Characteristics and Dynamics of California Coastal Grasslands

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Characteristic Grass Species of the Grasslands of Coastal California

**Coastal Grasslands**
- Pacific reedgrass
- Calamagrostis nutkaensis
- Pacific hairgrass
- Deschampsia californica
- California Bentgrass
- Agrostis californica
- California oatgrass
- Danthonia californica

**Hill and Valleys Grasslands**
- Purple needlegrass
- Nassella pulchra
- Idaho fescue
- Festuca idahoensis
- Pine bluegrass
- Poa scabrella
- Nodding Stipa
- Nassella cernua

"This place is one of very level land, well covered with pasturage, but it is lacking in firewood, for there is no other timber than the growth along the river, which is of cottonwoods, sycamores, ash, and laurels; and in all that region not a single stone."

Pedro Font, 1776
(near the mouth of the Guadalupe River)

California Perennials → European Annuals

Nassella pulchra

Avena fatua

Parks in the San Francisco Bay Area

“Discovery/Reappearance” of Grass Species

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>native</td>
<td>86</td>
<td>91</td>
</tr>
<tr>
<td>non-native</td>
<td>65</td>
<td>91</td>
</tr>
<tr>
<td>total</td>
<td>151</td>
<td>184</td>
</tr>
<tr>
<td>Tamalpais Species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>all species</td>
<td>73</td>
<td>-</td>
</tr>
<tr>
<td>native grasses</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>non-native grasses</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

* J.T. Howell - Marin Flora

Baccharis – *Baccharis pilularis* DC
(Coyote brush; Chaparral broom)

Baccharis/Grassland Dynamics

Phytolith Analysis

Squash
Maize
Sedge
Charcoal
Non-grass phytoliths
Grass phytoliths


Baccharis/Grassland Dynamics

1. Compare baccharis cover in regional parks on aerial photographs taken prior to park establishment and at later dates
2. Re-measure extent of baccharis along baccharis to grassland transects established by Heady

Case Studies

1. Berkeley Hills
2. Mt. Tamalpais State Park
3. The Sea Ranch


Invasion of Berkeley Hills Grasslands by Baccharis

Berkeley Hills

Berkeley Hills: Methods

Baccharis Invasion of Grasslands in the Berkeley Hills


Acreage of Baccharis in three East Bay Regional Parks

<table>
<thead>
<tr>
<th>Park</th>
<th>1963</th>
<th>1963 Increase</th>
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</thead>
<tbody>
<tr>
<td>Tilden</td>
<td>130</td>
<td>647</td>
</tr>
<tr>
<td>Redwood</td>
<td>132</td>
<td>480</td>
</tr>
<tr>
<td>Grass Valley</td>
<td>269</td>
<td>745</td>
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Increase

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</table>

Increase


Vegetation type changes in Tilden Park 1939-1997


Re-survey of Heady Transects

Mt. Tamalpais: Methods

1. Delineation of grasslands on aerial photos
2. Analysis of aerial photographs to determine baccharis
3. Field surveys to determine species composition and percent cover of perennial grasses

Number and Percent Cover of Bunchgrass Species

Proportion of the 185 surveyed grasslands by number of bunchgrass species

Count of grasslands by bunchgrass cover category (in grasslands in "90–100%"

Mt. Tamalpais Grasslands

Grassland Unit Dominated by Native Perennial Bunchgrasses
Grassland Unit Dominated by European Annual Grasses

Appearance of Baccharis on Aerial Photographs

Baccharis Invasion

<table>
<thead>
<tr>
<th>Invasion Class</th>
<th>% Baccharis Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>3%</td>
</tr>
<tr>
<td>5-10</td>
<td>15%</td>
</tr>
<tr>
<td>10-20</td>
<td>27%</td>
</tr>
<tr>
<td>20-40</td>
<td>29%</td>
</tr>
<tr>
<td>40-60</td>
<td>2%</td>
</tr>
<tr>
<td>60-80</td>
<td>2%</td>
</tr>
<tr>
<td>80-100</td>
<td>2%</td>
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</tbody>
</table>

*% baccharis cover in a grassland unit
**% of grassland units in study (185 units)


Baccharis/Grassland Dynamics

The Sea Ranch

Coastal Terrace Grasslands
Grassland Invasion at the Sea Ranch

Bush Lupine – Lupinus albifrons
Baccharis – Baccharis pilularis

The Sea Ranch: Methods

1. Step-point survey of grasslands

Grassland Units

Coastal Terrace Grassland: Shrub Cover (1991 & 2011)

<table>
<thead>
<tr>
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<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>65</td>
<td>0</td>
<td>10</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>25</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>20</td>
<td>0</td>
<td>25</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>26</td>
</tr>
<tr>
<td>30</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>40</td>
<td>10</td>
<td>10</td>
<td>2</td>
<td>5</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>50</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>85</td>
<td>15</td>
<td>85</td>
</tr>
<tr>
<td>Average</td>
<td>10.5</td>
<td>17.5</td>
<td>3.2</td>
<td>20.5</td>
<td>13.7</td>
<td>38.8</td>
</tr>
</tbody>
</table>


Prioritization of Treatment Areas for Baccharis Control at Mt. Tamalpais State Park

1. Establish priority classes
2. Identify of treatment areas

Mt. Tamalpais State Park
Prioritization of Grasslands Units

Grassland units were prioritized on the basis of bunchgrass and baccharis cover.

<table>
<thead>
<tr>
<th>Priority Class</th>
<th>Percent of Surveyed Meadows</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>46</td>
</tr>
<tr>
<td>3**</td>
<td>36</td>
</tr>
</tbody>
</table>

* Units with greatest bunchgrass cover and lowest coyote brush cover
** Units with lowest bunchgrass cover and greatest coyote brush cover

Prioritization of Grasslands Units

Ranking based on perennial grass cover (75%) and baccharis cover (25%)

Formula for ranking:
Score = (perennial cover % x 3) + (100- baccharis cover %)

Examples:
1. Grassland unit with 15% perennial grass cover and 20% baccharis cover
   Score = (15 x 3) + (100 – 20) = 45 + 80 = 125
2. Grassland unit with 7% perennial grass cover and 10% baccharis cover
   Score = (7x 3) + (100 – 10) = 21 + 90 = 111

The system was designed to assign greater importance to the presence of native grasses than to the level of baccharis invasion, in order to maximize the potential for preserving the bunchgrass cover.

Grassland Unit Priority

Identification of Treatment Areas

1. Priority class
2. Size of unit
3. Proximity to roads and trails
4. Spatial diversity of units

Treatment Areas

Treatment area 1A: 27 meadows adjacent to the lower half of the Ocean View Trail; excellent bunchgrass cover and low Baccharis cover; large total area (18 acres); high visibility to park users.

Treatment area 1B: 10 meadows at the north-west corner of the surveyed area; outstanding bunchgrass cover and low Baccharis cover; small total area (5.5 acres), but contributes to spatial diversity (away from the other treatment areas, and close to the ocean).

Treatment area 2A: 6 meadows surrounded by Douglas-fir forests; large total area (24 acres); these are the few large meadows that were found to have a moderate-to-good bunchgrass cover (other large meadows had low bunchgrass cover); high visibility to users.

Treatment area 2B: 12 meadows near the Chez Ridge Trail; small total area (8 acres), but best bunchgrass cover on the eastern edge of the park; visible to park users; contributes to spatial diversity.

Treatment area 2C: 26 meadows adjacent to the top of the Ocean View Trail; large total area (32 acres); very high use and visibility; low Baccharis cover but only moderate bunchgrass cover; excellent microhabitat variability.

Treatment area 3A: 9 moderate-size meadows covering 14 acres; contribute to spatial variability.

Treatment area 3B: 10 very small meadows (< 4 ac total); potential good bunchgrass cover.

Treatment area 3C: 6 meadows (7 ac total); excellent contribution to spatial variability, moderate-to-good bunchgrass cover.

Treatment Areas: Mt. Tamalpais
The End

Native American Conversion of Coastal Scrub to Grassland


<table>
<thead>
<tr>
<th>Table 1. Proposed time line of change in vegetation and dominance by the East Bay region</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>Human Impact</td>
<td>Expected or observed vegetation</td>
</tr>
<tr>
<td>Early-Pioneer (1800s)</td>
<td>Limited Native American population. Fire regime dominated by lightning with low-rainfall intervals</td>
<td>Woodland-dominated landscape with mosaic of shrublands, forests, and patches of grassland.</td>
</tr>
<tr>
<td>Mid-Pioneer to late 19th century</td>
<td>Increasing density of Native-Americans and increasing dependence on plant products in the adjacent area of fire for landscape management. Increase the rate at which subalpine is the result of decades to years.</td>
<td>Condensed-prairie landscape in response to shrubs and woodland dominated by high fire frequency. Dominated by a combination of native perennial grasses and some annual fields.</td>
</tr>
<tr>
<td>20th century</td>
<td>European settlement, farmers, and livestock grazing trends for landscape fire frequency probably higher than earlier period.</td>
<td>Grassland-dominated landscape maintained by replacing firesquash with livestock grazing. Native signals to native grasses and some annual fields.</td>
</tr>
</tbody>
</table>

Spanish Introduction of Livestock and European Annual Grasses to California

Vaqueros - Charles Christian Nahl, 1866

Literature Cited


