

Making Cost Effective Pasture & Range Improvements



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What's wrong with this pasture ?



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What's wrong with this pasture ?



You will get what you manage for !



Pasture Improvement: The first step

Before you start, know why you're needing to do it !



If the pasture needs renovated because of your past management, are you prepared to change what you're doing?



Important Considerations

- What can you afford ?
 - Almost every pasture improvement project is profitable in the long run



Important Considerations

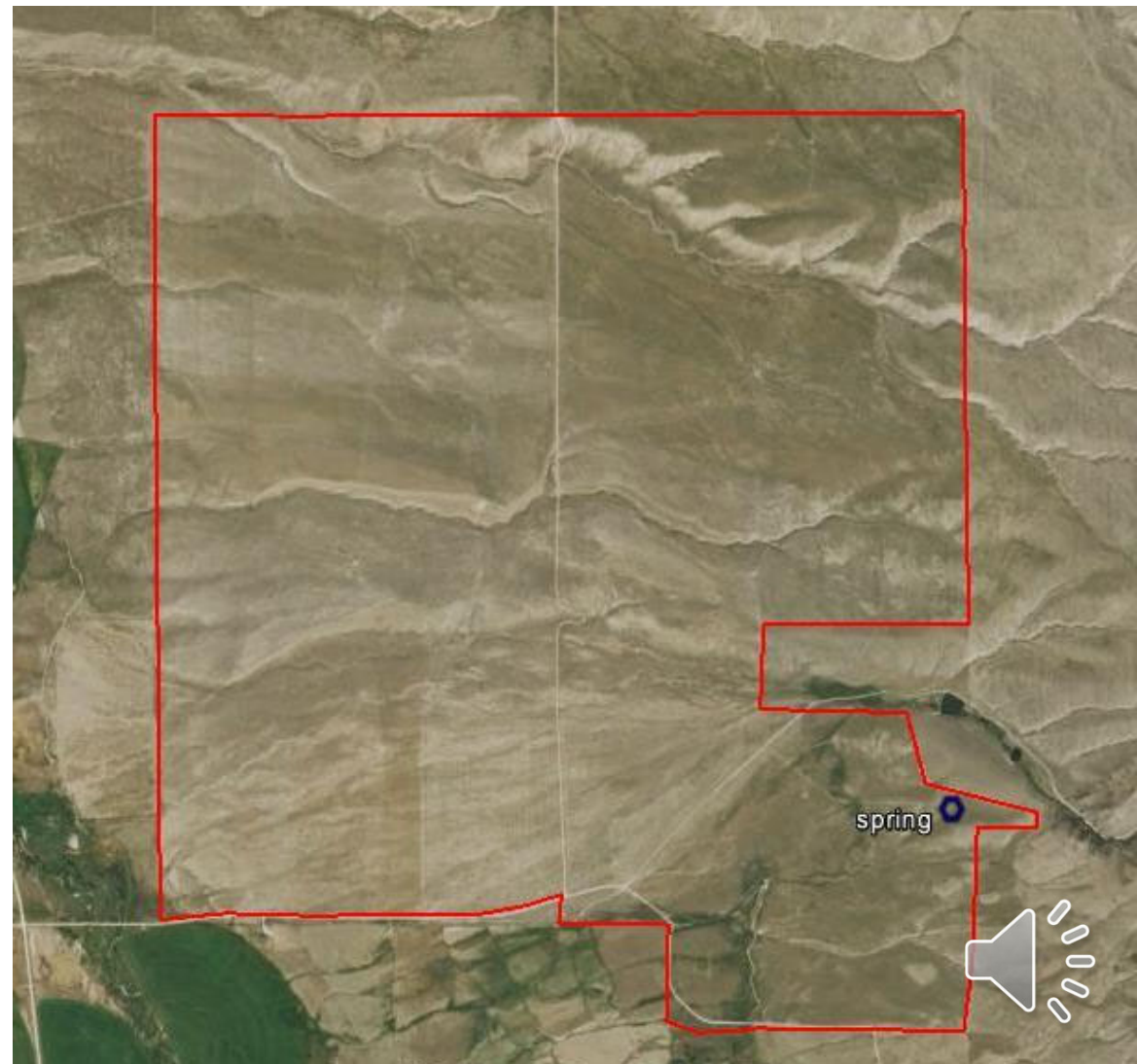
- What can you afford ?
 - Project has to cash flow to be feasible
 - How will you pay for this?



2640-acre winter range unit

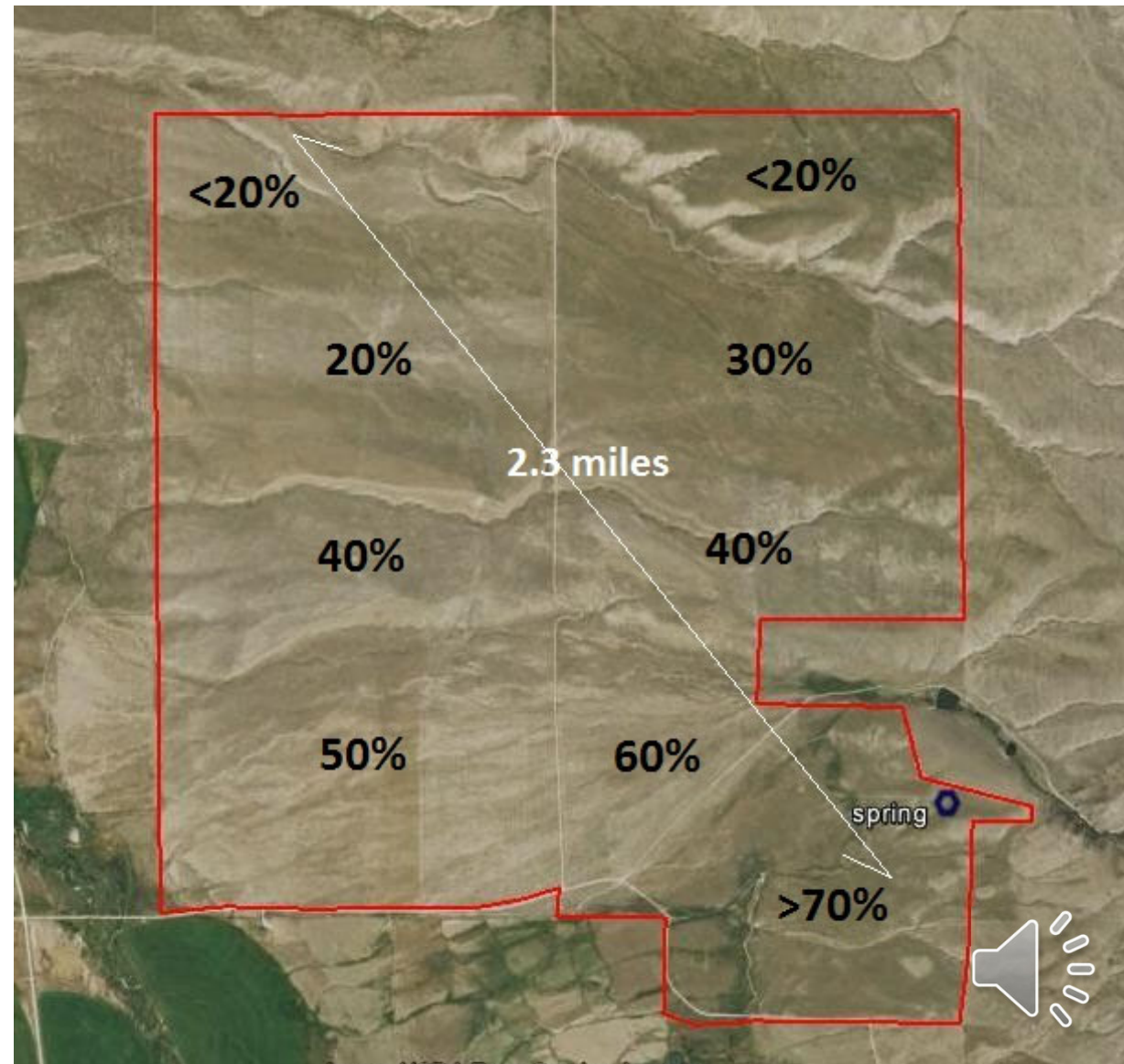
Winter 2004-5: 450 cows for 42 days

- Mixed native & seeded range
- No interior fence
- One water source
- 7.2 AUD/A



Grazing pattern in first year of winter grazing

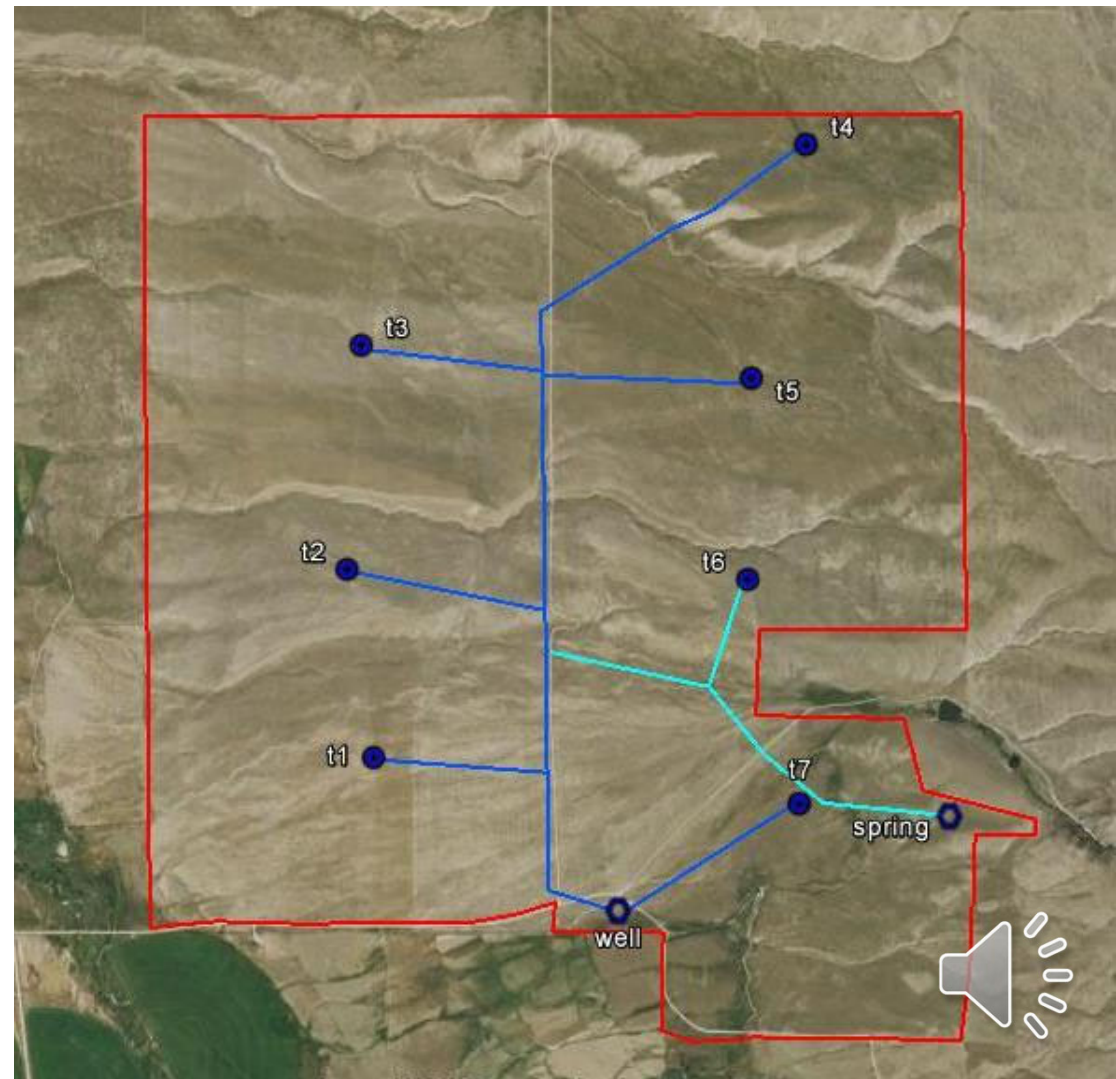
- Poor grazing distribution
- More hay fed
- Higher supplement costs



2640-acre winter range unit

Winter 2005-6: 800 cows for 45 days

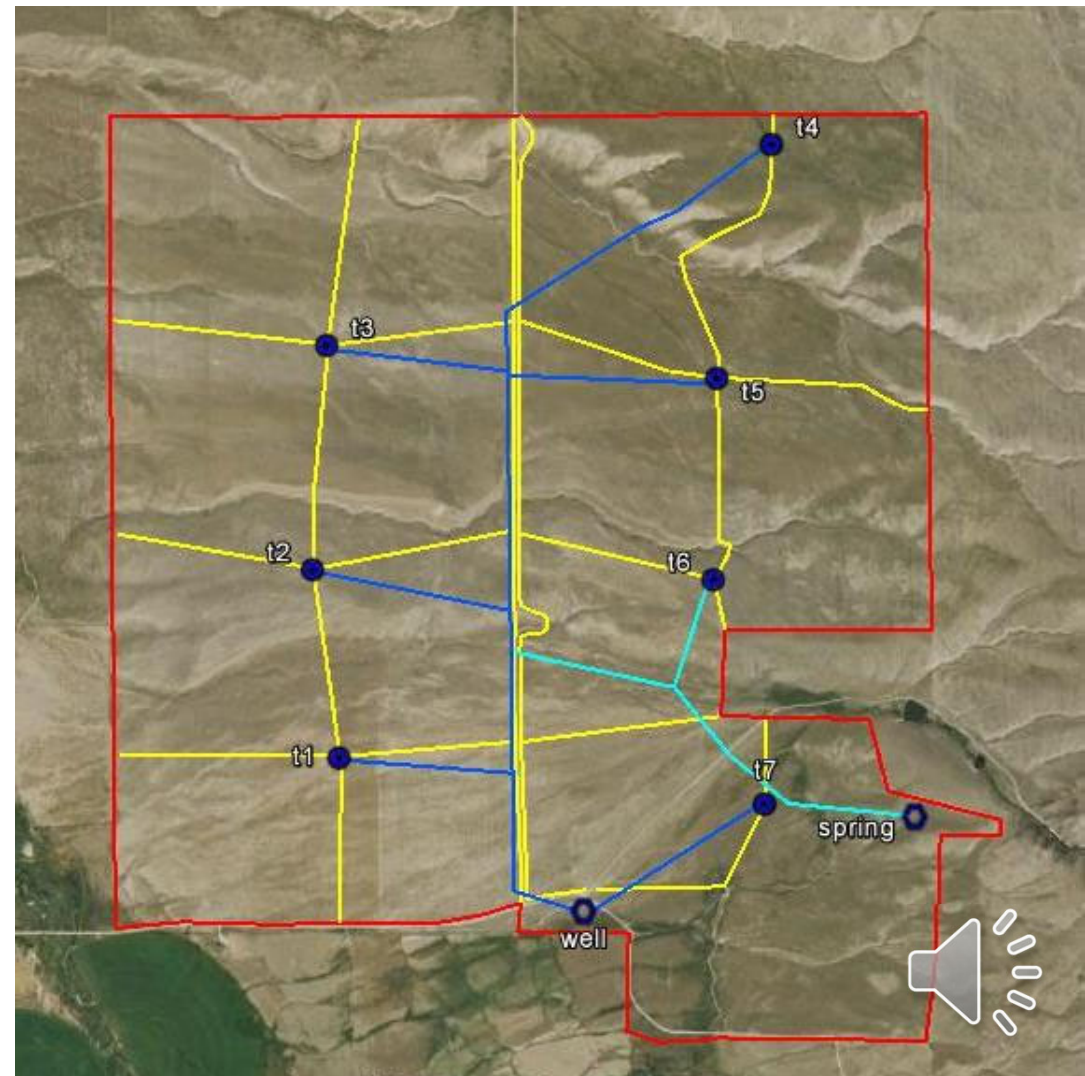
- Summer 2005 installed stock water system
- Drilled well & expanded spring development
- Still no interior fence
- 13.6 AUD/A



2640-acre winter range unit

Winter 2007-8: 900 cows for 85 days

- Summer 2006 installed subdivision fences
- Basically created 16 160-A paddocks
- 29 AUD/A



Simple grazier's math from 20 years ago

- 900 cows
- Add 40 more days of grazing
- Grazing saves \$1/cow-day
- Annual feed cost saving is \$36,000

➤ **What did the fence cost ?**

➤ **\$33,046.81***

Labor cost is 156% of material cost



Simple grazer's math:

Updated to 2023 costs & returns

- 900 cows
- Add 40 more days of grazing
- Grazing saves \$1.70/cow-day
- Annual feed cost saving is \$61,200

➤ **What did the fence cost ?**

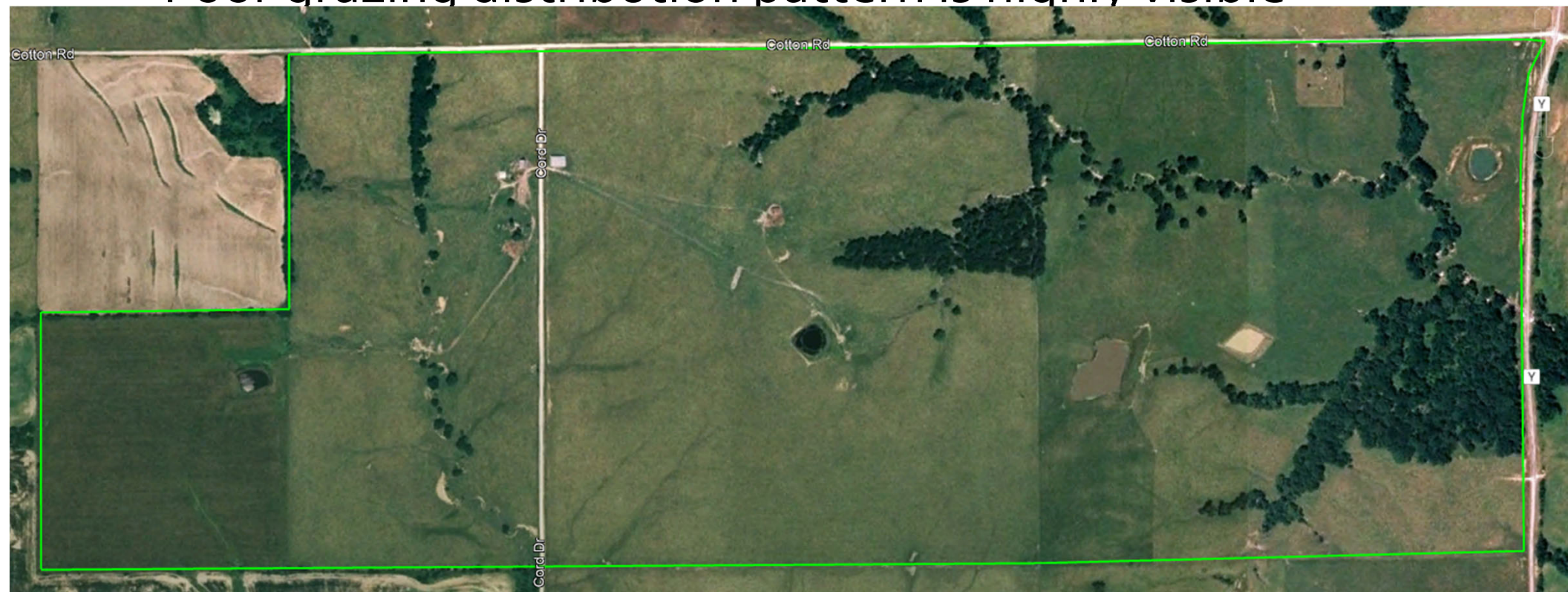
➤ **\$69,343***

Labor cost is 200% of material cost



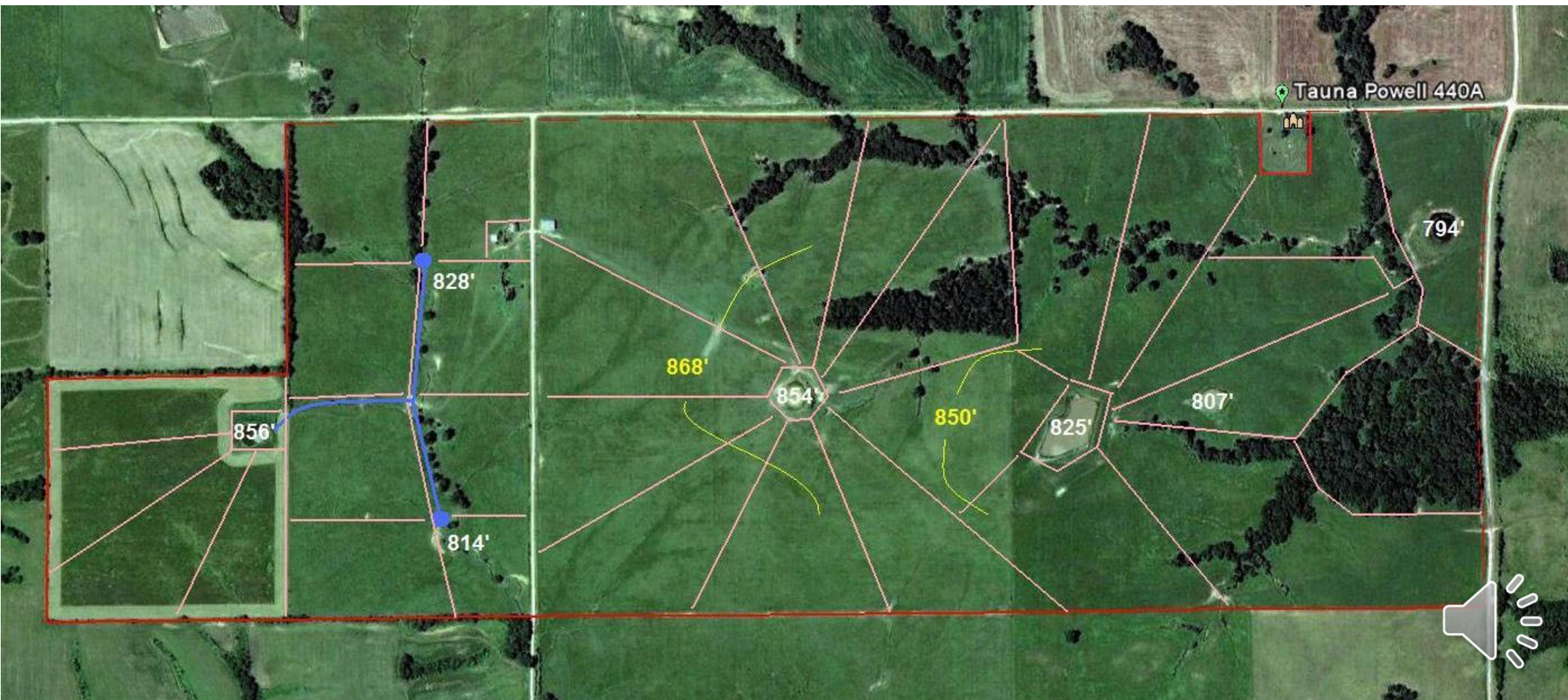
North Missouri farm example: 440A

- 440 A property in 6 paddocks of different sizes
- Watering directly from ponds
- Carrying 60-70 pairs 9 months with outside hay for 3 months
- Poor grazing distribution pattern is highly visible



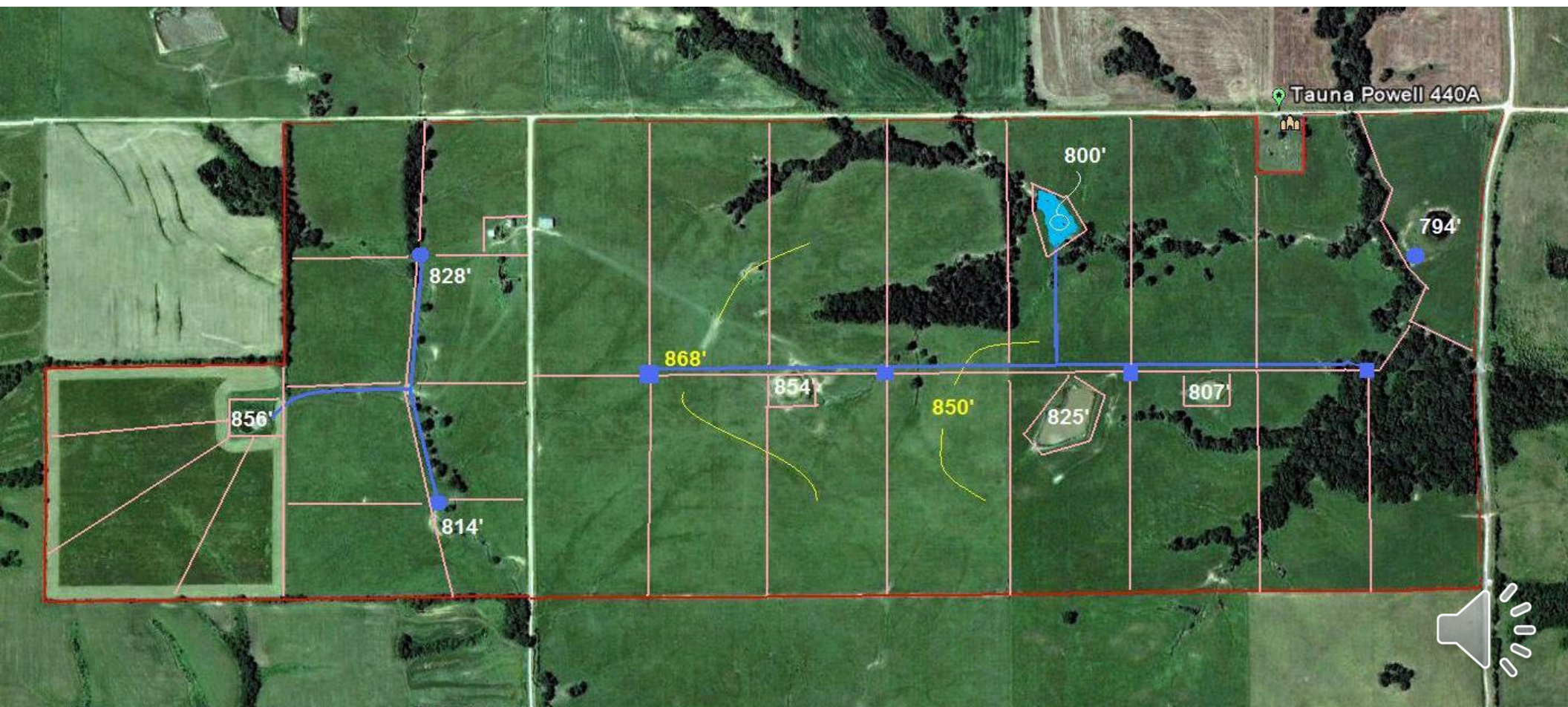
Why we look at more than one option: Landowner's plan

440 acres in North Missouri: Wagonwheel
Fence & Water cost = \$74 / acre



Why we look at more than one option: AGLS infrastructure plan

440 acres in North Missouri: **Block design**
Fence & Water cost = **\$109/acre** (\$30/A in pond & power)



Expected outcomes

CURRENT SITUATION

- Presently harvesting 80 AUD/A with very limited rotation
- Feeding hay for 90 days at daily cost of \$1.80/day
- Applying 60 units of N to 60% of the pastures annually
- Land health is declining

EXPECTATION WITH MIG IN PLACE

- Increase annual grazing capacity by 30%
 - Added GM \$1.30/AUD
 - $= 80 \times 30\% \times \$1.30 = \$31.20/\text{acre}$

Reduce hay feeding by 60 days

$65 \text{ cows} \times 60 \text{ days} \times \$1.80/\text{day} = \$7,020 \div 440 \text{ acres} = \$15.95/\text{acre}$

$60 \text{ units N} \times 250 \text{ acres} \times \$0.65/\text{unit} = \$9,750 \div 440 \text{ acres} = \$22.16/\text{acre}$

Total revenue increase + cost savings = \$60.27 + land is improving

Important Considerations

- What can you afford ?
 - Project has to cash flow to be feasible
 - All at once or by stages ?



Important Considerations

- What can you afford ?
 - Project has to cash flow to be feasible
 - All at once or by stages ?
 - Cost share opportunities ?



Important Considerations

- What can you afford ?
- Quality of land ?



Important Considerations

- Quality of land ?
 - Topography
 - Erosion phase
 - Drainage
 - Depth of soil
 - Organic matter



Important Considerations

- Quality of land ?
 - Good land pays back faster than poor land



Important Considerations

- Quality of land ?
 - Higher pasture yield lowers feed costs

Example: If annual pasture costs are \$50/acre.....

Pasture producing 75 AUD/acre has base cost of 67¢/AUD

Pasture producing 200 AUD/acre has base cost of 40¢/AUD



Important Considerations

- What can you afford ?
- Quality of land ?
- What type of livestock ?



Important Considerations

- What type of livestock ?

- Higher income potential can justify higher cost improvements



Important Considerations

● What type of livestock ?

■ Higher income potential justifies higher cost improvements

- Pasture-based dairy
- Pasture-finished lamb
- Pasture-finished beef
- Dairy replacement heifers
- Stockers or beef replacement heifers
- Cow-calf



Important Considerations

- What can you afford ?
- What type of livestock ?
- Quality of land ?
- Management intensity ?



Important Considerations

- Management intensity ?
 - Higher seasonal utilization rate pays more bills



Important Considerations

- Management intensity ?

- Higher utilization rate pays more bills

Example:

Pasture producing 6000 lbs/acre continuously grazed @ 40% utilization, yields 2400 lbs/acre harvested forage

= 92 AUD/A

Pasture producing 6000 lb/acre rotationally grazed w/ 3-4 day grazing periods @ 65% seasonal utilization, yields 3900 lb/acre harvested forage

=150 AUD/A



Important Considerations

- Management intensity ?
 - Higher stocking rate pays more bills



Important Considerations

- Management intensity ?
 - Higher stocking rate pays more bills

Example:

1 steer/acre gaining 2.0 lbs/day for 150 days @ 50¢/lb
returns \$150 / acre

1.25 steer/acre gaining 2.0 lbs/day for 150 days @
50¢/lb returns \$187.50 / acre



Important Considerations

- Management intensity ?

- Higher stocking rate pays more bills

Example:

*1 steer/acre gaining 2.0 lbs/day for 150 days @ 50¢/lb
returns \$150 / acre*

*1.25 steer/acre gaining 2.0 lbs/day for 150 days @ 50¢/lb
returns \$ 187.50 / acre*

but if ADG goes down....

**1.25 steer/acre gaining 1.6 lbs/day for 150 days @ 50¢/lb
returns \$150 / acre but has added more cost/acre**



Important Considerations

- What can you afford ?
- What type of livestock ?
- Quality of land ?
- Management intensity ?
- Does it fit with your goals?



Important Considerations

- Does it fit with your goals ?
 - Does the change move you toward your goals ?
 - Will you make necessary management changes ?
 - Can it be accomplished with existing labor ?



Pasture improvement

- Soil nutrient management



Nutrient management

■ Soil testing

Soil testing is not about determining how much fertilizer to apply, it is about:

- *What do you seed and where*
- *Where do you feed hay*
- *Diagnosis for weed problems*
- *Help formulate livestock mineral supplements*



What types of testing should you be doing?

- Conventional testing
 - (weak to strong chemical extractants)
 - Identifies mineral forms that may or may not exist in the soil solution
 - Ignore mineral forms that may be bio-available in healthy soils
 - Often over recommend fertilizer rates
- Haney tests & other biological tests
 - Identify soil mineral levels that would be available in biologically functional soils
 - Generally result in reduced fertilizer recommendation
 - Identify the classes and functionality of organisms in the soil

Nutrient management: Soil sampling

- Soil testing
 - Have a plan & stick to it
 - Sample $\frac{1}{4}$ of the farm each year
 - Use the results to plan nutrient management
 - Use results to plan species selection



Soil Sampling for Pastures

- Avoid watering points, shade trees and other known hot spots

Leave 150 ft buffer from shade or water



Soil Sampling for Pastures

- Avoid watering points, shade trees and other known hot spots
- At least 20 cores per sample
 - Continuously grazed
 - Avoid all manure piles and urine patches
 - MiG
 - Avoid only fresh manure and urine patches



Interpreting Soil Test Results

What if you have:

- Low nutrient levels
 - Yield loss likely
 - Forage quality reduced
- Medium nutrient levels
 - Yield loss possible
 - Improved persistence of some species
- High nutrient levels
 - Benefits from fertilization unlikely



Fertilizer decisions

- Does it pay to raise low fertility to medium fertility ?



Increasing soil test levels from low to medium:

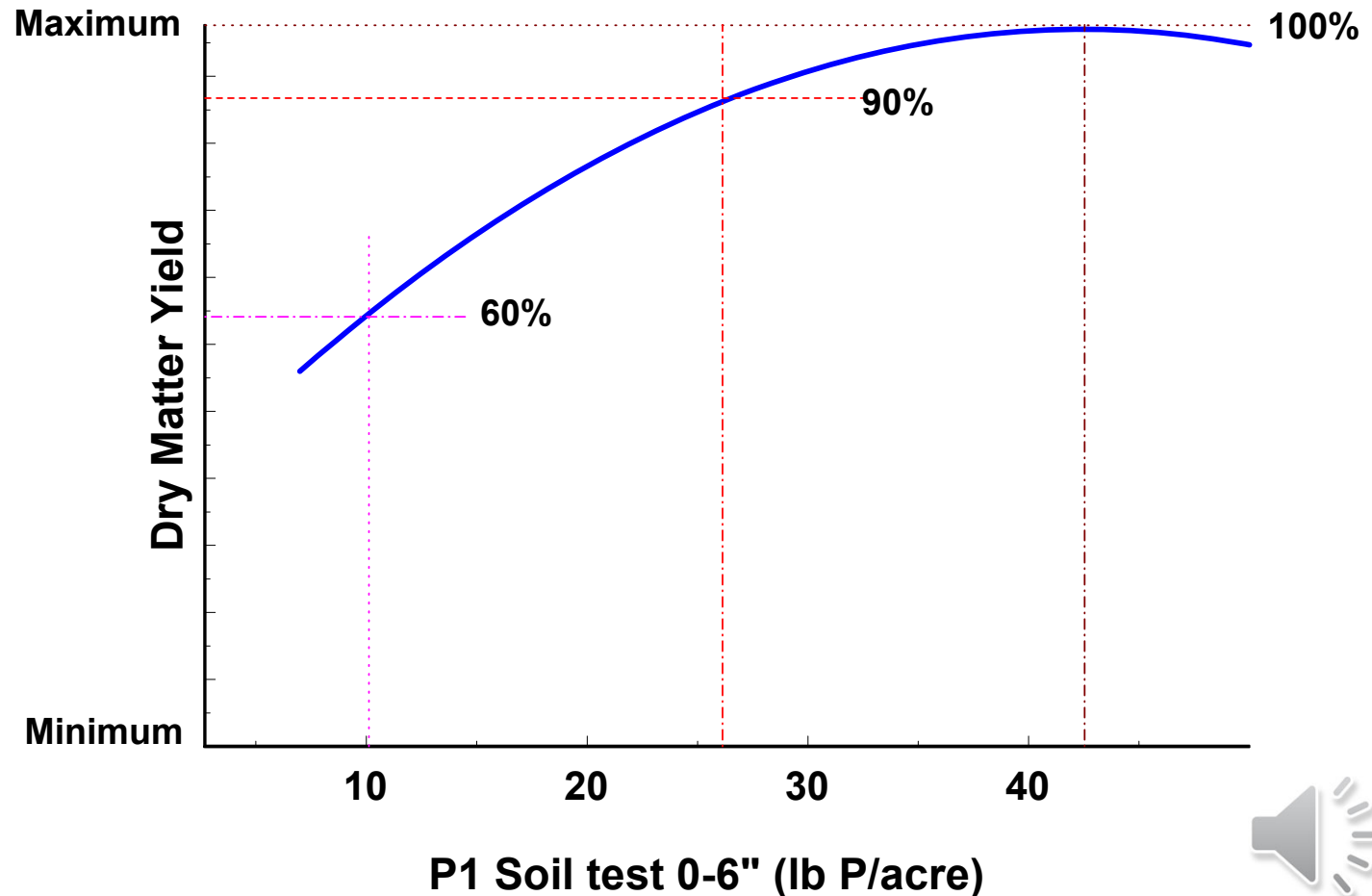
- Will increase legume persistence and production
- Will make available nitrogen more effective
- Will almost always pay



Should I apply additional nutrients?

■ Soil test levels

Going from
low to
medium
fertility
almost
always pays



Specific pasture improvements

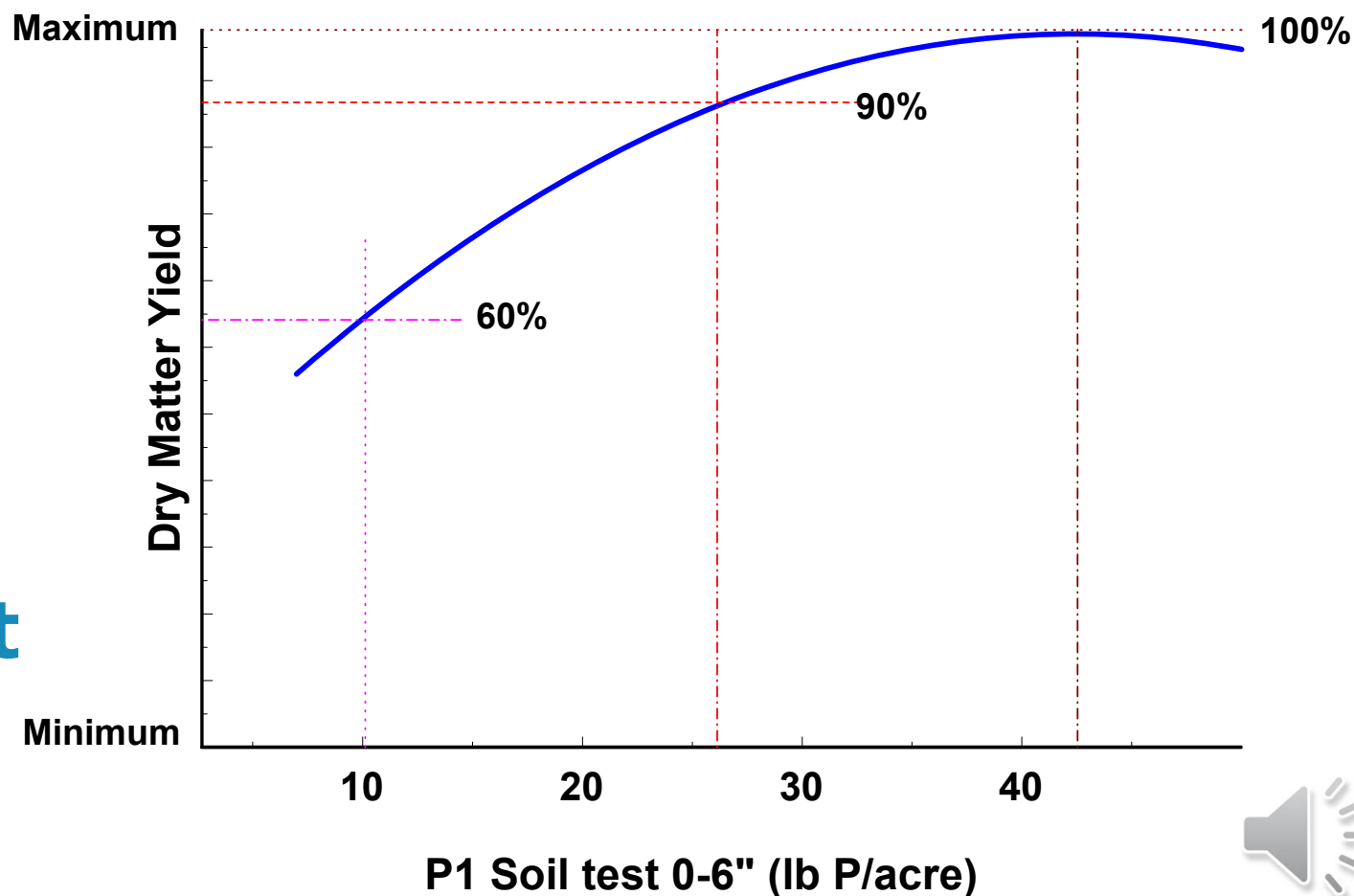
- Should you fertilize to raise medium fertility to high fertility ?
 - Some increase in productivity
 - Some increase in legume persistence
 - May improve drought resistance
 - Less likely to be beneficial in cow-calf situation



Should I Fertilize?

■ Soil test levels

Going from medium to high fertility only pays with high value product



Maintenance Applications

■ Pastures with MiG

- ◆ Low rates of P, K, S, and micronutrient removal
 - ◆ monitor with soil testing
- ◆ Nitrogen losses necessitate annual inputs
 - ◆ Legumes
 - ◆ Manures
 - ◆ Hay
 - ◆ Fertilizer



Should you be using N fertilizer ?

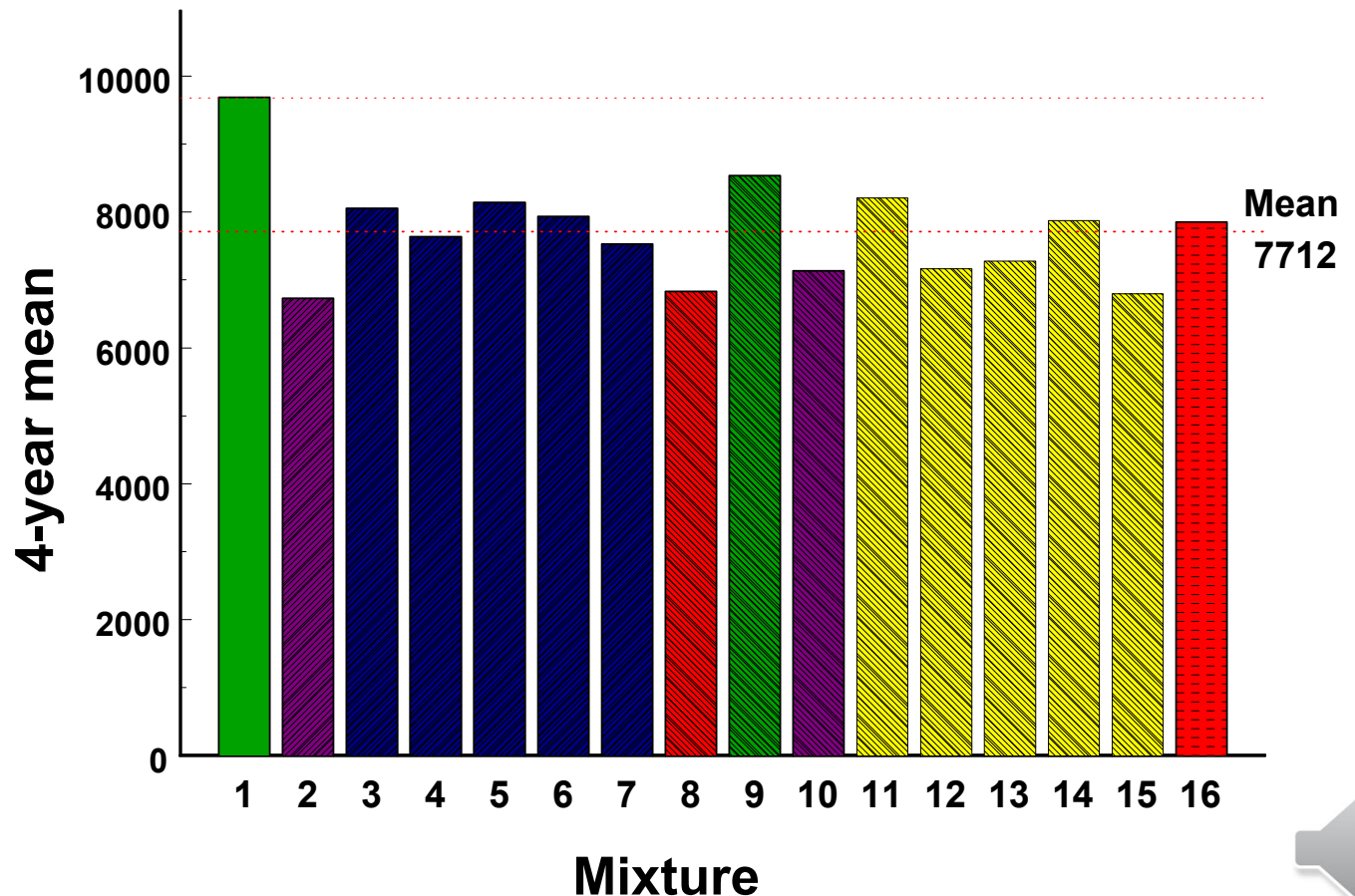


Grass + N vs Grass+Legume:

Tall fescue: 17 lb forage / lb N

Smooth brome: 3 lb forage/lb N

- 1: Fescue + 120 lb N
- 2: Fescue + 0 lb N
- 3-7: Fescue + legumes
- 8: TF+ OG+TM+legumes
- 9: Brome + 120 lb N
- 10: Brome + 0 lb N
- 11-15: Brome + legumes
- 16: TF+SB+OG+TM+BB
+legumes





N fertilization usually doesn't pay if legumes contribute 30 to 40% of yield

Nutrient management decisions

- Nutrient management on a budget
 - Target very low and low testing soils
 - Optimize use of legumes for N source
 - Manure can be an excellent nutrient source
 - Hay feeding is a good soil builder if done effectively
 - Even low addition rates of base nutrients (non-N) are beneficial over time



Making soil fertility pay

- Optimize forage utilization.
- Invest in adding nutrients where you expect the biggest benefit.
- The higher the value of your product, the better the return on fertility investments.



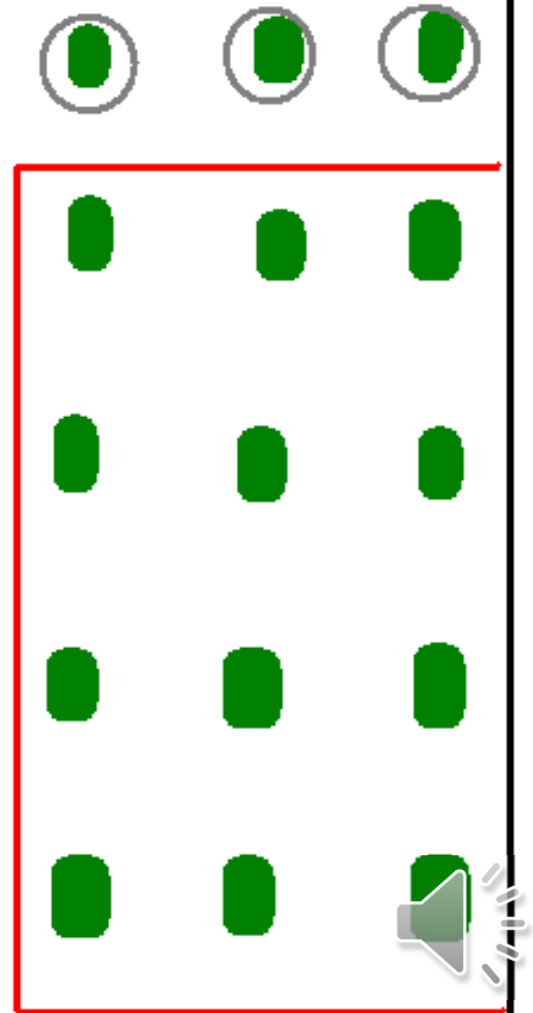
Using hay for building soil



When hay is fed, >90% of the minerals are returned to the soil



Spaced bale feeding system



**Managing where the nutrients end up
is your job**

**Ring feeders focus distribution in
limited areas**



Bale grazing is another alternative feeding strategy



In some cases the bales are fed
where they were dropped



How much of a good thing do you really need?

- 1 ton of 12% CP hay has 40 lbs of N
- 95% of N will be excreted in urine & dung
- About half of that N will be in urine & half in feces
- Thus, each ton of hay fed returns about 20 lbs of immediately available N to the soil
- **How much do you really want?**

Protein content of diet	8%	10%	12%	14%	16%
lbs of protein/ton	160	200	240	280	320
lbs of N/ton	26.4	33	39.6	46.2	52.8
lbs-N retained/ton fed	4.1	4.1	4.1	4.1	4.1
lbs excreted/ton fed	22.3	28.9	35.5	42.1	48.7
Fecal N excretion/ton fed	11.2	11.2	11.2	11.2	11.2
Urinary N / ton fed	11.2	17.8	24.4	31.0	37.6

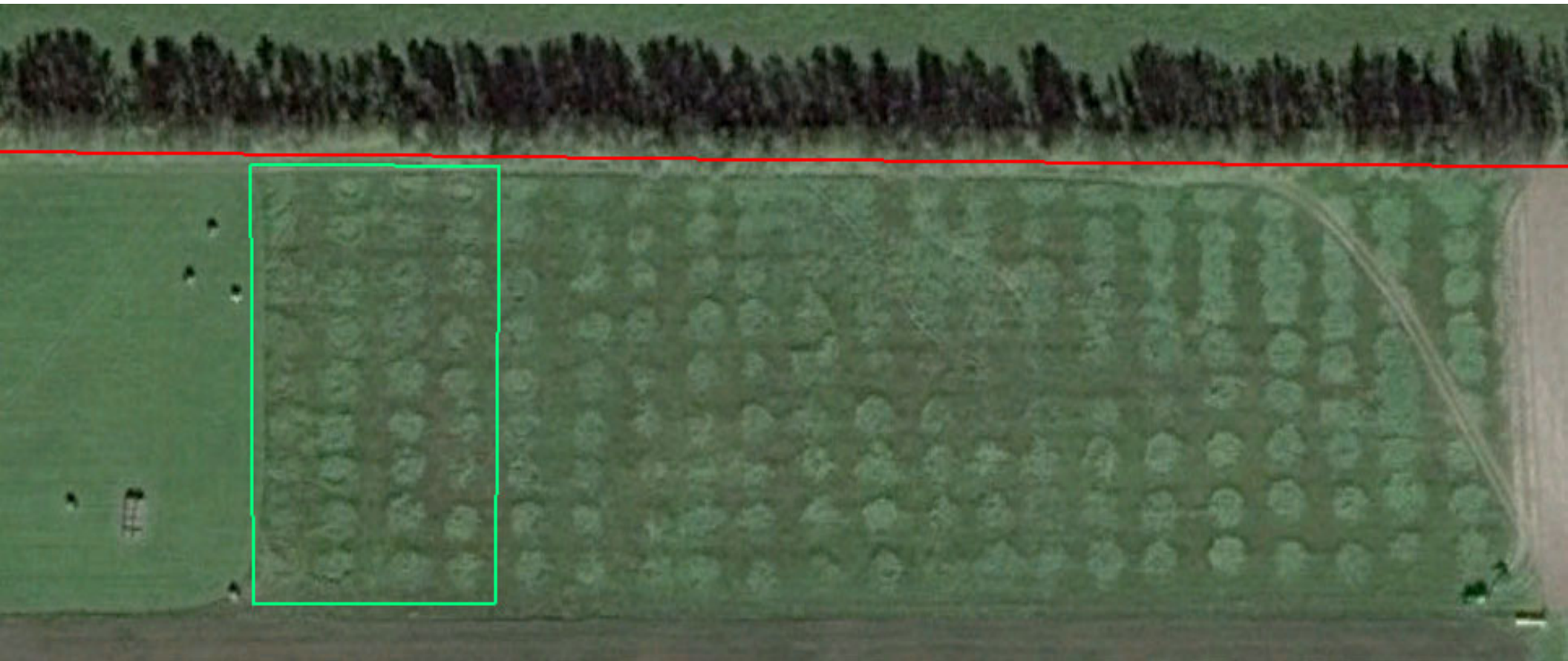


Do you feed to a target level of N or to excess nutrient loading ?

- Feed 5 tons/acre = 100 lbs/acre soluble N
- Feed 10 tons/acre = 200 lbs/acre soluble N
- Feed 20 tons/acre = 400 lbs/acre soluble N
- **Do you really want to put that much N in one place?**

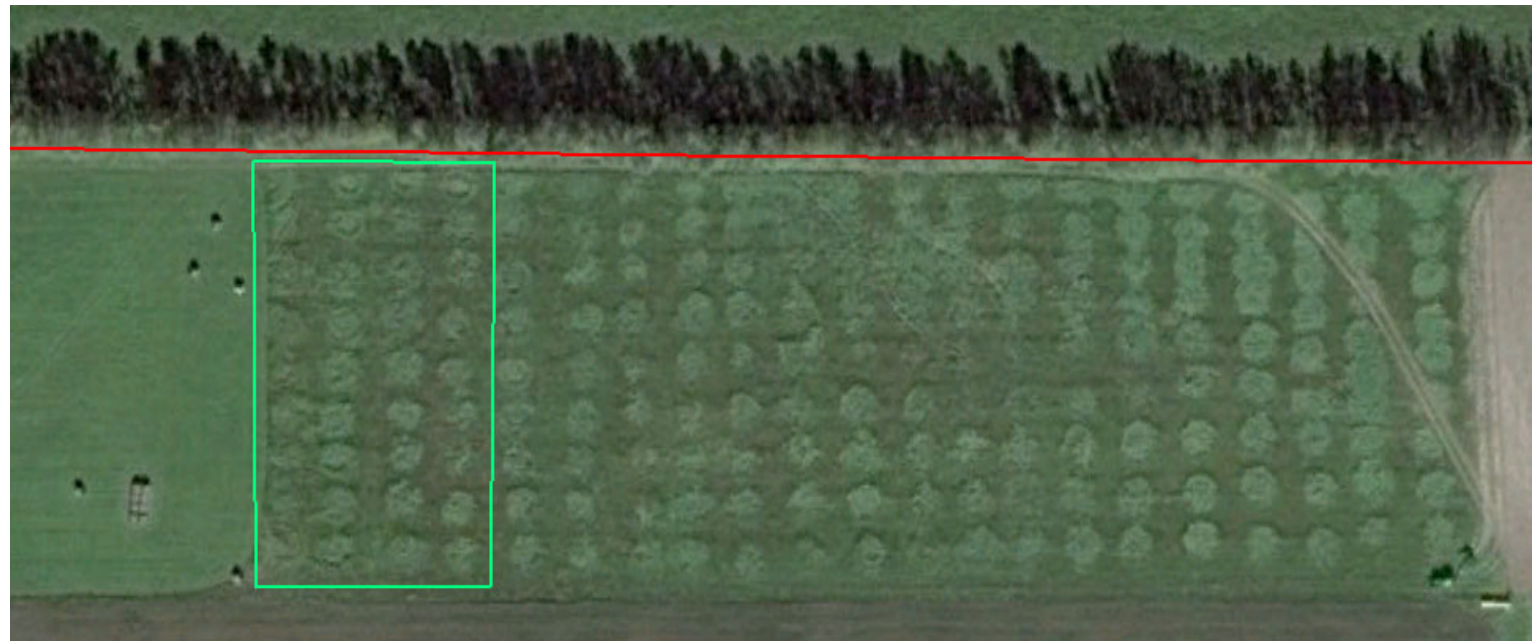
Example of nitrogen load level from bale grazing

- Feeding at 36 bales /acre @ 1300 lbs/bale = 412 lbs urinary N/acre



What about Phosphorus?

- Hay also contains P & a lot of other nutrients
- Typical P content ranges from 0.15% -> 0.3%
- Equivalent to 8 – 15 lbs P_2O_5 per ton fed
- **This example – about 80 lbs P_2O_5 / acre**



When is enough, enough

- How much N has been put down here?
- How much P?
- How much K?
- **Do you have a plan???**



250 cows in herd
Feed 30 lbs of hay/cow/day
7500 lbs of hay needed
Round up to 8000 lbs for wastage
One ton of 8% CP hay yields 11 lbs urinary N
Each day of feeding applies 44 lbs of soluble N
& 44lbs of slow release fecal N



You could feed 3 days on one acre to apply 120 lbs/acre

250 cows in herd
Feed 30 lbs of hay/cow/day
7500 lbs of hay needed
Round up to 8000 lbs for wastage
One ton of 14% CP hay yields 31 lbs urinary N
Each day of feeding applies 124 lbs of soluble N
& 44lbs of slow release fecal N



You could feed 1 day on one acre to apply 120 lbs/acre

Feeding big square bales



- Relatively low cost feeding system



Feeding to a target level

- Decide on your target N-rate
- Figure how many bales/acre are required
- Flake off the bales to cover a particular area
- Provides more uniform manure distribution compared to bale grazing or spaced-bale feeding



Cost is relative to equipment used



Feeding hay on ground with processor



- Distributes cattle and manure much more efficiently



Feeding & loading calculation

- Strip $\frac{1}{2}$ mile long X 16.5 ft = 1 acre
- 80 acres is 1320 ft wide
- Would take 80 days to completely cover 80 acres feeding at this rate



Pasture improvement

- Soil nutrient management
- Interseeding & managing legumes



Creating & Managing high-legume content pastures



Role of legumes in pasture

- Provide high quality forage



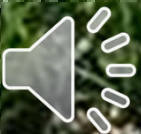
Grass vs. Grass-legume pastures: For beef cattle

- 20-80 lbs increase in weaning weights
- $\frac{1}{4}$ - $\frac{1}{2}$ increase yearling ADG
- Improved conception rates
- Lower cost/lb of gain



Grass vs. Grass-legume pastures: For lambs

- 2-20 lb increase in weaning weights
- .1 to .3 lb increase ADG
- Improved conception rates
- Lower cost/lb of gain



Role of legumes in pasture

- Provide high quality forage
- Source of N for the pasture



Nitrogen fixation

- N-fixation is a symbiotic bacterial process taking place in the root nodule
- Essential to have the right bacteria in the soil
- Much of the legume soil nutrient requirements are actually for the bacteria
- Perennial legumes can fix 30 to 300 lbs N/acre
- Annual legumes can fix 20 to 100+ lbs-N/acre
- Slow release N



Table 1. N fixation in mixed legume-grass stands on class 1 soils in Iowa

Species	<u>N fixed</u> 1 st year	<u>(lb/acre)</u> old stand	N from fixation
Alfalfa	70-80	120-230	60 - 94 %
Red Clover	10-90	130-250	40 - 96 %
Birdsfoot Trefoil	30-60	80-150	40 - 94 %
White Clover	10-100	20-240	35 - 100%



Role of legumes in pasture

- Provide high quality forage
- Source of N for the pasture
- Look good



Types of cool-season legumes

- Annual clovers

- Crimson
- Arrowleaf
- Ball
- Berseem
- Hop

- Annual vetches

- Hairy
- Common
- Big flower

- Biennials

- Yellow sweet clover
- Red clover(?)

- Perennial legumes

- Alfalfa
- Sainfoin
- Red clover
- White clover
- Alsike clover
- Birdsfoot trefoil
- Cicer milk vetch



Don't be afraid to use more
than one type!



Types of warm season legumes

■ Annuals

- Korean lespedeza
- Common lespedeza
- Cow peas
- Phaesi beans
- Mung beans
- Soybeans

■ Perennials

- Seresia lespedeza
- Perennial peanut
- Jointvetch



Cowpea & sorghum cover crop



Critical factors for growing legumes

■ Soil pH & liming

- Most legumes require >6 to thrive
- Some will do okay in mid 5 range
- Calcium is an essential plant nutrient
- Low pH choices: annual lespedeza, alsike clover, hairy vetch
- Warm season legumes have lower requirements
- Apply lime 6 months ahead of legume seeding



Critical factors for growing legumes

- Soil pH
- Phosphorus
 - Most legumes need at least medium P levels (P₁ test >15 ppm)
 - *Native legumes can do with less*
 - High P levels can offset some of the effects of lower pH
 - Plowing down rock phosphate really helps long term legume persistence



Critical factors for growing legumes

- Soil pH
- Phosphorus
- Potassium –
 - Difficult to maintain adequate levels on sandy soils- may need annual application
 - > 150 ppm on sand
 - > 100 ppm on clay



Critical factors for growing legumes

- Soil pH
- Phosphorus
- Potassium
- Sulfur
 - Essential for nodulation and N fixation
 - Need moderate level, not excessive



Critical factors for growing legumes

- Soil pH
- Phosphorus
- Potassium
- Sulfur
- Other micronutrients – Mo, B
 - Locally deficient to excessive
 - Don't use micros indiscriminately !



Critical factors for growing legumes

- Soil pH
- Phosphorus
- Potassium
- Sulfur
- Other micronutrients – Mo, B
- Inoculate seed
 - Use appropriate rhizobia inoculant
 - Make sure it is viable



How do we create high-legume content pastures?



Legume interseeding: Broadcast seeding

- Frost seeding
 - Needs multiple freeze-thaw cycles to work effectively
- Snow seeding
 - Do on late season snow
 - Seed pulled to ground as snow melts from the bottom up
- Feeding in mineral?
 - Most seed is digested in rumen



Legume interseeding: No-till drilling

- More consistent results compared to broadcast
- More expensive compared to broadcast seeding
- Soil needs to be in proper moisture state for drill to work
- Seed placement is critical!



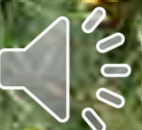
Recommendations:

Red clover - 4-6 lb/A

White clover - 1-2 lb/A

Alsike clover - 1-2 lb/A

Birdsfoot trefoil - 3-4 lb/A



Legume natural reseeding: Hoof & Tooth

- Allow pasture to produce mature seed
- Graze for 24 hours to put seed in rumen
- Move cattle to pasture to be interseeded
- Leave cattle there for 48 hours
- Seed is distributed via manure



What about native legumes?

- Important source of N for native rangelands
- Some are nutritious & beneficial
- Some are potentially toxic
- Dilution is the solution to pollution



Dilution is the solution to pollution

- Livestock rarely overeat toxic legumes as long as desirable feed is abundant.
- Don't leave cattle too long in pastures with abundance of possibly toxic legumes



Pasture improvement

- Soil nutrient management
- Interseeding & managing legumes
- Fence & stock water developments



Specific pasture improvements

- Fence and water developments
 - Improve your control of the operation
 - Increase pasture utilization
 - Subdivision makes all other pasture improvements more manageable and more cost effective



Electrified 12.5 ga hi-tensile as permanent fence



Self-insulating line posts



Use temporary fence for additional paddocks



Even in winter !





Buried pipelines for
year-around use



Permanent tank for larger herds



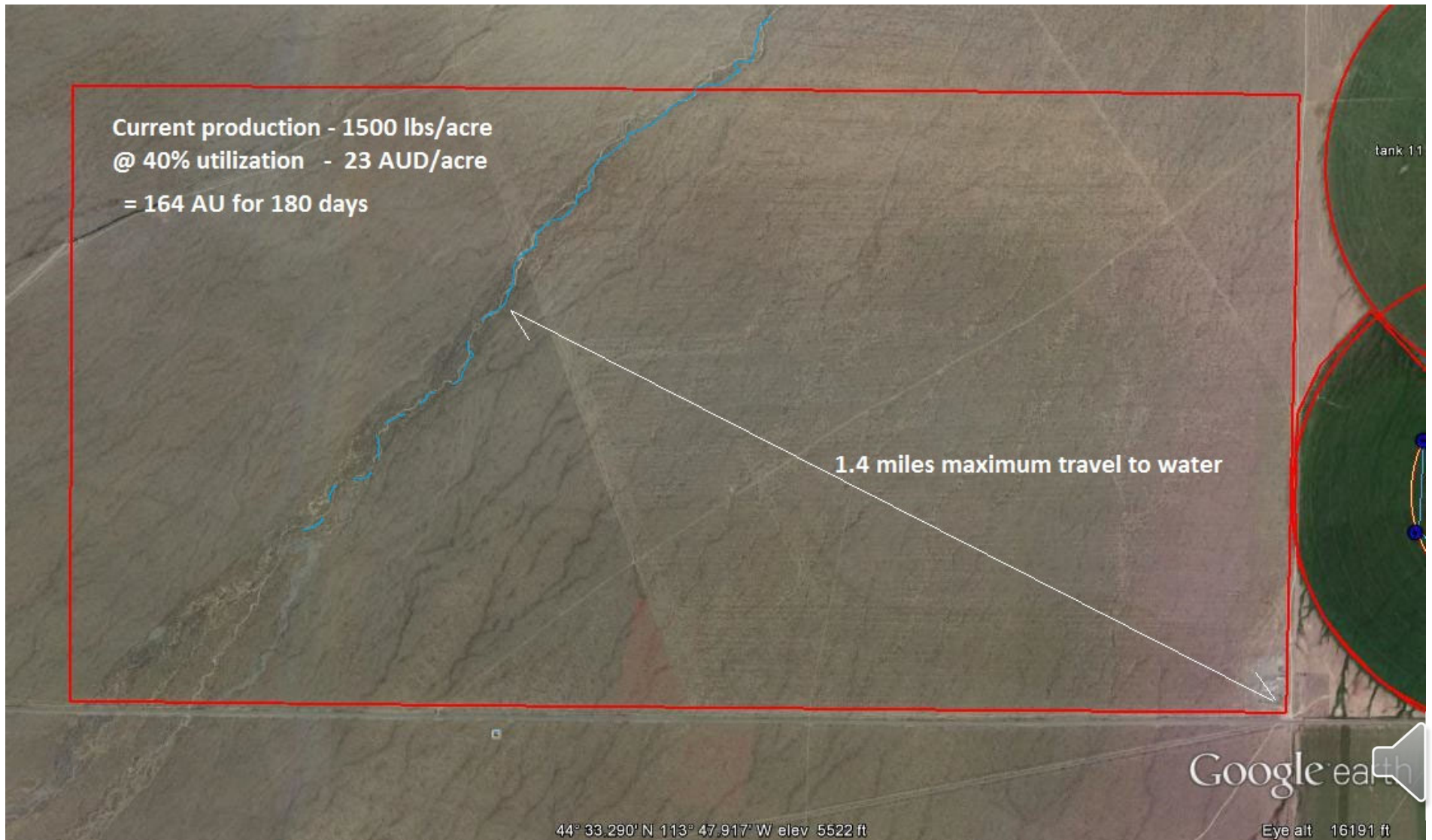
Movable tank for smaller herds



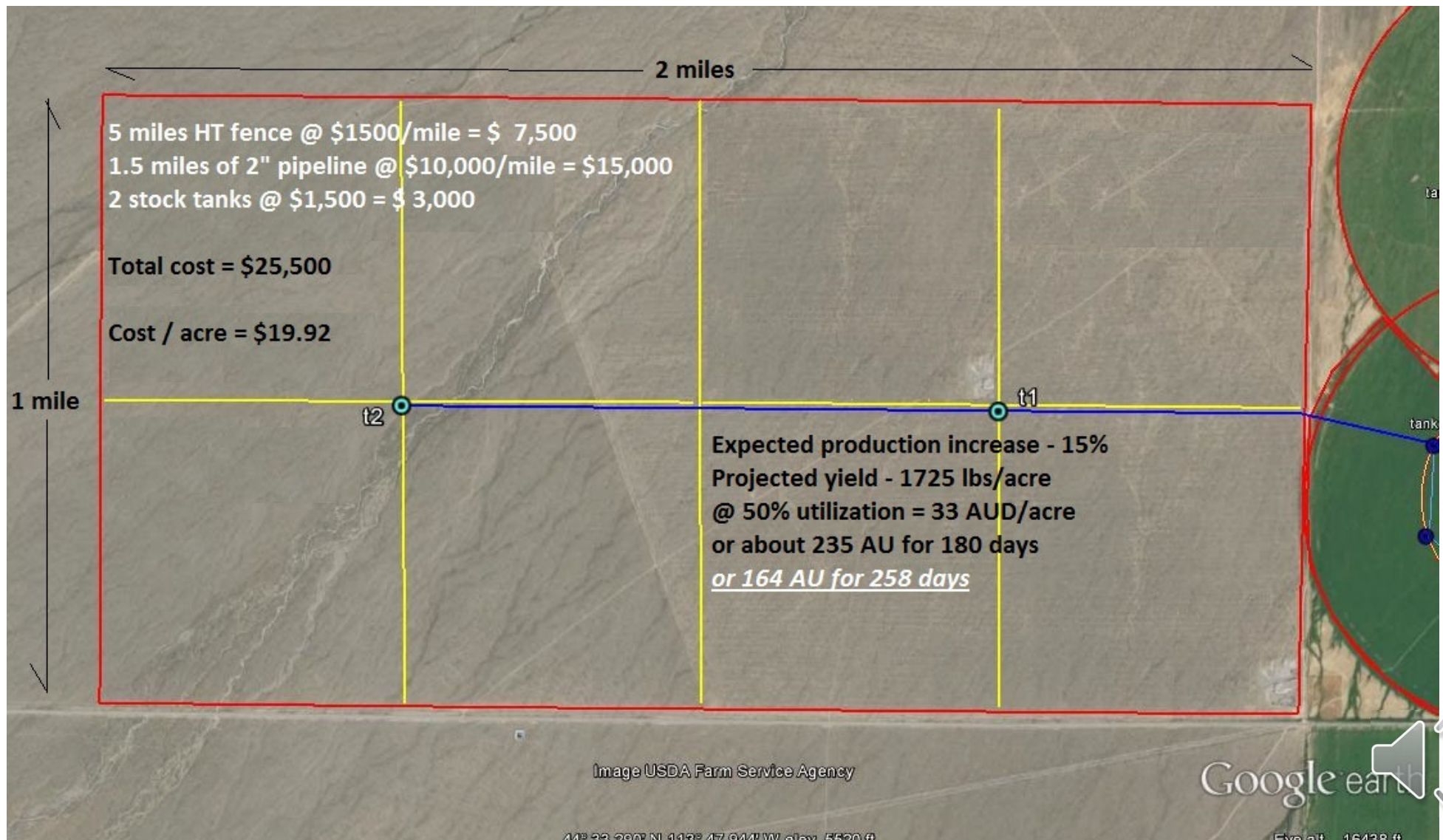
Tools for longer runs of fence



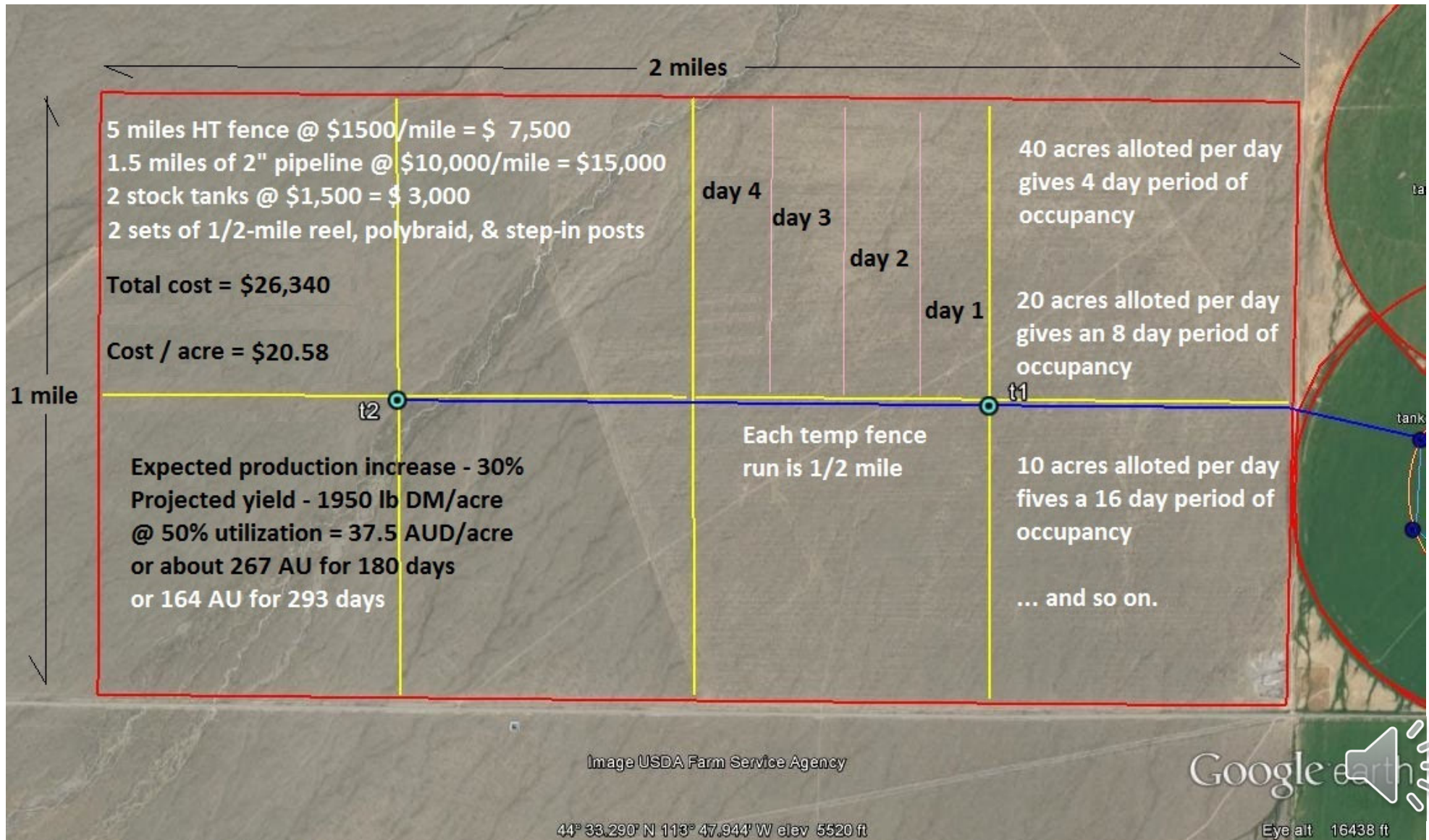
Assess your current situation



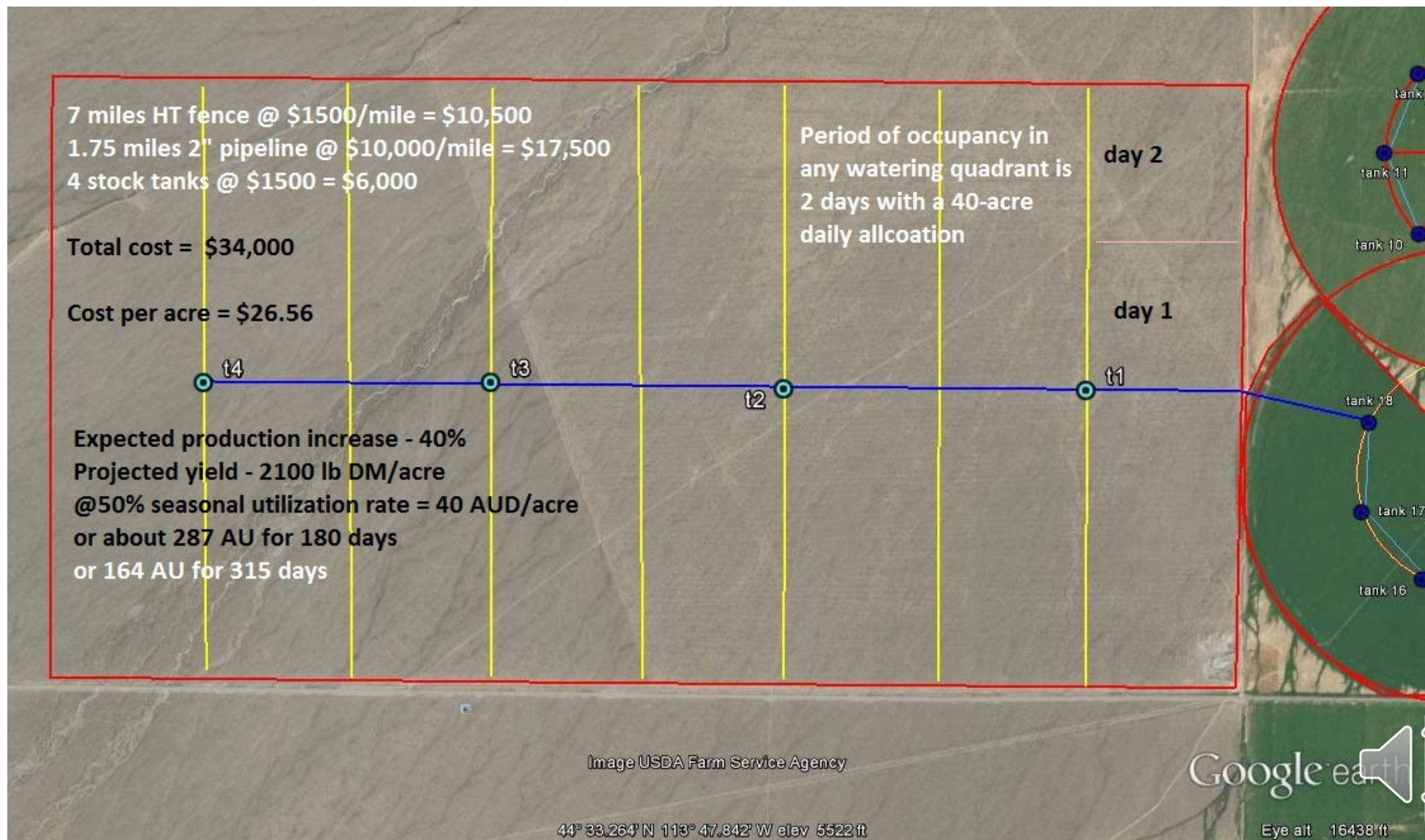
Evaluate your alternatives



What if you put a little more management into it?



Look at some other options

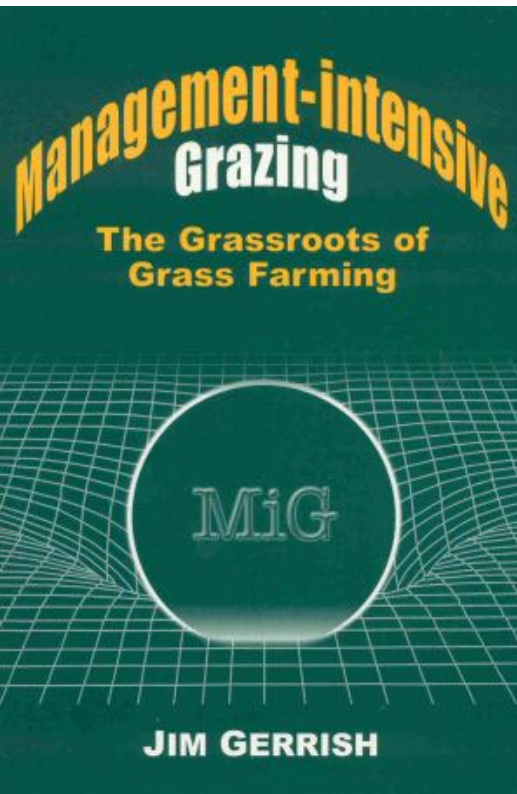


Summary

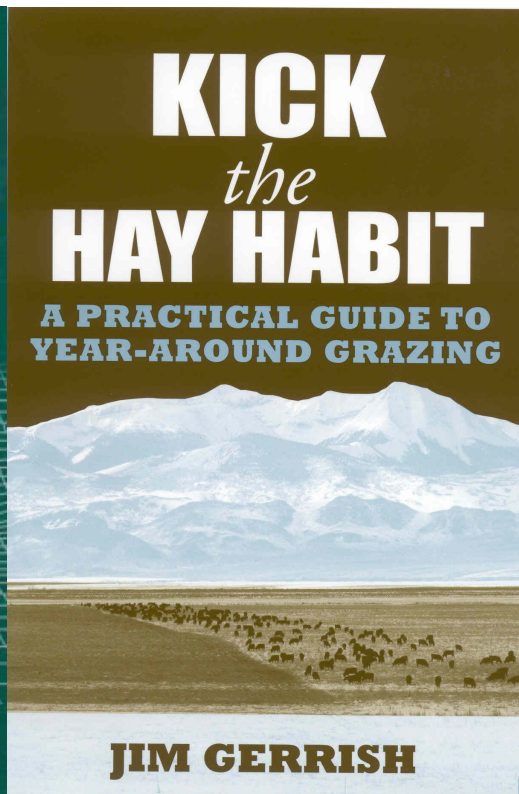
- Have a plan for where you want to be
- Know why a pasture needs improvement
- Make other necessary management changes
- Choose improvements that are right for your operation and resources



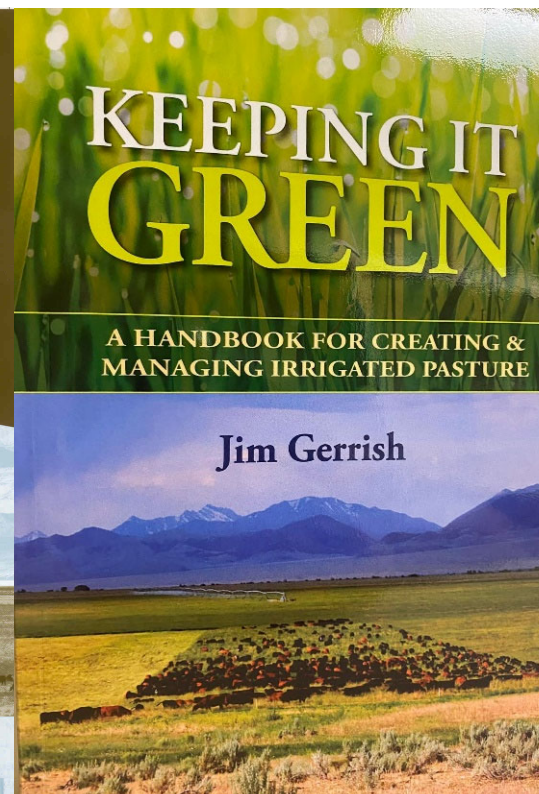
Books by Jim Gerrish



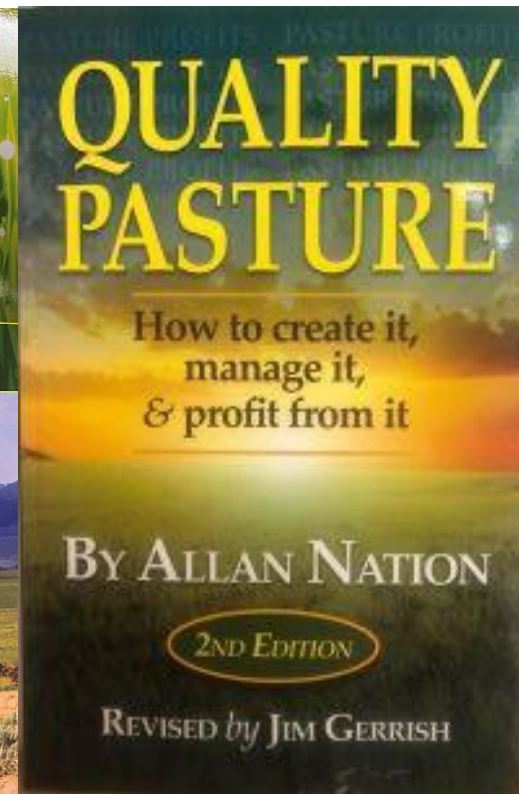
\$31



\$27



\$20



\$30

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