CITY OF MINNEAPOLIS

Growing Relationships

Providing innovative solutions to reach the Urban Indian community

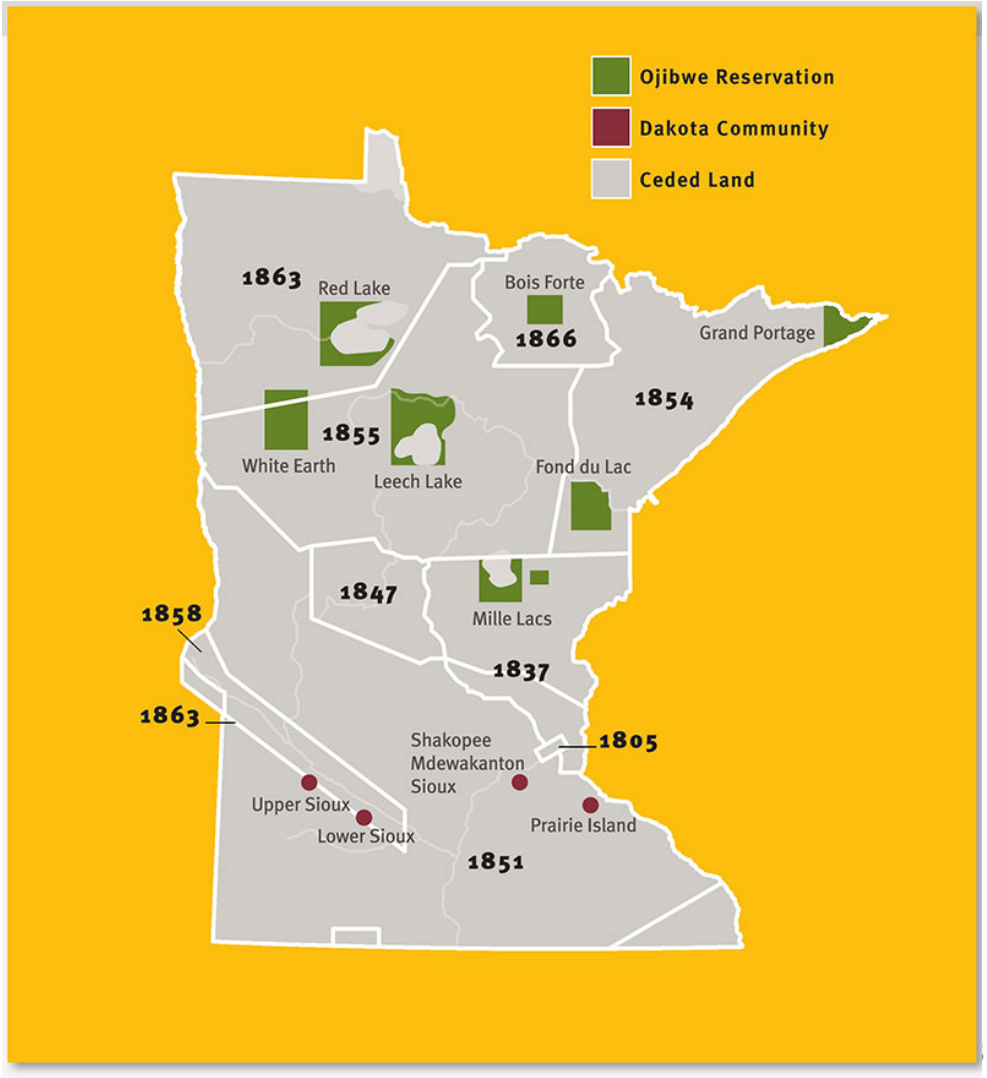
Minneapolis
City of Lakes

September 8, 2016

Minnesota Native Population

Land Cessation Treaties

- **Seven Ojibwe (Chippewa, Anishanaabe) reservations**
- **Four Dakota Communities**

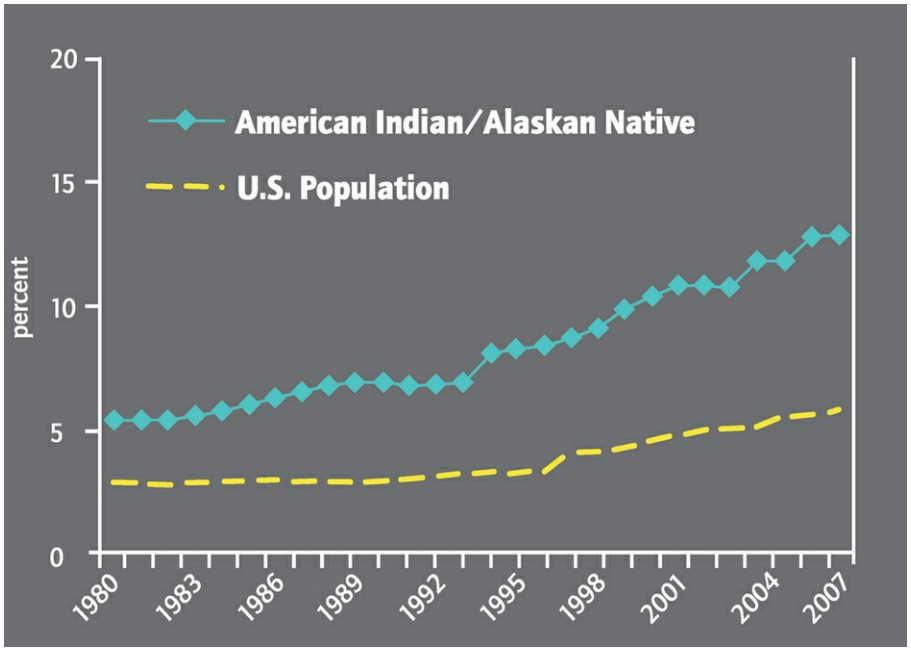


Government – Tribal relations

- Wards of the State 1831- 1887
- Assimilation policy 1887-1933
- Dawes Act 1887 -154 million acres to 48 million
- 1924 Citizenship
- Merriam Report 1928 – Breaking the Indian
- 1933 end of allotment and assimilation New Deal
- 1948 – 1961 Relocation policy to urban centers
- 1953 Termination

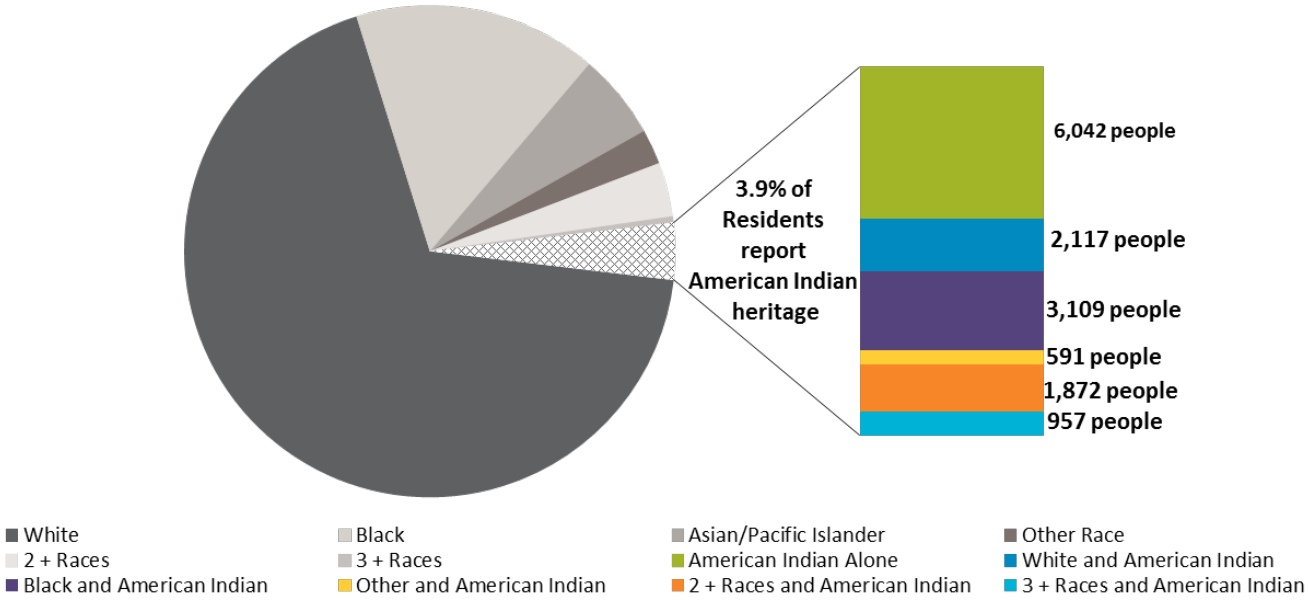
Results

- Abandonment and mistrust
  - Poverty
- Loss of identity
  - Alcoholism
  - Suicide
- Finding place in society
- Commodities
  - Obesity
  - Diabetes
  - Cardiovascular disease



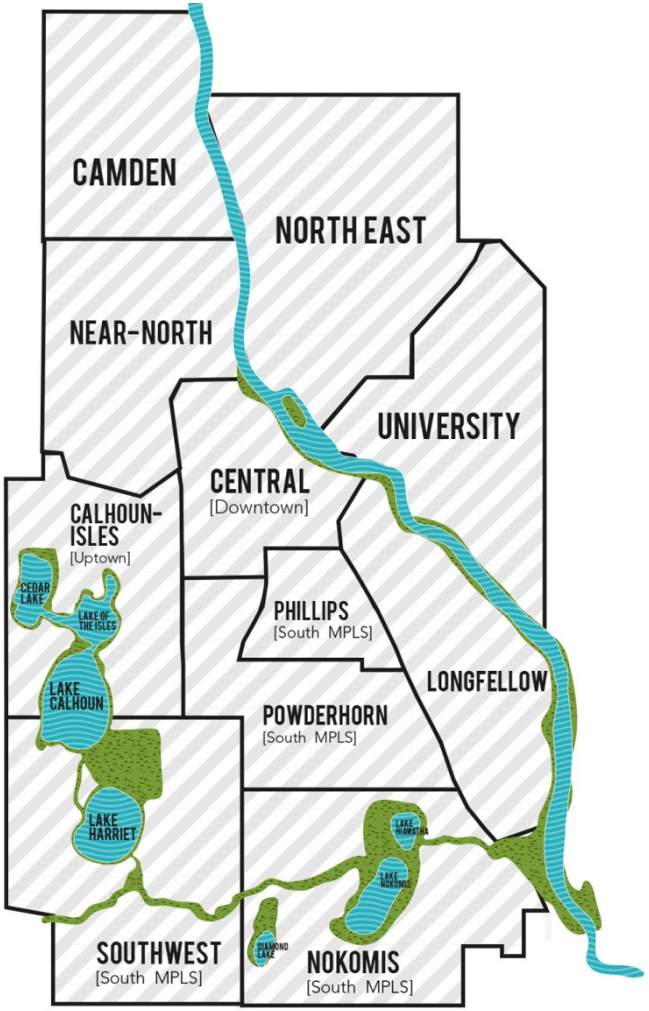
diabetes

Native Americans in MPLS

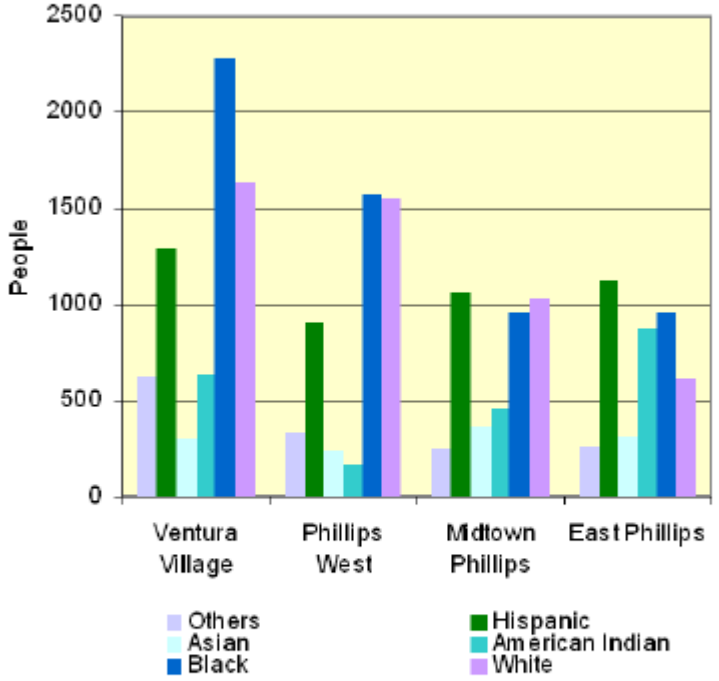


Tribal affiliation:
Cherokee 256
Chippewa 4486
Choctaw 147
Iroquois 62
Sioux 123
Other 134

Population distribution



Phillips: Ethnic composition by neighborhood in 2000



*Hispanics could be any race

Source: Minneapolis Community Planning and Economic Development with data from the U.S. Census of Population and Housing (SF1)

Little Earth Housing Community

Founded 1973
9.4 acres
212 HUD housing units
400 adults 800 children

Little Earth continued…

- 32 tribes (predominately Ojibwe bands)
- 68% on public assistance
- 98% very low income ($8,700 median)
- 65% unemployment: 47% head of household
  - High rates of obesity, diabetes, cardiovascular disease

How do you help?

Food Sovereignty

- Restore traditional native diet
  - Pre-contact seeds
  - Restore connection to the Earth
- Urban Agriculture
  - Limited space
  - Poor soils

Cool Soils Collaboration

Minneapolis
City of Lakes

MDEWAKANTON

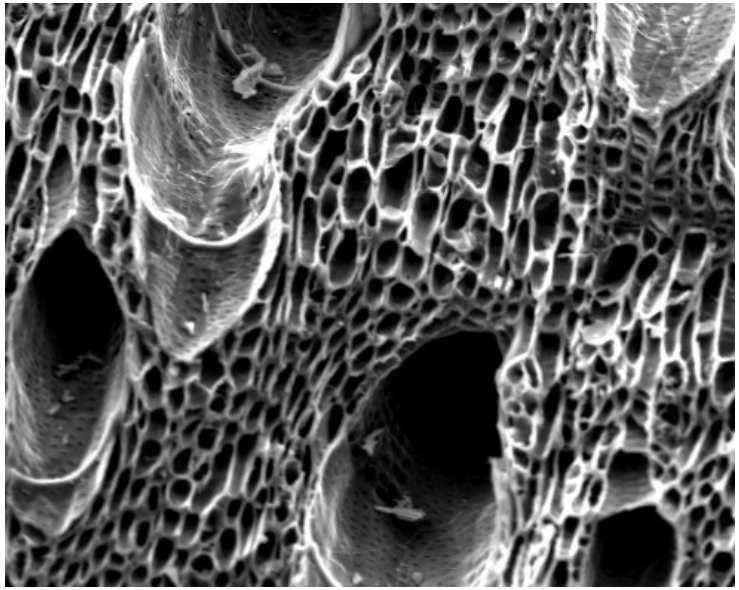
Dakotah Roots

Organics Recycling Facility

Biochar

- Waste biomass into fine grained, highly porous charcoal.
- High surface area.
- Designed for use as a soil amendment.
- Holds nutrients and water keeping available for the plant as well as beneficial microbes.
- Sequesters carbon
- Terra Preta - Amazon River basin.

Biochar



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- http://minnesota.cbslocal.com/2014/09/02/what-is-biochar-gardening/

What is biochar gardening

Pop Quiz

- Native American diabetes rate is _____ greater than the general population.

A. 50%
B. 100%
C. 150%
D. 200%

Anwer

- Native American diabetes rate is _____ greater than the general population.

B. 100%

Minneapolis native population over 200%

Little Earth Community Farm

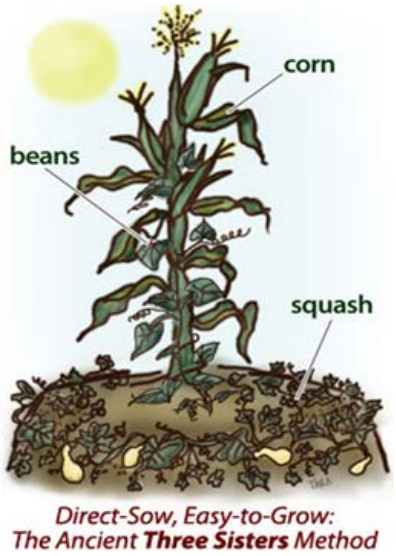
1.9 acres donated by the city
Reduce health disparities in Native American community

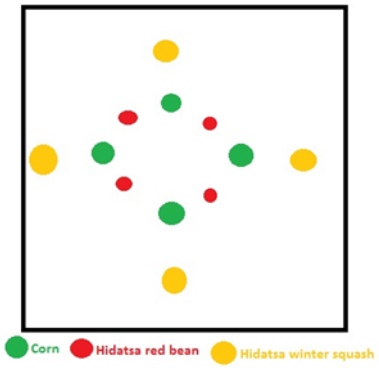
Little Earth Community Farm

- Biochar test plot – 15 cubic yards of black dirt/composted manure mixed with Biochar.
- 5:1 compost to biochar ratio
- Biochar - hardwood sawmill scrap
- Control test plot – 15 cubic yards of black dirt/composted manure.
- Each bed placed on bed of wood mulch

Little Earth Community Farm

- Three Sisters
  - Oneida Corn
  - Arikara Yellow Beans
  - Hidatsa Red Beans
  - Hidatsa Winter Squash





Study Outline

- Measure corn, squash, and beans throughout grow season until harvest

  - Corn height, thickness of stalk, color, and number of leaves/ cobs

  - Squash overall health and success rate of germination/ growth

  - Bean stalk height, overall health, and success rate of germination/growth

- Determine yield differences in the Fall

Quantitative and Qualitative Analysis

- **Qualitative:**
  - Corn **color**
  - Squash/ bean **overall health**
    - Graded 1-4
      - 1 = Plant/ Plants are dying, >50% yellow/ brown with no signs of impending improvement
      - 2 = Plant/ Plants are yellowing and wilting or have many leaves shriveling/ browning. Plant is still alive, but may be dying or suffering from obvious deficiencies
      - 3 = Plant/ plants are in good shape, with overall healthy green color. May have some yellow leaves or other imperfections, but overall health is good
      - 4 = Plant/ plants are in great shape w/ healthy vibrant look. Not many leaves yellowing, flowers coming in well and plant is continuing to mature as it should.

A-Green #000000	#001100	#002200	#003300	#004400	#005500	#006600	#007700	#008800	#009900	#00AA00	#00BB00	#00CC00	#00DD00	#00EE00	Green #00FF00
B-Yellow-green #000000	#081100	#112200	#193300	#224400	#2B5500	#336600	#3C7700	#448800	#4D9900	#55AA00	#5EBB00	#66CC00	#6FDD00	#77EE00	Yellow-green #84FF00
C-Yellow #000000	#111100	#222200	#333300	#444400	#555500	#666600	#777700	#888800	#999900	#AAAA00	#BBBB00	#CCCC00	#DDDD00	#EEEE00	Yellow #FFFF00
D-Orange #000000	#110800	#221100	#331900	#442200	#552B00	#663300	#773C00	#884400	#994D00	#AA5500	#BB5E00	#CC6600	#DD6F00	#EE7700	Orange #FF8000

Quantitative

Quantitative corn:

Measure <u>corn stalk height</u> from soil to 1" below tassel

- Thickness of stalk at thickest point 1-3" above soil
- Number of leaves/ stalk
- Number of cobs (ears)

Quantitative squash/ bean:

- Height of tallest vine of bean
- Percent of mounds with squash/ beans
- Number of beans/ squash per mound

Ready, set, grow!

Data Sheet example

Control Plot					
Date	Mound	Stalk Length	Stalk Width	Color	Number of Leaves
########	1, front	16.1	2.2	YG2	8
	2, right	15.3	2.1	YG2	9
	3, back	14.2	2	YG2	9
	4, left				
	5, front	15.2	1.9	YG2	8
	6, right	17.1	2.5	YG2	11
	7, back	18	2.3	YG2	10
	8, left	13.8	1.8	YG2	8
	9, front	14	2.4	YG2	9
	10, right	13.4	2	YG1	9
	11, back	24.1	2.1	YG1	10
	12, left	13.5	2.2	YG2	9
	13, front	13.6	1.8	YG2	8
	14, right	15.2	2.4	YG2	10
	15, back	12.4	1.9	YG2	9
	16, left	12.5	2.6	YG2	10
	17, front				
	18, right	15.1	2.4	YG2	10
	19, back	18.9	2.2	YG2	9
	20, left	17.2	2.6	YG2	10
	21, front	12.2	1.9	YG2	9
	22, right	20.1	2.6	YG2	10
	23, back	21.9	3.1	YG2	9
	24, left	22.8	2.8	YG1	11
	25, front	10.2	1.9	YG2	7
	26, right	17	2.4	YG2	10
	27, back	10	1.8	YG3	8
	28, left	15.1	2.1	YG3	10
	29, front	18.1	2.2	YG2	10
	30, right	18.5	2.5	YG2	10
	Averages:	15.91071429	2.239285714		9.285714286

Early season

July 8, 2015

- Biochar side began showing signs of advanced development in terms of color, height, and general health

July 27, 2015

Control plot had noticeably thinner stalks, delay in color change, and less leaves week-to-week as they remained in the YG5/ YG4 color

Biochar plot developed tassels quicker and in higher frequency, and darkened to YG3 and YG2 colors faster

August 12,2015

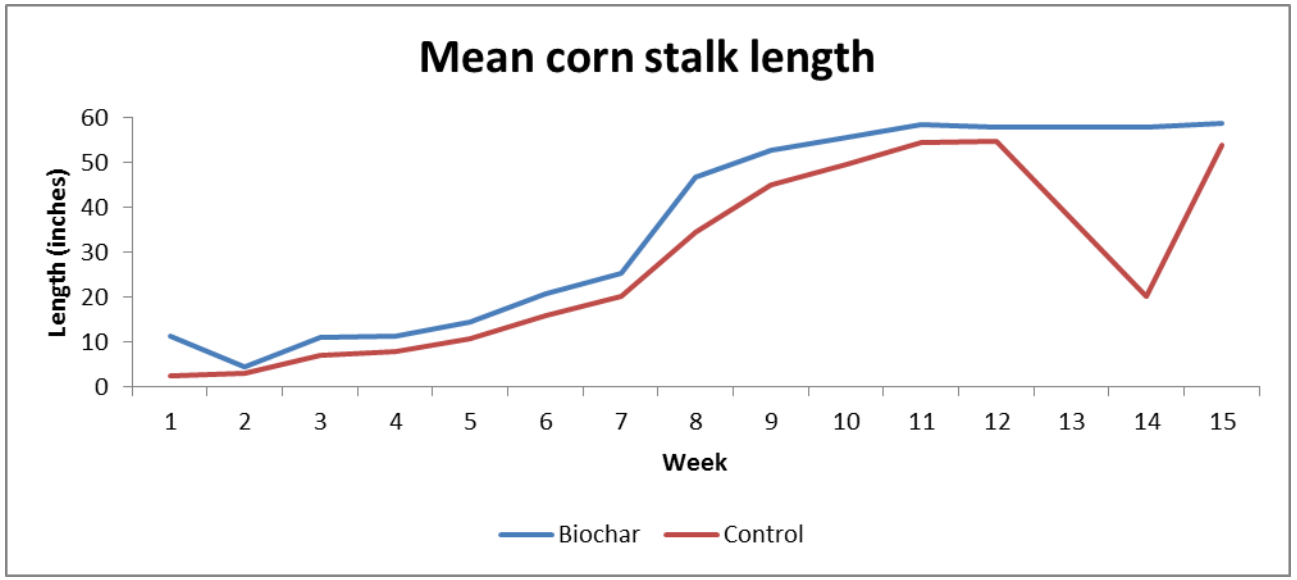
Example data sheets August 12, 2015

	Control Plot				
Date	Mound	Stalk Length	Stalk Width	Color	Number of Cobs
	1, front	27	2.8	YG2	0
	2, right	29.2	2.9	YG2	0
	3, back	27.6	2.6	YG2	0
	4, left				
	5, front	27	2.5	YG2	0
	6, right	33	2.5	YG2	0
	7, back	37.1	2.7	YG1	1
	8, left	26.9	2.1	YG2	0
	9, front	27.6	2.2	YG2	0
	10, right	32	2.7	YG1	0
	11, back	54.1	2.3	YG1	3
	12, left	28.3	2.5	YG1	0
	13, front	28.4	2.2	YG2	1
	14, right	38	2.5	YG1	1
	15, back	28	2.5	YG3	0
	16, left	32.2	3	YG2	0
	17, front				
	18, right	43	2.5	YG1	2
	19, back	44	2.7	YG2	2
	20, left	40	3	YG2	1
	21, front	24	2.5	YG2	0
	22, right	42.3	3.2	YG2	0
	23, back	23	3	YG3	0
	24, left	60.9	3	YG1	3
	25, front	29	2.6	YG2	1
	26, right	42	3	YG2	0
	27, back	27	2	YG2	0
	28, left	35.3	2.2	YG2	0
	29, front	38.1	2.2	YG2	0
	30, right	41.1	3	YG2	1
	Averages:	34.50357143	2.603571429		0.571428571

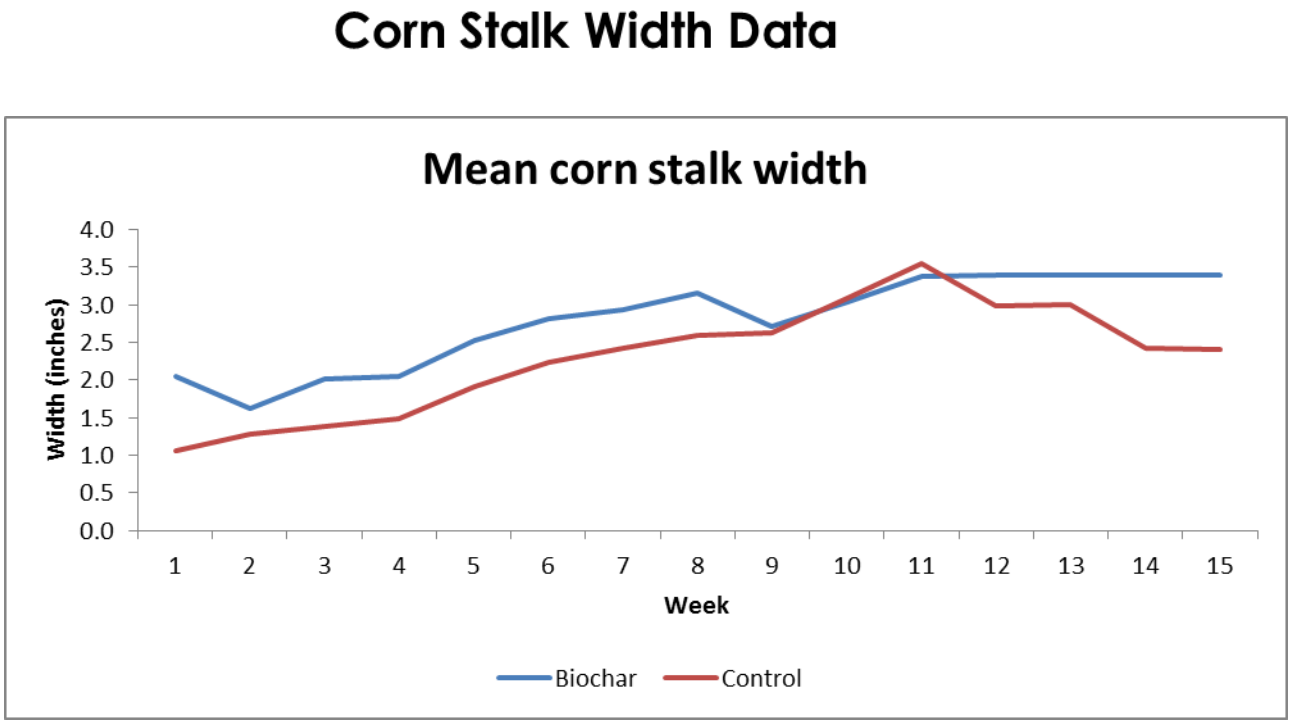
	Biochar-Enhanced Plot				
Date	Mound	Stalk Length	Stalk Width	Color	Number of Cobs
8/12/2015	1, front	45.8	3.1	YG1	2
	2, right	55	3.2	YG1	1
	3, back	40.7	2.6	YG2	0
	4, left	51	3.5	YG2	2
	5, front	53	3.3	YG1	1
	6, right	71.3	3.9	YG1	4
	7, back	66.5	3.4	YG1	4
	8, left	43	3.4	YG1	3
	9, front	40.9	2.9	YG2	0
	10, right				
	11, back	49.7	3.1	YG1	1
	12, left	29	2.8	YG1	1
	13, front	28.7	2.9	YG2	1
	14, right	33.7	2.3	YG2	0
	15, back	44.6	3.1	YG1	3
	16, left	35	3.2	YG2	2
	17, front	58.8	3.1	YG1	3
	18, right	49	3.3	YG1	3
	19, back	53.9	4.1	YG1	3
	20, left	46.2	2.5	YG2	2
	21, front	62.8	3.6	YG1	2
	22, right	50.3	3.1	YG1	2
	23, back	36.2	2.9	YG2	1
	24, left	33.2	3.2	YG1	2
	Averages:	46.8826087	3.152173913		1.869565122

Corn Data

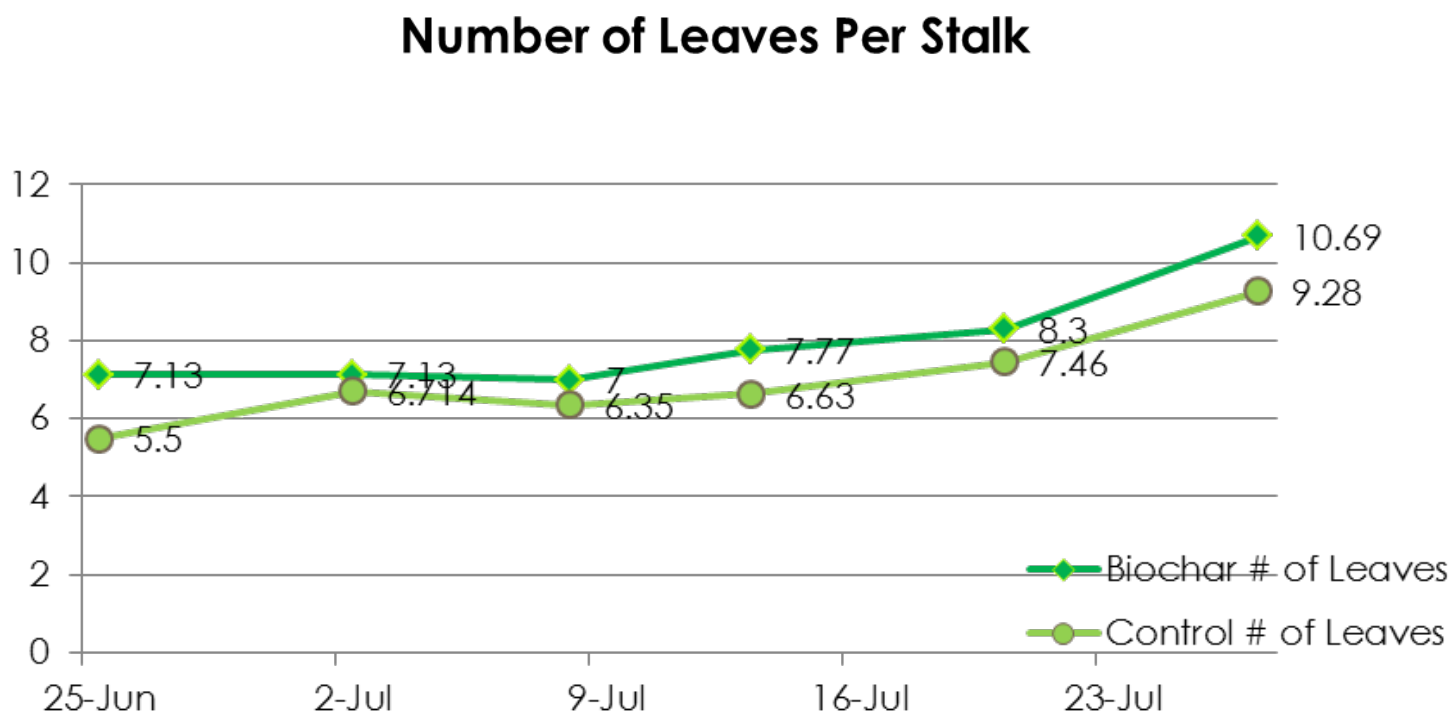
- Corn stalk length



Corn Stalk Width



Number of leaves per stalk



Corn summary

- Corn stalks in the biochar plot grew **20% thicker** as of August 12, 2015
- Stalks also grew **15% more leaves** as of July 27, 2015
- Biochar plot had an average of **1.86 cobs/stalk** developing, compared to **.57 cobs/stalk** in the control plot as of August 12, 2015
- Biochar plot has all stalks with a deep and matured YG1 color, control plot has half YG2/YG1

Squash and Beans

Squash and Beans

Control

Biochar

Observations

Control Plot Notes:

- Beans in the control plot remained stagnant throughout the weeks spent measuring corn
- Lighter green/ yellow hue in control plot, most plants had a leaf or two wilting
- Hardly any bean vines developing, no grappling to corn stalk
- Some mounds had beans completely absent

Biochar Plot Notes:

- Leaves bigger, deeper vibrant green color
- Faster sprouting of flowers, vines, and beans
- Most beans present in each mound
- Vines began latching and wrapping up corn stalks
- Overall looked healthier, well nourished

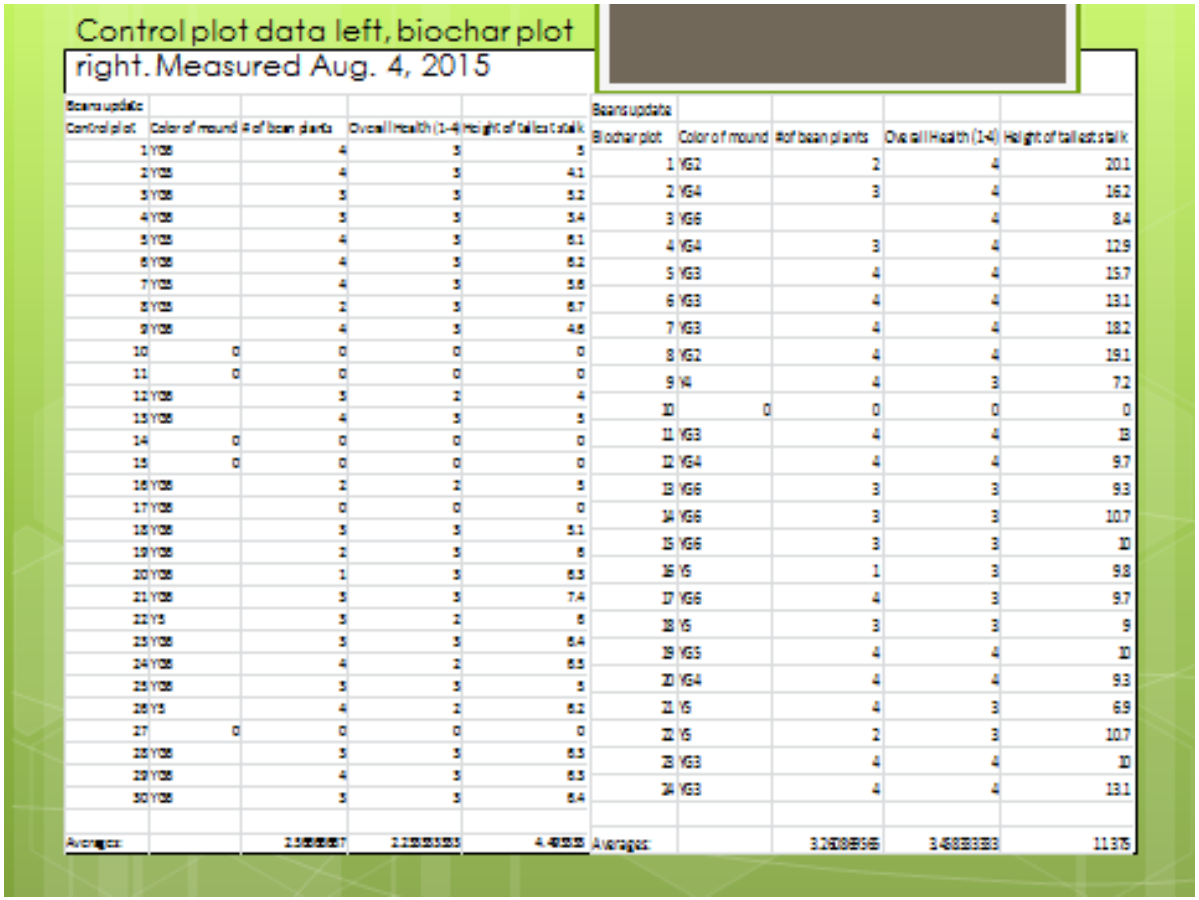
Bigger, better, beastlier beans*

Control

Biochar

*Quote from Cole Thompson

Bean date sheet August 4, 2015



Control plot data left, biochar plot right. Measured Aug. 4, 2015

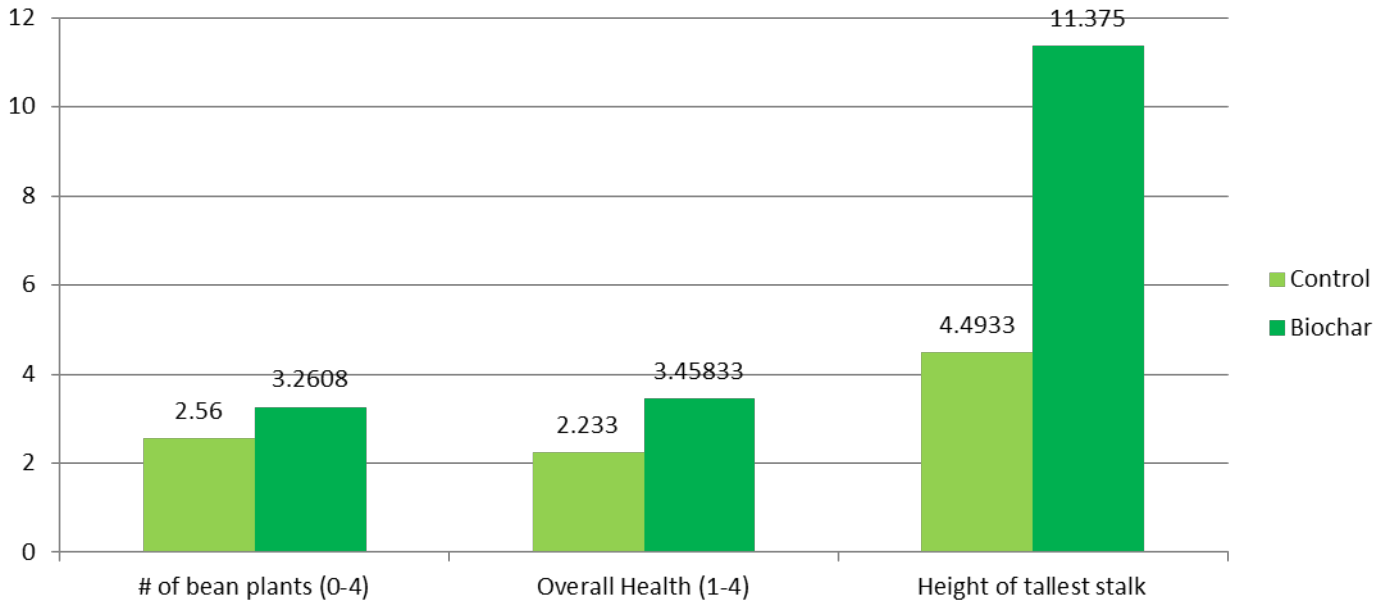
Beans update

Control plot	Color of mound	# of bean plants	Overall Health (1-4)	Height of tallest stalk
1	YG5	4	3	5
2	YG5	4	3	4.1
3	YG5	3	3	5.2
4	YG5	3	3	3.4
5	YG5	4	3	6.1
6	YG5	4	3	6.2
7	YG5	4	3	5.6
8	YG5	2	3	6.7
9	YG5	4	3	4.6
10	0	0	0	0
11	0	0	0	0
12	YG5	3	2	4
13	YG5	4	3	5
14	0	0	0	0
15	0	0	0	0
16	YG5	2	2	5
17	YG5	0	0	0
18	YG5	3	3	5.1
19	YG5	2	3	6
20	YG5	1	3	6.3
21	YG5	3	3	7.4
22	Y5	3	2	6
23	YG5	3	3	6.4
24	YG5	4	2	6.5
25	YG5	3	3	5
26	Y5	4	2	6.2
27	0	0	0	0
28	YG5	3	3	6.3
29	YG5	4	3	6.3
30	YG5	3	3	6.4
Averages:		2.966666667	2.233333333	4.493333

Beans update

Biochar plot	Color of mound	#of bean plants	Overall Health (1-4)	Height of tallest stalk
1	YG2	2	4	20.1
2	YG4	3	4	16.2
3	YG6		4	8.4
4	YG4	3	4	12.9
5	YG3	4	4	15.7
6	YG3	4	4	13.1
7	YG3	4	4	18.2
8	YG2	4	4	19.1
9	Y4	4	3	7.2
10	0	0	0	0
11	YG3	4	4	13
12	YG4	4	4	9.7
13	YG6	3	3	9.3
14	YG6	3	3	10.7
15	YG6	3	3	10
16	Y5	1	3	9.8
17	YG6	4	3	9.7
18	Y5	3	3	9
19	YG5	4	4	10
20	YG4	4	4	9.3
21	Y5	4	3	6.9
22	Y5	2	3	10.7
23	YG3	4	4	10
24	YG3	4	4	13.1
Averages:		3.260869565	3.458333333	11.375

Bean Results as of August 12, 2015



Number of beans to germinate and grow is 27% higher
Overall health is 50% higher (rating scale 1-4)
Height of tallest point of stalk 250% higher

Squash

Control

Biochar

July 27. 2015

Observations

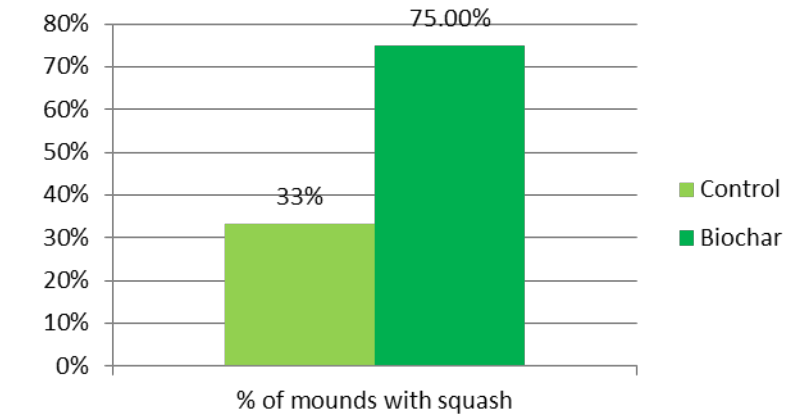
Control Plot Notes:

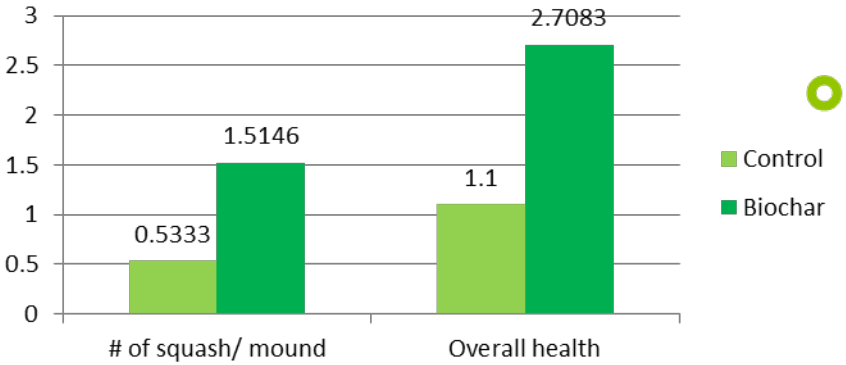
- Not many squash germinated or survived
- Many suddenly died after a few weeks

Biochar Plot Notes:

- Higher success rate of squash, but also not great
- Slightly bigger
- Flowers sprouted sooner
- More leaves

Squash results as of August 12, 2015



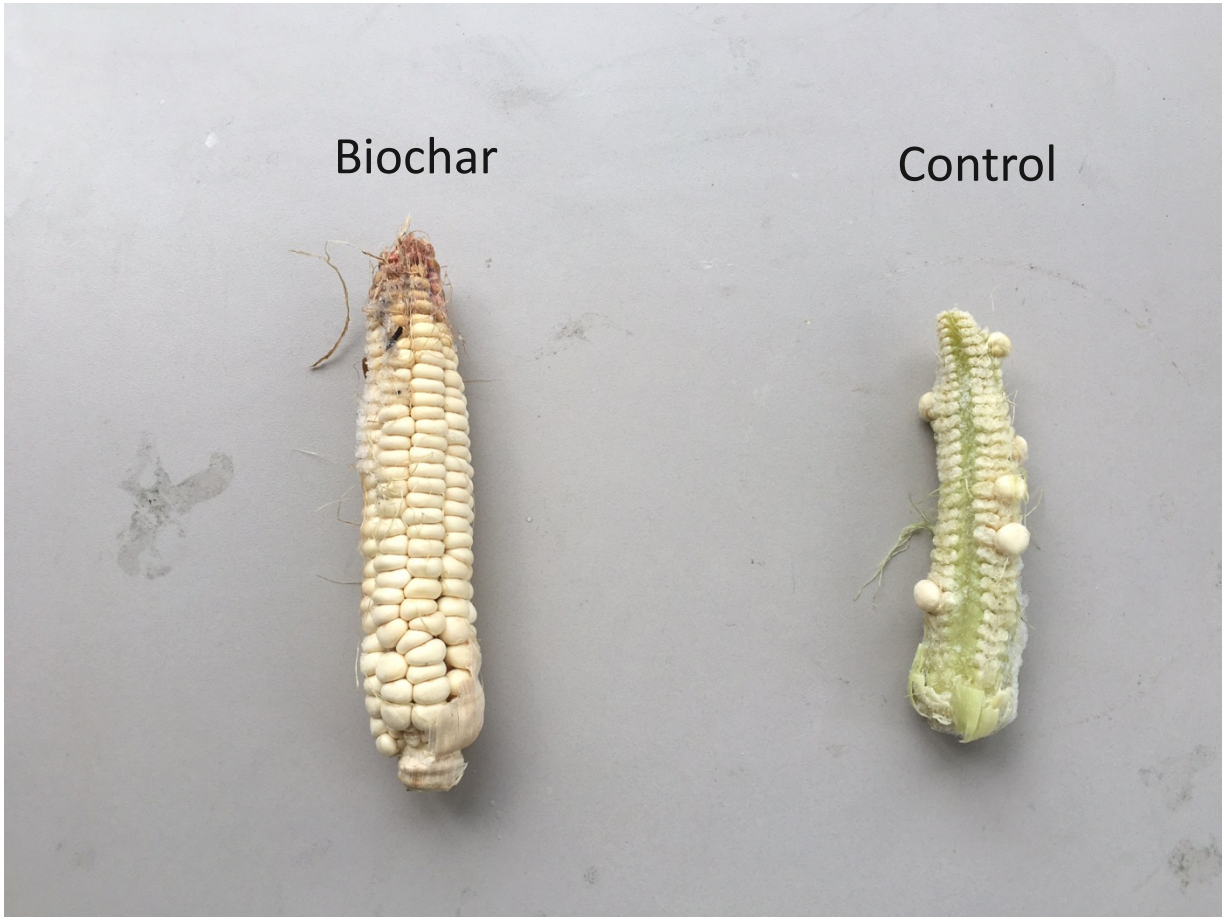


- Percent of mounds with at least 1 squash over **2 times higher**
- Number of squash on average was **3 times higher/ mound**
- Overall health over **2 times better** (grade scale 1-4)

Corn Final September 28, 2015

Corn	Control	Biochar
Mean stalk length inches	54.0	58.71
Mean stalk width inches	2.4	3.4
Average Cobs	1.44	1.46

Qualitative corn results



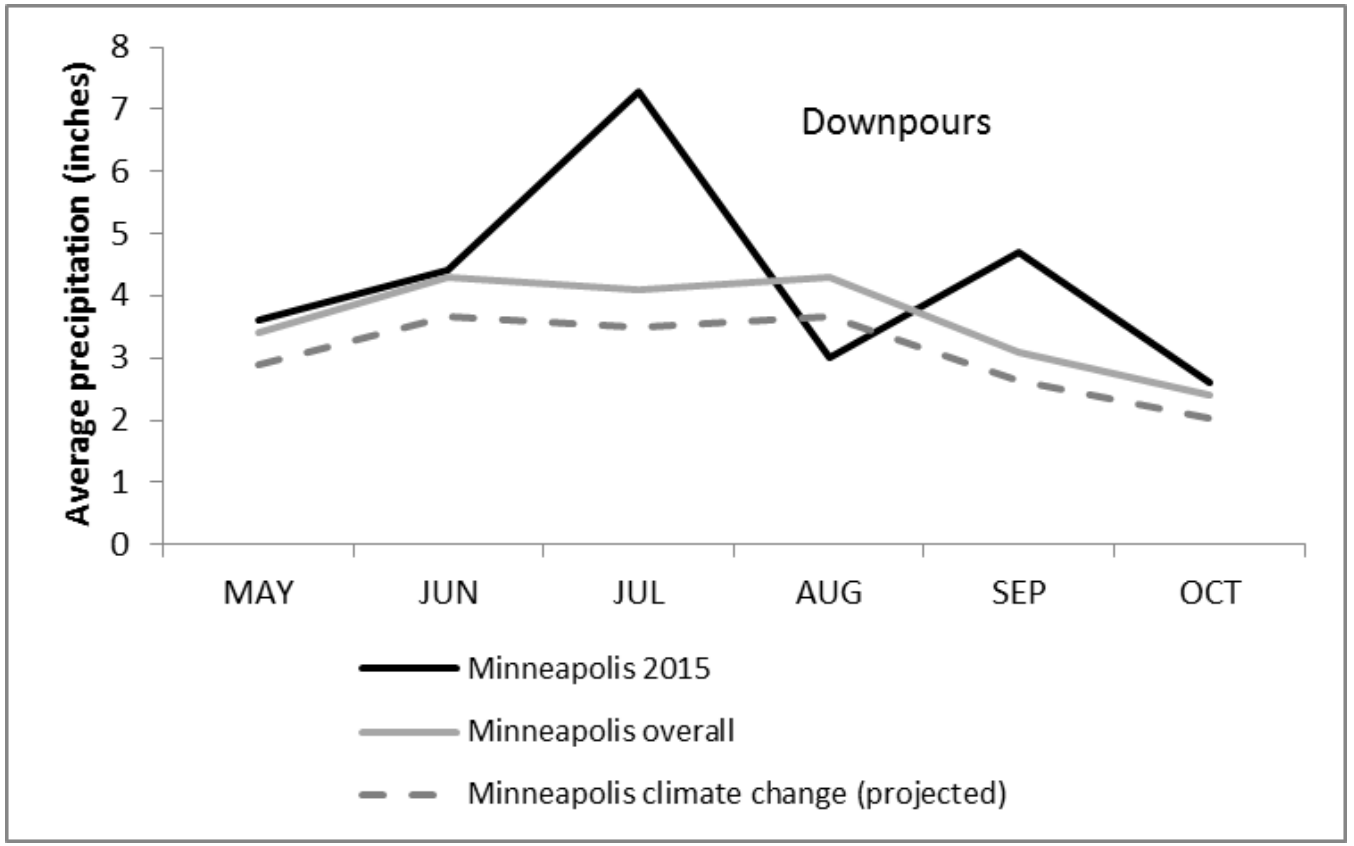
Beans and Squash Final September 28, 2015

Beans	Control	Biochar
Plants/mound	1	1.83
Health	2.5	3.56
Pods per plant	0.17	8.65

Squash	Control	Biochar
# of plants in plot	4	20
Health	3	3.67
# of squash/flowers	3/3	3/16

October 5, 2015 vandalism

Precipitation



Nutrients - post

	pH ppm	Bray P ppm	Olson P ppm	NH4 ppm	LOI OM %
Biochar	8/8	171/173	102/110	712/716	13.9/12.8
Control	8	181	121	816	12.4

Conclusions

- Better yields on biochar plot.
- Overall better health/color observed.
- Further investigation to confirm.
- Promising indications.

Thanks to:

Susen Fagrelius, Health Initiative Coordinator

Patrick Hanlon, Manager Environmental Initiatives

Dan Huff, Director Environmental Health

Cole Thompson, Environmental Technician

Brittny Douglas, Environmental Technician

Shakopee Mdewakanton Sioux Community

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