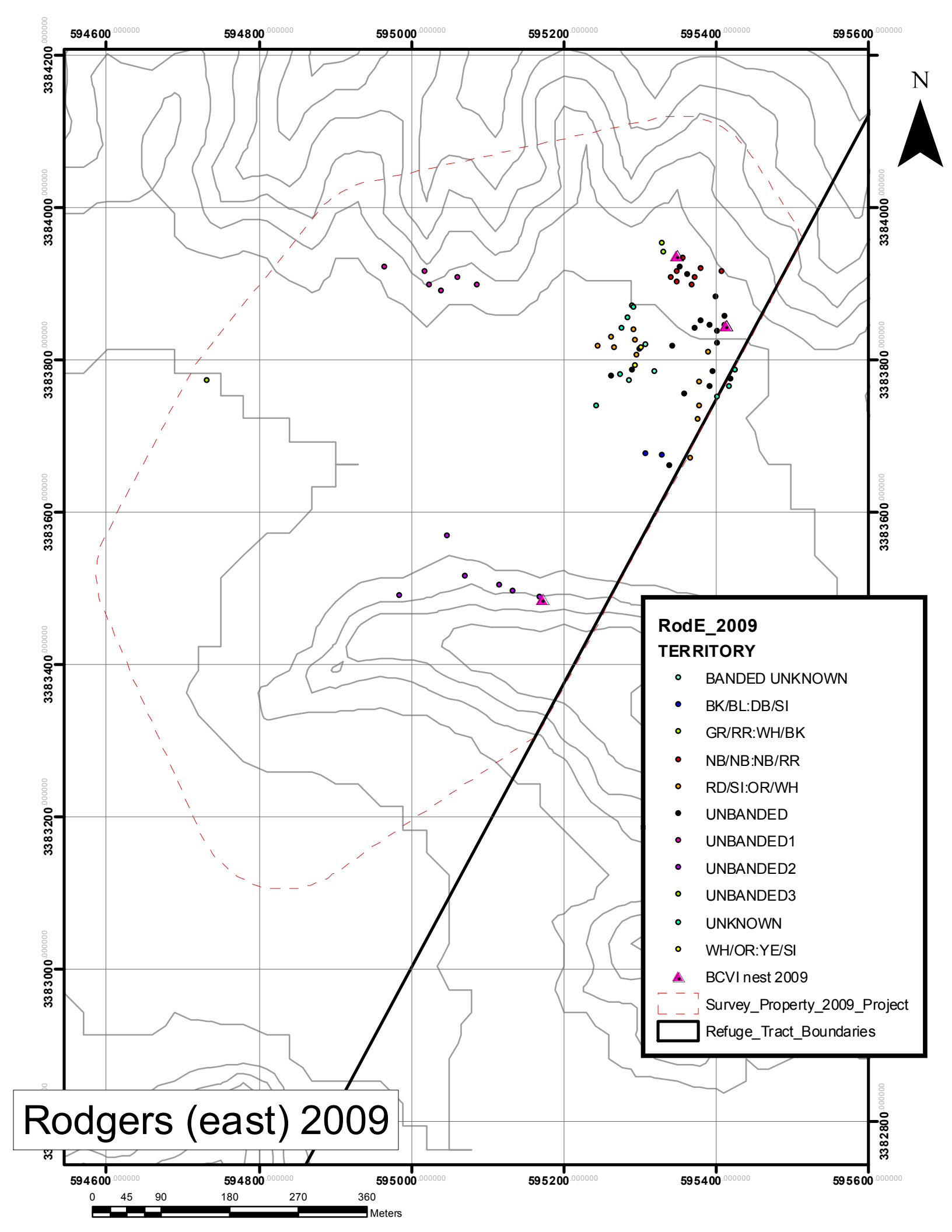

590600
590800
591000
591200
591400
3392400
3392200
3392000
3391800
3391600
3391400
N
EckN_2009
TERRITORY
BK/GR:OR/RR
DG/RR:BK/DB
METAL
OR/MV:RD/RR
PI/PI:DG/SI
UNBANDED1
UNBANDED2
BCVI nest 2009
Survey_Property_2009_Project
Refuge_Tract_Boundaries
Eckhardt (north) 2009
0 35 70 140 210 280
Meters

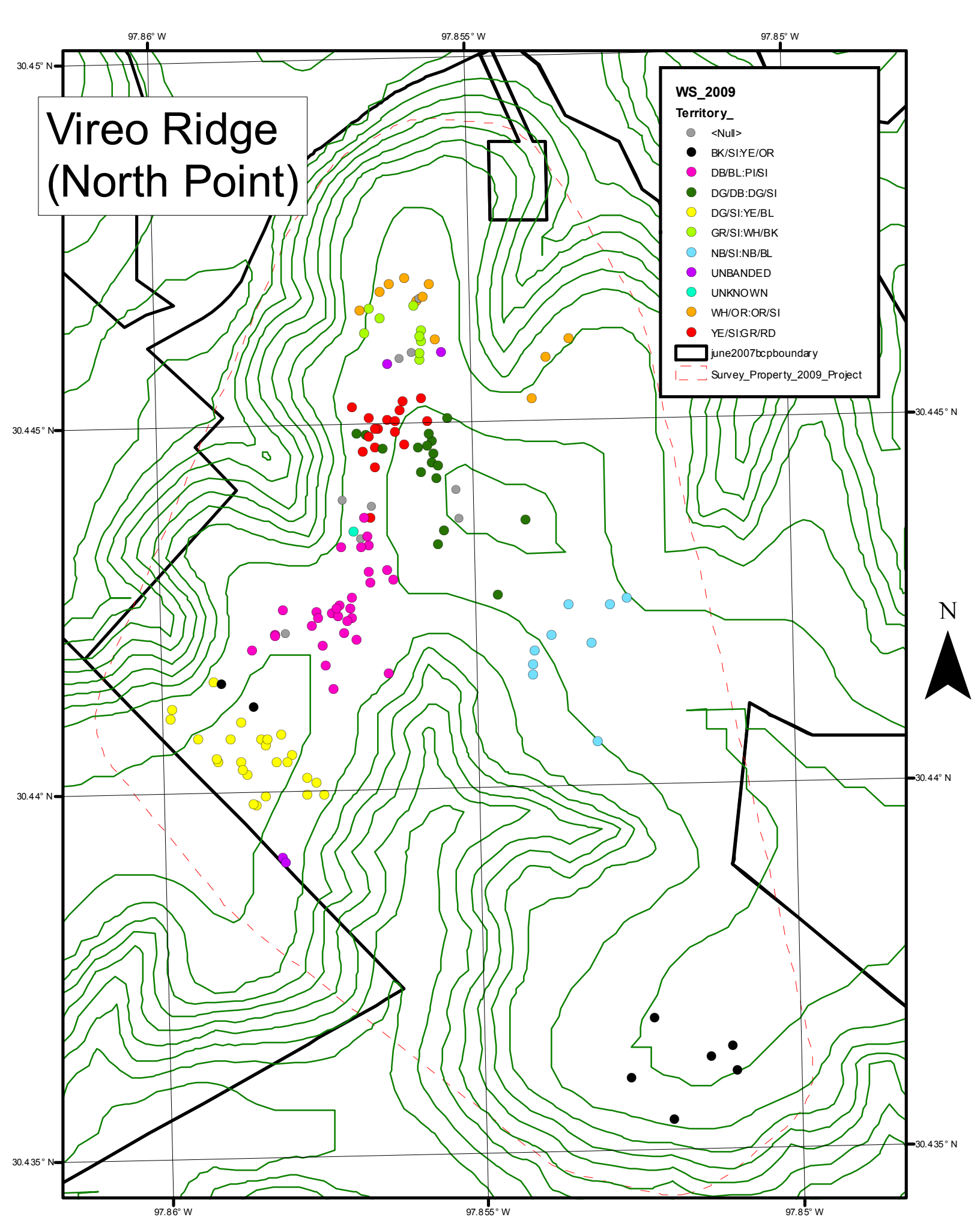

592000
592200
592400
592600
592800
593000
3393400
3393200
3393000
3392800
3392600
3392400
3392200
3392000
N
EckE_2009
TERRITORY
MV/RR:OR/WH
PI/DG:OR/RR
UNBANDED
UNKNOWN
Survey_Property_2009_Project
Refuge_Tract_Boundaries
Eckhardt (east) 2009
0
45
90
180
270
360
Meters

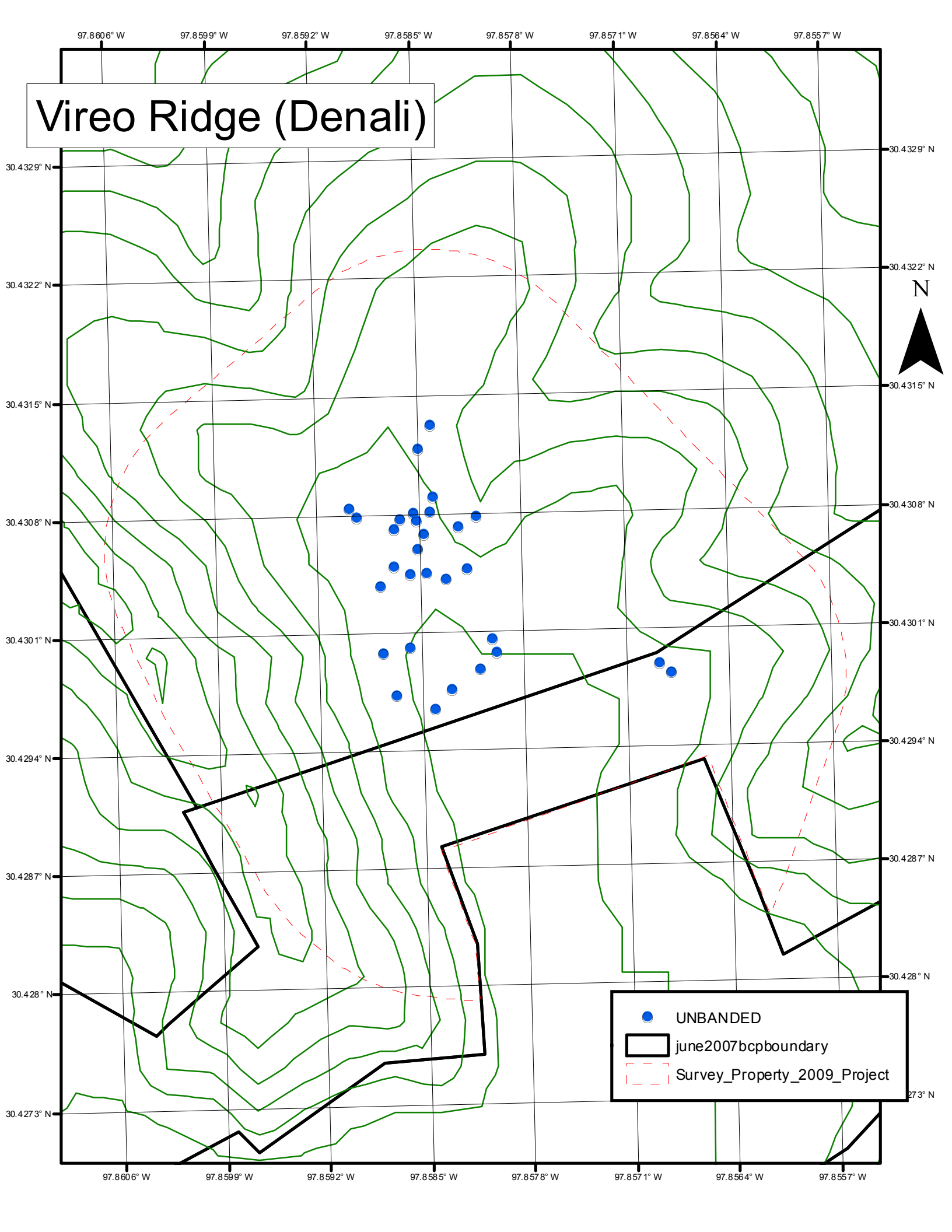

EckS_2009
TERRITORY
METALLEFT
MV/SI:YE/DG
UNBANDED
UNBANDED1
UNBANDED2
UNBANDED3
UNBANDED4
UNBANDED5
UNBANDED6
UNBANDED7
UNBANDED8
UNBANDED9
UNKNOWN
Survey_Property_2009_Project
Refuge_Tract_Boundaries
590600
590800
591000
591200
591400
591600
591800
592000
3391600
3391400
3391200
3391000
3390800
3390600
3390400
3390200
3390000
3389800
3389600
N
0 60 120 240 360 480
Meters
Eckhardt (south) 2009

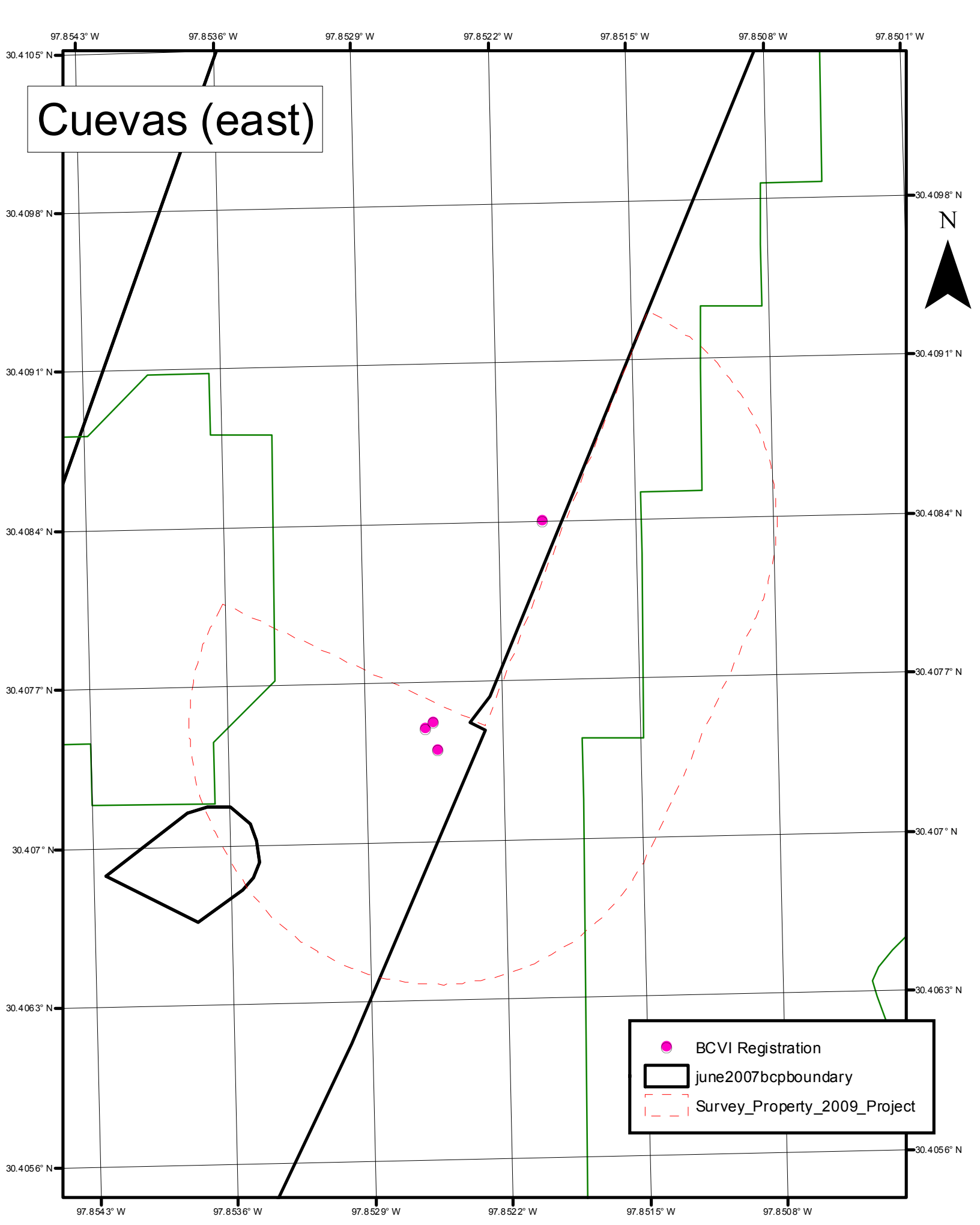

Gain_2009
TERRITORY
BK/DG:DB/RR
DB/SI:WH/YE
DB/YE:DG/RR
METAL
NB/RR:OR/WH
OR/GR:YE/SI
PI/RR:GR/YE
RD/RR:DG/DB
RD/RR:DG/WH
UNBANDED
UNBANDED1
UNBANDED2
UNKNOWN
WH/WH:MV/RR
YE/RR:BL/BL
YE/RR:YE/YE
YE/WH:GR/RR
BCVI nest 2009
Survey_Property_2009_Project
Refuge_Tract_Boundaries
N
595600
596000
596400
596800
597200
597600
598000
3389200
3388800
3388400
3388000
3387600
3387200
3386800
3386400
3386000
3385600
0
110
220
440
660
880
Meters
Gainer 2009

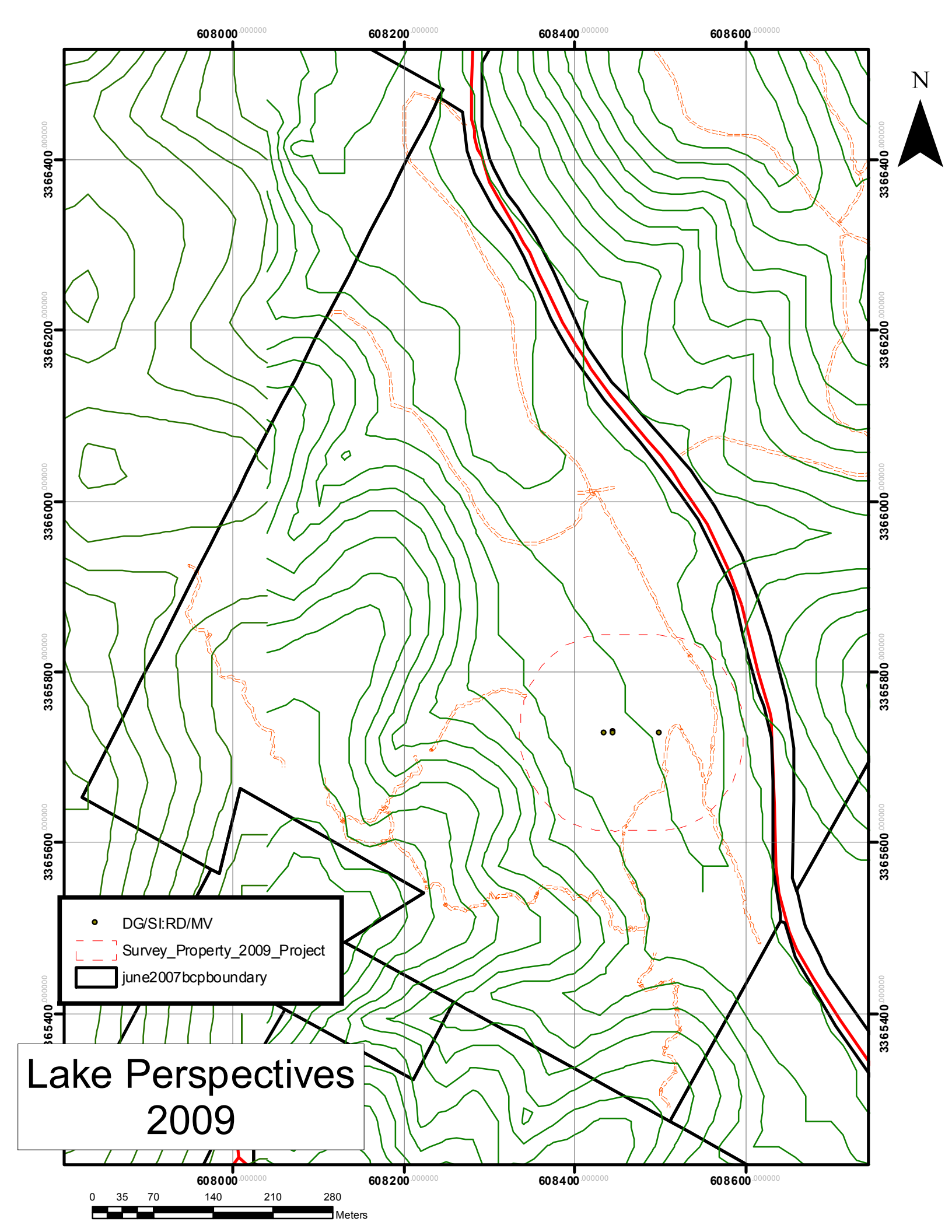

Rodgers (west) 2009
N
593000
593200
593400
593600
593800
594000
594200
3385800
3385600
3385400
3385200
3385000
3384800
3384600
3384400
3384200
3384000
RodW_2009
TERRITORY
DG/RR:YE/GR
NB/SI:BL/RD
UNBANDED
UNBANDED1
UNBANDED2
UNBANDED3
UNBANDED4
Refuge_Tract_Boundaries
Survey_Property_2009_Project
0 50 100 200 300 400
Meters

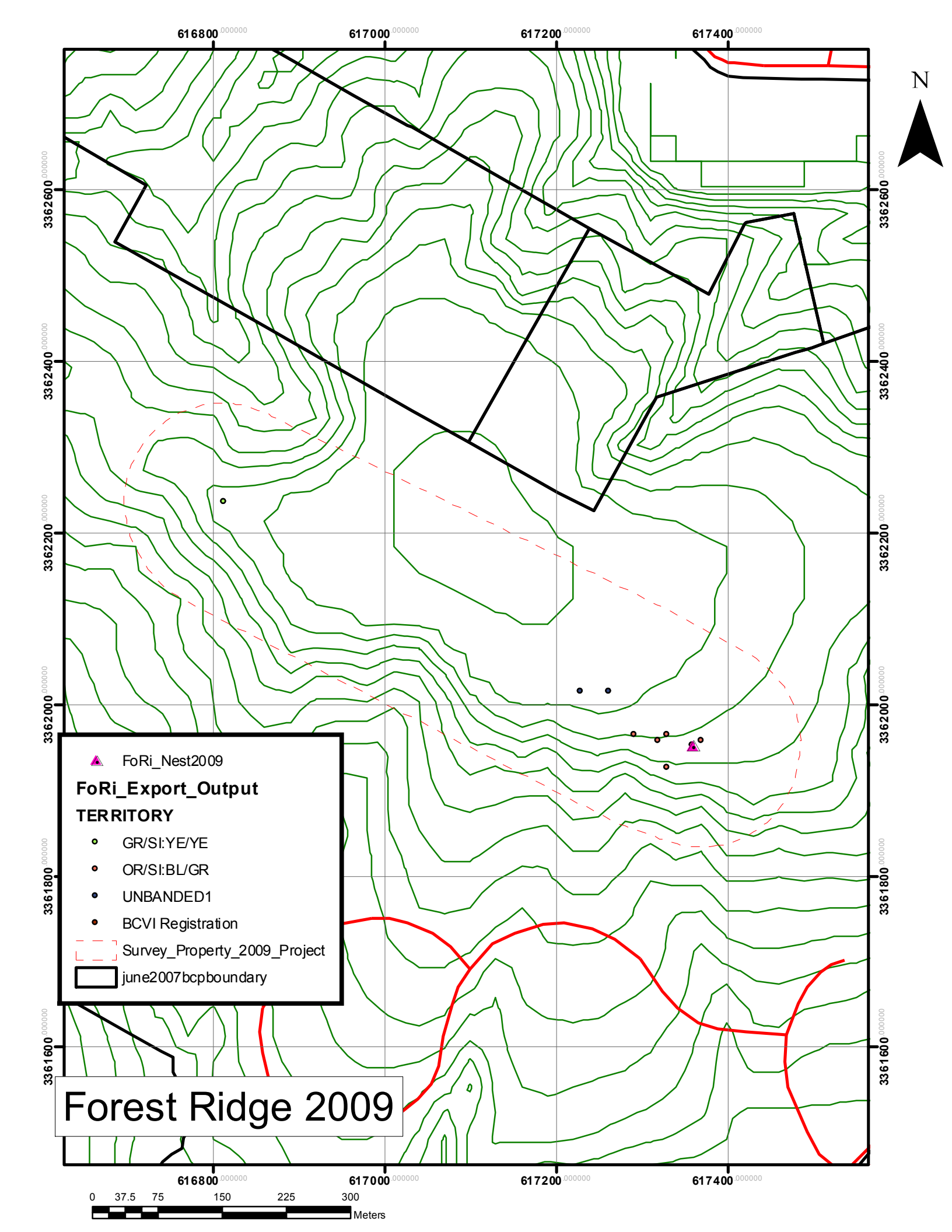

Rodgers (east) 2009
N
RodE_2009
TERRITORY
BANDED UNKNOWN
BK/BL:DB/SI
GR/RR:WH/BK
NB/NB:NB/RR
RD/SI:OR/WH
UNBANDED
UNBANDED1
UNBANDED2
UNBANDED3
UNKNOWN
WH/OR:YE/SI
BCVI nest 2009
Survey_Property_2009_Project
Refuge_Tract_Boundaries
594600
594800
595000
595200
595400
595600
3384200
3384000
3383800
3383600
3383400
3383200
3383000
3382800
0
45
90
180
270
360
Meters

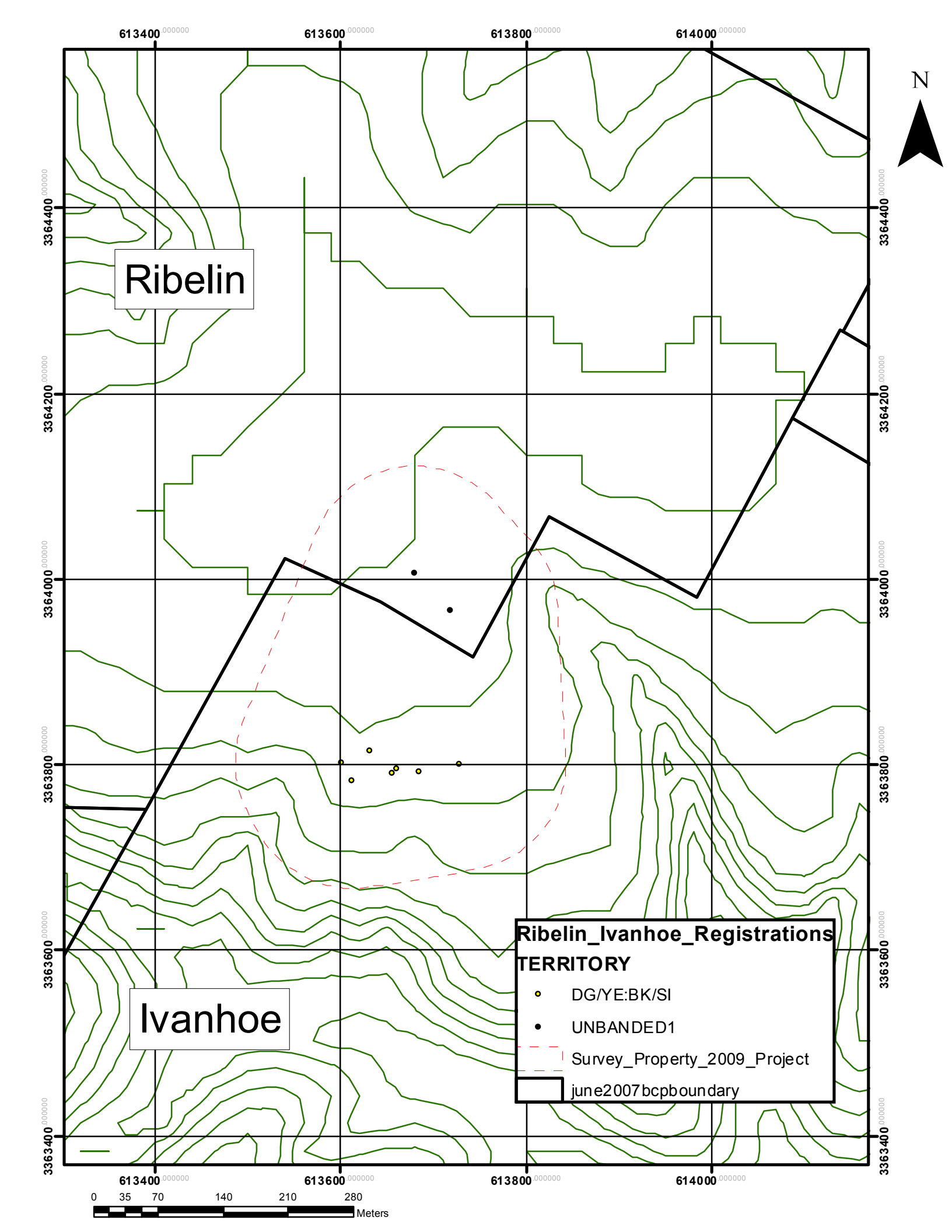

Vireo Ridge
(North Point)
WS_2009
Territory_
<Null>
BK/SI:YE/OR
DB/BL:PI/SI
DG/DB:DG/SI
DG/SI:YE/BL
GR/SI:WH/BK
NB/SI:NB/BL
UNBANDED
UNKNOWN
WH/OR:OR/SI
YE/SI:GR/RD
june2007bcpboundary
Survey_Property_2009_Project
97.86° W
97.855° W
97.85° W
30.445° N
30.44° N
30.435° N
N

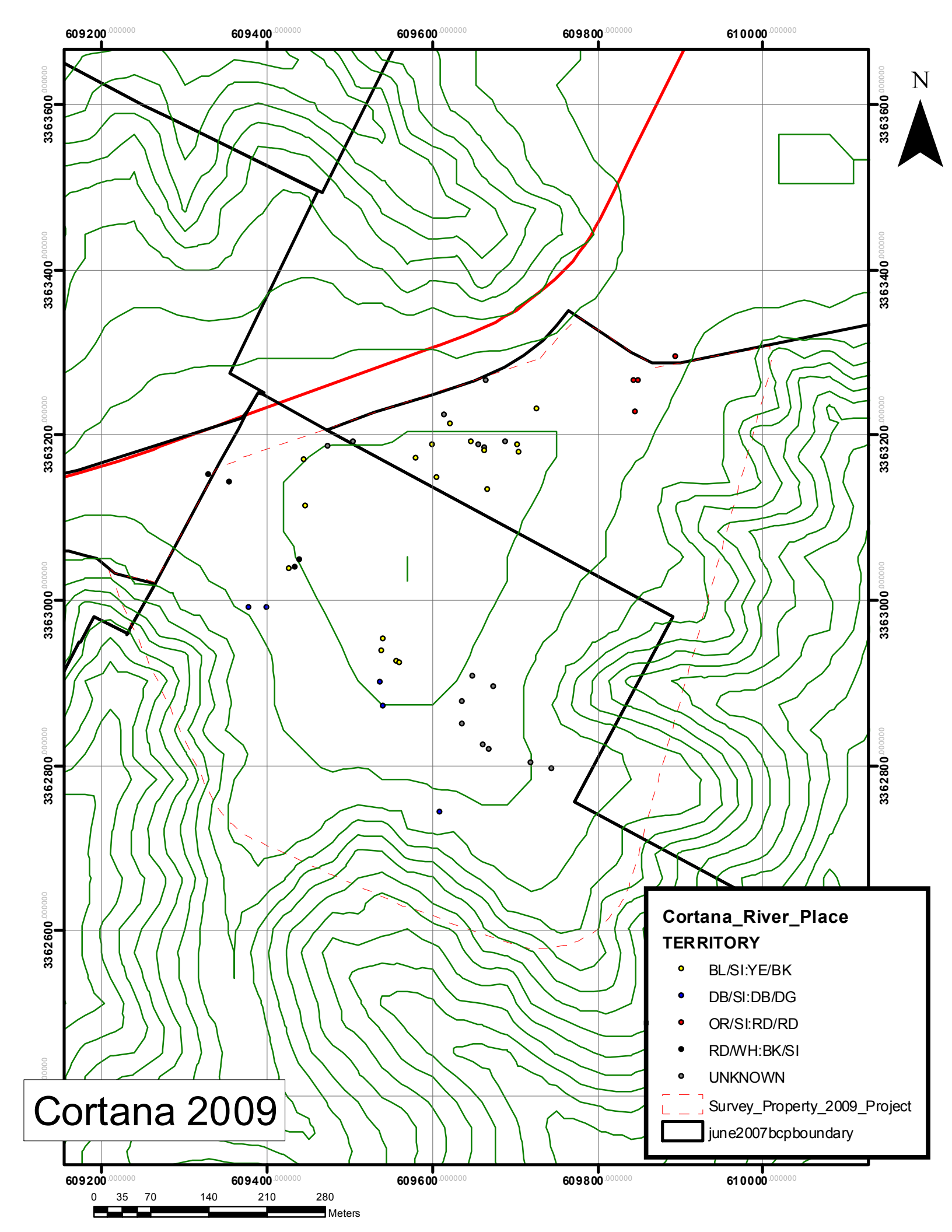

Vireo Ridge (Denali)
97.8606° W
97.8599° W
97.8592° W
97.8585° W
97.8578° W
97.8571° W
97.8564° W
97.8557° W
30.4329° N
30.4322° N
30.4315° N
30.4308° N
30.4301° N
30.4294° N
30.4287° N
30.428° N
30.4273° N
N
UNBANDED
june2007bcpboundary
Survey_Property_2009_Project


Cuevas (east)
97.8543° W
97.8536° W
97.8529° W
97.8522° W
97.8515° W
97.8508° W
97.8501° W
30.4105° N
30.4098° N
30.4091° N
30.4084° N
30.4077° N
30.407° N
30.4063° N
30.4056° N
N
BCVI Registration
june2007bcpboundary
Survey_Property_2009_Project


608000.000000
608200.000000
608400.000000
608600.000000
3366400.000000
3366200.000000
3366000.000000
3365800.000000
3365600.000000
3365400.000000
N
DG/SI:RD/MV
Survey_Property_2009_Project
june2007bcpboundary
Lake Perspectives
2009
0 35 70 140 210 280
Meters


616800
617000
617200
617400
3362600
3362400
3362200
3362000
3361800
3361600
N
FoRi_Nest2009
FoRi_Export_Output
TERRITORY
GR/SI:YE/YE
OR/SI:BL/GR
UNBANDED1
BCVI Registration
Survey_Property_2009_Project
june2007bcpboundary
Forest Ridge 2009
0 37.5 75 150 225 300
Meters


613400
613600
613800
614000
3364400
3364200
3364000
3363800
3363600
3363400
N
Ribelin
Ivanhoe
Ribelin_Ivanhoe_Registrations
TERRITORY
DG/YE:BK/SI
UNBANDED1
Survey_Property_2009_Project
june2007bcpboundary
0 35 70 140 210 280
Meters


609200
609400
609600
609800
610000
3363600
3363400
3363200
3363000
3362800
3362600
N
Cortana_River_Place
TERRITORY
BL/SI:YE/BK
DB/SI:DB/DG
OR/SI:RD/RD
RD/WH:BK/SI
UNKNOWN
Survey_Property_2009_Project
june2007bcpboundary
Cortana 2009
0 35 70 140 210 280
Meters