Condition of San Francisco Bay Area Freshwater Wetlands

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Freshwater depressional wetlands are the most abundant, yet most threatened wetland type in California. Despite their relatively ubiquitous nature, they are poorly characterized, and unlike streams, they are not subject to any systematic ambient monitoring and assessment in California. Consequently, decisions regarding protection, restoration, and management, are usually made without the benefit of any regional context of condition, knowledge of predominant stressors, or rigorous documentation of reference conditions.

The goals of this study were: 1) To evaluate the condition of depressional wetlands based on three indicators; and 2) To evaluate the relationship between condition and stress by sampling both local stressors, such as water and sediment chemistry, and landscape stressors, such as adjacent land use and flow diversions. The three condition indicators included:

1) the California Rapid Assessment Method (CRAM),

which evaluated conditions surrounding the wetland, local hydrologic conditions, and physical and wetland plant conditions;

2) macroinvertebrates community structure, which examined the presence and abundance of insects, snails, and crustaceans living in the wetland; and

3) algae community structure, which examined the presence and abundance of a type of algae called diatoms.

Depressional wetlands in this study included both natural water bodies such as sag ponds and small lakes, as well as created wetlands such as stock (cattle) ponds, aesthetic ponds, and irrigation or treatment ponds.

Thirty wetlands in the San Francisco Bay area were sampled during the spring of 2014. We found that approximately 30% of wetlands in

the San Francisco Bay Area were in good condition when looking at agreement across two of the three condition indictors (see Figure below). When considering the condition indicators independently, approximately 37% of the sites were in good condition based on CRAM scores, 43% based on algae scores, and 33% based on macroinvertebrate scores.

Excessive nutrients, variables related to ionic concentration such as salinity, and direct habitat alteration were the dominant stressors affecting wetland condition, with different assessment indicators being sensitive to different stressors. CRAM scores were sensitive to the intensity of agriculture and urbanization. Both algae and macroinvertebrate indicators were relatively insensitive to surrounding land use factors, but were sensitive to water quality factors. Algae assemblages were negatively correlated with alkalinity and conductivity and both indicators were sensitive to phosphorous- and nitrogen-containing nutrients. The most common stressors in the surrounding landscape were mowing/excessive herbivory, intensive row-crop agriculture, ranching, non-point source pollution, urbanization and rangeland.

Based on the results of this assessment and a similar study in Southern California, we recommend that ambient assessment of depressional wetlands be expanded statewide to provide more comprehensive information on the condition of these ubiquitous, but highly threatened wetlands.

The full technical report is available on the SWAMP website, here.
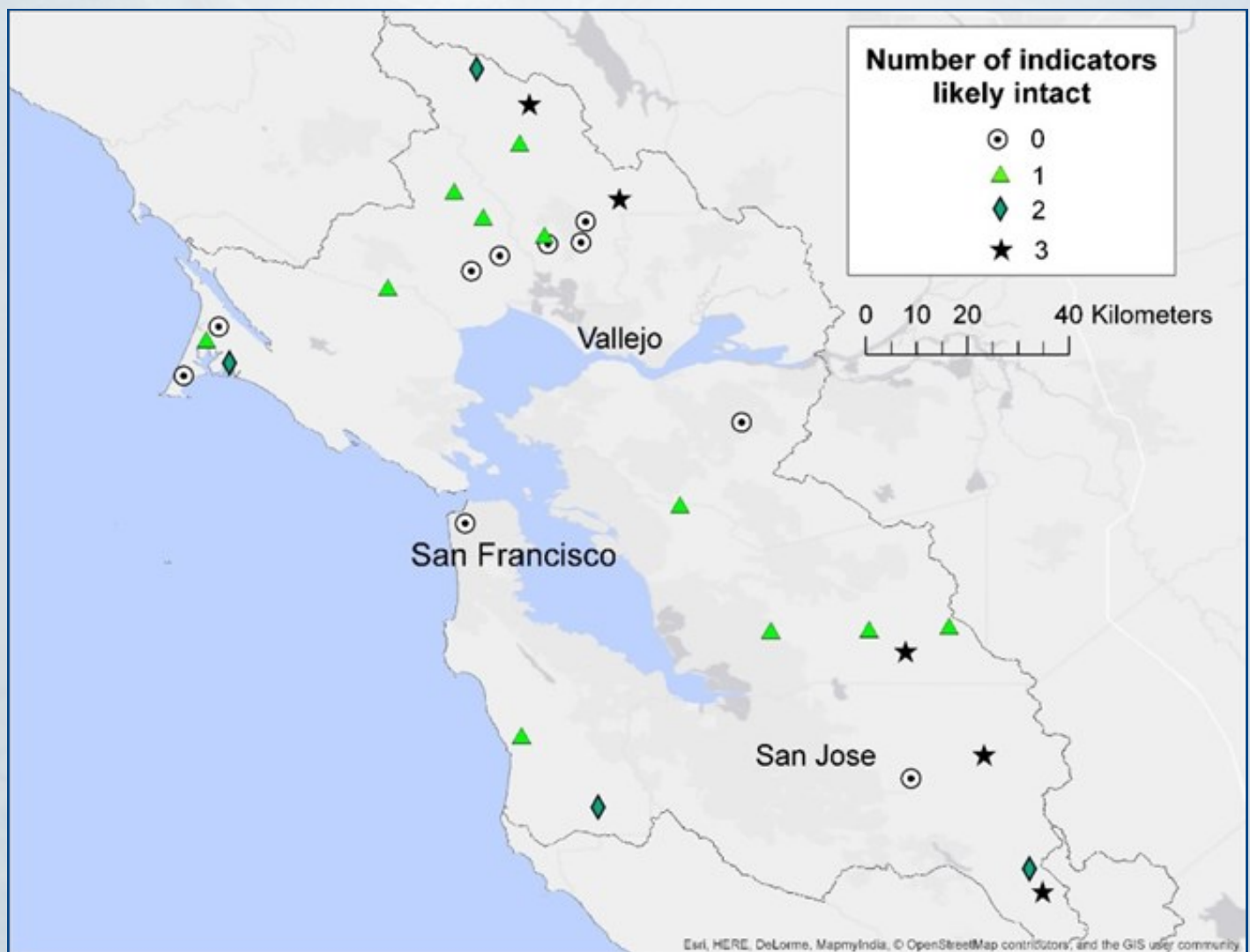
Locations of sampling sites and condition based on the number of indicators indicating intact wetlands.