



MARIN MUNICIPAL WATER DISTRICT

Getting Swept Away by Broom

2013 Re-Mapping on Mt. Tamalpais reveals faster-than-predicted spread

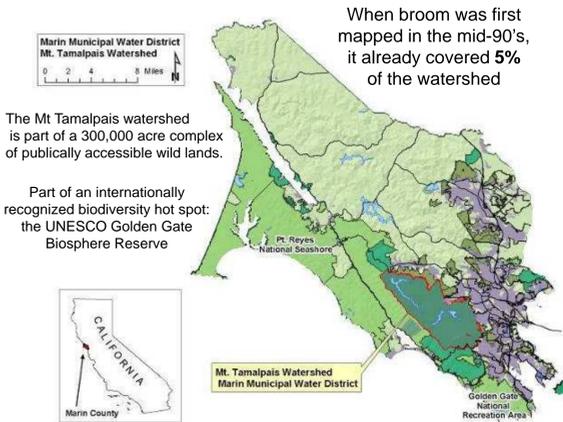
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THE SITE

Nearly 20,000 acres of Mt. Tamalpais watershed lands in Marin County have been stewarded by the Marin Municipal Water District (MMWD) over the past 100 years. MMWD's mission includes both biodiversity protection and water supply. Broom—mostly French (*Genista monspessulana*), but also Scotch (*Cytisus scoparius*) and Spanish (*Spartium junceum*)—has long been a problem, increasing maintenance burdens along roads and trails and in fuel breaks, and reducing biodiversity in woodlands, grasslands, and riparian areas.

More than 50% of Marin's flora is found in the watershed (only 12% of the area of Marin County) 15% of California's flora is found on watershed lands (0.01% of the area of the state)



When broom was first mapped in the mid-90's, it already covered 5% of the watershed

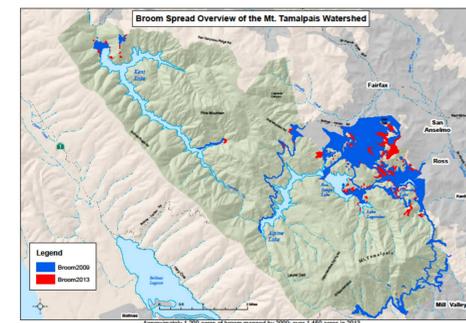
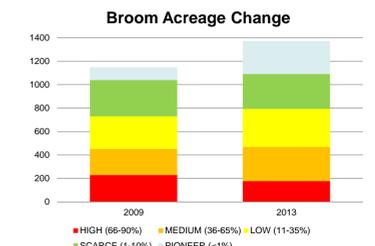
THE GOALS

Document current state of broom on Mt. Tamalpais. Record areas searched to know where we looked. Establish spread rate for improved projections.

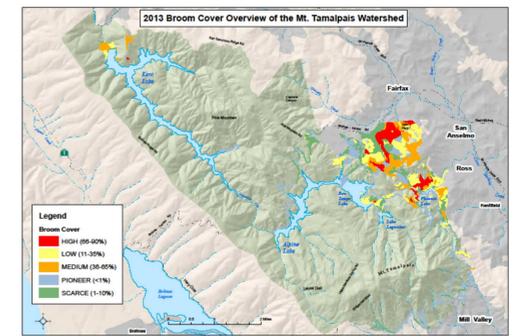
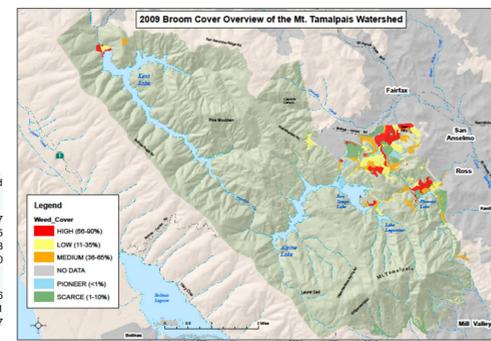
THE RESULTS

TOTAL BROOM EXTENT increased by over 200 acres, or approximately a 20% increase, at a rate of around 60 acres a year. The "literature" rate is 3' per year, or 30 acres per year at our baseline level.

"INFESTED ACRES" That magical number of gross acres x cover class increased around 0.75 acres a year: that is OVER 33,000 SQUARE FEET OF SOLID BROOM EVERY YEAR.

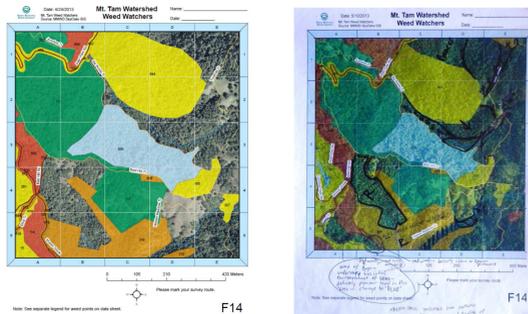


Vegetation Types Of the six basic vegetation types, spread was much faster than expected in barren waste areas and hardwood forest (oak woodlands)

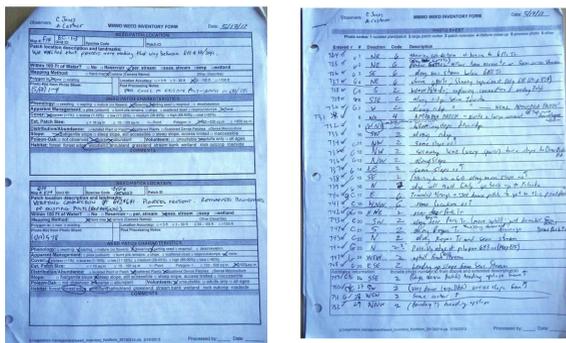


Veg Type	Expected Acreage		Expected Acreage	
	Slow	Fast	Slow	Fast
BARREN	6	11	6	7
CONIFER	46	44	50	55
GRASS	190	194	209	228
HARDWOOD	575	722	632	690
MIXED				
CONIFER-HARDWOOD	263	318	290	316
SCRUB	68	83	75	81
TOTAL	1148	1372	1263	1377

THE METHODS



Mappers took the most recent (2009) maps out in the field, and annotated existing polygons wherever possible for comparability and to save time.



Field mapping used a standard 20m "interpatch distance" and a minimum patch size of 100m²; smaller patches were recorded as points. This follows the 2009 Williams et al. Early Detection protocol available at http://www.sfnpa.org/download_product/1260/0



Using GPS cameras, mappers took "points" at vertices and small patches. Above: IMG_737; left: datasheets for photos and patches.

GPS cameras allow for both visual and spatial recording of patches, with a tracklog for search area data, at a similar cost and accuracy to recreational-grade GPS units.

To edit the base layers, photos were loaded into ArcMap 10.1 using ArcPhoto; existing polygon vertices and attributes (e.g., cover) adjusted, and new polygons added.

To create the search area, tracklog .kml files were loaded into ArcMap, converted using the "kml to shapefile" tool, buffered a 20m standard sight distance, and combined into a single search area layer clipped to MMWD boundaries.



Additional editing in some spots was done based on 2011 15cm-resolution imagery. Above: blue represents 2009-mapped <1% cover broom; spread visible in central area.

THE DISCUSSION

How many acres? The numbers given for acres mapped in 2009 and 2013 differ depending on how they are parsed: whether they are on MMWD lands only, or owned by others but still sometimes managed by MMWD (e.g., the Bolinas-Fairfax Road corridor). While our gross acres increased significantly, our infested acres remained steady. This is largely due to cover reduction in areas we have been hand-pulling, but also a couple of mapping errors in the 2009 data.

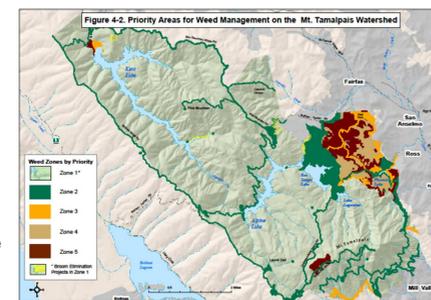


Figure 4-2. Weed management priorities Zones 1 and 2, zones where there is a reasonable chance of preventing new weed introductions or restoring existing areas. Weed management in Zone 3 will focus on maintaining desired fuel loads in fuelbreaks. Weed management in Zone 4 (single weed populations) or Zone 5 (introduced weed populations) will only occur if and when resources are available after management in Zones 1-3. See text in Section 6.6 for more information.

Why don't you do something?

MMWD currently spends around \$100,000 each year, and between 3,000 and 6,000 person-hours (including volunteers), pulling broom over 400 net acres.



Implications for management

The figure at left indicates our proposed response to our current inability to keep up with broom spread. While we focus on management in the "good" areas in green, and mow the orange (infested fuelbreaks), the brown "sacrifice zones" continue to fill in with broom.

ACKNOWLEDGEMENTS: Many thanks to Alan Castner and Christine Jones, formerly of Shelterbelt Builders, for their many field hours tromping through broom. Volunteer Natural Resource Program Interns Jason Slamovich, Steph Kawachi, Steven Feher, and Armando Chavez also contributed many valuable hours in the field and at the computer! Funding for the project was [something] by the MMWD Board of Directors.