Costs and Losses Imposed on California Ranchers by Yellow Starthistle

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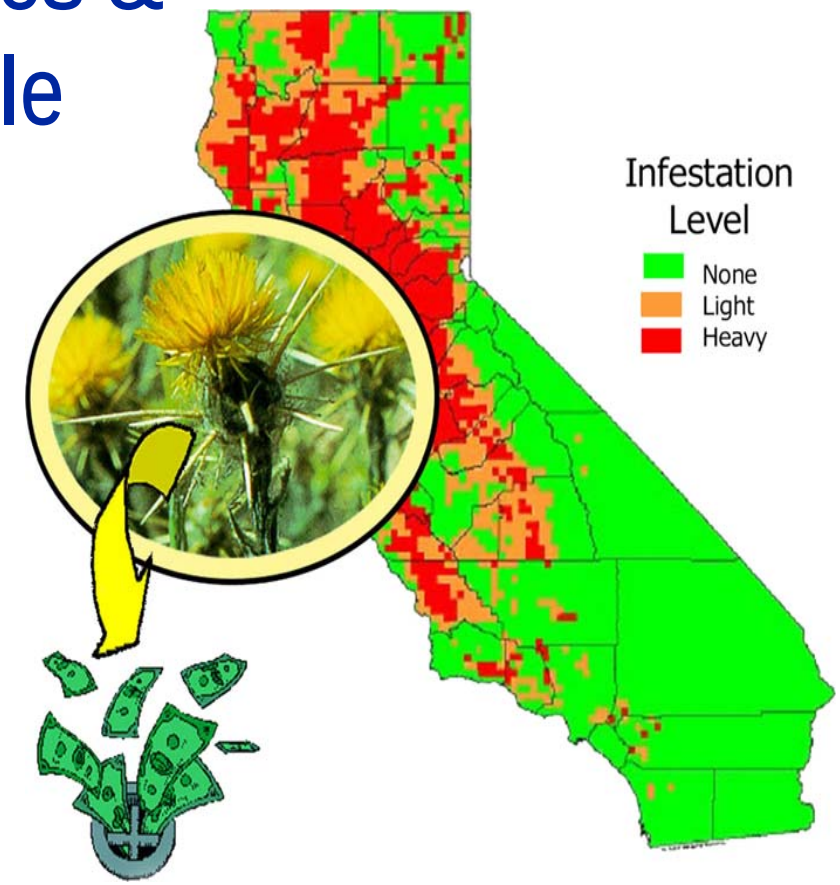
Project Goals

- Estimate economic losses & costs of yellow starthistle to CA's agricultural producers

- Identify economically optimal management strategies for yellow starthistle



Selected Data Collected by "CA Yellow Starthistle Survey: Economic Impacts on Agriculture"

- Baseline data on ranches and ranch economics
- YST occurrence (no. of acres) and percent cover rates
- Out-of-pocket YST control costs expended by ranchers
- Impacts on forage productivity
- Losses in net ranch revenues
- Other impacts and opinions

Survey Sampling

Tri-county mailings: Mailed surveys to all ranchers in 3 targeted counties: **Calaveras, Mariposa, and Tehama**

- Budget constraints
- Focus the survey effort

Survey Sampling

Convenience sampling: Allowed producers in other counties to be surveyed, if they desired

- *Collected data from other geographic areas*
- *Two survey modes: web-based & mail-out*
- *California Cattlemen's Association meetings*

Numbers of Completed Surveys and Response Rates

- Mailed 1,076 surveys to tri-county target area
- Overall response rate for mail surveys in 3 target counties = 20%
- In total: received 302 completed surveys (243 hardcopy, 59 web-based)

Losses in Net Grazing Revenues: Tri-county Area

$$L_i = Y^{nr}\ \eta^{nr}\ A_i^{nr} + Y^{ip}\ \eta^{ip}\ A_i^{ip}$$

L_i = annual loss in net revenues from grazing in county *i*;

Y^{nr} = baseline net revenue on native range in the absence of YST and other weeds ($/ac/yr);

η^{nr} = reduction in forage (grazing) yield caused by YST on native range, as a proportion of total yield;

A_i^{nr} = harvested area of 'pasture, range' in county *i*;

Y^{ip} = baseline net revenue on improved pasture in the absence of YST and other weeds ($/ac/yr);

η^{ip} = reduction in forage (grazing) yield caused by YST on improved pasture, as a proportion of total yield;

A_i^{ip} = harvested area of 'pasture, irrigated' land in county *i*.

Losses in Net Grazing Revenues: Statewide Extrapolations

$$L_i = (g^{nr}A_i^{nr} + g^{ip}A_i^{ip})*\delta_i*W_i$$

L_i = annual loss in net revenues from grazing in county *i*;

g^{nr} = mean losses in grazing net revenues due to YST on native range ($/ac/yr);

A_i^{nr} = harvested area of 'pasture, range' in county *i;*

g^{ip} = mean losses in grazing net revenues due to YST on improved pasture ($/ac/yr);

A_i^{ip} = harvested area of 'pasture, irrigated' land in county *i;*

δ_i = amount of YST-infested land in county i historically used for grazing;

W_i = area in county i that is estimated to be infested with YST (from Pitcairn et al., 2004)

Baseline Grazing Productivity & YST Impacts

Characteristic or Parameter	*Type of Grazing Land*	
	Native Range	*Improved Pasture*
Mean net revenue of grazing land not infested with YST or other invasive weeds (baseline net revenue)	$6.11/acre/yr	$16.75/acre/yr
Mean percent decrease in forage yield because of YST	15.3%	12.8%
Mean decrease in net revenue attributable to YST	$0.93/acre/yr	$2.14/acre/yr

Actions Taken by Ranchers in Response to YST-related Forage Losses on Private Land

Response (n=246)	*% of Respondents*
Leased additional private land for grazing	12.2%
Sold livestock to reduce herd size	21.5%
Purchased additional hay for feeding	46.8%
Began controlling weeds	83.3%

YST Control Actions Taken by Ranchers on Private Land (n=198)

Control method	*% of Respondents*
Chemical application	59.6%
Mowing	46.5%
Timed grazing	34.9%
Cultivation	20.2%
Prescribed burning	19.2%
Biological control	16.2%

YST annual loss and cost estimates for Calaveras, Mariposa, and Tehama counties added together (2003)[1]

Category of loss or cost	*Estimated YST losses and costs*
Losses due to reduced forage for livestock	$1.00 — $1.72 million
Rancher out-of-pocket costs for YST control (*excluding* time cost of labor)	$0.98 million
Subtotal losses/costs	$1.98 — $2.70 million/yr

[1] Lower-bound estimates of the true impacts of YST in these counties. Estimated 'subtotal' losses and costs include the two categories shown, excluding other lost values (e.g., water losses, losses in outdoor recreation, lost ecosystem service flows such as soil retention, nutrient cycling, biodiversity, etc.), public expenditures on YST management, and several components of private expenditure on YST control.

Estimated annual losses and costs for California ranchers from YST[1]

Category of loss or cost	*Estimated Annual YST Losses and Costs (Millions of $), 2003*		
	Lower	*Central*	*Higher*
Losses due to reduced forage for livestock	$5.92	$7.96	$10.31
Rancher out-of-pocket expenditures for YST control (*excluding* time cost of labor)	$4.95	$9.45	$13.95
Subtotal losses/costs statewide	$10.87 (+)	$17.41 (+)	$24.26 (+)

[1] Estimates from 49 of the 58 California counties. Estimated 'subtotal' losses and costs include the two categories shown, excluding other lost values (e.g., water losses, losses in outdoor recreation, lost ecosystem service flows such as soil retention, nutrient cycling, biodiversity, etc.), public expenditures on YST management, and several components of private expenditure on YST control.

Conclusions

- Yellow starthistle significantly impacts on California ranchers financially (at least tens of millions of dollars/yr)
- Losses/costs of YST may seem "less than expected." But it is important to note:
  - YST invades ecological niches that offer relatively low values in agriculture. Impacts on affected ranchers are large, but the aggregate losses may appear "less than anticipated."
  - Our analysis focuses only on livestock forage losses and rancher out-of-pocket expenditures.

Other Impacts from YST May Be Larger in Magnitude

- Values of water losses (due to higher rates of plant water uptake by yellow starthistle relative to other vegetation)
- Losses in quantity and quality of outdoor recreation (e.g., hiking, hunting)
- Negative impacts on ecological functions and services
- Research on the magnitudes of these impacts is needed!

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