

Fertilizer Value of Nitrate-N in Irrigation Water



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Fertilizer Value of Nitrate in Irrigation Water



- The quantity of nitrate-N in well water varies substantially depending on the location: land history (dairys, prior crop history, etc.), depth to groundwater, rainfall patterns, etc.
- Nitrate-N in well water varies from <1 to 70+ ppm nitrate-N
- Canal water typically has low levels of nitrate-N

Nitrate in Irrigation Water

- **The usefulness of nitrate-N in irrigation water is driven by the concentration**
- **At low concentrations, the amount provided is minimal and impossible to separate from other sources of N (it gets lost in the “noise”)**
- **At moderate levels it becomes more significant**
- **At high levels it can be a key/dominant source of N for crop growth**

How much N is applied in irrigation water:

$$\text{ppm NO}_3\text{-N} \times 0.23 = \text{lbs N/acre inch of water}$$

$$20 \text{ ppm} \times 0.23 = 4.6 \text{ lbs N/acre inch}$$

$$2.0 \text{ acre inch} \times 4.6 \text{ lbs N/acre inch} = \underline{9 \text{ lbs N}}$$

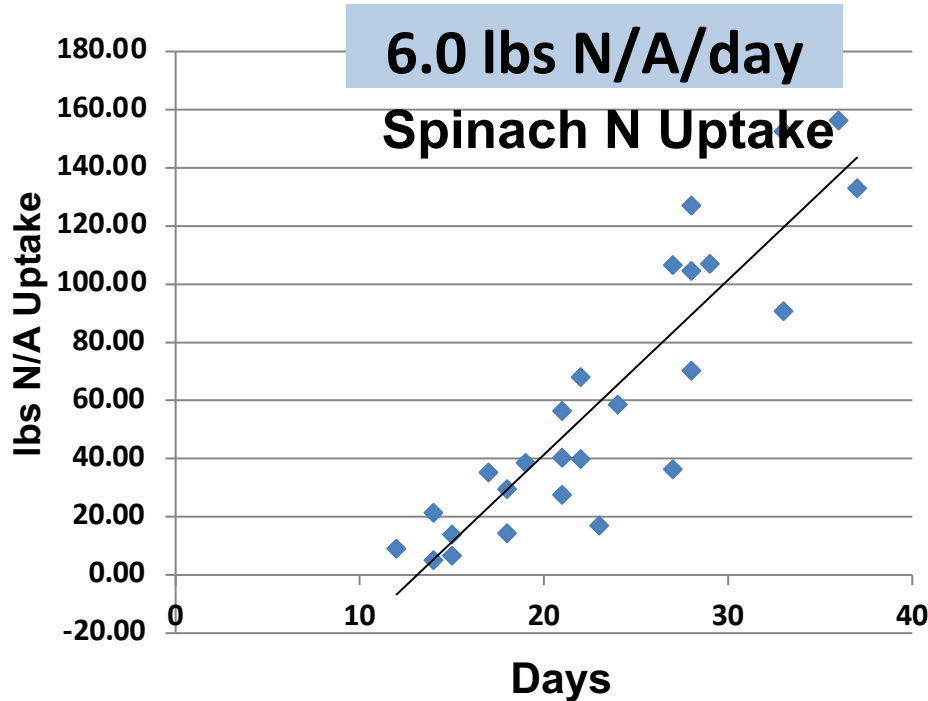
$$40 \text{ ppm} \times 0.23 = 9.2 \text{ lbs N/acre inch}$$

$$2.0 \text{ acre inch} \times 9.2 \text{ lbs N/acre inch} = \underline{18 \text{ lbs N}}$$

$$60 \text{ ppm} \times 0.23 = 13.8 \text{ lbs N/acre inch}$$

$$2.0 \text{ acre inch} \times 13.8 \text{ lbs N/acre inch} = \underline{28 \text{ lbs N}}$$

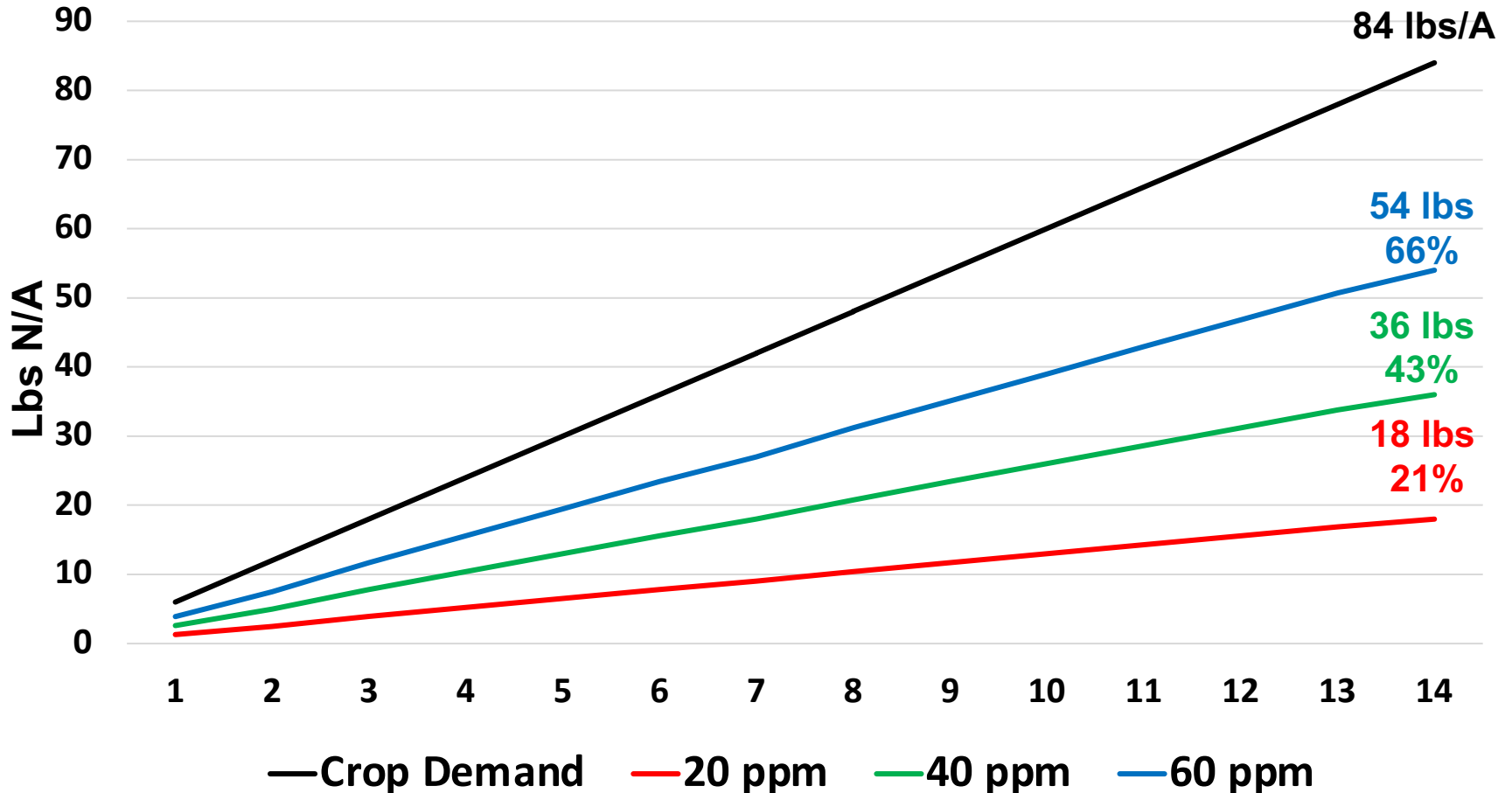
Impact of N in Irrigation Water



- High density spinach is a short-season, high N demanding crop
- Spinach takes up 6 lbs N/A/day during the final two weeks of the crop cycle = 84 lbs N/A
- What can the irrigation water contribute to this crop N demand?

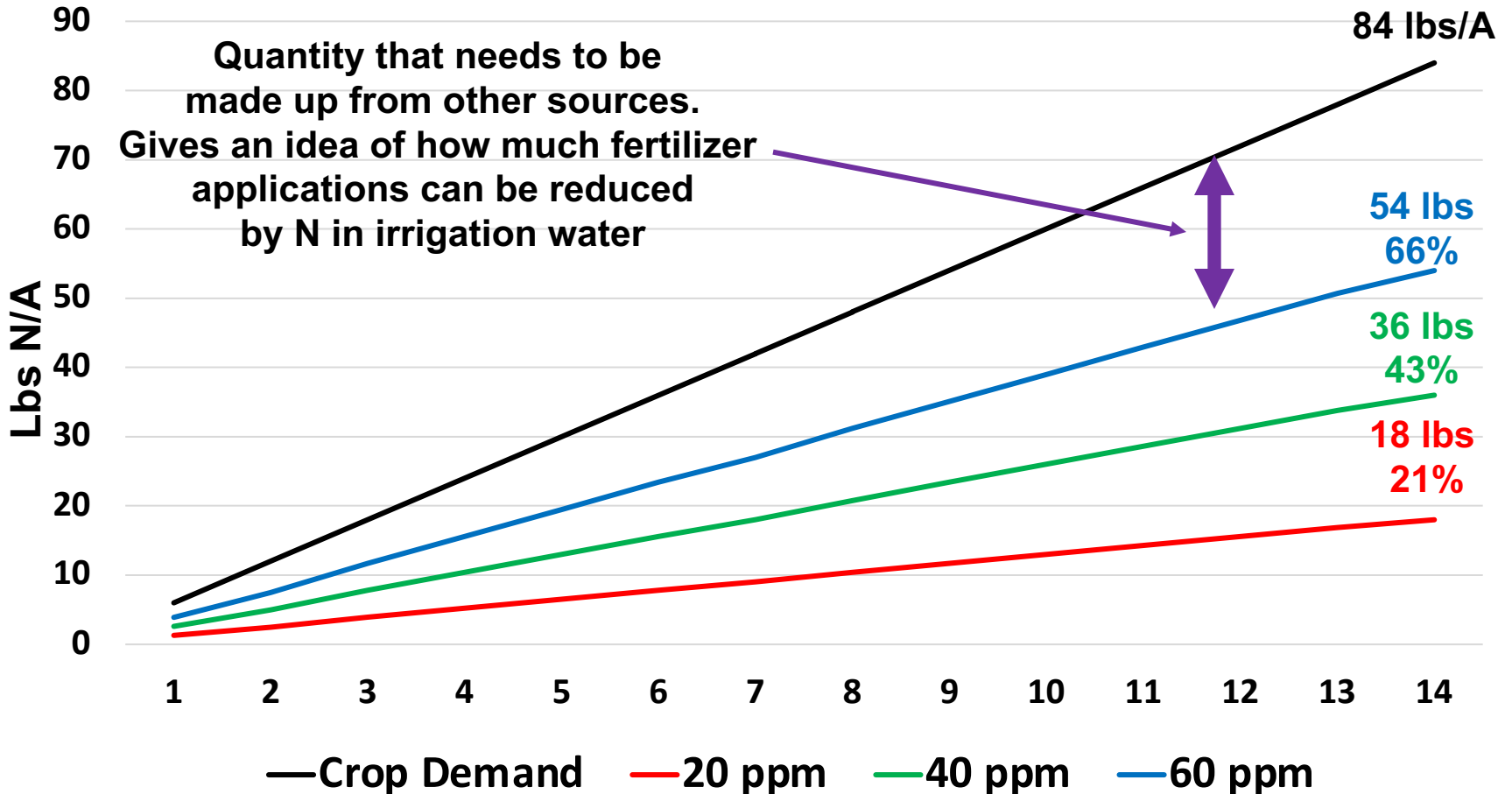


Crop Demand vs Nitrate-N in Irrigation Water*



* 2 inches of water applied per week at 20, 40 and 60 ppm

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D1. Sampling water for testing

To convert NO₃-N concentration in the water to lb N/acre inch, NO₃-N concentration reported in ppm is multiplied by 0.227 and by the number of acre-inches of water applied. For example, for 1 acre-inch of water containing 10 ppm nitrate-N: (10 ppm) x (1 acre-inch) x (0.227) = 2.27 lb N are applied per acre.

55

15. **lb N/A 15. N contribution from irrigation water based on water test result**

[Test date: 5/7/2018] Test Result: 8 ppm

Conversion Tool

Convert ppm to lb N 8 ppm x 0.227 = 1.816 lb N/ acre inch
NO₃-N NO₃-N

Estimate total water use:

30 acre-inches x 1.816 lb N/ acre inch = 54.5 lb N

Water use

NO₃-N in water

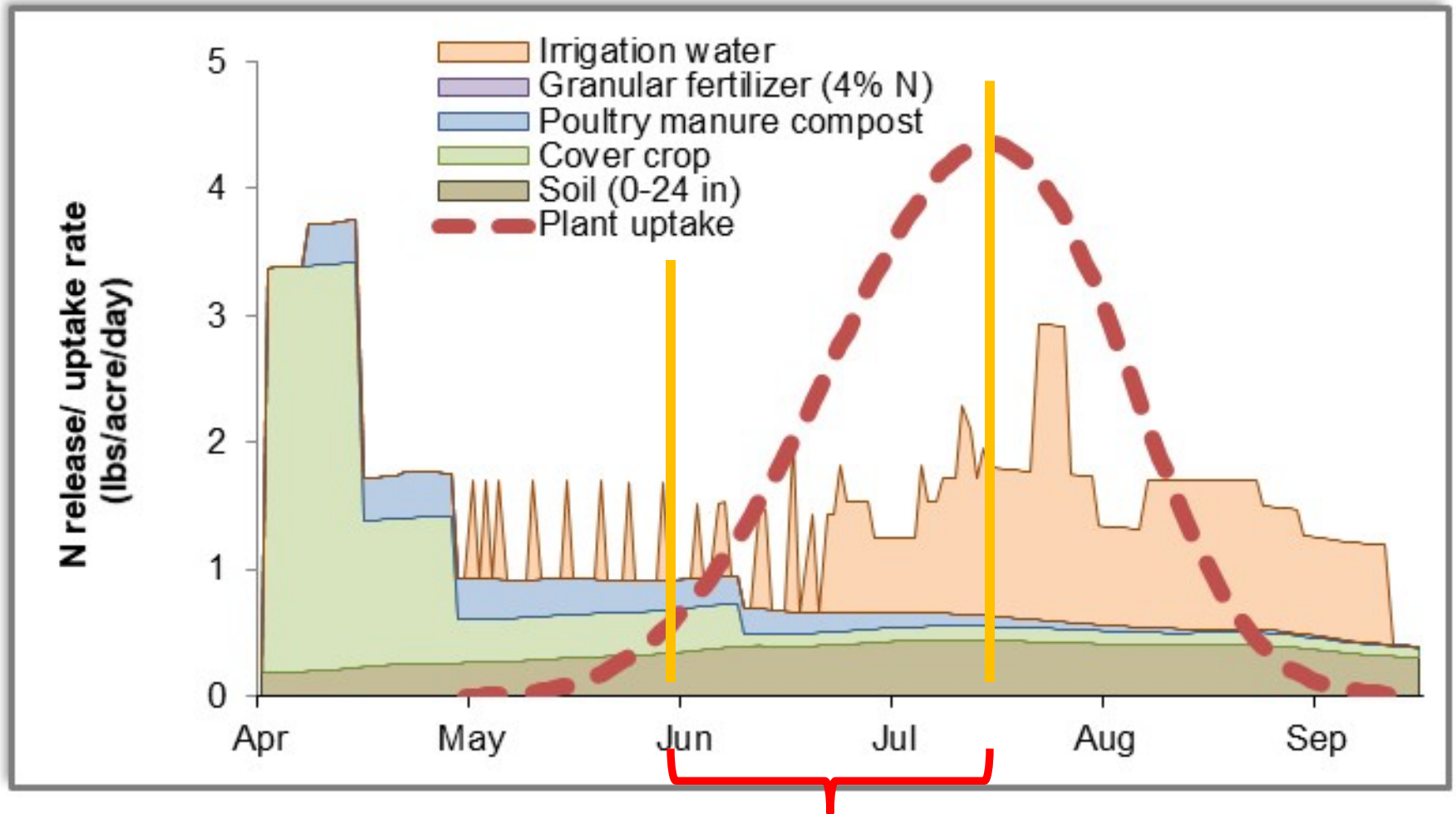
15.

Nitrate in Irrigation Water

- **The total quantity of N in the irrigation water can be substantial**
- **However, it is important to keep in mind the time of peak N demand to calculate the total quantity of N being contributed in the water (x irrigation amount) to know how much is being contributed**

Contribution to the N budget of Tomatoes from Sacramento Valley

Water contained **10 ppm** Nitrate-N



From Patricia Lazicki

6 weeks peak uptake

Evaluation of Use of Nitrate in Irrigation Water

- Example: 6 inches applied thinning to harvest in lettuce @ 42 ppm NO₃-N = **58 lbs N**
- Only source of N for the crop



42 ppm

2 ppm

Nitrate in Irrigation Water Summary

- Nitrate levels in well water vary widely and it is important to know how much is in your water to determine how significant of a source of N it can be for crop growth**
- For short-season crops levels of nitrate-N of <20 ppm contribute small amounts of N on a daily/weekly basis, whereas ≥ 40 ppm contributes significant amounts**
- For longer-term, warm-season crops the situation may be different because the quantity of applied water is greater**

Nitrate in Irrigation Water Summary

- The reality is that adjusting N fertilizer rates based on the contribution of N from the irrigation water is tricky**
- If you have significant quantities of N in irrigation water, it is best to experiment with small strips where you reduce fertilizer applications and observe if the water is satisfying the N demand needs of the crop and build on your experience over time**