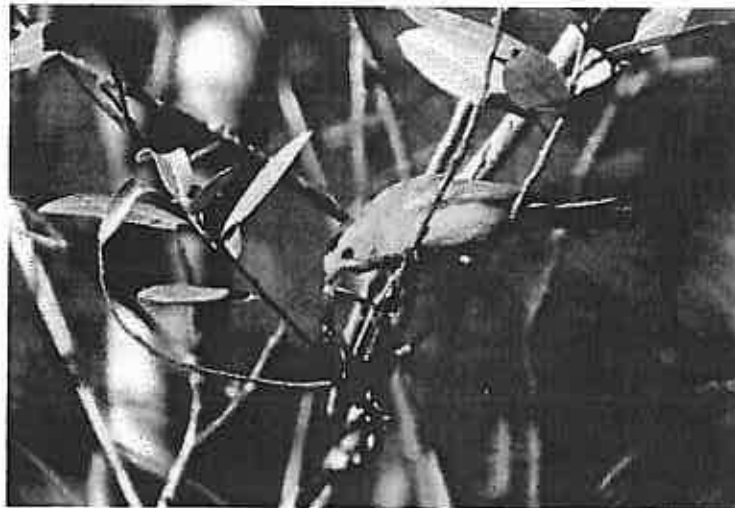


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SONGBIRD INVENTORY AND MONITORING
at
GOLDEN GATE NATIONAL RECREATION AREA
1997



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INTRODUCTION

In recent years, concern has grown over the widespread decline of numerous songbird populations, particularly neotropical migrant species (Robbins et al. 1989). During the past six years an unprecedented international effort has been promoted and coordinated through the Partners in Flight Program to protect non-game bird species and their habitats (for a review see Finch and Stangel 1993). The land holdings of the Golden Gate National Recreation Area (GGNRA) represent diverse habitat types including urban riparian forests, grasslands, mixed hardwood forests, and coastal scrub. While riparian areas have been identified as important habitat for protecting neotropical migrant and resident birds (Miller 1951, Gaines 1974, Manley and Davidson 1993) much information on healthy bird populations is still needed regarding coastal scrub and oak woodland habitats adjacent to urban areas. Grassland bird species have declined more drastically than any other guild of North American species during the past 25 years (Knopf 1994).

The Point Reyes Bird Observatory (PRBO) and the GGNRA began a cooperative assessment of songbirds in these habitats in the summer of 1997. The assessment of the riparian areas is a continuation of a cowbird study initiated by the Kern River Research Center (KRRC) with the GGNRA in 1995. This project is part of a county wide songbird monitoring program being implemented by PRBO with help from numerous federal, state, and private land holders. All monitoring protocols follow nationally standardized guidelines to allow comparisons across space and time. Standardization of methods is essential for land management agencies to garner specific information of population health and status across different regions and habitat types (Ralph et al. 1995).

This progress report presents preliminary findings of data from the 1997 breeding season. Future reports will include analysis of the Kern River Research Center data from 1995 and 1996 as well as habitat correlation's with nest success, species diversity and abundance (pending availability of funds).

The **principle objectives** (short and long term) of the GGNRA songbird monitoring program are summarized below:

- 1) Determine relative abundance, species richness, and species diversity by site and habitat type (short/long term).
- 2) Determine breeding productivity of as many species as possible in riparian areas, with special focus on species of concern (short/long term).
- 3) Assess specific habitat conditions for successfully breeding species in riparian habitats (long term).
- 4) Identify anthropogenic, biological (e.g. cowbird parasitism) and vegetational causes of nest failure of selected species (long term).
- 5) Direct adaptive management efforts to conserve songbird populations and help determine best management practices for declining and sensitive bird populations (long term).
- 6) Promote national and regional conservation efforts by using standardized methodologies and contributing data to national monitoring programs (short/long term).

METHODS

Selection of Study Sites

The point count study sites were selected in two ways. The first is a continuation of an existing Brown-headed Cowbird study initiated in 1995 by the KRRC and the GGNRA. Thus, we continued censusing the preexisting riparian point count stations established by KRRC (Lagunitas Creek, Redwood Creek, Gerbode Valley, and Tennessee Valley). The remaining 5 study sites were established this year based upon randomly generated survey points for small mammal work conducted by Judd Howell of the Biological Research Division of the US Geological Survey. At each site one small mammal survey point served as both a songbird survey point and a starting point for the entire census route. The five new sites were established at Coyote Ridge, Morse's Gulch, Stinson Gulch, Rodeo/Bobcat Trail, and Stewart Ranch. See Appendix 5 for detailed directions to all point count stations and corresponding maps (the points are GPS generated). All sites are located within the GGNRA in western Marin county, California.

Point Count Censuses

The point count method is used to monitor population changes of breeding landbirds. With the point count method it is possible to study the yearly changes of bird populations at fixed points, differences in species composition between habitats, assess breeding status and abundance patterns of species.

Point count methodology followed guidelines described in Ralph et al. (1993 and 1995). In summary, we used five minute, fifty meter, fixed radius point count stations. A total of 75 permanent point count stations were established in the GGNRA in 1997 at 250 meter intervals. The 66 KRRC points were established at 200 meter intervals. The number of point count census stations at each site in each habitat type (see Discussion section for more information on habitat types) are presented in Table 1. All stations were censused 3 times, see Appendix 1 for dates. Counts were conducted from local sunrise until approximately 3 hours after sunrise (peak singing hours). All birds detected were recorded, those detected within a radius of 50 meters surrounding the census station being recorded separately from those at greater than 50 meters. The type of detection (song, visual, or call) was also noted. Counts were not conducted in excessively rainy, foggy, or windy conditions. PRBO field biologists, trained in the songs and calls of the birds in the area, conducted all censuses.

TABLE 1. The number of point count census stations at each site in each habitat type.

Site	Riparian	Grazed Grassland	Ungrazed Grassland	Mixed Hardwood	Grassland/ Scrub	Edge
Lagunitas Creek	18					
Redwood Creek	17					
Gerbode Valley	18					
Tennessee Valley	13					
Stewart Ranch		7		6		2
Coyote Ridge Trail					15	
Rodeo/Bobcat Trail					15	
Stinson Gulch			5		9	1
Morse's Gulch			6	3	6	

Nest Monitoring

Nest monitoring measures nesting success in specific habitats providing information on trends in recruitment, and measurement of vegetation associated with nests may identify habitat influences on breeding productivity. Examination of nests also allow collection of life history data (e.g. clutch size, number of broods, numbers of nesting attempts), which provide important insight into vulnerability of species to decimation or perturbations (Martin and Geupel 1993).

Nest finding and monitoring followed specific guidelines in Martin and Geupel (1993). Nest Monitoring occurred at 2 sites (Lagunitas Creek and Redwood Creek). Each site was divided into 2 plots approximately 800m x 45m or 3.6 hectares. Nest finding began in early April and lasted until breeding activity severely declined in late July. Plots were searched at least every 4 days, and individual nests were checked at least every 4 days until outcome could be determined. Outcome could usually be determined by conditions at the nest or by observing fledglings near the nest. Nests were located at all stages (construction, egg-laying, incubation, and nestling stage). Upon finding a nest various data were recorded directly onto a "nest record sheet." Examples include; number of eggs or young, nest attempt, cue used to find nest, and parental elusiveness. Basic measurement of the nest and nest substrate were also recorded on the "nest record sheet" after outcome was determined. Examples include: nest height, plant height, plant species, and # of support branches. For a complete list of data variables see Martin and Conway (1995). More detailed measurements of vegetation associated with the nest were recorded separately, see section below. Checking nests was done with careful and conscientious attention to minimizing human induced mortality. These precautionary measures include: keeping visits brief, minimizing disturbance to area around nest (for example, avoid creating a dead end trail to nest), and staying clear of nest sites when predators were detected nearby (Martin and Geupel 1993).

All data from nest monitoring was recorded and entered in a compatible format with the "Breeding Biology Research and Monitoring Database (BBIRD)" program run out of the Fish and Wildlife Service Cooperative Unit at the University of Montana (Martin and Conway 1995).

Spot Mapping

The spot mapping method is based on territorial behavior of birds. By marking the locations of observed birds on a detailed map throughout the breeding season, it is possible to count the number of territories in an area and estimate the density of birds.

Spot mapping was conducted at the 4 nest plots and followed International Bird Census Committee recommendations (IBCC 1970). Each plot was visited by the same observer at least 8 times during the breeding season (April-July), and territorial individuals were mapped.

Vegetation assessment.

Point count vegetation assessment

The objective of point count vegetation assessment is to relate the changes in bird composition and abundance to differences in vegetation. These vegetation changes can either be over time, or differences between habitats or study sites.

Vegetation at each point count station was assessed using a relevé, a plot of 50 meter radius centered on the census point, following the procedures outlined in Ralph et al. (1993, pp. 37-39: "Methods of Habitat Assessment: Estimation of stand characteristics"). General habitat characteristics of the site were recorded (maximum tree dbh, canopy cover, aspect). The cover, abundance, and height of each vegetation stratum (tree, shrub, herb, and bare ground) were estimated. Within each vegetation stratum the species composition was determined and each species' relative cover estimated, as a percent of the total cover for that stratum.

Nest vegetation assessment

As soon as a nesting attempt terminated (successful or unsuccessful) we measured the vegetation associated with the nest (nest substrate and surrounding patch). We used a slightly modified version of the BBIRD (Martin and Conway 1995) method for vegetation measurements. The modification made to the BBIRD protocol was the addition of a section for forb cover and height by species. The basic units for vegetation sampling were a 5 meter radius plot (for shrubs and forbs) and an 11.3 meter radius plot (for trees) centered on the nest. The plot was divided into 4 quadrants to facilitate our measurements and estimations. Stems of all shrubs were counted by species within each 5 meter radius plot at 10 cm above the ground. The number of stems of each shrub species was counted for each of two size classes (<2.5 cm diameter or >2.5 cm diameter). For each of the four quadrants in the plot we made visual estimates of % vegetation, bare ground, water, logs or stumps, and litter.

Vegetation was also sampled at the plot level utilizing the point count locations as plot vegetation points. Four subpoints were established at each plot vegetation sampling point (point count location). A "nest" vegetation assessment was done at each point count location (as described above) and the point-centered quarter method (Mueller-Dombois and Ellenberg 1974) was done at each subpoint. The point-centered quarter method is used to estimate densities of woody plants.

Statistical Analysis

Point count census data yielded information on relative abundance, species richness (defined as the number of species detected within 50 m) and species diversity. Species diversity measures ecological diversity based on the number of species detected within 50 meters weighted by the number of individuals of each species. A high score indicates high ecological (species) diversity. Species diversity was measured using a modification of the Shannon-Wiener index (also called Shannon-Weaver index or just Shannon index; Krebs 1989). We used a transformation of the usual Shannon-Weiner index (symbolized H'). This transformed index, which was introduced by MacArthur

(1965) is N_1 where $N_1 = 2^{H'}$. The advantage of N_1 over H' (the original Shannon-Wiener metric) is that N_1 is measured in terms of species whereas H' is measured in terms of bits of information, and thus the former is more easily interpretable. Also, species diversity (measured as N_1) and richness can be compared.

Nest success was calculated using Mayfield (1975) as recommended by Johnson (1979). The Mayfield estimate of nest success allows for precise analysis of mortality and survival by accounting for the elapsed time of the observations as well as the number of nests, eggs, and young.

Personnel

Project supervisor Thomas Gardali and field biologists Britt Heidinger and Sandy Scoggin, under the supervision of Terrestrial Program Director Geoff Geupel, conducted all field work.

RESULTS and DISCUSSION

Species Classification

All species encountered in the 9 study areas were classified by migration status, taxonomic category, nest location, nest type, and foraging behavior (see Appendix 2). Migration status was determined by using a modification of Gathreaux et al. (1991). All species with a migration status code of 1 are neotropical migrants according to USDA Forest Service, Pacific Southwest Region (updated 9/91). Neotropical migrants are further classified as: A = species that breed in North America and winter primarily south of the United States border and B = species that breed and winter extensively in North America but have some populations that winter south of the United States. Migration status codes 2 = short distance migrant and 3 = resident. Species of management concern as defined by the Office of Migratory Bird Management of the United States Fish and Wildlife (1995) are italicized. Neotropical migrant landbirds of special concern in California (Layman 1995) are marked with an asterisk. Species of Conservation Priority (Riparian associates only) as listed by California Partners in Flight (1997) are underlined. All common names are the most current as published in the American Ornithologists Union checklist (1982), and supplements (1987 and 1996).

Point count census data

The number of individuals of each species detected within 50 meters during all three point count censuses is listed for each species at each site in Appendix 3. A total of 65 species were detected on all censuses and locations.

Data from standardized censuses (point counts) allow for comparisons between sites. A summary of the species richness, species diversity, total number of individuals, and mean number of individuals by site is presented in Table 2. Stewart Ranch had the highest diversity index (22.52) of all sites, with Tennessee Valley and Lagunitas Creek following closely. The Coyote Ridge Trail had a lower diversity index than all other sites.

TABLE 2. Species diversity, richness, total individuals, and mean number of individuals per station for all sites.

Site	Diversity N ₁	Richness	Total ind. (<50m)	Mean # of ind. per station
Stewart Ranch	22.52	30	169	11.26
Coyote Ridge Trail	8.56	15	206	13.73
Rodeo\Bobcat Trail	10.74	17	104	6.93
Stinson Gulch	13.19	22	139	9.26
Morse's Gulch	18.44	30	233	15.53
Lagunitas Creek	20.49	38	418	23.22
Tennessee Valley	22.15	33	273	21
Gerbode Valley	17.65	27	323	17.94
Redwood Creek	17.68	32	343	20.17

Point count data also allowed for comparisons between habitat types. A summary of the results are presented in Table 3. PRBO staff decided on 5 general habitat types based on dominant plant species at each site and assigned them to the individual points within the study sites. The habitat types are riparian, grazed grassland, ungrazed grassland, grassland/scrub, and mixed hardwood forest. A total of 3 points fell between habitat types and were excluded from the analysis (see Table 1). Riparian areas showed maximum measures of diversity and richness as well as mean number of individuals. The riparian areas sampled in GGNRA showed higher measures of diversity than calculated for the Marin Municipal Water District in 1996 (24.32 vs. 19.16) (Geupel et al. 1997). Grazed grassland showed the lowest measures of diversity and richness as well as mean number of individuals. Ungrazed grassland was richer by 19 species and had a diversity index 4 times as great as that of grazed grassland. Diversity indices for mixed hardwood forest sites are higher than those calculated for mixed hardwood forests within the Marin Municipal Water District (16.91, Geupel et al. 1997) and similar to those in Brewer's oak/coniferous forests in the Mendocino National Forest (21.53, Gardali et al. 1996).

TABLE 3. Species diversity, richness, total individuals, mean number of individuals per station, and number of stations by general habitat type.

Habitat	Diversity N ₁	Richness	Total ind. (<50m)	Mean # of ind. per station	Number of stations
Riparian	24.32	53	1357	20.56	66
Grazed grassland	4.59	7	21	3	7
Ungrazed grassland	18.66	26	112	10.18	11
Grassland /Scrub	15.27	32	529	11.75	45
Mixed hardwood	19.02	27	154	17.11	9

Nest Data

We examined nest success in two ways (after Martin 1992): nesting success as the proportion of nests that fledged and Mayfield (1975) estimates of survivorship.

Proportional success

The number of nests monitored and proportion successful for each study site are presented in Tables 4, 5, and 6. The Muir Beach nest plot is adjacent to the Muir Beach community and is probably affected by it (e.g. house cats and bird feeders) so we considered it a separate nest plot from Redwood Creek. Rates of parasitism and predation are both positively correlated with adjacent human population size (Martin, personal communication). House cats were seen on a regular basis in and around the riparian area (study plot) at Muir Beach. Song Sparrows' showed similar measures of nest success at Muir Beach, Redwood Creek and Lagunitas Creek. The mean proportional estimate of nest success for open-cup nesting passerines wintering in the neotropics is 42% (± 4.2) (Martin 1992).

TABLE 4. Number of nests located for each species at Lagunitas Creek in 1997 and proportion successful. Cavity nesting species are marked with an asterisk *.

Species	Number of Nests	Proportion successful
Allen's Hummingbird	5	.80
American Goldfinch	5	.20
American Robin	3	.33
Black-headed Grosbeak	7	.71
Black Phoebe	2	1
Chestnut-backed Chickadee*	1	1
Downy Woodpecker*	1	1
Hairy Woodpecker*	2	1
Pacific-slope Flycatcher	4	0
Song Sparrow	27	.41
Stellar's Jay	2	1
Swainson's Thrush	4	.50
Tree Swallow*	1	1
Warbling Vireo	12	0
Western-wood Pewee	1	1
Wilson's Warbler	7	0
TOTAL	84	.40

TABLE 5. Number of nests located for each species at **Redwood Creek** in 1997 and proportion successful. Cavity nesting species are marked with an asterisk *.

Species	Number of Nests	Proportion successful
Allen's Hummingbird	1	0
American Robin	2	0
Belted Kingfisher*	1	1
Chestnut-backed Chickadee*	2	1
Downy Woodpecker*	1	1
Pacific-slope Flycatcher	1	0
Pileated Woodpecker*	1	0
Song Sparrow	7	.43
Scrub Jay	1	0
Swainson's Thrush	6	0
Wilson's Warbler	4	0
TOTAL	27	.26

TABLE 6. Number of nests located for each species at **Muir Beach** in 1997 and proportion successful. Cavity nesting species are marked with an asterisk *.

Species	Number of Nests	Proportion successful
American Kestrel*	1	0
American Robin	3	.33
Black-headed Grosbeak	1	1
Black Phoebe	2	.50
Brewer's Blackbird	1	1
California Towhee	1	1
Common Bushtit	3	0
Olive-sided Flycatcher	1	0
Pygmy Nuthatch*	2	1
Song Sparrow	2	.50
Swainson's Thrush	7	.14
Wilson's Warbler	4	0
TOTAL	28	.32

Mayfield survivorship estimates

Mayfield (1975) estimates of nest success are better estimates of nest survivorship in that they take into account the number of days nests are under observation, thus eliminating the potential under-estimation of losses (see methods). The Mayfield nest success estimate for open-cup nesting passerines wintering in the neotropics is 44%(±3.2) (Martin 1992).

Due to low sample sizes nest success was calculated for four species (all nest plots combined): Song Sparrow, Swainson's Thrush, Warbling Vireo, and Wilson's Warbler. Table 7 shows Mayfield estimates of total nest success and daily survivorship (and standard error) for these species. Nest success is further broken down into success at two stages of the nesting cycle, incubation and nestling. For example, Warbling Vireo's

success at the incubation stage (.80) is high compared to success at the nestling stage (.11) suggesting that depredation occurs mainly in the nestling stage. Nest success for Swainson's Thrush, Warbling Vireo, and Wilson's Warbler (all neotropical migrants) were considerably lower than mean nest success of neotropical migrants (Martin 1992). While this may be a function of small sample size, further investigation is recommended.

TABLE 7. Number of nests located and Mayfield estimates of survival of four species in the Golden Gate National Recreation Area.

Species	Number of Nests	Total Nest Success	Daily (Standard Error)	Total Incubation	Total Nestling
Song Sparrow	30	.26	.948(.012)	.63	.48
Swainson's Thrush	13	.13	.931(.020)	.59	.35
Warbling Vireo	6	.13	.938(.026)	.80	.11
Wilson's Warbler	13	.01	.856(.038)	.65	.05

Cowbird parasitism

Brown-headed Cowbirds are brood parasites on many species of North American Passerines (Friedmann 1929, Friedmann et al. 1977, Friedmann and Kiff 1985). Cowbird parasitism is frequently cited as a contributing factor in the decline of United States passerine populations (Mayfield 1977, Brittingham and Temple 1983). The Brown-headed Cowbird has undergone a remarkable population explosion and range expansion during this century. It has spread from its original home in the Great Plains following the conversion of forest to farms and pastures (Mayfield 1965, Rothstein et al. 1990, Layman 1987, Lowther 1993).

Of the 24 species for which nests were located, 5 species (21%) were parasitized by Brown-headed Cowbirds. Nest data from all nest plots combined, proportion parasitized, proportion parasitized and successful, proportion parasitized and depredated, and proportion abandoned as a result of parasitism are presented in Table 8. Wilson's Warblers had the highest rate of parasitism of any of the species parasitized. Only 7 percent of the parasitized Wilson's Warbler nests were successful while 40 percent of the parasitized nests were depredated. Warbling Vireo nests monitored at Lagunitas Creek may have been parasitized more than the data suggests (1 of 12) as it was usually impossible to check the contents. The one Warbling Vireo nest that did fledge young only fledged a cowbird. Recent studies suggest that cowbirds are either effective nest predators, or that their activities near host nests increases the chance that nests are found by predators (Arcese et al. 1992, 1996).

TABLE 8. Total number of nests located for parasitized species, proportion parasitized, proportion parasitized and successful, proportion parasitized and depredated, and proportion abandoned as a result of parasitism. (all sites combined).

Species	Number of Nests	Proportion parasitized	Parasitized/ Successful	Parasitized/ Depredated	Abandoned (as a result of parasitism)
American Goldfinch	5	.20	0	0	.20
Song Sparrow	29	.17	.07	.10	0
Swainson's Thrush	17	.06	.06	0	0
Warbling Vireo	12	.08	.08	unknown	unknown
Wilson's Warbler	15	.47	.07	.40	0
TOTAL	78	.19	.06	.12	.01

Spot Mapping

Spot mapping provides data on the number of territories in an area. Tables of the number of territories mapped for each species on each plot are presented in Appendix 3. Territories were mapped for a number of species whose nests were not located during nest monitoring efforts. Song Sparrows were the most abundant species at all nest plots at an average of 4 per hectare.

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Literature Cited

- ARCESE, P., J.N.M. SMITH, W.M. HOCHACHKA, C.M. ROGERS, AND D. LUDWIG. 1992. Stability, regulation and the determination of abundance in an insular Song Sparrow population. *Ecology* 73: 805-822.
- ARCESE, P., J.N.M. SMITH, AND M.I. HATCH. 1996. Nest predation by cowbirds and its consequences for passerine demography. *Proc. Natl. Acad. Sci.* 93: 4608-4611.
- BIBBY, C.J., N.D. BURGESS, AND D.A. HILL. 1992. *Bird Census Techniques*. Academic Press Inc. San Diego, CA. 257pp.
- FRIEDMANN, H. 1929. *The cowbirds: A study in the biology of parasitism*. C. Thomas Publ., Springfield IL.
- FRIEDMANN, H. L., L. F. KIFF, AND S. J. ROTHSTEIN. 1977. A further contribution to knowledge of the host relations of parasitic cowbirds. *Smithson. Contrib. Zool.* 295.
- FRIEDMANN, H., L. F. KIFF. 1985. The parasitic cowbirds and their hosts. *Proc Western Foundation Vert. Zool.* 2:226-304.

GAINES, D.F. 1977. The valley riparian forests of California: Their importance to bird populations in Ann Sands (editor) Riparian Forests in California: Their ecology and conservation. Institute of Ecology Publication 15, Univ. of California, Davis, CA. 57-85.

GAINES, D.F. 1974. A new look at the riparian avifauna of the Sacramento Valley, California. West. Birds 5: 57-85.

GARDALI, T., G.R. GUEPEL, AND G. BALLARD 1996. Songbird Census in Brewer's Oak Forests of the Mendocino National Forest: Results from the 1996 field season. PRBO unpublished report to USFS. Stinson Beach, CA.

GAUTHREAUX, A.D., D. FINCH, S. DROEGE, R. GREENBERG 1991. National Migratory Status. Unpublished report to USDA Forest Service, Pacific Southwest Region. Dept. of Biological Sciences, Clemson University, Clemson, SC.

GEUPEL, G.R., A. KIENER, G. BALLARD 1997. Status and Distribution of Bird Populations within the Marin Municipal Water District: A progress report of the 1996 field season. PRBO unpublished report to the Marin Municipal Water District. Stinson Beach, CA.

I.B.C.C. (International Bird Census Committee) 1970. An international standard for a mapping method in bird census work recommended by the International Bird Census Committee. Audubon Field Notes 24: 722-726.

JAMES, F.C. AND H.H. SHUGART 1970. A Quantitative method of habitat description. Aud. Field Notes 24: 727-736.

JOHNSON, D.H. 1979. Estimating nest success: The Mayfield method and an alternative. Auk 96: 651-661.

KNOPF, F.L. 1994. Avian assemblages on altered grasslands. Studies in Avian Biology 15: 247-257.

KREBS, C.J. 1989. Ecological methodology. Harper and Row Publishers, New York, New York: 654pp.

LAYMON, S. A. 1995. Neotropical Migrant Landbirds of Special Concern in California. Kern River Research Center unpublished report to California Partners in Flight. Weldon, CA.

LAYMAN, S. A. 1987. Brown-headed Cowbirds in California: historical perspectives and management opportunities in riparian habitats. West. Birds 18: 63-70.

LOWTHER, P.E. 1993. Brown-headed Cowbird in The Birds of North America, No. 232. The American Ornithologists Union and The Academy of Natural Sciences. Benjamin Franklin Parkway, Philadelphia, PA.

MACARTHER, R.H. 1965. Patterns of species diversity. Biological Reviews 40: 510-533.

MANLEY, P. AND DAVIDSON 1993. A risk analysis of neotropical migrant birds in California, USFS report, Region 5, San Francisco CA.

MARTIN, T.E. 1993. Nest Predation and nest sites: New perspectives on old patterns. Bioscience 43: 523-532.

MARTIN, T.E. 1992. Breeding productivity considerations: What are the appropriate habitat features for management? Pg. 455-473 in J.M. Hagan and D.W. Johnston (editors) *Ecology and Conservation of Neotropical Migrant Birds*. Smithsonian Inst. Press, Washington, D.C.

MARTIN, T.E. and C. CONWAY 1995. BBIRD Field Protocol: Breeding Biology Research and Monitoring Database. Montana Coop. Wildl. Res. Unit, Missoula, MT. March 1995. 39pp.

MARTIN, T.E. and G.R. GEUPEL 1993. Nest monitoring plots: Methods for locating nests and monitoring success. *J. Field Ornith.* 64: 507-519.

MAYFIELD, H.F. 1961. Nesting success calculated from exposure. *Wilson Bull.* 73: 255-261.

MAYFIELD, H.F. 1975. Suggestions for calculating nest success. *Wilson Bull.* 87: 456-466.

MAYFIELD, H. F. 1965. The Brown-headed Cowbird, with old and new hosts. *Living Bird* 4: 13-28.

MAYFIELD, H. F. 1977. Brown-headed cowbird: Agent of Extermination? *American Birds* 31:107-113.

MILLER, A.H. 1951. An analysis of the distribution of the birds of California. Univ. Calif. Publication Zool. 50: 531-643.

MUELLER-DOMBOIS, E. AND H. ELLENBERG 1974. Aims and methods of vegetation ecology. John Wiley & Sons, New York. 547pp.

RALPH, C.J., G.R. GUEPEL, P. PYLE, T.E. MARTIN, & D.F. DESANTE 1993. Field Methods for Monitoring Landbirds. USDA Forest Service Publication, PSW-GTR 144, Albany, CA.

RALPH, C.J., J.R. SAUER, and S. DROEGE 1995. Monitoring bird populations by point counts. USDA Forest Service Publication, PSW-GTR 149, Albany, CA.

ROTHSTEIN, S. I., J. VERNER, AND E. STEVENS 1980. Range expansion and diurnal changes in dispersion of the Brown-headed Cowbird in the Sierra Nevada. *Auk* 97: 253-267.

USFWS 1995. Migratory nongame birds of management concern in the United States: the 1995 list. Office of Migratory Bird Management U.S. Fish and Wildlife Service, Washington D.C. September 1995. 20pp.

Appendix 1. Visit date of point count census by site in 1997.

<u>Site</u>	<u>Date 1997</u>		
	<u>Visit #1</u>	<u>Visit #2</u>	<u>Visit #3</u>
Coyote Ridge Trail	May 14	June 8	July 2
Gerbode Valley	April 24	May 21	June 20
Lagunitas Creek	April 25	May 20	June 18
Morse's Gulch	May 20	June 11	June 30
Redwood Creek	April 23	May 26	June 17
Rodeo/Bobcat Trail	May 14	June 6	June 27
Stewart Ranch	May 9	June 6	June 25
Stinson Gulch	May 12	June 4	June 24
Tennessee Valley	April 24	May 20	June 17

Appendix 2. Species List. Species of management concern as defined by the Office of Migratory Bird Management of the United States Fish and Wildlife (1995) are *italicized*. Neotropical migrant landbirds of special concern in California (Layman 1995) are marked with an asterisk*. Species of Conservation Priority (Riparian associates only) as listed by California Partners in Flight (1997) are underlined.

<u>A.O.U. common name</u>	<u>Migration status</u>	<u>Nest location</u>	<u>Nest type</u>	<u>Foraging strategy</u>	<u>Taxa group</u>
Acorn Woodpecker	3	4	2	3	4
<i>Allen's Hummingbird</i>	1A	4	1	4	5
American Crow	3	4	1	1	2
American Goldfinch	1B	3	1	7	14
American Kestrel	1B	4	2	4	8
American Robin	1B	4	1	11	11
Anna's Hummingbird	1B	4	1	4	5
Ash-throated Flycatcher	1A	4	1	4	3
Barn Swallow	1A	1	1	4	6
Belted Kingfisher*	1B	1	2	5	9
Bewick's Wren	3	4	2	1	10
Brown-headed Cowbird	1B	-	-	2	9
<u>Black-headed Grosbeak</u>	1A	4	1	2	13
Black Phoebe	3	1	1	4	3
Brewer's Blackbird	1B	3	1	2	9
Brown Creeper	3	4	2	3	2
Band-tailed Pigeon*	1A	3	1	2	7
Bullock's Oriole	1A	3	3	2	9
Bushtit	3	4	3	2	1
Canada Goose	2	2	1	5	9
California Towhee	3	3	1	1	13
California Quail	3	2	1	1	9
Caspian Tern	1A	2	1	5	9
Chestnut-backed Chickadee	3	4	2	2	1
Cedar Waxwing	1B	4	1	2	9
Chipping Sparrow*	1A	4	1	1	13
Cliff Swallow	1A	1	4	4	6
Common Raven	3	1	1	1	2
<u>SF Common Yellowthroat*</u>	1B	3	1	2	12
Downy Woodpecker	3	4	2	3	4
European Starling	3	4	2	2	9
Golden-crowned Kinglet	1B	4	1	2	9
Great Horned Owl	3	4	1	4	9
Grasshopper Sparrow*	1A	2	1	2	13
Hairy Woodpecker	3	4	2	3	4
Hermit Thrush	1B	2	1	1	11
House Finch	3	1	4	2	14
Horned Lark	2	2	1	1	9
House Wren	1A	4	2	2	10
Hutton's Vireo	3	4	1	2	12
<i>Lark Sparrow</i>	1A	2	1	1	13
Lazuli Bunting	1A	3	1	1	13
Mallard	1B	2	1	5	9
Marsh Wren	1B	3	4	2	10
Mac Gillivray's Warbler	1A	3	1	2	12

Appendix 2. (continued).

<u>A.O.U. common name</u>	<u>Migr.</u>	<u>Nest location</u>	<u>Nest type</u>	<u>Forag.</u>	<u>Taxa group</u>
Mourning Dove	3	4	1	1	7
Northern Harrier*	1B	2	1	4	8
Nuttall's White-crown Sparrow	3	3	1	2	13
Orange-crowned Warbler	1A	2	1	2	12
Oregon Junco	1B	2	1	1	13
Olive-sided Flycatcher*	1A	4	1	4	3
Pine Siskin	1B	4	1	7	14
Pileated Woodpecker	3	4	2	3	4
Plain Titmouse	3	4	2	2	1
Pacific-slope Flycatcher	1A	4	2	4	3
Purple Finch	1B	4	1	1	14
Pygmy Nuthatch	3	4	2	3	1
Red-breasted Nuthatch	2	4	2	3	1
Ruby-crowned Kinglet	1B	4	1	2	9
Ring-necked Pheasant	3	2	1	1	9
Red-shafted Flicker	2	4	2	3	4
Red-shouldered Hawk*	1B	4	1	5	8
Red-tailed Hawk*	1B	4	1	4	8
Red-winged Blackbird	1B	3	1	2	9
Savannah Sparrow	1B	2	1	2	13
Scrub Jay	3	4	1	1	2
Song Sparrow	1B	2	1	1	13
Spotted Towhee	1B	2	1	1	13
Steller's Jay	3	4	1	1	2
Swainson's Thrush*	1A	3	1	2	11
Tree Swallow*	1B	4	2	4	6
Turkey Vulture	1A	1	4	4	9
Violet-green Swallow	1A	4	2	4	6
Warbling Vireo*	1A	4	1	2	12
Western Bluebird	1B	4	2	4	11
Western Meadowlark	3	2	1	1	9
Western Wood-pewee	1A	4	1	4	3
Wilson's Warbler*	1A	2	1	2	12
Winter Wren	2	1	4	2	10
Wrentit	3	3	1	2	9
White-tailed Kite*	3	3	1	5	8
White-throated Swift	1A	1	4	4	6
Yellow Warbler*	1A	3	1	2	12

Explanation of codes

Migr.: 1A = Neotropical Migrant that breeds primarily in the Nearctic Region and winters generally south of the United States, 1B = neotropical Migrant that winters primarily in the United States but some population do winter south of the United States, 2 = short distance migrant, 3 = Resident.

Nest location: 1 = bank, cliff or human made, 2 = ground, 3 = shrub, 4 = tree or snag.

Nest type: 1 = open cup (includes scrape or platform), 2 = cavity, 3 = pendant, 4 = other.

Forg.: 1 = ground gleaning, 2 = foliage gleaning, 3 = bark gleaning, 4 = aerial, 5 = other.

Tax. group: 1 = tit, 2 = jay, 3 = flycatcher, 4 = woodpecker, 5 = hummingbird, 6 = swift and swallow, 7 = dove/pigeon, 8 = raptor, 9 = other, 10 = wren, 11 = thrush, 12 = warbler and vireo, 13 = sparrow, 14 = finch.

Appendix 3. Total number of individuals (within 50 meters) of each species censused during point counts by site.

	Site ¹								
<u>A.O.U. Common Name</u>	<u>CRTR</u>	<u>GERB</u>	<u>LACR</u>	<u>MOGU</u>	<u>RECR</u>	<u>RODE</u>	<u>STGU</u>	<u>STRA</u>	<u>TEVA</u>
Allen's Hummingbird	0	20	17	5	20	2	3	2	20
American Crow	0	0	0	0	0	0	0	1	0
American Goldfinch	8	21	2	0	16	0	2	0	13
American Robin	0	2	8	1	9	0	0	4	2
Anna's Hummingbird	4	15	1	12	5	6	3	1	8
Ash-thrtd Flycatcher	0	0	3	0	0	0	0	6	2
Barn Swallow	0	0	2	0	0	0	0	0	0
Belted Kingfisher	0	0	0	0	1	0	0	0	0
Bewick's Wren	10	9	7	20	1	12	19	8	9
Brown-headed Cowbird	0	8	12	1	3	0	0	0	10
Blk-headed Grosbeak	0	3	19	0	10	0	0	0	6
Black Phoebe	0	0	0	0	5	0	0	0	0
Brewer's Blackbird	0	11	4	0	7	1	0	0	0
Brown Creeper	0	0	2	2	0	0	0	4	0
Band-tailed Pigeon	0	0	0	1	0	0	0	0	0
Bushtit	0	4	10	29	6	0	18	2	5
California Towhee	2	3	10	14	3	3	14	8	6
California Quail	16	2	3	4	0	0	2	3	8
Chestnut-bkd Chickadee	0	19	44	26	21	1	12	16	17
Chipping Sparrow	0	0	3	0	0	0	0	8	0
Common Raven	3	0	0	0	0	1	0	0	0
Common Yellowthroat	0	15	0	0	0	1	0	0	5
Downy Woodpecker	0	0	6	2	8	0	0	0	0
European Starling	0	0	0	0	2	0	0	0	2
Golden-crowned Kinglet	0	0	0	2	0	0	0	0	0
Great-horned Owl	0	0	0	0	0	0	0	0	1
Grasshopper Sparrow	0	0	0	7	0	1	0	10	0
Hairy Woodpecker	0	0	6	1	1	0	0	1	2
Hermit Thrush	0	0	0	1	0	0	0	0	0
House Finch	8	0	0	0	2	0	0	0	3
House Wren	0	0	1	0	0	0	0	0	0
Hutton's Vireo	0	0	0	6	0	0	2	4	0
Lark Sparrow	0	0	0	0	0	0	2	0	0
Lazuli Bunting	0	0	0	1	0	0	1	0	0
Mallard	0	0	0	0	10	0	0	0	0
Marsh Wren	0	1	0	0	0	0	0	0	9
MacGillivray's Warbler	0	2	0	0	0	0	0	0	0
Morning Dove	0	4	1	0	0	0	0	2	3
Norhtern Harrier	0	1	0	0	0	0	0	0	0
Nuttall's Wt-crn Sparrow	36	0	0	0	0	10	0	0	2
Orange crnd Warbler	0	19	9	5	12	0	1	1	4
Oregon Junco	0	0	0	5	0	0	1	10	1
Olive-sided Flycatcher	0	0	0	1	0	0	0	0	0
Pacific-slope Flycatcher	0	0	12	4	3	0	4	10	0
Purple Finch	0	6	5	5	0	0	1	1	0
Red-breasted Nuthatch	0	0	1	0	0	0	0	0	0

Appendix 3. (continued)

Site¹

<u>A.O.U. Common Name</u>	<u>CRTR</u>	<u>GERB</u>	<u>LACR</u>	<u>MOGU</u>	<u>RECR</u>	<u>RODE</u>	<u>STGU</u>	<u>STRA</u>	<u>TEVA</u>
Ruby-crowned Kinglet	0	0	1	0	0	0	0	0	0
Red-shafted Flicker	0	1	1	4	2	2	0	0	1
Red-tailed Hawk	1	0	0	0	0	0	0	1	0
Red-winged Blackbird	0	20	0	0	13	4	0	0	25
Savannah Sparrow	15	0	0	0	0	2	0	9	0
Scrub Jay	3	6	10	3	4	8	7	0	9
Song Sparrow	67	62	77	8	66	23	5	0	34
Spotted Towhee	20	12	6	32	2	16	18	9	8
Stellar's Jay	0	0	7	7	7	0	2	5	3
Swainson's Thrush	0	14	33	0	25	0	1	5	16
Tree Swallow	0	0	0	0	1	0	0	0	0
Turkey Vulture	0	0	1	0	0	0	0	0	0
Violet -green Swallow	0	0	7	0	0	0	0	0	0
Warbling Vireo	0	0	28	0	13	0	0	18	1
Westen-wood Pewee	0	0	9	0	0	0	0	4	0
Wilson's Warbler	1	16	38	9	55	0	1	9	24
Winter Wren	0	0	0	0	7	0	0	2	0
Wrentit	12	27	9	15	3	11	20	5	12
Yellow Warbler	0	0	3	0	0	0	0	0	2

¹ CRTR = Coyote Ridge Trail (15 points), GERB = Gerbode (18 points), LACR = Lagunitas Creek (18 points), MOGU = Morse's Gulch (15 points), RECR = Redwood Creek (17 points), RODE = Rodeo (15 points), STGU = Stinson Gulch (15 points), STRA = Stewart Ranch (15 points), and TEVA = Tennessee Valley (13 points).

Appendix 4. Number of territories determined from spot mapping at each site.**TABLE 1.** Number of territories at Lagunitas Creek plot A and B determined from spot mapping data.

Plot A		Plot B	
Species	No. of Territories	Species	No. of Territories
American Robin	3	American Robin	2
American Goldfinch	0	American Goldfinch	5
Black-headed Grosbeak	5	Black-headed Grosbeak	5
Black Phoebe	1	Black Phoebe	1
California Towhee	3	California Towhee	3
Chestnut-backed Chickadee	4	Chestnut-backed Chickadee	2
Downy Woodpecker	1	Downy Woodpecker	2
Hairy Woodpecker	1	Hairy Woodpecker	1
Lazuli Bunting	0	Lazuli Bunting	2
Pacific-slope Flycatcher	3	Pacific-slope Flycatcher	4
Orange-crowned Warbler	3	Orange-crowned Warbler	2
Scrub Jay	1	Scrub Jay	1
Song Sparrow	15	Song Sparrow	21
Steller's Jay	2	Steller's Jay	2
Swainson's Thrush	8	Swainson's Thrush	8
Warbling Vireo	4	Warbling Vireo	4
Western Wood Pewee	2	Western Wood Pewee	3
Wilson's Warbler	7	Wilson's Warbler	9
Wrentit	3	Wrentit	2

Appendix 4 (continued). Number of territories determined from spot mapping at each site.

TABLE 2. Number of territories at Redwood Creek and Muir Beach determined from spot mapping data.

Redwood Creek		Muir Beach	
Species	No. of Territories	Species	No. of Territories
American Goldfinch	1	American Goldfinch	0
American Kestrel	0	American Kestrel	1
American Robin	2	American Robin	5
Bewick's Wren	1	Bewick's Wren	0
Black-headed Grosbeak	3	Black-headed Grosbeak	1
Black Phoebe	0	Black Phoebe	2
Bushtit	0	Bushtit	2
California Towhee	0	California Towhee	2
Common Raven	1	Common Raven	0
Common Yellowthroat	0	Common Yellowthroat	1
Belted Kingfisher	1	Belted Kingfisher	0
Brewer's Blackbird	0	Brewer's Blackbird	2+
Downy Woodpecker	3	Downy Woodpecker	2
European Starling	0	European Starling	4
Hairy Woodpecker	1	Hairy Woodpecker	0
Mourning Dove	2	Mourning Dove	0
Olive-sided Flycatcher	0	Olive-sided Flycatcher	1
Oregon Junco	1	Oregon Junco	0
Pacific-slope Flycatcher	1	Pacific-slope Flycatcher	0
Pileated Woodpecker	1	Pileated Woodpecker	0
Purple Finch	3	Purple Finch	0
Pygmy Nuthatch	0	Pygmy Nuthatch	2
Red-shafted Flicker	0	Red-shafted Flicker	1
Red-tailed Hawk	1	Red-tailed Hawk	1
Red-winged Blackbird	0	Red-winged Blackbird	5+
Scrub Jay	1	Scrub Jay	2
Song Sparrow	12	Song Sparrow	11
Sora Rail	0	Sora Rail	1
Steller's Jay	1	Steller's Jay	0
Swainson's Thrush	11	Swainson's Thrush	8
Virginia Rail	0	Virginia Rail	1
Warbling Vireo	3	Warbling Vireo	1
Wilson's Warbler	11	Wilson's Warbler	8
Winter Wren	2	Winter Wren	0
Wrentit	2	Wrentit	0

Appendix 5. Point count locations.**Station:** Rodeo Gulch = ROGU**Flags:** Orange and blue**Intervals:** 250 meters**Total #:** 15 points

Notes: You can park at the trailhead by taking the "Rodeo" exit off of 101. However, this is considered to be part of the freeway and you may receive a warning stating that your car may be towed if you park there for more than four hours. If you are biking, you can also park at the Tennessee Valley trailhead and take the Marincello trail to the Bobcat trail. At the Bobcat trail you would then take a left to get to point #1. The following directions are from the Rodeo trail.

- #1) Bike up the Rodeo trail. Turn left at the Bobcat trail, then take the trail that comes off of the left side of the trail. Point #1 is located ~50 meters down this trail. It is on the right side, on a coyote bush at the bottom of a dip, and is adjacent to a rock outcrop.
- #2) Go back to the Bobcat trail and back down the Rodeo trail. Just past the first fire road that goes off to your left, there is an unofficial trail that heads up the hill. As you ascend, veer left at the "V" in the trail. Veer off trail just past the rock and walk north towards the freeway. Or you can veer off at the rock and contour around away from the trail. The point is ~65 meters from the rock on a small coyote bush at the edge of the scrub.
- #3) Go back to the Bobcat trail and take a left again. About 25 meters up the trail, you'll see the point to your left ~10 meters off trail. (this point is one of Judd's points)
- #4) Proceed down the Bobcat trail away from point #1. Point #4 is 250 meters down the Bobcat trail just before the bottom of the dip. It is on the left hand side on a small coyote bush.
- #5) 250 meters further, on the right side on a dead coyote bush in front of a small fence.
- #6) 250 meters further, on the right side on a coyote bush. It is near the Bobcat/Hawk trail junction.
- #7) 250 meters further, on the left side on a small coyote bush in front of a dead coyote bush.
- #8) 250 meters further, on the right side about 50 meters past trail sign, next to rock.
- #9) 250 meters further, on the left side on a PG&E pole.
- #10) Take a left onto the foot path and follow the trail along the fence line. Point #10 is 250 meters from point #9, on the left side across from the air traffic station. It is about 25 meters off trail on a small coyote bush.
- #11) Follow a compass bearing of 230 degrees for 250 meters. You will descend a hill and cross a trail. Continue across the trail and up the hill. The point is ~20 meters off trail on a small coyote bush.
- #12) Continue to follow the compass bearing of 230 for 250 meters up the hill and along the ridge. The point is visible from the top of the hill in a coyote bush clump down ~50 meters from the lone juniper-like shrub.
- #13) Continue to follow the compass bearing of 230 for 250 meters. The point is near the base of the hill on a coyote bush. A trough is visible ahead of you to the right.
- #14) Walk down to the Old Springs trail and take a left. Proceed down the trail until you see a large live oak clump about 50 meters off the trail to your right. The flagging should be visible from the trail, tied to the front of this live oak cluster.
- #15) Walk back to the trail and continue in the direction you were heading when you left the trail. You will cross ~5 small bridges. The point is on the right side just before the trail junction.

You are now at the junction of the Old Springs trail and the Miwok trail. Turn left up the Miwok trail and it will take you back to the Bobcat trail between points 7 and 8, where you can then find your way back to your vehicle.

Appendix 5. Point Count Locations.

Station: Stinson Gulch = STGU

Flags: Orange and blue

Intervals: 250 meters

Total #: 15 points

Notes: see attached map. Park at wide turnout along Shoreline Hwy between McKinnan Gulch and the Stinson Beach school. You'll see a gated overgrown fire road on the north/east side of the highway.

- #1) 100 meters up the trail on the left hand side on a toyon.
- #2) 260 meters further up trail on the right hand side on a small douglas fir.
- #3) The trail turns sharply to the right as you reach the first meadow and becomes more overgrown. Continue along this trail. Pt. 3 is ~250 meters from pt. 2 on the right hand side of the trail on a coyote bush.
- #4) 350 meters along switch-backing trail (about 250 meters from #3 in actual distance). The point is ~50 meters off trail at the west edge of a clump of douglas firs. (this point is one of Judd's points.)
- #5) 250 meters further--just beyond the hiking sign on the right hand side on a small douglas fir.
- #6) 250 meters further, on the right hand side on a small douglas fir.
- #7) 250 meters further, on the left hand side on the metal fence.
- #8) 250 meters further, on the right hand side on a large douglas fir.
- #9) 250 meters further, on the left hand side in a lone coyote bush.
- #10) 250 meters further, and 25 meters to the left of the trail in a coyote bush at the base of the large rock.
- #11) 250 meters further, on the left hand side on a large douglas fir next to a stump.
- #12) 250 meters further, on the left side on a small douglas fir ~20 meters from a large live oak on the right.
- #13) 200 meters further tied to the trail sign at Ridgecrest rd.

go back down the trail the way you came up

- #14) Just past point #5, look to your left for the trail that leads down towards Stinson Beach Elementary School. Pt. #14 is 250 meters down the trail on the right hand side on a large douglas fir.
- #15) 250 meters further down the trail, on the left side on a coyote bush.

You can now continue to the end of the trail, and then to your right to the highway. You are now approximately one mile south of the turnout where you parked.

Appendix 5. Point Count locations.

Station: Coyote Ridge Trail = CRTR

Flags: Orange and blue

Intervals: 250 meters

Total #: 15 points

Notes: See attached map. Points are on three trails (fire-roads); Coastal Trail Fire Road (there is a Coastal Trail single-track), Fox Trail (fire-road), and Coyote Ridge Trail (fire-road).

Coyote Ridge Trail (fire-road)

#1) 75 meters from Coyote Ridge/Coastal Trail junction (single-track). Point on West side of trail.

#2) W side of trail.

#3) W side of trail.

#4) Point flagged on both sides of trail (North and South).

Fox Trail (fire-road)

#5) 230 meters down Fox Trail from the "Fox Trail" sign.

Coyote Ridge Trail (fire-road)

#6) Judd Howell's point (rebar). 45 meters NE off of trail in small clearing (see map).

#7) Go right to remain on Coyote Ridge Trail. Point is on fence post behind a sign that marks the Coyote Ridge Trail (East) in the midst of Green Gulch and Middle Green Gulch junctions.

#8) Continue down trail. Point flagged on West side of trail.

Coastal Trail (fire-road)

#9) Return to Coastal Trail (fire-road). Point is 200 meters from beginning of fire-road on the SE side.

#10) Point on SE side of trail just past large boulders (also SE side, 40 m off trail).

#11) This is an off trail point. From the top of the boulders at #10 sight approx. 188° down obvious gully.

#12) Return to trail. Point on fence post (N) where trail briefly flattens and area becomes grassy.

#13) Point on NW side of trail 19 meters past small fenced in area on SE side of trail.

#14) Point on fence post on NW side of trail.

#15) Point on S side of trail 20 meters past sign "figures" (hiking, biking, horsing) at Coastal Trail fire-road and Coastal Trail single-track junction.

Appendix 5. Point count locations.

Station: Stewart Ranch = STRA

Flags: Orange and blue

Intervals: 250 meters

Total #: 15 points

Notes: See attached map. Points 1 and 2 are Judd Howell's points. There are no points on trails. Access transect by Bolinas Ridge fire rd. The points are roughly located between the Bolinas Ridge fire road and the Olema cemetery.

- #1) Located 40 meters and 148° from the round cattle water trough. Grassland point.
- #2) From #1 walk toward drainage/forest (roughly 330°) 50 meters into drainage (forest edge flagged blue). Point is on a California Bay. Woodland point.
- #3) Return to grazed grassland and walk down the forest edge 250 meters then into the forest 50 meters. Point is on a CA Bay that is drooped over with large off-shoot branches that are reaching toward the sun. Woodland point.
- #4) Return back out of drainage at roughly 200° until you see another round cattle trough. Point is 20 meters past the trough at 200°. Grassland point.
- #5) Walk 250 meters at 270° (back toward drainage). Point is 40 meters from forest edge and 18° and 76 meters from red feeding station. Grassland point.
- #6) Walk down slope the forest edge and into forest on a farm road. Point is on a red and white metal fence post. Woodland point.
- #7) Continue through the drainage/forest on road until forest edge. Walk out of forest uphill at 218° until you reach the top of the first ridge. Grassland point.
- #8) Walk 330° from #7. Point is on edge of forest (woodland/coastal scrub).
- #9) Walk through forest/drainage and continue on to next drainage. Edge point. Sorry so vague.
- #10) Walk uphill along forest edge 250 meters and into drainage (roughly 15 meters before small (dbh~40 cm) oak that slightly protrudes from forest edge). Point is in woodland at the bottom of the drainage.
- #11) Return to forest edge and continue uphill along edge until it sharply curves left, continue straight out into grassland 60 meters.
- #12) Go 70° and 250 meters. Grassland point.
- #13) Go 30° toward Bolinas Ridge Rd. (necessary to hop fence). Point is on a rock/boulder that is 24 meters west of fire road. Grassland point.
- #14) 316° downslope. Walk into drainage/forest 15 meters past lone mixed plant species "clump." Point is on SW side of drainage, roughly 50 meters in forest. Woodland point.
- #15) Return to edge and walk into the "V" of the forest edge (312°). Cross confluence of two drainage's and stay parallel to drainage. Point is roughly 10 meters beyond the 2nd confluence you come to.

Appendix 5. Point Count Locations.

Station: Morse's Gulch = MOGU

Flags: Orange and Blue

Intervals: 250m

Total #: 15 points

Notes: see attached map. Drive along Bolinas lagoon and park beyond volunteer canyon at a small pull-out on the east side of the road with the "no camping" sign and a roped off trail.

#1) is located up the steep slope to your left as you walk down the trail. Follow the tree-line at the top of the slope for 50m, the flag is tied to a small Douglas Fir-adjacent to telephone pole.

#2) is located 240m further up the slope along the tree-line on a small, lone Douglas Fir.

#3) Follow the tree-line of the side (perpendicular to main) drainage and at the end of the tree line cross drainage and proceed straight up—point is on a lone coyote bush.

Veer towards the tree-line on your right (main drainage) walking up the slope, continue right past the small, wooden remnant fence corner.

#4) is located on a lone Douglas Fir surrounded by large Coyote Bushes in a small coyote bush filled gully approx. 40 meters from the tree-line. (3 bushy Doug Firs are in a line in this gully)

Walk back past the remnant fence and cross slope to the other side of the hill (drainage).

#5) is located across the hill from Point #4. A flag is tied to a large Douglas Fir Branch (large fir with trunk split in two half way up) it is accessible to enter the forest. The Point is located 50m within the forest edge tied to a large Bay Laurel.

Walk back out to the scrub and continue back up slope along the outside of the barbed wire fence.

#6) is located 250m up slope at the edge of the scrub/forest tied to a Coyote Bush.

Walk back down the hill, 250m beyond Point#5.

#7) is located 250m down slope from Point #5, it is tied to a small Live Oak, next to the scrub/forest edge.

#8) is located 250m down slope from Point #7. A flag is tied to a Live Oak where it is accessible to enter the forest. The point is 50m within the forest edge on a large Douglas Fir.

Walk back to the scrubby hill. Continue down the renegade bike trail to the road. Walk back to the parking area and drive to Audubon Canyon Ranch. Park near the bridge at the trail entrance. Walk up the trail for 200m.

#9) is located on the right hand side of the trail on the last large Douglas Fir before trail opens up into scrub.

#10) is 250m further up the trail on the right hand side of the trail on a dead Coyote Bush, beyond the Volunteer Canyon Trail (approx. 25 meters beyond where tele poles cross trail).

#11) is located 250m further up the trail on the right hand side of the trail on a Coyote Bush.

#12) is located 250m further up the trail on the left hand side of the trail on a Douglas Fir (on the fir that is just beyond the two firs growing close to each other).

#13) is located 250m further up the trail on the right hand side of the trail on a Live Oak bush at the Bourne Trail junction.

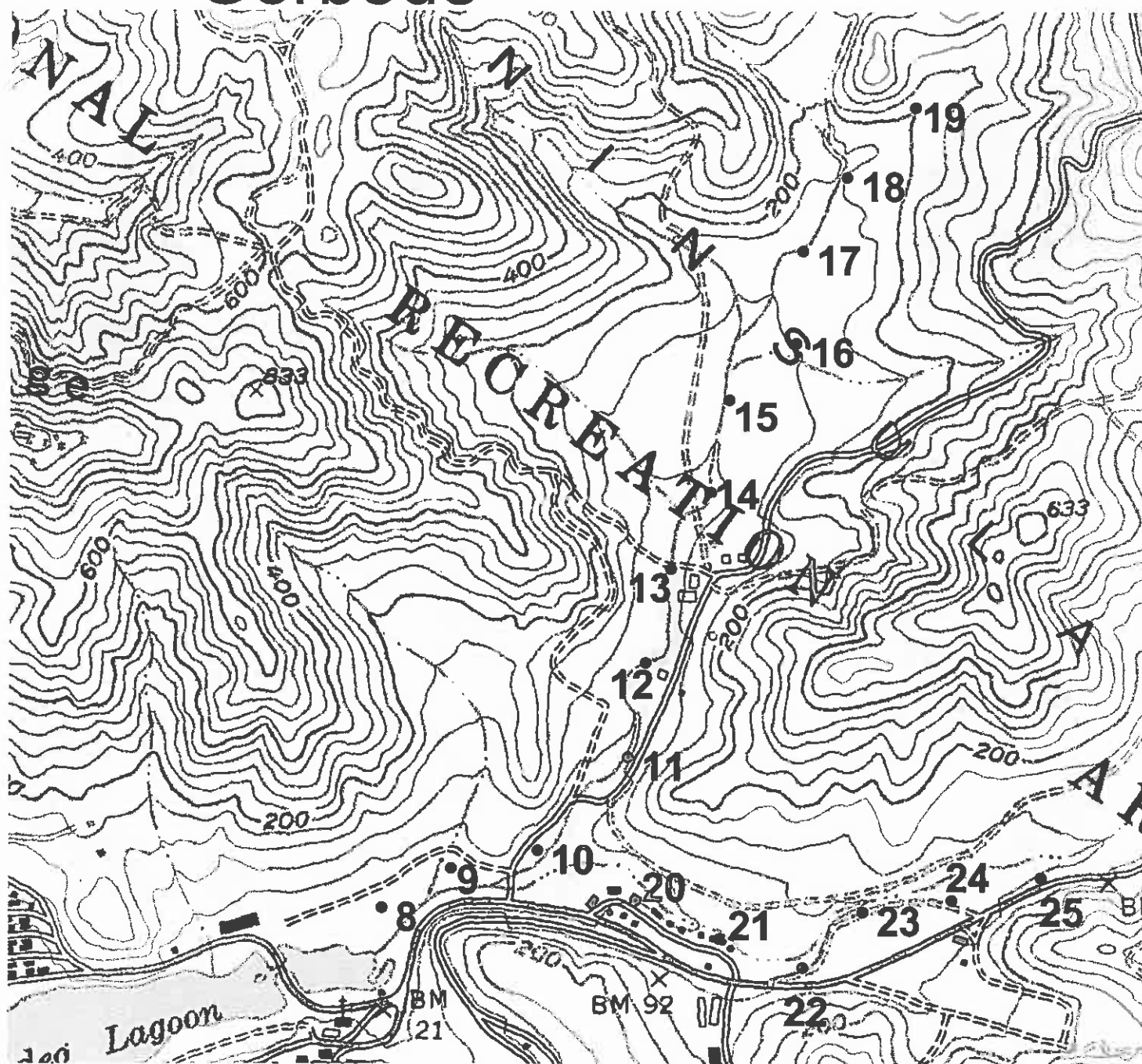
Continue up the Bourne Trail

#14) is located 250m up the trail on the right hand side of the trail on a small Douglas Fir/CA Bay clump.

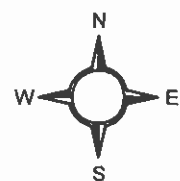
#15) is located 350m further up the trail, 50m within the forest on the left hand side of the trail.



Gerbode

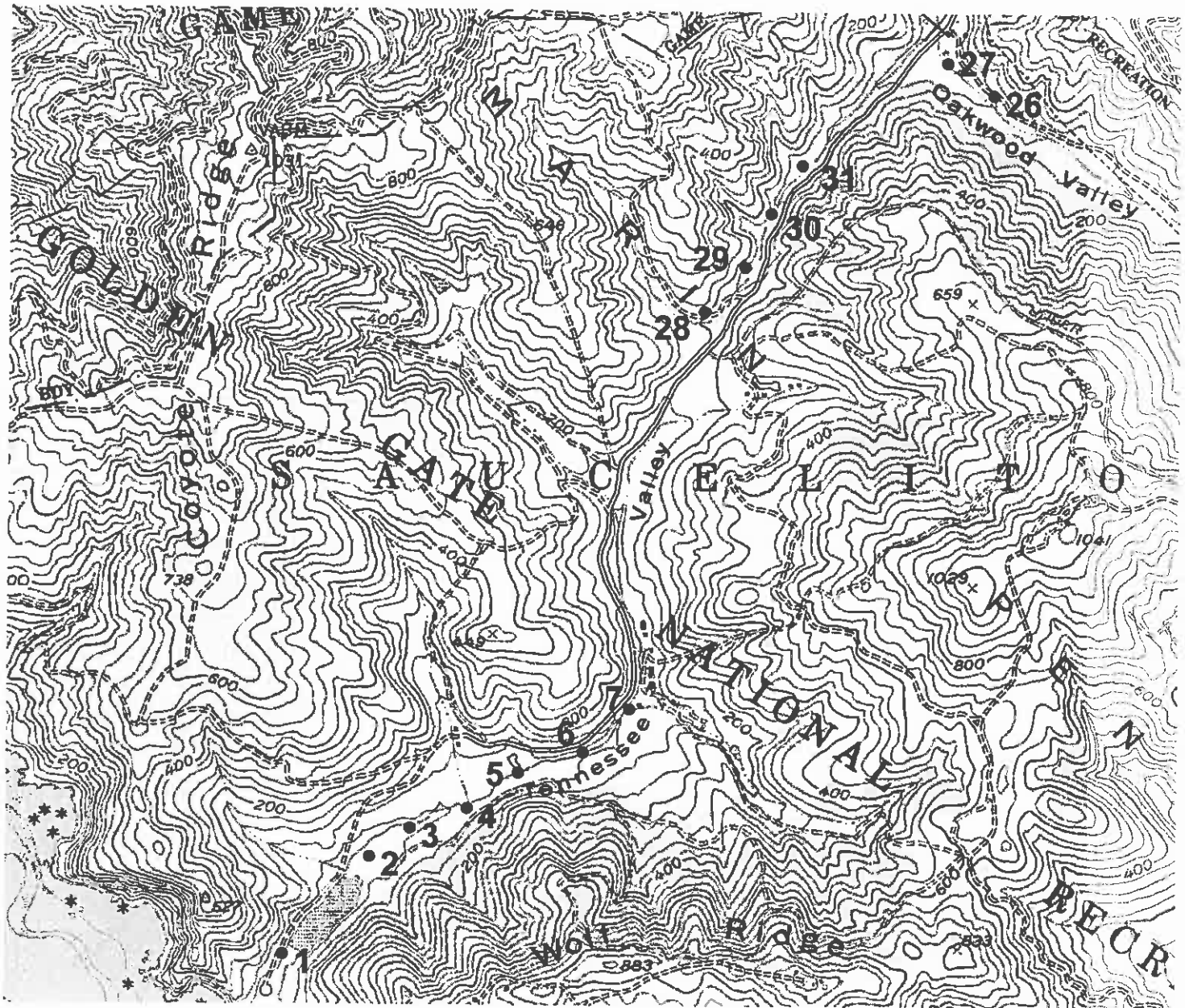


● Point Count Stations

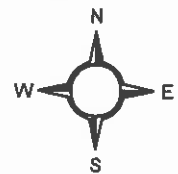


250 0 250 500 750 1000 1250 1500 Meters

Tennessee Valley



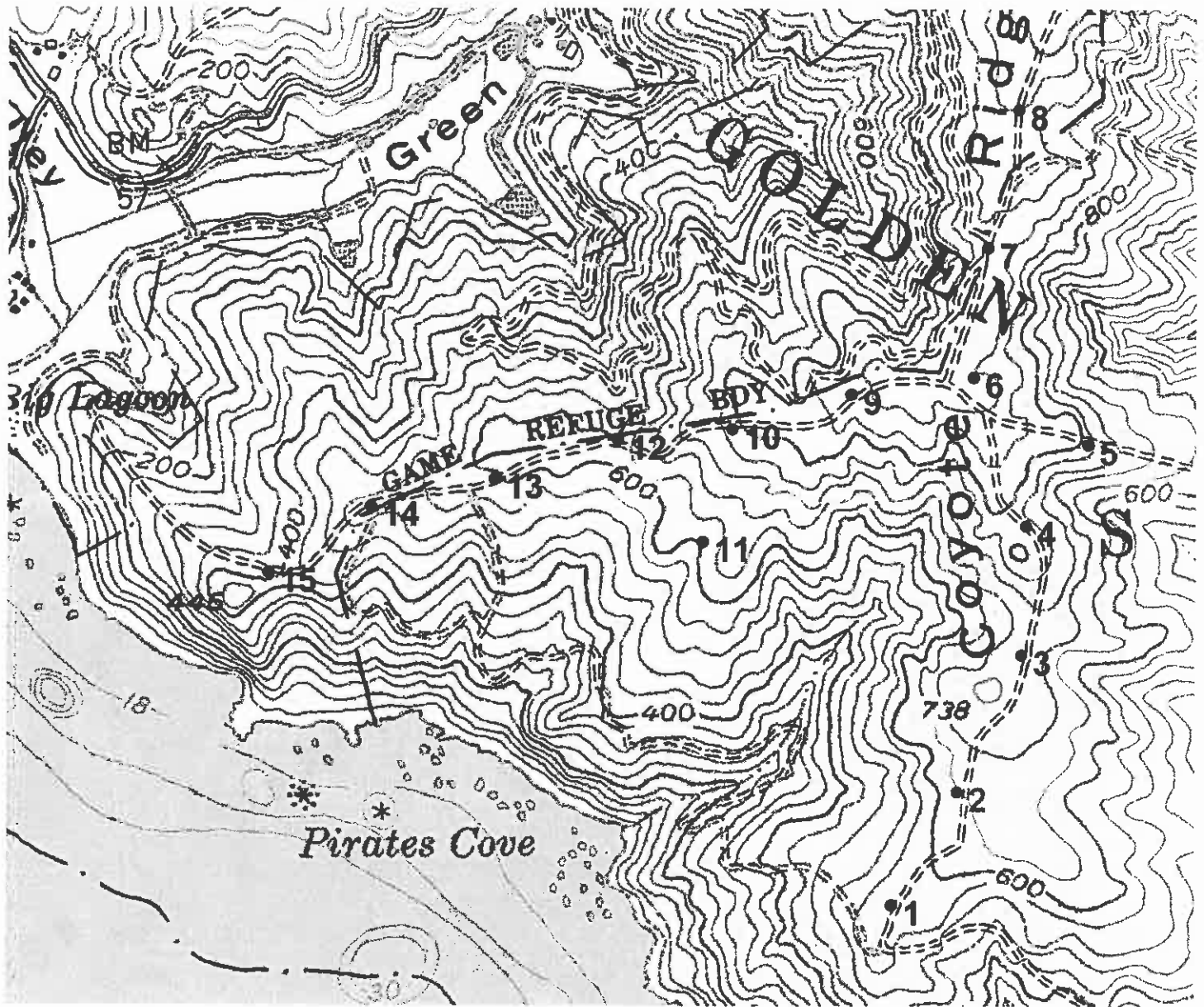
● Point Count Stations



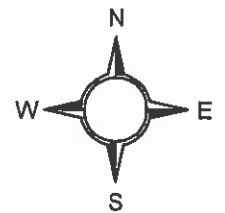
250 0 250 500 750 1000 1250 1500 1750 2000 2250 2500 Meters

A scale bar representing distances in meters, ranging from 0 to 2500 meters. The bar is divided into segments corresponding to the numerical values provided.

Coyote Ridge

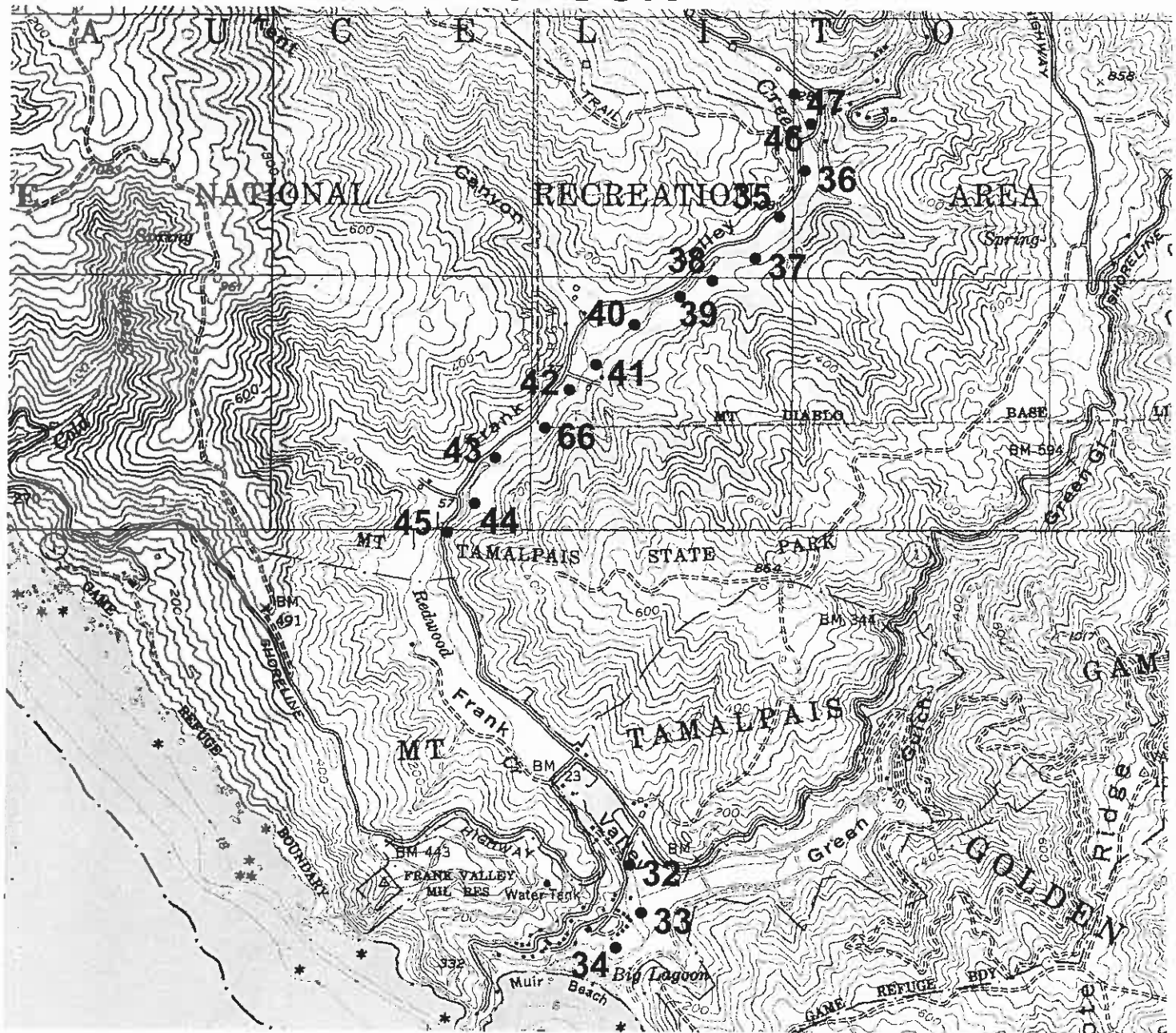


● Point Count Stations

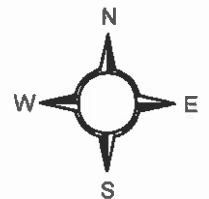


250 0 250 500 750 1000 1250 1500 Meters

Redwood Creek



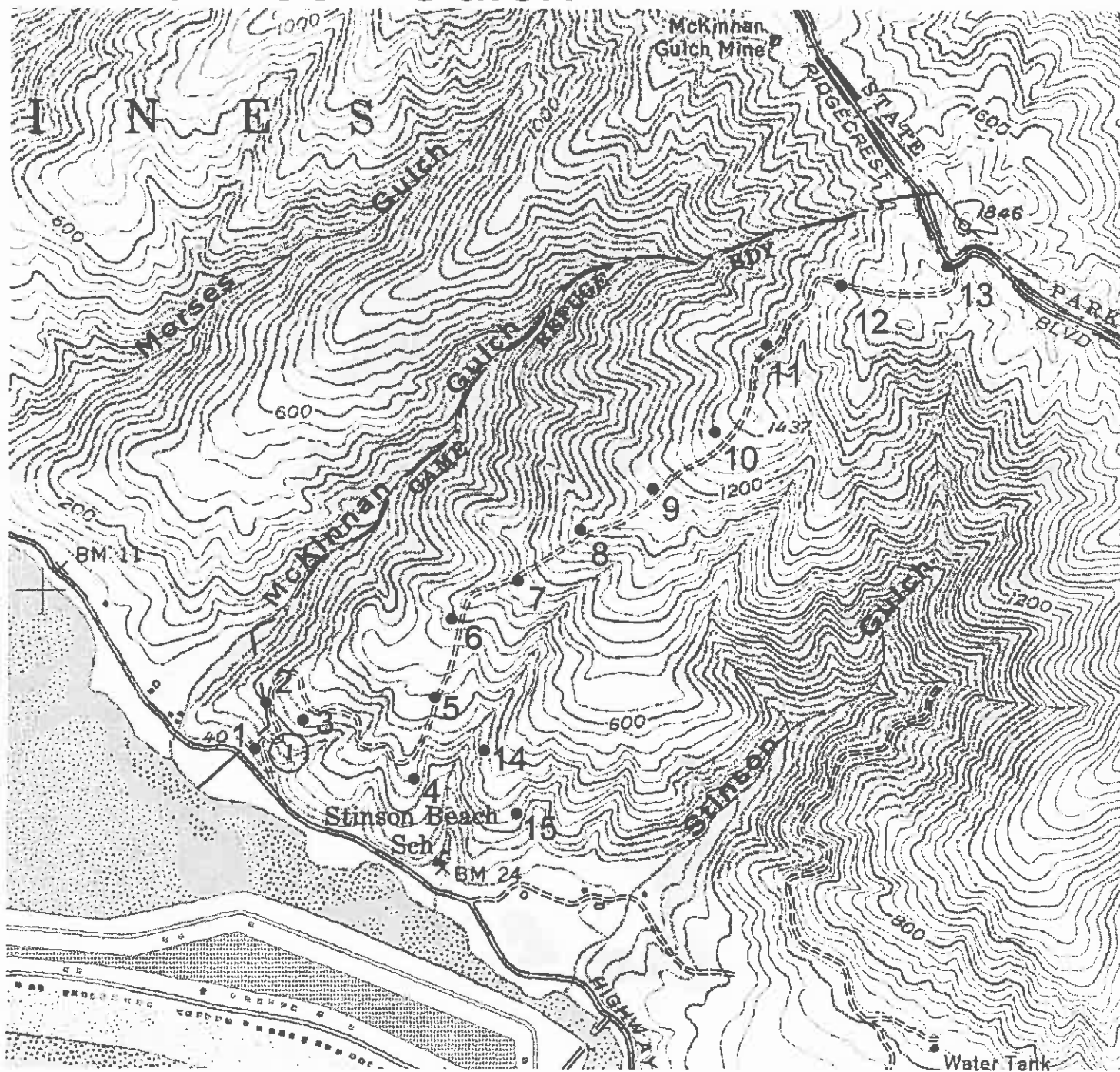
● Point Count Stations



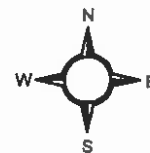
250 0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750 3000 Meters

A horizontal scale bar with alternating black and white segments, corresponding to the distances listed above it. The bar is used to measure distances on the map in meters.

Stinson Gulch



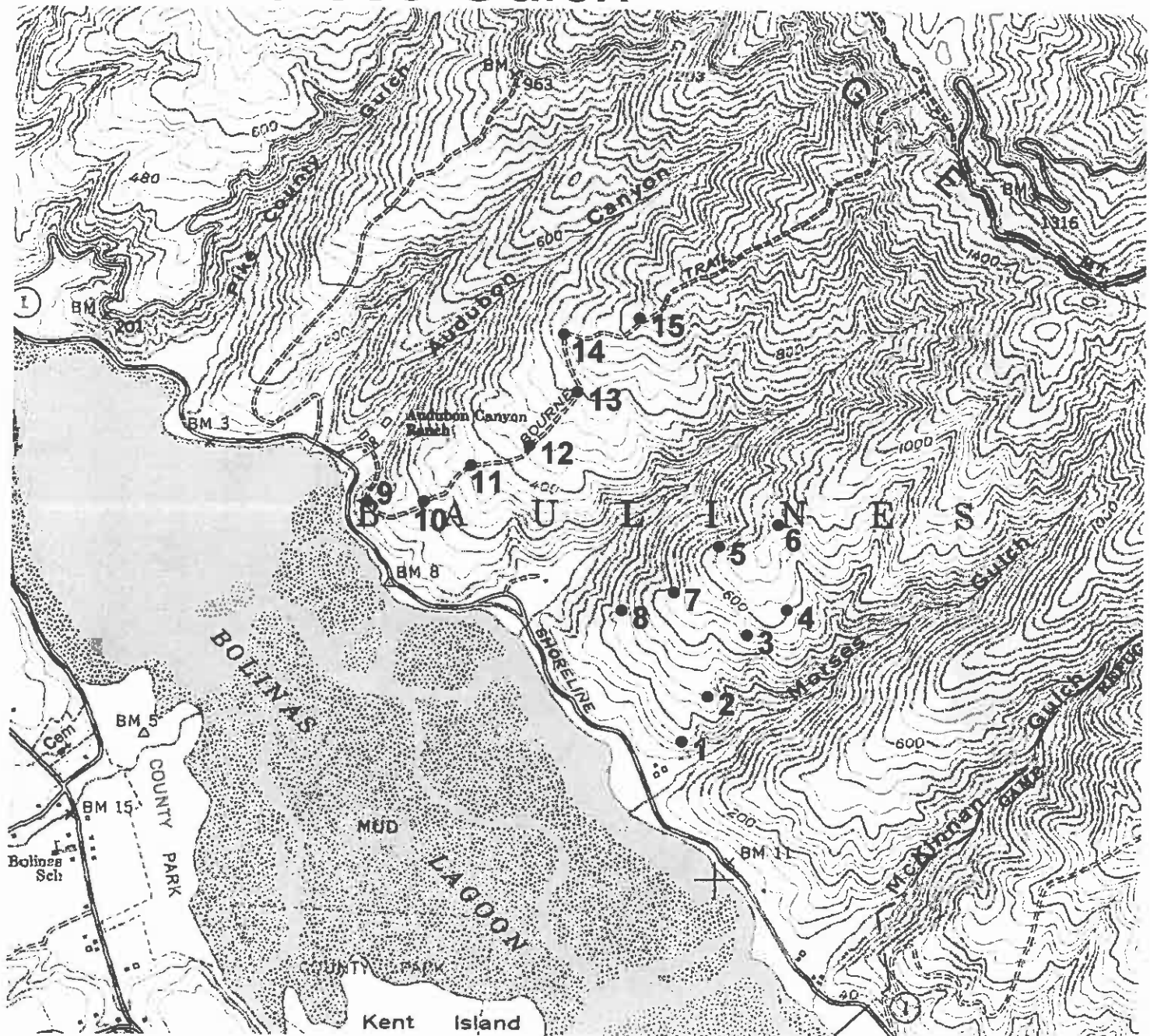
● Point Count Stations



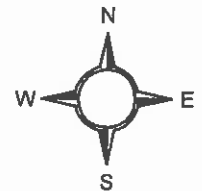
250 0 250 500 750 1000 1250 1500 1750 2000 Meters



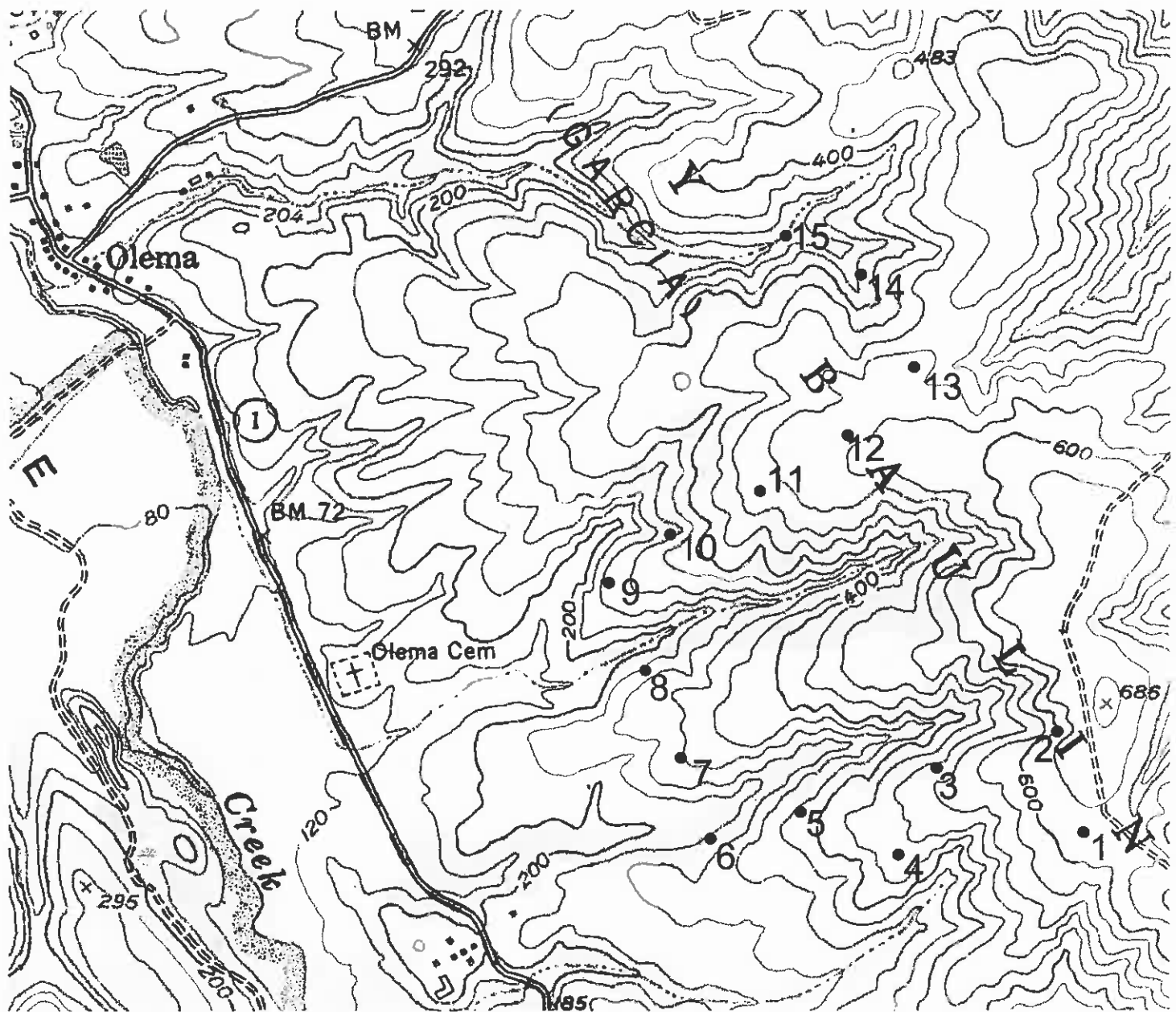
Morses Gulch



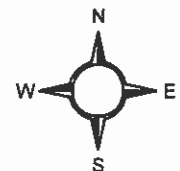
● Point Count Stations



Stewart Ranch

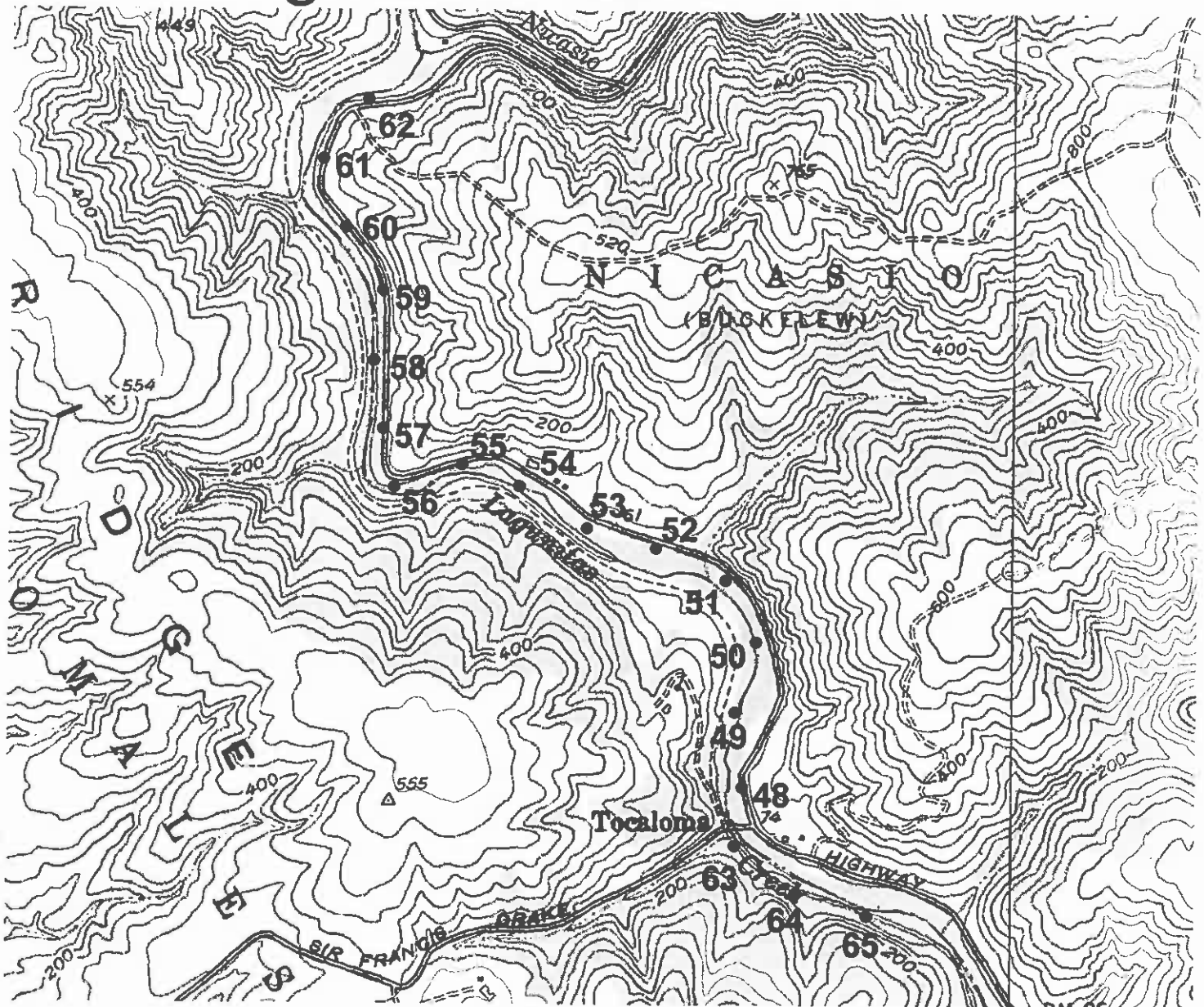


● Point Count Stations

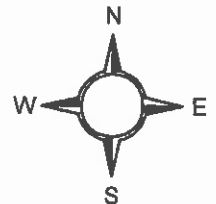


250 0 250 500 750 1000 1250 1500 1750 2000 Meters

Lagunitas Creek

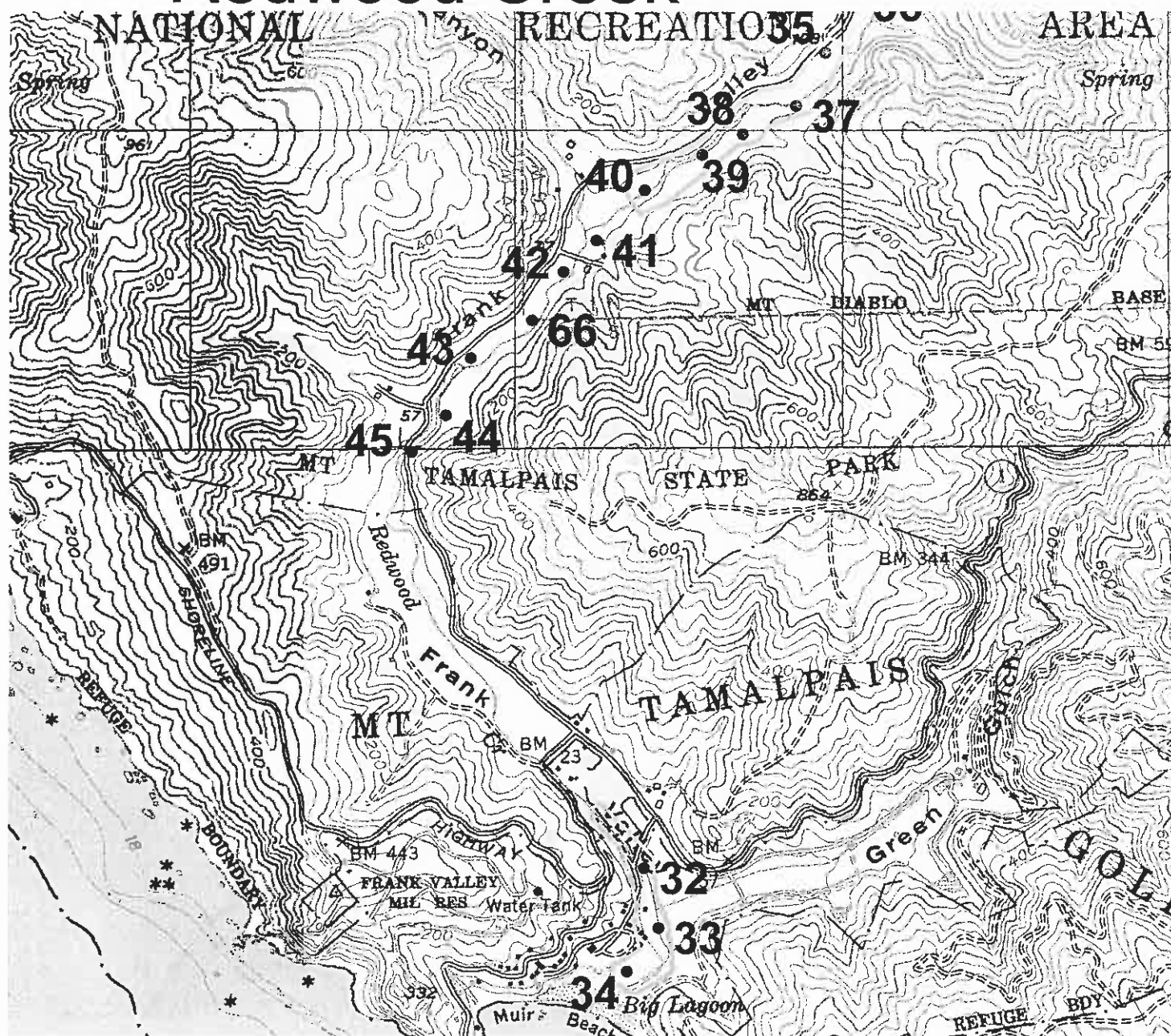


● Point Count Stations



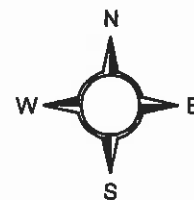
Nest Search Areas

Redwood Creek



● Point Count Stations

— Nest Search Areas

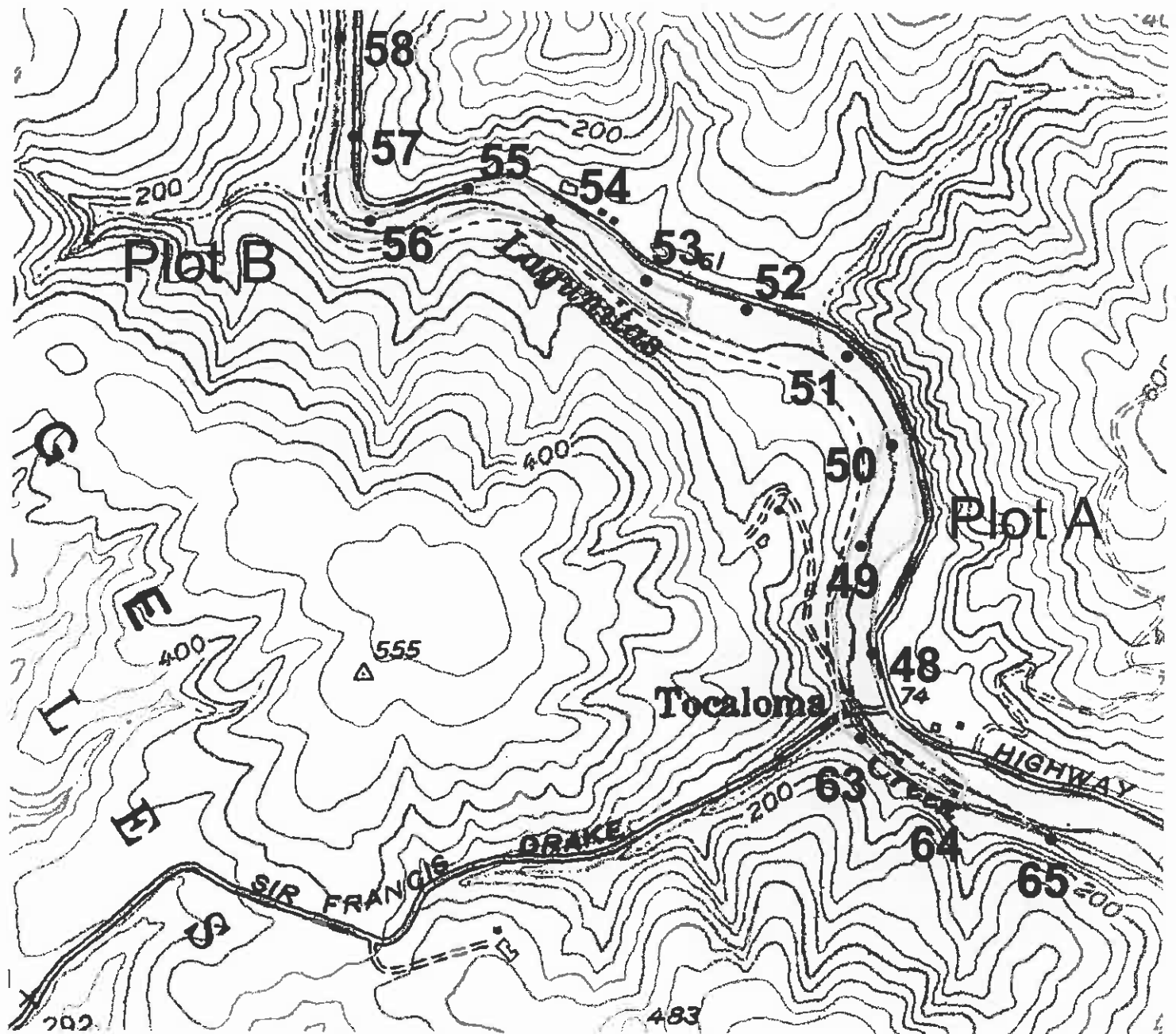


250 0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750 Meters



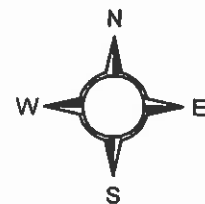
Nest Search Areas

Lagunitas Creek



□ Nest Search Areas

● Point Count Stations



250 0 250 500 750 1000 1250 1500 Meters