Using GPS and GIS Technology to Track Rabbit Damage in Southern California Nursery

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Background

Cottontail rabbits (*Sylvilagus audubonii*) cause economic loss to ornamental tree nurseries in Southern California through vegetation destruction and damage to irrigation lines, which can be recognized by characteristic 45-degree angle cuts. One large commercial tree nursery in San Diego County reported $20,000 to $30,000 annual costs from repairing irrigation lines and crop damage due to rabbits. Currently there are few methods to control the damage by cottontail rabbits and growers are frustrated by the lack of IPM solutions to this economically important problem.

Cottontail Rabbit (*Sylvilagus audubonii*)

¼" Drip Line Cut by a Rabbit

Plant Damage Caused by Rabbits

Objective

This research employed GPS mapping technology to understand the relationship between nursery practices and the incidence of rabbit damage as well as to monitor the impact of experimental strategies to reduce damage caused by cottontails.

Methods-How GPS was Used

We employed GPS technology in combination with GIS software to map the nursery. Nursery employees conducting irrigation repair used Garmin GPS units to record waypoints at the locations of irrigation damage. We then superimposed the waypoints onto the map of the nursery to gather information in the following areas (Map 1):

1. Where regular damage by rabbits occurred. We correlated this damage profile with characteristics of nursery production (Results Section 1).

2. If an extensive trapping and removal program within nursery beds had an impact on irrigation damage at those locations (Results Section 2).

3. Whether an experiment using irrigation line covers protected irrigation lines from damage (Results Section 3).

Irrigator Hand-Watering Plants in 5-Gallon Containers

These GPS devices were given to the irrigators to mark rabbit-caused irrigation damage

Result Section 1: Mapping Nursery Damage

Mapping the nursery provided us with a layer on which to place the irrigation damage waypoints (see red dots on Map 1 below). We then analyzed the cultural practices of the areas receiving large amounts of damage and determined target areas for experiments.

Characterized Nursery by:

- Irrigation Type
- Container Type
- Planting Density
- Canopy Width
- Canopy Height

We found that most of the rabbit damage to irrigation was associated with drip irrigation using ¼" spaghetti tubing and 15 gallon containers planted at high density. Beds with hanging drip lines or ¾" tubing received significantly less damage.

Map 1. GPS-mapped Nursery with rabbit-caused irrigation damage waypoints (red dots) superimposed

Result Section 2: Impact of Rabbit Removal

GPS waypoints showed beds 128 and 129 received large amounts of irrigation damage. Both beds are approximately one acre, have 15 gallon containers at high density and have ¼" drip irrigation (see Photo 1 below).

We wanted to determine if rabbit removal would reduce irrigation damage. We removed rabbits from Beds 128 and 129 with live traps set on the ground throughout the beds. The damage tracked by GPS waypoints did not decrease as a result of the rabbit removal, as shown in the Figures 1 & 2 below.

Bed 128 Rabbit Trapping

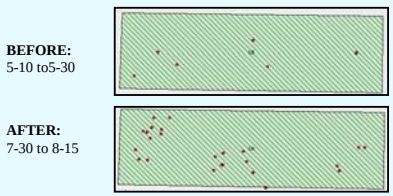

Figure 1. Irrigation damage waypoints before and after rabbit trapping in bed 128. There were four rabbits removed from 6-8 to 7-6-05 over 88 trap nights. Irrigation waypoints increased from nine to 27, a 50% increase in damage.

Bed 129 Rabbit Trapping

Photo 1. Bed 129

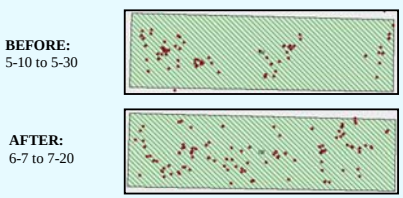

Figure 2. Irrigation damage before and after trapping in bed 129. There were eleven rabbits removed from 6-7 to 7-20-05 over 338 trap nights. Irrigation damage waypoints increased from 64 to 101, a 22% increase in damage.

Result Section 3: Irrigation Line Covers

Rabbits can easily bite through ¼" drip lines and studies at the nursery showed ¾" drip lines received less damage.

We wanted to know if protecting the ¼" drip lines with covers would prevent damage. We placed ¾" recycled poly hose over the drip lines in a bed receiving large amounts of damage. Covers were put on the drip lines on 4/15/05 (see before and after photos below). Waypoint data demonstrated the irrigation line covers were effective in providing a lower amount of damage points in the trial area, as shown in the Figures 3 & 4 below.

Broken Drip Lines due to Rabbit Damage

Drip Lines with Covers in Place

Figure 3. Irrigation damage waypoints before covers. 27 waypoints (3/28/05-4/13/05)

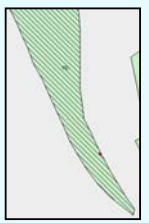

Figure 4. Irrigation damage waypoints after covers. 1 waypoint (5/1/05-5/21/05) (96% decrease)

Discussion

Cottontail rabbit damage continues to be a major economic consideration of growers at Southern California nurseries. However the use of GPS technology has assisted in characterizing the types of nursery production practices most vulnerable to damage and given researchers an additional objective tool to measure the impact of IPM experimental control strategies.

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