

Search for Western Lily (*Lilium occidentale*) on Public and Private Lands in Humboldt and Del Norte Counties, California



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** Cover Photograph by David K. Imper, USFWS, Arcata, CA*

I. INTRODUCTION

A search for new populations of the federally endangered western lily (*Lilium occidentale*) was conducted from late June to mid July 2003 within suitable coastal habitat in Del Norte and Humboldt Counties, California. The project area included both private and public lands located between Punta Gorda (approximately 2 miles south of the Mattole River mouth) and the California border (approximately 16 miles north of Crescent City) (Figure 1). Public lands surveyed included Redwood National Park [RNP], California State Parks [DPR], Department of Fish and Game [DFG], and Bureau of Land Management [BLM]. Identification of potential suitable coastal habitat within the project area was made using various maps and aerial photographs, and was followed by a focused field survey within high quality habitat in each general area. No new populations of western lily were encountered during our field surveys, though each survey site was assessed for overall habitat quality and its current or potential suitability to support a transplanted population. The search for new western lily populations contributes to Recovery Tasks 122 and 123 [Priority 1] included in the Final Recovery Plan (USFWS, 1999).

The known populations of western lily occur along the Pacific coast between Coos Bay, Oregon (approximately 100 miles north of the California border) and Table Bluff, California (approximately 6 miles south of Eureka). In 1991, the largest known population of western lily was discovered in Del Norte County at the Crescent City Marsh Wildlife Area (CCMWA, [DFG]). The CCMWA is located in the northern portion of our project area, less than 1 mile south of Crescent City (Figure 1). In 2002, the annual population survey estimated more than 1,300 flowering individuals at this site, making this the only western lily population that meets the demographic criteria of a recovering population as defined by the Final Recovery Plan (Bencie and Imper, 2003a). However since 1999, this CCMWA population has been steadily declining for unknown reasons. Population size and expansion of the second largest western lily population, located in Humboldt County at the Table Bluff Ecological Reserve (TBER, [DFG]), are currently restricted by severe deer browsing that has resulted in a steady decline in the number of flowering individuals (Bencie and Wear, 2004a). A total of 20 viable and thriving populations of 1,000+ reproductive individuals is required to consider western lily for down-listing from endangered status.

This project was funded under contract with the California Department of Fish and Game (#P0110012). Portions of this contract were conducted in conjunction with a suitable habitat search on public lands in Del Norte County for western dog violet (*Viola adunca*), a host plant for the larval stage of the federally threatened Oregon silverspot butterfly (*Speyeria zerene hippolyta*) (Bencie and Wear, 2004c; Wear, 2004). Because both western lily and western dog violet share similar habitat of early to mid-successional stage coastal prairie and coastal scrub, several reconnaissance surveys for potential western lily habitat were conducted concomitantly with field surveys for western dog violet populations.

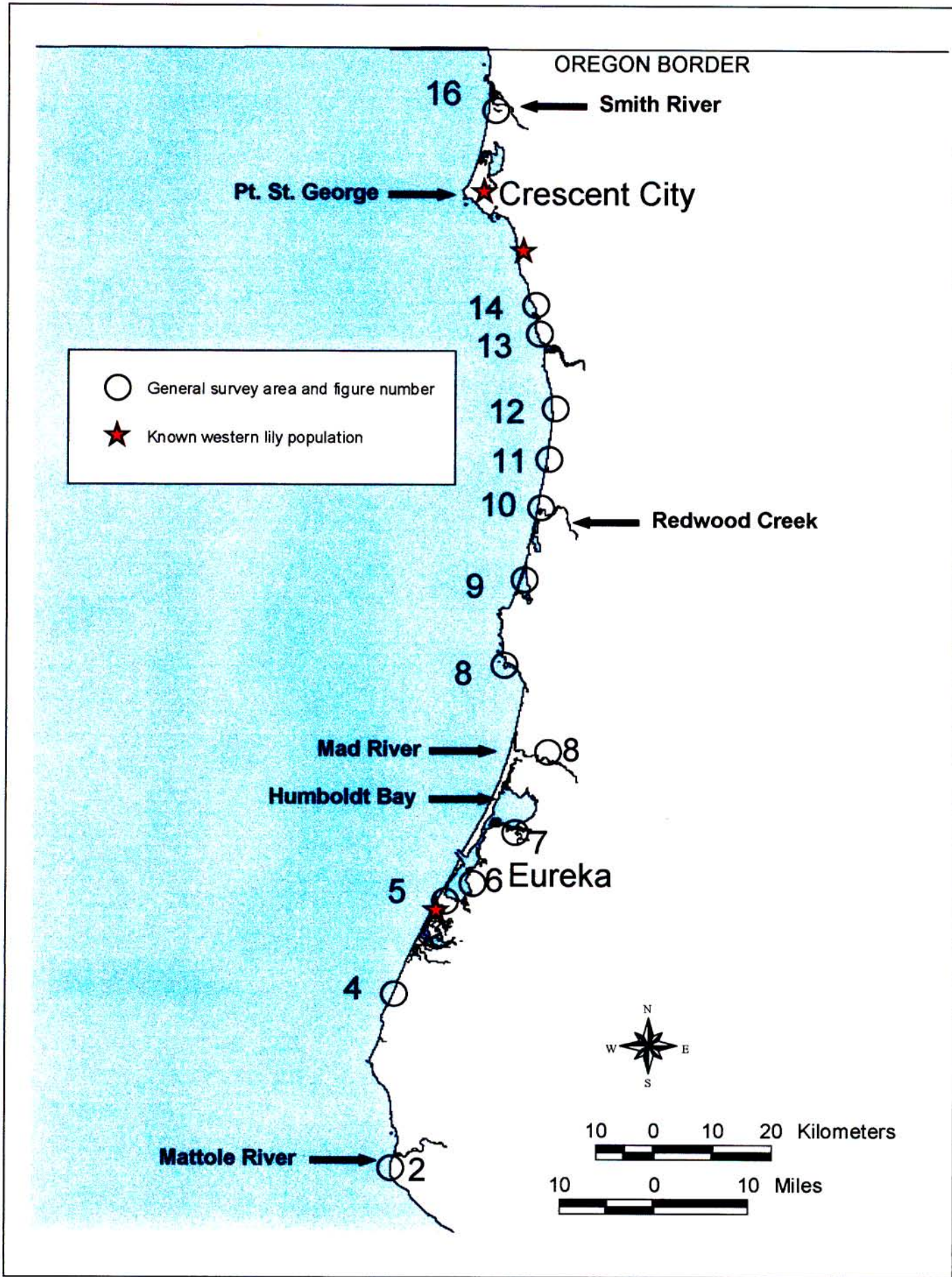


Figure 1. Project area for western lily search and general survey areas.

II. METHODS

Western Lily Habitat Characterization

The two diverse habitat types found at the CCMWA and TBER were evaluated and compared (described below) in order to determine which sites within our project area were most likely to support a western lily population and thus warrant a survey. Annual population and vegetation monitoring at these two sites has provided detailed data on population demographics and habitat structure, as well as, the response of western lily and associated species to vegetation removal, cattle grazing, and deer browsing (Bencie and Wear, 2004a; Bencie and Imper, 2003a). Important differences in habitat structure exist between the TBER and CCMWA sites; however, these habitats support the two most robust western lily populations suggesting broad environmental tolerances for the species. Although the differences between these sites are readily apparent, there are important similarities as well.

The primary criteria used for choosing survey sites were the presence of key associated species (indicator species) and the appropriate soil characteristics, including the series, structure, and seasonal moisture regime. The quality of suitable habitat was considered high, and thus the potential for the presence of western lily considered greatest, if sites were equivalent to either the CCMWA or the TBER site. Moderate quality habitat either had indicator species present but soils were unsuitable, or the soils appeared suitable but either few to no indicator species were present or the habitat had grown beyond the early to mid-successional stage. Typically, poor habitat quality was associated with either the absence of key indicator species, dense canopy cover, or inappropriate soil characteristics. Other factors considered in choosing survey sites were current and historical land use (e.g., grazing history, industrial or timber operations), site hydrology, and proximity to the coast and other western lily populations.

The largest western lily population at the CCMWA occurs within a large fen near the northern boundary. Fens are poorly drained wetlands characterized by the accumulation of partially decomposed peat (Wear, 2003). The dominant woody species associated with the fen are: Sitka spruce (*Picea sitchensis*), Labrador tea (*Ledum glandulosum*), western azalea (*Rhododendron occidentale*), Sitka alder (*Alnus viridis* ssp. *sinuata*), red alder (*Alnus rubra*), wax myrtle (*Myrica californica*), willow (*Salix sitchensis*, *S. hookeriana*), cascara (*Rhamnus purshiana*), spiraea (*Spiraea douglasii*), honeysuckle (*Lonicera involucrata* var. *ledebourii*), and Oregon crab apple (*Malus fusca*). The lilies occur in openings within the fen interior in association with the herbaceous species: pacific reed grass (*Calamagrostis nutkaensis*), marsh cinquefoil (*Potentilla palustris*), great burnet (*Sanguisorba officinalis*), skunk cabbage (*Lysichiton americanum*), and bog bean (*Menyanthes trifoliata*). Western lily occupies a narrow elevation band within the fen, generally on top of peat hummocks raised above the level of standing water during much of the year. In 1966, the fen soils were mapped as Hutsinpillar silty clay loam, which are characterized as poorly drained, fine-textured, and strongly acidic soils derived from alluvial parent material and possessing a strongly developed profile (McLaughlin and Harradine, 1966).

At the CCMWA, there are also three separate small populations located south of the principal population, all occurring in distinctive habitat types (Bencie and Wear, 2004b). At the Humboldt Road West site, lilies are found under scrub canopy and extend towards a large freshwater marsh, occupying a narrow elevation zone between the scrub and marsh. Sitka spruce dominates

the forest in the upland area surrounding the marsh. The dominant associated herbaceous species along the marsh edge are slough sedge (*Carex obnupta*), arctic starflower (*Trientalis arctica*), great burnet, spike rush (*Eleocharis* sp.), northern bugleweed (*Lycopus uniflora*) and other sedge species (including *Carex viridula* var. *viridula* and *C. echinata* ssp. *phyllomanica*). Soils are mapped as Hutsinpillar (McLaughlin and Harradine, 1966). When discovered in 1992, the few lilies located at the Humboldt Road site (east of the Humboldt Road West site) were associated with great burnet and stream orchid (*Epipactis gigantea*), both freshwater marsh species (Imper and Sawyer, 2001). Currently, the habitat has shifted to primarily slough sedge, California blackberry (*Rubus ursinus*), and non-native grasses, with an increase in scrub cover. The third small population is located on the west side of US Highway 101 (Highway 101 West site). Here, lilies are found along the transition zone between willow scrub and degraded coastal prairie. Similarly, slough sedge, California blackberry, and non-native grasses are common associated herbaceous plants. Soils at this site are mapped as sand dunes (McLaughlin and Harradine, 1966).

A population of western lily also occurs on the portion of Point St. George owned by Del Norte County, located near the western boundary of the county airport (McNamara Field), less than 1 mile northwest of Crescent City (Figure 15). This population consists of several clusters scattered within wet meadow, adjacent to an isolated Sitka spruce stand that is nearly surrounded by willow scrub. Associated species include pacific reed grass, spiraea, Labrador tea, marsh cinquefoil, sedges, rushes (*Juncus* spp.), and arctic starflower.

At TBER, western lily occurs within openings inside Sitka spruce forest in the northwestern corner of the reserve. The openings have low canopy cover and are dominated by understory species that include pacific reed grass, false lily-of-the-valley (*Maianthemum dilatatum*), fairy bells (*Disporum smithii*), pacific iris (*Iris douglasiana*), cow parsnip (*Heracleum lanatum*), sword fern (*Polystichum munitum*), and salmonberry (*Rubus spectabilis*) (Imper et al., 1987). When annual population monitoring was initiated in 1987, the majority of flowering plants were distributed along the edge of the Sitka spruce stand and within small, remnant interior openings. After manual removal of woody vegetation and controlled seasonal grazing, the population size has increased and individuals remain primarily located within the herbaceous-dominated internal openings and along the forest edge.

The soils at TBER are characterized as an imperfectly drained Hookton silt loam derived from consolidated sediment now residing on top of an uplifted marine terrace (McLaughlin and Harradine, 1965). These soils retain moisture for long periods of time as they overlie a clayey hardpan substratum (C horizon) that effectively perches water into the summer months, resulting in soil moisture estimates ranging from 21-35% in mid June (Imper et al., 1987). The acidity of the surface horizon is neutral to moderate depending on overstory cover, but increases to strongly acidic in the C horizon (McLaughlin and Harradine, 1965). The western lily population at TBER is found well upslope from the nearby creek, unlike the primary CCMWA population that is located within a freshwater marsh. Western lily requires soil moisture during the summer months, and thus at the TBER site, the clay pan layer is crucial for retaining rainfall in situ. Fog drip may also contribute to the distribution of lilies along the forest edge.

Habitat descriptions of the Oregon populations vary somewhat, but in general, western lily occurs in habitats similar to California sites: freshwater wetland, wet coastal prairie, or coastal

scrub, with the common associates of Sitka spruce, pacific reed grass, Labrador tea, western azalea, spiraea, salmonberry, and slough sedge (Imper et al., 1987). The Oregon sites also show evidence of imperfect drainage or a perched water table, further supporting a critical seasonal soil moisture requirement for western lily.

The most consistent and seemingly predictable habitat similarities for western lily populations are their distribution within openings and edge habitats, in association with Sitka spruce and pacific reed grass, with soils that retain moisture well into the summer months. Species indicating potential high quality western lily habitat in addition to Sitka spruce and pacific reed grass are slough sedge, willow, and less common wetland shrubs such as Labrador tea, western azalea, spiraea, and Oregon crab apple. Soil types indicating potential high quality habitat include the Hookton and Hutsinpillar series, and any soils where a perched water table or imperfect drainage is present. Rohnerville, Bayside, and Atwell soil series have some characteristics similar to Hookton soils, but are generally either forested or heavily grazed. Woody vegetation removal and a low-intensity grazing regime have led to beneficial results in the abundance and success of flowering plants (Bencie and Imper, 2003a). Thus, areas dominated by dense canopy cover and lacking openings, or areas with a historical or current high-intensity grazing regime, were considered poor quality sites with a low probability of occurrence, and thus were not surveyed.

Resources Utilized to Identify Survey Sites

All available resources were used during the pre-field investigation phase of this project in order to determine the highest priority sites for field surveys. Vegetation structure and soil characteristics were determined using the following resources:

- 1) Color and black/white aerial photographs of coastal Humboldt and Del Norte Counties from 1993 and 2001; 1:8,000.
- 2) Humboldt and Del Norte County Soil Surveys, UC Cooperative Extension (McLaughlin and Harradine, 1965 and 1966).
- 3) Western lily monitoring reports from TBER and CCMWA (Bencie and Imper, 2003a and 2003b; Bencie and Wear, 2003; Imper and Sawyer, 2000 and 2001; Imper et al., 1987).
- 4) Soil-Vegetation Survey Maps, Humboldt and Del Norte Counties, California Cooperative, 1944-1951. Primarily used to locate general habitat types and species. The Hookton soil series was not mapped during this survey.
- 5) A General Soil Map of Coastal Humboldt and Del Norte Counties, California. Generated from Statsgo Soil Database, USDA-Natural Resources Conservation Service (USDA, 2001).
- 6) General Vegetation Map, Redwood National and State Parks, 1:50,000.

In addition, personal communication with David K. Imper (USFWS) was a key source of information on western lily populations, habitat, and site histories. Joe Seney, USDA-Natural Resources and Soil Conservation Service (NRCS), provided important soil maps and information.

III. RESULTS

The general areas described below were chosen as potentially high quality habitat sites for western lily given the criteria outlined above. Within each general area, focused surveys were conducted at sites that were the most similar to habitats where western lily is known to occur. Unfortunately, no new populations of western lily were found during the course of these surveys. Three potential habitat sites were not surveyed during the course of this project for reasons described below; these sites may warrant future surveys.

1. Punta Gorda to the Mattole River

Potential habitat within the northern portion of the King Range National Conservation Area [BLM], extending from Punta Gorda north to the Mattole River, was surveyed on July 5 (Figure 2). Surveys were focused on the flat, terraced grasslands atop the coastal bluffs, as well as, mesic sites near seeps and ephemeral waterways located along Prosper Ridge Road and associated jeep trails. Within this general area, mesic sites in association with the edge habitat between grassland and Douglas fir (*Pseudotsuga menziesii*) canopy had the greatest likelihood for supporting western lily. At these sites, common species included pacific reed grass, slough sedge, *Juncus* sp., horsetail, sword fern, and red alder. Dominant upland species adjacent to these sites included coyote brush (*Baccharis pilularis*), bracken fern (*Pteridium aquilinum*), California blackberry, cow parsnip, *Iris* sp., and a suite of exotic annual grasses, including velvet grass (*Holcus lanatus*), dogtail grass (*Cynosurus echinatus*), hair grass (*Aira caryophyllea*), soft chess (*Bromus hordeaceus*), and annual fescues (*Vulpia* spp.). Although pacific reed grass was present throughout this area, no Sitka spruce occurrences were indicated on the vegetation maps or observed during the survey. Soils associated with the grassland areas are mapped primarily as the Hugo and Wilder series; Hookton soils are not present in this area (McLaughlin and Harradine, 1965).

Along Mattole Road from Petrolia north to Ferndale, roadside surveys were conducted in scattered areas with remnant spruce stands associated with pacific reed grass. Generally, the grassland areas located on private land adjacent to the county road right-of-way were considered poor quality habitat due to extensive historical and current cattle grazing. However, the following two sites located on private land were considered potential habitat with a low likelihood of occurrence given the presence of Hookton soils and the absence of Sitka spruce (Figure 3). These sites were not surveyed due to lack of permission from the landowners.

An area of Hookton soils occurs adjacent to Mattole Road between McNutt Gulch and the North Fork of the Mattole River, approximately 2 miles northwest of Petrolia (Figure 3). The portion most suitable for western lily occurs on the southwest side of Mattole Road, in areas with imperfectly drained soils near the base of steep slopes. This area is dominated by Douglas fir and grand fir (*Abies grandis*) with no indication of openings within the forest canopy. The majority of the open grassland habitat on both sides of Mattole Road in this area is extensively grazed.

A smaller area of Hookton soils occurs on private land on the west side of Mattole Road, less than 1 mile southwest of Capetown (Figure 3). Here, the imperfectly drained soils with 0-3%

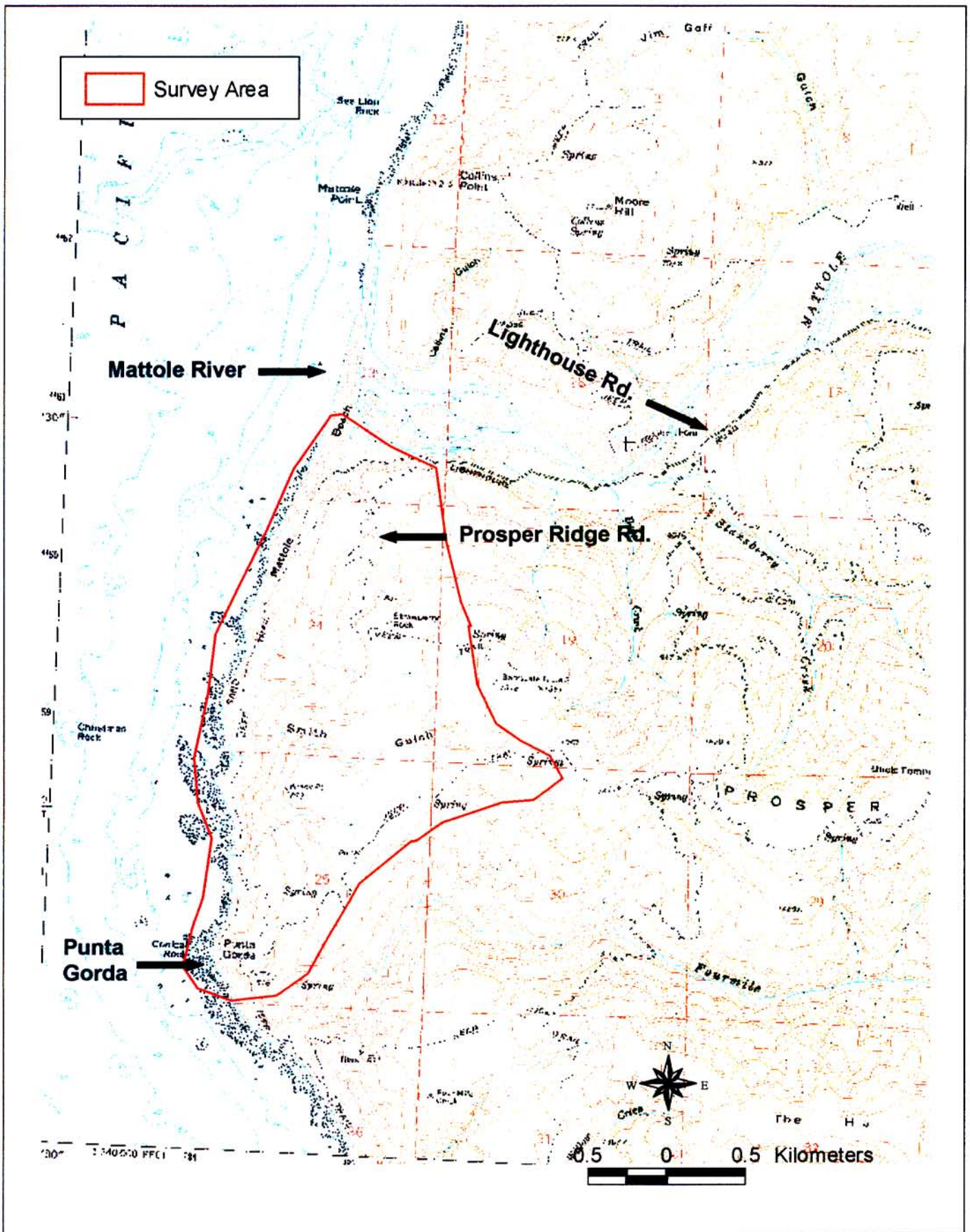


Figure 2. General survey area for western lily, Punta Gorda to the Mattole River. Petrolia USGS Quadrangle.

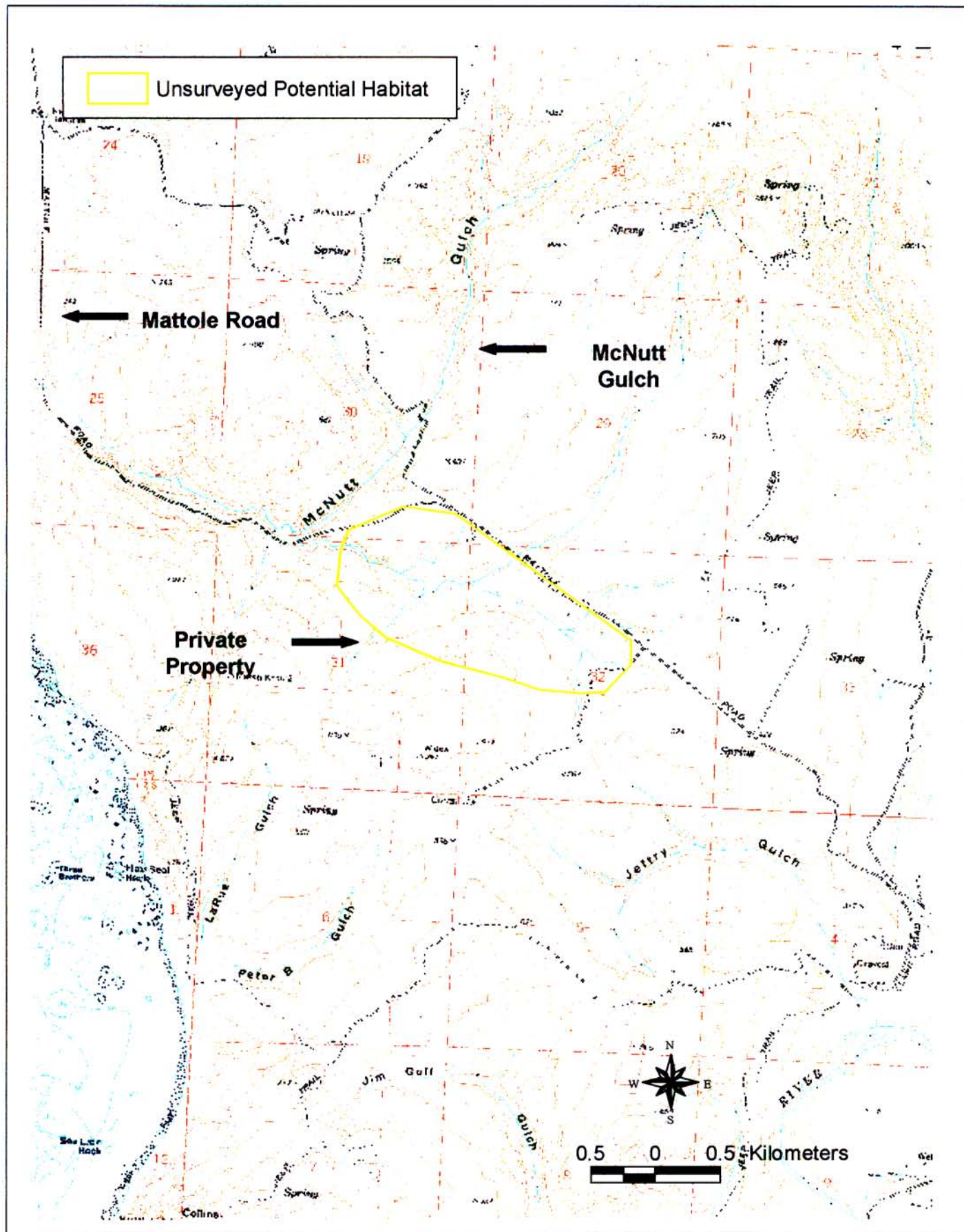


Figure 3. Unsurveyed potential habitat for western lily, Petrolia to Capetown. Petrolia USGS Quadrangle.

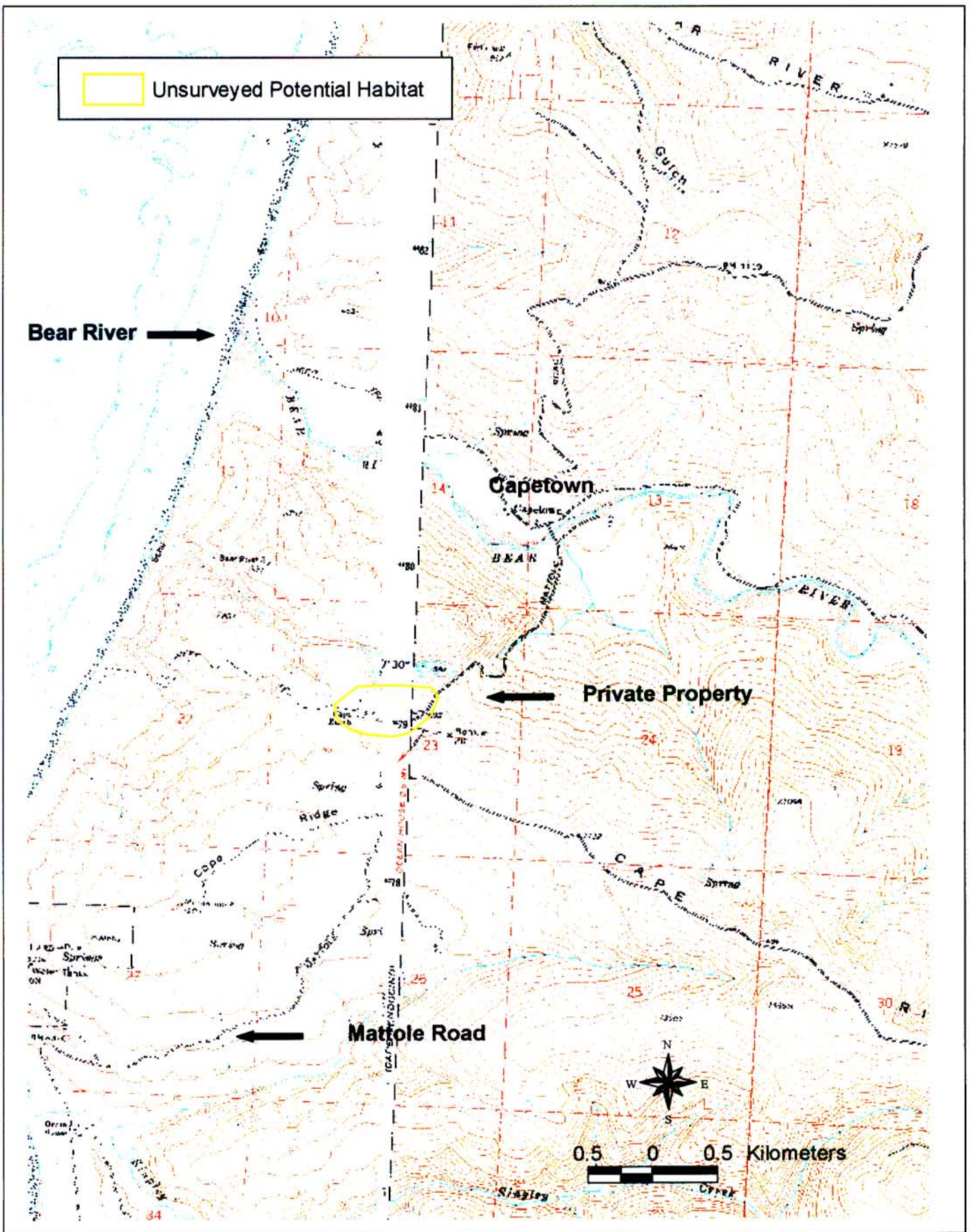


Figure 3 (cont.). Unsurveyed potential habitat for western lily, Petrolia to Capetown. Cape Mendocino USGS Quadrangle.

slope are located on top of a knoll dominated by Sitka spruce, grand fir, and Douglas fir, and also surround a large pond currently dominated by yellow pond lily (*Nuphar luteum* ssp. *polysepalum*). A distant view from the residence indicates that these sites have been heavily disturbed from logging and/or grazing. Additional small grassland areas with Hookton soils are located on private land north of the Bear River near the river mouth. These areas were considered low quality habitat due to either the presence of steep slopes or the high probability of extensive current or historical grazing.

Much of the coastal grasslands extending from Petrolia north to Ferndale were considered poor quality habitat with a low likelihood of occurrence as cattle grazing has had a substantial impact on the vegetation structure and species composition. In addition, along this section of coast, remnant Sitka spruce stands are small and distant, slopes are steep, and the soils are generally unsuitable for western lily.

2. Guthrie Creek to Centerville Beach

Scattered suitable habitat sites located along Centerville Road from Guthrie Creek north to Centerville Beach were surveyed on July 9 (Figure 4). Surveys were conducted on Hookton soils with relatively moderate slope dominated by pacific reed grass or Sitka spruce. Additional species common at these sites included sword fern, red alder, false lily-of-the-valley, and bracken fern. Within adjacent openings, common species included coyote brush, cow parsnip, *Angelica* sp., velvet grass, orchard grass (*Dactylis glomerata*), California blackberry, and thistle (*Cirsium* spp.). Hookton soils were primarily associated with steep ravines above waterways, and thus the extent of potential suitable habitat was limited. Additional soils mapped in this area include the Rohnerville and Loleta silt loams, which are generally located on the flat portions of the coastal terrace. Private land located outside the county right-of-way was considered unsuitable due to heavy grazing.

3. Table Bluff

The only known extant occurrences of western lily in Humboldt County are located on Table Bluff. Surveys were conducted on June 22 within suitable habitat sites not previously surveyed, as well as, in the general areas surrounding the known sites located outside of TBER (Figure 5). These survey sites were located on Hookton soils in openings and edge habitat associated with Sitka spruce, and included: a) the roadside adjacent to Clough Road, b) the old cemetery site near the town of Table Bluff and the roadside habitat adjacent to Cemetery Road, c) the ravine and mesic openings located at the north end of Cemetery Road and down-slope towards Hookton Road, d) the remnant Sitka spruce stand located east of the junction of Rasmussen Road and Hawk's Hill Road, e) the Barry site, located north of the gravel pit and extending towards Humboldt Bay, f) grassland habitat located west of the Phelan Landing Bed & Breakfast, g) the Christensen site, and h) a remnant Sitka spruce stand adjacent to the western portion of Bluff Road.

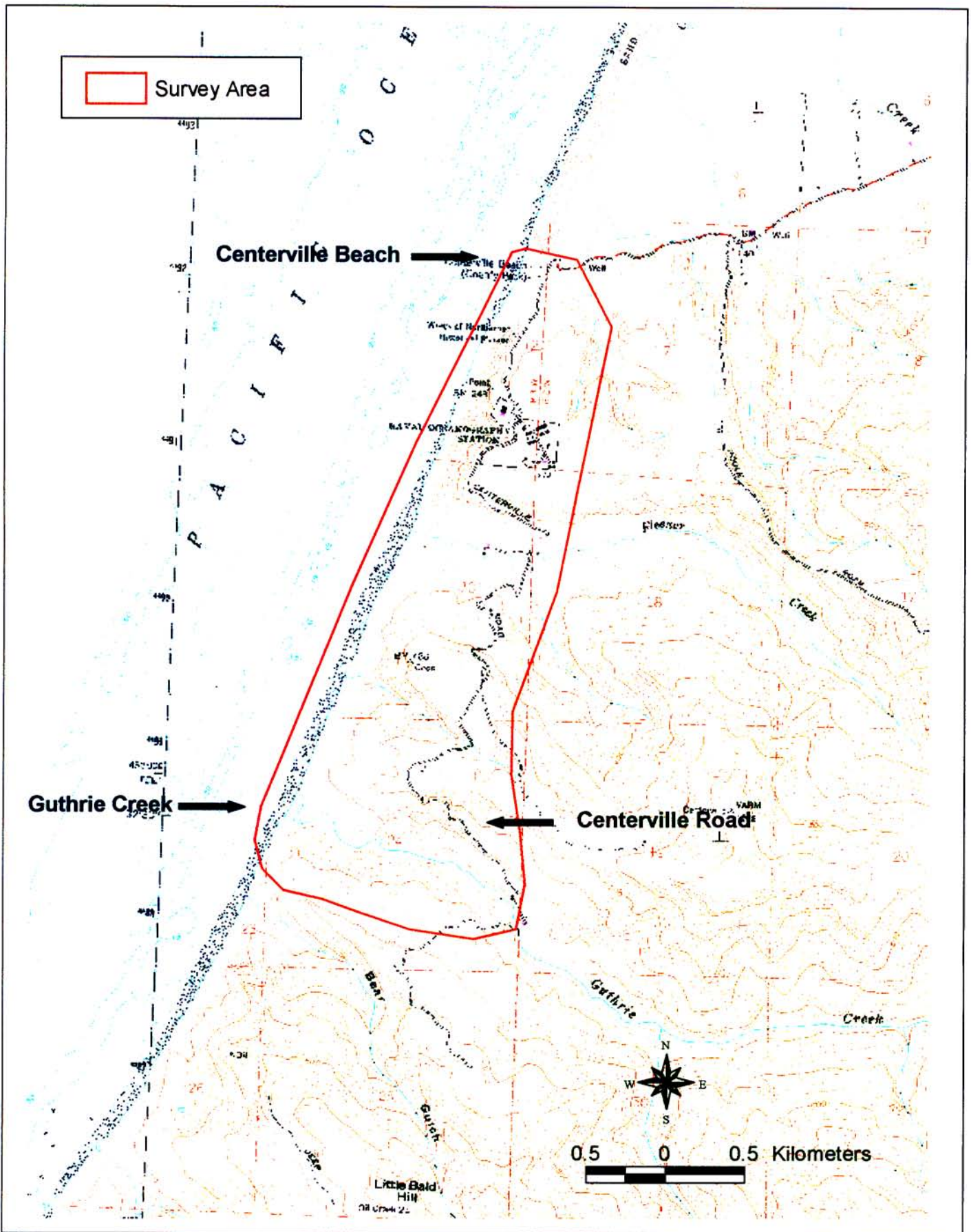


Figure 4. General survey area for western lily, Guthrie Creek to Centerville Beach. Ferndale USGS Quadrangle.

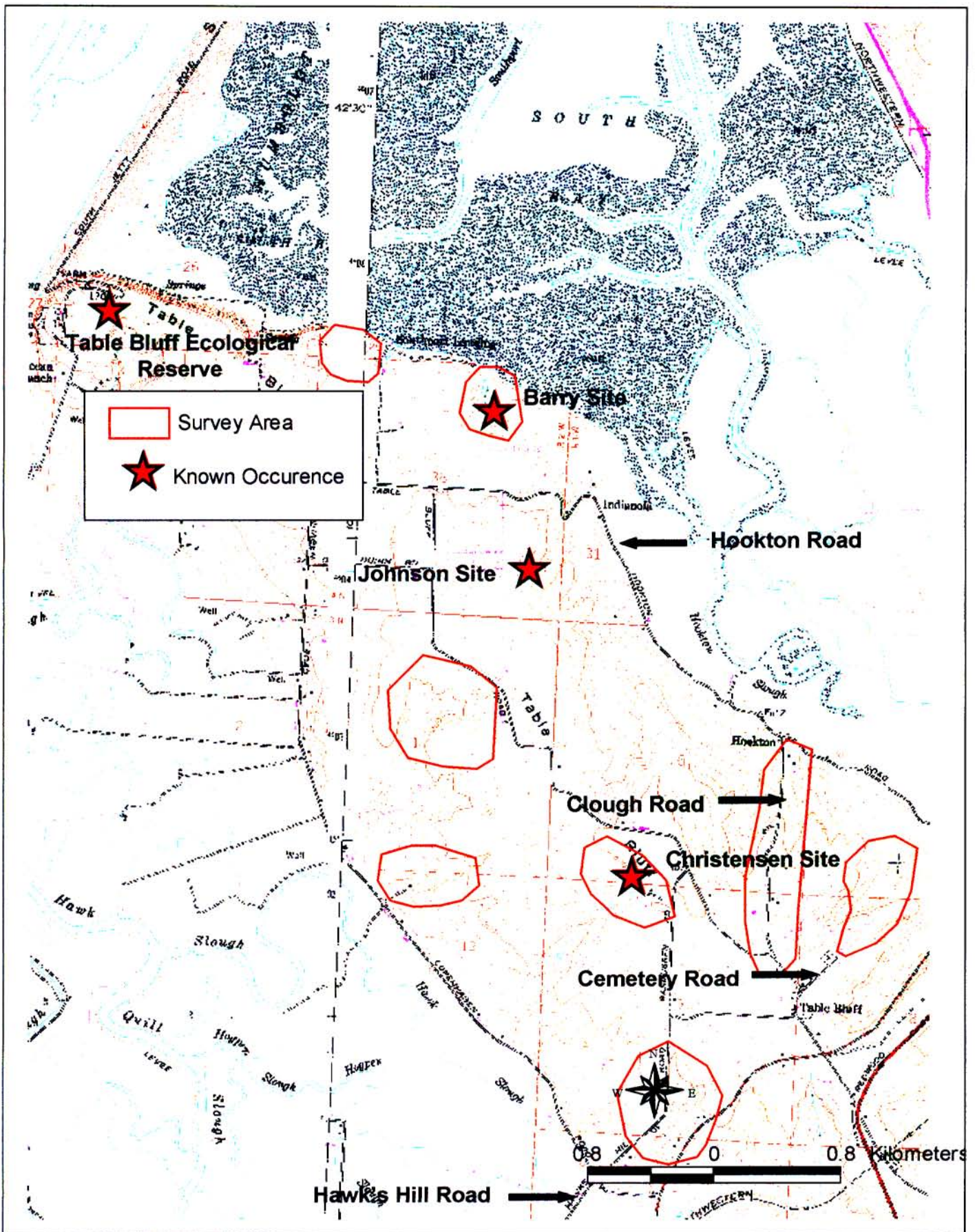


Figure 5. General survey area for western lily, Table Bluff. Fields Landing and Cannibal Island USGS Quadrangles.

4. South Eureka to Arcata

Suitable habitat in the vicinity of several historical sites located between south Eureka and Arcata was surveyed on July 29. These historical sites are documented with the Natural Diversity Data Base (NDDDB, [DFG]). Two collections were made by Joseph P. Tracy south of Eureka: in 1918, on Humboldt Hill near Humboldt Bay at 600 feet elevation, and in 1938, approximately 2 miles south of Fields Landing at Still Ranch.

The historical Humboldt Hill site is considered to be in the vicinity of the old Eureka Golf Course, located in the central portion of Section 20 near London Drive (Figure 6). Soils in this area are Rohnerville silt loam and the Larabee series. The 1944 vegetation map indicates this area was dominated by Sitka spruce, California lilac (*Ceanothus thyrsiflorus*), thimbleberry (*Rubus parviflorus*), salal (*Gaultheria shallon*), coyote brush, California blackberry, bracken fern, and grasses. A field survey, in addition to a comparison between current and 1941 aerial photos, concluded a low probability of suitable habitat remaining in this residential area.

The former Still Ranch site was located in the general area of College of the Redwoods, approximately 5 miles south of Eureka (Figure 6). The original location information gives the habitat as "sedge swamp". The 1959 vegetation map indicates this area was dominated by red alder, thimbleberry, salmonberry, and elderberry (*Sambucus racemosa* var. *racemosa*), with only occasional Sitka spruce. In spite of the presence of Hookton soils in this area, a focused survey was not conducted here due to extensive urban development.

Between north Eureka and Arcata, three historical collections were made by Joseph P. Tracy in 1912 and 1925. The collection information for the 1912 specimen states "near Ryan's Slough, Eureka; elevation 10 feet", which is the general area south of Myrtle Road near Ryan Slough at the northern edge of Eureka (Figure 7). A survey was conducted along Old Arcata Road, Pennsylvania Avenue, Spears Road, and the power line corridor within this general area. This area has Hookton soils with redwood (*Sequoia sempervirens*), Sitka spruce, evergreen huckleberry (*Vaccinium ovatum*), and pacific wax myrtle (*Myrica californica*), however, it is nearly completely residential and the likelihood of an extant western lily population is low.

The collection information from one 1925 specimen states "near Bayside, near Humboldt Bay; elevation 50 feet", which is considered to be in the vicinity of Indianola. This area has Hookton soils on slopes less than 8%. In 1960, the dominant vegetation was a mixed redwood forest with Sitka spruce, Douglas fir, grand fir, and red alder, along with open areas dominated by grasses, bracken fern, California blackberry, and thimbleberry. A survey was conducted in the vicinity of the Indianola Cut-off, Walker Point Road, and the power line corridor (Figure 7).

The collection information from a second 1925 specimen states "on road to Humboldt Country Club, 7 miles from (N?) Eureka, mapped at Bayside Cut-off; elevation 8 feet". This is the general area of the old Bayside Golf Course, which was located adjacent to the east side of Highway 101 at the Bayside Cut-off (Figure 7). The soils in this area are primarily Bayside silty clay loam and an imperfectly drained Russ silt loam. The 1960 vegetation map indicates cultivated or fallow fields in the low lying areas with a mixed redwood forest in the upland areas

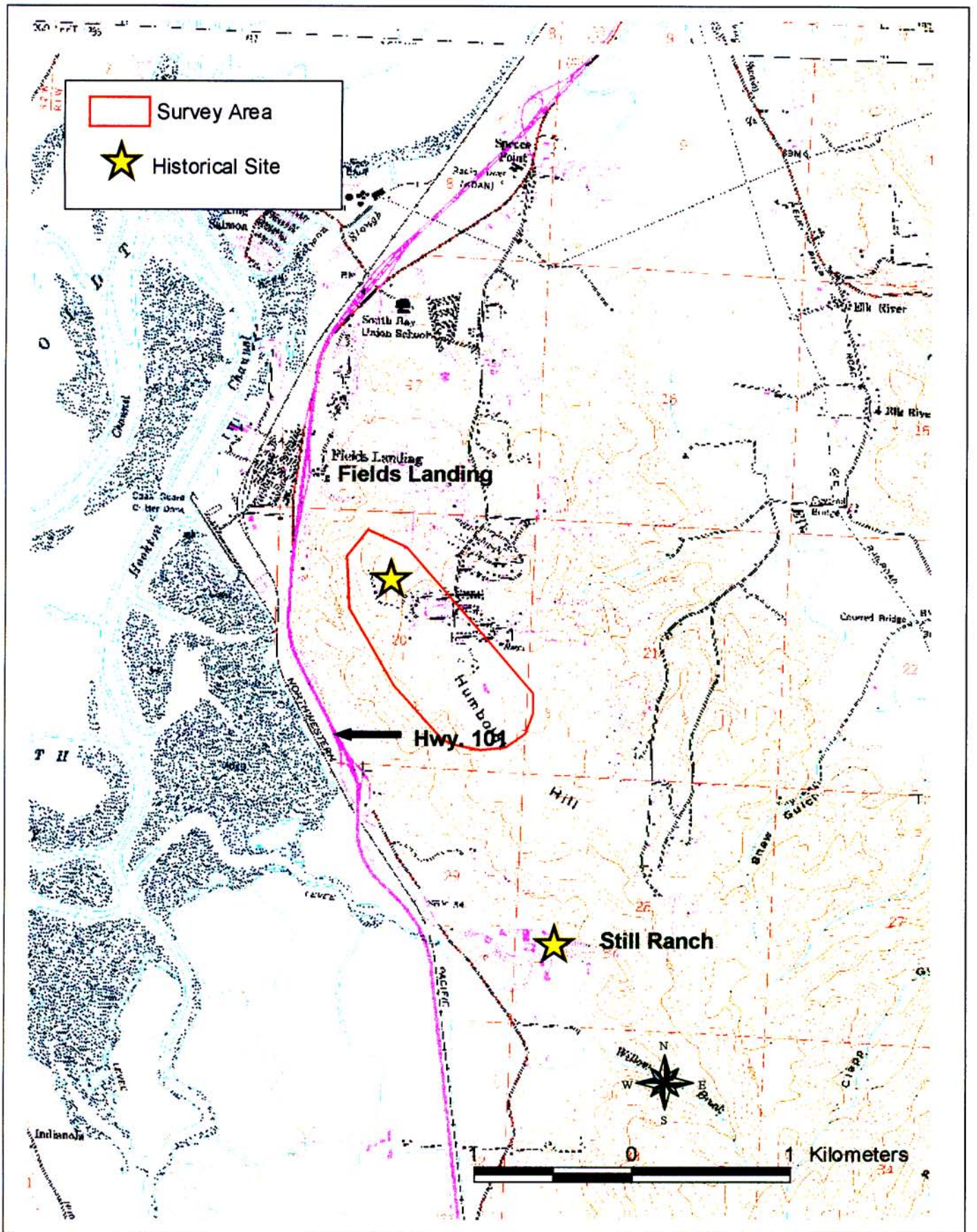


Figure 6. General survey area for western lily, south Eureka. Fields Landing USGS Quadrangle.

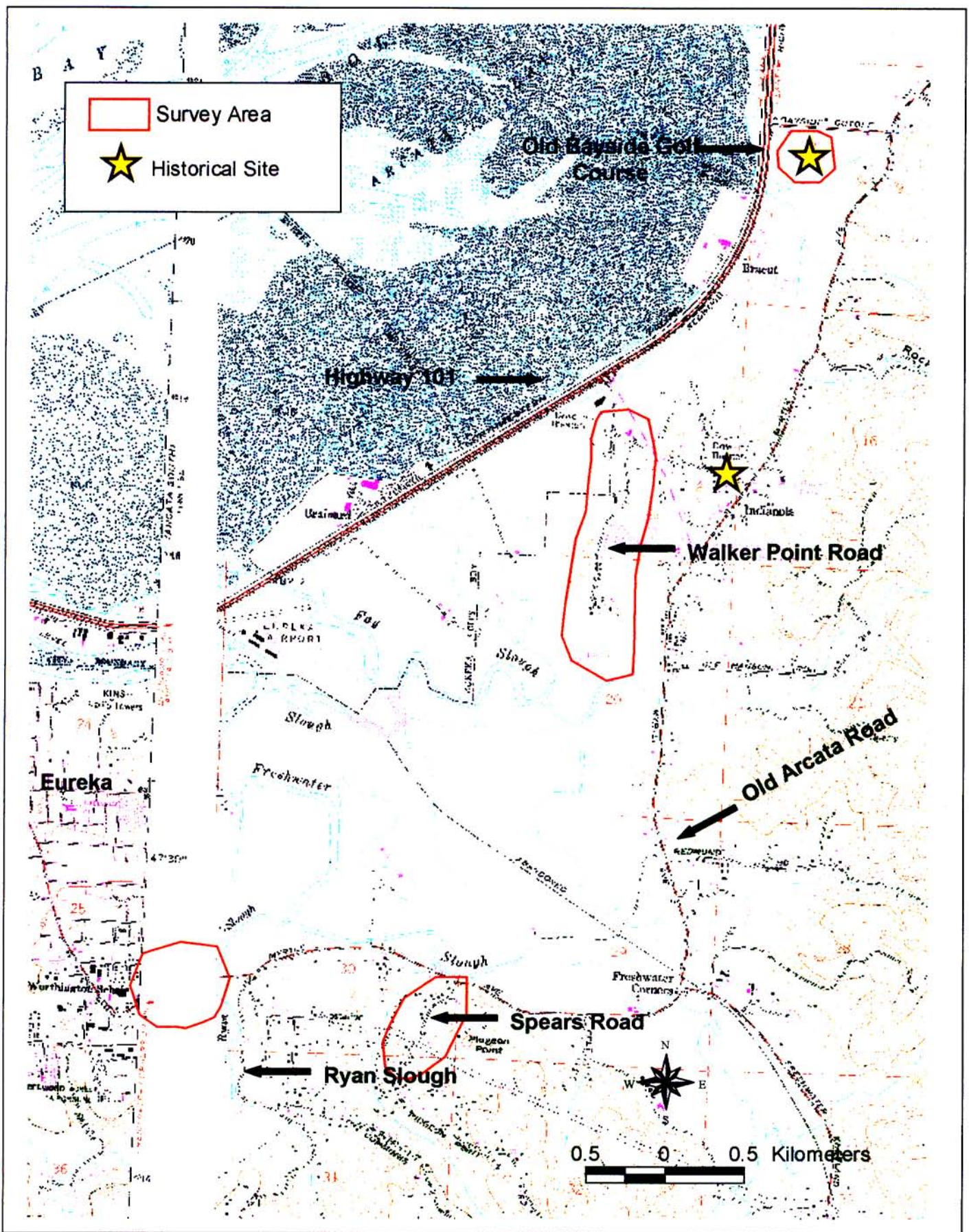


Figure 7. General survey area for western lily, Eureka to Arcata. Eureka and Arcata South USGS Quadrangles.

and Sitka spruce occurring along stream channels. Currently, this area is extensively grazed with few private residents.

5. Arcata to Trinidad

The soils on the coastal terrace extending from the Mad River north to Dows Prairie consist primarily of Hookton silt loams in the southern portion and Arcata loam in the northern portion. Although this area is nearly completely urban and residential, remnant stands of Sitka spruce are still present along creek channels, including a large stand occurring along Mill Creek, approximately .5 miles north of the Mad River. A survey was conducted on July 31 along Mill Creek from the southern end of Turner Road (located west of Central Avenue) to well beyond the end of Bartow Road (Figure 8). The current vegetation includes an overstory of Sitka spruce, Douglas fir, and grand fir, with a lush understory of sword fern, cascara, ocean spray (*Holodiscus discolor*), pacific nine-bark (*Physocarpus capitatus*), salal, thimbleberry, fairy bells, false lily-of-the-valley, *Juncus* spp., *Carex* spp., and skunk cabbage. No pacific reed grass was observed along Mill Creek.

In 1932, a specimen was collected from Trinidad Head by Herbert L. Mason (Figure 8). The vegetation on Trinidad Head consists primarily of coastal scrub, including California lilac, silk tassel (*Garrya elliptica*), salal, California huckleberry, and poison oak (*Toxicodendron diversilobum*), with scattered Sitka spruce. Pacific reed grass is common on Trinidad Head, particularly on the northern side. The soils are the Hely series, and rock outcrops and steep, eroding cliffs are present throughout.

The mixed redwood and Sitka spruce forest extending from Trinidad State Beach north to Elk Head was also surveyed (Figure 8). Here, the understory consists of dense sword fern, thimbleberry, elderberry, salal, and California huckleberry, with occasional openings supporting exotic grasses, cow parsnip, California blackberry, and coyote bush. Soils throughout this general area are the Hugo series. Columbia lily (*Lilium columbianum*) was observed on Elk Head.

6. Big Lagoon to Redwood Creek

A survey of Big Lagoon Bog [Humboldt County] was conducted on July 15 (Figure 9). The bog is located near the southwestern edge of Big Lagoon, adjacent to Big Lagoon County Park. The vegetation here is very similar to the CCMWA, as Sitka spruce surrounds a freshwater bog with Labrador tea, western azalea, Oregon crab apple, spiraea, and pacific reed grass.

On July 15, a survey was also conducted within Humboldt Lagoons State Park [DPR] in the vicinity of the Azalea Nature Trail on Stagecoach Hill (Figure 9). This area is dominated by a mixed forest of redwood and Sitka spruce, with an understory of western azalea, salmonberry, pacific reed grass, salal, California huckleberry, sword fern, false lily-of-the-valley, and western trillium (*Trillium ovatum*). Columbia lily was observed here along the Sitka spruce forest edge in association with western azalea.

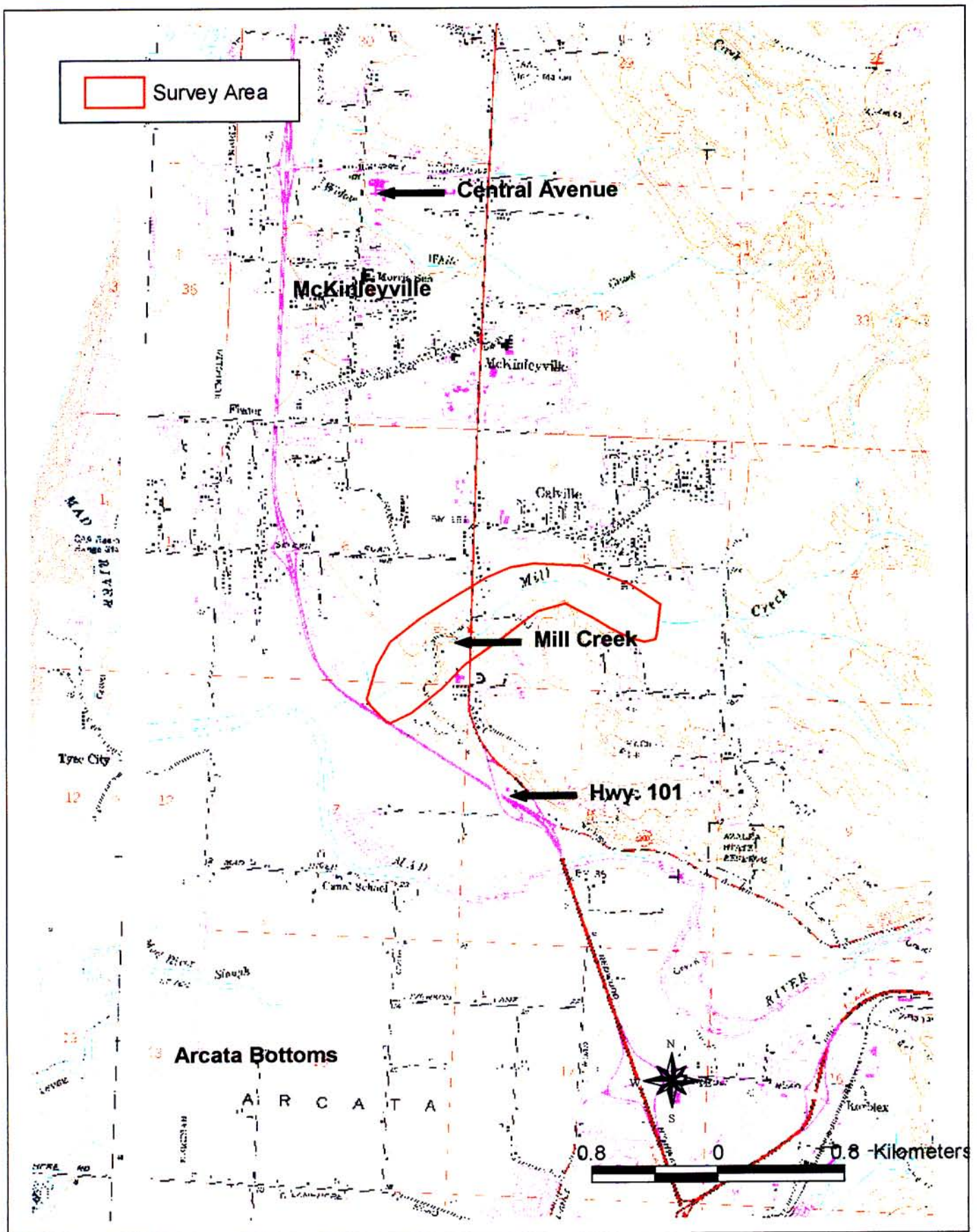


Figure 8. General survey area for western lily, Arcata to Trinidad. Arcata North USGS Quadrangle

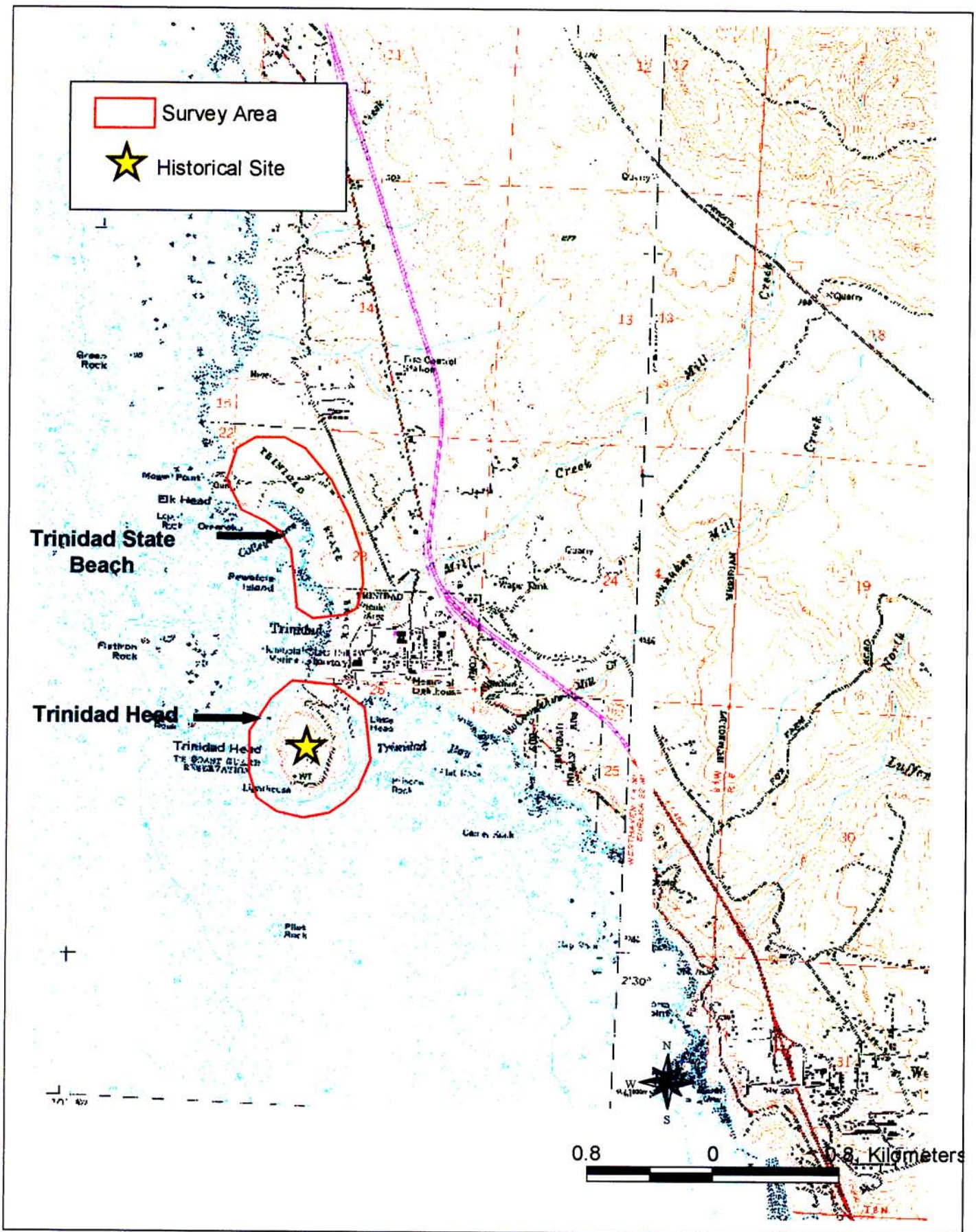


Figure 8 (cont.). General survey area for western lily, Arcata to Trinidad. Trinidad USGS Quadrangle

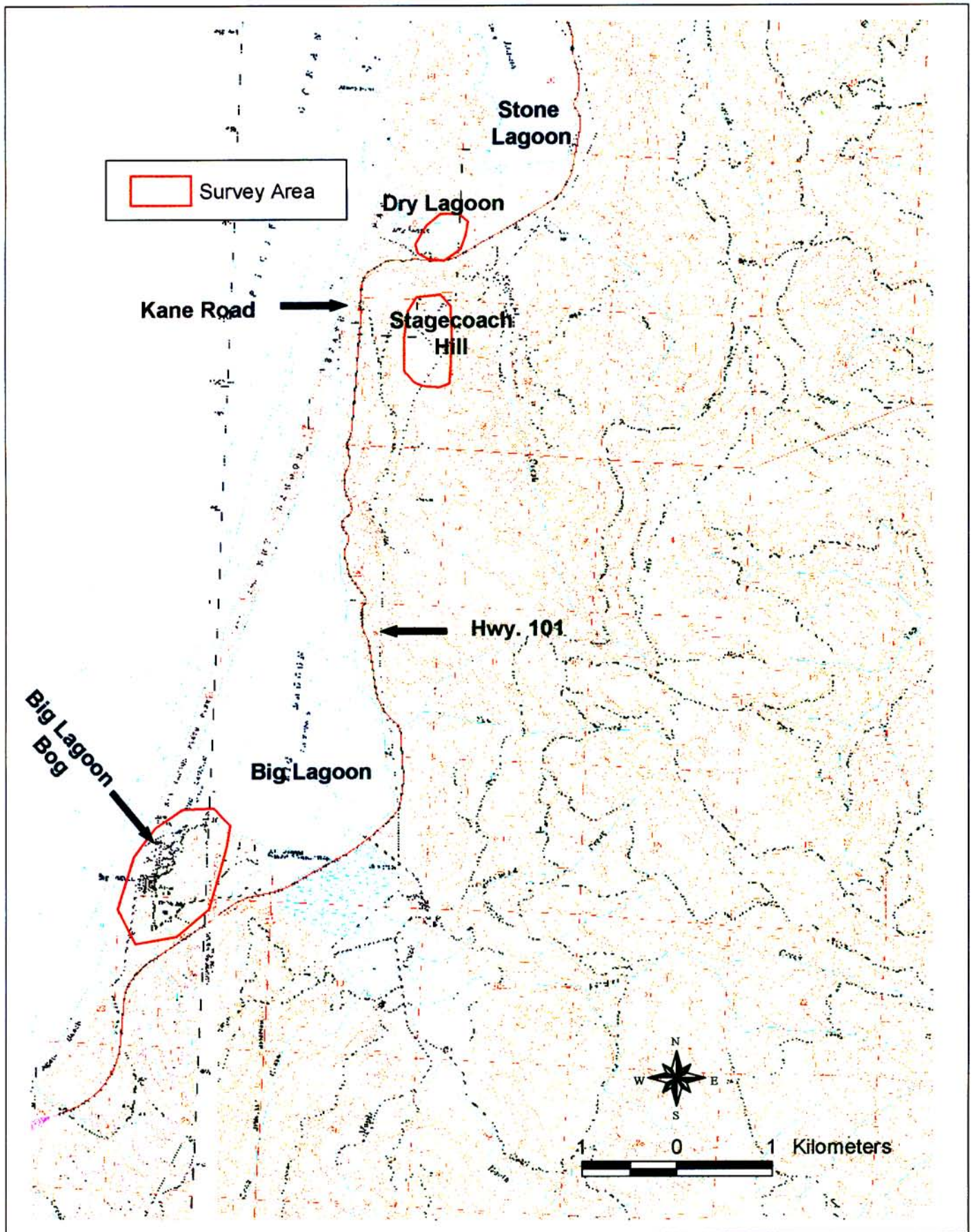


Figure 9. Survey area for western lily, Big Lagoon to Stone Lagoon.

The general area east of Dry Lagoon and north of McDonald Creek was surveyed on July 15 (Figure 9). The low lying areas with standing water were characterized by Sitka spruce, red alder, willows, western azalea, salmonberry, skunk cabbage, slough sedge, and manna grass (*Glyceria* sp.). The areas above standing water also supported Sitka spruce, red alder and salmonberry, along with western hemlock (*Tsuga heterophylla*), stinging nettle (*Urtica dioica*), cow parsnip, velvet grass, and orchard grass. Pacific reed grass was not observed in this area. The soils here consist of Kerr loams and the Melbourne series. A large elk herd was present, indicating seasonal grazing does occur.

On July 15, a survey was conducted within a wetland located along the northern edge of Redwood Creek, on the eastern side of Hufford Peak (Figure 10). The overstory at this site was dominated by Sitka spruce and red alder, with an understory of salmonberry, sword fern, pacific reed grass, *Scirpus microcarpus*, skunk cabbage, stinging nettle, and canary grass (*Phalaris* sp.). Soils in this general area are poor to moderately drained Kerr silt loams.

7. Major Creek to Ossagon Creek

On July 10 and 13, a survey was conducted within the general area extending from Major Creek north to Ossagon Creek [RNP], and included suitable habitat surrounding Espa Lagoon and Fern Canyon (Figures 11 and 12). Sitka spruce and coastal prairie are associated with wetland areas at Major Creek, Espa Lagoon, Fern Canyon, Ossagon Creek, and along Gold Bluffs Beach Road. The vegetation at Espa Lagoon is a dense canopy of Sitka spruce, willow, and wax myrtle, with an understory of slough sedge, skunk cabbage, pacific reed grass, salmonberry, sword fern, salal, and wild ginger (*Asarum caudatum*). Pacific reed grass was observed scattered from Espa Lagoon south to Major Creek. Sitka spruce and western hemlock surround the wetland at the mouth of Major Creek, with slough sedge, skunk cabbage, and willows dominant in the understory. The wetlands located at the mouth of Ossagon Creek were dominated by red alder, slough sedge, *Scirpus microcarpus*, pennyroyal (*Mentha pulegium*), stink currant (*Ribes bracteosum*), and non-native grasses. Although the soils at RNP were in the process of being mapped during 2003, Joe Seney, NRCS soil scientist, noted the soils near Espa Lagoon were characteristic of western lily habitat.

8. Requa to False Klamath Cove

On June 24, a survey was conducted along the Coastal Trail [RNP] from the northern end of Requa Road to Hidden Beach Campground [RNP] (Figure 13). The Trail traverses under a dense canopy of Sitka spruce, red alder, salmonberry, and thimbleberry with an understory of sword fern, false lily-of-the-valley, and slough sedge, and additionally through scattered openings dominated by native and non-native grasses, bracken fern, cow parsnip, *Aster chilensis*, and wild cucumber (*Marah oreganus*). Pacific reed grass was observed along the northern end of the Trail near False Klamath Cove, and Columbia lily was observed near the southern end.

The wetlands associated with the confluence of Hunter Creek and Mynot Creek, adjacent to Highway 101 less than .5 miles east of Requa, consist of potentially suitable western lily habitat in areas where raised hummocks occur adjacent to standing or slow-moving water. The vegetation in this area is dominated by willows and grasses, and the soils are generally poorly

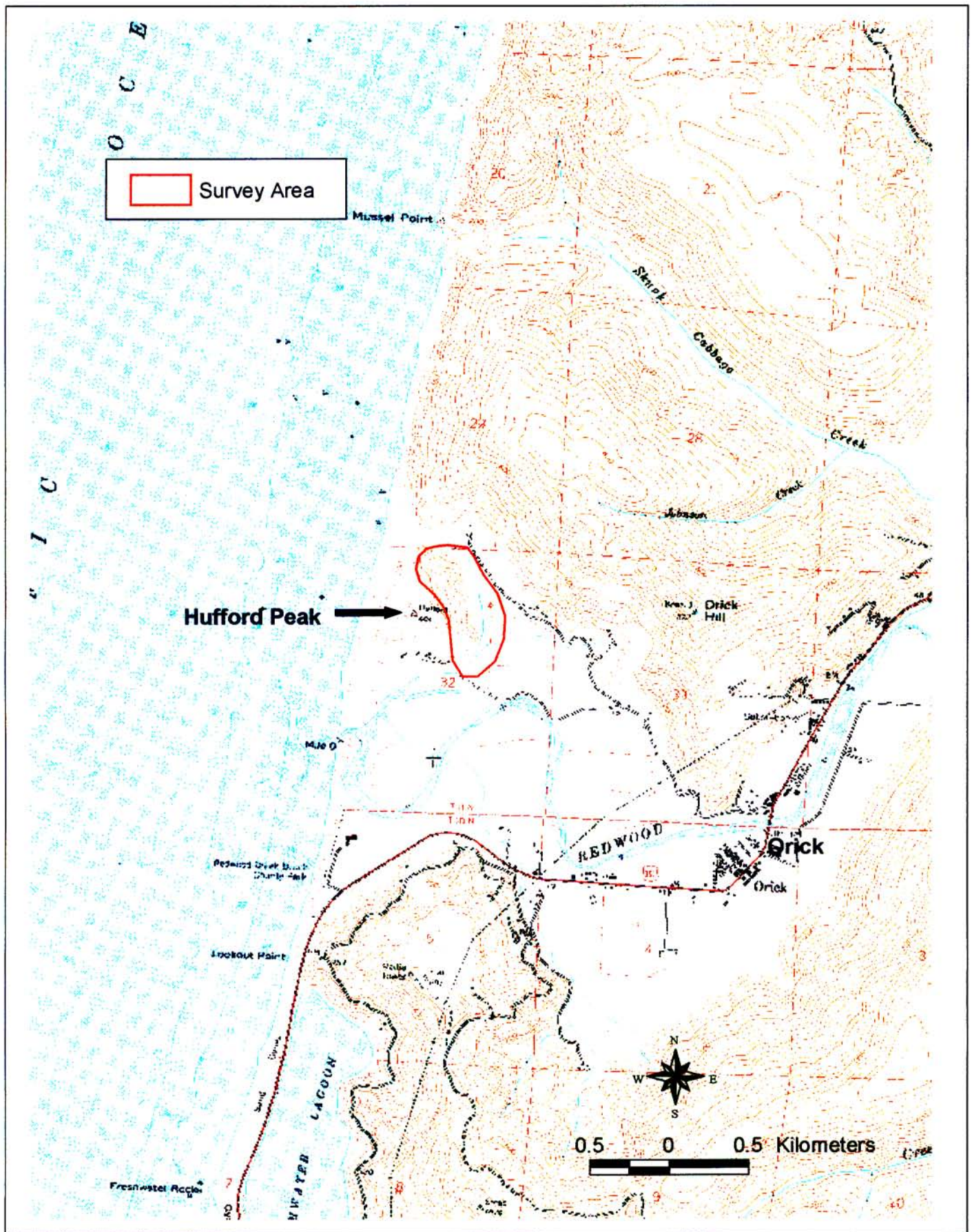


Figure 10. General survey area for western lily, Redwood Creek. Orick USGS Quadrangle

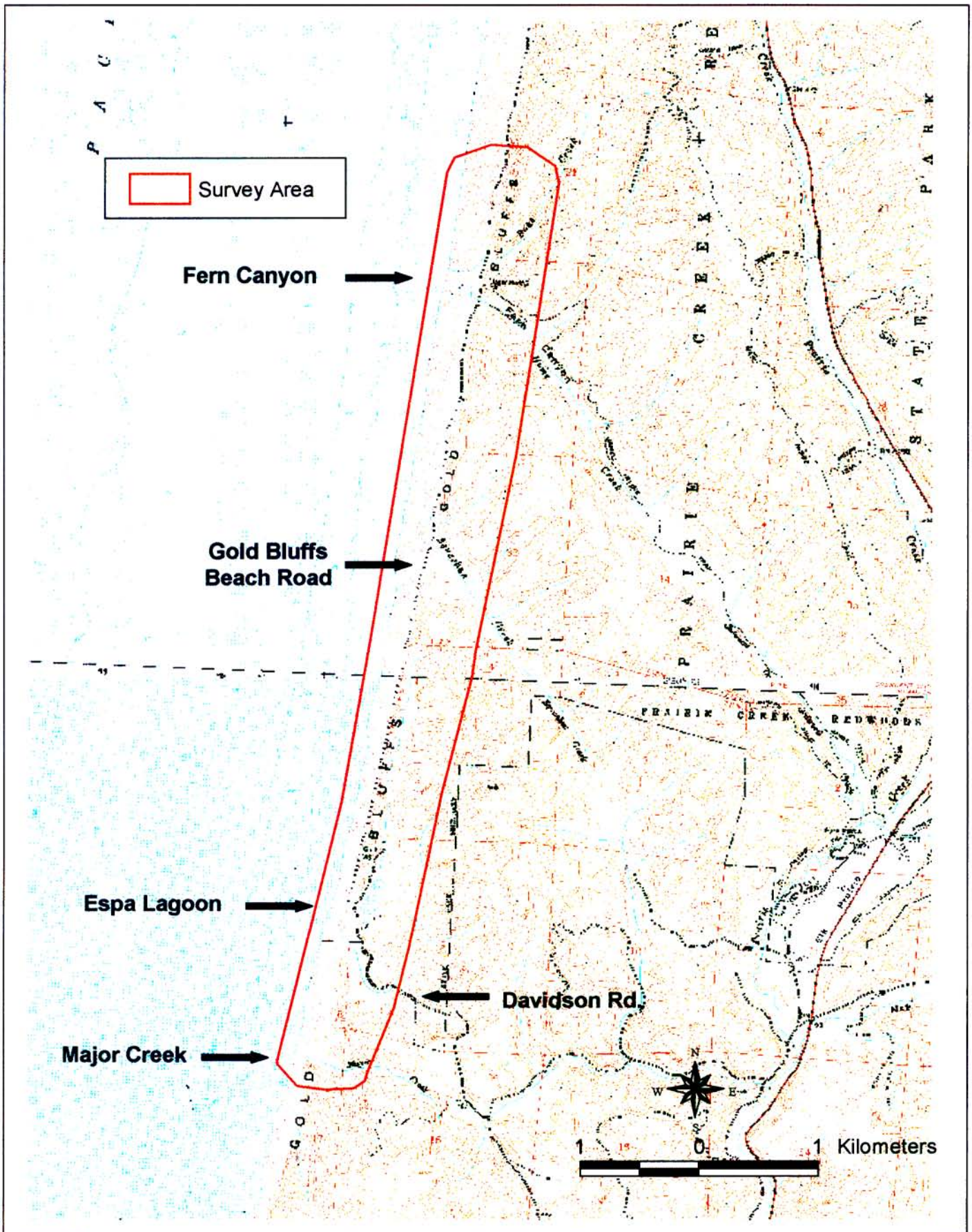


Figure 11. General survey area for western lily, Major Creek to Fern Canyon. Orick and Fern Canyon USGS Quadrangles.

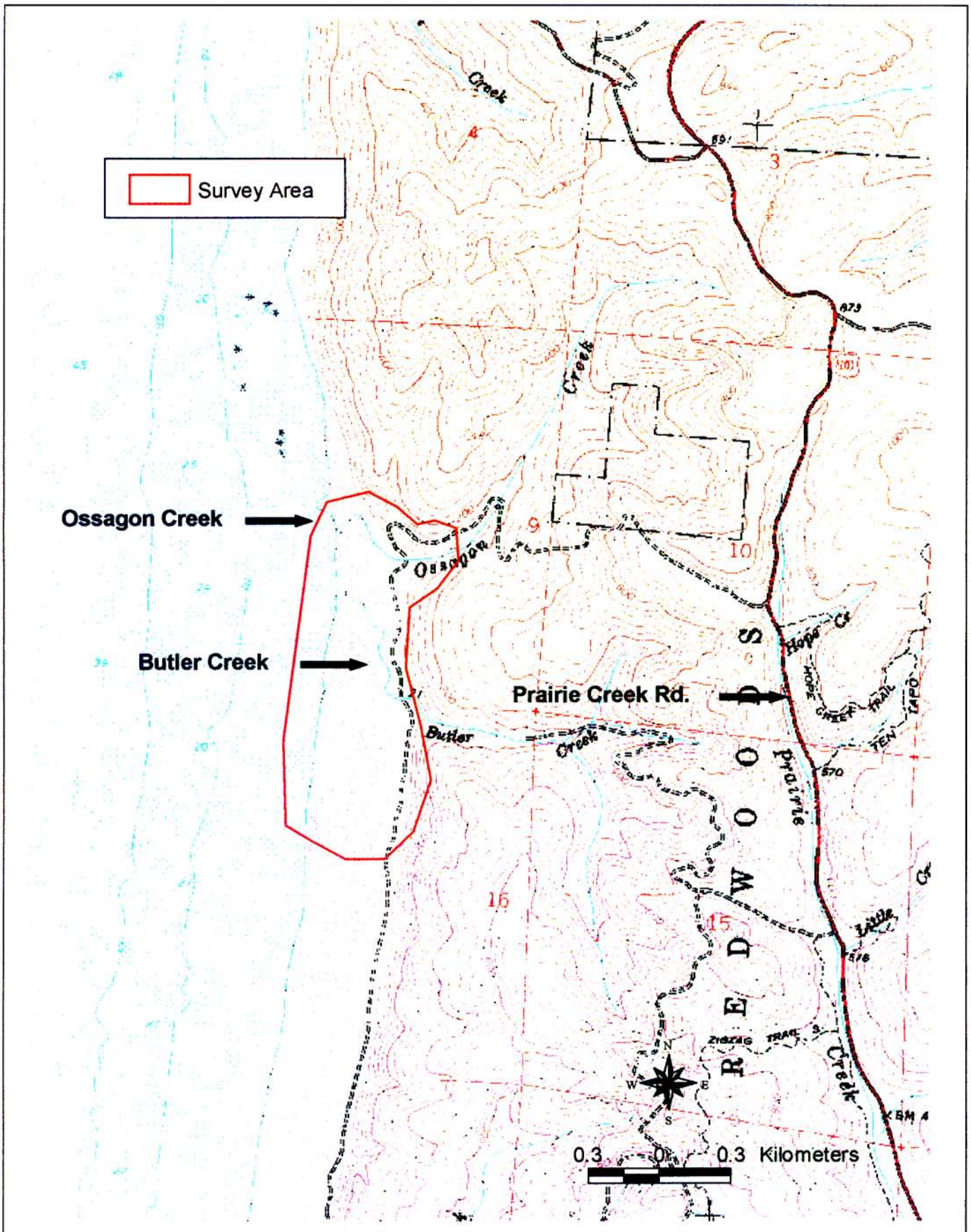


Figure 12. General survey area for western lily, Butler Creek to Ossagon Creek. Fern Canyon USGS Quadrangle.

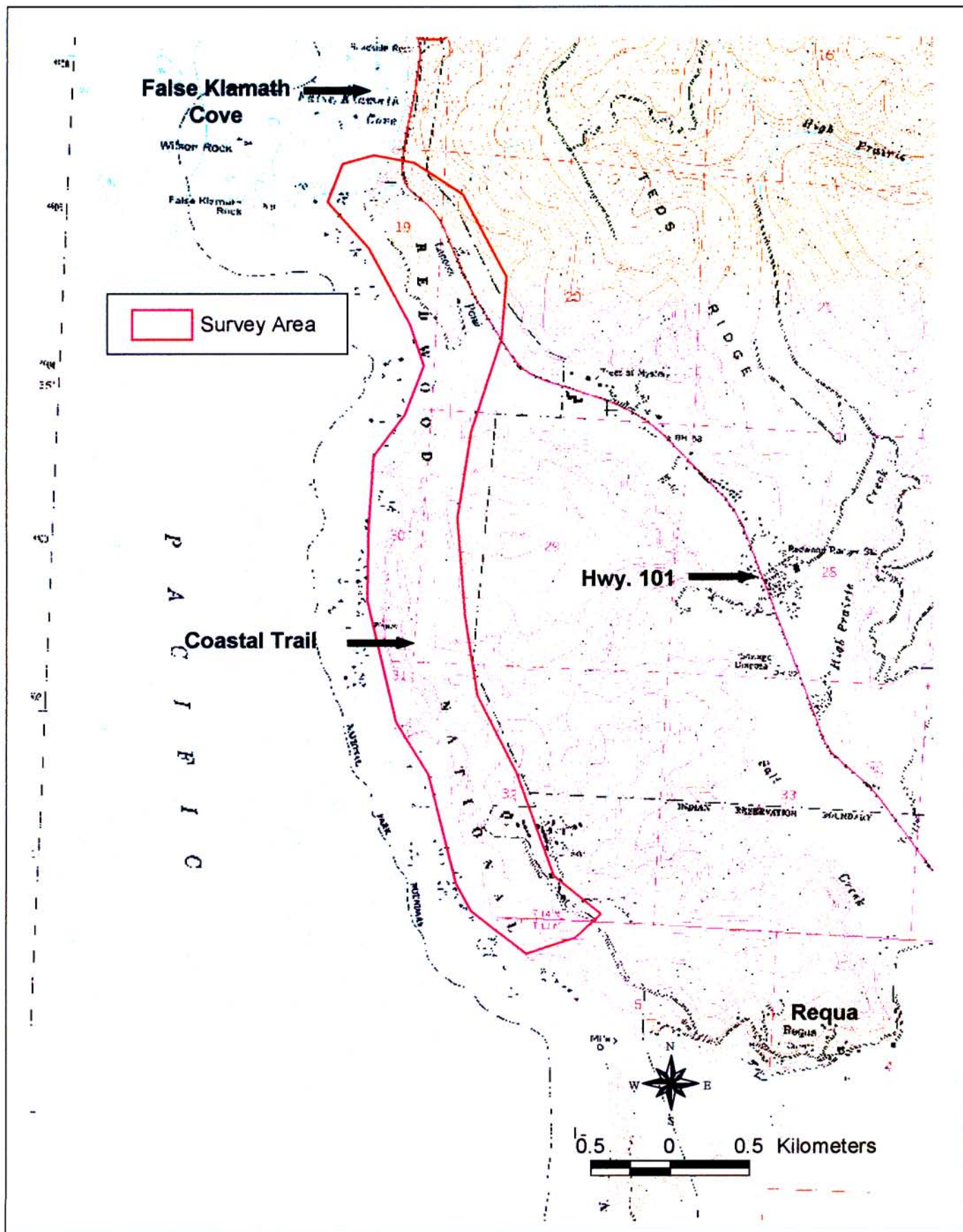


Figure 13. General survey area for western lily, Requa to False Klamath Cove. Requa USGS Quadrangle.

drained Loleta soils. The area is currently grazed, and likely has been historically grazed for some time. This general area may warrant a survey with landowners' permission, however, this area was flooded in 1964 with nearly a foot of silty deposits, and thus, the likelihood is low that a western lily population has survived flooding and continuous grazing.

9. Wilson Creek and DeMartin Prairie

The edge habitat and scattered openings along Wilson Creek were surveyed on July 14 (Figure 14). This general area has been developed and includes a youth hostel. Sitka spruce, cascara, willows, and elderberry are common near the creek, with an understory of salmonberry, thimbleberry, and coyote brush. The openings generally are dominated by non-native grasses, cow parsnip, Himalayan berry (*Rubus discolor*), buttercup (*Ranunculus repens*), and horsetail. No pacific reed grass was observed.

The DeMartin Prairie is located less than 1 mile north of Wilson Creek (Figure 14). This area is a mosaic of coastal prairie and scrub, with cascara, elderberry, red alder, and occasional Sitka spruce occurring along the perimeter. Within the prairie, the dominant vegetation includes native species: pacific reed grass, cow parsnip, wild cucumber, yarrow (*Achillea millefolium*), *Aster chilensis*, *Elymus* sp., sword fern, California blackberry, and non-native species: velvet grass, orchard grass, and ox-eye daisy (*Leucanthemum vulgare*). Scattered mesic sites include slough sedge, horsetail, *Scirpus microcarpus*, stinging nettle, hedge nettle (*Stachys* sp.), and buttercup. The area is obviously heavily used by deer.

10. Crescent City Area

Under a separate contract with DFG (#P0210714), seven potentially suitable habitat sites located on public lands in Del Norte County were surveyed for western lily with negative results (Bencie and Wear, 2004c). The general survey areas are described fully in that final report; the figures illustrating the survey areas are provided as Attachment 1. The focused surveys were conducted in the following areas: Enderts Beach [RNP], Elk Creek Marsh [DFG], Dead Lake [DPR], and selected wetlands located in the southern portion of Lake Earl Wildlife Area [DFG].

Potential high quality habitat exists at McNamara Slough, located adjacent to Pebble Beach Drive less than .5 miles west of Crescent City (Figure 15). Attempts to contact the landowner were unsuccessful, but binocular surveys from the roadside indicated habitat very similar to the CCMWA, and included western azalea, spiraea, and willows. This site is located approximately 1 mile south of the known western lily population on Point St. George. A survey was conducted in the eastern portion of Yontocket Slough, located approximately .25 miles south of the junction of Lower Lake Road and Pala Road (Figure 16). Here, an isolated Sitka spruce stand occurs with willows, Himalayan berry, and yellow pond lily along the southern perimeter of the slough.

In general, potential suitable habitat sites north of the Smith River within remnant coastal grasslands or in mesic areas near Gilbert Creek and Lopez Creek were considered either poor quality habitat or currently unsuitable due to urban encroachment, agricultural development, or grazing.

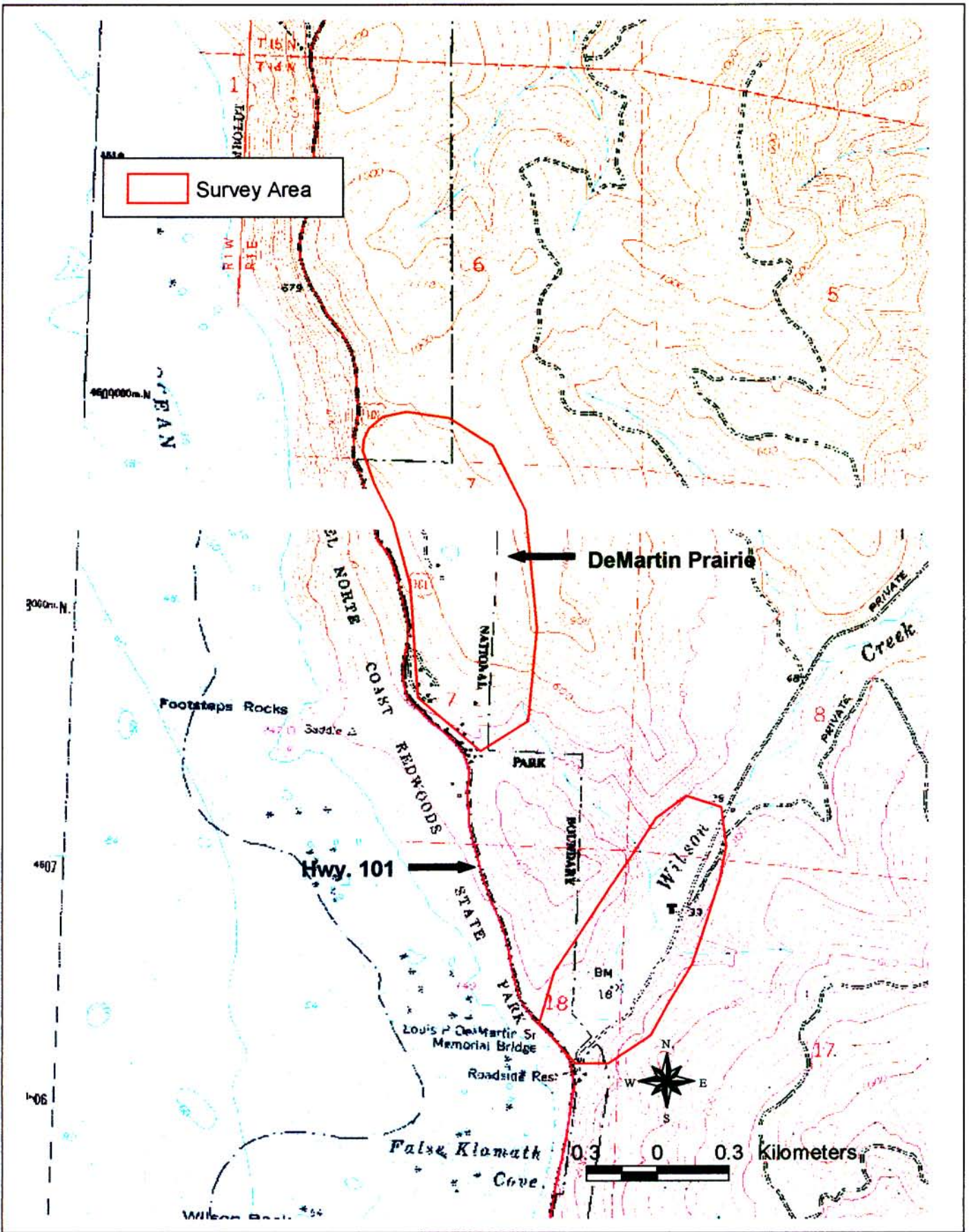


Figure 14. General survey area for western lily, Wilson Creek and DeMartin Prairie. Requa And Childs Hill USGS Quadrangles.

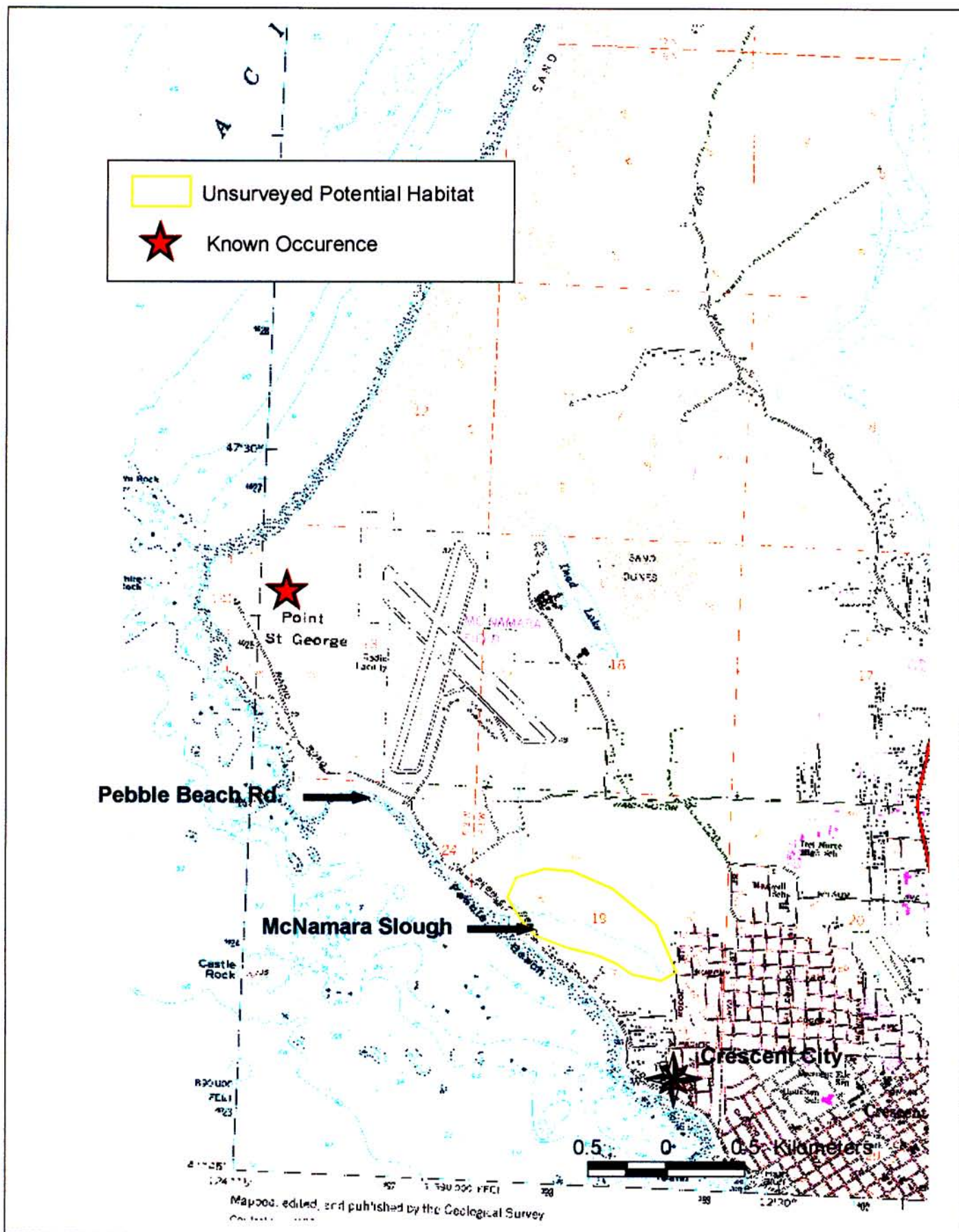


Figure 15, Unsurveyed potential habitat for western lily, McNamara Slough. Crescent City USGS Quadrangle

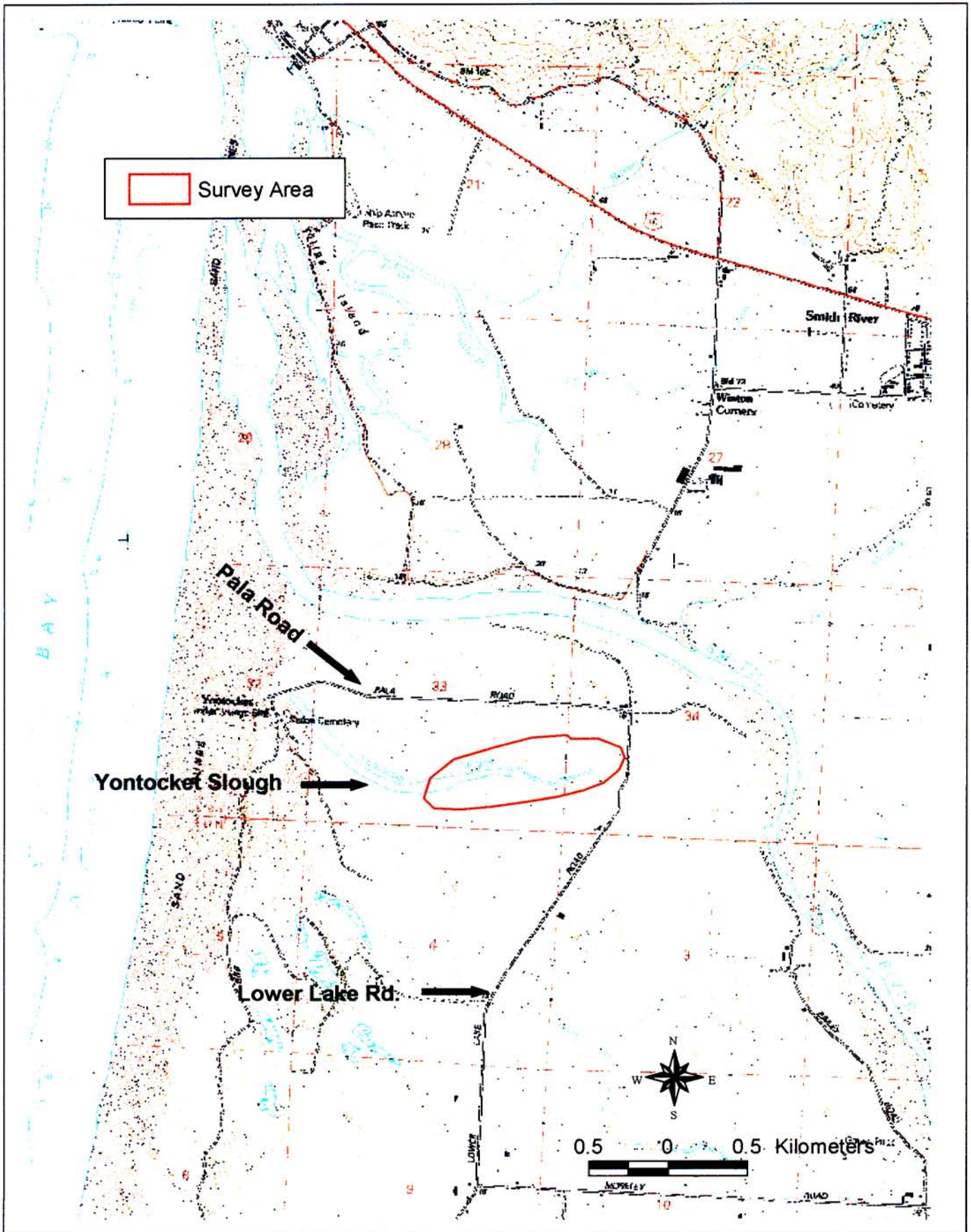


Figure 16. General survey area for western lily, Yontocket Slough. Smith River USGS Quadrangle.

IV. POTENTIAL EXPANSION SITES FOR WESTERN LILY

Given the overall habitat quality and current site conditions in areas surveyed for western lily on public and private lands in Humboldt and Del Norte Counties, the highest quality western lily habitat, and thus the areas of greatest likelihood for population expansion success, occurs in areas near the existing populations at the CCMWA, Point St. George, and TBER. The populations at CCMWA and TBER are currently in decline due to habitat degradation and predation (Bencie and Imper, 2003a; Bencie and Wear, 2004a and 2004b). Our most efficacious efforts towards species recovery are the habitat improvements and herbivore protection measures necessary to maintain these populations and encourage their expansion. These measures include removal of woody vegetation and invasive weeds, initiating a controlled grazing plan, and installing, as well as, enlarging deer exclosures.

Big Lagoon County Bog and McNamara Slough appeared to be the most suitable western lily expansion sites outside of the known occupied sites. The soil characteristics and current hydrological conditions support a vegetation structure and species composition that is very similar to the site of the largest population at the CCMWA.

For any western lily expansion project to be successful, habitat maintenance and predator control is paramount. Periodic removal of encroaching woody vegetation is necessary for reducing canopy cover and maintaining openings and edge habitat. Annual monitoring has shown that the majority of plants (flowering, juvenile, and seedlings) are concentrated within openings, and that reproductive success and longevity decline with canopy closure and habitat degradation (Bencie and Imper, 2003a and 2003b). The 2002 TBER census indicates that at least 75% of the mature, reproductive individuals were browsed by deer before setting fruit (Bencie and Imper, 2003b). A prolonged loss of fecundity at this level will likely have serious consequences for the sustainability of a population.

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**SEARCH FOR WESTERN LILY ON
PUBLIC AND PRIVATE LANDS IN
HUMBOLDT AND DEL NORTE COUNTIES**

ATTACHMENT 1

**FIGURES OF SURVEY AREAS FROM FINAL REPORT:
SEARCH FOR WESTERN LILY ON
PUBLIC LAND IN DEL NORTE COUNTY
AUGUST 2004**

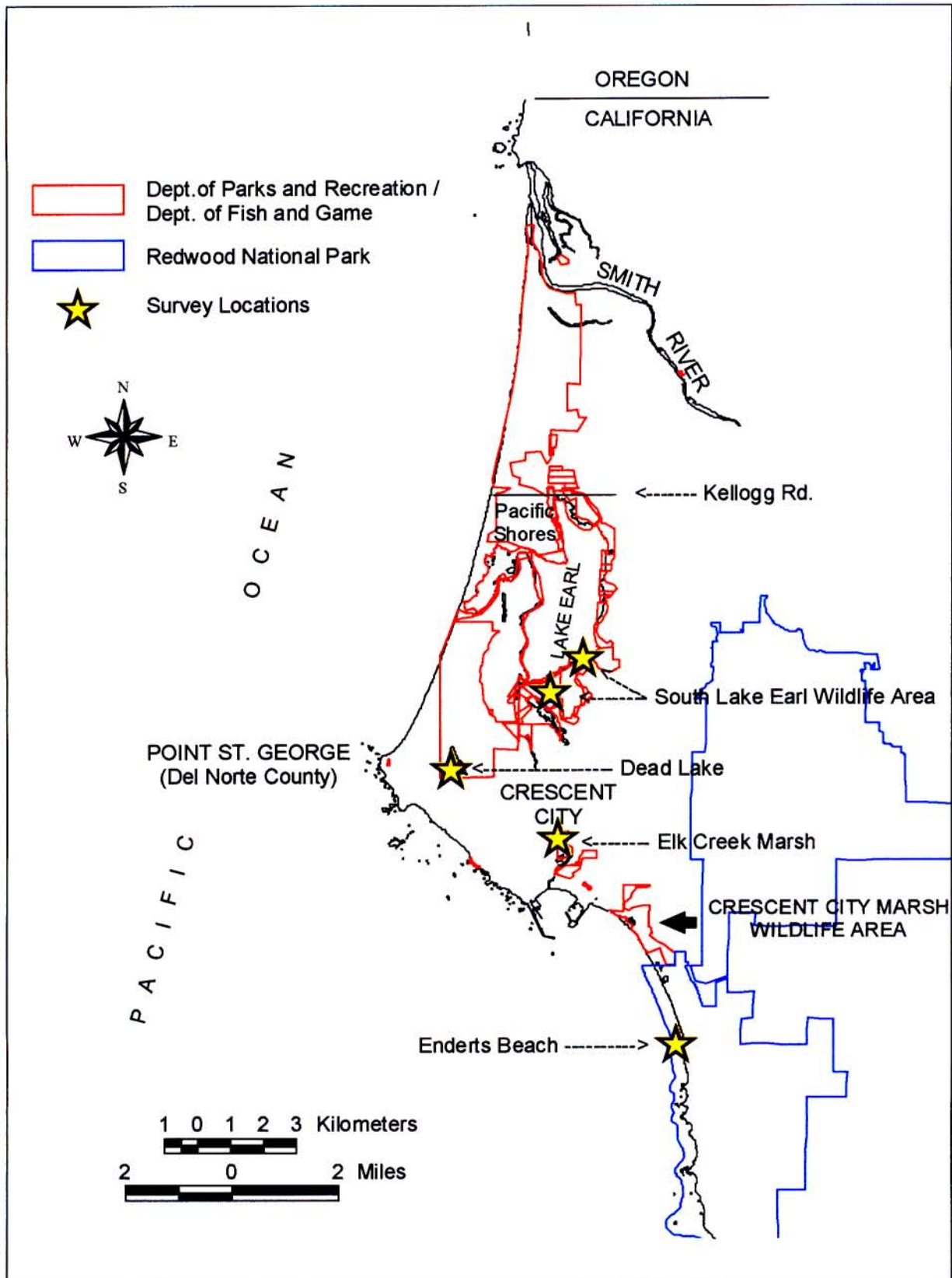


Figure 1. Project area for western lily search on public lands in Del Norte County, California.

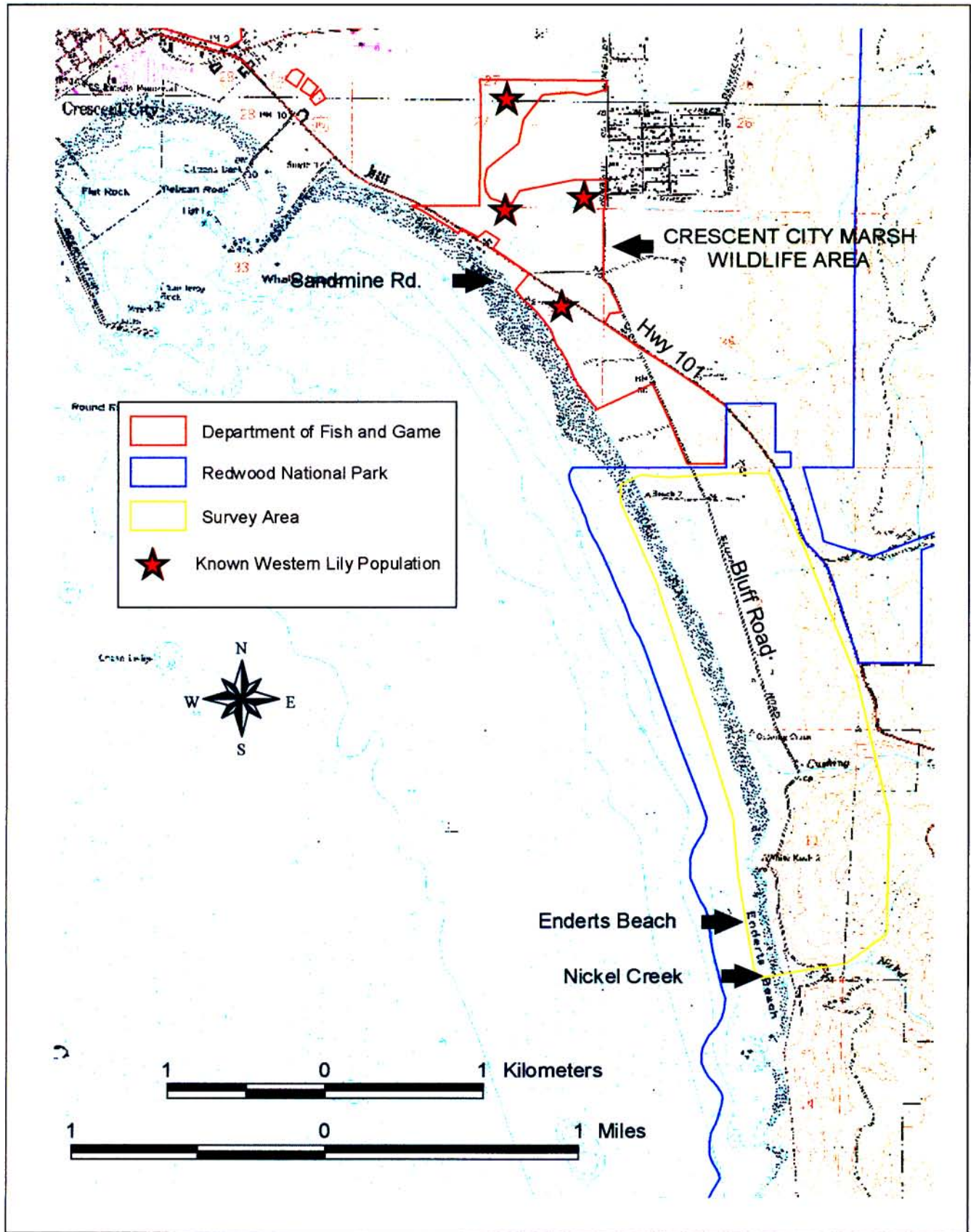


Figure 2B. Endert's Beach survey area (Crescent City and Sister Rocks USGS DRGs).

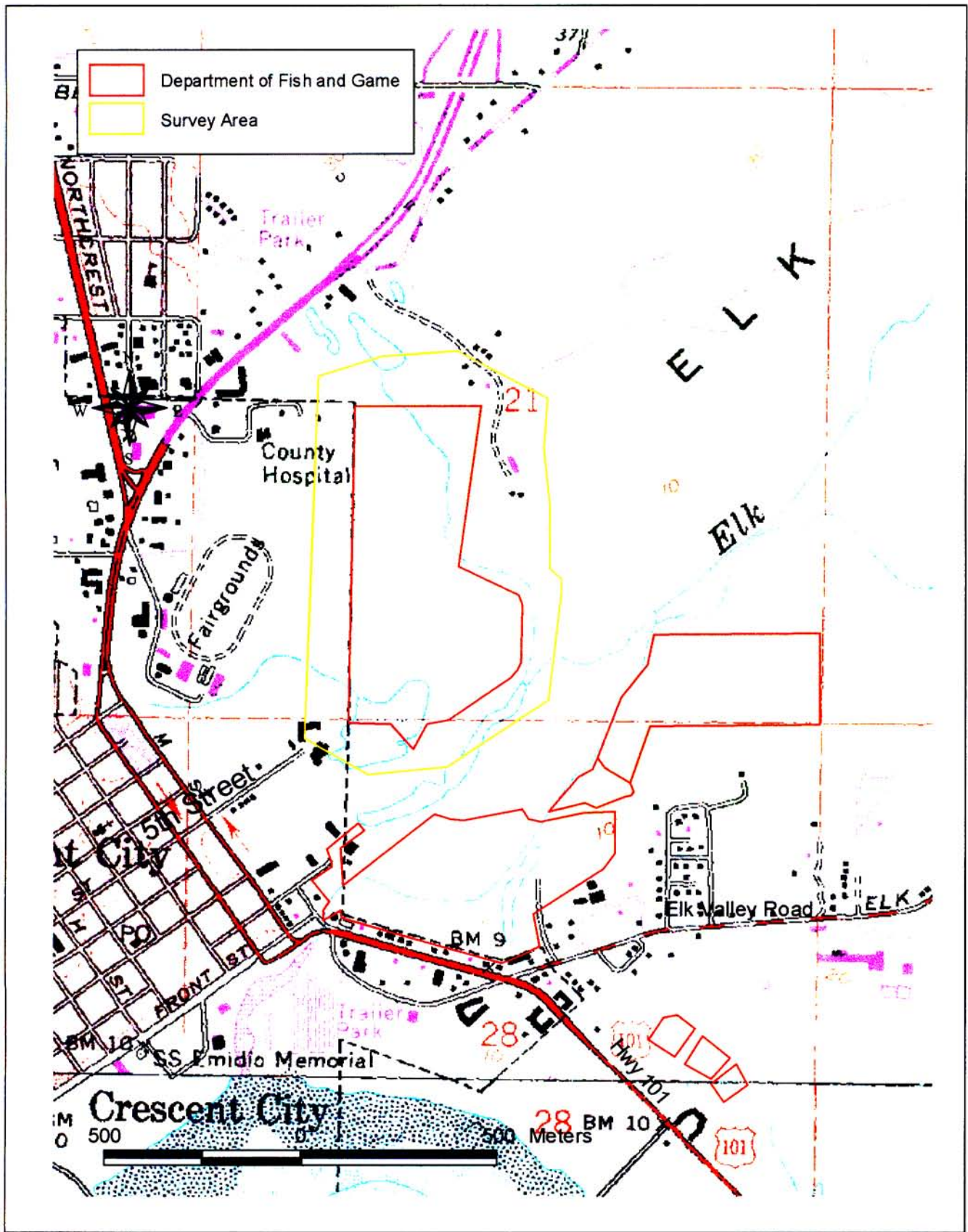


Figure 3B. Elk Creek freshwater marsh survey area (Crescent City USGS DRG).

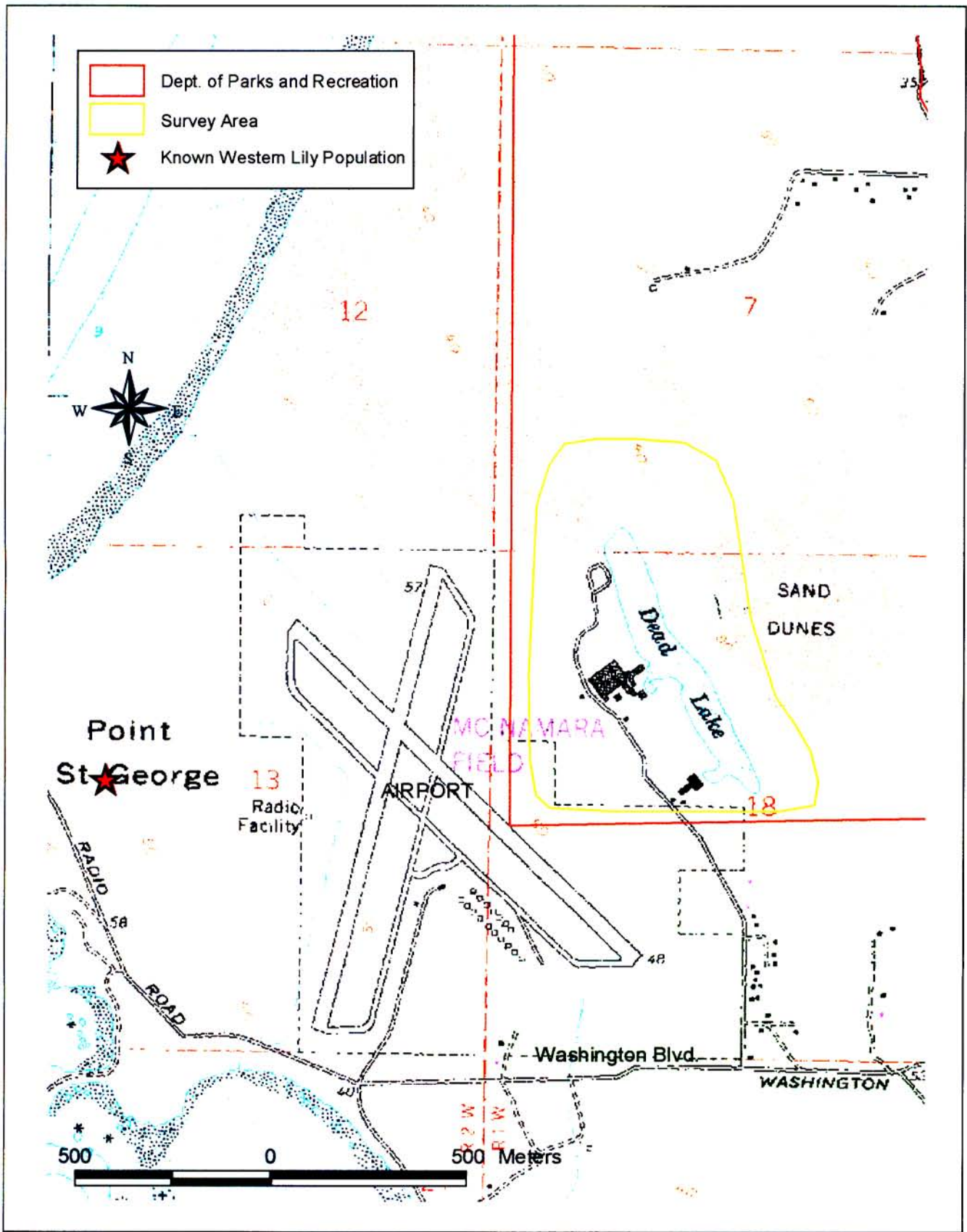


Figure 4B. Dead Lake survey area (Crescent City USGS DRG).

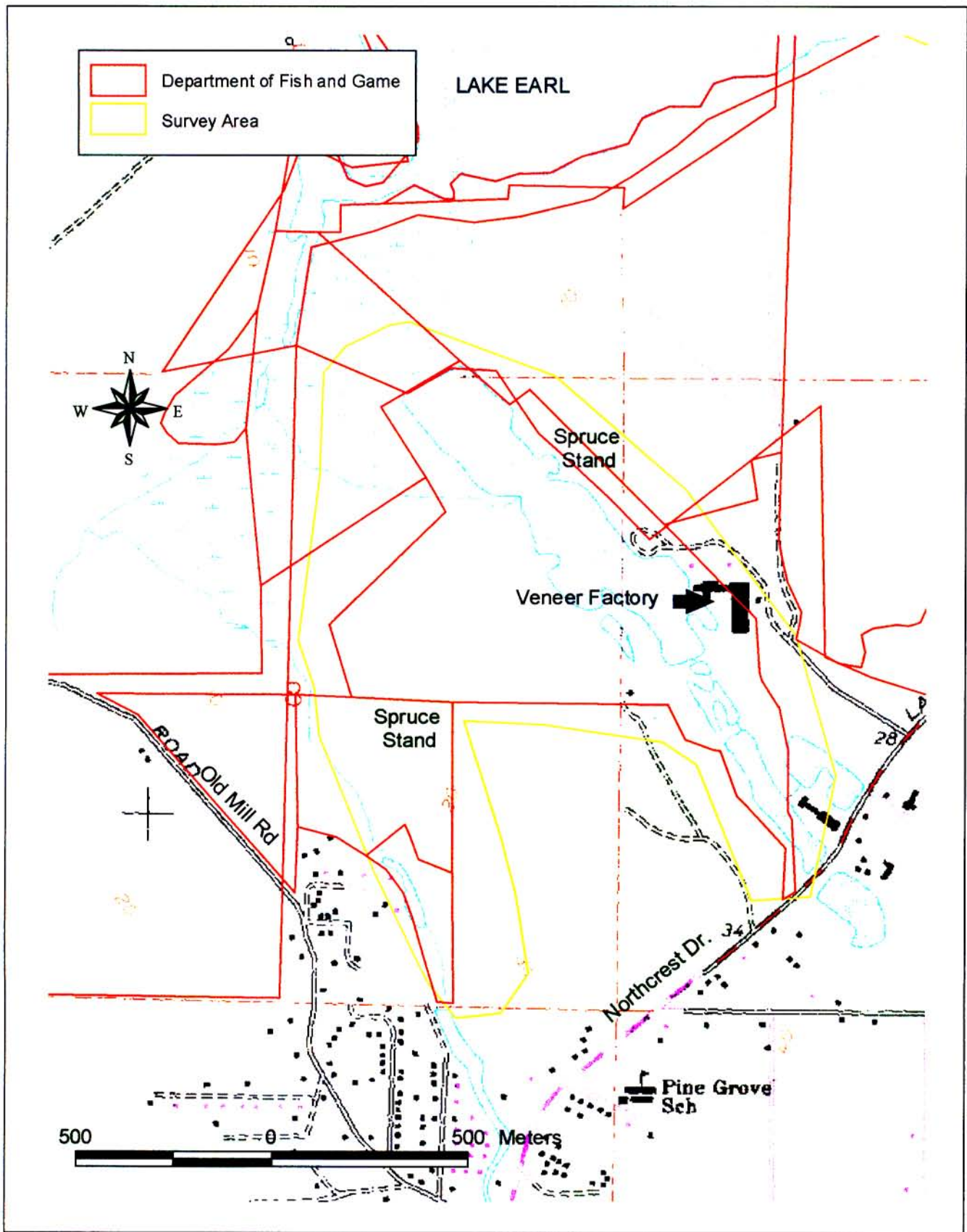


Figure 5B. South Lake Earl Wildlife Area (southern portion) (Crescent City USGS DRG).

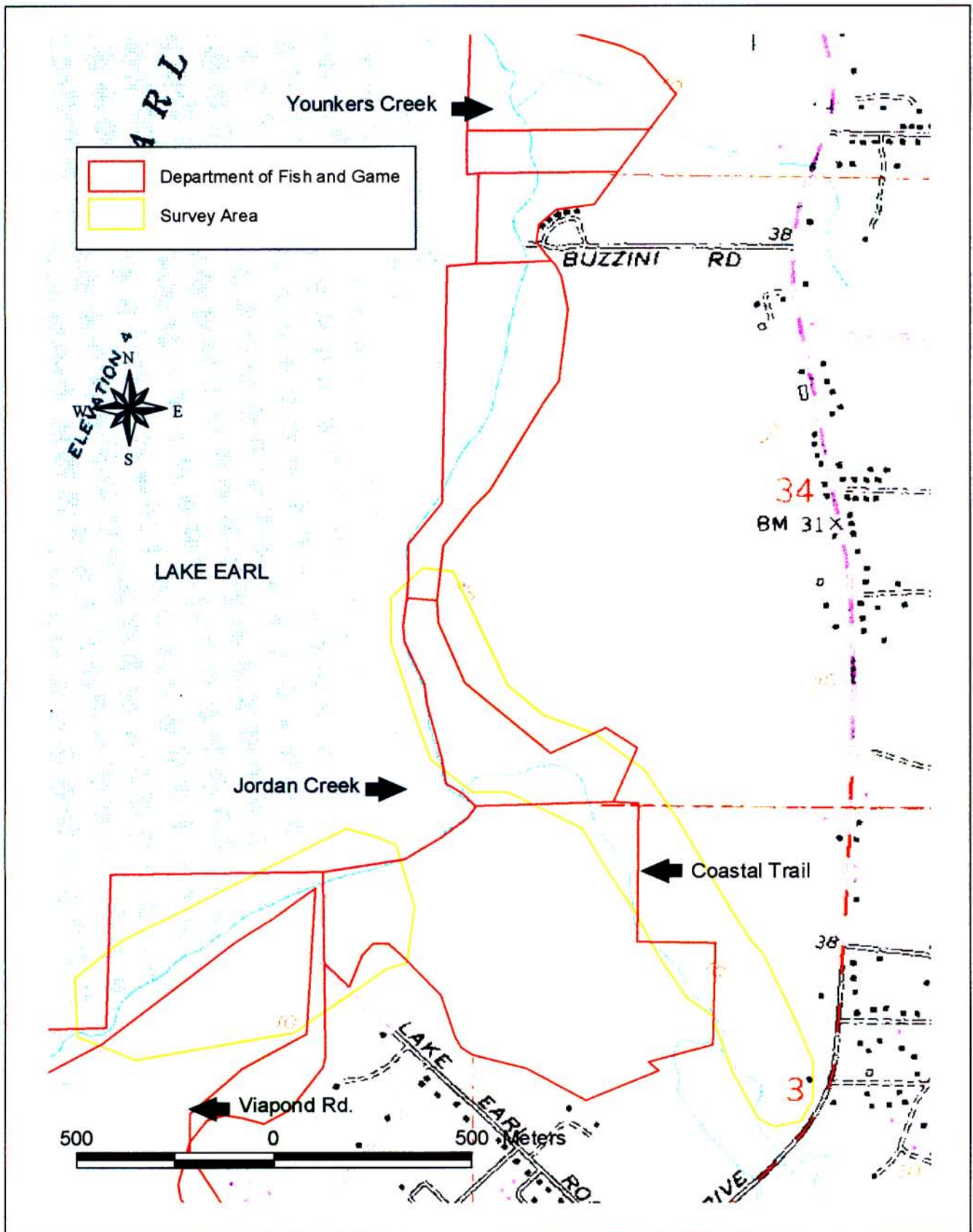


Figure 6B. South Lake Earl Wildlife Area (northern portion) (Crescent City USGS DRG).