

Mason's Lilaeopsis Ten Years Monitoring a Metapopulation on the Napa River

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Want more information? Visit our *Lilaeopsis masonii* data mashup: <http://web.stillwatersci.com/napa/botanicalsurvey.html>



Background

Since the mid-1900s, a series of over-bank flooding events by the Napa River resulted in over \$500 million of economic damage. As a result, the Flood Protection Project was initiated in 1964 by Napa County Flood Control and Water Conservation District along 6 miles of Napa River and 1.4 miles of Napa Creek. Implementation began in 1999 and included restoring riparian and floodplain ecosystems of the Napa River to minimize future flood risks.

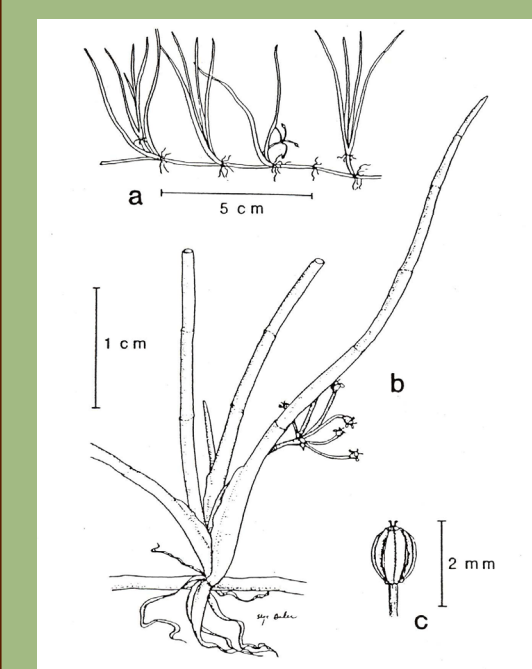
Objectives of the 10-year rare plant monitoring are to:

- Investigate effects of flood protection construction along Napa River
- Mitigate for impacts to the rare *Lilaeopsis masonii*
- Track *L. masonii* occurrences and extent against Mitigation Targets



Lilaeopsis masonii (Mason's lilaeopsis)

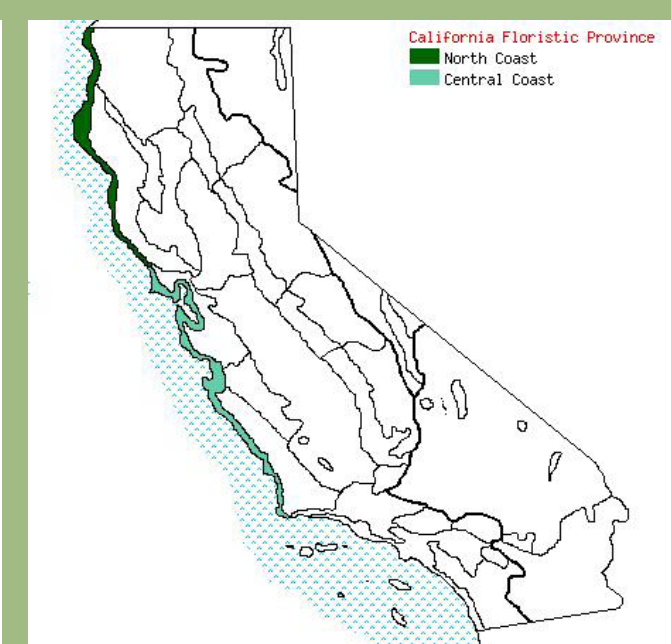
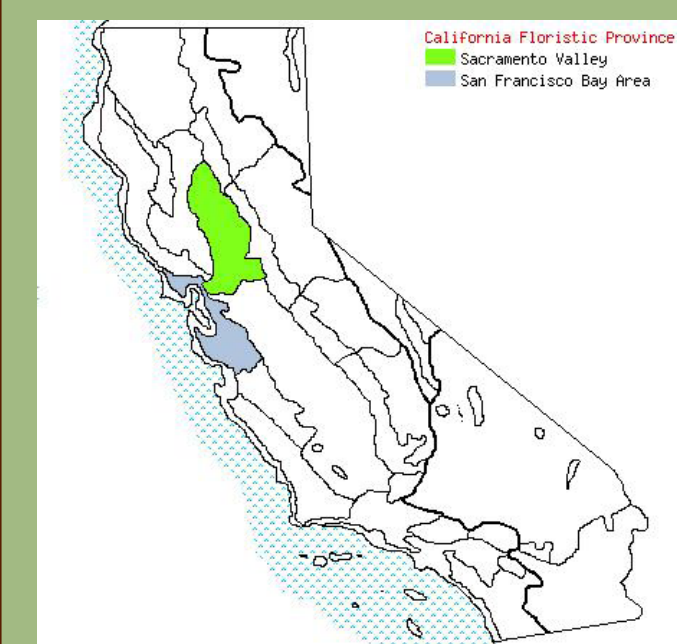
CNPS List 1B.1



(From Mathias and Constance 1977)



During 2010, the team documented *Ectactia* sp. visiting *L. masonii* flowers and collecting pollen.



Lilaeopsis masonii (far left): Considered restricted to inland brackish/freshwater habitats of the Golden Gate Estuary. *Lilaeopsis occidentalis* (near left): Considered characteristic of salt/brackish marshes of the Pacific Coast and larger/more robust than *L. masonii* (maps taken from Hickman 1993)

In 2008, Fiedler *et al.* (2010) initiated a taxonomic genetic study to determine if *L. occidentalis* and *L. masonii* should continue to be considered as two taxonomically distinct units:

- *L. occidentalis* and *L. masonii* are not distinct
- *L. masonii* should be subsumed under the widespread taxon *L. occidentalis*
- These conclusions corroborated by field observations and overlap in geographic distribution in this area

At each occurrence of *L. masonii* we recorded:

- > Patch size
- > Phenology
- > Habitat
- > Site quality
- > Threats

Methods

Annual surveys conducted by foot during low tide between April and July. At each occurrence, we:

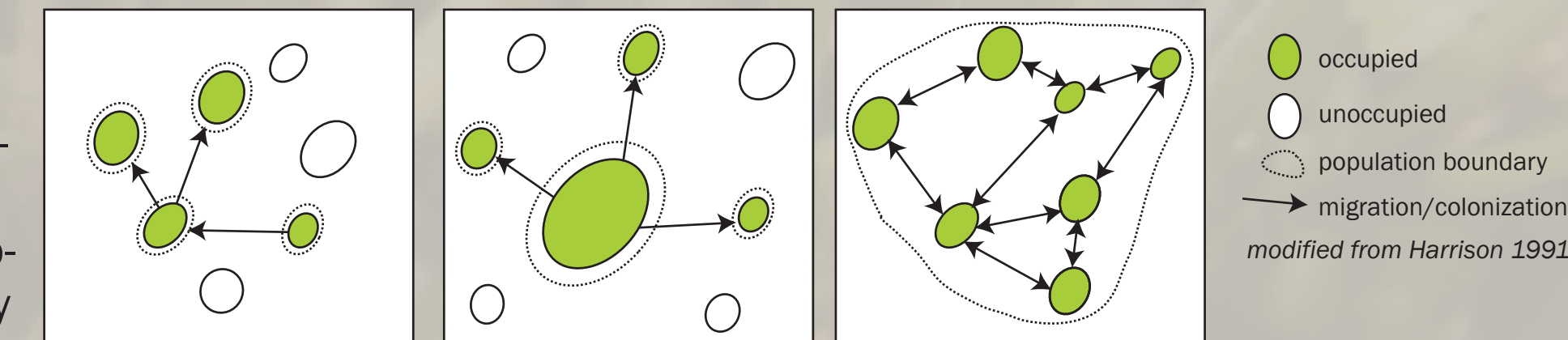
- Mapped with GPS
- Collected basic data (shown to left)
- Entered into GIS to evaluate annual trends

The simple, turf-like life form of *L. masonii*, combined with its population biology, makes it extremely difficult to differentiate distinct 'populations' – population dynamics are best described by a 'metapopulation'.

- Occurrences distinguished by a 50-ft break or habitat change
- Length and width of each patch was recorded
- Site quality based on non-native cover, stability of substrate, and observed threats
- Threats included bank sloughing, sedimentation, trampling, goose grazing, and encroaching vegetation

Metapopulation: A Population of Populations - Sources, Sinks, and Unoccupied Habitat

- Metapopulations are composed of relatively smaller 'patch' populations that establish and extinguish in what appears to be an unpredictable pattern. Large patches are not necessarily more important than smaller ones – location of a particular patch may be as important as patch size in maintaining the metapopulation. Both small and large patches serve as source populations, which is particularly true in fluvial systems such as the Napa River.



- Small clods of soil with *L. masonii* that break from the river bank and disperse may be instrumental in founding new populations within adjacent, nearby, or even relatively distant suitable habitat.
- Populations at the river bank margin are not necessarily longer lived (nor more secure) than those closer to the high tide line.

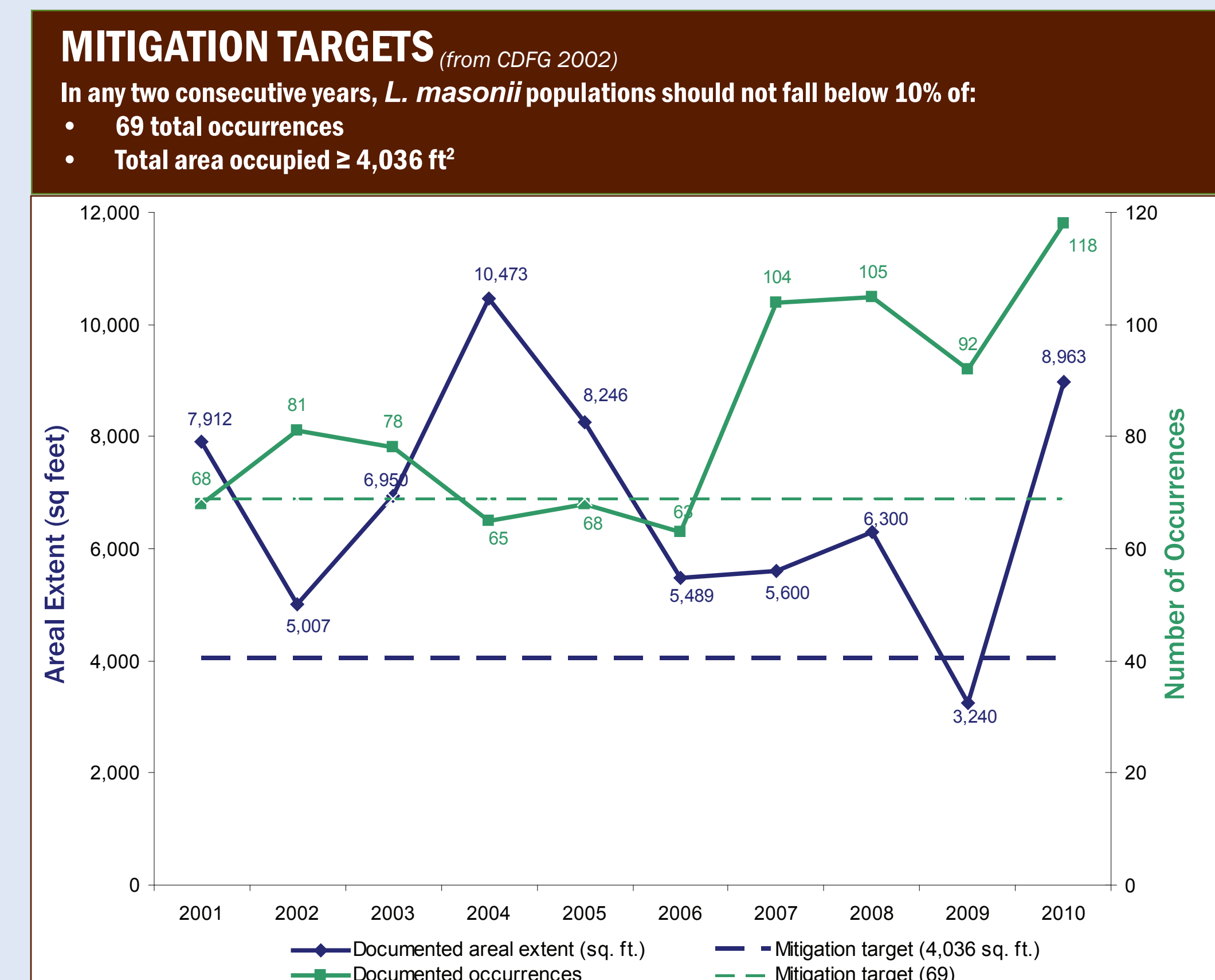


Field surveys were conducted during low tides when intertidal vegetation along Napa River river banks was exposed.

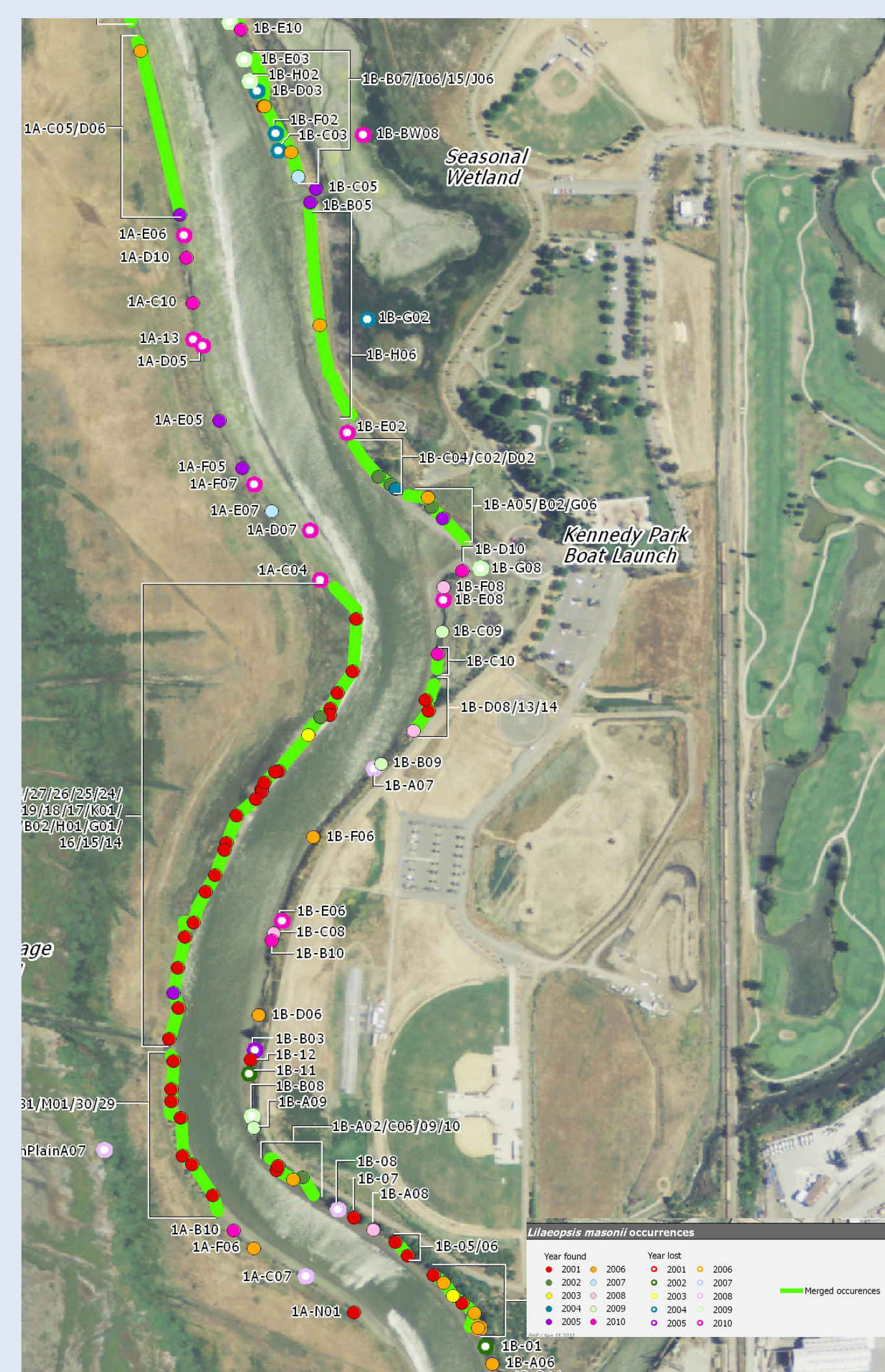
Results

A robust metapopulation persists; *L. masonii* flourished in newly created habitat on restored floodplain, primarily within depositional areas with greater hydraulic complexity and slower velocities. Final 2010 monitoring documented:

- 28% increase in occurrences from 2009
- Total area occupied of 8,963 ft², over double 2009
- 74% increase in occurrences (2001-2010)
- 13% increase in area occupied (2001-2010)
- Never below mitigation targets two consecutive years
- Large inter-annual fluctuations; patches established/extinguished unpredictably



Trends of *Lilaeopsis masonii* occurrence and areal extent from 2001-2010 throughout the project area.



This shows the results of 2010 surveys in a portion of the Project Area. Filled circles depict occurrences observed in 2010; open circles depict occurrences not observed in 2010; and, the color of the circle indicates the year the occurrence was first established. Finally, the merged lines depict the linear extent of each occurrence as observed in 2010 – some occurrences have grown from small, separate patches into long linear stretches of uninterrupted *L. masonii*.

Discussion

Conservation recommendations for *Lilaeopsis masonii* were based upon a landscape-level approach to managing rare plant populations. Results indicate:

- *Lilaeopsis masonii* has persisted and flourished in the Napa River
- Annual variability: No one-year is predictable from previous years
- Occurrences declined due to direct habitat loss from construction; this was followed by reduced areal extent due to secondary effects of increased sediment, algal growth due to an abundance of nitrogen from newly exposed sediments, and wrack loads in the river
- Recruits primarily within depositional areas of the floodplain – in areas of greater hydraulic complexity and slower velocities
- Roughness features (e.g., large *Scirpus* sp. stands, large woody debris) facilitate founding of new populations by providing habitat and/or lower velocity zones to settle out



The majority (79%) of *Lilaeopsis* patches are between 0.25 and 4.0 ft². Over time, the most obvious population trend is the coalescence of smaller occurrences into larger ones. In 2010, 1% of patches observed (11 out of 1,294) were over 150 ft².



Populations on small clods of soil that break from river bank and disperse at high tide are instrumental in founding new populations.



New riprap is generally unsuitable habitat for *Lilaeopsis*, but after several years of twice daily inundation with concomitant sedimentation, suitable habitat may form. At the end of the ten-year study, riprap developed into some marginally suitable habitat.



Propagation and outplanting is difficult: In winter '04-05, 190 ft² of transplanted material was installed. By 2010 only 1.8 ft² remained. Inadequate securing led to large losses by spring '05; inappropriate scale and placement of logjams led to steady decline 2006-2010.

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