Economic and Agronomic Considerations of Farming Saline Land

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Outline

- Salinity Management Options
- Costs of salinity
- Economics of converting to perennial cover
- Summary and final thoughts

"There is only one fundamental cause of soil salinity: a high water table and conditions where evaporation exceeds precipitation"

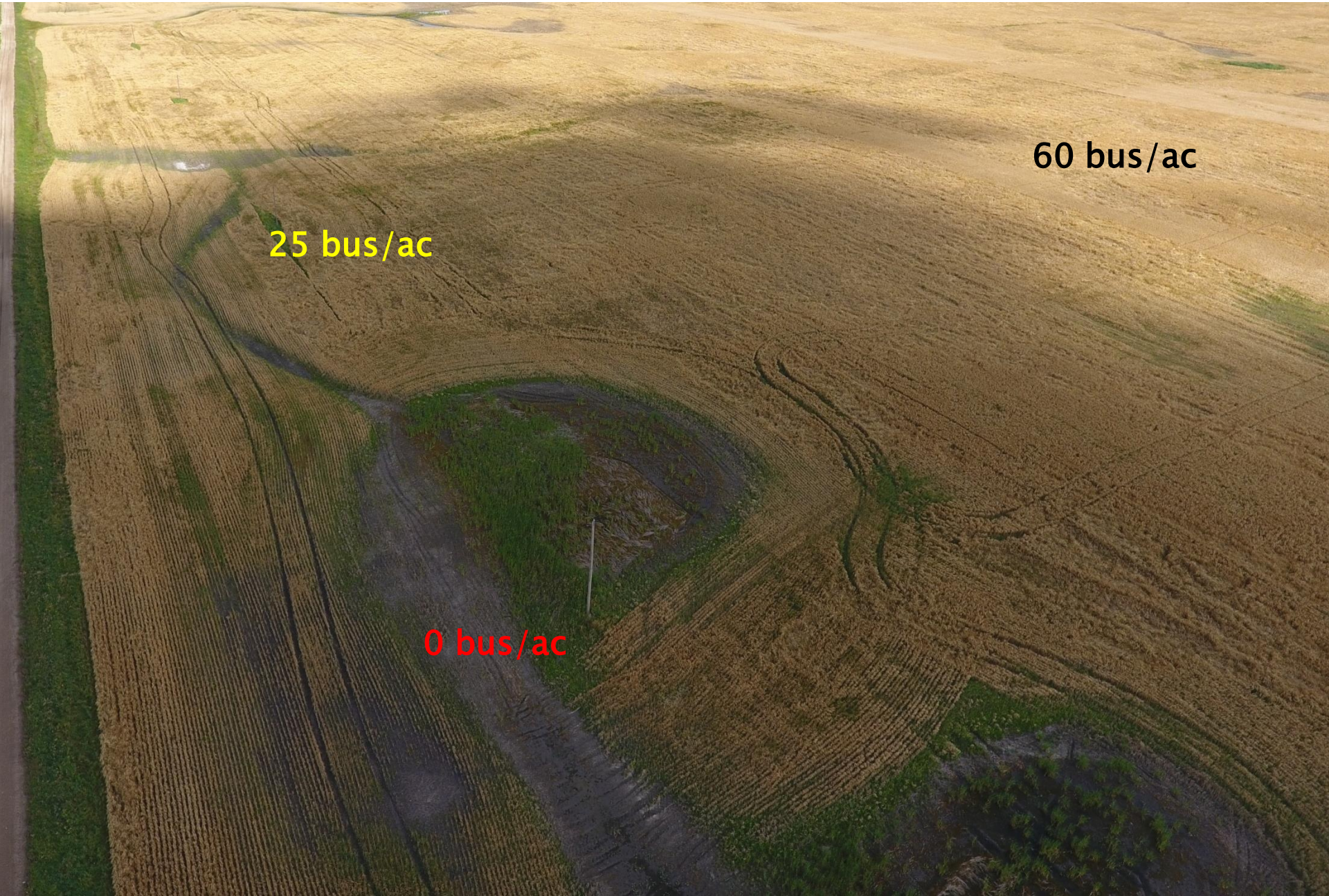
Dr. Les Henry
Grainews

Options for managing salinity

1. Do Nothing
2. Establish perennial cover
3. Variable rate inputs
4. Tile Drainage
5. Combinations

	Spring Wheat	Malt Barley	Canola	Yellow Peas
Estimated Yield (bus/ac)	64.7	74.6	53.8	58.4
Estimated Price ($/ac)	$6.42	$4.70	$10.70	$6.85
GROSS REVENUE ($/ac)	**$415.37**	**$350.62**	**$575.66**	**$400.04**
Seed & Treatment	$34.72	$41.11	$75.19	$55.08
Fertilizer	$72.81	$56.57	$92.51	$24.57
Crop Protection Products	$63.16	$91.69	$109.39	$101.81
Equipment Fuel & Repairs	$30.19	$30.19	$31.33	$32.46
Custom Work/Hired Labour	$23.05	$21.05	$21.05	$20.30
Crop Insurance	$4.91	$4.25	$9.72	$6.25
Utilities & Misc.	$4.75	$4.75	$4.75	$4.75
Interest Costs	$5.34	$5.71	$7.86	$5.61
TOTAL VARIABLE EXPENSES	**$238.93**	**$255.32**	**$351.80**	**$250.83**
REVENUE OVER VAR. EXP.	**$176.44**	**$95.30**	**$223.86**	**$149.21**

Source: SK 2020 Crop Planning Guide – Black Soil Zone


60 bus/ac
25 bus/ac
0 bus/ac

Spring Wheat

	Field Average	Moderately Saline	Saline	Extremely Saline
Estimated Yield (bus/ac)	64.7	37.2	25	0
Estimated Price ($/ac)	$6.42	$6.42	$6.42	$6.42
GROSS REVENUE ($/ac)	**$415.37**	**$238.93**	**$160.50**	**$0.00**
Seed & Treatment	$34.72	$34.72	$34.72	$34.72
Fertilizer	$72.81	$72.81	$72.81	$72.81
Crop Protection Products	$63.16	$63.16	$63.16	$63.16
Equipment Fuel & Repairs	$30.19	$30.19	$30.19	$30.19
Custom Work/Hired Labour	$23.05	$23.05	$23.05	$23.05
Crop Insurance	$4.91	$4.91	$4.91	$4.91
Utilities & Misc.	$4.75	$4.75	$4.75	$4.75
Interest Costs	$5.34	$5.34	$5.34	$5.34
TOTAL VARIABLE EXPENSES	**$238.93**	**$238.93**	**$238.93**	**$238.93**
REVENUE OVER VAR. EXP.	**$176.44**	**$0.00**	**-$78.43**	**-$238.93**

Source: SK 2020 Crop Planning Guide – Black Soil Zone

2. Establish Perennial Cover

- Seed perennial grass, grass/legume in non-productive areas
- Reduce input costs in non-productive areas

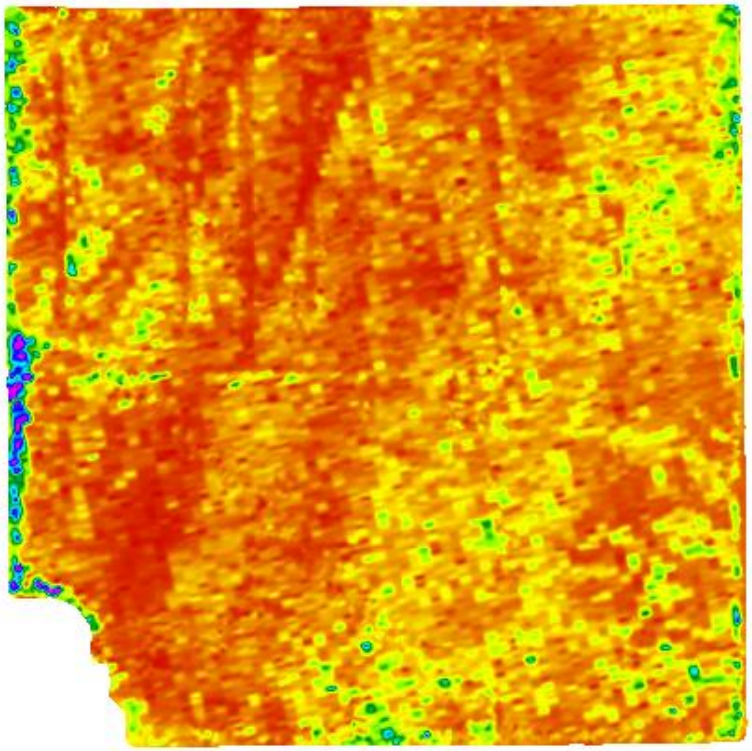
Case Study – Removing saline areas with perennial cover

627 acre field

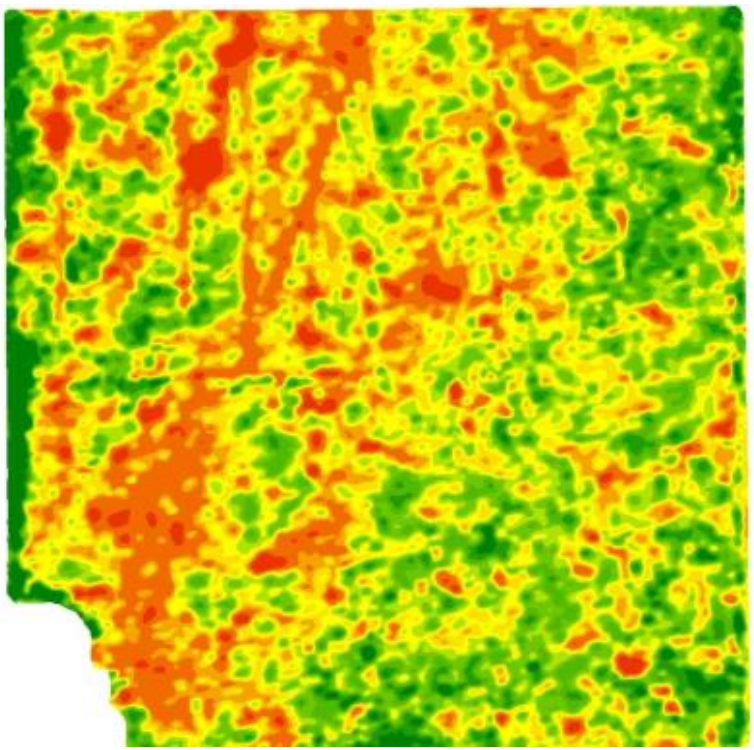
ASSUMPTIONS:

- Seed salt tolerant perennial in saline areas – $75/ac
  - No plan to use this for livestock
  - Keep stand for 10 years
- Remove low yielding areas
  - 25 bus/ac = 5% of field
  - 0 bus/ac = 3% of field

CONDUCTIVITY MAP



PRESCRIPTION ZONE MAP



Acres	
	16.4
	78.9
	69.2
	100.6
	102.7
	88
	76.5
	50.6
	25.7
	18
Total Acres	627

	Wheat		
	Before Forage	**After Forage**	**Difference**
Acres	627	577	-50
Estimated Yield (bus/ac)	64.7	69.0	
Estimated Price ($/ac)	$6.42	$6.42	
GROSS REVENUE ($/ac)	**$260,439.50**	**$255,423.87**	**-$5,015.63**
Forage establishment	$0.00	$0.60	
Seed & Treatment	$34.72	$34.72	
Fertilizer	$72.81	$72.81	
Crop Protection Products	$63.16	$63.16	
Equipment Fuel & Repairs	$30.19	$30.19	
Custom Work/Hired Labour	$23.05	$23.05	
Crop Insurance	$4.91	$4.91	
Utilities & Misc.	$4.75	$4.75	
Interest Costs	$5.34	$5.34	
TOTAL VARIABLE EXPENSES	**$149,809.11**	**$138,207.71**	**-$11,601.40**
REVENUE OVER VAR. EXP.	**$110,630.39**	**$117,216.17**	**$6,585.78**

Degree of Salinity Tolerated (EC)	Annual Field Crops
Severely to Very Severely Saline (8-16 dS/m)	May produce Barley?
Moderately Saline (4-8 dS/m)	Sugarbeets 6-row barley Sunflower Safflower 2-row barley Oats Fall Rye Wheat Mustard Flax Canola
Non to Slightly Saline (0-4 dS/m)	Corn Peas Fababeans Field Beans Soybeans

Source: SK Ministry of Agriculture

	Canola			
	Field Average	**Moderately Saline**	**Saline**	**Extremely Saline**
Estimated Yield (bus/ac)	53.8	32.9	20	0
Estimated Price ($/ac)	$10.70	$10.70	$10.70	$10.70
GROSS REVENUE ($/ac)	**$575.66**	**$351.80**	**$214.00**	**$0.00**
Seed & Treatment	$75.19	$75.19	$75.19	$75.19
Fertilizer	$92.51	$92.51	$92.51	$92.51
Crop Protection Products	$109.39	$109.39	$109.39	$109.39
Equipment Fuel & Repairs	$31.33	$31.33	$31.33	$31.33
Custom Work/Hired Labour	$21.05	$21.05	$21.05	$21.05
Crop Insurance	$9.72	$9.72	$9.72	$9.72
Utilities & Misc.	$4.75	$4.75	$4.75	$4.75
Interest Costs	$7.86	$7.86	$7.86	$7.86
TOTAL VARIABLE EXPENSES	**$351.80**	**$351.80**	**$351.80**	**$351.80**
REVENUE OVER VAR. EXP.	**$223.86**	**$0.00**	**-$137.80**	**-$351.80**

Source: SK 2019 Crop Planning Guide – Black Soil Zone

	Canola		
	Before Forage	**After Forage**	**Difference**
Acres	627	577	-50
Estimated Yield (bus/ac)	53.8	57.4	
Estimated Price ($/ac)	$10.70	$10.70	
GROSS REVENUE ($/ac)	**$360,938.82**	**$354,251.32**	**-$6,687.50**
Forage establishment	$0.00	$0.60	
Seed & Treatment	$75.19	$75.19	
Fertilizer	$92.51	$92.51	
Crop Protection Products	$109.39	$109.39	
Equipment Fuel & Repairs	$31.33	$31.33	
Custom Work/Hired Labour	$21.05	$21.05	
Crop Insurance	$9.72	$9.72	
Utilities & Misc.	$4.75	$4.75	
Interest Costs	$7.86	$7.86	
TOTAL VARIABLE EXPENSES	**$220,578.60**	**$203,333.70**	**-$17,244.90**
REVENUE OVER VAR. EXP.	**$140,360.22**	**$150,917.62**	**$10,557.40**

Malt Barley

	Field Average	Moderately Saline	Saline	Extremely Saline
Estimated Yield (bus/ac)	74.6	54.3	35	0
Estimated Price ($/ac)	$4.70	$4.70	$4.70	$4.70
GROSS REVENUE ($/ac)	**$350.62**	**$255.32**	**$164.50**	**$0.00**
Seed & Treatment	$41.11	$41.11	$41.11	$41.11
Fertilizer	$56.57	$56.57	$56.57	$56.57
Crop Protection Products	$91.69	$91.69	$91.69	$91.69
Equipment Fuel & Repairs	$30.19	$30.19	$30.19	$30.19
Custom Work/Hired Labour	$21.05	$21.05	$21.05	$21.05
Crop Insurance	$4.25	$4.25	$4.25	$4.25
Utilities & Misc.	$4.75	$4.75	$4.75	$4.75
Interest Costs	$5.71	$5.71	$5.71	$5.71
TOTAL VARIABLE EXPENSES	**$255.32**	**$255.32**	**$255.32**	**$255.32**
REVENUE OVER VAR. EXP.	**$95.30**	**$0.00**	**-$90.82**	**-$255.32**

Source: SK 2018 Crop Planning Guide – Black Soil Zone

	Malt Barley		
	Before Forage	**After Forage**	**Difference**
Acres	627	577	-50
Estimated Yield (bus/ac)	74.6	79.2	
Estimated Price ($/ac)	$4.70	$4.70	
GROSS REVENUE ($/ac)	**$219,838.74**	**$214,698.12**	**-$5,140.63**
Forage establishment	$0.00	$0.60	
Seed & Treatment	$41.11	$41.11	
Fertilizer	$56.57	$56.57	
Crop Protection Products	$91.69	$91.69	
Equipment Fuel & Repairs	$30.19	$30.19	
Custom Work/Hired Labour	$21.05	$21.05	
Crop Insurance	$4.25	$4.25	
Utilities & Misc.	$4.75	$4.75	
Interest Costs	$5.71	$5.71	
TOTAL VARIABLE EXPENSES	**$160,085.64**	**$147,664.74**	**-$12,420.90**
REVENUE OVER VAR. EXP.	**$59,753.10**	**$67,033.38**	**$7,280.28**

Yellow Peas

	Field Average	Moderately Saline	Saline	Extremely Saline
Estimated Yield (bus/ac)	58.4	36.6	15	0
Estimated Price ($/ac)	$6.85	$6.85	$6.85	$6.85
GROSS REVENUE ($/ac)	**$400.04**	**$250.83**	**$102.75**	**$0.00**
Seed & Treatment	$55.08	$55.08	$55.08	$55.08
Fertilizer	$24.57	$24.57	$24.57	$24.57
Crop Protection Products	$101.81	$101.81	$101.81	$101.81
Equipment Fuel & Repairs	$32.46	$32.46	$32.46	$32.46
Custom Work/Hired Labour	$20.30	$20.30	$20.30	$20.30
Crop Insurance	$6.25	$6.25	$6.25	$6.25
Utilities & Misc.	$4.75	$4.75	$4.75	$4.75
Interest Costs	$5.61	$5.61	$5.61	$5.61
TOTAL VARIABLE EXPENSES	**$250.83**	**$250.83**	**$250.83**	**$250.83**
REVENUE OVER VAR. EXP.	**$149.21**	**$0.00**	**-$148.08**	**-$250.83**

Source: SK 2019 Crop Planning Guide – Black Soil Zone

	Yellow Peas		
	Before Forage	**After Forage**	**Difference**
Acres	627	577	-50
Estimated Yield (bus/ac)	58.4	62.6	
Estimated Price ($/ac)	$6.85	$6.85	
GROSS REVENUE ($/ac)	**$250,825.08**	**$247,614.14**	**-$3,210.94**
Forage establishment	$0.00	$0.60	
Seed & Treatment	$55.08	$55.08	
Fertilizer	$24.57	$24.57	
Crop Protection Products	$101.81	$101.81	
Equipment Fuel & Repairs	$32.46	$32.46	
Custom Work/Hired Labour	$20.30	$20.30	
Crop Insurance	$6.25	$6.25	
Utilities & Misc.	$4.75	$4.75	
Interest Costs	$5.61	$5.61	
TOTAL VARIABLE EXPENSES	**$157,270.41**	**$145,074.01**	**-$12,196.40**
REVENUE OVER VAR. EXP.	**$93,554.67**	**$102,540.14**	**$8,985.47**

Summary of analysis

- Canola: $ 10,557.40/627 ac = **$16.84/ac** benefit
- Wheat: $ 6,585.78/627 ac = **$10.50/ac** benefit
- Barley: $ 7280.28/627 ac = **$11.61/ac** benefit
- Peas: $ 8,985.47/627 ac = **$14.33/ac** benefit

Hypothetical Farm

- 5000 acres
- 50% canola (2500 ac X $16.84/ac) = $42,100
- 30% wheat (1500 ac X $10.50/ac) = $15,750
- 15% barley (750 ac X $11.61/ac) = $8707.50
- 5% peas (250 ac X $14.33/ac) = $3582.50

TOTAL = $70,140 benefit

+ $14.03/ac

Benefits of perennial cover

- Increasing profitability of farm
- Environmental benefits
  - Healthy riparian areas
  - Habitat for wildlife/beneficial insects
  - Carbon sequestration
- Clubroot management
- Weed competition
- Draw down salts
- Sell forage or graze

Challenges of perennial cover

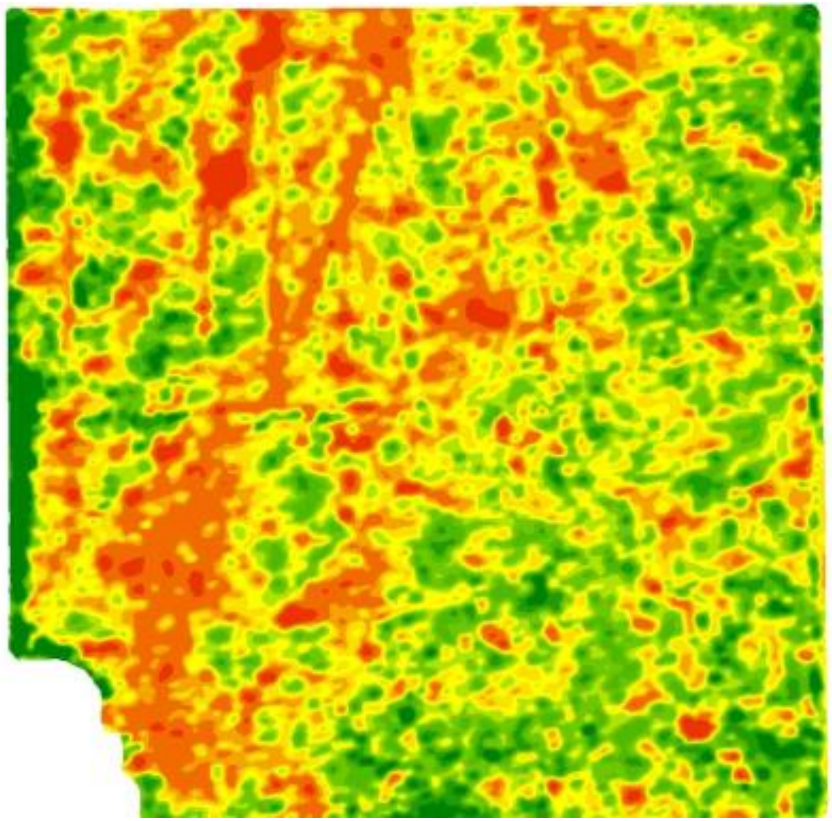
- Seed is expensive
- May be difficult to get established in high salinity areas
- Other than field margins, creates ‘obstacles’ in field (more overlapping)

3. Variable Rate Inputs

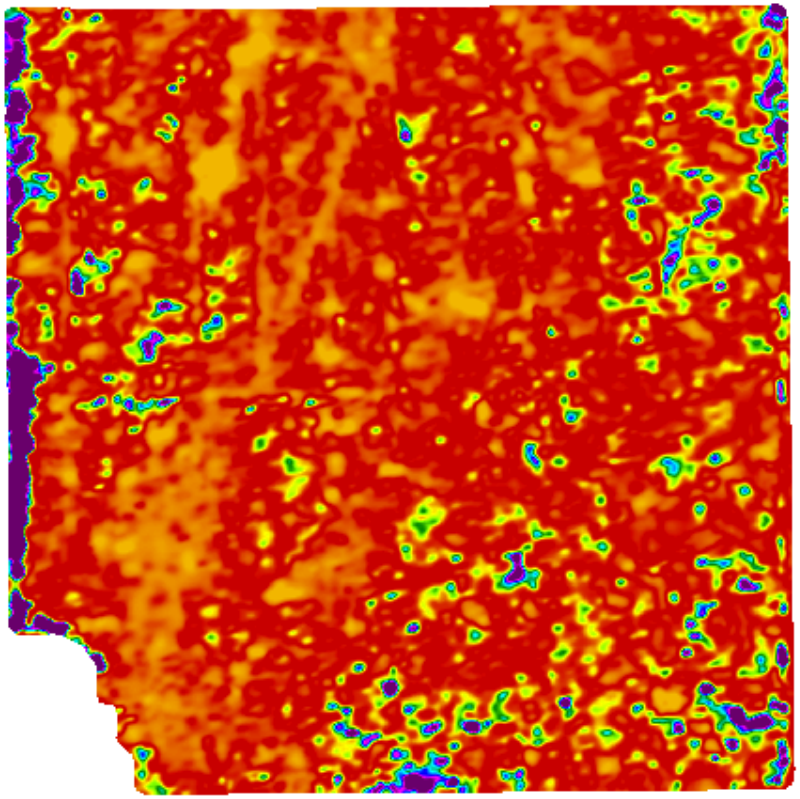
- Lower fertilizer rates in saline areas
  - Match lower yield potential
  - Reflect fact that nutrients already high
  - Don't add to the problem (more salt)
- Increase seed rates in saline areas
  - Reflect higher seedling mortality rates

FIELD GOOD AGRONOMICS

ZONE MAP

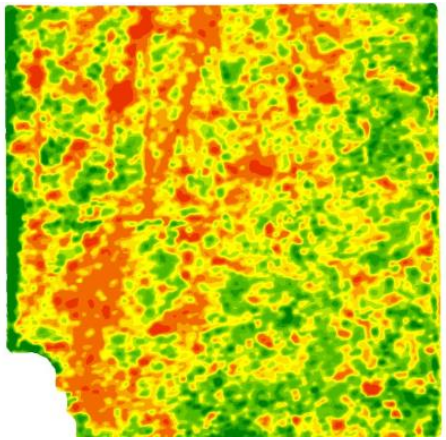


SEED Rx



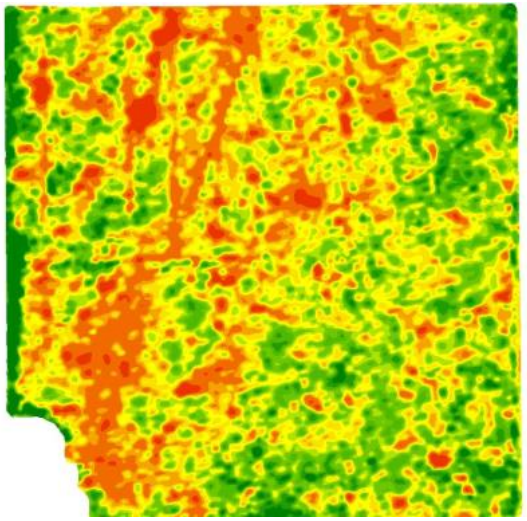
Variable Rate Inputs – Pros

- Decrease fertilizer costs in saline areas
- Better stand establishment, esp. in moderately saline areas
- Overall, better allocation of inputs
  - Less negative environmental impacts from over-applications
  - Spending input dollars where you'll get returns
- Easier to manage salinity patches in middle of field



Variable Rate Inputs – Cons

- Not economical on extreme saline areas (still lose money, but less so)
- Up front costs of creating zones
- Zones may not reflect saline areas
- Doesn't remedy the salinity



4. Tile Drainage

- Create a situation where water moves down through the soil profile
- Salts are ‘flushed’ out of the rooting zone

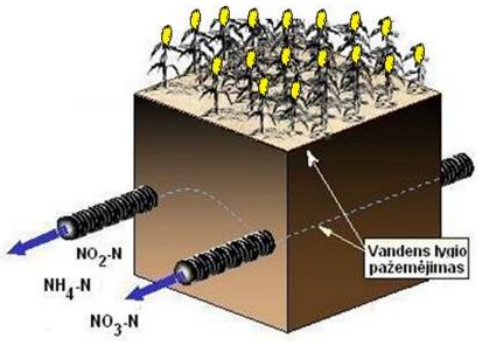
Tile Drainage – Pros

- Is remedial – gets rid of salts
- Relatively quick?: 3 – 10 years depending on weather & degree of salinity
- Can also remedy excess water situations (regardless of salinity issue)

Tile Drainage – Cons

- Expensive capital costs up front
- Need someplace for water to go (neighbours, roads)
- Environmental Concerns
  - Footprint of installation
  - Downstream water quality (mobile nutrient loss)

- **Annual Losses:**
- from **3 to 40** kg N/ha
- **0.05-0.40** kg P/ha



Options for managing salinity

1. Do Nothing
2. Establish perennial cover
3. Variable rate inputs
4. Tile Drainage
5. Combinations

Perennial Cover & Variable Rate Inputs

- Establish perennial cover in extreme saline areas and/or field edges, corners, etc.
  - Areas that produce <10 bushels/acre yields
  - Areas that won't create 'obstacles' in field
- Variable rate inputs in moderately saline areas and in mid-field areas
  - Areas can be managed effectively with input rates
  - Easy way to manage mid-field areas without creating obstacles

Tile Drainage & Variable Rate Inputs

- Tile extreme saline areas only, maybe only on field margins
  - Keeps capital costs lower
  - Remedial and fairly quick fix
- Variable rate inputs in moderately saline areas and in mid-field areas
  - Areas can be managed effectively with input rates
  - Easy way to manage mid-field areas without creating obstacles

Tile Drainage & Perennial Cover

- Establish perennial cover in saline areas and/or field edges, corners, etc
  - Areas that produce <10 bu/ac yields
  - Areas that won't create 'obstacles in the field'
- Tile extreme saline areas only, maybe only on field margins
  - Keeps capital costs lower
  - Remedial and fairly quick fix

SUMMARY

- Cost of doing nothing is significant
  $14.00+/ac
- Various options including combinations
- Consider
  - Cost of option
  - Remedial?
  - Economic impact on **YOUR FARM**
  - Environmental and other impacts

FIELD GOOD AGRONOMICS

THANK YOU!