

Technical Memorandum

Date: July 8, 2011

To: Mr. Dan Efseaff, Park and Natural Resource Manager, City of Chico

From: Ms. Christine Hantelman, Botanist

Project: NSR No. 51325 - Peregrine Point Disc Golf Course Botanical Monitoring

Subject: 2011 Botanical Monitoring Results

I. INTRODUCTION

On behalf of the City of Chico (City), North State Resources, Inc. (NSR) conducted a botanical survey on and around the site of the Peregrine Point Disc Golf Course, hereinafter referred to as the “study area.” The purpose of this survey is to document the distribution and extent of Butte County checkerbloom and Bidwell’s knotweed as identified in the *Bidwell Park and Disc Golf Course/Trailhead Area Concept Plan Environmental Impact Report - Master Mitigation and Monitoring Plan* (City of Chico and EDAW 2008). This letter summarizes the results of the findings regarding the selected botanical resources detected and mapped within the study area. All figures are located at the end of the memorandum.

II. PROJECT LOCATION

The approximately 70-acre study area is located along the west side of State Highway 32 approximately 7 miles east of the city of Chico (Figure 1). The study area occurs in the eastern portion of Bidwell Park on the south rim of the ridge overlooking Big Chico Creek at an elevation range of approximately 1,050 to 1,300 feet above mean sea level. Barbed-wire fence encloses the study area on the southern and western edges.

III. PHYSICAL AND BIOLOGICAL SETTING

The study area contains thin soils that are formed from the volcanic mudflow breccia that is part of the Tuscan Formation. These hard mudflows form the rocky outcrops covered with thin soils that support the vegetated areas identified as “wildflower fields” in previous studies of the study area (City of Chico and EDAW 2008). Blue oak occurs on the deeper soils formed on volcanic conglomerate (U.S. Department of Agriculture and Natural Resources Conservation Service 2006).

The site has been used by hikers and naturalists and, for the last 15 years, informally as a disc golf course. Footpaths and trails, eroded soils, trampled plants, and damaged trees are some examples of disturbances at this site that reflect its historical and current use.

Vegetation on the site is a mix of blue oak (*Quercus douglasii*) savannah with sparse, scattered tree cover and blue oak/foothill woodland with foothill pine (*Pinus sabiniana*) and interior live oak (*Quercus wislizenii*), interspersed with annual grassland elements and exposed volcanic

mudflow. Understory shrubs and vines occurring within the woodland are manzanita (*Arctostaphylos manzanita*), redberry (*Rhamnus ilicifolia*), buck brush (*Ceanothus cuneatus*), poison oak (*Toxicodendron diversilobum*), and honeysuckle (*Lonicera interrupta*). Grassland within the study area is dominated by non-native annual grasses such as wild oats (*Avena barbata*), Italian wildrye (*Lolium multiflorum*), soft chess (*Bromus hordeaceus*), annual fescues (*Vulpia* spp.), false brome (*Brachypodium distachyon*), dogtail (*Cynosurus echinatus*) and medusahead (*Taeniatherum caput-medusae*). Non-grass species flowering in the woodland at the time of survey include twining brodiaea (*Dichelostemma volubile*), soap plant (*Chlorogalum pomeridianum*), purple clarkia (*Clarkia purpurea*) and Butte County checkerbloom (*Sidalcea robusta*).

Thinner soils associated with the edges of the exposed volcanic mudflow supported a few annual grasses, mostly annual fescues and soft chess, as well as needle-leaved navarretia (*Navarretia intertexta*), June centauray (*Centaureum muehlenbergii*), Douglas' sandwort (*Minuartia douglasii*), dwarf stonecrop (*Parvisedum pumilum*), timwort (*Cicendia quadrangularis*), Hansen's spike-moss (*Selaginella hansenii*) and Bidwell's knotweed (*Polygonum bidwelliae*).

IV. SURVEY METHODOLOGY

In late May 2011, a targeted survey was conducted to relocate and map previously recorded occurrences of the Butte County endemics, Butte County Checkerbloom (hereafter "checkerbloom") and Bidwell's knotweed (hereafter "knotweed"). The City provided a map of checkerbloom occurrences from surveys done in 2002, 2005, and 2010 that was used to relocate known checkerbloom plants. As a consequence of time and budgetary constraints, the survey was limited to the portion of the study area encompassing the Peregrine Point Disc Golf Course area and the northeastern end of the study area where checkerbloom was documented in 2010 (Chico Environmental 2010). Wildflower fields within the main area of play that were known from previous surveys to contain knotweed were surveyed, and knotweed occurrences were mapped; other wildflower fields were scanned for presence of knotweed as time permitted. Incidental observations of noxious weeds were also recorded. Although associated species and general vegetation attributes were noted with regard to rare plant occurrences, a full floristic survey was not conducted.

Checkerbloom is a long-lived rhizomatous species, with multiple aboveground growing points (meristems) arising from the whole length of the underground stems (rhizomes) of the same genetic individual. These growing points can also be naturally separated and relocated (e.g. by fossorial mammals). Because of this clonal nature, genetically separate individuals of checkerbloom are difficult or impossible to identify in the field (Hantelman 2004), and "clumps" were defined as a checkerbloom counting unit (unit) wherever two or more meristems were separated from each other by less than 10 cm (4 in). During the survey, the following checkerbloom units were used:

- Individuals - single meristems separated from other meristems by 50 cm (19.6 in).
- Small clumps - clumps with 1-5 separate meristems co-located in an area less than 50 cm x 50 cm.
- Large clumps - clumps with 5 or more meristems close together that cover an area greater than 50 cm x 50 cm.

Checkerbloom also produces large “clonal mats”: tightly intermingled groups of meristems covering at least a square meter, with the meristems not separable by visual inspection. These were treated as “large clumps”.

The location of checkerbloom units was recorded as point data using a Trimble Pathfinder Pro XH Global Positioning System (GPS) capable of sub-meter accuracy. For each data point, the number of checkerbloom units, checkerbloom phenology, plant associates, and potential threats were recorded using the *California Native Species Field Survey Form* (CNDDDB 2008).

To determine between year changes in populations of checkerbloom within discrete areas, polygons were drawn around closely co-located checkerbloom data points recorded from the current 2011 survey and the points recorded in the 2010 survey. The total number of units within each polygon (checkerbloom group) was counted. Where the number of plants was estimated (e.g., “4-5”), the lowest number was used for data from both years. The 2010 survey data provided to NSR by the City did not specify how individuals or clumps (aka patches) were distinguished, therefore, in the comparison between years, all units used (individuals, small clumps, and large clumps) were each counted as one unit. For example, if a data point records the location of “one small and one large clump”, the number of checkerbloom units would be two. Flowering stems (racemes) were also counted and recorded for checkerbloom units mapped in 2011. Raceme data are only available for 2011, so no comparisons could be made with previous years.

Bidwell’s knotweed is a diminutive annual that occurs on the exposed volcanic mudflow and thin soils of the wildflower fields in the study area. Because knotweed plants occur close together and in great numbers (often 100 or more), mapping individuals is impractical. For this survey, knotweed plants at the perimeter of a larger occurrence were flagged and polygon data were generated by walking from flag to flag, using a Trimble Pathfinder Pro XH Global Positioning System (GPS) capable of sub-meter accuracy. Estimated number of individuals, phenology, plant associates, and potential threats were also recorded.

The two-visit botanical survey was conducted by NSR Botanist, Christine Hantelman, on May 24 and 27, 2011. Dan Efseaff, City Park and Natural Resource Manager, met with Ms. Hantelman during a portion of the survey to assist in the relocation of previously recorded botanical resources.

V. RESULTS AND DISCUSSION

Checkerbloom

A total of 132 checkerbloom units were mapped (53 data points) during the 2011 survey. About half of the units (51.5%) were in a vegetative state, that is, they produced no racemes. Just less than half (48.5%) bore flowering stems in various stages of development. Phenologically, the population at the study area was in early flower with about a third (34.5%) of the racemes in full flower and 26.8% of the racemes still in bud. The remaining racemes (38.6%) had been “nipped” below the buds. The data are summarized in Table 1. The data points and checkerbloom groups (CGs) are shown in Figure 2.

Table 1. Summary of field data for Butte County Checkerbloom occurrences at Peregrine Point Disc Golf Course

Checkerbloom Occurrence Attribute	Total number	% of total
Total # checkerbloom units (individuals, small & large clumps)	132	
# units reproductive	64	48.5%
# units vegetative	68	51.5%
Total # checkerbloom racemes	145	
# racemes in flower/fruit racemes	50	34.5%
# racemes in bud	39	26.8%
# racemes nipped	56	38.6%

Most of the checkerbloom units occurred within blue oak woodland paralleling the 15th, 16th and 14th fairways or were associated with individual oak trees or the drip line of shrubs at the ecotone of woodland and grassland (CG-3, CG-4, and CG-5). Another cluster of points is located along the edge of woodland east of the 2nd fairway (CG-2). One particularly robust individual was found nestled against a rock in the heavily disturbed and eroded area downslope of the 3B tee pad. The out-of-bounds areas between the 3B and 3 baskets and bounded by rail fence was another area where checkerbloom was relatively abundant. Additional checkerbloom units were mapped in the northeastern portion of the study area, outside the general area of disc golf play (CG-7 and CG-8).

In general, plants appeared to be in good condition, with no obviously trampled or damaged plants in the area of golf play. Flowering stems were robust with few buds aborting as has been observed at other checkerbloom locations (Hantelman 2004). Evidence of herbivory on checkerbloom racemes was observed and recorded at the study area. About 38.6% of the racemes counted were “nipped” to a few centimeters (1 – 2 inches) from ground level, with no buds or flowers left on the stem.

Compared with the 2010 survey results in which 65 checkerbloom units were mapped as 30 data points, 132 units were mapped in 2011 (Table 2). This apparent doubling in number of checkerbloom individuals may be due to inconsistencies in survey counting methods between years. Because of clonal nature of the plant and rainfall variation between years, checkerbloom units can change in apparent size and in the number of aboveground meristems and racemes produced from year to year. Non-flowering meristems often go undetected in dense vegetation and can fail to emerge in a resource-poor year (personal observation). Counts of this plant can vary widely, depending on the experience of the surveyor and the methods chosen for counting individuals.

The raceme count at each data point was added to the methodology as it was quick; often being completed while the GPS receiver was logging data. Raceme count is an alternative method of determining reproductive effort. Although checkerbloom plants are long-lived and can multiply clonally, for the population to persist and remain resilient in the face of environmental changes, seed production and recruitment of seedlings is ultimately necessary. Therefore quantifying

Table 2. Comparison of checkerbloom survey points and units counted between 2011 and 2010 within checkerbloom groups (CG)

CG-#	2011 Data Points	Checkerbloom Units ¹ (2011)	2010 Survey Points	Checkerbloom Units (2010)
1	SIRO 30-45	39	Wsc (unnumbered); Wsc 002-006	16
2	SIRO 27-29	4	Wsc 1	9
3	SIRO 11-20; SIRO 26	28	Wsc 011; Bcb1	2
4	SIRO 21-25	20	Wsc 010; Wsc 009; Bcb1 002; Bcb1 003	6
5	SIRO 53	1	Wsc 007	2
6	SIRO 46-52	28	Bcb1 005; Bcb1 006; Wsc 16-19	17
7	SIRO 6-9	5	Bcb1 009-013	6
8	SIRO 1-5; SIRO 10	7	Bcb1 008; Bcb1 007; Bcb1 014	4
Total		132	Total	62

¹ Number of units determined by counting all recorded individuals, clumps (small or large) and mats as equal units.

reproductive effort may be relevant to the long-term monitoring of the population at the study area. Between-year variation of raceme counts would likely be large due to interannual variation in precipitation (and thus available resources for the plants to use in reproduction), however, general trends up or down would be detectable after a few years effort. The combination of relocating and counting checkerbloom units and counting racemes may give the most information for the same effort.

Knotweed

Previously mapped occurrences of Bidwell's knotweed within the main disc golf area were relocated and mapped in 2011 (Figure 2). Time and budget constraints did not allow for knotweed surveying west of the 8th tee pad or in the northeastern end of the study area. The large wildflower field along the rim of the canyon between the ridge edge and north of 5th and 6th fairways was briefly scanned for knotweed, but none was observed. Knotweed mapped by Stuart (2002) near the 14th tee pad was relocated and mapped in 2011, although it does not appear to have been mapped during the 2005 survey (EDAW 2005).

The mapping effort was well-timed: 95-100% of the knotweed plants were in flower, when the species is most readily detected. In all, ten large polygons containing 100s to 1000s of knotweed plants were mapped. All occurred on the thin soils associated with the edges and surface of exposed volcanic mudflow. Knotweed was almost always found growing with June centaury and needle-leaved navarretia, and was also strongly associated with undisturbed algal crusts on the volcanic mudflow. Knotweed plants also occurred along the edges of trails or footpaths within or beside the wildflower fields, however, few if any plants were observed in the compacted soil of the actual trails and paths. A summary of knotweed polygons, estimated number of plants, associated plant species, and possible threats are found in Table 3.

Table 3. Comparison of checkerbloom survey points and units counted between 2011 and 2010 within checkerbloom groups (CG)

Polygon ID #	# plants	% in bud	% in flwr	Knotweed Associates	Threats
POBI-1	1000-3000	10	90	<i>Centaurium muehlenbergii</i> , <i>Brodiaea coronaria</i> , <i>Navarettia intertexta</i> , <i>Clarkia purpurea</i> , <i>Minuartia douglasii</i>	footpath along edge of occurrence; proposed trailway
POBI-2	100-1000	5	95	Same as POBI-1; tends to occur with algal crusts	trails, bulldozer disturbance from previous years
POBI-3	100-300	0	100	<i>Centaurium muehlenbergii</i> , close associate; dead <i>Parvisedum pumilum</i> present	n/a ¹
POBI-4/5	1000-5000	0	100	<i>Centaurium muehlenbergii</i> , close associate; dead <i>Parvisedum pumilum</i> present	n/a
POBI-6	50-100	0	100	n/a	sheet erosion, heavy trampling, high gopher activity, trails/footpaths throughout
POBI-7	<50	0	100	n/a	
POBI-8	1000-3000	0	100	algal crust, <i>Selaginella hansenii</i> , <i>Clarkia purpurea</i> , <i>Cicendia quadrangulata</i> , <i>Aira caryophyllea</i> .	goat grass (<i>Aegilops triuncialis</i>) surrounding site along N edge.
POBI-9	1000-3000	0	100	n/a	foot traffic along fairway
POBI-10	100-500	n/a	n/a	n/a	n/a

¹ Due to time constraints in the field, not all attributes were assessed for each knotweed occurrence.

Incidental Observations

During the 2011 survey, a fairly large infestation of barbed goat grass (*Aegilops triuncialis*) was observed in the grassland area southwest of the 9th fairway and north of the large wildflower field containing knotweed (south of 8th and 9th fairways and west of the 10th tee). Plant number was estimated at tens of thousands; most plants were in fruit. This species spreads readily by seed, is unpalatable to grazing animals, has a 2-5 year seed life, establishes easily on disturbed and compacted soils and produces over 100 seeds per plant on average (California Department of Food and Agriculture [CDFA] 2011). Given the heavy foot traffic (high dispersal potential) observed in this portion of the study area, it is recommended that control efforts of this CDFA List B noxious weed be undertaken before it spreads further, potentially impacting rare plants within the study area. Other incidental observations include a single scotch broom (*Cytisus scoparius*) plant (CDFA List C) in the eastern end of the study area and a blue elderberry shrub (*Sambucus mexicana*) near the 16th basket.

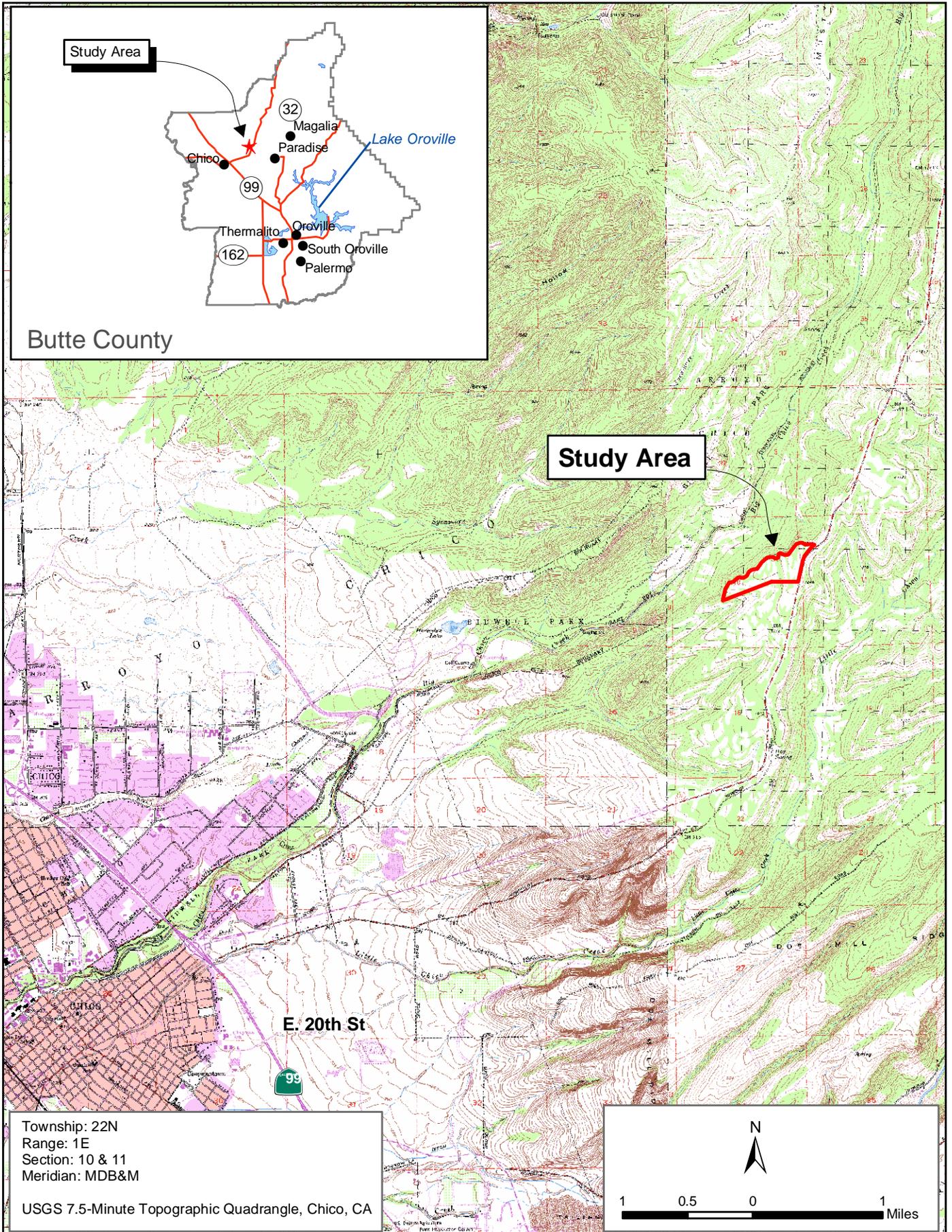
VI. CONCLUSION

Butte County checkerbloom and Bidwell's knotweed plants were relocated and mapped at most of the locations from which they were previously known, including all those within the main disc golf area. Nearly twice as many checkerbloom units were counted in 2011 than were observed in 2010; however, this difference may be due to counting inconsistencies between the surveys related to the clonal nature of checkerbloom. This survey provides numeric descriptions of counting units in an attempt to provide standardized checkerbloom counting units for more relevant between-year comparisons. No numerical comparison of knotweed plants is available between years; however, the extent of knotweed appears to have remained about the same between years in wildflower fields that were surveyed. The noxious weeds barbed goat grass and scotch broom were discovered within the study area. Potential threats to both checkerbloom and knotweed continue to be trampling, soil erosion, weed invasions, and additionally in the case of checkerbloom, herbivory.

VII. REFERENCES

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Township: 22N
 Range: 1E
 Section: 10 & 11
 Meridian: MDB&M
 USGS 7.5-Minute Topographic Quadrangle, Chico, CA

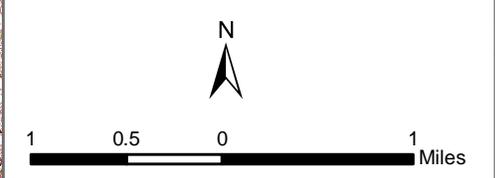


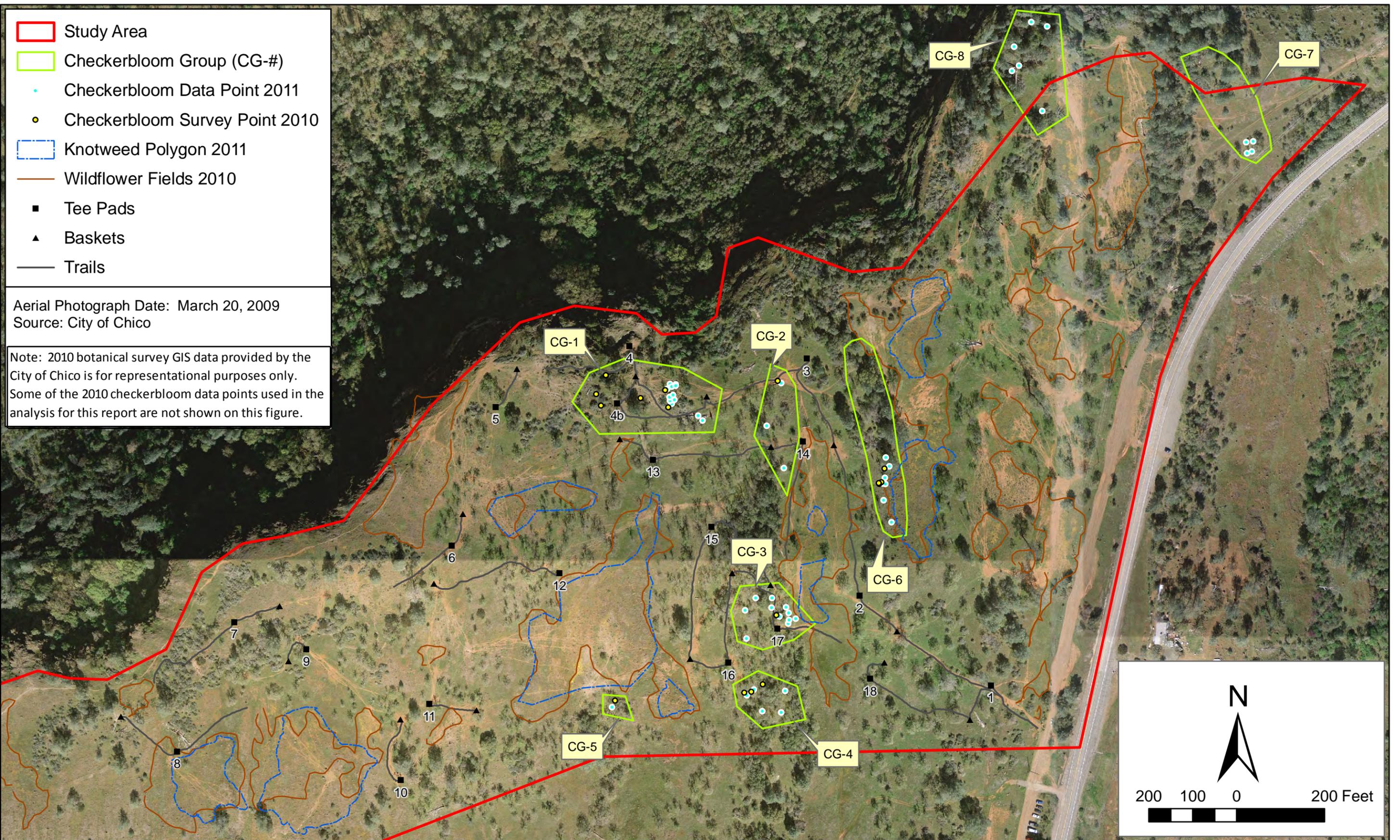
Figure 1
Study Area Location and Vicinity



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Figure 2
Checkerbloom and Knotweed Locations - 2011 Survey

G:\Projects\51325 Bidwell_Disc Golf\GIS\Working_Mxds\51325 Figure 3_plants compare.mxd Created: 2011-07-07 kirk



- Study Area
- Checkerbloom Group (CG-#)
- Checkerbloom Data Point 2011
- Checkerbloom Survey Point 2010
- Knotweed Polygon 2011
- Wildflower Fields 2010
- Tee Pads
- ▲ Baskets
- Trails

Aerial Photograph Date: March 20, 2009
 Source: City of Chico

Note: 2010 botanical survey GIS data provided by the City of Chico is for representational purposes only. Some of the 2010 checkerbloom data points used in the analysis for this report are not shown on this figure.

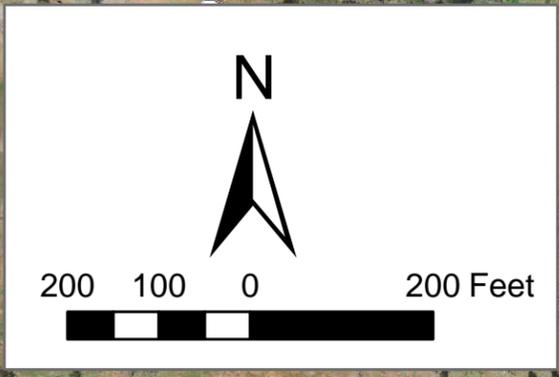


Figure 3
Comparison of 2011 and 2010 Botanical Monitoring