Cover Crop Multi Species Mixes for Lower Feed Cost & Soil Improvement

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We Know There Are Many Benefits of Pasture Grazing

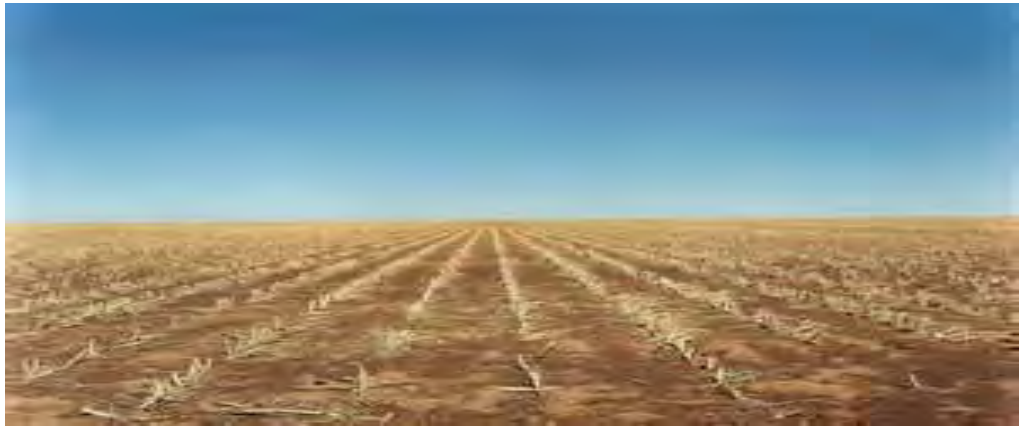
- Low labor costs to feed animals
- Low depreciation cost on equipment
- Can provide high quality forage for animals
- Healthy environment for animals
- Environmental benefits to the earth's environment (reduced soil erosion, greater water infiltration, soil carbon sequestration, wildlife habitat, etc.)
- Viewed by society to afford better animal comfort than confined housing

Hay making has gotten expensive

If You Have Animals Here is Another Reason to Graze as Long as Possible

Making dry hay will cost $85 - $105/ton in 2017 MSU Extension

So why not graze more and feed less hay ?



Do You Have Enough Pasture To Graze More?

- **Usually need 2 – 5 acres of pasture per cow/calf pair;**

  0.2 – 0.8 acres for sheep or

  goat females with lambs/kids

- **Do you have to start feeding hay in the early fall? How late can your pasture last –Nov.?, Dec.? , Jan.?**
- **When you factor in the storage loss (8%) & feeding wastage (10%) $100/ton hay costs $1.78/cow/day vs $1.17/cow/day for pasture**

Alfalfa/grass Hay, 3 cuts, 3.8 T/acre 2017 Osceola Co. MSU Extension

	Quantity	Unit	Price per Unit	Total per Acre
REVENUE SOURCES				
Alfalfa Hay	3.8	ton	$115.00	**$437.00**
Cash Expenses				
Seeding Yr. Costs (less 1st yr. hay revenue)				$54.00
Fertilizer				
Phosphate	48	lb. ($590/t 0-46-0)	$0.64	$23.96
Potash	200	lb. ($365/t 0-0-60)	$0.30	$45.00
Boron	2	lb.	$5.00	$10.00
Land Cost				$ 50.00
Storage & Utilities				$10.00
Twine, Wrap	8	bales	$2.00	$16.00
Fuel, Oil, Lube	8	gal	$1.50	$17.25
Equipment Repairs				$56.00
Equipment Depreciation				$22.50
Trucking/Hauling	3.8	ton	$4.80	$21.20
Labor	3.0	hrs.	$15.00	$45.00
TOTAL SELECTED CASH EXPENSES			**$97.61/ton**	**$ 370.91**
REVENUE ABOVE SELECTED CASH EXPENSES				**$ 66.09**

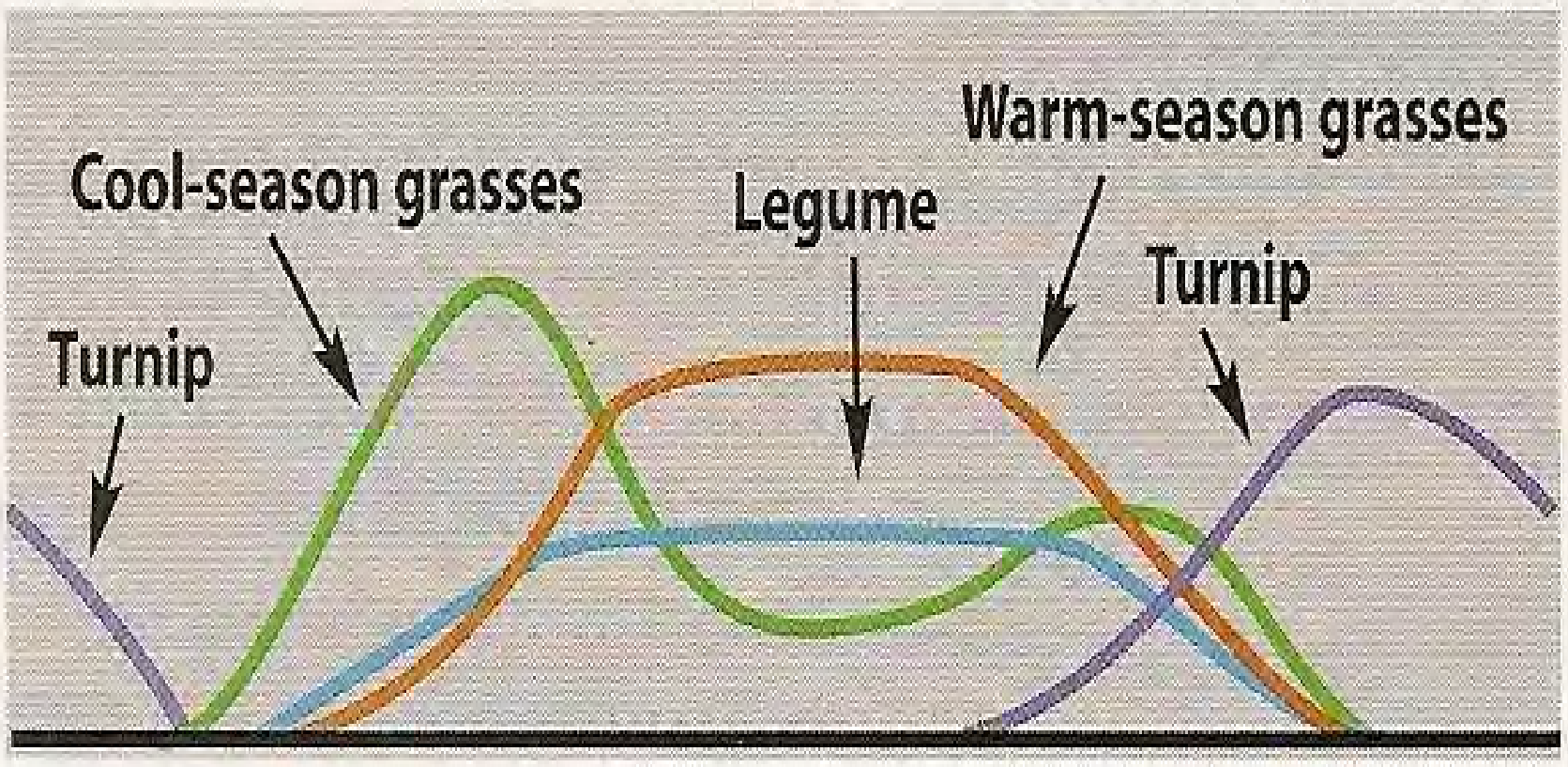
Options For Fall Grazing

- Corn field residue
- Hay fields
- Stockpiled pasture
- Rent extra pasture ground for fall grazing
- Just feed hay if under $50/ton

- Annual forage crops
  - Grazing standing corn
  - Turnips with small grain
  - Rape with small grain
  - Kale with small grain
  - Oats, triticale, or wheat
  - Cover crop cocktail mixes, or multi specie cover crop mixes

Figure 5. Growth patterns of forage species by region.

Corn Belt, Upper Midwest, and Northeast



Latest Trend Has Been to Graze Multi Species Cover Crop Mixes (3 - 12 way mixes)

Advantages of Multi Specie Mixes for Grazing Over 1 or 2 Way Mixes

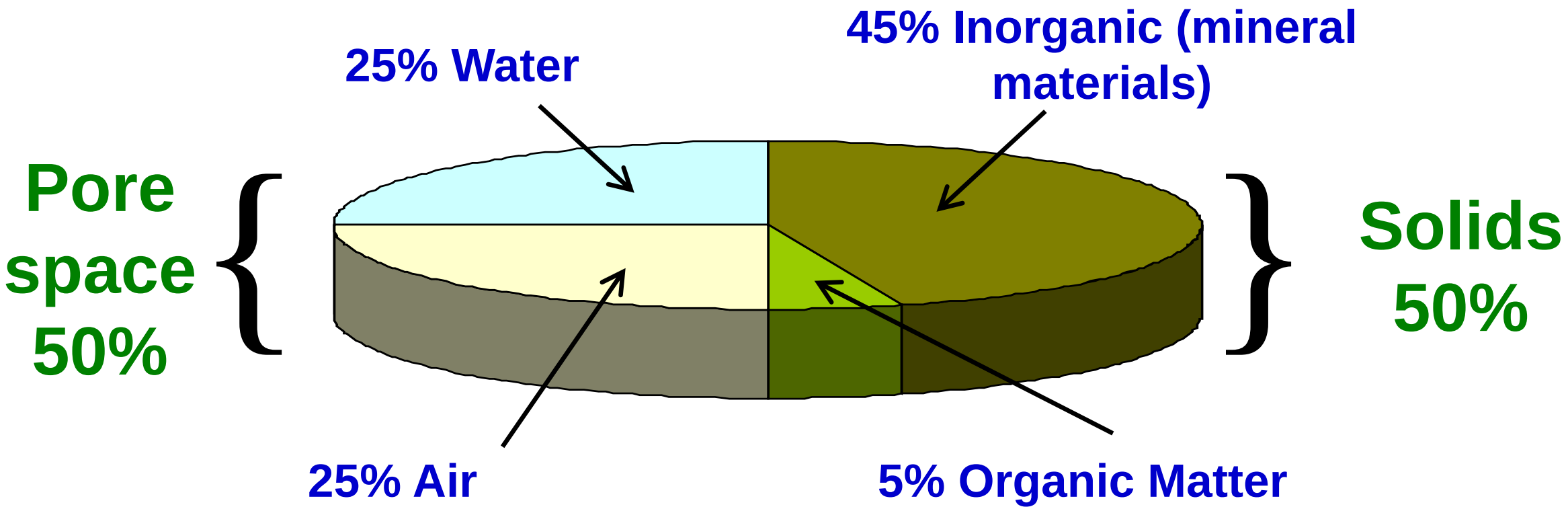
- Plant diversity improves yield efficiency
- Plant diversity reduces weather, insect, and wildlife risks
- Plant diversity reduces risk of feed toxicity i.e. nitrate toxicity, bloat, etc.
- Plant diversity provides for a more balanced diet of protein, fiber, energy, and minerals
- And these complex mixes seem to have an extra benefit for the soil

Multi Specie Mixes Seem to Have Some Soil Improving Benefits

If we want more efficient crops

We need better soils

The Ideal Soil



How Do You Increase Soil Organic Matter?

- Organic Matter is material in the soil that was once part of a living organism.
- Examples = plant leaves, stems, roots, animal manures, poultry litter, compost, sawdust, etc.

- Additions of any of these can increase soil organic matter
- Even management practices like not over-grazing pastures

Value of Soil Organic Matter

Assumptions: 2,000,000 pounds soil in top 6 inches
1% organic matter = 20,000#

Nutrients:

Nitrogen:	1000# * $0.50/#N	=	$500
Phosphorous:	100# * $0.48/#P	=	$ 48
Potassium:	100# * $0.42/#K	=	$ 42
Sulfur:	100# * $0.50/#S	=	$ 50
Carbon: 10,000# or 5 ton	* $2/Ton	=	$ 10

Value of 1% SOM Nutrients/Acre = $650

Jim Kinsella/Terry Taylor (2006)

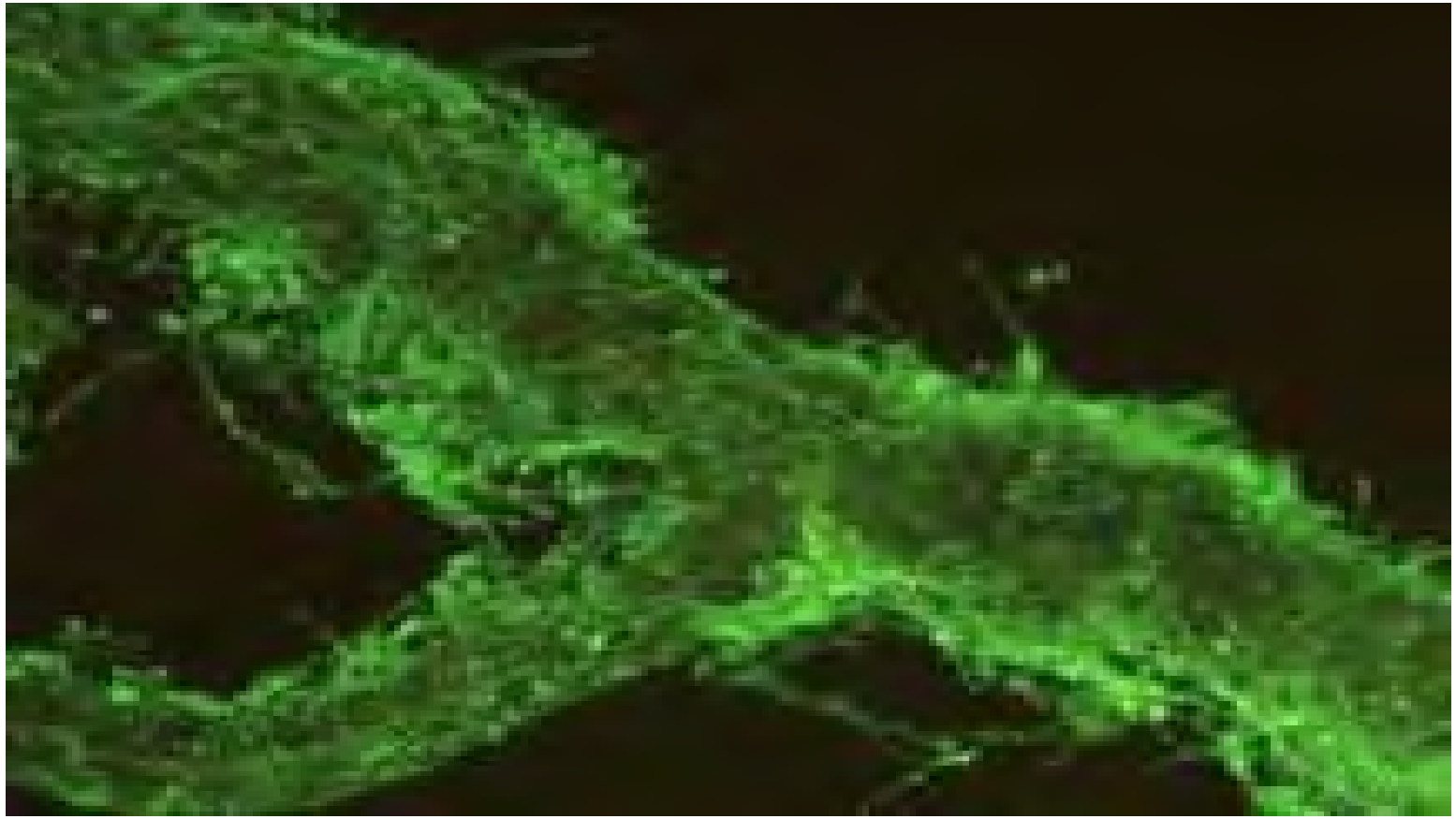
Also Soils Higher in Organic Matter Hold More Water

- For every 1% increase in soil organic matter the soil will hold an extra 1 acre inch of water (27,200 gals per acre)
- Also we know that living plants on the soil surface increase rainfall infiltration

Multi Specie Cover Crop Mixes are One New Efficient Way to Improve Organic Matter

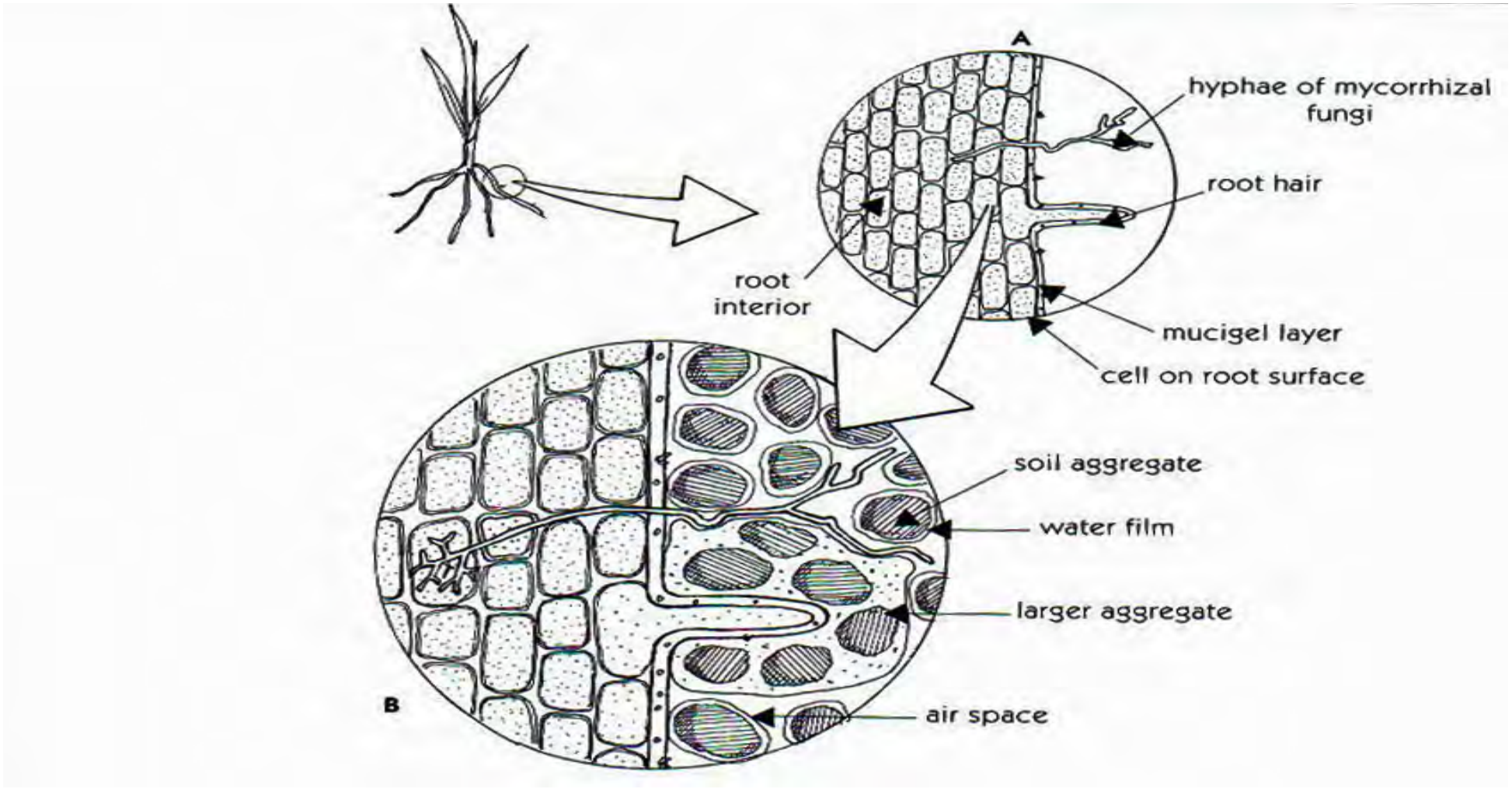
Long Term Benefits

- Reduce soil erosion & evaporation – i.e. protect the soil for more months of the year
- Increase rainfall infiltration
- Increase soil organisms in soil surface
- Mine nutrients from deep down in sub soil
- Increase soil organic matter (ND trial went from 3% to 11% in eight years)



Sticky substance, glomalin, surrounding root heavily infected with mycorrhizal fungi. Fungi help roots explore up to 20% of the soil volume. A root by itself can only explore 1% of the soil volume. Photo by Sara Wright.

Mycorrhizal Fungus



“Grazing Animal is the Key to making multi specie mixes work better”, Gabe Brown

- Keep the soil covered with armor 365 days.
- Keep a living root in the soil as much as possible.
- Use the grazing animal to graze 1/3, and trample 1/3. Let the other 1/3 stand for soil protection and re-growth.
- Use no till, or at least minimum till – why build organic matter and then destroy it.
- Try new things – on our ranch if we don’t fail at least 3X per year we are not progressing enough

Michelle & Chad Nicklas, Hersey, MI.

- Seeded Aug. 5., 2014
- 6 lbs. of oats/acre
- 6 lbs. of Italian Ryegrass/acre
- 6 lbs. of Winter Triticale/acre
- 2 lbs. of Mammoth Red Clover/a
- 2 lbs. of Forage Radish/acre
- 2 lbs. of Turnip/acre
- 1 lbs. of Hairy Vetch/acre
- Total of 25 lbs/acre (assuming there would also be volunteer wheat)
- Topdressed 56 lbs. of N/acre on Sept. 14

Nicklas Farm

- Avg. herd of 17 cows grazed the 16 acre field from Oct. 21 – Dec. 31
- Establishment costs $77.90/acre or $0.94/head/day
- Feeding hay would have cost $1.71/hd/day ($95/ton hay)
- Savings of $0.77/hd/day, plus manure was already applied
- Soybean yield on this field in 2016 was 46 bu/acre. Best yielding field!

Salinas Farms

- On August 14, 2015 planted different trials on 56 acres wheat stubble:

- Forage Plus Oats 44 lbs/a & Barkant Turnips 6 lbs/acre
- Forage Plus Oats 40 lbs/acre & Nitro Radish 5.3 lbs/acre
- Forage Plus Oats 40 lbs/acre & Winfred Hybrid Rape 5.3 lbs/acre
- F. P. Oats 40 lbs/acre, Barkant Turnips 1.3 lbs/a, Nitro Radishes 1.3 lbs/a, & Impact Forage Collards 1.3 lbs/a
- On other 50 some acres seed oats, Dwarf Essex Rape, and turnips

Salinas Farms

- Top dressed fertilizer on 9/12/15
- Ran a total of 160 cows ten days in Oct. & more days for a second graze in Nov.
- Cows had access to pasture as well
- Estimated seed ($38), fertilizer ($42), no till drill cost ($17), and interior fence costs totaled $98.23/acre

Mark Fuller Farm

- In Mid-Aug. seeded oats, wheat, rape, triticale, turnips, and peas on five acres.
- Grazed 36 cows for 21 days plus fed four round bales (4x5s) of hay
- If fed hay 36 cows X $1.67 X 21 days=$1,263 of hay
- If it costs $100/acre X 5 acres=$500 to plant (seed + 200 lbs/a 16-16-16 + field work)
- If hay that was fed was $95/ton, then 4 bales fed X $40/bale = $160
- Total costs $500 + $160= $660
- Savings would be $1,263 - $660= $603 or $0.80/cow/day

John Miller Farm, Clare, MI. 2016

- Ran 33 cows on 18 acres for 28 days & fed 4.5 ton of grass hay over that time

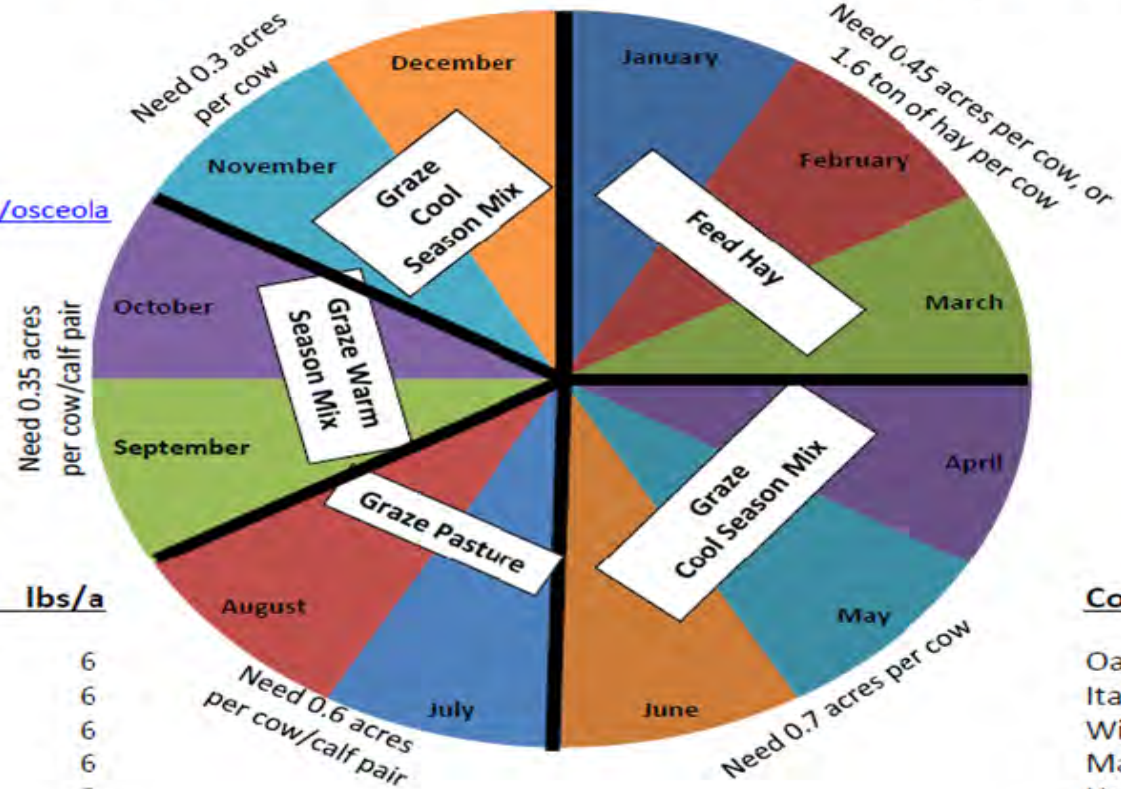
- Saved $68/acre in hay feed cost ($1,225) vs. feeding just hay
- Do not know his seeding cost

Greatest Challenge on Beef & Dairy Farms May Be Where to Fit Cover Crops Into Rotations

- Multi specie cover crop mixes need 70 – 110 days to maximize yield potentials before fall temps drop into the low 20s F
- Seeding after wheat or oat harvest works well
- After a 1st cutting hay field or pasture that is due for renovation
- We don’t believe the economics justify taking out a productive grass sod pasture just to grow a cover crop.

Beef Cow Herd Annual Feed Supply
Utilizing Multi Specie Cover Crop Mixes

For more info go to:
http://msue.anr.msu.edu/county/info/osceola
under "Grazing"



Note that the cool season mix acreage for Nov-Dec and for April-June will be the same crop.

Acreage requirements per cow do not include feed requirements for replacement heifers.

Warm Season Mix Example	lbs/a
Sorghum/Sudan grass hybrid	6
Hybrid millet	6
Forage soybean	6
Italian ryegrass	6
Mammoth red clover	2
Sunflower	1
Radish	1
Turnip	1

All blended in large seed box of grain drill and seeded after risk of spring frost is gone.

Jerry Lindquist, MSU Extension
Grazing & Crop Management Educator

Cool Season Mix Example	lbs/a
Oats	6
Italian ryegrass	6
Winter triticale	6
Mammoth red clover	2
Hairy vetch	1
Radish	2
Turnip	2

All blended and seeded in grain drill large seed box in July – mid August after a hay, oat or wheat harvest.

Soil Fertility is Important for Cover Crops

- Soil pH should be above 6.0 for grasses and brassica; at 6.5 or higher for legumes
- P & K should be at adequate levels
- Nitrogen is important for brassicas and grasses: 25 – 30 lbs./acre of N at planting time, & topdress of 40 – 50 lbs. on N in late Sept for cool season mixes
- 1 lb./acre of Boron helps brassicas on low organic matter soils and maybe sulfur

Recommendations for Multi Specie Fall Cover Crops for Grazing

- Seed 25 – 35 lbs. of total seed per acre (try to keep total budget under $90/acre)
- Seed by August 10
- Seed 4 – 12 different plant species (do include oats, radish & turnips)
- Mix all in the big seed box of drill, plant mix at 1” depth
- Soil test and follow recommendations for the oats, except increase nitrogen to 55 – 70 lbs/acre
- If field is tilled apply fertilizer including 20 lbs./acre of N before planting, then topdress 50 lbs./acre of additional N around Sept. 20.
- If field will be no tilled apply necessary fertilizer at planting except no N, apply 55 lbs/a of N topdress around Sept. 20.
- Try to not graze until close to Nov. 1
- Be aware of herbicide carry over restrictions from previous crops


Cover Crop
Interseeder
Nitrogen

2015 Chris & Mary Harrington 10 acre field

- After 1st cut Sudex Aug. 10
- Drilled into live stubble a mix of
  30 # field grain rye

  30 # oats

  5 # hairy vetch

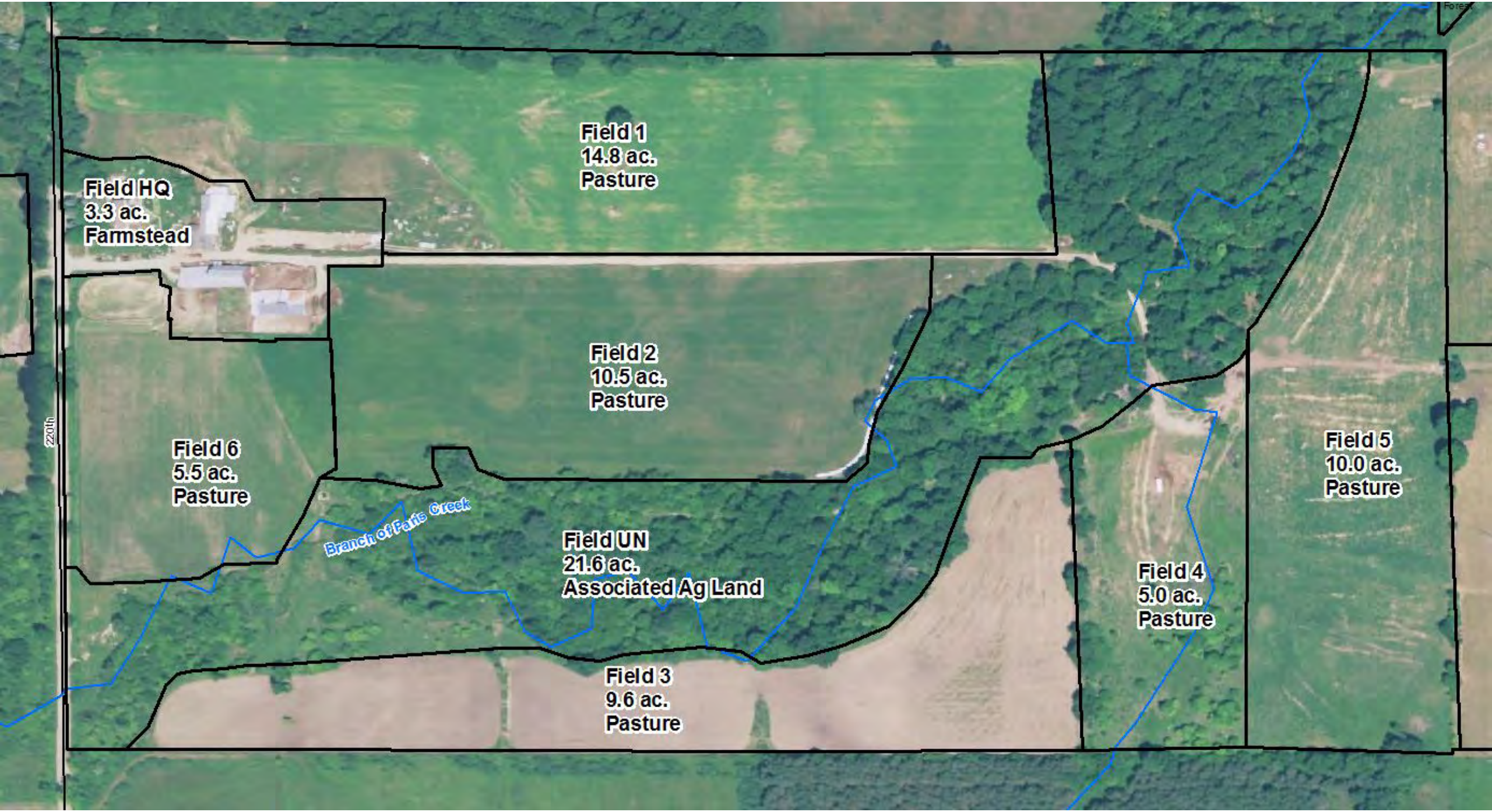
  1 # turnip/acre
- Grazed in late Nov. for 4 days
- Grazed 70 cow/calf pairs in late May, 2016 for 28 days

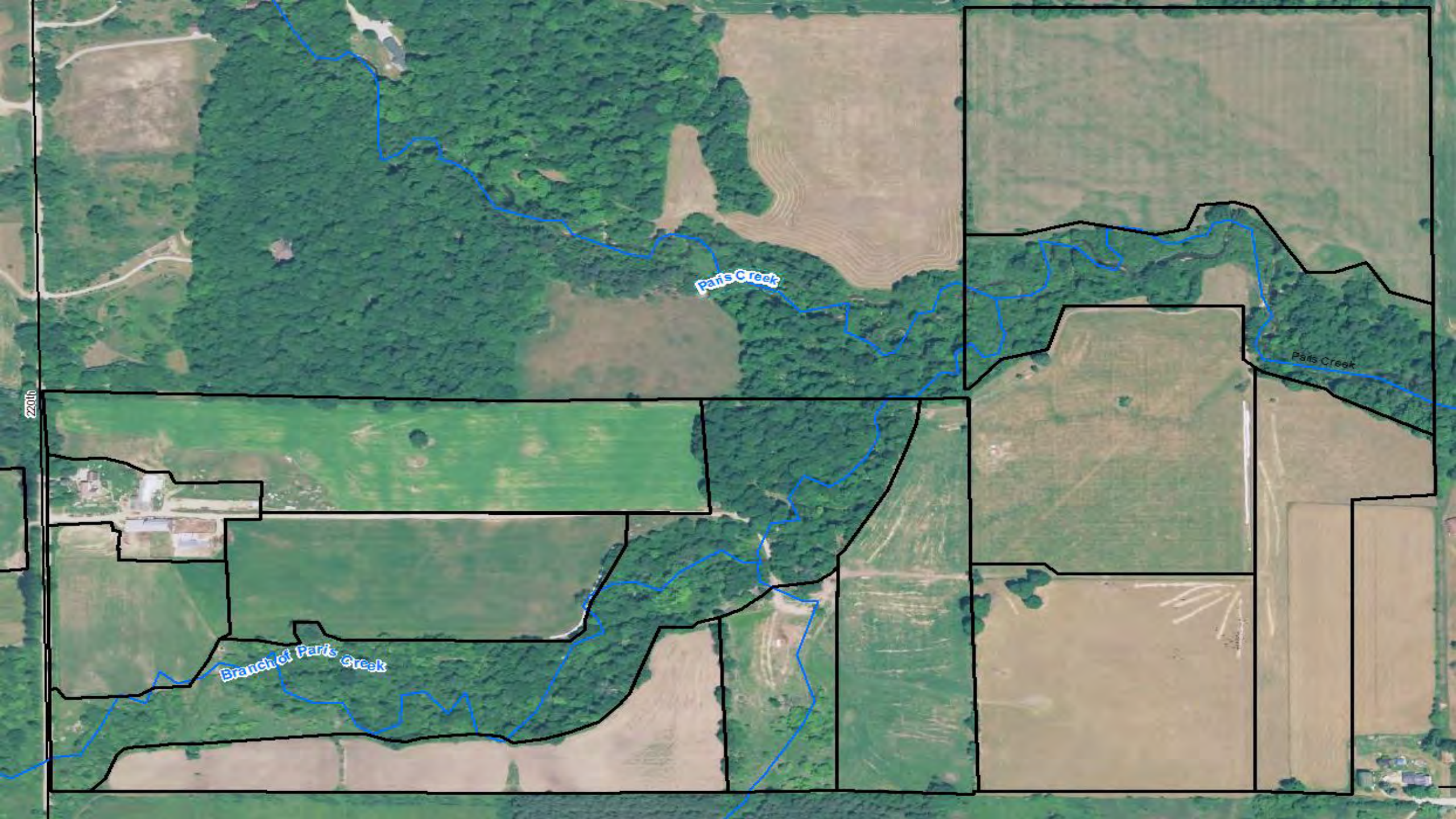
Harrington 10 acre multi specie mix

- Expenses
  - Seed cost $152.25/acre
  - Grain drill $ 15.25/acre
  - Total expense $167.50/acre or **$1,675**
- Savings
  - Fall grazing hay savings 5.5 ton @ $90/ton = $493
  - 70 pairs for 28 days @ $1.00/pair/day = $1,960
  - Total savings **$2,453**

Net + $778 or

+ $77.80/a


Field 1
14.8 ac.
Pasture
Field HQ
3.3 ac.
Farmstead
Field 2
10.5 ac.
Pasture
Field 6
5.5 ac.
Pasture
Branch of Paris Creek
Field UN
21.6 ac.
Associated Ag Land
Field 3
9.6 ac.
Pasture
Field 4
5.0 ac.
Pasture
Field 5
10.0 ac.
Pasture
220th


Paris Creek
Paris Creek
220th
Branch of Paris Creek

Chris & Mary Harrington Farm, Paris, MI. 2016

Harrington 15 acre multi specie mix 2016/2017

- Seeding mix
  - Oats 20 lbs/a
  - Field grain rye 20 lbs/a
  - Hairy vetch 4 lbs/a
  - Red clover 3 lbs/a
  - Turnips 1 lb/a
  - Rape 2 lbs/a

  Total 50 lbs/a

- Expenses
  - Seed cost $118/acre
  - Disc, spread fert, drill, pac $ 52/acre
  - Fert. 215 lbs/a 23-0-14-11 $ 27/acre
  - Total expense $197/acre or **$2,955**
- Savings
  - Fall grazing (72 cows for 13.5 days) hay savings 21.3 tons @ $90/ton = **$1,917**
  - Spring grazing will have to provide 72 cow/calf pairs 14.5 days of grazing to break even



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