

25th Cal-IPC Symposium Tenaya Lodge @ Yosemite
November 2, 2016



**Quick Survey of
Mechanical Control &
Chemical Application
Techniques for
Wildland Weed Control**

Drew Kerr

Treatment Program Manager for Invasive *Spartina* Project

Pulling Tools

Digging Tools

Cutting Tools

Pulling Tools





Weed Wrench

www.weedwrench.com







Extractigator vs. Weed Wrench



7:30:34



Ivy Needle

Compact Loader



Modified Compact Loader for Ivy Pulling



Digging Tools



Transplanting Shovel or “Sharpshooter”



Cutting Tools



Hand Pruners

Bypass style



Anvil style

Weed Whacker



**“Many two strokes emit up to 25% unburned gasoline in their exhaust. And the hydrocarbons emissions for two strokes is almost 25 times higher than four strokes.”
(California Air Resources Board)**



One lawnmower = emissions of 40 newer cars

Weed Whacker Four Stroke Engine



IMPORTANT ENGINE INFORMATION
CASHI FUEL - DIESEL OIL
NEVER USE 2-STROKE OIL AND
NEVER USE A FUEL OIL REGULATOR
DISCONNECT BATTERY FROM THE
WIRING SYSTEM TO THE OWNER'S
MANUAL FOR MAINTENANCE
SPECIFICATIONS AND DIMENSIONS
DISPLACEMENT / 25cc

GX25
HONDA
4 STROKE
Honda Motor Co., Ltd.
MADE IN JAPAN

Chainsaw & Weed Whacker Safety Gear



Herbicide Application Techniques

- Directed Application
- Broadcast Application

Directed Application



Targets individual
plants

Spot treatment

Foliar Spray – High Volume

- Spray to wet basis
- 0.25% - 1.5% solutions for many herbicides
- Higher volumes of water or other diluents necessary than other methods
- Treat all leaf surfaces, stopping just before the point of runoff



Hose from truck with extra long wand attached for greater reach

Backpack application



Argo amphibious tracked vehicle has very low ground pressure. It can go where you can't even walk

ISP staff guiding the treatment crew on the Marsh Master to previously mapped clones at Calaveras Marsh in 2010



Airboats allow access to mudflat *Spartina* infestations during low and/or receding tides



**Just a few inches of water
on an outgoing tide =
Maximum dry time**

Hauling up to 100m of hose from an airboat at optimal tide for treatment, replaces amphibious vehicles with less marsh disturbance



Foliar Spray - Low Volume

- Lower volumes of water or other diluent necessary than spray to wet
- Typically 1.5% - 8% solutions for many herbicides
- Treat only top $\frac{1}{2}$ or $\frac{1}{4}$ of plant

Directed Application



Dr. James Leary, demonstrating herbicide ballistic technology

Wick Application



- Uses a concentrated solution (10% - 100%)
- Wiped directly onto plant surfaces
- Treat weeds taller than non-target plants

Wick Application

For working around listed species



- Gloves (cotton knit/ jersey)
- Vernacular:
 - Glove-of-Death
 - Healing-Hand
 - Bloody Glove application

Spartina patens Eradication from Southampton Marsh




Chloropyron molle molle
(soft bird's beak)




- ❖ Original treatment plan designed around *Chloropyron* (CHMO),
- ❖ Hemiparasite that can form a haustorial connection to *S. patens*
- ❖ Treatment could only be conducted after CHMO had set seed (Oct/Nov) so as not to impact future populations
- ❖ But by autumn *S. patens* can be senescent, greatly reducing herbicide translocation and efficacy



Seedling of *Chloropyron molle molle*
growing amongst a small patch of
Spartina patens

A close-up photograph showing a person wearing a blue protective suit and black gloves. The person is holding a black backpack sprayer nozzle, which is positioned over a blue sponge. The sponge is being used to wick the glyphosate solution. The background consists of tall, green grass. The scene is set outdoors in a field.

Applying glyphosate from a backpack sprayer to a sponge for wicking onto *S. patens* in areas within one meter of *Chloropyron*



Wicking glyphosate onto *S. patens* in areas within one meter of *Chloropyron*

Broadcast Application



Apply spray solution uniformly over entire treated area

Broadcast Application

- Large infestations
- Most effective on continuous infestations/monocultures (limit turning boom on/off to reduce drift)
- Highly calibrated equipment = consistency
- May add drift retardant



HELICOPTER BROADCAST APPLICATIONS

Essential part of IPM strategy for controlling vast monocultures during the initial years

By 2010, 89% reduction in the number of acres treated by helicopter as compared with 2006





HELICOPTER SPRAY BALL APPLICATIONS

Developed with PJ Helicopters for aerial spot treatment

Remnant patches within previously treated marshes



Spartina densiflora:

Developing an IPM Strategy through Adaptation



Endangered Species Constraints on *Spartina* Treatment



Spartina inventory and treatment is carefully planned around the breeding season of the California Ridgway's rail

Manual Treatment of *Spartina densiflora*



Unlike hybrid *S. alterniflora*, individual *S. densiflora* can be dug without exacerbating the infestation.

But large scale removal is damaging to the marsh surface, so herbicide has less impact.



Photos courtesy of Sandy Guldman,
Friends of Corte Madera Creek



**Photo courtesy of Sandy Guldman,
Friends of Corte Madera Creek**

In 2008 alone, the Conservation Corps dug and hauled 13 TONS of *Spartina densiflora* from the Corte Madera Creek watershed



**Photo courtesy of Sandy Guldman,
Friends of Corte Madera Creek**

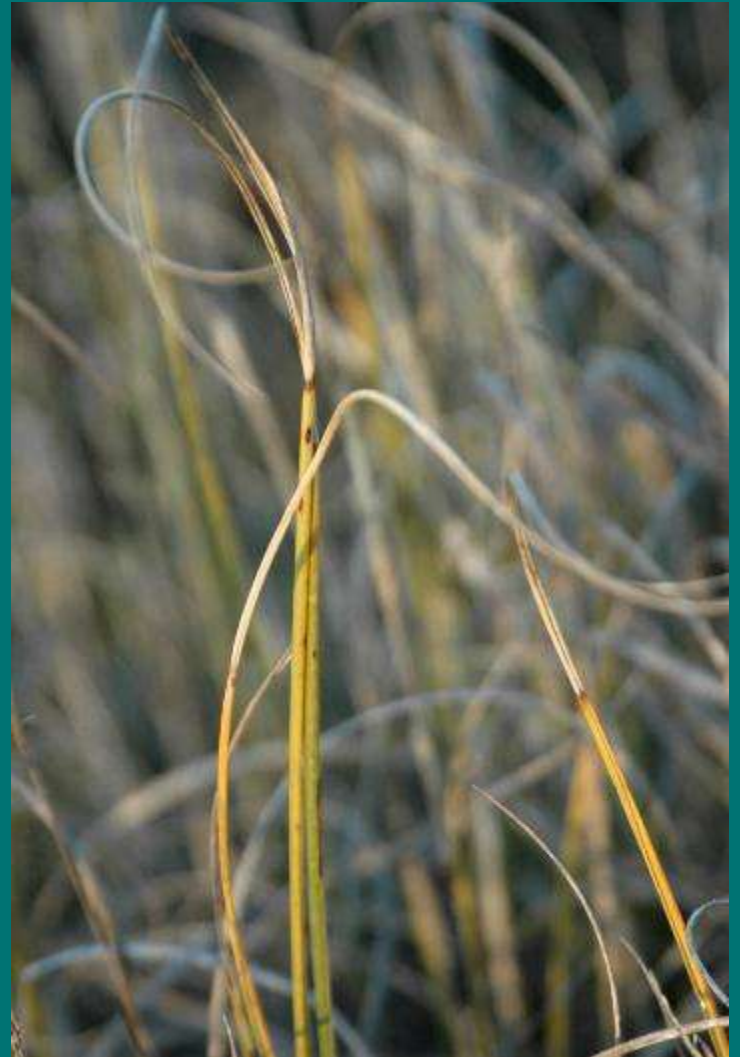
MARSH OF THE LIVING DEAD

Some *S. densiflora* can display this yellow/green/grey, half-dead appearance one year post-treatment

Not healthy enough to translocate another herbicide application & this necromass is very persistent



THE LIVING DEAD – Up Close



And then there are...

THE TRULY DEAD



Efficacy from imazapyr treatment on *S. densiflora* has been highly variable, with many instances of full mortality as well as cases of low efficacy



Mowing Pilot Project 2008 Under Ridgway's Rail Constraints



Mowing of previously-treated *Spartina densiflora*

- Removes dead (or **PARTIALLY-DEAD**) above-ground biomass allowing for best assessments of current plant status
- Weakens the plants' reserves by interrupting the transfer of nutrients back down to perennial roots

Accreted mounds formed by mature *Spartina densiflora* plants



Photo courtesy of Sandy Guldman,
Friends of Corte Madera Creek



Mowing and bagging 3 mo. post-treatment
Spartina densiflora meadow at Creekside Park

November 2008

Wrack was raked into piles near the truck path. At more remote locations the plants were bagged and heaved across channels



June Imazapyr Application to *S. densiflora*

Primary purpose: Arrest development of plants and stop seed production/dispersal

Mowing reduced amount of herbicide needed due to big reduction in above-ground biomass

Preserves integrity of marsh plain: only a fraction of these plants will now need to be dug





Lush pickleweed and *S. foliosa* colonizing Creekside Park that was a *S. densiflora* meadow 18 months prior

Methods: Annual imazapyr treatment and mowing to ground, followed by spot digging over several years

2009: Before initiation of mowing within this meadow





2014: Tall, dense pickleweed and *Distichlis spicata* covering mid-marsh (where *S. densiflora* was most dominant)

Methods: Annual imazapyr treatment and mowing to ground, followed by spot digging of outliers over several years

Endangered Ridgway's Rail at Hal Brown Park on July 21, 2016



Current *S. densiflora* eradication methodology

ISP biologists survey all historical sites 2X annually;

1st in early June when flower stalks help detection

2nd in January when pickleweed has senesced

All plants are manually removed and disposed offsite

Herbicide is no longer needed to maintain the eradication trajectory



Task remaining: Exhaust the seed bank

- Just 52m² found throughout the Estuary in 2015 with 20m² of that in Creekside Park (introduction site)
 - ISP data appears to indicate 3-5 year seed viability



Tom's Point, Marin County, CA

THANK YOU

