Biology and Conservation of the Alameda Whipsnake

Alameda County Resource
Conservation District

May 9-10, 2018

Prepared by
Swaim Biological, Inc.

Taxonomy

Masticophis lateralis - (Hallowell, 1853)
Proc. Acad. Nat. Sci. Philadelphia 6: 236-238

Masticophis lateralis euryxanthus - (Riemer, 1954)
Copeia 1954: 45-58

Masticophis l. euryxanthus = *Coluber l. euryxanthus*
Alameda whipsnake = Alameda striped racer
Myers *et al.* (2017) *Copeia* 105(4):642-650.

Richmond *et al.* (2016) *Herpetologica* 72(3): 202-213

Two Subspecies of California whipsnake

Alameda whipsnake

(*Masticophis lateralis euryxanthus*)

Chaparral whipsnake

(*Masticophis lateralis lateralis*)

California whipsnake

Range: From northern California to west of the Sierran crest down into Baja California

Habitat: Distribution aligns with general distribution of Chaparral and scrublands where it forms a mosaic with woodlands, grasslands, and riparian scrub habitats.

- Slender body, fast moving, diurnal
- Large head and eyes
- Adults up to 5 feet total length
- Relatively large hatchlings

- Alameda whipsnake (*Masticophis lateralis euryxanthus)*
- State Threatened (1971) and Federally Threatened (1997)
- Subspecies of California whipsnake

Alameda whipsnake

Range: Contra Costa County, Alameda County (Most of it???)

- Described by Riemer in 1954
- All of the 8 differences between subspecies are color characteristics

Alameda whipsnake

Scale Types

Loreal scale

Dorsum

Venter

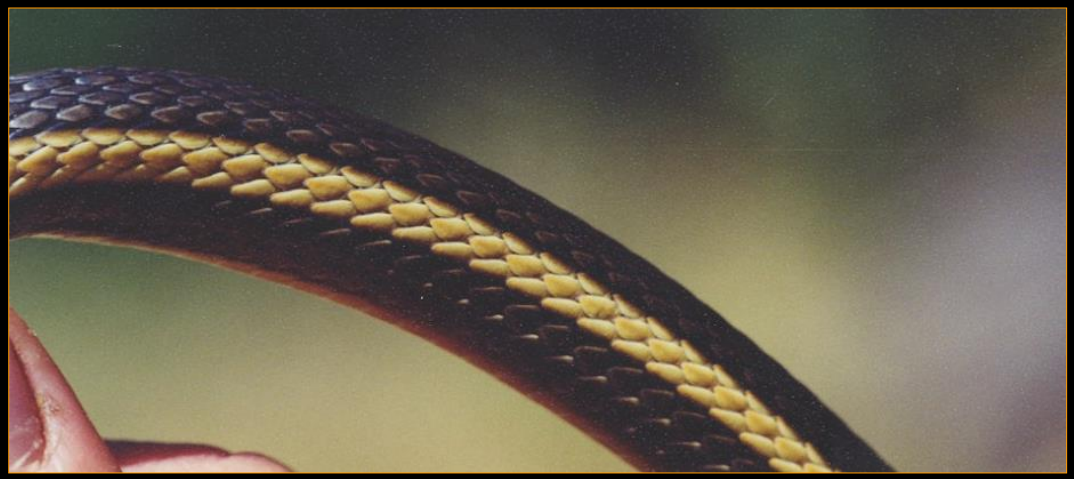
Rostral

Parietals

1.Width of Lateral Stripe:

Distinct, ≥ 1 plus 2 half scale rows wide or nearly 2 full scale rows >1.5 scale rows

Alameda whipsnake



<1.5 scale Rows wide

Chaparral whipsnake

2. Spotting on chin and ventral surface

Almost none

Minimal

Moderate

Moderate -heavy

Heavy

Degree of spotting

Alameda whipsnake

Chaparral whipsnake

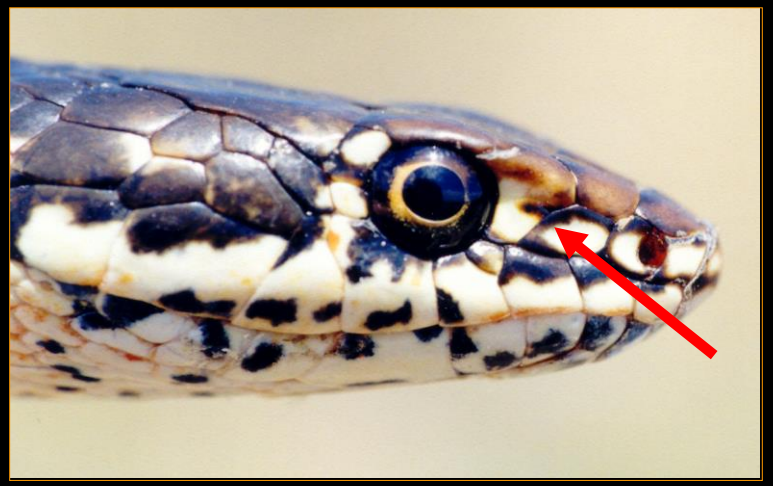
3. Presence or absence of dark vertical lines along margins of loreal scale

Alameda whipsnake

Dark vertical lines usually absent

Chaparral whipsnake

Dark vertical lines usually present



4. Presence or Absence of Horizontal Stripe on rostral scale

Alameda whipsnake

Usually absent

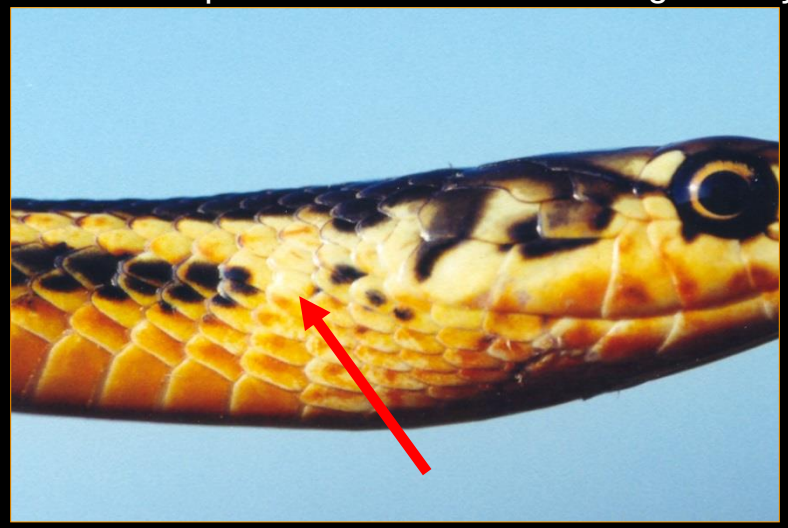
Chaparral whipsnake

Usually present

5. Presence or absence of Direct communication of light ventral color with lateral stripe

Alameda whipsnake

Connection present in counties touching the bay



Chaparral whipsnake

6. Absence of dorsal color on edge of ventral scales

Alameda whipsnake 4.5-6 x the SP Distance

Chaparral whipsnake **1.5 – 4 x the SP Distance**

7. Dorsal Coloration

Alameda whipsnake

Sooty Black

Chaparral whipsnake

Dark Brown, Olive, or Grayish

8. Suffusion of orange pigment on anterior light portions of the snake

Heavy orange-Rufous

Moderate orange-rufous

Light orange-rufous

Yellow

Light cream

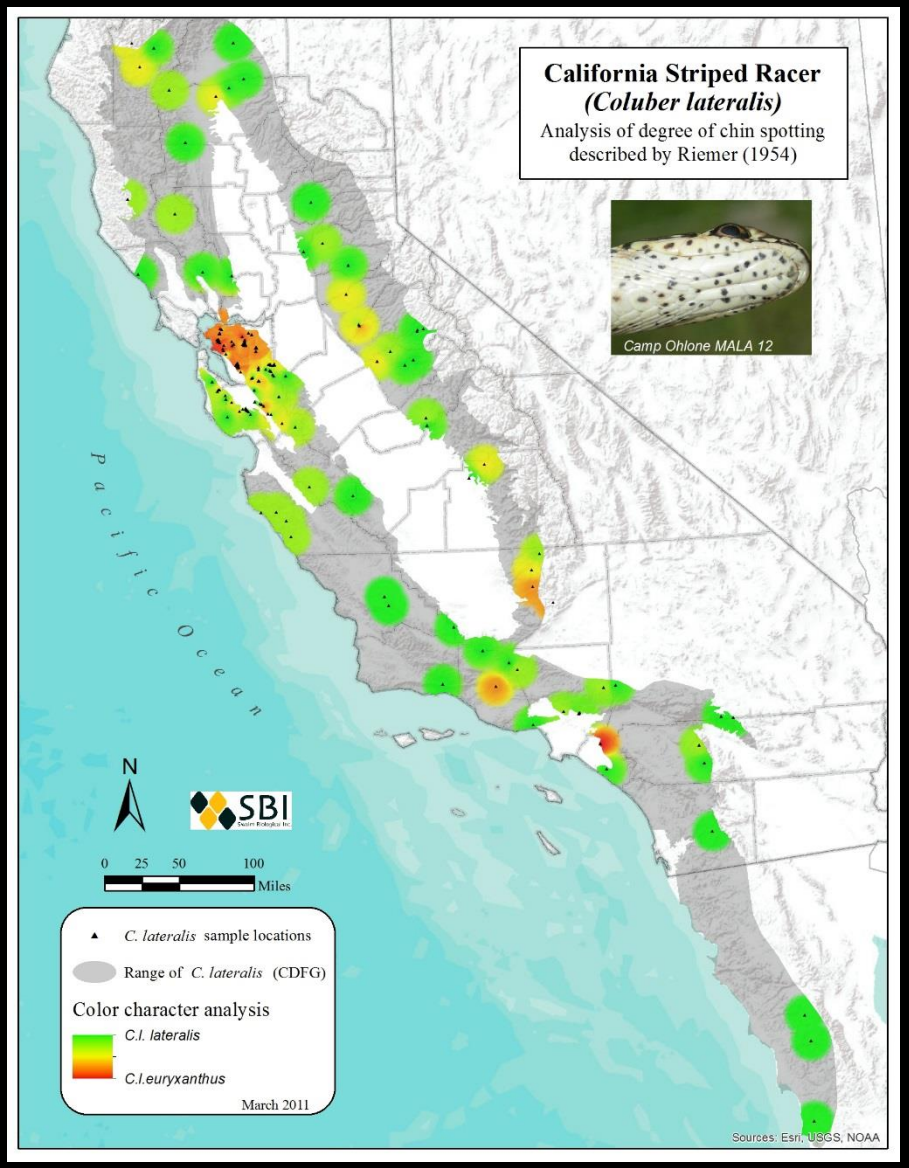
Alameda whipsnake

Color Gradient

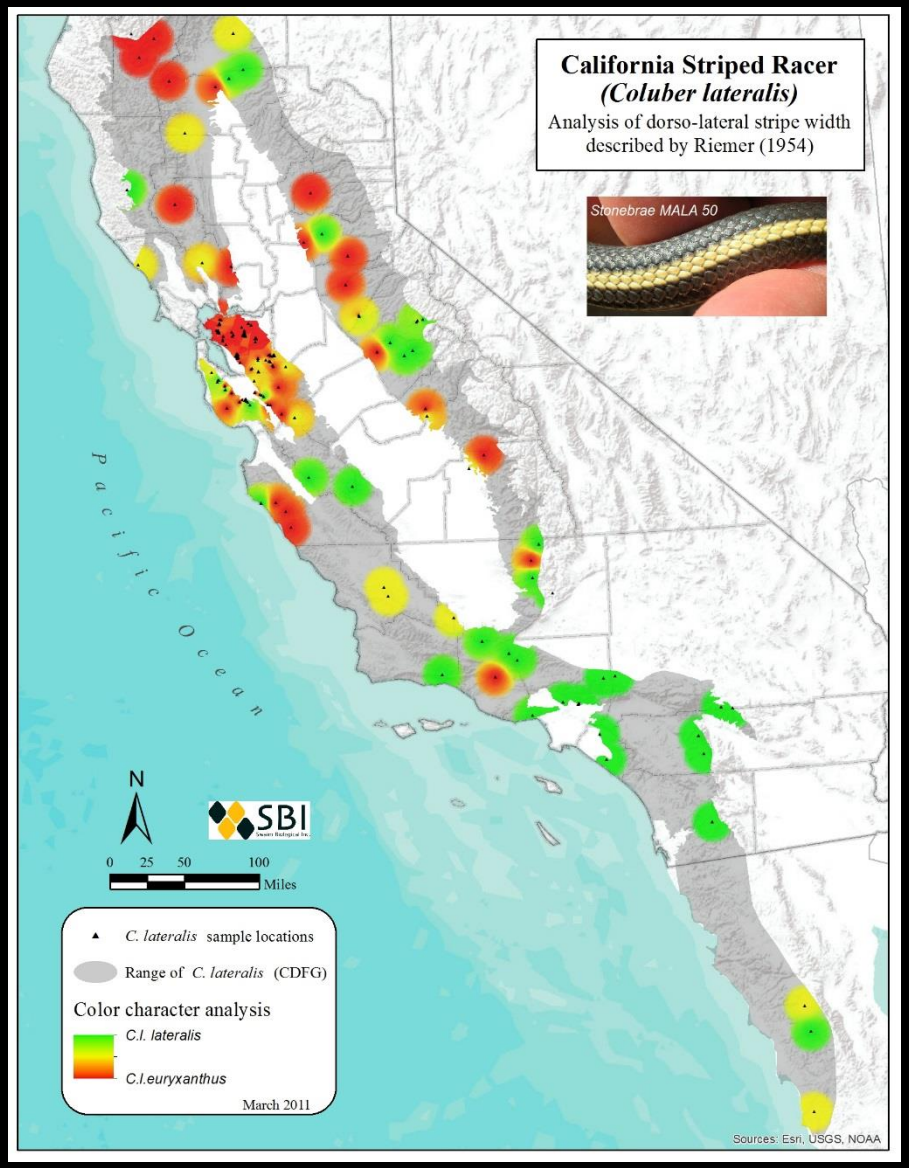
Chaparral whipsnake

Range-wide analysis of color characters

Degree of chin spotting

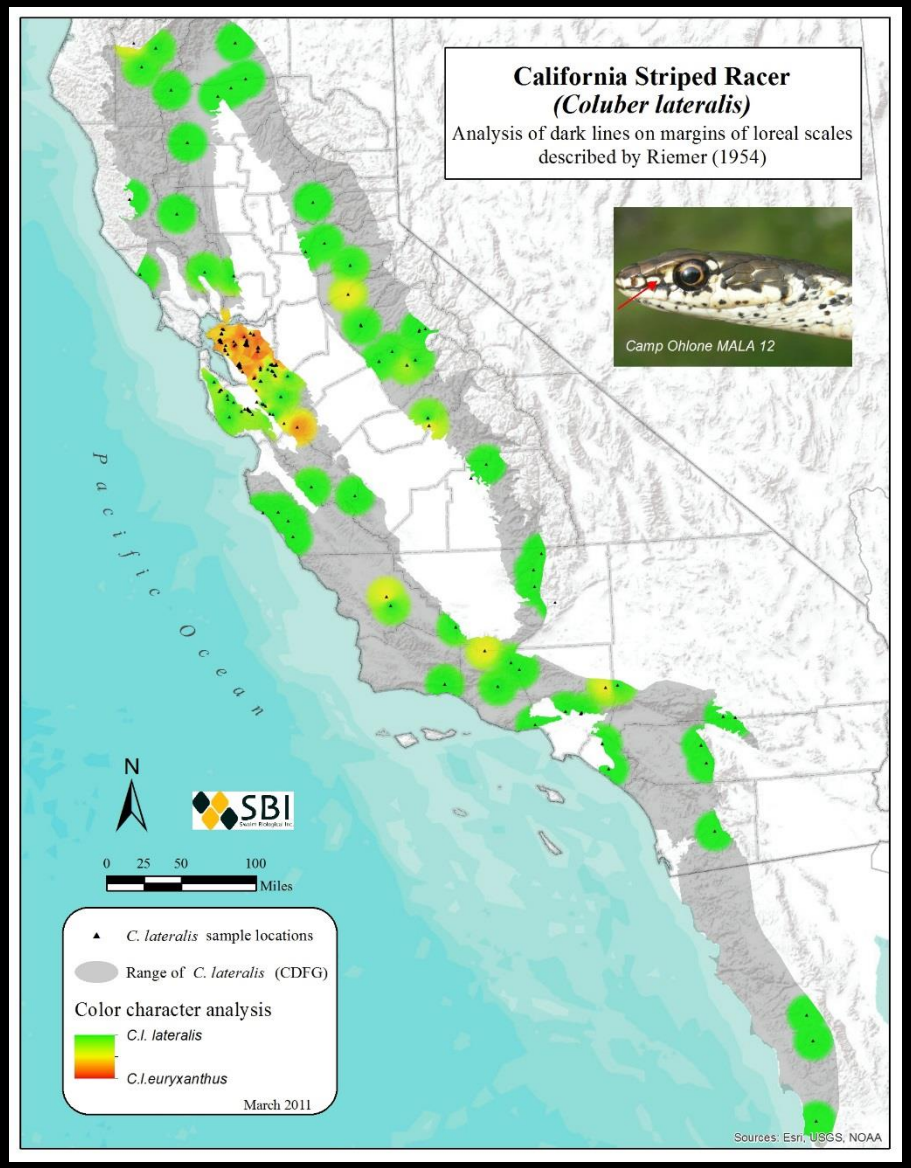


Width of Lateral Stripe

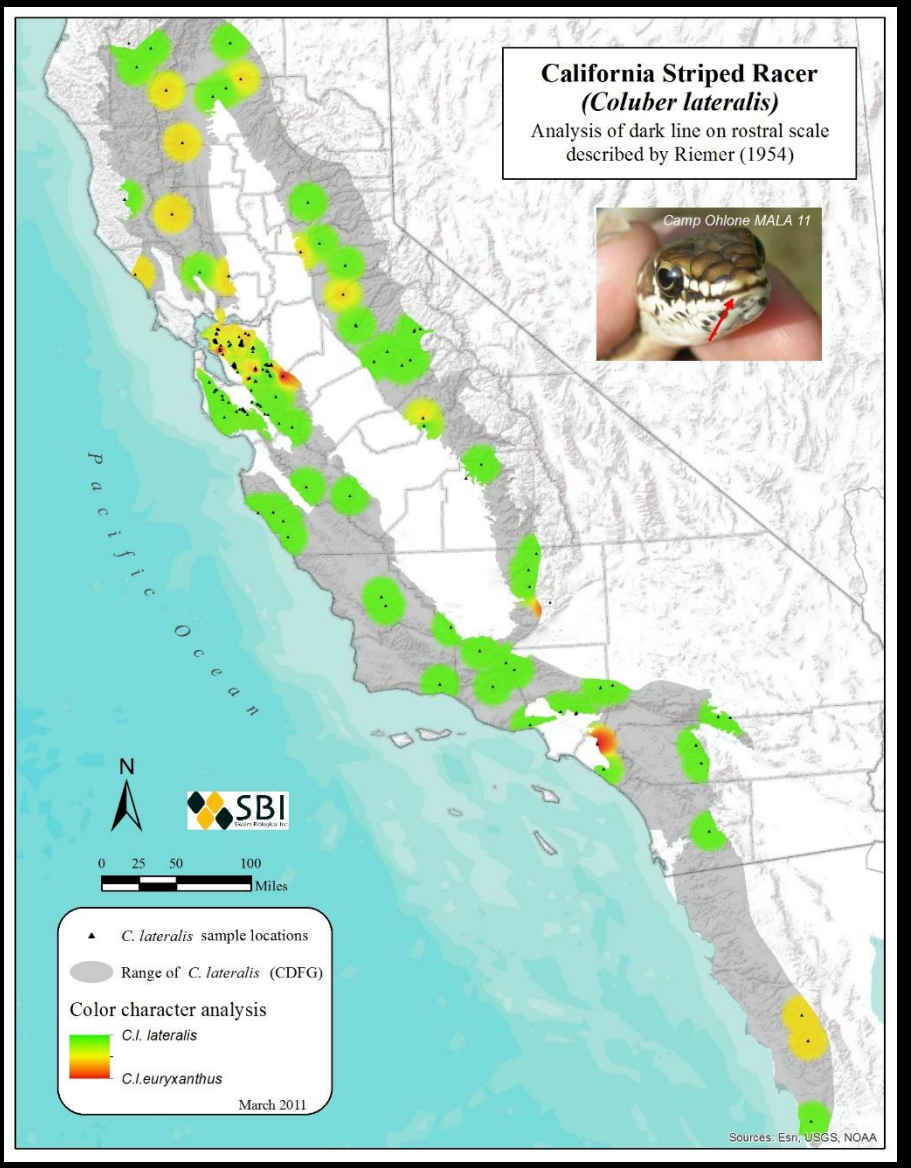


Range-wide analysis of color characters

Dark lines along margins of loreals

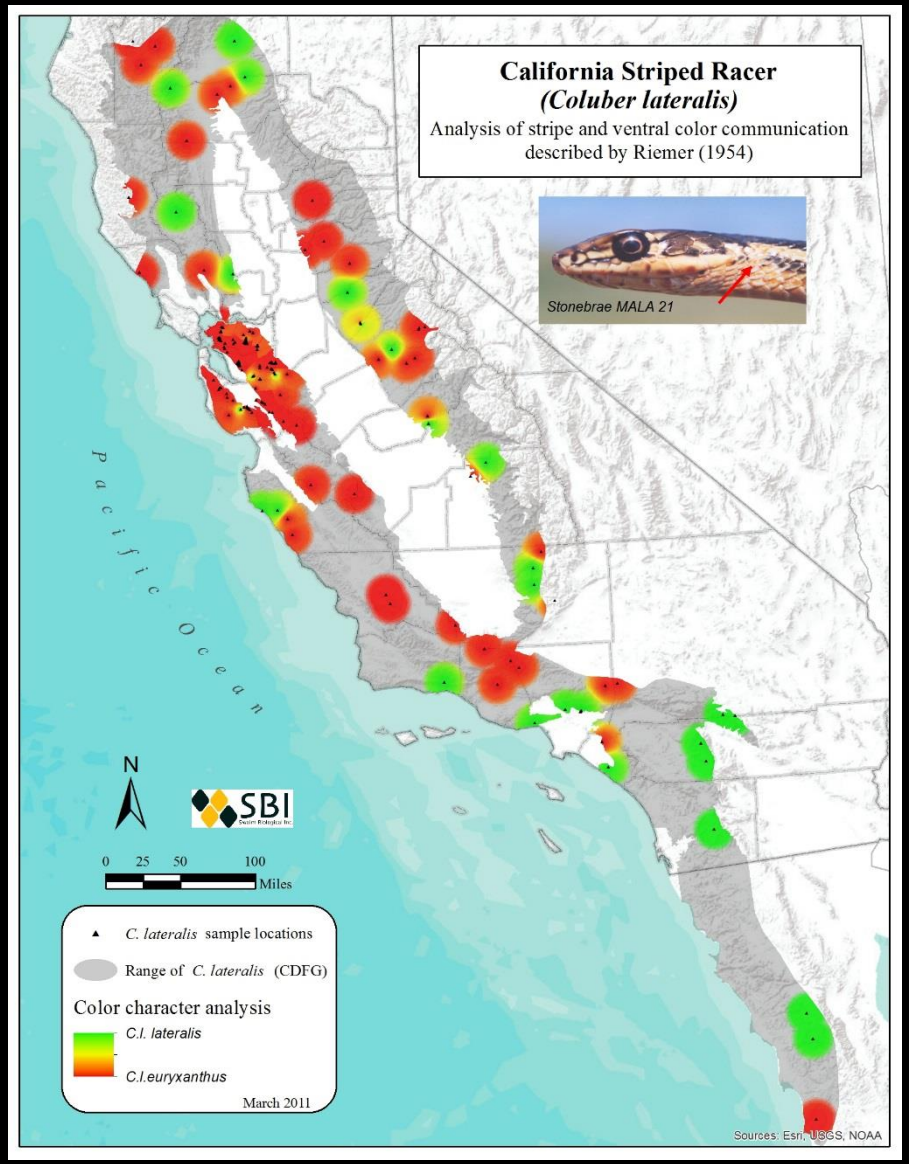


Dark line across rostral scale

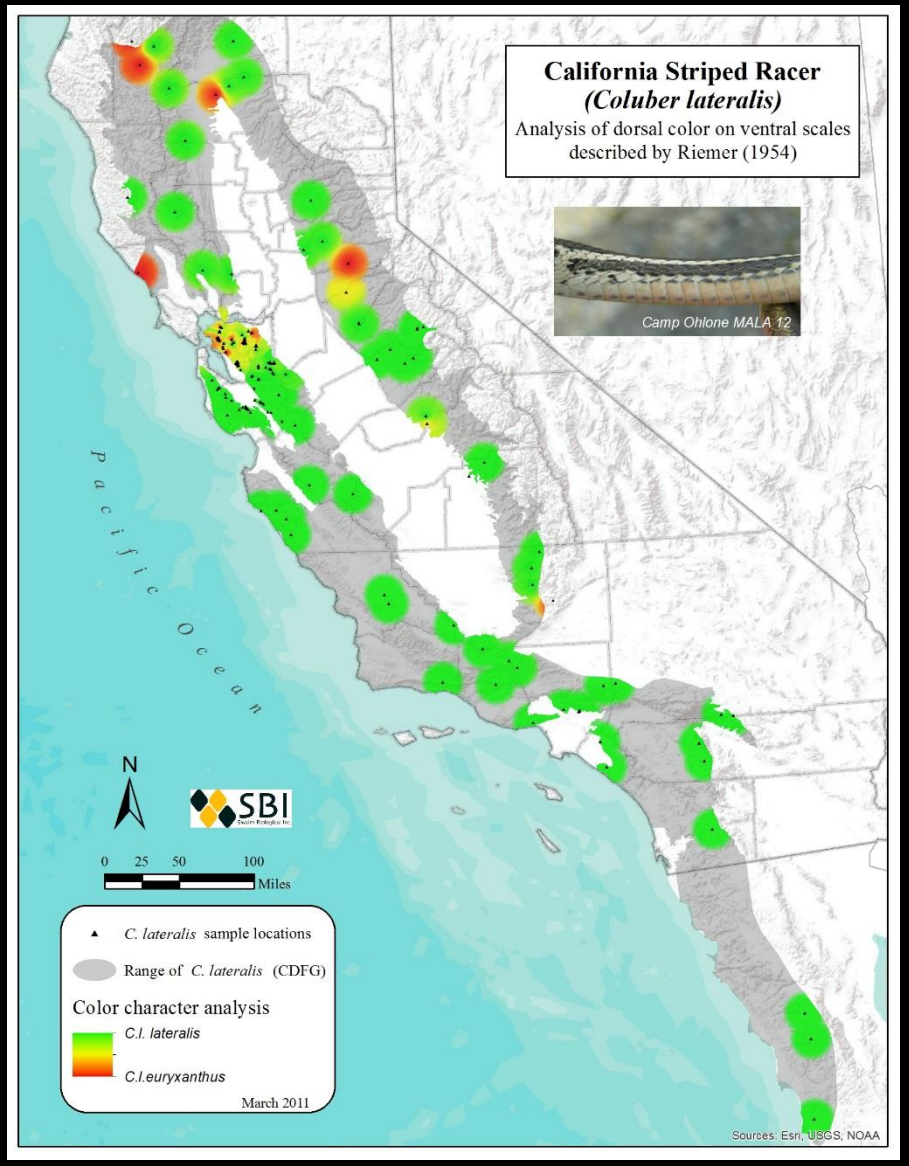


Range-wide analysis of color characters

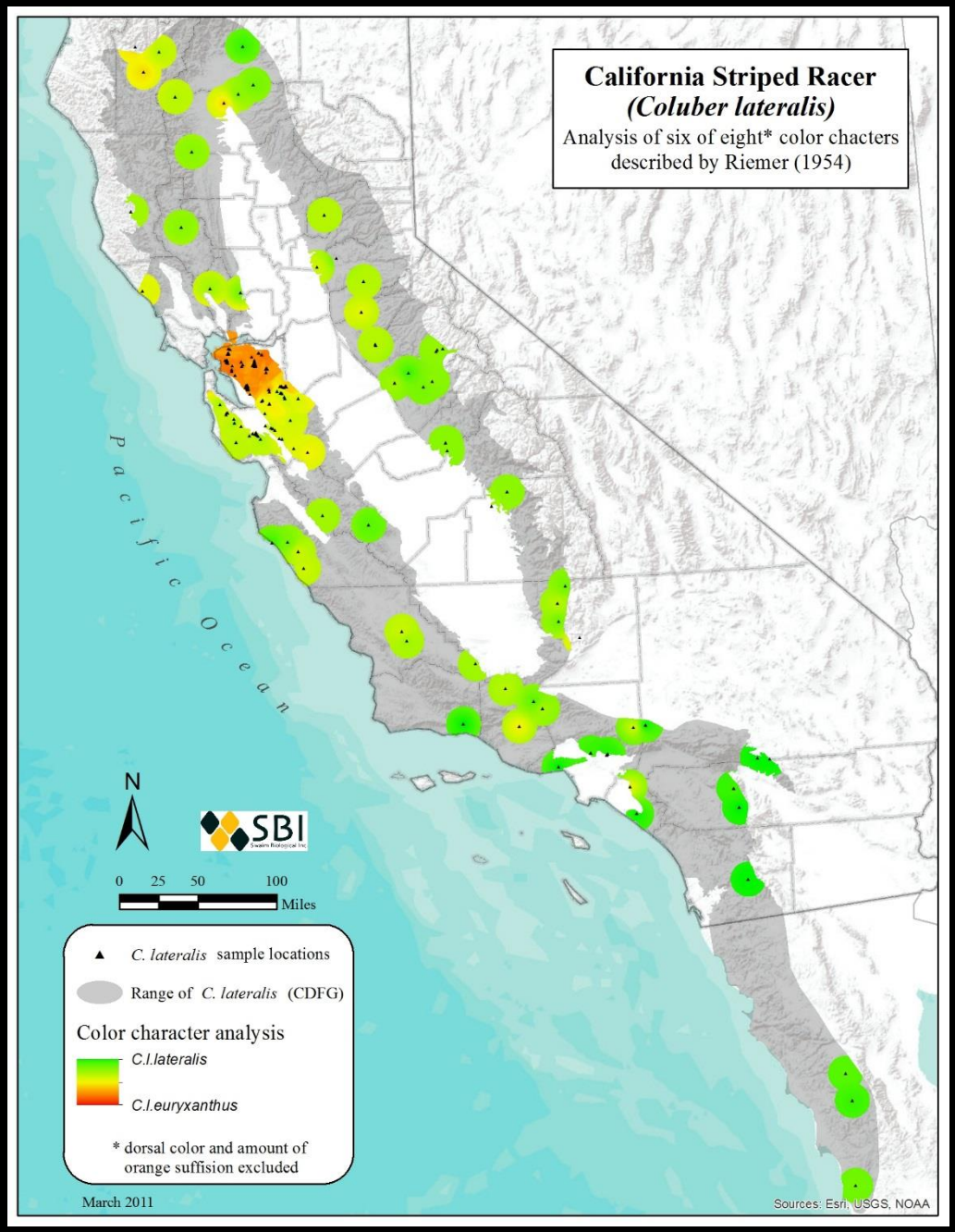
Anterior light color communication



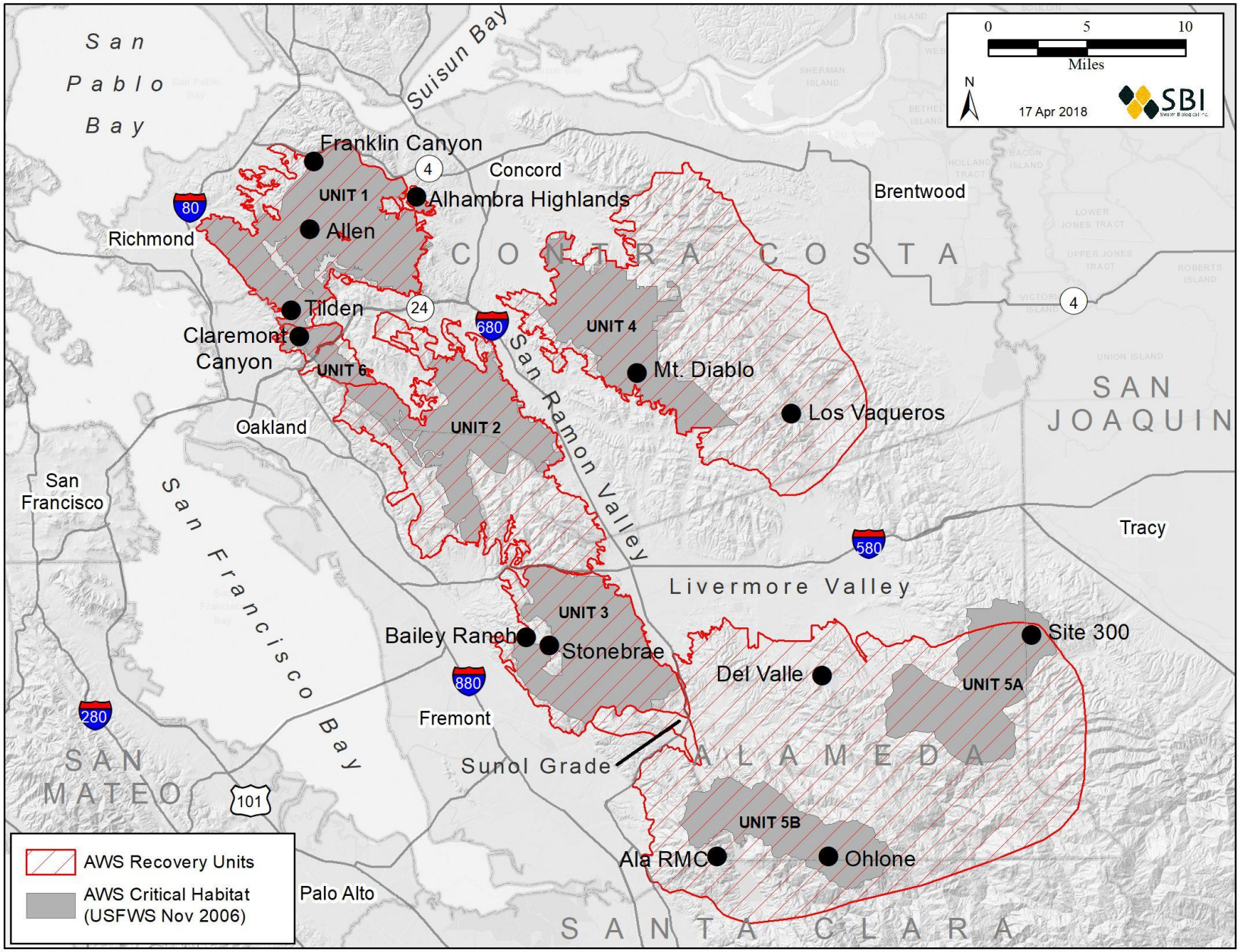
Dark color on ventral scales



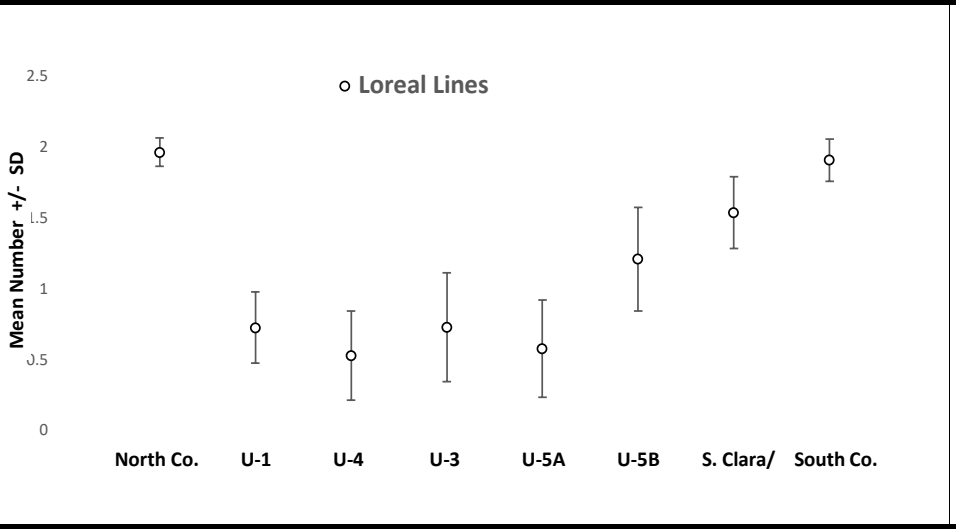
Range-wide analysis - Sum of 6 color characters

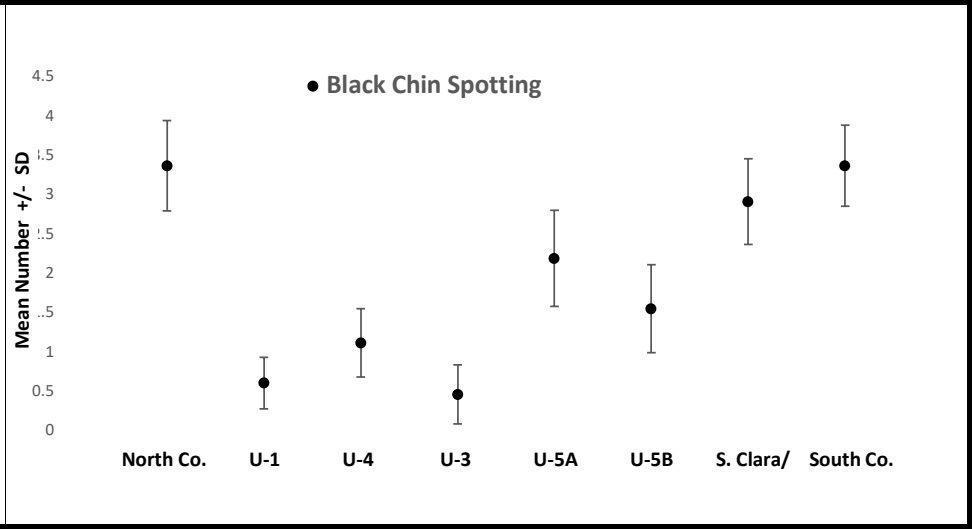


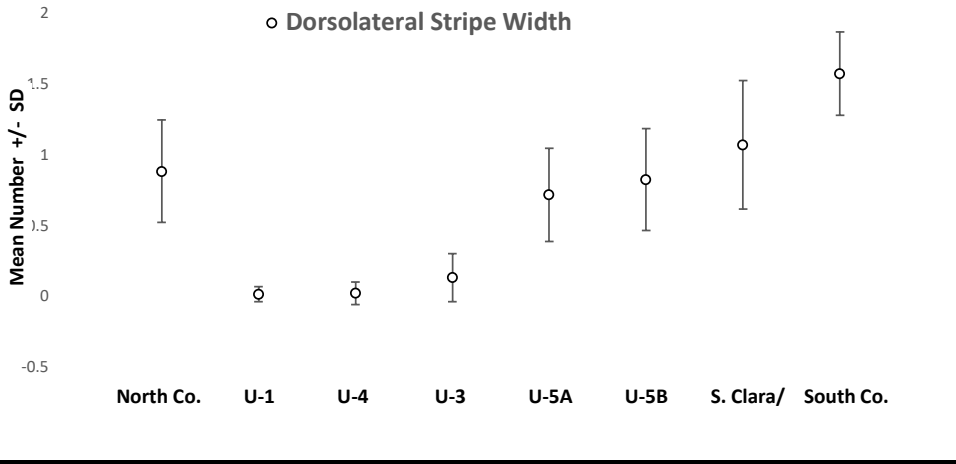
Range-wide analysis – Subspecies Boudaries

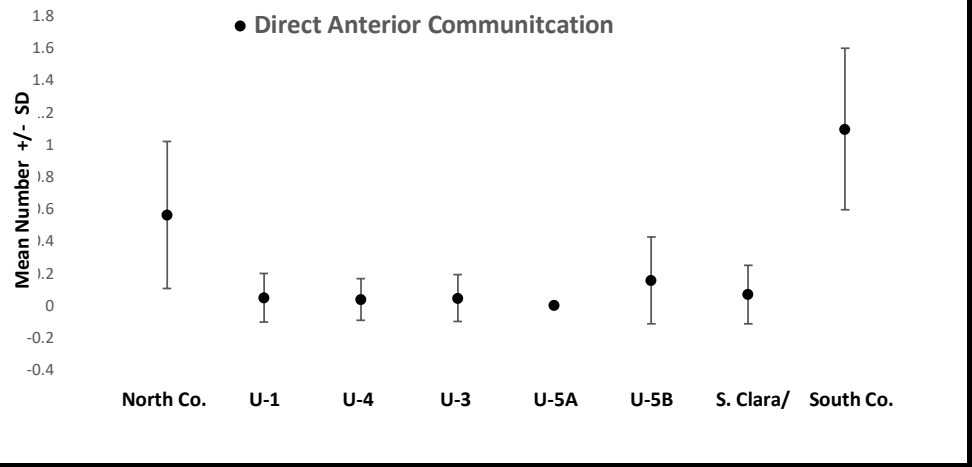


Range-wide analysis – Subspecies Boudaries

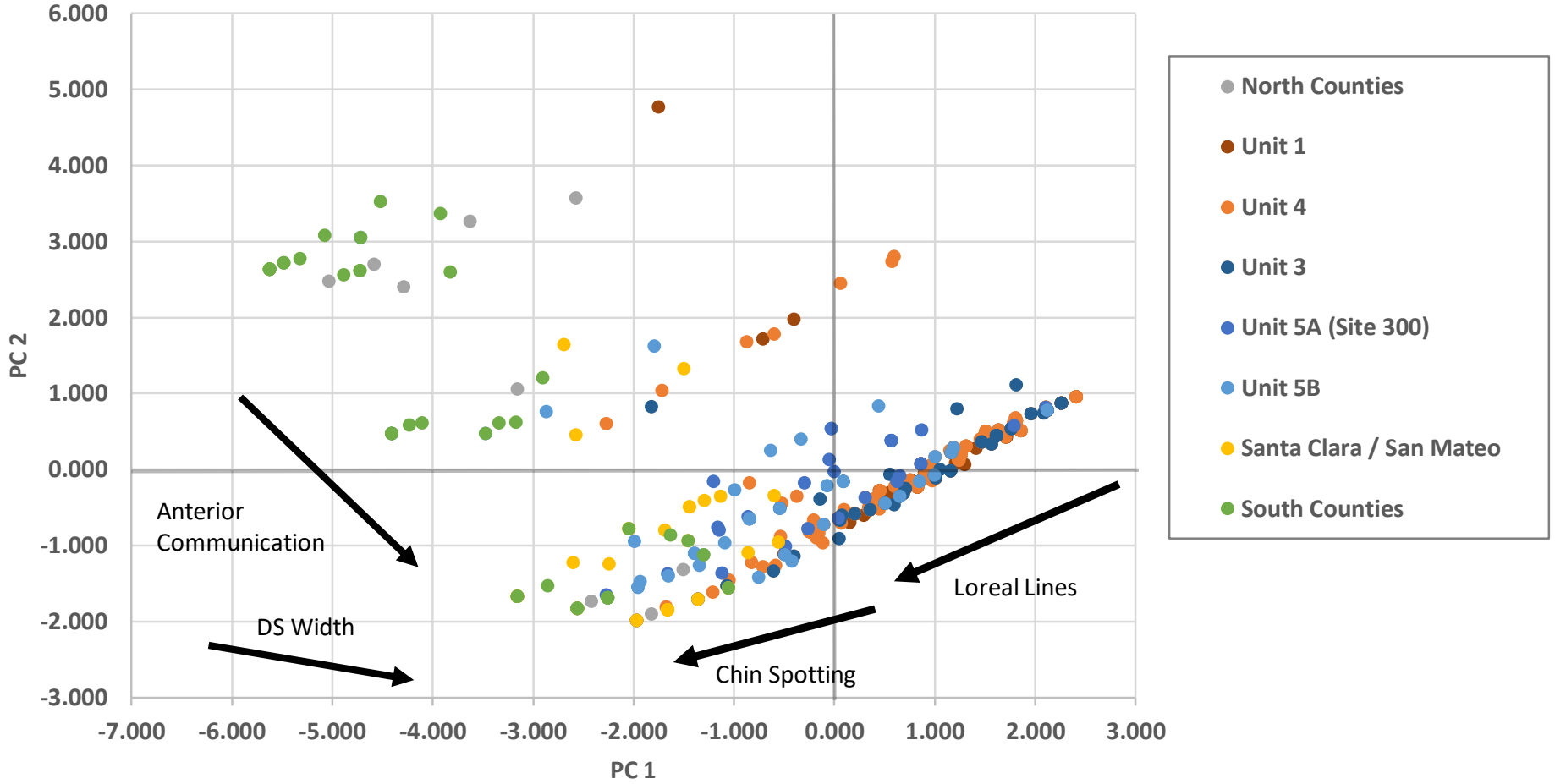




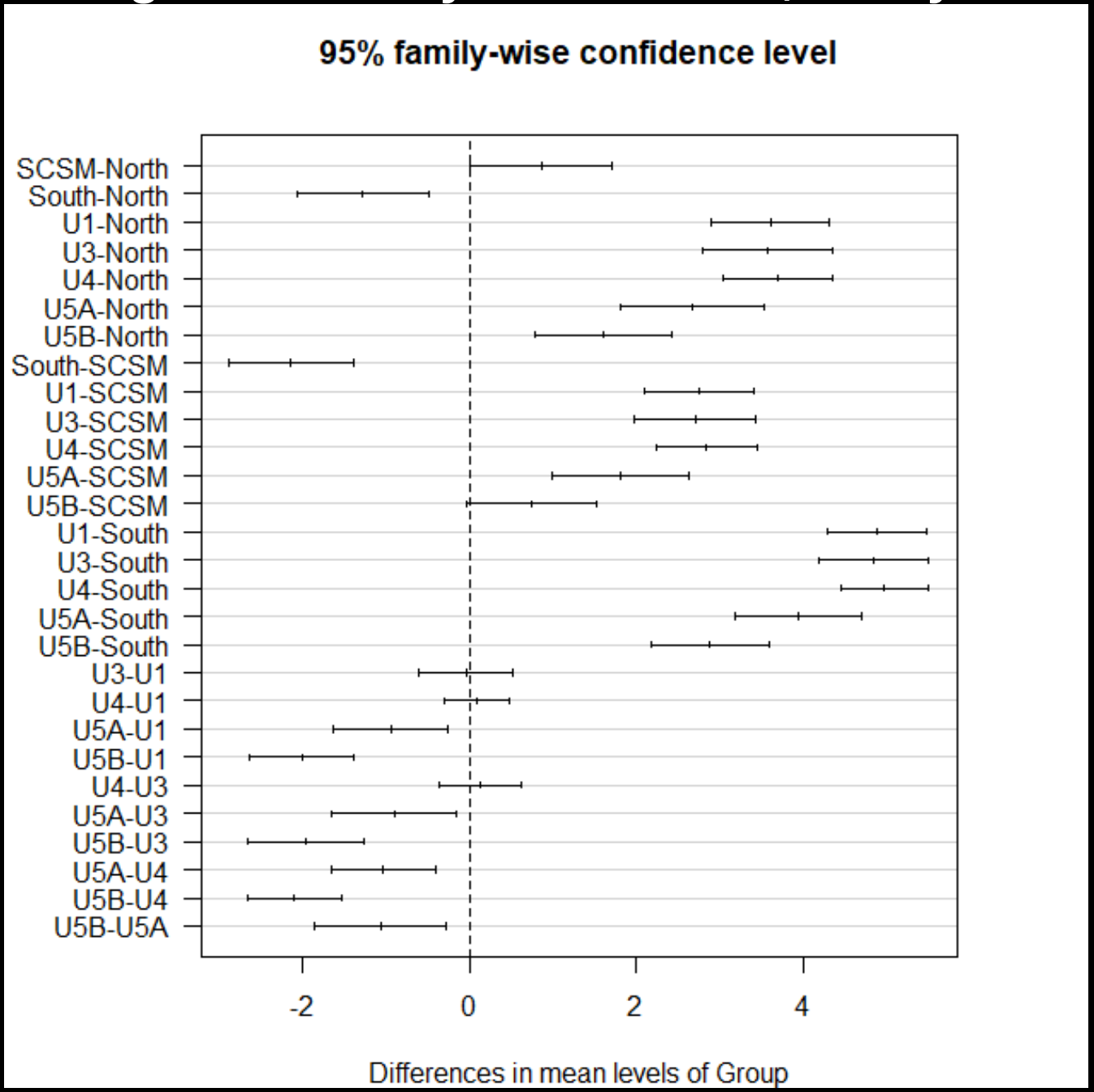




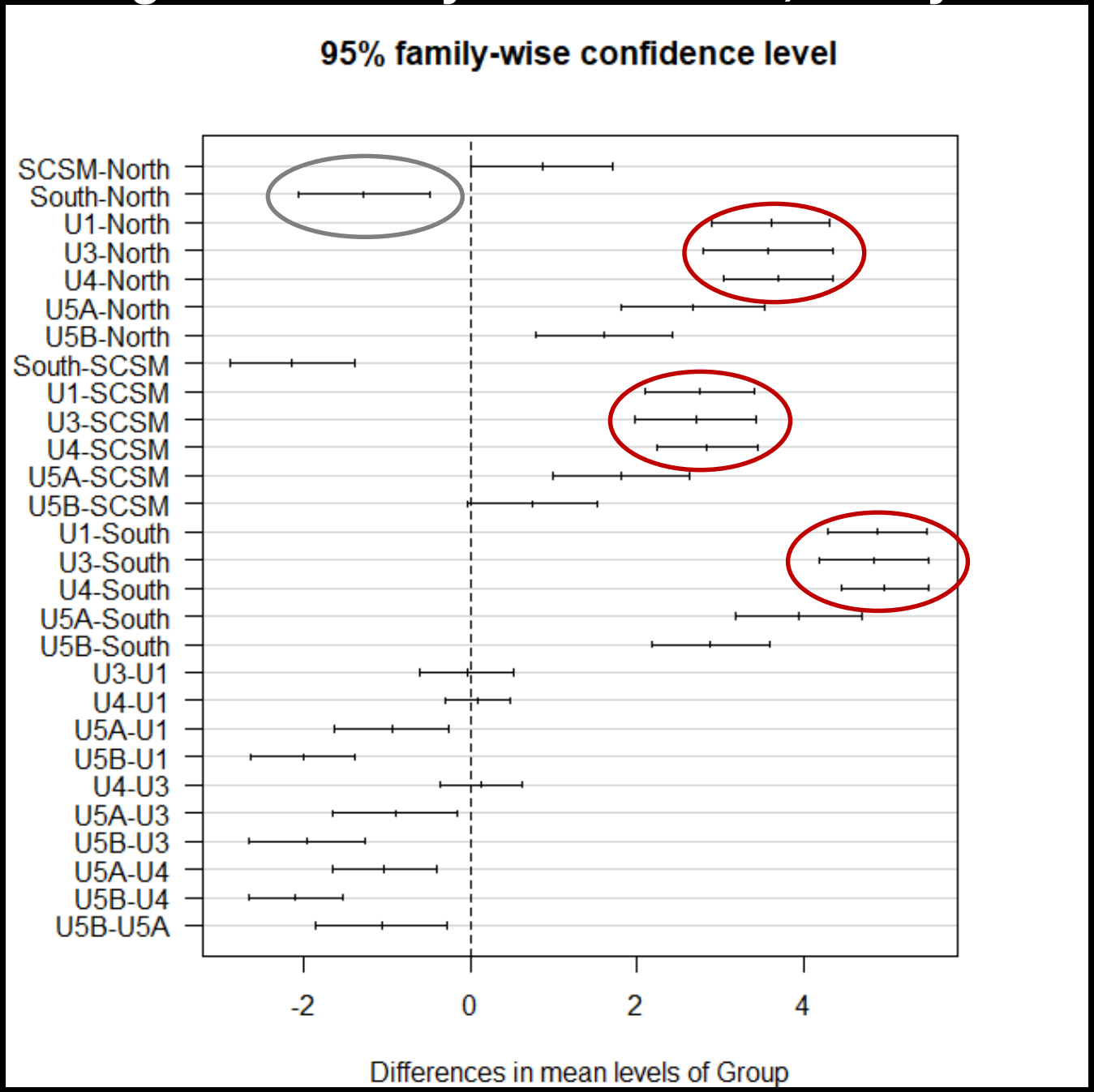
Range-wide analysis – Principal Components Analysis



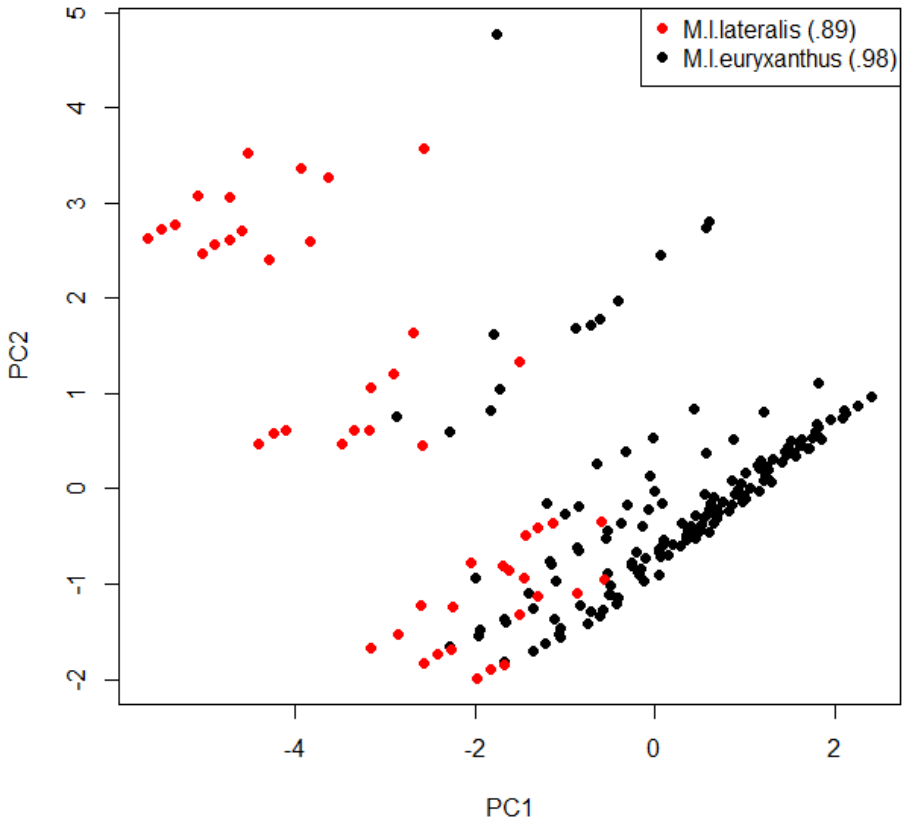
Range-wide analysis – ANOVA, Tukey HSD

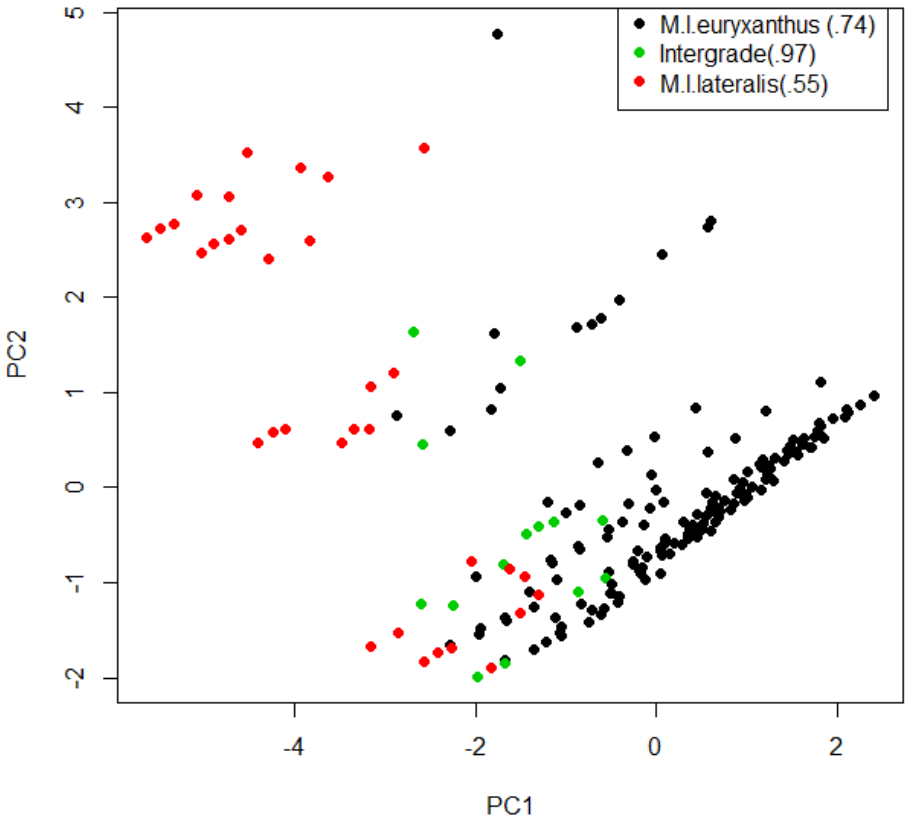


Range-wide analysis – ANOVA, Tukey HSD

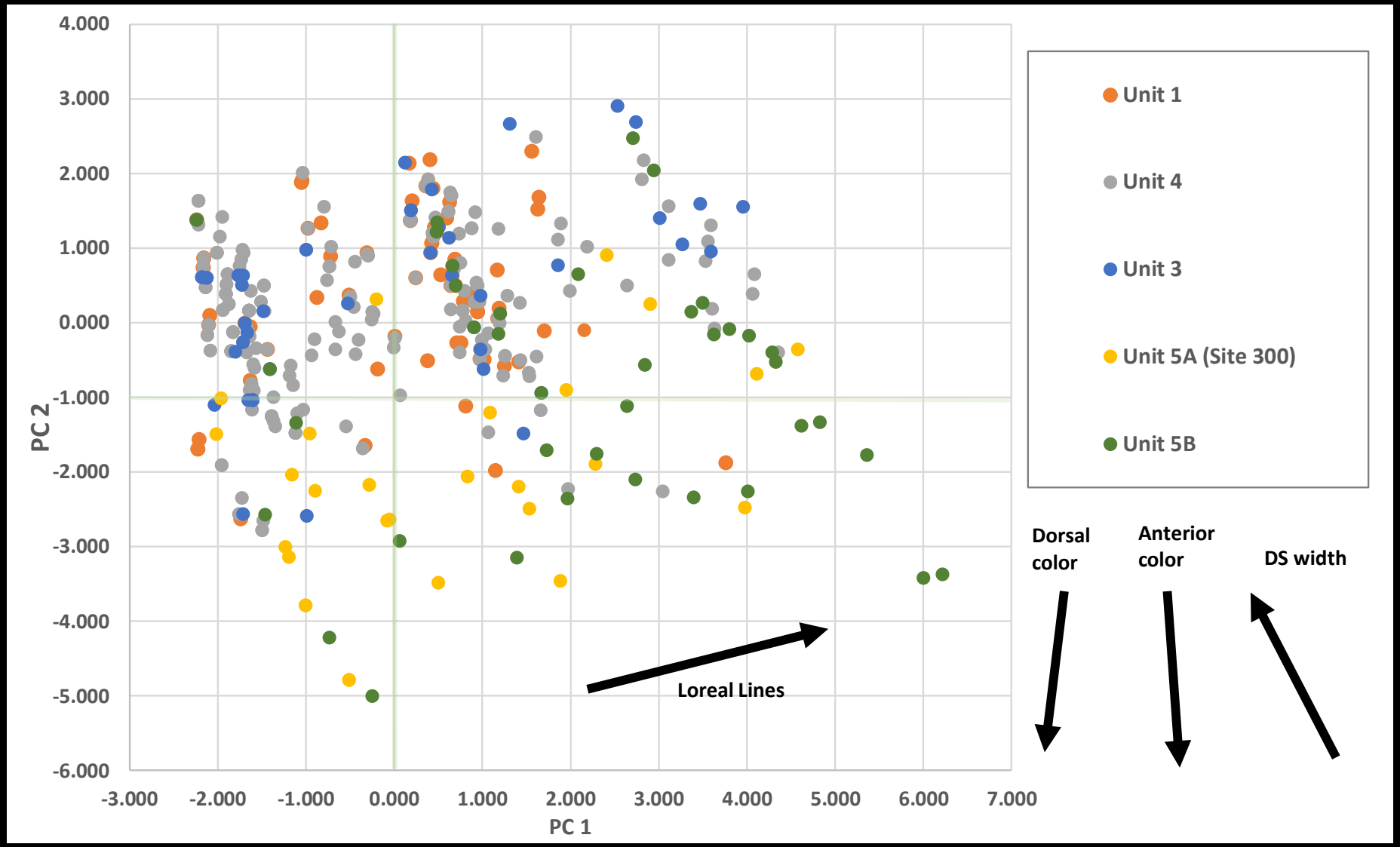


Range-wide analysis – Cluster Analysis



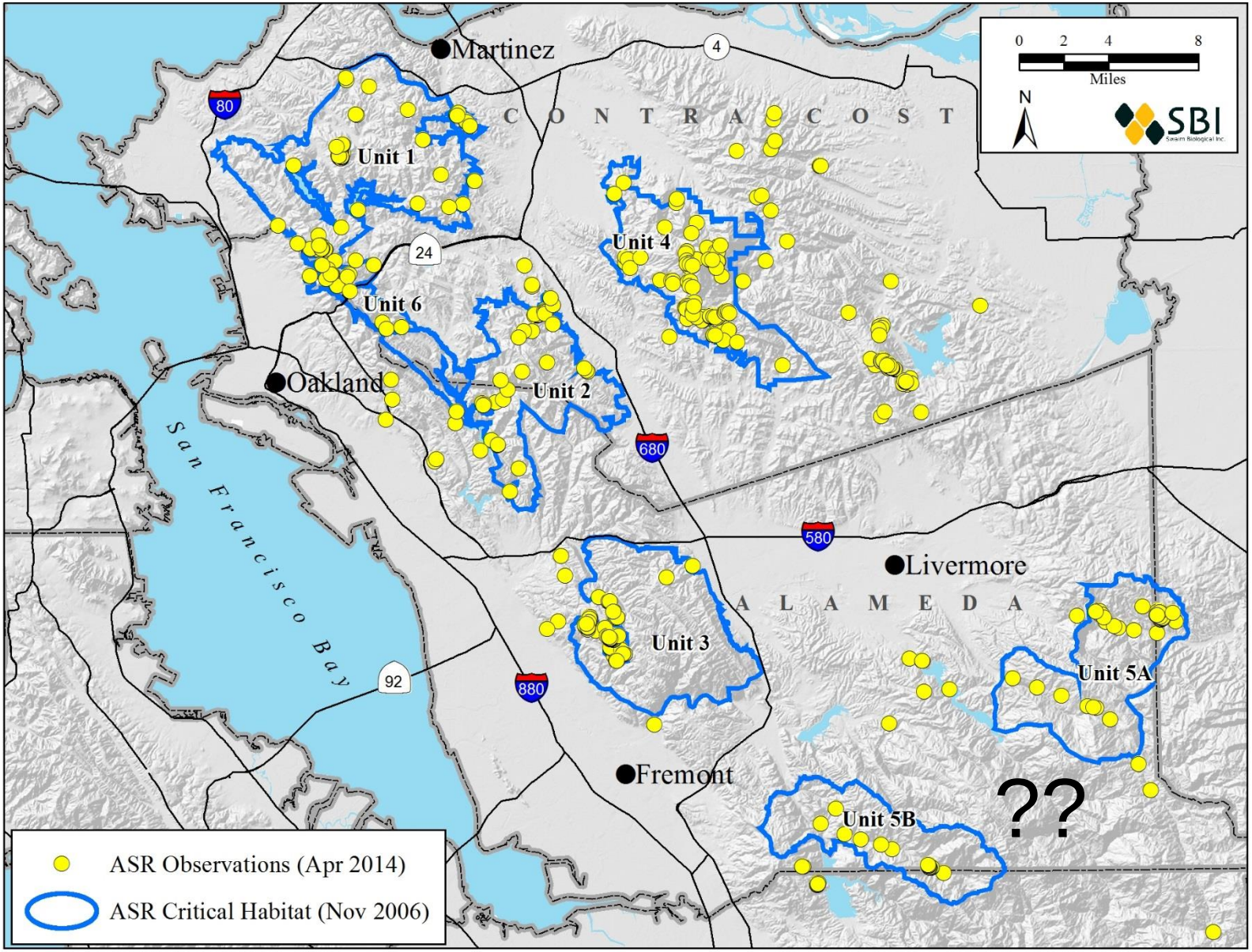


East San Francisco Bay AWS analysis – Principal Components Analysis

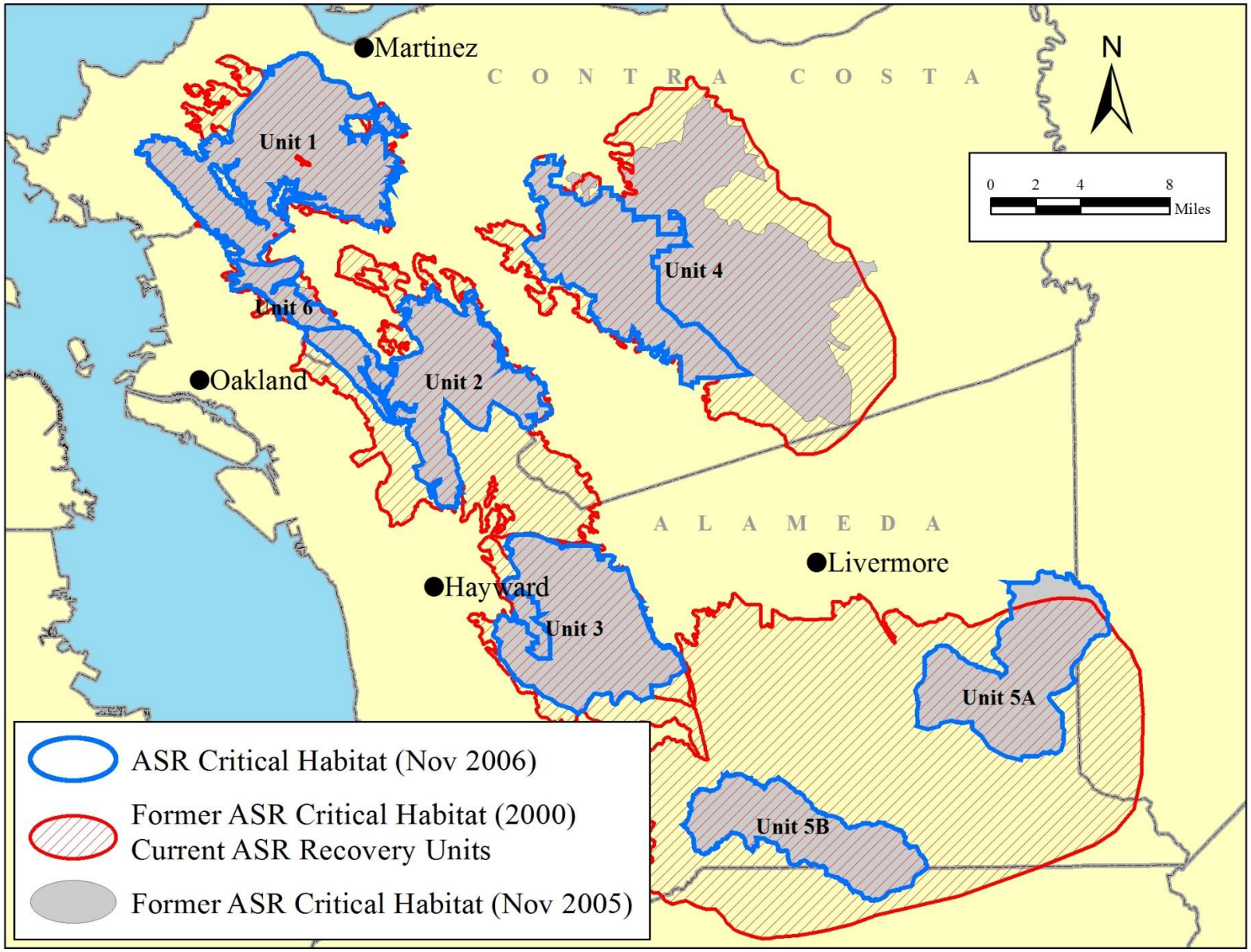


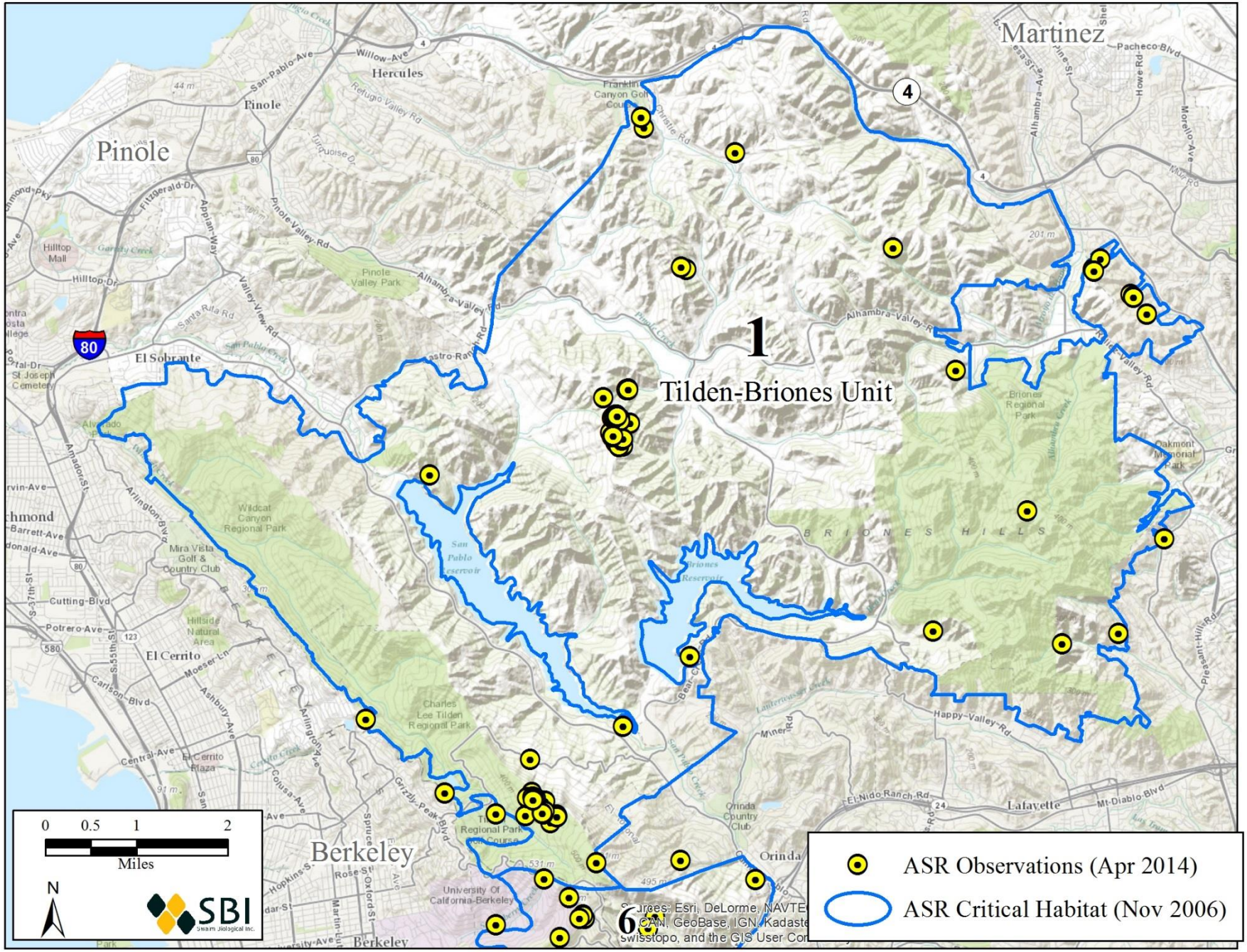
AWS Distribution and Critical Habitat

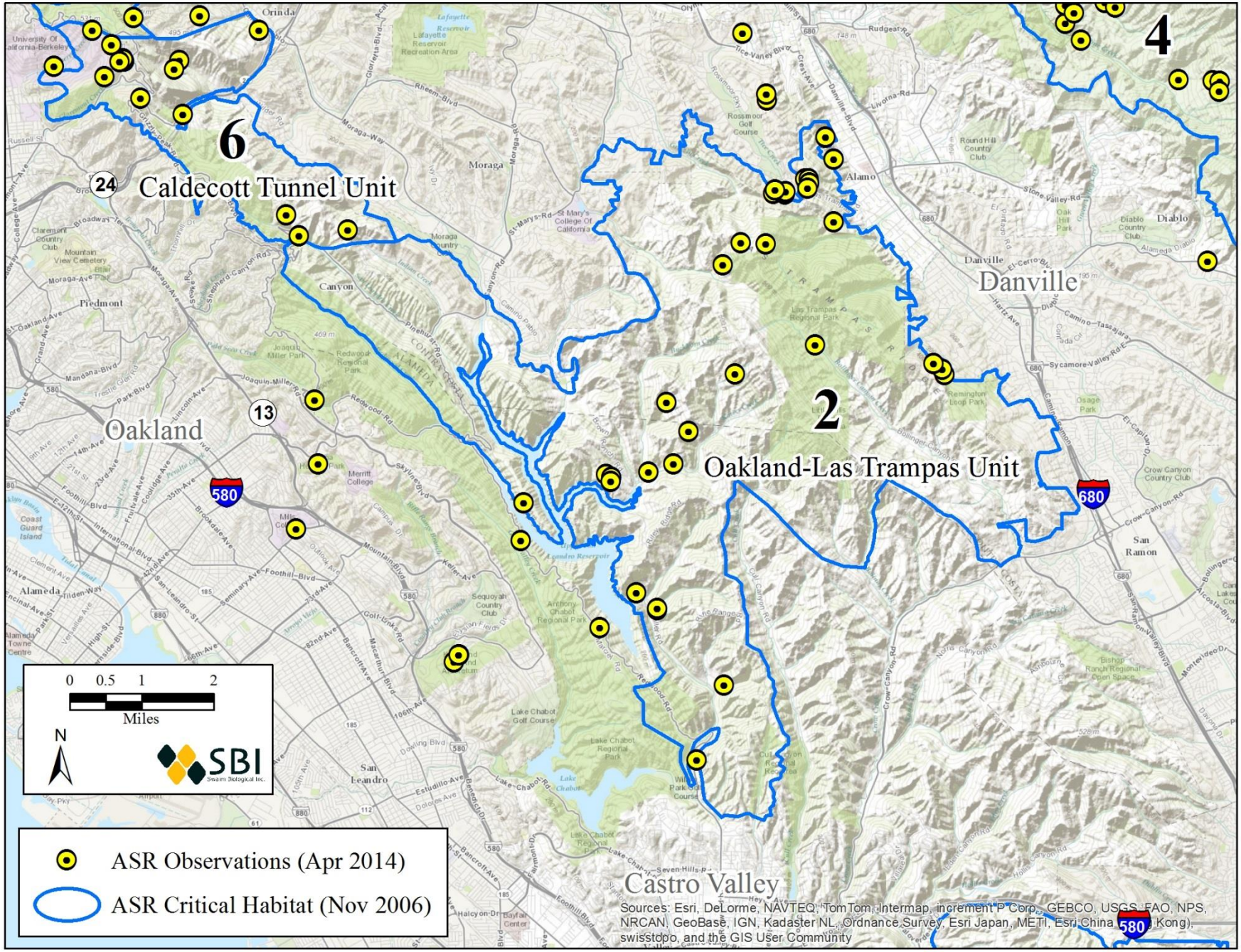
California whipsnake Distribution in Contra Costa, Alameda and Northern Santa Clara Counties

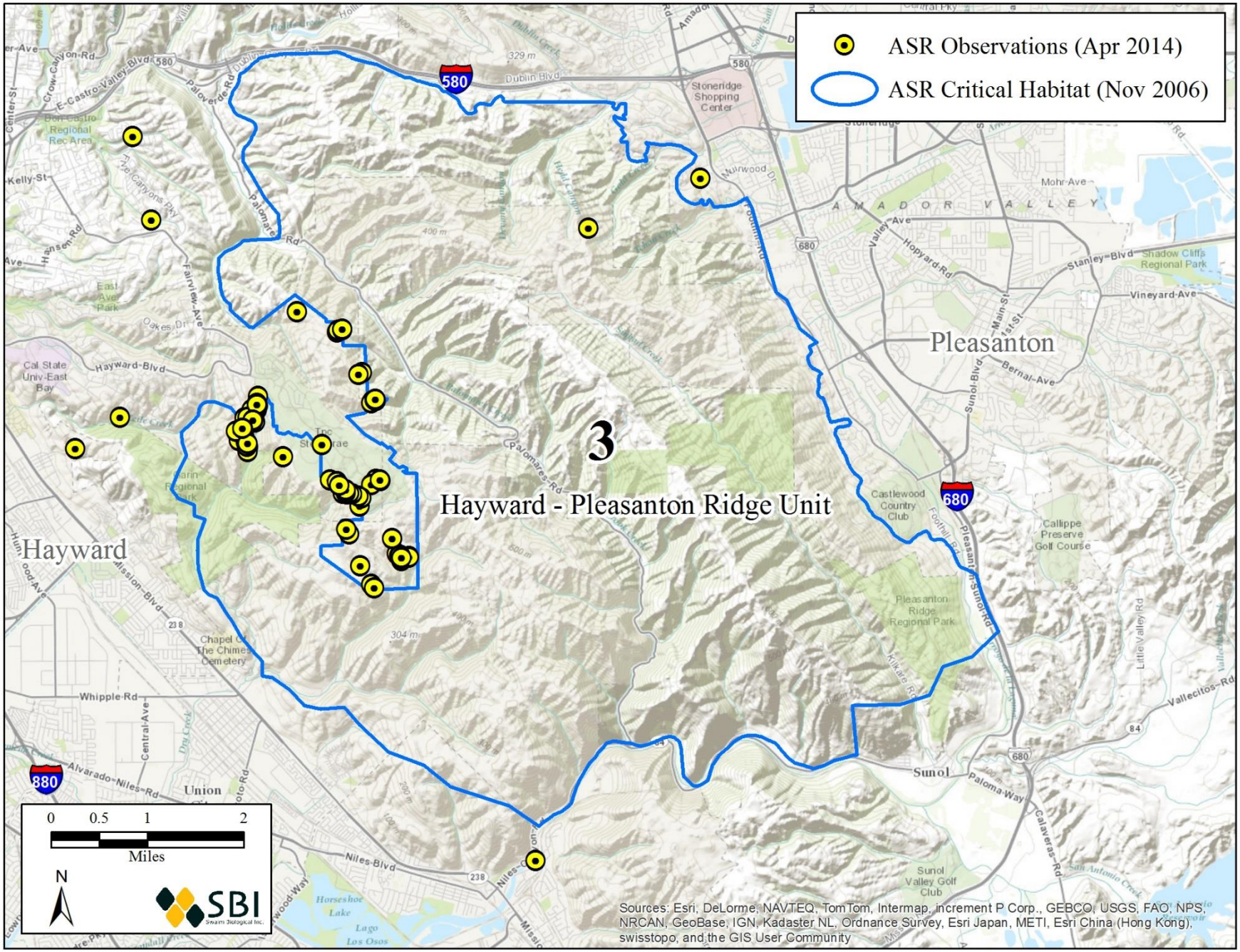


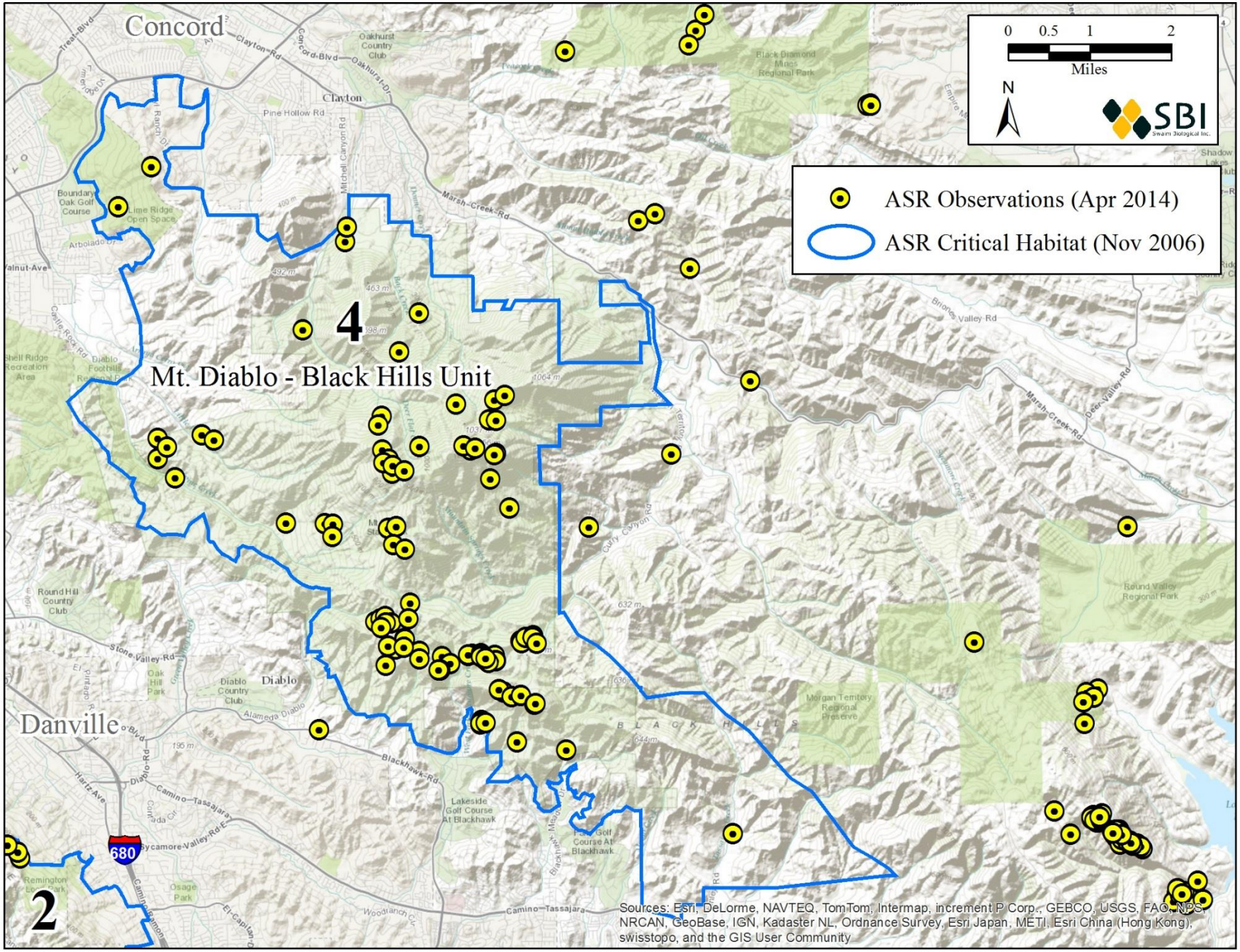
AWS Critical Habitat

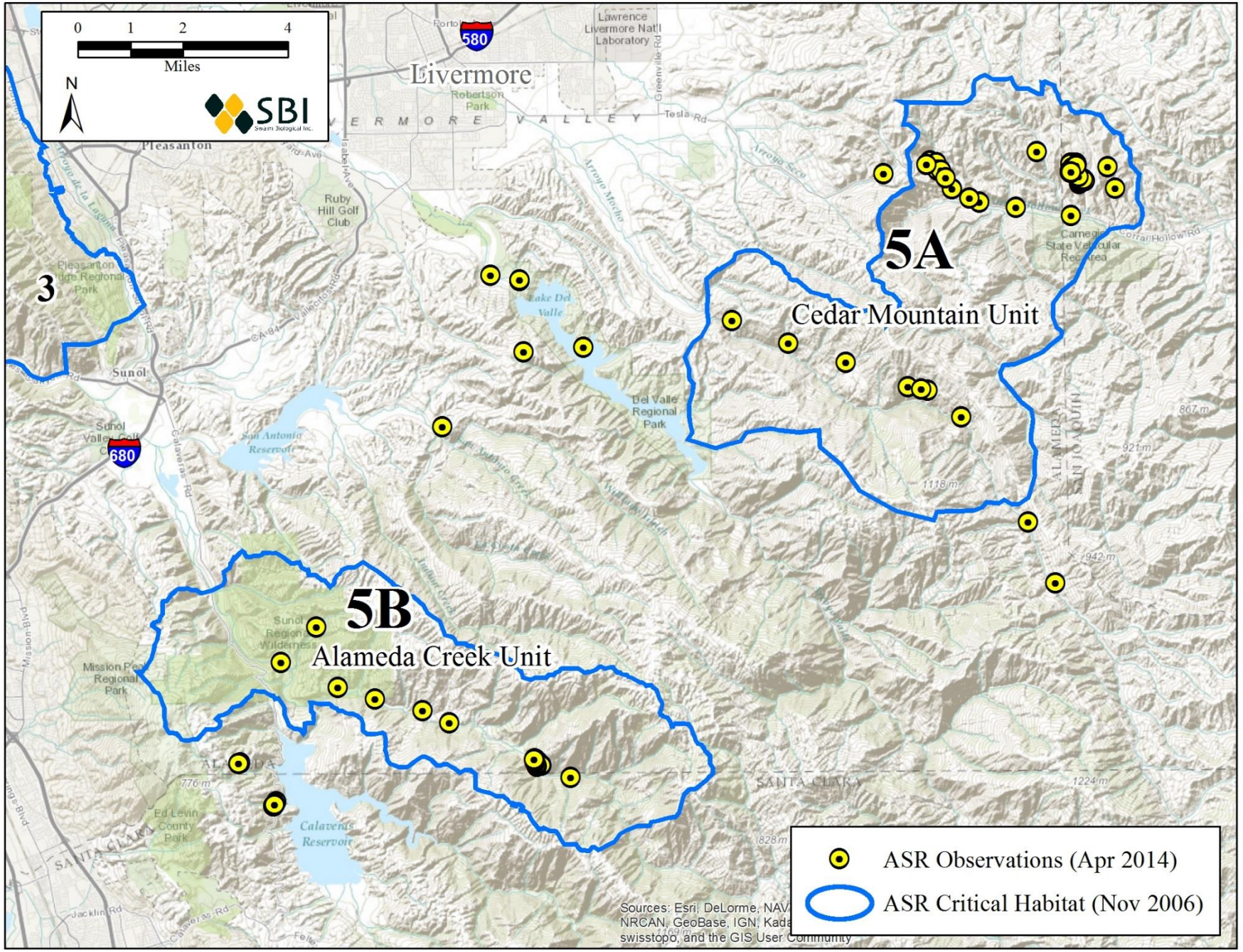



1
Tilden-Briones Unit
Martinez
Pinole
Hercules
El Sobrante
Berkeley
Orinda
Lafayette
Briones Regional Park
Tilden Regional Park
Wildcat Canyon Regional Park
Charles Lee Tilden Regional Park
Hillside Natural Area
San Pablo Reservoir
Briones Reservoir
B R I O N E S H I L L S
0 0.5 1 2
Miles
N
SBI
ASR Observations (Apr 2014)
ASR Critical Habitat (Nov 2006)


6
Caldecott Tunnel Unit
2
Oakland-Las Trampas Unit
4
Oakland
Danville
Castro Valley
Moraga
Orinda
Piedmont
Canyon
Alamo
San Ramon
San Leandro
Alameda
0 0.5 1 2
Miles
N
SBI
Swaim Biological Inc.
ASR Observations (Apr 2014)
ASR Critical Habitat (Nov 2006)
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community


ASR Observations (Apr 2014)
ASR Critical Habitat (Nov 2006)
3
Hayward - Pleasanton Ridge Unit
Hayward
Pleasanton
Sunol
Union
0 0.5 1 2
Miles
N
SBI
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community


Concord
Clayton
Danville
Mt. Diablo - Black Hills Unit
4
2
0 0.5 1 2
Miles
N
SBI
ASR Observations (Apr 2014)
ASR Critical Habitat (Nov 2006)
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community


0 1 2 4
Miles
N
SBI
Livermore
Pleasanton
Sunol
Ruby Hill Golf Club
Lawrence Livermore Natl Laboratory
Robertson Park
Lake Del Valle
Del Valle Regional Park
San Antonio Reservoir
Calaveras Reservoir
Sunol Regional Wilderness
Mission Peak Regional Park
Ed Levin County Park
Pleasanton Ridge Regional Park
Sunol Valley Golf Course
Carnegie State Vehicular Recreation Area
3
5A
Cedar Mountain Unit
5B
Alameda Creek Unit
ASR Observations (Apr 2014)
ASR Critical Habitat (Nov 2006)
Sources: Esri, DeLorme, NAV
NRCAN, GeoBase, IGN, Kada
swisstopo, and the GIS User Community

Field Study Methods

Trapping Surveys

- Drift fences with funnel traps at each end.
- Traps constructed of large hardware cloth panels on a wooden frame for air circulation.
- Foam refugia are placed inside traps to provide retreat from heat, minimize nose rubbing.
- A wood coverboard on top of the trap provides additional shade

Trapline with Activated Traps

Typical Trapping Period

Season	# of Trap Days	Begin Date
Spring	90	March 15 - April 1
Fall	45	Aug. 15 - Nov. 1

Data Collection

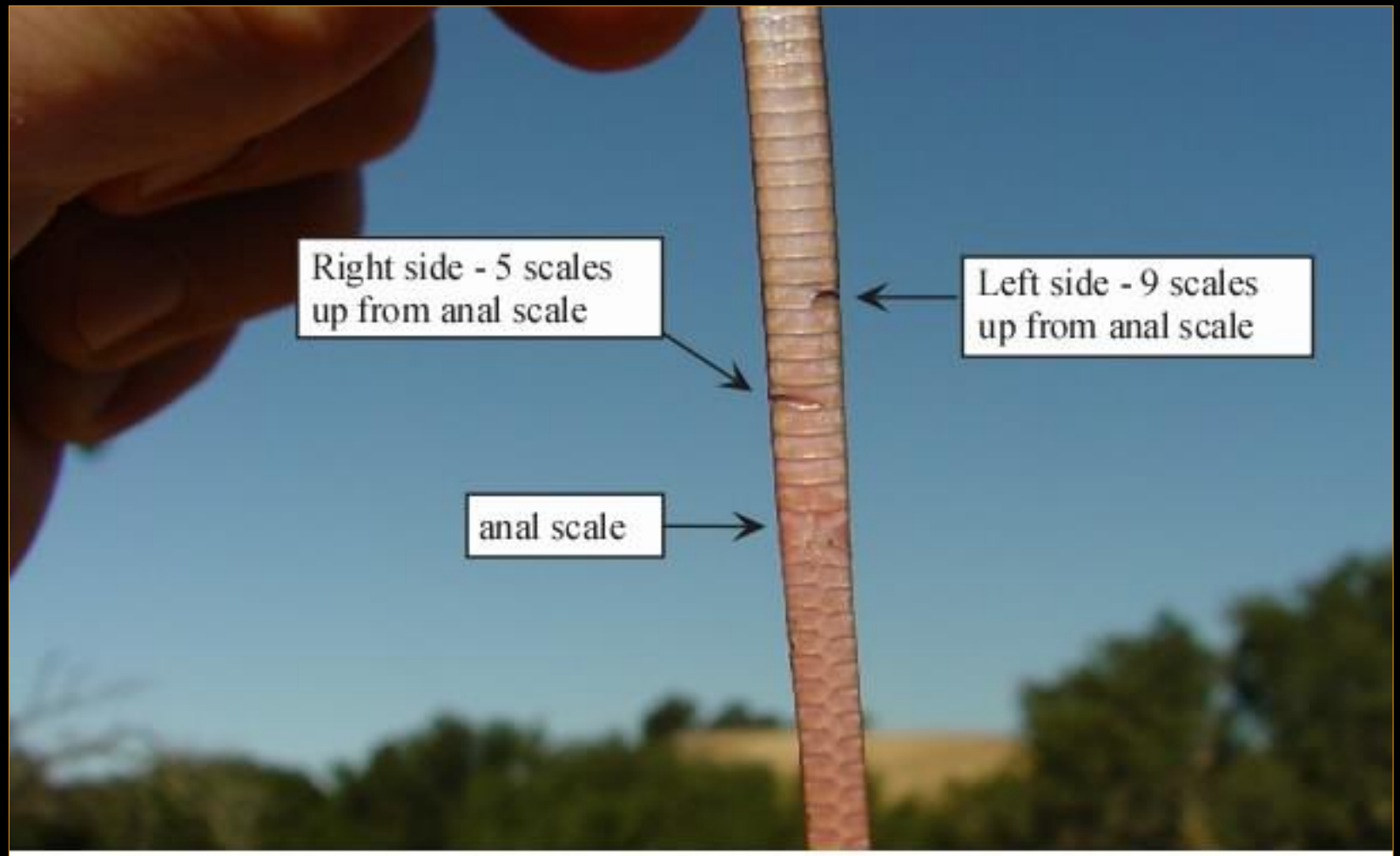
Processing AWS

- Sex
- Length (snout – vent & total length)
- Weight
- Age class
- Reproductive status
- Capture location
- Mark individuals (PIT tag and/ or scale clip)
- Taxonomy data
- Recent meal?

Identify and record all other vertebrate species at a minimum

Marking - PIT Tagging

Marking - Scale Clipping



Example of a scale mark on a juvenile whipsnake. (Whipsnake #59).

Taxonomy

- Record taxonomic characters (8 scale color differences) on data sheet.
- Sequence of photographs to support demonstration of each of the 8 color differences.
- Tail clip for on-going genetic work.

General Background

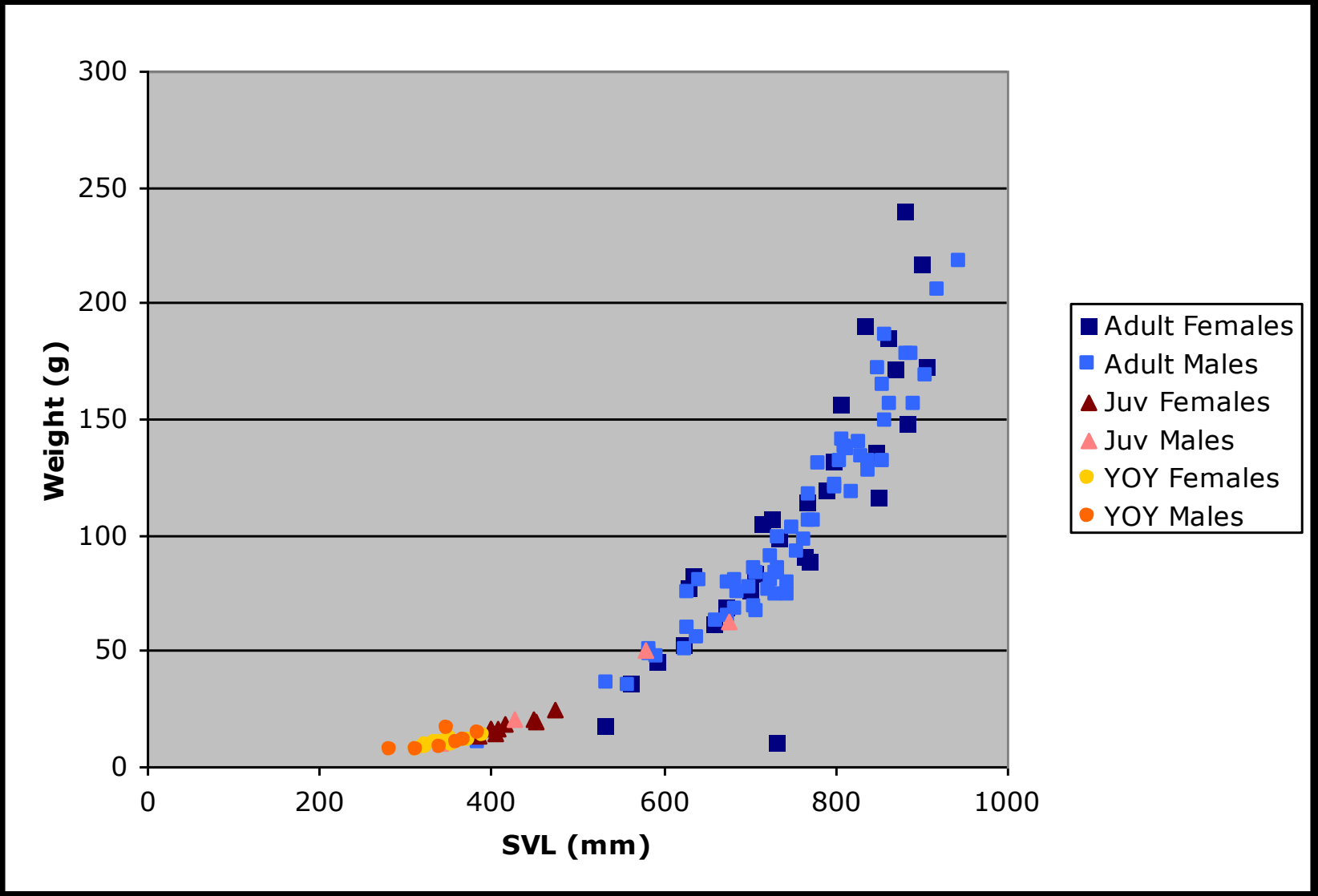
Foraging Behavior

Active, fast, diurnal visual hunters adapted to pursuing and capturing lizards, birds, other snakes

Lizards are the primary prey

Also prey on small rodents, frogs

Approx. Size Distribution by Age Class and Sex



Reproduction

- Mating occurs late March-mid June
- Copulation usually occurs at or near the female's winter retreat
- Males and females may both mate with several individuals

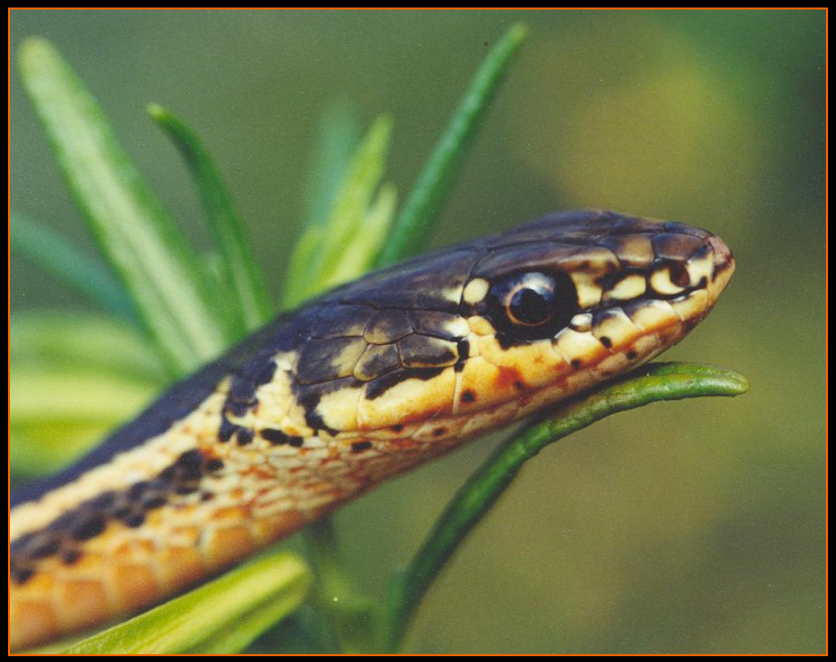
Reproduction

- Oviparous- Egg laying
- Eggs hatch August through September
- Egg laying sites unknown- rodent burrows?

Habitat

Habitat Parameters Studied (Swaim 1994)

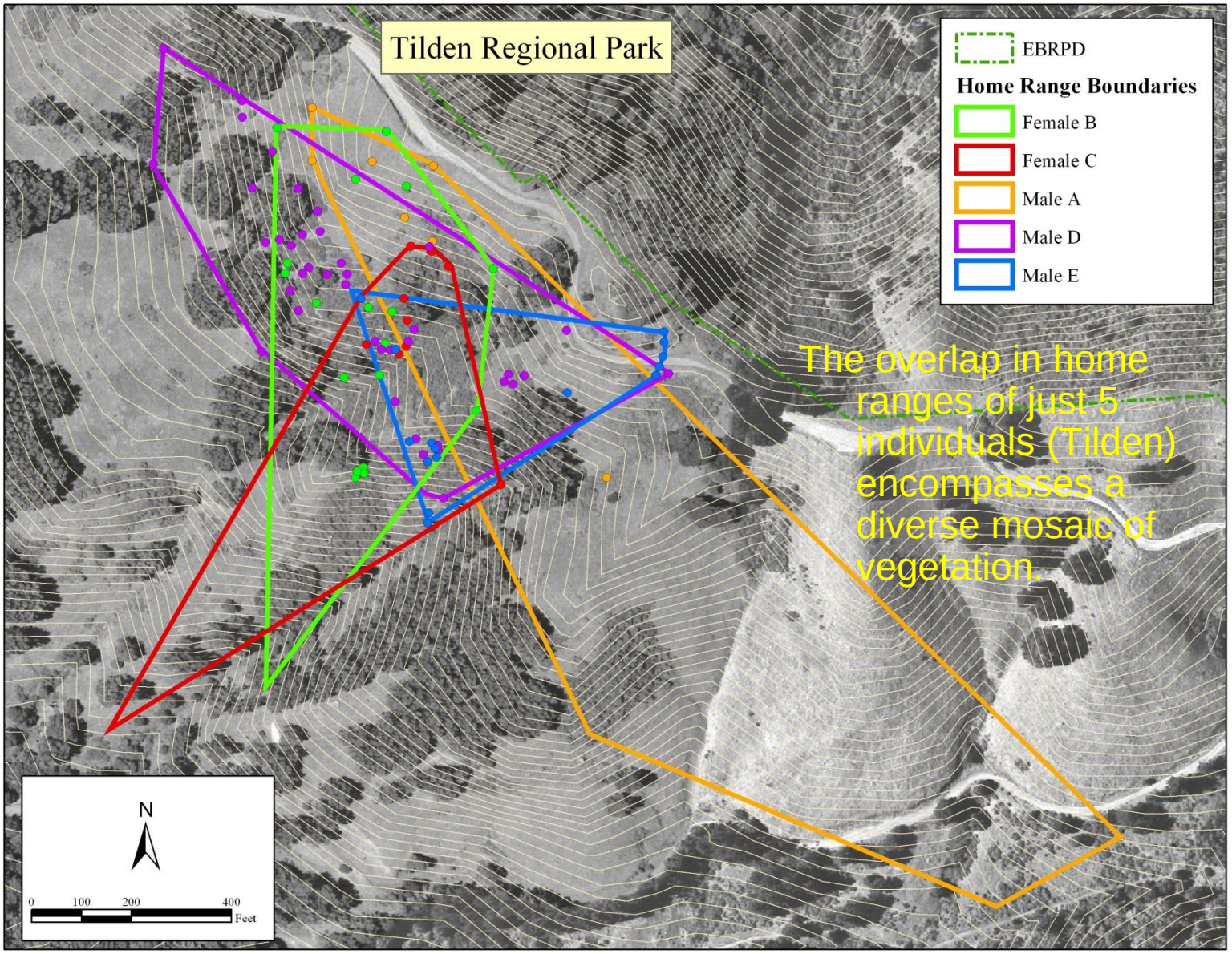
- Aspect of scrub/ chaparral
- Canopy cover (closure)
- Species composition (vegetation)
- Scrub patch size & distribution
- Use of non-scrub habitats
- Spatial use of habitat
- Importance of rock outcrops



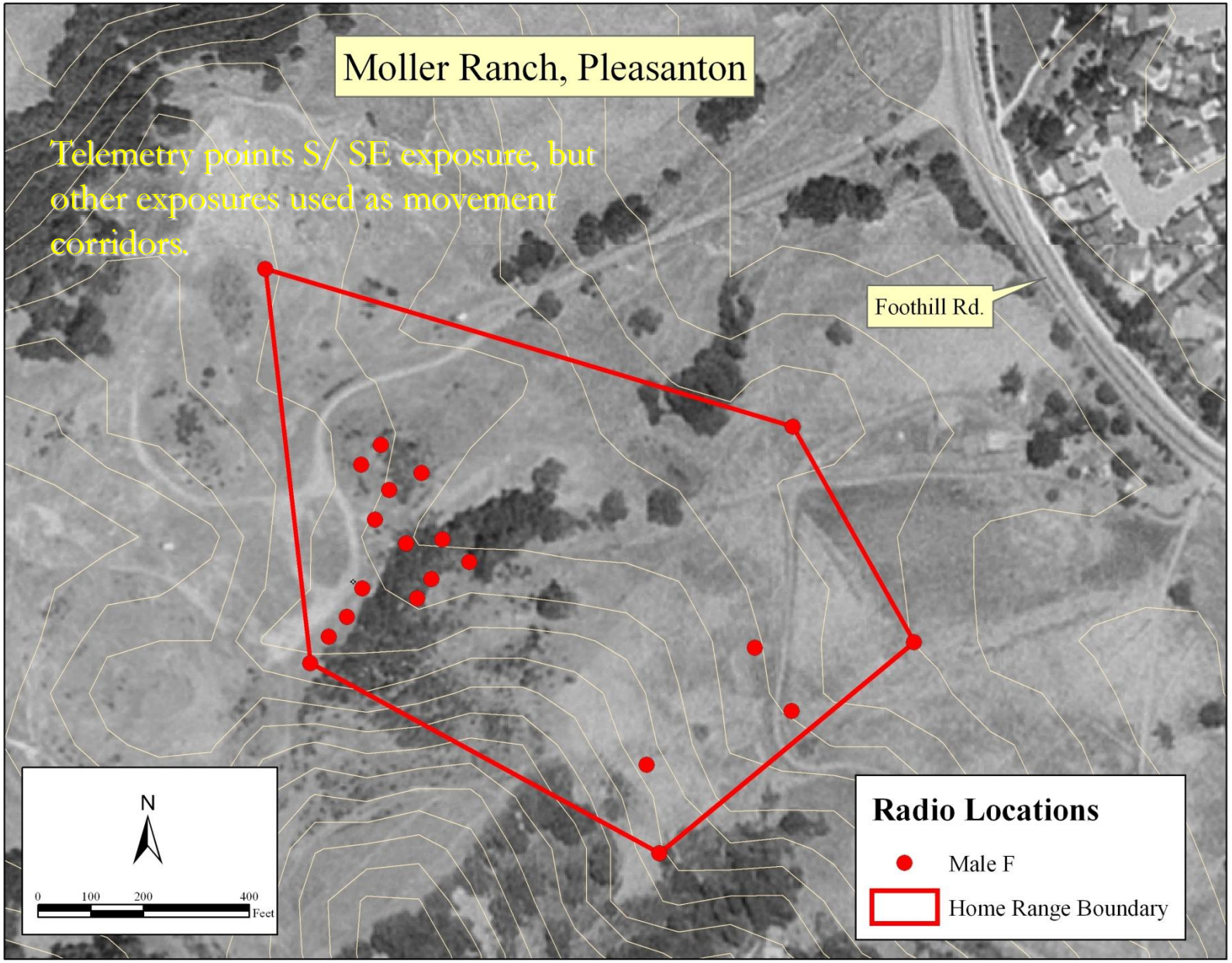
Radiotelemetry (Swaim 1994)

* N=6
* 4 males
* 2 females (gravid)
* Tilden Park (Berkeley) = 5
* Moller Ranch (Pleasanton)= 1

Results: Telemetry (Swaim 1994)



Results: Telemetry (Swaim 1994)



Mean MCP Home Range Size

(Swaim 1994)

Sex	Home Range in Hectares	Mean Home Range
M	*8.7	5.5
M	4.7	
M	1.9	
M	7.0	
F	3.9	3.4
F	2.9	

Movement Patterns (Swaim 1994)

- Gravid females appear more sedentary than non-gravid females
- Gravid female movement is unidirectional to oviposition site
- Female movement becomes multidirectional in late summer/ fall
- Males generally multidirectional throughout home range in the active season
- Fidelity for certain areas/ retreats

Telemetry Data Biases (Swaim 1994)

- Sample Size N=6
  - Habitat Use information skewed towards only that of large Adult AWS.
  - AWS have incredible site fidelity and knowledge of home range
  - Use same retreats (burrows, rock interstices) over and over with long intervals between use.
  - Experience of large adults makes them less likely to wander or explore some habitats.
  - Only represents habitat types and scrub patch configuration at two sites

Results: Trapping (Swaim 1994)

- Trapping Data (22 Thesis Sites-ONLY Trapping Scrub and Chaparral)
- AWS detected and relatively abundant at sites with open and partially open canopy/ scrub chaparral, on SW, S, SE, E, NE aspects
- No AWS detected at sites with only closed canopy coyote brush, poison oak, on N, NW aspect.
- Low or no captures indicates lesser frequency of use versus absence in many cases.

Clarifications of Misinterpretations from Swaim and McGinnis 1992[1] and Swaim 1994[2]

- Condensation and simplification of the research findings has led to misinterpretations of what constitutes AWS habitat and resulted in project review missing potential effects to the species and its habitat.
- Closed Canopy does not negate potential for AWS to occur-
- Lack of a sunny slope aspect does not negate the potential for AWS to occur.

[1]Swaim. K. E. and S. M. McGinnis. 1992. Habitat associations of the Alameda whipsnake. *Transactions of the Western Wildlife Society* 28:107-111.

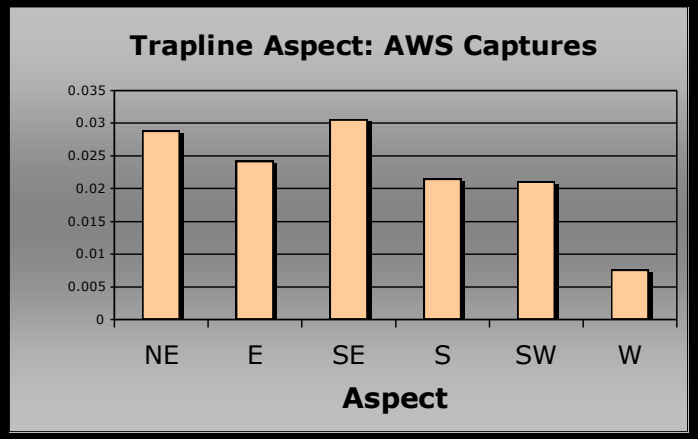
[2]Swaim, K. E. 1994. Aspects of the ecology of the Alameda whipsnake (*Masticophis lateralis euryxanthus*). Unpublished Masters Thesis. CSU-Hayward. 140 pp.

Clarifications of Misinterpretations from Swaim and McGinnis 1992 and Swaim 1994

- Lack of "core habitat" does not negate potential for AWS to occur.
- Core Habitat was defined as areas of concentrated use- not extent of habitat use and was not limited to scrub/ chaparral habitats.
- An individual can have multiple core habitat areas in patches of scrub/ chaparral separated by less suitable habitats.

Post -1994 Trapping Studies

More Oriented to Detailing Habitat Use



Use of NE aspect at Los Vaqueros

- Multiple trap captures of AWS on N facing slopes
- Detections of AWS populations using scattered patches ranging from 0.25 to 0.8 acres
- Marked AWS moving between distant scrub patches (approx. 1000 feet) through woodland and grassland

Whipsnake Observations > 500 feet outside of scrub

General Location	*Habitat*	*Approximate Distance to Scrub (ft.)*	*Locality Source*
Moller Ranch-Pleasanton	G	627	Swaim (1994)
Rossmoor, Walnut Creek	G	680	Pers. obs.
Site 300, Livermore	G	1,190	J. Woollett, pers. comm.
Site 300, Livermore	G	770	J. Woollett, pers. comm.
Tesla Road, Livermore	G	3,300+	J. Woollett, pers. comm.
Corral Hollow Road	G	600+	B. Sullivan, pers. comm.
Finley Road	G/R	2,000	Pers. obs.
Morgan Territory Road	G	5,000+	Greene (MVZ database)
Round Valley	G	8,000+	J. DiDonato and B. Bozein
Los Vaqueros Res. Watershed	G	21,100+	J. Alvarez, pers. comm.
Los Vaqueros Res. Watershed	G/S	2,500	J. Alvarez, pers. comm.
Los Vaqueros Res. Watershed	G/S	21,100+	CDFG

Range of observations = > 500 feet – 21,000 feet from Scrub

G=grassland S=savanna R=riparian

Swaim, K.E. 2000. Alameda whipsnake habitat assessment for Carnegie State Vehicle Recreation Area and Alameda/ Tesla Properties, Alameda and San Joaquin Counties, CA. Unpublished report prepared for California Department of Parks and Recreation, Twin Cities District. 16+ pp.

Project Review

Habitat Assessments

- Conduct assessments/ evaluate potential for AWS for all projects that are with in the recovery units and potentially other undeveloped areas not included.

- A sustained population of AWS is dependent on the presence of scrub/ chaparral, but the species ranges widely and makes use of the entire mosaic of habitats that occur in the East Bay.

- Need to recognize broad range of habitats used by AWS when conducting or reviewing environmental assessments at the earliest stages in order to minimize encroachment and fragmentation of habitat.

Mitigation/ Minimization

- Avoid high quality core type habitat
- Avoid/ minimize fragmentation
- Conservation of large blocks of contiguous land encompassing the entire mosaic of habitats found in the AWS range.
- Control non-native flora (*e.g.*, eucalyptus, broom)
- Rock outcrop creation

Mitigation/ Minimization

Take Avoidance

- Pre-construction surveys
- Exclusion Fencing
- Monitoring

Example Projects

- You choose… or I can

Acknowledgments

SBI Staff
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