

# Nitrogen Management in Nursery Production and Irrigation Training for the Green Industry

Bruno J.L. Pitton

California Nursery Conference

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# Central Valley Regional Water Quality Control Board

## Nitrogen Management Plan WORKSHEET

### Template for the Nitrogen Management Plan Summary of Regulatory Requirements

This publication contains the template for the Nitrogen Management Plan (NMP) approved on December 23, 2014 by the Executive Officer of Central Valley Regional Water Quality Control Board (Regional Board). Each member of a third party entity (coalition) must prepare and implement an NMP for every crop "management unit" covered by the membership. "Management unit" is a term used to describe a group of parcels that are managed in the same way in regards to nitrogen applications.

Each member must use the NMP template described in this publication as the basis for planning their crop production activities. Summary information from this NMP that covers the previous crop year must be submitted to the coalition on request (specific summary information that must be submitted has yet to be determined). A template for this summary information will be provided to the member by each coalition based on the entity's deadline for compiling and reporting the NMP information.

The NMP and NMP Summary Report (yet to be developed) for all fields/parcels shall be maintained at the member's farming operations headquarters or primary place of business. The member must provide the NMP and Summary Report to board staff, if requested or, should board staff or an authorized representative conduct an inspection of the member's irrigated agricultural operation. In addition, members shall comply with the following requirements where applicable:

**Members within a High Vulnerability Groundwater Area**  
For members in a high vulnerability groundwater area, for which nitrate is identified as a constituent of concern, the member must prepare and implement a

certified NMP. Starting in 2015 (some coalition deadlines differ), the plan must be certified in one of the following ways:

- Self-certified by the member who attends a California Department of Food and Agriculture or other Executive Officer approved training program for nitrogen plan certification. The member must retain written documentation of their attendance in the training program; or

- Self-certified by the member that the plan adheres to a site-specific recommendation from the Natural Resources Conservation Service (NRCS) or the University of California Cooperative Extension. The member must retain written documentation of the recommendation provided; or

- Certified by a nitrogen management plan specialist as defined in each coalition's General Order. Such specialists include Professional Soil Scientists, Professional Agronomists, Crop Advisors, certified by the American Society of Agronomy, or Technical Service Providers certified in nutrient management in California by the NRCS; or

- Certified in an alternative manner approved by the Executive Officer. Such approval will be provided based on the Executive Officer's determination that the alternative method for preparing the NMP meets the objectives and requirements of the General Order.

**Members within a Low Vulnerability Groundwater Area**  
All members within low vulnerability areas shall prepare and update annually an NMP. The member must use the NMP described in this publication or equivalent. Certification of the NMP and submittal of an NMP Summary Report are not required.

For compliance with the General Orders for the Irrigated Lands Regulatory Program

Approved: 23 December 2014

## IRRIGATION AND NITROGEN MANAGEMENT PLAN (INMP) WORKSHEET

### IRRIGATION AND NITROGEN MANAGEMENT PLAN (INMP) WORKSHEET

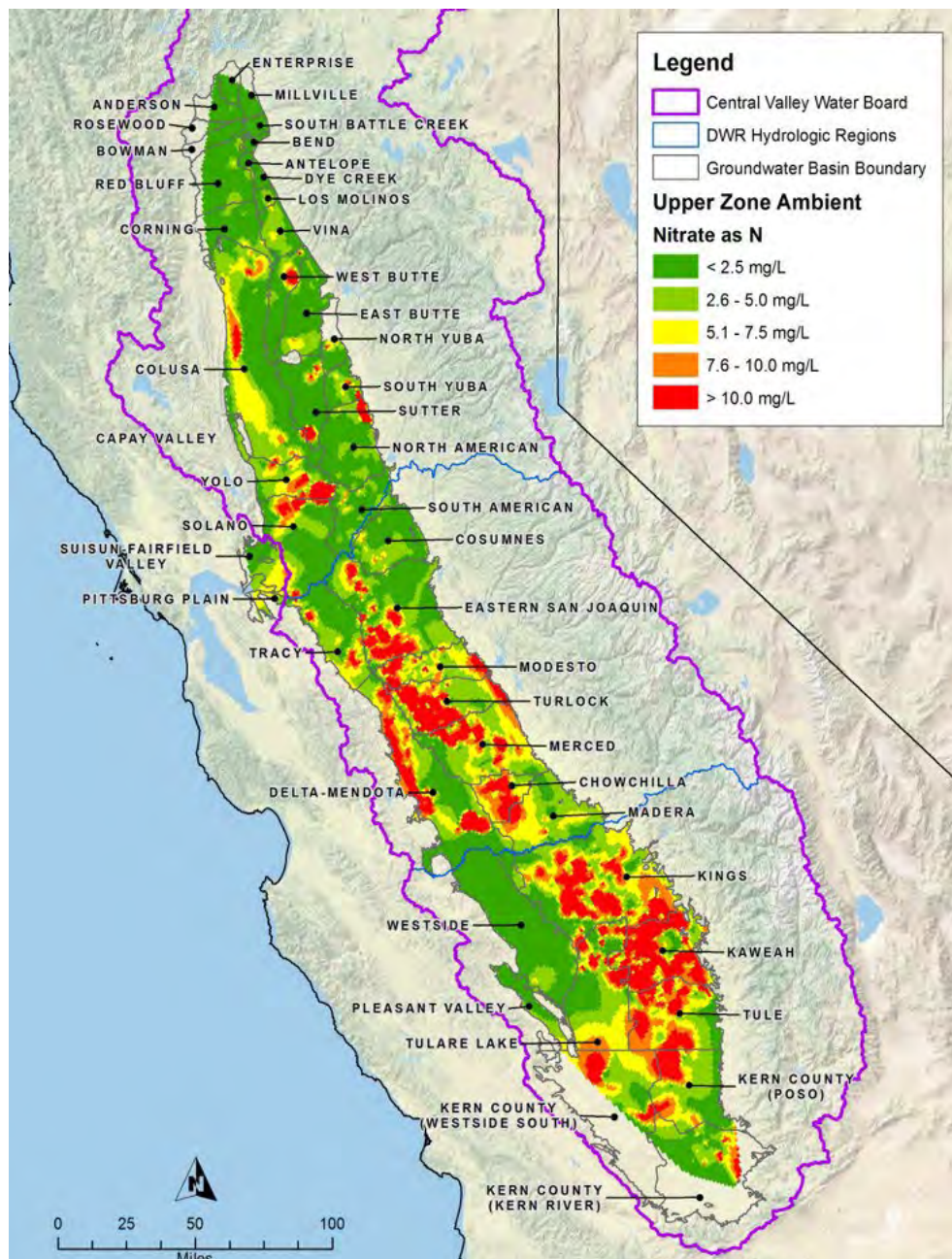
Member ID: \_\_\_\_\_ INMP Field or MU: \_\_\_\_\_ Crop: \_\_\_\_\_ Total Acres: \_\_\_\_\_

IRRIGATION MANAGEMENT				
1. Irrigation Method*		Pre-Season Planning		
(check one for Primary; if applicable, check one for Secondary)		2. Crop Evapotranspiration (ET, inches)		
Primary	Secondary <sup>1</sup>	3. Anticipated Crop Irrigation (inches)		
<input type="checkbox"/>	<input type="checkbox"/>	4. Irrigation Water N Concentration (ppm or mg/L, as NO <sub>3</sub> -N)		
<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	<input type="checkbox"/>			
5. Irrigation Efficiency Practices* (Check all that apply)				
<input type="checkbox"/>	Laser Leveling		<input type="checkbox"/>	Soil Moisture Neutron Probe
<input type="checkbox"/>	Use of ET in scheduling irrigations		<input type="checkbox"/>	Pressure Bomb
<input type="checkbox"/>	Water application schedule to need		<input type="checkbox"/>	Other _____
<input type="checkbox"/>	Use of moisture probe (e.g. tensiometer)		<input type="checkbox"/>	Other _____
HARVEST / YIELD INFORMATION				
Harvest / Yield Information			Expected (A)	Actual (B)
6. Production Unit (lbs, tons, etc.)		7. Harvested Yield*		
NITROGEN MANAGEMENT				
8. Nitrogen Efficiency Practices* (Check all that apply)		Nitrogen Sources	Recommended/Planned N (A)	Actual N (B)
<input type="checkbox"/>	Split Fertilizer Applications	9. Soil – Available N in Root Zone (Annualized, lbs/ac)		
<input type="checkbox"/>	Irrigation Water N Testing	10. N in Irrigation Water* (Annualized, lbs/ac)		
<input type="checkbox"/>	Soil Testing	11. Organic Amendments* (Manure/Compost/Other, lbs/ac estimate)		
<input type="checkbox"/>	Tissue/Petiole Testing	12. Dry/Liquid Fertilizer N* (lbs/ac)		
<input type="checkbox"/>	Fertigation	13. Foliar Fertilizer N* (lbs/ac)		
<input type="checkbox"/>	Foliar N Application			
<input type="checkbox"/>	Cover Crops			
<input type="checkbox"/>	Variable Rate Applications using GPS			
<input type="checkbox"/>	Other: _____			
<input type="checkbox"/>	Other: _____			
14. TOTAL NITROGEN (lbs/ac)			0	0

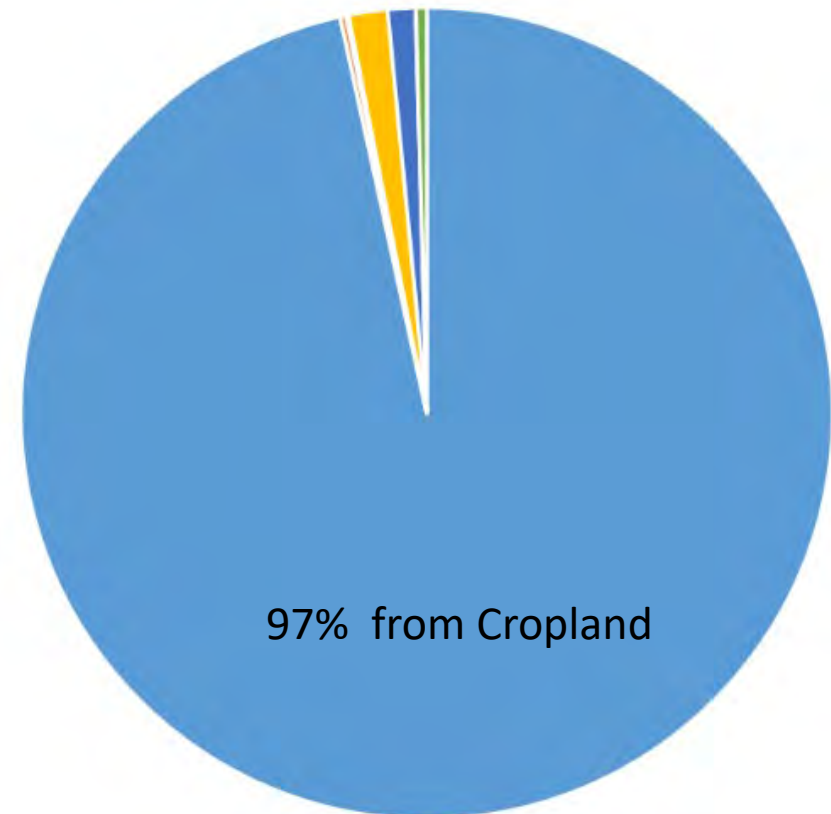
<sup>1</sup> A secondary irrigation system could be used for crop germination, frost protection, crop cooling, etc.

\* (Bold Text) Data to be reported to the Coalition on the INMP Summary Report, based on Actual Yield and Actual N.

Plan Certifier Initials




Central Valley Salt and Nitrate Management Plan



Harter, T. & Lund, J. 2012 Addressing Nitrate in California's Drinking Water: Executive Summary

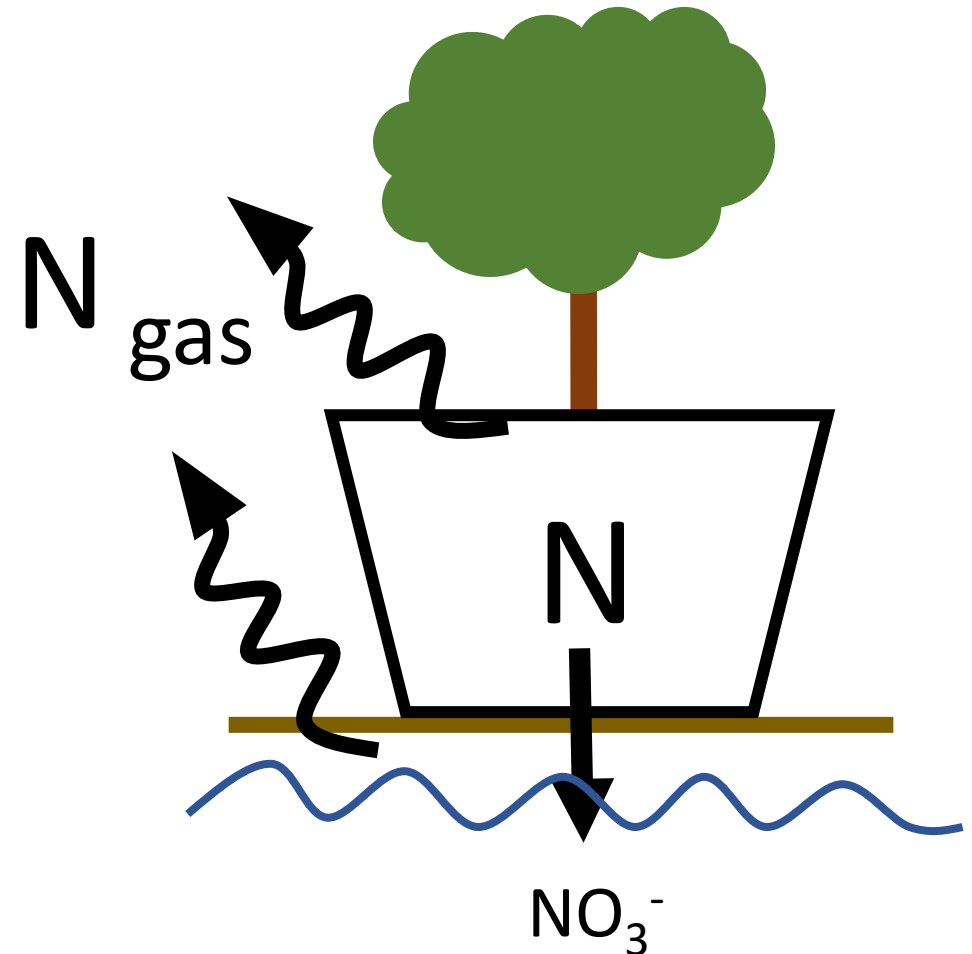


CROP NITROGEN MANAGEMENT PLANNING		N APPLICATIONS/CREDITS	26. Recommended/ Planned N	27. Actual N
6. Crop	Cont. Ornament	15. Nitrogen Fertilizers		
7. Production Units	Each	16. Dry/Liquid (lbs/ac)		122
8. Projected Yield (Units/Acre)	Various	17. Foliar N (lbs/ac)		144
9. N Recommended (lbs/ac)	500	18. Organic Material N		
10. Acres	12.5	19. Available N in Manure/Compost (lbs/ac estimate)		0
Post Production Actuals		20. Total Available N Applied (lbs per acre)		266
11. Actual Yield (Units/Acre)	Difficult to determine	21. Nitrogen Credits (est)		
12. Total N Applied (lbs/ac)	267.1	22. Available N carryover in soil; (annualized lbs/acre)		0
13. ** N Removed (lbs N/ac)	267.1	23. N in Irrigation water (annualized, lbs/ac)		1.1
14. Notes:		24. Total N Credits (lbs per acre)		1.1
Type of crop is container ornamentals, when container is sold, soil goes with plants. Due to various container sizes, difficult to determine "yield/acre".		25. Total N Applied & Available		267.1

CROP NITROGEN MANAGEMENT PLANNING		N APPLICATIONS/CREDITS	26. Recommended/ Planned N	27. Actual N
6. Crop	Cont. Ornamer			
7. Production Units	Each			
8. Projected Yield (Units/Acre)	Various			
9. N Recommended (lbs/ac)	500			
10. Acres	12.5			
Post Production Actuals				
11. Actual Yield (Units/Acre)	Difficult to determine			
12. Total N Applied (lbs/ac)	267.1			
13. ** N Removed (lbs N/ac)	267.1			
14. Notes:				
Type of crop is container ornamentals, when container is sold, soil goes with plants. Due to various container sizes, difficult to determine "yield/acre".				

# Where does unutilized nitrogen go?

- How much N leaves nursery at sale?
  - N utilized by plant
  - N left in container substrate
- How much N loss from leaching?
- How much N gas lost?






# What we found

Use analytical results to estimate nitrogen amount:

- In plant shoots ~5%
- Remaining in substrate ~56%
- In runoff water ~6%
- Lost as N gas ~30%
- Leached into bed soils ~3%



CROP NITROGEN MANAGEMENT PLANNING		N APPLICATIONS/CREDITS	15. Recommended/ Planned N	16. Actual N
6. Crop		17.		
7. Production Unit		18. Dry/Liquid N		
8. Projected Yield		19. Foliar N (lbs/		
9. N Recommended				
10. Acres		21. Available N in (lbs/ac estimat		
POST PRODUCTION ACTUALS		22. Total N Appl (lbs per ac) (Box 10+19+21)		
11. Actual Yield (Units/ac)				
12. Total N Applied (lbs/ac)	100%	23. NITROGEN CREDITS (EST)		
13. ** N Removed (lbs N/ac)	61%	24. * Available N carryover in soil; (annualized lbs/ac)		
14. *** Notes:	<p>100% - 61% = 39%</p> <p>“potentially leachable”</p>	25. *N in Irrigation water (annualized, lbs/ac)		
		26. Total N Credits (lbs per ac) (Box 24+25)		
		27. Total N Applied + Available + Credits (Box 22+26)		100%
			Transfer to Box 9	Transfer to Box 12



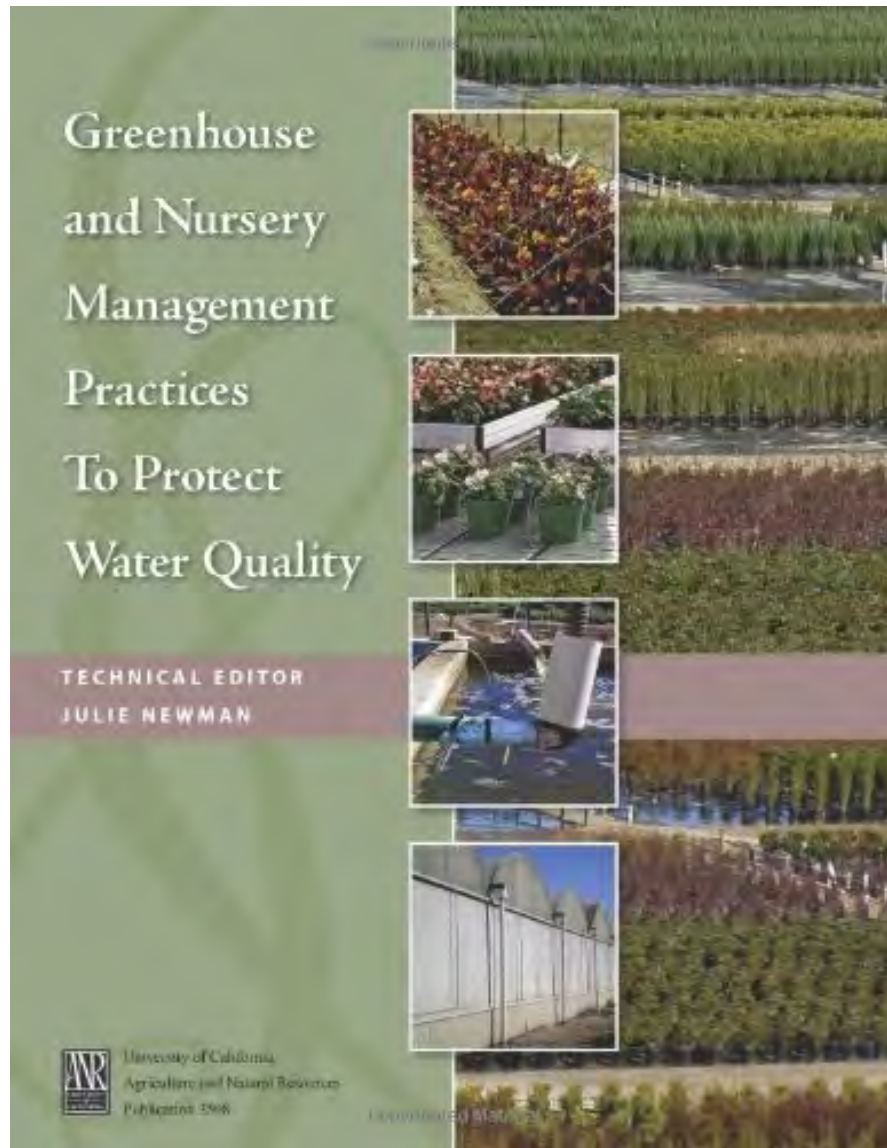
# Summary

- \$\$ to determine removal values
  - Diverse taxa and fertilizer programs
- NMP worksheet overestimates potentially leachable N by 13x
- 39% applied N = “potentially leachable”
- $\approx 3\%$  of applied N leached





# Best Management Practices to protect water quality



The image is a screenshot of the Clean Water3 website. The header features the logo "CLEAN WATER<sup>3</sup>" with the tagline "REDUCE • REMEDIATE • RECYCLE" below it. The navigation bar includes links for "home", "water problems", "training", "tools", "research", "ask an expert", "newsletter", "about", and "search". A dropdown menu for "water problems" is open, showing options: "conserving water", "pH & salts", "nutrients & agrichemicals", "pathogens & biofilms", "particles & debris", and "quality". Below the navigation bar, there are three featured articles with images and titles: "How many steps do I need to take to install a constructed wetland?", "What type of plants should I use to establish constructed wetlands?", and "Have other nurseries installed constructed wetlands to treat runoff water?". At the bottom, there is a section for "Workshops, conferences and outreach" with a logo for "ask an EXPERT", a red button that says "Take Our Impact Survey", and a link to "View our past webinars on irrigation water conservation and quality management". There is also a link to "Subscribe to our free newsletter to get research updates as soon as they are released."





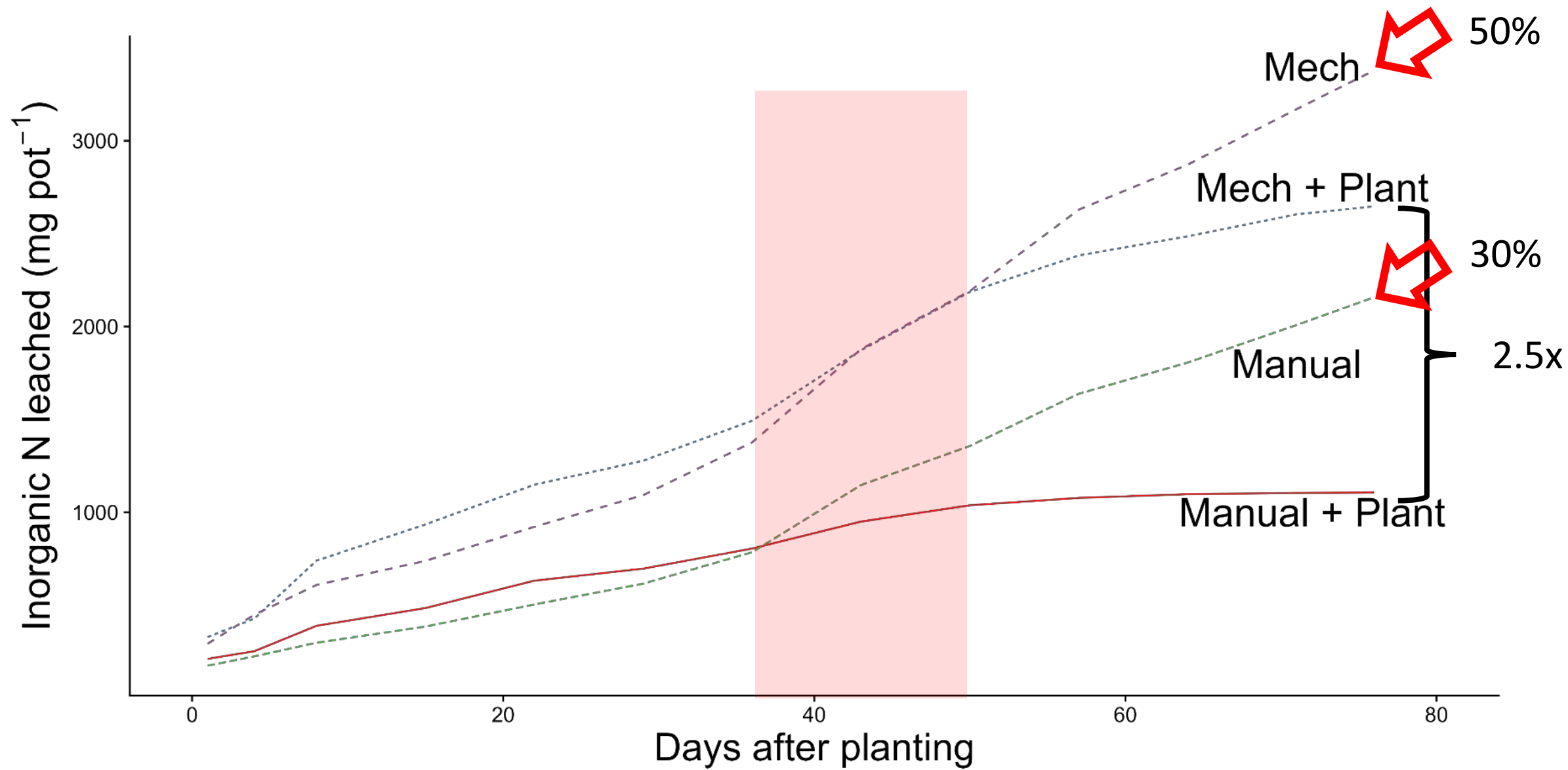


# CRF leaching

- CRF incorporation
  - Manual or mechanical
- *Lavandula angustifolia* 'Provence'
  - With or without
- Leached pots weekly
- Total  $\text{NH}_4\text{-N}$  and  $\text{NO}_3\text{-N}$  leached







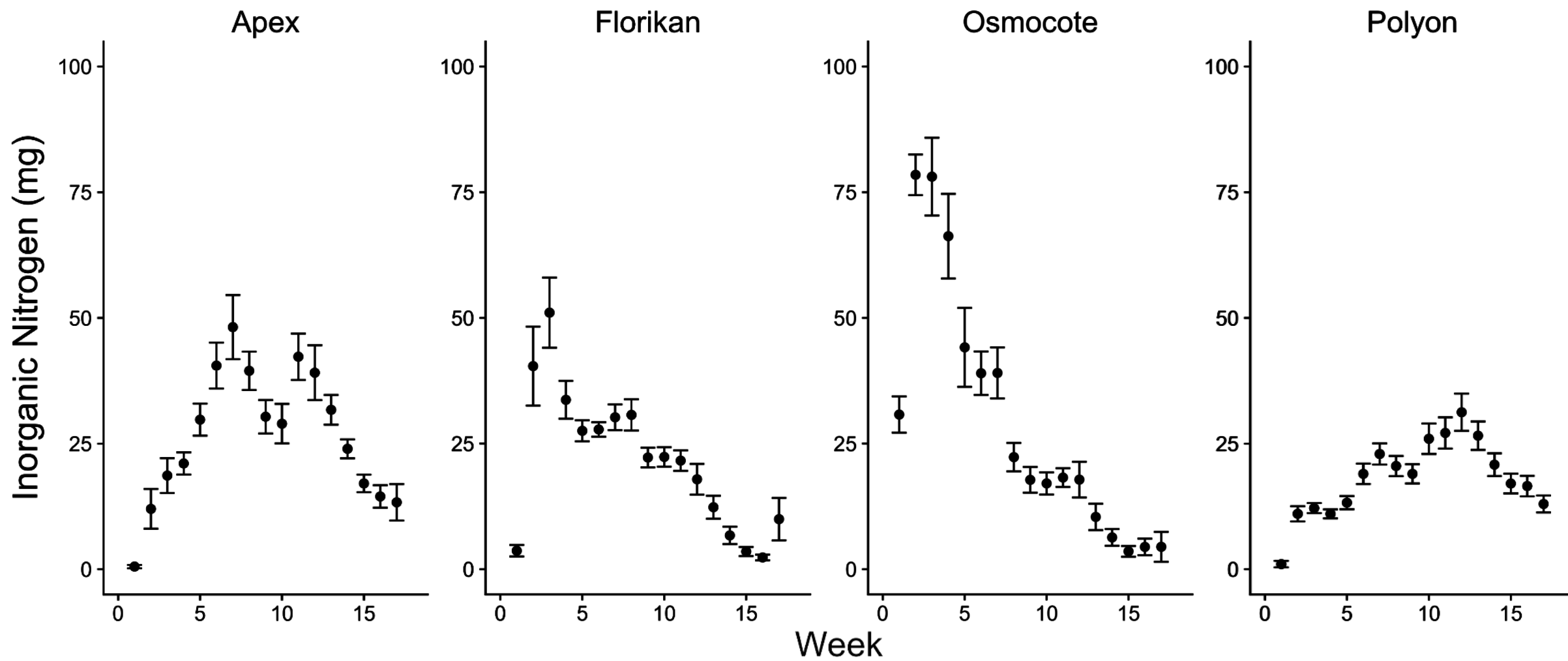




# CRF polymer coating

- Apex NPK (19-6-13)
- Florikan w/ Nutricote (18-6-8)
- Osmocote Plus (19-6-12)
- Polyon (19-6-13)





B.J.L. Pitton (UCANR) and J.S. Owen (USDA-ARS)



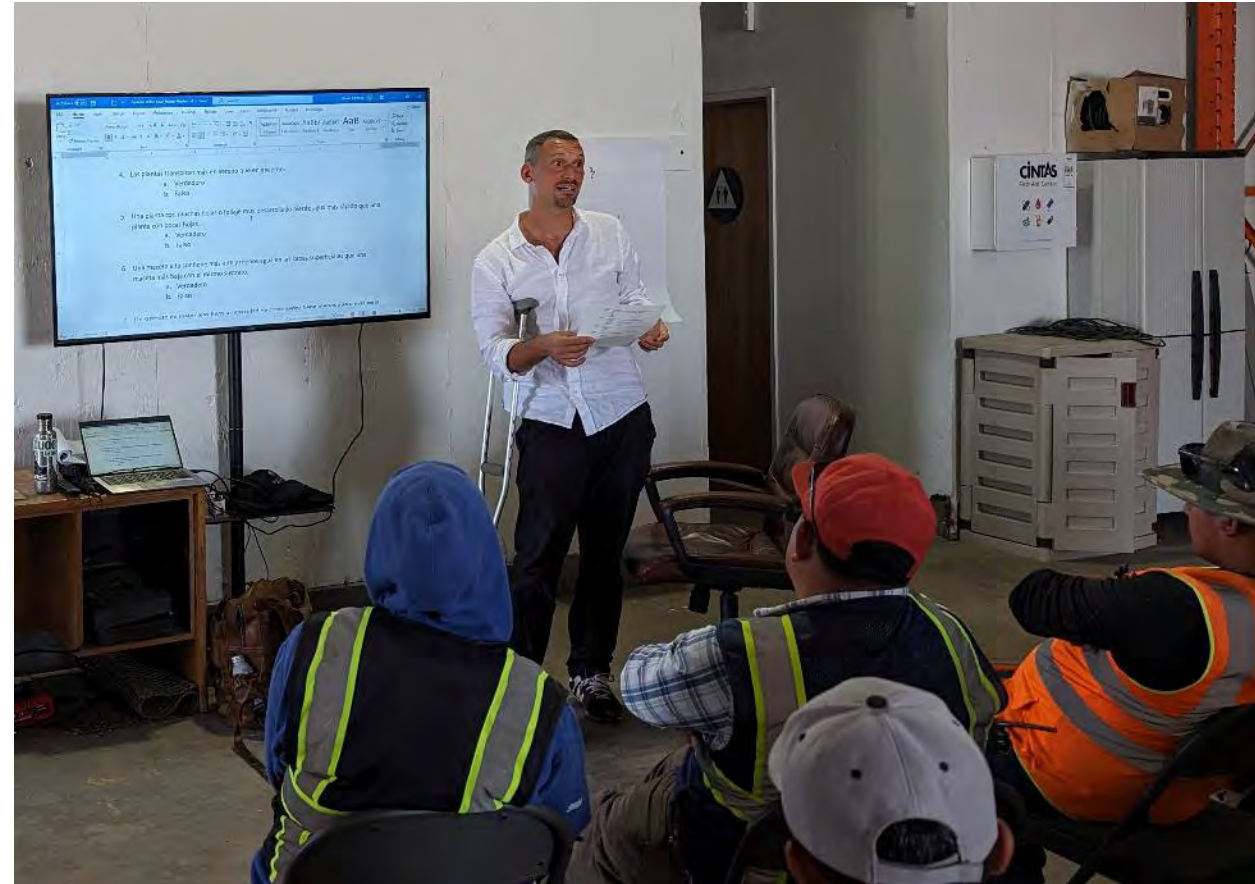
# Conclusions

- Equipment can damage CRF coating
  - Work with engineers to reduce damage to CRF
- Early release with Florikan and Osmocote
- Apex and Polyon release matches plant establishment
- Polyon is most consistent release
- Choose the right fertilizer for the purpose



# FREE Technical Irrigation Training

- Improve irrigation efficiency and plant health while reducing water consumption
- Science behind irrigation BMPs
- Half-day course at your nursery
- English or Spanish instruction





# Fundamental Concepts for Managing Irrigation in Potting Media

- Basic plant physiology
- Science of the pot
- Disease triangle
- Irrigation management practices
- In-field demonstration



# Testimonials

- “The training’s practical demonstrations and real-world examples made the concepts easy to grasp, allowing our team to implement the strategies immediately.” – Mauricio de Almeida, Burchell Nursery
- “It is so much more impactful to have trainings like this on-site where our staff can learn and then go out into the nursery and actually put it into practice while the presenters/experts are here.” – Deanna van Klaveren, Generation Growers
- “This training isn’t just about irrigation and plant management. It’s also about savings, both water and costs.” – Francisco “Frank” Anguiano, Boething Treeland Farms





# Contact

## Northern California

- **Jessie Godfrey**, UCCE environmental horticulture and water resources management advisor, [jmgodfrey@ucanr.edu](mailto:jmgodfrey@ucanr.edu)

## Central Coast (Santa Cruz County to Ventura County)

- **Emma Volk**, UCCE production horticulture advisor, [evolk@ucanr.edu](mailto:evolk@ucanr.edu)

## San Joaquin Valley

- **Chris Shogren**, UCCE environmental horticulture advisor, [cjshogren@ucanr.edu](mailto:cjshogren@ucanr.edu)

## Southern California

- **Grant Johnson**, UCCE urban agriculture technology advisor, [gejohnson@ucanr.edu](mailto:gejohnson@ucanr.edu)

## Spanish Only

- **Gerry Spinelli**, UCCE production horticulture advisor, [gspinelli@ucanr.edu](mailto:gspinelli@ucanr.edu)





Thank you  
[bjpittton@ucanr.edu](mailto:bjpittton@ucanr.edu)

