Summary Statistics: Establishing Monarch Butterfly Breeding Habitat on Iowa Swine Production Sites

Jarad Niemi, Seth Appelgate, and Nehemias Ulloa

2019-05-07

Table 1, 2, and 4 provide mean count of nectar plant species averaged across all data collection events within a year. Values in table represent the specific floral counting unit for each species (flower head, ramet [stem], spike, or umbel) and is not associated with number of plants. Floral counting units differ between species. Table 5, 6, and 8 provide nectar plant species floral unit density (per m2) averaged across all data collection events within a year. Table 9 provides mean counts of milkweed ramets. This data is unavailable for 2016 and 2017 therefore 2016 and 2017 do not have the associated milkweed ramet tables or figures. Table 10 provides mean density of milkweed ramets.

Figures 1, 2, 3, 4, and 5 are heatmaps which plot the log density of species floral counting units (planted as part of the seed mix and non-planted species) with transects on the columns and species on the rows; transects are sorted by average density and species are sorted by average presence. Figure 6 is a heatmap which plots the log density of milkweed ramets with transects on the columns and species on the rows; transects are sorted by average density and species are sorted by average presence.

Table 1: 2016 nectar plant species: mean count across all surveys

Nectar Plant Species	tall1a	tall2a	tarm1b	tarm2a	tcre1a	tdun2a	tdun3a	tgro1a	tgro2a	tnkn1a	tnkn2a	tnor1b	tpio1a	tpio2a	tprd1a	tprd2a	tsut2a	tver1a
alfalfa	-	-	-	-	-	-	-	272.0	20.3	-	-	-	-	-	-	-	-	-
birdsfoot trefoil	-	-	18.3	7.7	-	-	-	-	-	-	33.3	-	-	-	-	-	-	191.0
black eyed susan	-	-	-	-	9.0	-	-	-	-	-	-	-	210.3	-	-	-	-	-
black medic	-	8.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
bladder campion	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
canada goldenrod	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	-
canada thistle	-	2.0	-	-	-	0.7	-	93.3	45.3	-	-	-	-	-	0.3	-	-	-
carolina horsenettle	-	-	-	-	2.7	33.3	9.7	-	11.7	-	-	-	13.3	-	-	8.3	-	-
common dandelion	1.3	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
common evening primrose	-	-	-	-	-	-	-	-	-	-	-	-	17.3	-	-	-	-	-
common mallow	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
common milkweed	-	-	-	-	-	0.3	-	0.3	1.0	-	-	-	-	-	-	-	-	-
common mullein	1.7	2.7	-	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-
common yarrow	-	-	-	-	-	-	-	-	-	-	-	-	2.7	-	-	-	-	-
compass plant	1.0	3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
eastern daisy fleabane	-	-	-	-	2.3	11.7	-	-	-	-	-	-	1.3	-	-	-	-	372.7
flowering spurge	-	-	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
lanceleaf fogfruit	-	-	-	-	-	-	16.7	-	-	-	-	-	-	-	-	-	-	-
morning glory	231.7	-	-	-	-	-	-	26.0	10.7	-	-	-	-	-	-	-	-	-
ox eye sunflower	-	-	-	-	-	4.0	-	-	-	-	-	-	-	-	-	-	-	-
plantain	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.0
prickly lettuce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3	-	-
queen annes lace	-	-	104.0	-	85.0	-	-	-	-	-	3.3	-	-	-	-	-	-	10.7
red clover	4.0	-	2.7	377.0	129.0	-	-	82.3	415.7	7.3	25.0	-	-	-	-	-	-	32.0
smartweed	1.3	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
stinging nettle	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-
white clover	388.7	473.3	-	8.0	13.7	2.0	-	-	-	107.7	257.0	-	13.7	-	-	-	-	72.3
whitestar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
whorled milkweed	-	-	-	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-
yellow sweet clover	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3	-	-

Table 2: 2017 nectar plant species: mean count across all surveys

Nectar Plant Species	tall1a	tall2a	tarm1b	tarm2a	tcre1a	tdun2a	tdun3a	tgro1a	tgro2a	tnkn1a	tnkn2a	tnor1b	tpio1a	tpio2a	tprd1a	tprd2a	tsut2a	tver1a
alfalfa	-	-	-	16.3	-	-	-	20.7	-	-	-	-	-	-	-	-	-	-
bedstraw	-	-	-	-	-	-	-	-	-	574.3	184.0	-	-	429.0	-	-	-	-
birdsfoot trefoil	-	-	10.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70.0
black eyed susan	1.0	-	-	0.7	2.3	1.0	-	1.0	1.3	14.7	36.7	3.0	1.0	1.0	0.3	2.0	0.3	1.0
black medic	1.7	-	-	-	-	298.0	164.0	-	-	-	-	16.3	-	204.3	-	-	-	-
bladder campion	34.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
blue vervain	-	-	-	0.3	-	-	-	-	-	-	30.0	501.0	-	-	-	-	-	-
brown eyed susan	-	0.3	0.7	-	-	0.7	1.7	-	-	-	-	-	6.0	-	-	1.0	-	0.3
buffalobur nightshade	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
canada thistle	-	-	-	-	-	-	-	-	2.3	-	-	1.0	-	-	-	-	-	-
chicory	-	-	-	-	-	-	-	-	-	18.3	2.7	-	-	-	-	-	-	-
clasping venus looking glass	-	-	-	-	-	-	-	-	-	-	-	-	-	4.7	-	-	-	-
common cinquefoil	-	-	0.3	-	-	-	-	-	-	0.3	4.0	1.3	-	-	-	-	-	0.3
common dandelion	-	-	-	11.0	-	2.0	-	1.0	1.3	19.7	20.7	0.3	-	-	-	1.7	21.0	0.3
common mallow	-	-	-	-	-	0.3	0.3	-	-	-	-	-	-	-	-	-	-	-
common mullein	-	-	-	-	-	-	-	-	-	-	-	0.7	-	-	-	-	-	-
common purslane	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	-
common yarrow	-	-	-	-	-	-	-	-	-	2.3	88.7	-	-	-	-	-	-	-
compass plant	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	-	4.3	-	-
culvers root	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-
eastern black nightshade	-	-	-	2.0	-	6.7	-	-	-	-	-	-	1.0	-	0.3	-	-	-
eastern daisy fleabane	-	-	-	-	49.7	6.0	73.7	-	-	-	-	-	1.0	19.3	-	-	-	20.0
field pennycress	-	-	-	-	-	-	-	20.0	1.0	1.3	-	-	-	-	-	-	5.0	-
foxglove beardtongue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
groundcherry	-	-	-	-	-	-	0.3	-	0.3	-	-	-	-	-	-	-	-	-
hawkweed	-	-	-	-	-	-	-	-	-	106.7	-	-	-	-	-	-	-	-
hoary vervain	-	-	-	-	-	-	-	-	-	-	4.3	0.3	-	-	-	-	-	-
ironweed	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
morning glory	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
musk thistle	-	-	-	2.0	-	12.7	0.3	-	-	1.0	-	-	-	-	-	-	-	-
ox eye sunflower	-	-	-	-	-	-	-	0.3	0.3	-	-	-	-	-	-	-	-	-
partridge pea	13.3	-	1.0	2.0	-	3.3	0.3	-	-	1.0	4.3	8.0	5.3	4.0	-	2.7	2.0	-
pineapple weed	-	-	-	-	-	3.3	0.7	-	-	-	-	-	-	-	-	-	-	-
prickly sowthistle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.7	-	-
prostrate knotweed	-	3.3	-	-	-	-	-	-	-	-	-	-	-	-	0.3	-	-	-
prostrate vervain	12000.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-
queen annes lace	-	-	269.3	-	96.7	2.0	8.3	506.7	538.7	43.0	67.7	3.3	0.7	0.3	-	-	-	-
red clover	2.7	-	29.3	129.7	12.3	8.0	9.3	-	-	360.0	396.0	0.7	0.7	14.0	-	-	-	16.0
rough avens	-	-	-	-	-	-	-	-	31.7	-	-	-	-	-	-	-	0.3	0.3
shepherds purse	-	-	1.3	9.0	-	-	-	2.7	-	4.0	3.3	3.3	-	-	21.0	0.3	60.3	0.3
shortstalk chickweed	-	-	-	-	-	-	15.3	5.0	10.0	-	-	-	-	-	-	-	-	-
smartweed	1.3	-	1.3	3.3	7.0	2.3	11.3	-	-	782.7	257.3	1.0	-	-	-	-	-	-
venice mallow	-	14.3	-	-	-	74.7	605.7	-	-	0.3	-	-	-	-	-	-	-	185.3
white clover	-	-	2.3	87.3	0.7	-	-	1.7	-	74.7	174.3	9.0	-	-	-	-	-	-
white sweet clover	-	2.7	-	-	-	-	1.7	-	6.7	-	-	-	-	-	-	-	-	-
wild mustard	-	-	-	-	-	-	-	18.3	-	1.0	-	-	-	0.7	-	-	-	-
yellow coneflower	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-
yellow sweet clover	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-
yellow wood sorrel	-	-	-	-	-	10.3	31.7	-	-	-	-	20.0	-	4.3	-	-	1.3	-

Table 3: 2018 nectar plant species: mean count across all surveys

Nectar Plant Species	tall1a	tall2a	tarm1b	tarm2a	tcre1a	tdun2a	tdun3a	tgro1a	tgro2a	tnkn1a	tnkn2a	tnor1b	tpio1a	tpio2a	tprd1a	tprd2a	tsut2a	tver1a
alfalfa	-	-	-	247.3	-	-	-	15.7	-	-	-	-	-	-	-	-	-	-
american bellflower	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-
birdsfoot trefoil	-	5.3	25.3	-	3.0	1.3	112.0	-	-	973.0	1024.7	-	-	-	-	-	-	331.7
black eyed susan	-	-	5.3	-	111.3	6.7	3.7	-	-	-	1.7	-	70.0	57.7	15.0	127.0	-	5.3
black medic	5.0	1.7	-	-	-	134.7	-	-	-	-	-	-	30.0	1.7	-	-	6.7	-
bladder campion	123.3	26.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
blue vervain	1.0	-	-	-	-	-	35.0	-	-	62.0	103.3	2288.7	-	13.3	1.7	7.7	-	-
bull thistle	-	-	-	-	0.7	-	-	-	-	1.7	1.0	-	-	-	-	1.7	-	-
canada goldenrod	-	-	-	-	-	-	-	-	-	-	-	7.3	-	-	-	-	-	-
canada milk vetch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-
canada thistle	-	11.3	-	3.0	-	-	-	9.0	1.3	13.0	-	19.7	-	-	-	-	98.0	-
carolina horsenettle	-	-	-	-	-	6.3	5.3	-	2.3	-	-	-	0.3	-	-	-	-	-
catnip	-	-	-	-	-	16.0	-	20.0	-	-	-	-	-	-	-	-	154.7	-
chicory	126.7	-	-	-	-	-	-	-	-	106.7	-	-	-	-	-	-	-	-
common cinquefoil	-	21.0	0.3	-	0.7	-	0.7	-	-	18.0	13.0	4.0	-	-	-	-	-	-
common dandelion	0.7	0.3	-	-	-	0.3	0.7	-	-	-	-	0.3	-	-	-	-	0.7	-
common evening primrose	-	-	-	-	-	-	-	-	-	-	-	2.3	2.0	-	-	0.7	1.7	-
common mullein	-	-	-	-	-	18.0	19.3	-	-	-	-	-	0.3	-	-	-	-	-
common selfheal	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7	-	-	-	-
common sneezeweed	-	-	-	-	-	-	-	-	-	-	-	-	-	10.0	-	-	-	30.0
common yarrow	-	-	-	-	3.3	-	-	-	-	-	24.0	-	21.0	-	-	-	-	-
compass plant	-	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
deptford pink	-	-	-	-	80.3	-	-	-	-	-	-	-	-	-	-	-	-	-
eastern daisy fleabane	-	-	195.3	-	928.3	51.7	301.7	-	-	0.7	3.7	1.0	101.7	1361.3	-	5.0	-	1025.0
field pennycress	-	-	-	-	-	4.3	-	-	-	-	-	-	-	-	-	-	-	-
field thistle	-	-	-	-	-	-	-	-	-	-	-	15.3	-	-	-	-	-	10.0
flowering spurge	-	-	3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
foxglove beardtongue	-	-	5.0	0.3	-	-	-	-	-	-	18.7	44.3	-	3.0	26.7	8.3	17.7	-
golden alexanders	-	-	0.3	1.7	-	-	0.7	0.7	-	2.3	-	2.3	-	-	-	-	-	-
great blue lobelia	-	-	-	-	-	-	127.7	-	-	-	-	-	-	1.0	-	-	-	-
hoary vervain	0.3	-	-	-	-	10.0	-	10.0	-	-	-	44.0	-	7.3	5.0	4.3	2.7	-
ironweed	-	-	-	-	-	-	1.3	-	-	-	-	-	-	0.3	-	-	-	-

Table 4: 2018 nectar plant species: mean count across all surveys

Nectar Plant Species	tall1a	tall2a	tarm1b	tarm2a	tcre1a	tdun2a	tdun3a	tgro1a	tgro2a	tnkn1a	tnkn2a	tnor1b	tpio1a	tpio2a	tprd1a	tprd2a	tsut2a	tver1a
lanceleaf fogfruit	-	-	-	-	-	-	4.0	-	-	-	-	-	-	-	-	-	-	-
leadplant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
lesser burdock	-	-	-	-	-	-	-	-	0.7	-	-	-	-	0.3	-	-	-	-
marestail	-	-	-	30.7	6.7	-	-	-	-	-	-	-	-	-	-	38.7	12.7	-
morning glory	0.7	11.0	1.0	-	-	-	-	1.7	1.0	-	-	-	-	-	-	-	-	-
musk thistle	1.7	-	-	-	-	41.3	17.7	-	-	-	-	-	1.7	0.7	-	-	-	-
new england aster	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0	-
ox eye daisy	-	0.7	-	-	6.7	-	-	-	-	-	-	-	-	-	-	-	-	-
ox eye sunflower	5.0	1.0	6.0	65.7	15.3	83.0	48.7	76.7	12.0	80.7	125.0	145.3	16.0	146.3	4.3	34.3	120.3	7.7
pale purple coneflower	-	-	-	-	-	-	-	-	-	-	-	-	4.3	-	-	-	1.0	-
partridge pea	-	-	-	-	-	1.3	-	-	-	-	-	1.0	13.0	6.3	3.3	10.0	-	4.0
plantain	4.7	-	-	17.0	-	-	1.0	-	-	2.0	-	-	-	-	-	-	-	-
prairie blazing star	-	-	-	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-
prairie cinquefoil	-	-	-	-	-	-	1.3	-	-	-	0.3	-	-	-	7.0	-	-	-
prickly lettuce	0.3	-	-	-	118.0	17.3	3.3	11.7	-	-	-	-	-	-	-	1.0	-	-
prickly sowthistle	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
prostrate vervain	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.0	-	-
purple prairie clover	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-
queen annes lace	68.3	-	350.3	-	943.3	6.3	36.7	783.0	0.7	19.0	33.0	-	78.3	-	-	-	-	596.7
red clover	-	28.3	1043.0	3244.0	1056.3	54.0	103.0	-	3081.7	1331.7	1184.3	4.7	959.0	559.3	-	-	10.0	414.3
rough avens	-	-	-	-	-	-	-	-	-	-	-	0.3	-	-	-	-	2.0	-
smartweed	58.3	9.3	-	-	-	2.3	10.0	190.0	29.7	-	-	-	-	-	-	-	9.0	-
stinging nettle	-	-	-	-	-	23.3	2.3	-	-	-	-	-	-	-	-	-	-	-
swamp milkweed	-	-	-	8.0	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-
tall thistle	-	-	0.3	-	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-
venice mallow	-	-	-	-	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-
virginia mountain mint	-	-	-	-	-	-	-	-	-	6.7	-	2.0	-	6.7	-	-	2.0	-
white clover	698.7	260.0	7.3	239.7	-	1431.7	1746.7	-	-	497.3	495.3	53.0	-	1.0	-	-	21.7	488.0
white sweet clover	1.3	-	54.7	-	-	-	-	6.7	-	0.7	-	25.0	-	-	-	-	0.3	-
whorled milkweed	-	-	-	-	-	-	-	-	-	-	-	-	193.0	-	-	-	-	-
wild bergamot	3.0	6.0	-	1.7	1.7	-	-	124.7	12.7	56.3	98.0	57.7	-	17.7	73.0	11.0	49.0	-
wild cucumber	-	-	-	-	-	-	-	50.3	-	-	-	-	-	-	-	-	-	-
wild mustard	-	-	-	-	-	-	-	116.7	-	-	-	1.7	-	-	-	-	-	-
wild parsnip	-	-	-	2.0	8.3	19.7	-	-	-	-	-	-	-	-	-	-	-	-
yellow coneflower	56.7	39.0	29.3	155.0	10.3	60.0	90.0	165.7	63.0	502.7	520.3	220.0	72.3	273.0	182.7	165.3	1115.0	1.7
yellow salsify	-	-	-	-	-	-	-	-	-	-	-	0.7	-	-	-	-	-	-
yellow sweet clover	6.3	13.0	23.3	6.0	193.3	13.0	-	4.7	8.3	29.0	17.3	6.7	15.7	127.0	-	11.7	1.7	-
yellow wood sorrel	-	-	-	-	-	31.7	-	-	-	-	-	-	-	-	-	-	-	-

Table 5: 2016 nectar plant species density: average density (count / m2) across all rounds

Nectar Plant Species	tall1a	tall2a	tarm1b	tarm2a	tcre1a	tdun2a	tdun3a	tgro1a	tgro2a	tnkn1a	tnkn2a	tnor1b	tpio1a	tpio2a	tprd1a	tprd2a	tsut2a	tver1a
alfalfa	-	-	-	-	-	-	-	4.53	0.34	-	-	-	-	-	-	-	-	-
birdsfoot trefoil	-	-	0.31	0.08	0.10	-	-	-	-	-	0.67	-	-	-	-	-	-	1.91
black eyed susan	-	-	-	-	-	-	-	-	-	-	-	-	2.63	-	-	-	-	-
black medic	-	0.17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
bladder campion	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
canada goldenrod	-	-	-	-	-	-	-	-	-	-	-	0.02	-	-	-	-	-	-
canada thistle	-	0.04	-	-	-	0.01	-	1.56	0.76	-	-	-	-	-	0.08	-	-	-
carolina horsenettle	-	-	-	-	0.03	0.33	0.10	-	0.19	-	-	-	0.17	-	0.00	-	-	-
common dandelion	0.03	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
common evening primrose	-	-	-	-	-	-	-	-	-	-	-	-	0.22	-	-	-	-	-
common mallow	-	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
common milkweed	-	-	-	-	-	-	-	0.01	0.02	-	-	-	-	-	-	-	-	-
common mullein	0.03	0.05	-	-	-	0.00	-	-	-	-	-	-	0.02	-	-	-	-	-
common yarrow	-	-	-	-	-	-	-	-	-	-	-	-	0.03	-	-	-	-	-
compass plant	0.02	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
eastern daisy fleabane	-	-	-	-	0.02	0.12	-	-	-	-	-	-	0.02	-	-	-	-	3.73
flowering spurge	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
lanceleaf fogfruit	-	-	-	-	-	-	0.17	-	-	-	-	-	-	-	-	-	-	-
morning glory	4.63	-	-	-	-	-	-	0.43	0.18	-	-	-	-	-	-	-	-	-
ox eye sunflower	-	-	-	-	-	0.04	-	-	-	-	-	-	-	-	-	-	-	-
plantain	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-	0.04
prickly lettuce	-	-	1.73	-	0.86	-	-	-	-	-	-	-	-	-	-	-	-	0.11
queen annes lace	-	-	-	-	1.38	-	-	-	-	0.15	0.07	-	-	-	-	0.04	-	-
red clover	0.08	-	0.04	3.77	-	-	-	1.37	6.93	-	0.50	-	-	-	-	-	-	0.32
smartweed	0.03	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
stinging nettle	-	-	-	-	-	-	0.02	-	-	-	-	-	-	-	-	-	-	-
white clover	7.77	9.47	-	0.08	0.18	0.02	-	-	-	2.09	4.74	-	-	-	-	-	-	0.72
whitestar	-	-	-	-	-	-	-	-	-	-	-	-	0.17	-	-	-	-	-
whorled milkweed	-	-	-	-	-	-	-	-	-	-	-	-	0.02	-	-	-	-	-
yellow sweet clover	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-

6

Table 6: 2017 nectar plant species density: average density (count / m2) across all rounds

Nectar Plant Species	tall1a	tall2a	tarm1b	tarm2a	tcre1a	tdun2a	tdun3a	tgro1a	tgro2a	tnkn1a	tnkn2a	tnor1b	tpio1a	tpio2a	tprd1a	tprd2a	tsut2a	tver1a
alfalfa	-	-	-	-	-	-	-	0.34	-	-	-	-	-	-	-	-	-	-
bedstraw	-	-	-	0.16	-	-	-	-	-	-	-	-	-	5.36	-	-	-	-
birdsfoot trefoil	-	-	0.18	-	-	-	-	-	-	5.74	1.84	-	-	-	-	-	-	0.70
black eyed susan	0.02	-	-	0.01	0.02	0.01	-	0.02	0.02	0.15	0.37	0.06	-	0.01	0.00	0.02	0.00	0.01
black medic	0.03	-	-	-	-	2.98	1.64	-	-	-	-	0.33	0.01	2.55	-	-	-	-
bladder campion	0.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
blue vervain	-	-	-	0.00	-	-	-	-	-	-	0.30	10.02	-	-	-	-	-	-
brown eyed susan	-	0.01	0.01	-	-	0.01	0.02	-	-	-	-	-	0.07	-	-	0.01	-	0.00
buffalobur nightshade	-	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
canada thistle	-	-	-	-	-	-	-	0.04	-	-	-	0.02	-	-	-	-	-	-
chicory	-	-	-	-	-	-	-	-	-	0.18	0.03	-	-	-	-	-	-	-
clasping venus looking glass	-	-	-	-	-	-	-	-	-	-	-	-	-	0.06	-	-	-	-
common cinquefoil	-	-	-	-	-	-	-	-	-	0.00	0.04	0.03	-	-	-	-	-	0.00
common dandelion	-	-	0.01	0.11	-	0.02	-	0.02	0.02	0.20	0.21	0.01	-	-	-	0.02	0.30	0.00
common mallow	-	-	-	-	-	0.00	0.00	-	-	-	-	0.01	-	-	-	-	-	-
common mullein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
common purslane	-	-	-	-	-	-	-	-	-	-	-	0.02	-	-	-	-	-	-
common yarrow	-	-	-	-	-	-	-	-	-	0.02	0.89	-	-	-	-	0.04	-	-
compass plant	-	-	-	-	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-
culvers root	-	-	-	-	-	-	-	-	0.01	-	-	-	-	-	-	-	-	-
eastern black nightshade	-	-	-	0.02	-	0.07	-	-	-	-	-	-	0.01	-	0.00	-	-	-
eastern daisy fleabane	-	-	-	-	0.50	0.06	0.74	-	-	-	-	-	0.01	0.24	-	-	-	0.20
field pennycress	-	-	-	-	-	-	-	0.33	0.02	0.01	-	-	0.01	-	-	-	0.07	-
foxglove beardtongue	-	-	-	-	-	-	-	-	0.01	-	-	-	-	-	-	-	-	-
groundcherry	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
hawkweed	-	-	-	-	-	-	-	-	-	1.07	-	-	-	-	-	-	-	-
hoary vervain	-	-	-	-	-	-	-	-	-	-	0.04	0.01	-	-	-	-	-	-
ironweed	-	-	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
morning glory	0.05	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-	-	-
musk thistle	-	-	-	0.02	-	0.13	-	-	-	0.01	-	-	-	-	-	-	-	-
ox eye sunflower	-	-	-	-	-	-	-	0.01	0.01	-	-	-	-	-	-	-	-	-
partridge pea	0.27	-	0.02	0.02	-	0.03	0.00	-	-	0.01	0.04	0.16	0.07	0.05	-	0.03	0.03	-
pineapple weed	-	-	-	-	-	0.03	0.01	-	-	-	-	-	-	-	-	-	-	-
prickly sowthistle	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	0.00	0.01	-	-
prostrate knotweed	-	0.07	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-
prostrate vervain	240.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	-	-
queen annes lace	-	-	4.49	-	0.97	0.02	0.08	-	-	0.43	0.68	0.07	-	0.00	-	-	-	1.60
red clover	0.05	-	0.49	1.30	0.12	0.08	0.09	8.44	8.98	3.60	3.96	0.01	0.01	0.17	0.01	-	-	0.16
rough avens	-	-	-	0.09	-	-	-	0.04	0.53	0.04	-	-	-	-	-	-	0.00	-
shepherds purse	-	-	0.02	-	-	-	-	-	-	-	0.03	-	-	-	0.21	0.00	0.86	-
shortstalk chickweed	-	-	-	-	-	-	0.15	-	-	0.04	-	-	-	-	-	-	-	-
smartweed	0.03	0.29	0.02	0.03	0.07	0.02	0.11	0.08	0.17	7.83	2.57	-	-	-	-	-	-	-
venice mallow	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-
white clover	-	-	0.04	0.87	0.01	0.75	6.06	0.03	-	0.75	1.74	0.18	-	-	-	-	-	1.85
white sweet clover	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
wild mustard	-	-	-	-	-	-	-	0.31	0.11	0.01	0.02	-	-	0.01	-	-	-	-
yellow coneflower	-	-	-	-	-	-	0.02	-	-	-	-	-	-	-	-	-	-	-
yellow sweet clover	-	-	-	-	-	-	-	-	-	-	-	-	0.02	-	-	-	-	-
yellow wood sorrel	-	-	-	-	-	0.10	0.32	-	-	-	-	0.40	-	0.05	-	-	0.02	-

Table 7: 2018 nectar plant species density: average density (count / m2) across all rounds

Nectar Plant Species	tall1a	tall2a	tarm1b	tarm2a	tcre1a	tdun2a	tdun3a	tgro1a	tgro2a	tnkn1a	tnkn2a	tnor1b	tpio1a	tpio2a	tprd1a	tprd2a	tsut2a	tver1a
alfalfa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
american bellflower	-	-	-	2.47	-	-	-	0.26	-	-	-	0.03	-	-	-	-	-	-
birdsfoot trefoil	-	-	0.42	-	-	-	1.12	-	-	9.73	10.25	-	-	-	-	-	-	3.32
black eyed susan	-	0.11	0.09	-	0.03	0.01	0.04	-	-	-	0.02	-	0.88	0.72	0.15	1.27	-	0.05
black medic	0.10	0.03	-	-	1.11	0.07	-	-	-	-	-	-	0.38	0.02	-	-	0.10	-
bladder campion	2.47	0.53	-	-	-	1.35	-	-	-	-	-	-	-	-	-	-	-	-
blue vervain	0.02	-	-	-	-	-	0.35	-	-	0.62	1.03	45.77	-	0.17	0.02	0.08	-	-
bull thistle	-	-	-	-	0.01	-	-	-	-	0.02	0.01	-	-	-	-	0.02	-	-
canada goldenrod	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
canada milk vetch	-	-	-	-	-	-	-	-	-	-	-	0.15	-	-	-	-	0.02	-
canada thistle	-	0.23	-	0.03	-	-	-	0.15	-	0.13	-	0.39	-	-	-	-	1.40	-
carolina horsenettle	-	-	-	-	-	0.06	0.05	-	0.02	-	-	-	0.00	-	-	-	-	-
catnip	-	-	-	-	-	0.16	-	0.33	0.04	-	-	-	-	-	-	-	2.21	-
chicory	-	-	-	-	-	-	-	-	-	1.07	-	-	-	-	-	-	-	-
common cinquefoil	2.53	0.42	0.01	-	0.01	-	0.01	-	-	0.18	0.13	0.08	-	-	-	-	-	-
common dandelion	0.01	0.01	-	-	-	0.00	0.01	-	-	-	-	0.01	-	-	-	-	0.01	-
common evening primrose	-	-	-	-	-	-	-	-	-	-	-	0.05	0.02	0.01	-	0.01	0.02	-
common mullein	-	-	-	-	-	0.18	0.19	-	-	-	-	-	0.00	-	-	-	-	-
common selfheal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
common sneezeweed	-	-	-	-	-	-	-	-	-	-	-	-	-	0.12	-	-	-	0.30
common yarrow	-	-	-	-	0.03	-	-	-	-	-	0.24	-	0.26	-	-	-	-	-
compass plant	-	-	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
deptford pink	-	-	-	-	0.80	-	-	-	-	-	-	-	-	-	-	-	-	-
eastern daisy fleabane	-	-	3.26	-	9.28	0.52	3.02	-	-	0.01	0.04	0.02	1.27	17.02	-	0.05	-	10.25
field pennycress	-	-	-	-	-	0.04	-	-	-	-	-	-	-	-	-	-	-	-
field thistle	-	-	-	-	-	-	-	-	-	-	-	0.31	-	-	-	-	-	0.10
flowering spurge	-	-	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
foxglove beardtongue	-	-	0.08	0.00	-	-	-	-	-	-	0.19	0.89	-	0.04	0.27	0.08	0.25	-
golden alexanders	-	-	0.01	0.02	-	-	-	0.01	-	0.02	-	0.05	-	-	-	-	-	-
great blue lobelia	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01	-	-	-	-
hoary vervain	0.01	-	-	-	-	0.10	1.28	0.17	-	-	-	0.88	-	0.09	0.05	0.04	0.04	-
ironweed	-	-	-	-	-	-	0.01	-	-	-	-	-	-	0.00	-	-	-	-

Table 8: 2018 nectar plant species density: average density (count / m2) across all rounds

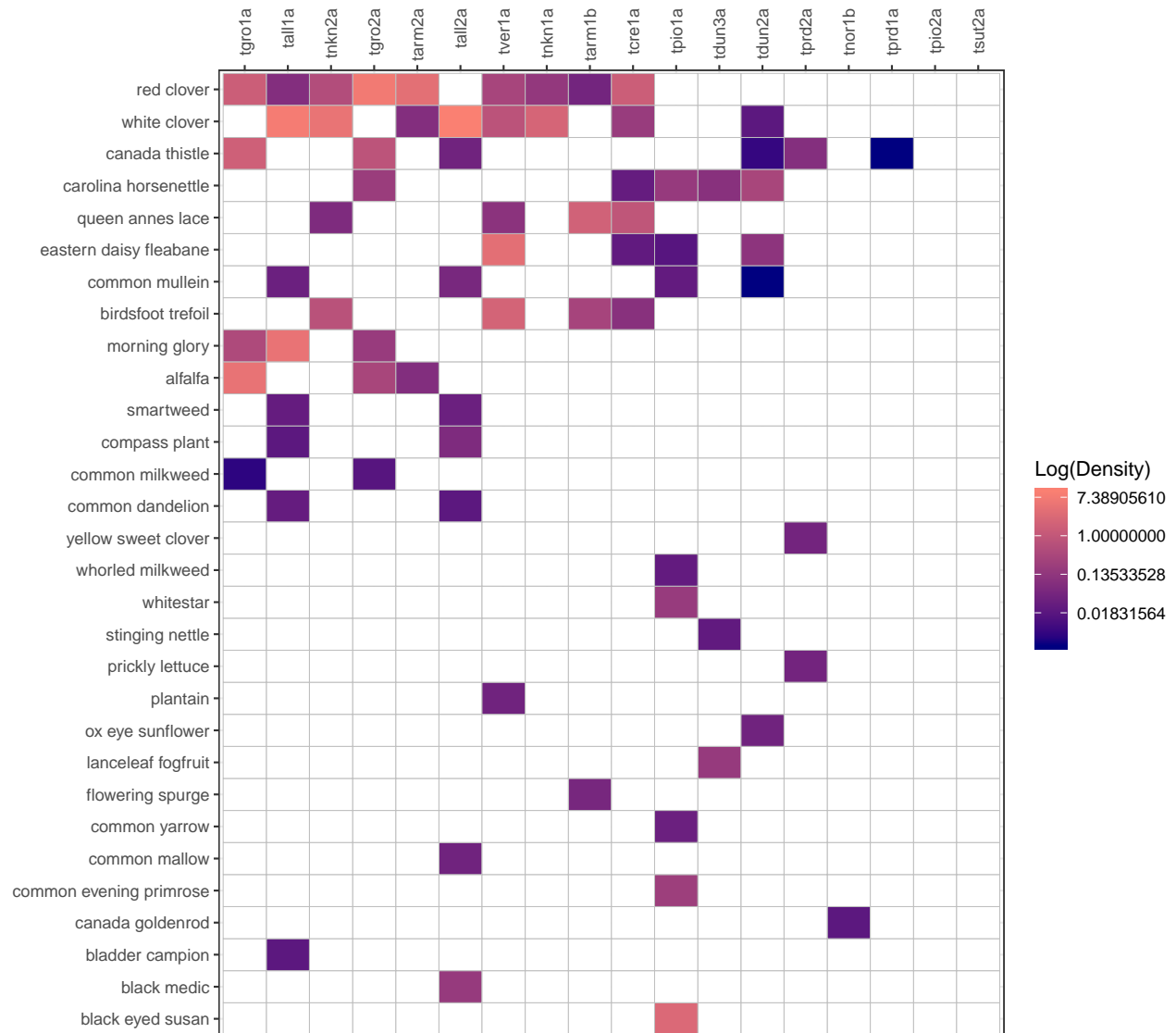| Nectar Plant Species	tall1a	tall2a	tarm1b	tarm2a	tcre1a	tdun2a	tdun3a	tgro1a	tgro2a	tnkn1a	tnkn2a	tnor1b	tpio1a	tpio2a	tprd1a	tprd2a	tsut2a	tver1a
lanceleaf fogfruit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
leadplant	-	-	-	-	-	-	0.04	-	-	-	-	-	-	-	-	-	-	-
lesser burdock	-	-	-	-	-	-	-	-	0.01	-	-	-	-	0.00	-	-	-	-
marestail	-	-	-	0.31	0.07	-	-	-	-	-	-	-	-	-	-	0.39	0.18	-
morning glory	0.01	0.22	0.02	-	-	-	-	0.03	0.02	-	-	-	-	-	-	-	-	-
musk thistle	0.03	-	-	-	-	0.41	0.18	-	-	-	-	-	0.02	0.01	-	-	-	-
new england aster	-	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.07	0.07	-
ox eye daisy	-	0.01	-	-	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-
ox eye sunflower	0.10	0.02	0.10	0.66	0.15	0.83	0.49	1.28	0.20	0.81	1.25	2.91	0.20	1.83	0.04	0.34	1.72	0.08
pale purple coneflower	-	-	-	-	-	-	-	-	-	-	-	-	0.05	-	-	-	0.01	-
partridge pea	-	-	-	-	-	0.01	-	-	-	-	-	0.02	0.16	0.08	0.03	0.10	-	0.04
plantain	0.09	-	-	0.17	-	-	0.01	-	-	0.02	-	-	-	-	-	-	-	-
prairie blazing star	-	-	-	-	-	-	-	-	-	-	-	0.01	-	-	-	-	-	-
prairie cinquefoil	-	-	-	-	-	-	0.01	-	-	-	0.00	-	-	-	-	-	-	-
prickly lettuce	0.01	-	-	-	1.18	0.17	0.03	-	-	-	-	-	-	-	0.07	0.01	-	-
prickly sowthistle	-	0.02	-	-	-	-	-	0.19	-	-	-	-	-	-	-	-	-	-
prostrate vervain	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.10	-	-
purple prairie clover	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01	-	5.97
queen annes lace	1.37	-	5.84	-	9.43	0.06	0.37	-	0.01	0.19	0.33	-	0.98	-	-	-	-	-
red clover	-	0.57	17.38	32.44	10.56	0.54	1.03	13.05	51.36	13.32	11.84	0.09	11.99	6.99	-	-	0.14	4.14
rough avens	-	-	-	-	-	-	-	-	-	-	-	0.01	-	-	-	-	0.03	-
smartweed	1.17	0.19	-	-	-	0.02	0.10	3.17	0.49	-	-	-	-	-	-	-	0.13	-
stinging nettle	-	-	-	-	-	0.23	0.02	-	-	-	-	-	-	-	-	-	-	-
swamp milkweed	-	-	-	0.08	-	-	-	0.03	-	-	-	-	-	-	-	-	-	-
tall thistle	-	-	0.01	-	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-
venice mallow	-	-	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
virginia mountain mint	13.97	-	-	-	-	-	-	-	-	0.07	-	0.04	-	0.08	-	-	0.03	-
white clover	-	5.20	0.12	2.40	-	14.32	17.47	-	-	4.97	4.95	1.06	-	-	-	-	0.31	4.88
white sweet clover	0.03	-	0.91	-	-	-	-	0.11	-	0.01	-	0.50	-	0.01	-	-	0.00	-
whorled milkweed	-	-	-	-	-	-	-	-	-	-	-	-	2.41	-	-	-	-	-
wild bergamot	0.06	0.12	-	0.02	0.02	-	-	2.08	0.21	0.56	0.98	1.15	-	0.22	0.73	0.11	0.70	-
wild cucumber	-	-	-	-	-	-	-	0.84	-	-	-	-	-	-	-	-	-	-
wild mustard	-	-	-	-	-	-	-	1.94	-	-	-	-	-	-	-	-	-	-
wild parsnip	-	-	-	0.02	0.08	0.20	-	-	-	-	-	0.03	-	-	-	-	-	-
yellow coneflower	1.13	0.78	0.49	1.55	0.10	0.60	0.90	2.76	1.05	5.03	5.20	4.40	0.90	3.41	1.83	1.65	15.93	0.02
yellow salsify	-	-	-	-	-	-	-	-	-	-	-	0.01	-	-	-	-	-	-
yellow sweet clover	0.13	0.26	0.39	0.06	1.93	0.13	-	0.08	0.14	0.29	0.17	0.13	0.20	1.59	-	0.12	0.02	-
yellow wood sorrel	-	-	-	-	-	0.32	-	-	-	-	-	-	-	-	-	-	-	-

Figure 1: This plot is a heatmap for density of nectar species planted and non-planted with transects on the columns and species on the rows sorting transects by average density and sorting species by avg presence for year 2016.
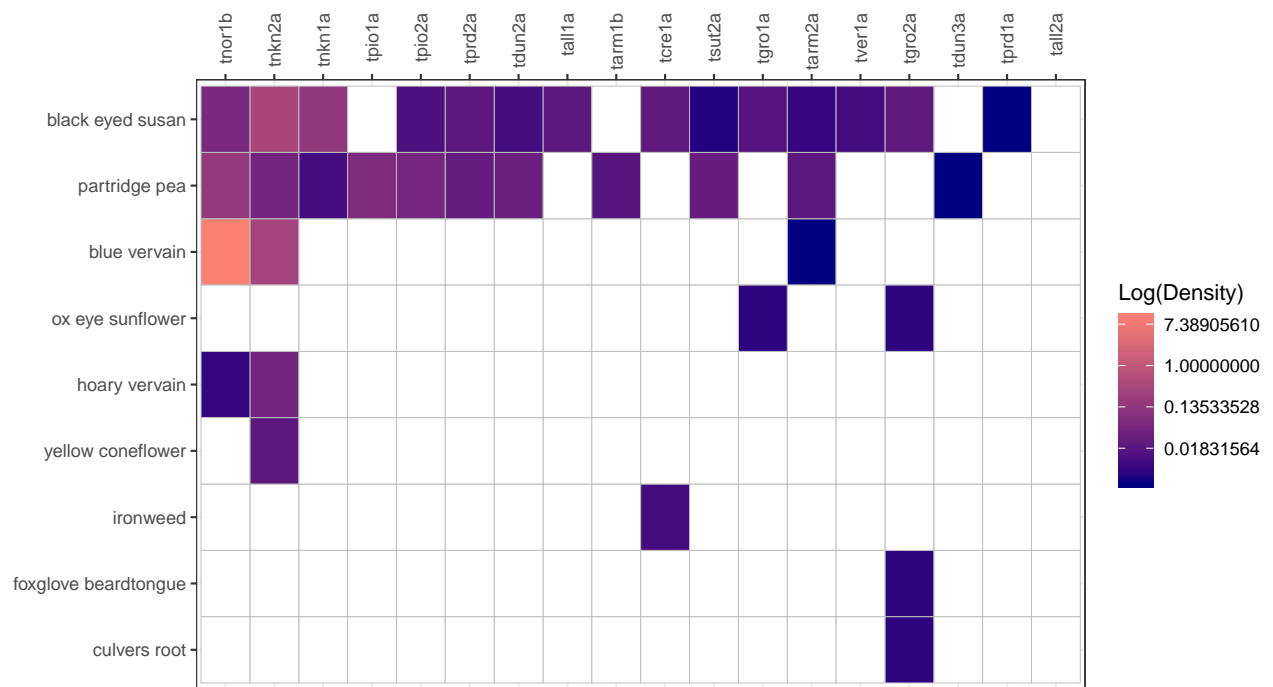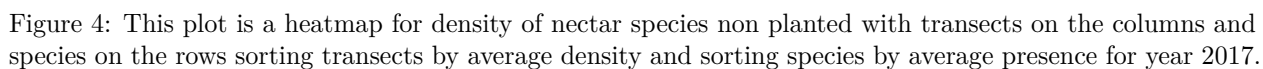
Figure 2: This plot is a heatmap for density of nectar species planted with transects on the columns and species on the rows sorting transects by average density and sorting species by avg presence for year 2017.
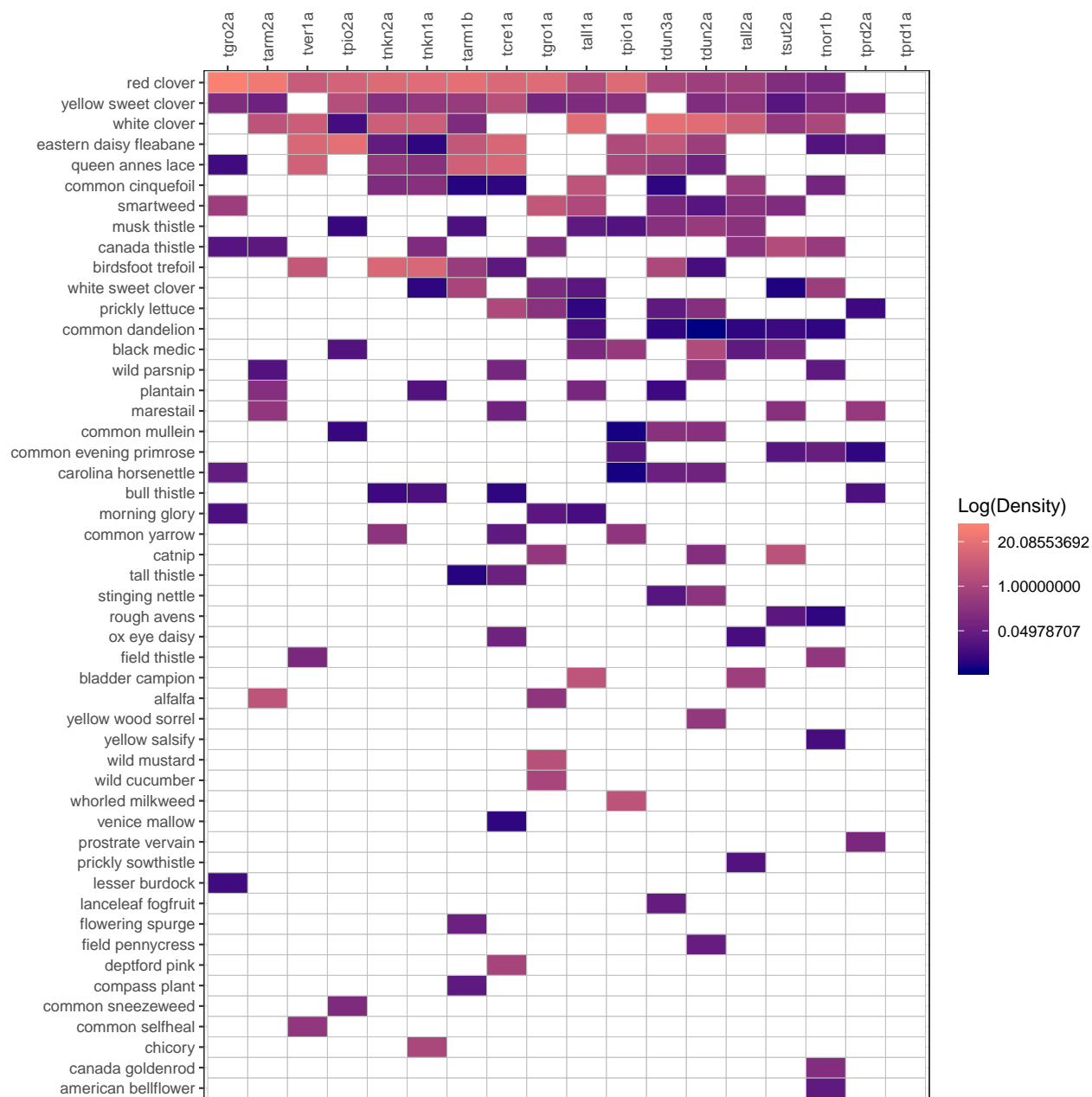
Figure 3: This plot is a heatmap for density of nectar species planted with transects on the columns and species on the rows sorting transects by average density and sorting species by average presence for year 2018.

Figure 4: This plot is a heatmap for density of nectar species non planted with transects on the columns and species on the rows sorting transects by average density and sorting species by average presence for year 2017.

Figure 5: This plot is a heatmap for density of nectar species non planted with transects on the columns and species on the rows sorting transects by average density and sorting species by average presence for year 2018.

Table 9: 2018 ramet plant species: mean count across all surveys

Nectar Plant Species	tall1a	tall2a	tarm1b	tarm2a	tcre1a	tdun2a	tdun3a	tgro1a	tgro2a	tnkn1a	tnkn2a	tnor1b	tpio1a	tpio2a	tprd1a	tprd2a	tsut2a	tver1a
butterfly milkweed ramet	2.7	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-
common milkweed ramet	-	-	-	0.3	0.3	-	1.0	0.7	4.7	-	0.3	9.3	5.0	2.0	0.7	1.0	7.3	2.7
swamp milkweed ramet	-	-	-	-	-	-	-	0.3	-	-	-	1.7	0.7	0.3	-	-	19.0	-

Table 10: 2018 ramet plant species density: average density (count / m2) across all rounds

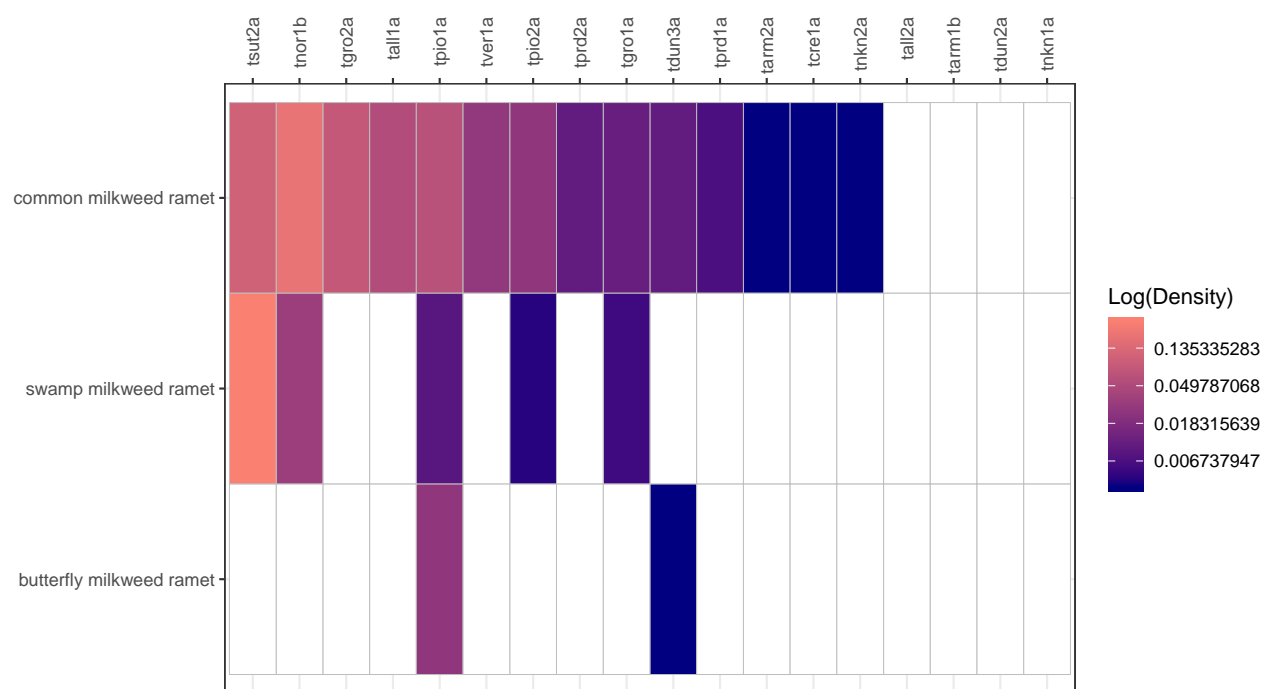| Nectar Plant Species	tall1a	tall2a	tarm1b	tarm2a	tcre1a	tdun2a	tdun3a	tgro1a	tgro2a	tnkn1a	tnkn2a	tnor1b	tpio1a	tpio2a	tprd1a	tprd2a	tsut2a	tver1a
butterfly milkweed ramet	0.05	-	-	-	-	-	0.00	0.01	-	-	-	-	0.03	-	-	-	-	-
common milkweed ramet	-	-	-	0.00	0.00	-	0.01	0.01	0.08	-	0.00	0.19	0.06	0.03	0.01	0.01	0.10	0.03
swamp milkweed ramet	-	-	-	-	-	-	-	0.01	-	-	-	0.03	0.01	0.00	-	-	0.27	-

Figure 6: This plot is a heatmap for density of ramet species with transects on the columns and species on the rows sorting transects by average density and sorting species by average presence for year 2018.