Challenges and Lessons Learned in the Muir Beach Wetland Restoration Project

Naomi LeBeau, Restoration Manager (she/her)
• Muir Beach background
• Construction project to restore wetland connectivity and conveyance
• Management challenges
• Lessons learned
Land Use History

- Coast Miwok
- Azorean dairy farmers
- Golden Gate Bridge brings vacationers
- George Wheelwright channelizes creek
- Tavern and the 1960s
- Golden Gate National Recreation Area
Threatened and Endangered Species

- Coho salmon
- Steelhead trout
- California red-legged frog
- Western pond turtle
Beautiful land with some problems...
Restoration Project Goals

- Reconnect creek to floodplain
- Restore healthy creek meander and conveyance
- Improve habitat for T&E species
- Improve visitor and emergency vehicle access
Construction

- Four phases over five years
- New creek channel
- New pedestrian access and upgraded access trail
- Initial removal of all cape ivy
Construction is done...
Now what?
Habitat Restoration Goals

- Revegetate construction footprint
- Healthy overbank habitat for salmonids
- Healthy CRLF habitat
- Low cover of invasive species
- No tolerance for highly invasive species as defined by Cal-IPC rating and observations over time
Restrictions
Don’t alter the erosion control
Reduced access during rainy season
T&E Species Restrictions

- Work in creek channel and on banks during driest time of year
- In winter and early spring, do not enter standing water or ponds
- Biomonitor ahead of power tools
- Do not pile weeds on site for disposal
No Herbicide
Don’t alter erosion control

Reduced access during rainy season

T&E species restrictions

No herbicide

Ensure beautiful, healthy habitat

Ok, I’ve got this!
Challenge #1: Revegetation

• Four different methods used
• Many different labor sources: volunteers, CCC, contractors
Container Plants

- Possibly most expensive method
- Sourced from local seeds and grown by Conservancy nurseries
- Time intensive installation, especially in clay soils
- Phytophthora worries
- Easy to monitor
Direct Seeding

- Sourced within parks
- Timing for seed distribution important
- Need lots of seed for good outcomes
- Can install over or under erosion control

- Focused on “nurse” plants and pioneer species
  - Madia sativa
  - Elymus glaucus
  - Hordeum brachyantherum
Field to Field Divisions

- Salvage plants ahead of construction
- Source from outside project area
- Store in moist and shaded place ahead of install
- Install under erosion control – awesome!

- Naomi’s favorites
  - *Elymus triticoides*
  - *Carex preagracilis*
  - *Juncus lesceurii*
  - *Carex obnupta*
  - *Scirpus microcarpus*
Willow Staking

- Possibly the least expensive method
- Source straight poles
- Diameter depends on installation method
- Length depends on water table
- Harvest close to installation and store bottom ends in freshwater
- Install right side up
Deer will browse willows

Stakes may need exclosures
Other lessons learned

- Time planting before winter rains or spring as rains let up
- Water plants through drought for better survivorship
- Soil compaction is your enemy
- Budget and resources will play large role in determining reveg method
Challenge #2: Weed control in project area

- Mark plant locations
- Hand remove weeds
- Straw mulch

- Great volunteer project
- Greater survivorship of plants
Early Invaders

- *Trifolium fragiferum and T. repens*
- *Lotus corniculatus*
- *Polypogon interruptis*
- *Festuca perennis*
- *Raphanus sativus*
- *Hirschfeldia incana*
- *Conium maculatum*
- *Cirsium vulgare*
Challenge #3: Manage weeds coming in from upstream

- The never-ending gift of the watershed
- Triage species and make a plan
Manage to Low Level

- *Ehrharta erecta*
- *Festuca arundinacea*
- *Alopecuris pratensis*
- *Holcus lanatus*
- *Lotus corniculatus*
- *Hedera helix & H. canarensis*
- *Rubus armeniacus*
- *Mentha aquatica*
- *Zantedeschia aethiopica & Arum italicum*

*H. lanatus is a landscape level issue in some areas*
Zero Tolerance

- *Delairea odorata*
- *Carex pendula*
- *Clematis vitalba*
- *Tradescantia fluminensis*
- *Salsola soda*
- *Iris pseudacorus*
- *Calendula arvensis*
- *Anthoxanthum odoratum*
- *Cortaderia jubata & C. selloana*
- *Pennisetum clandestinum* *

*P. clandestinum* added recently with permission to apply herbicide
EDRR Creek Sweep

- Once a year when creek at lowest
Twice yearly full site sweep for Delairea odorata

• Three containment lines to clear
• Takes 2-3 days of a five-person crew
Challenge #4: The question of herbicide

- Biological Opinions - no herbicides to be used within 100’ of the project boundary

- Some species impossible or ridiculously expensive to control manually or mechanically
Pennisetum clandestinum

- Have covered and manually removed patches for years.
- Got quote for treating four patches totaling around 250 sq. ft.... $36,000
- Is this really the best for the habitat?
- How can we show that we can apply herbicide safely?
Re-initiate consultation

• Convince NPS contact that re-initiation is needed and worth their time

• Invite regulators out to site!
Lessons Learned

- Great habitat restoration can happen with restrictions
- Field to field divisions and willow stakes are awesome
- Straw mulch is your best friend
Lessons Learned

- Managing weeds downstream of infestations takes a good plan and lots of resources
- Get to know your regulators and ask for what you want
- Wetlands are wild, beautiful places!
Thanks to my NPS and Conservancy colleagues for their amazing work on this project

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