Part II
Flaring and Venting Maps

Robert Balch
Martha Cather
Petroleum Recovery Research Center
New Mexico Tech

Data Source

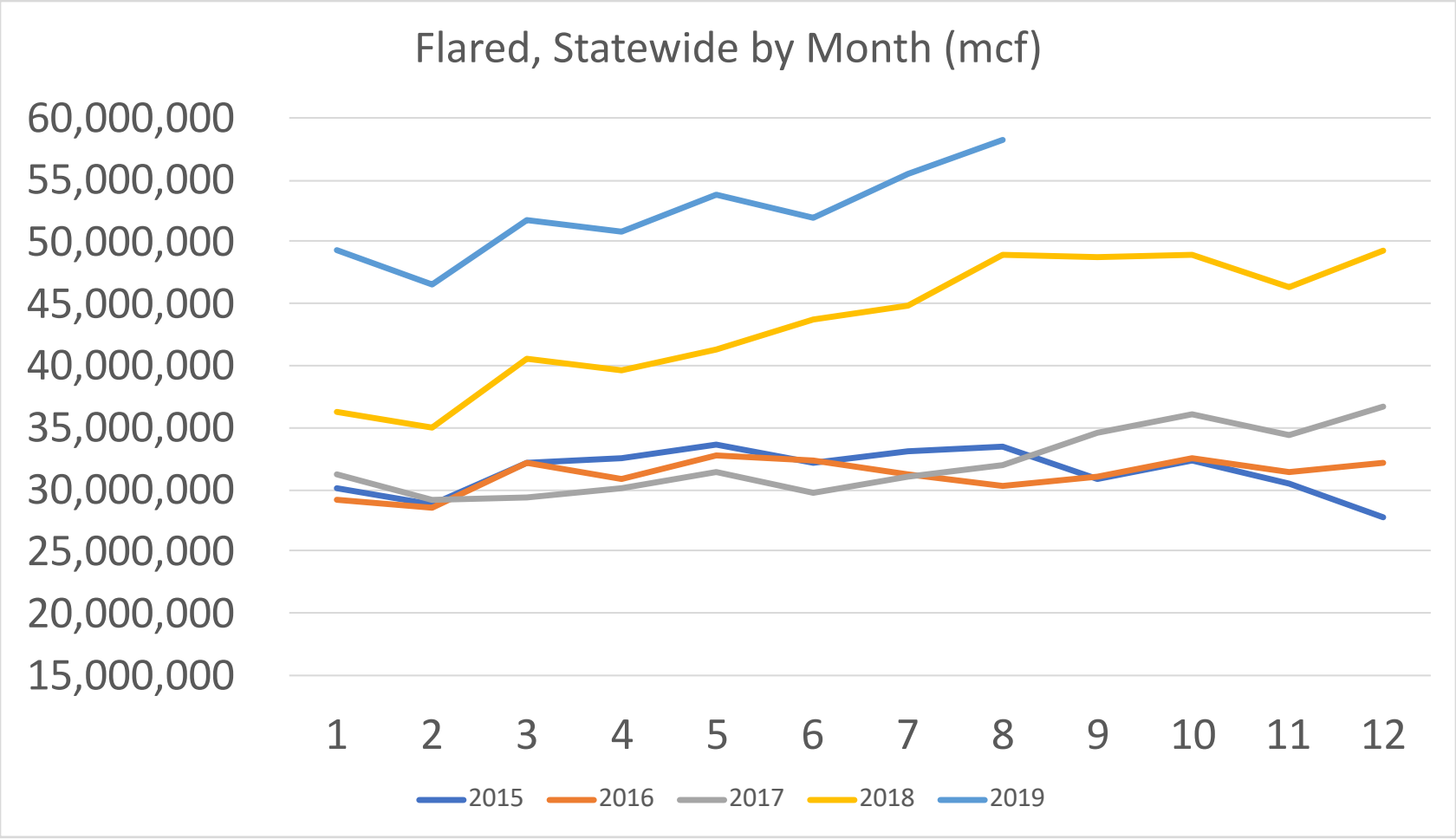
- For Emissions, NM OCD Production Database, “Other Volumes”
  - Data is reported by as a lump sum grouped by Operator, Property ID, Year, Month, and type of emission (flared, vented, used on lease, lost, etc)
  - For work to date we focus on flared and vented data from 2015-2019

- For Production, NM OCD Production & GIS Databases, various tables incl. oil & gas production, well locations, well information

Data Methods

- For most analyses, Property ID is the most granular we could get.*
- Property ID does not have a geographical location attached, since there may be many “API’s” lumped into a given property. The “largest” property had associated APIs (556 active wells, 14 cancelled). Others have only 1 or no wells
- For mapping, Centroid of locations of all associated APIs was used to create a single property location. Could use a variety of criteria to further refine (eg., centroid for flared properties vs vented, all APIs vs only active wells, etc)

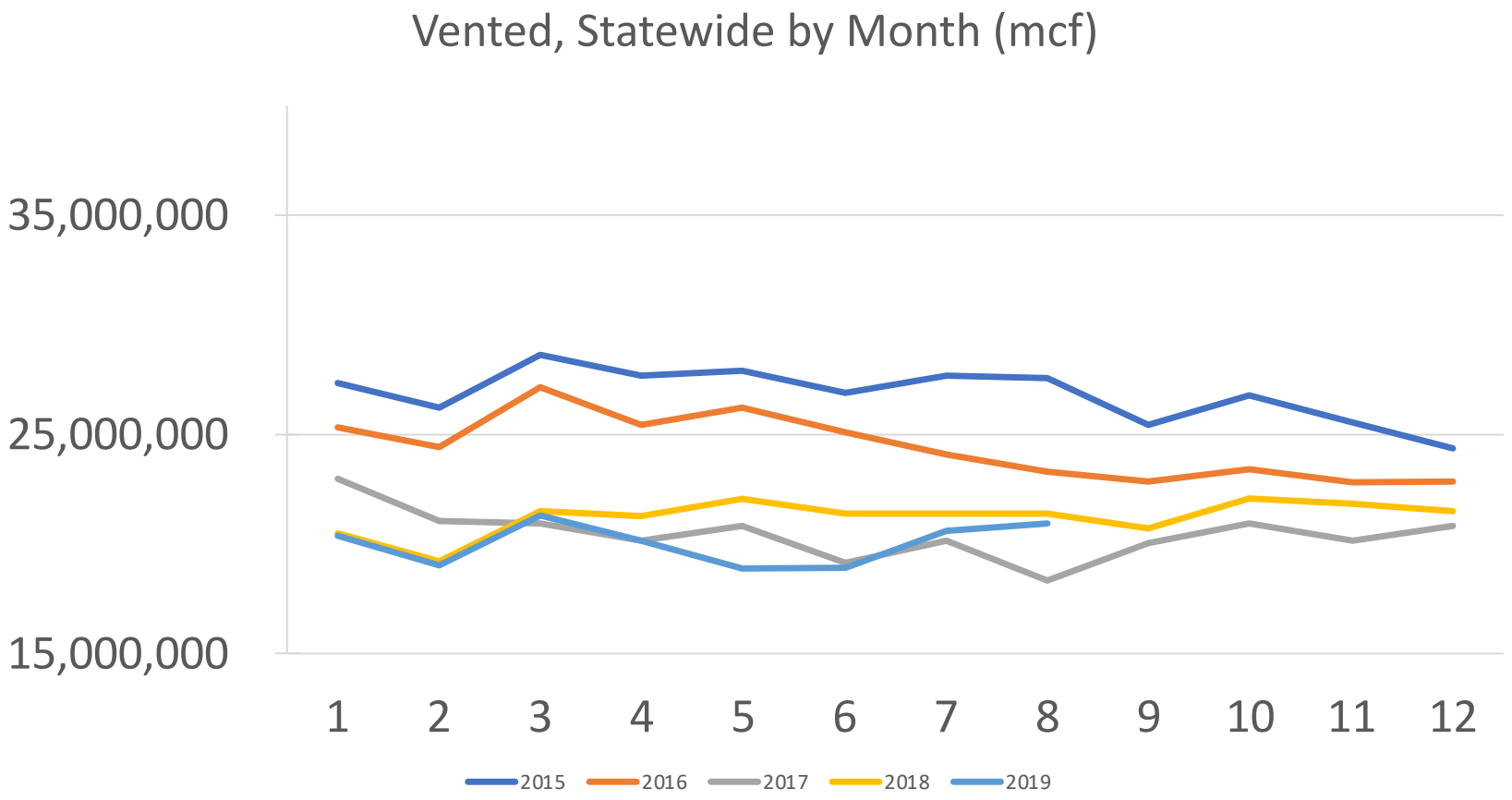
Results – Flaring Trends



- Flaring generally increases towards year end
- Quite a bit of month to month variation

- Flaring generally follows completions or lags slightly (Slide 16 of previous presentation)

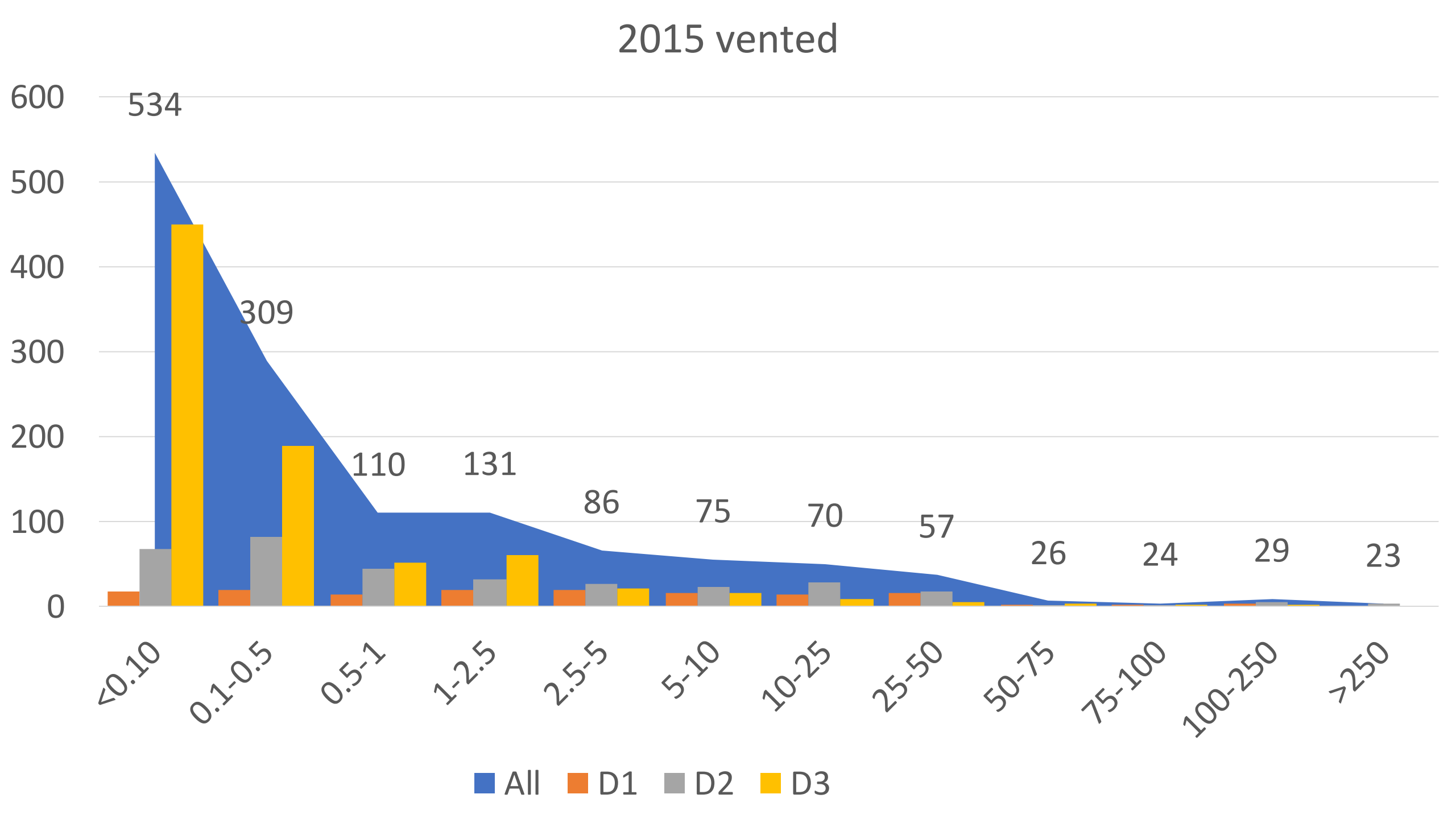
Results – Venting Trends

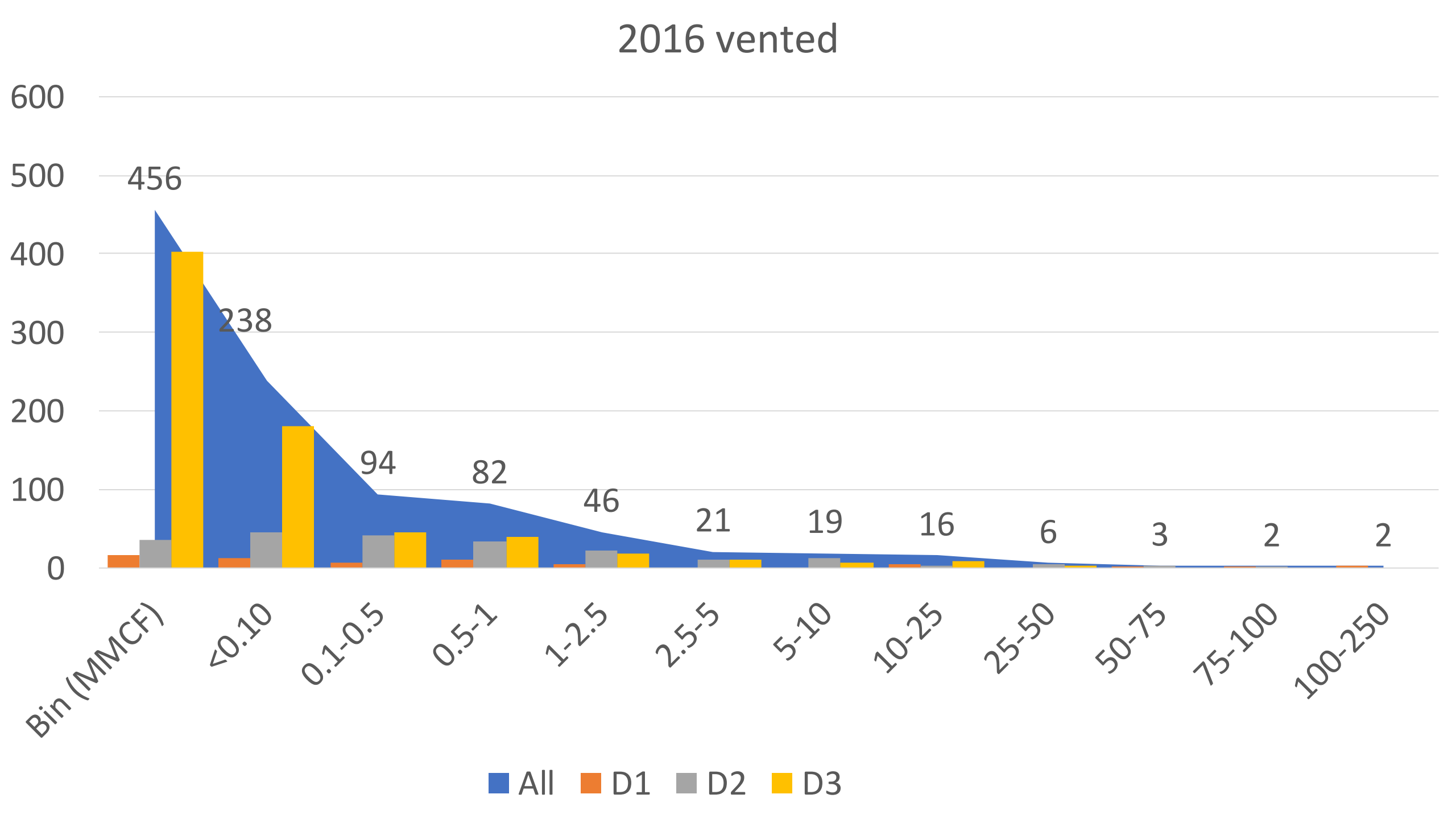


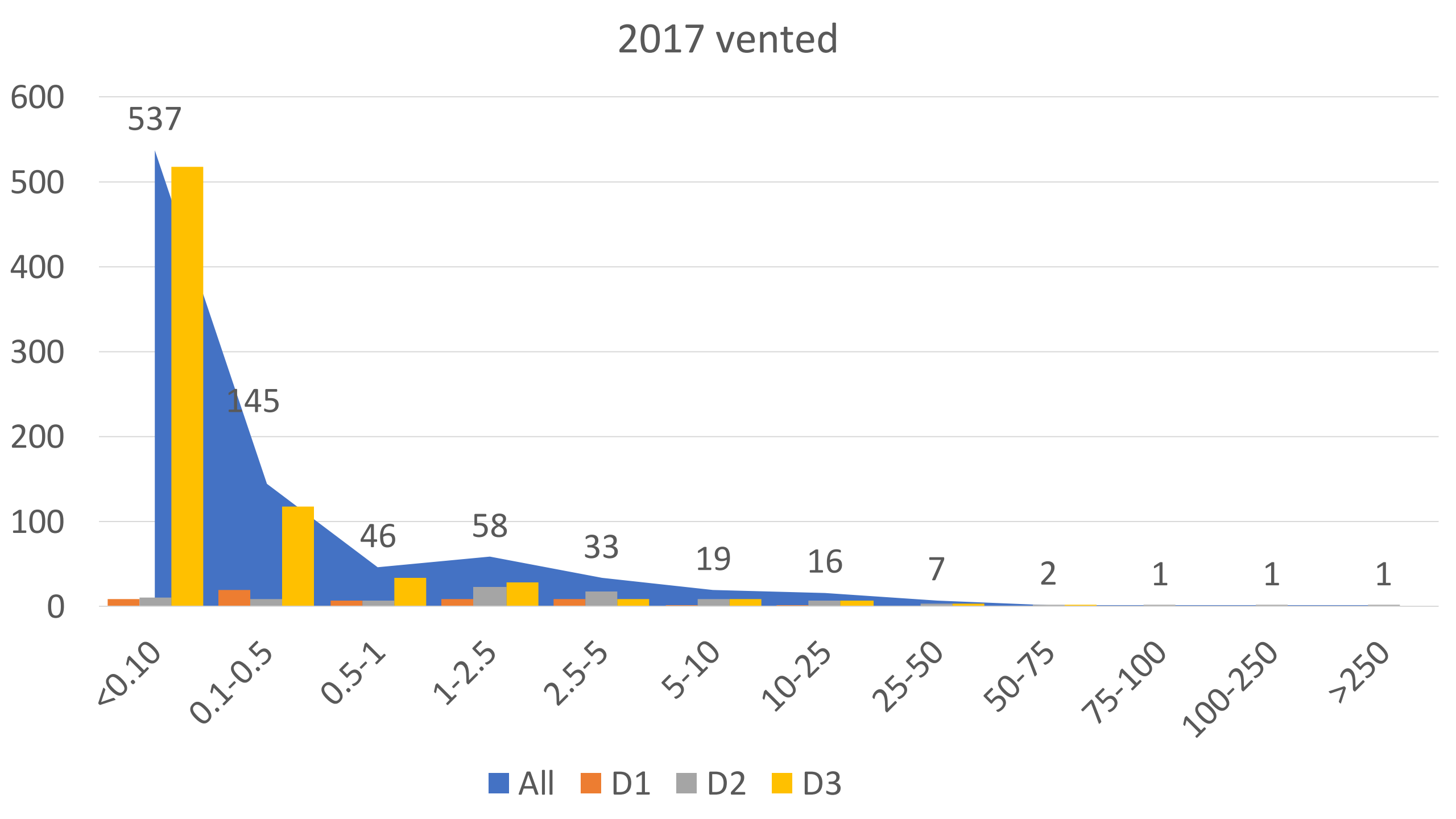
- Venting less volume, larger impact
- Any trend seems to decline during year
- Quite a bit of month to month variation

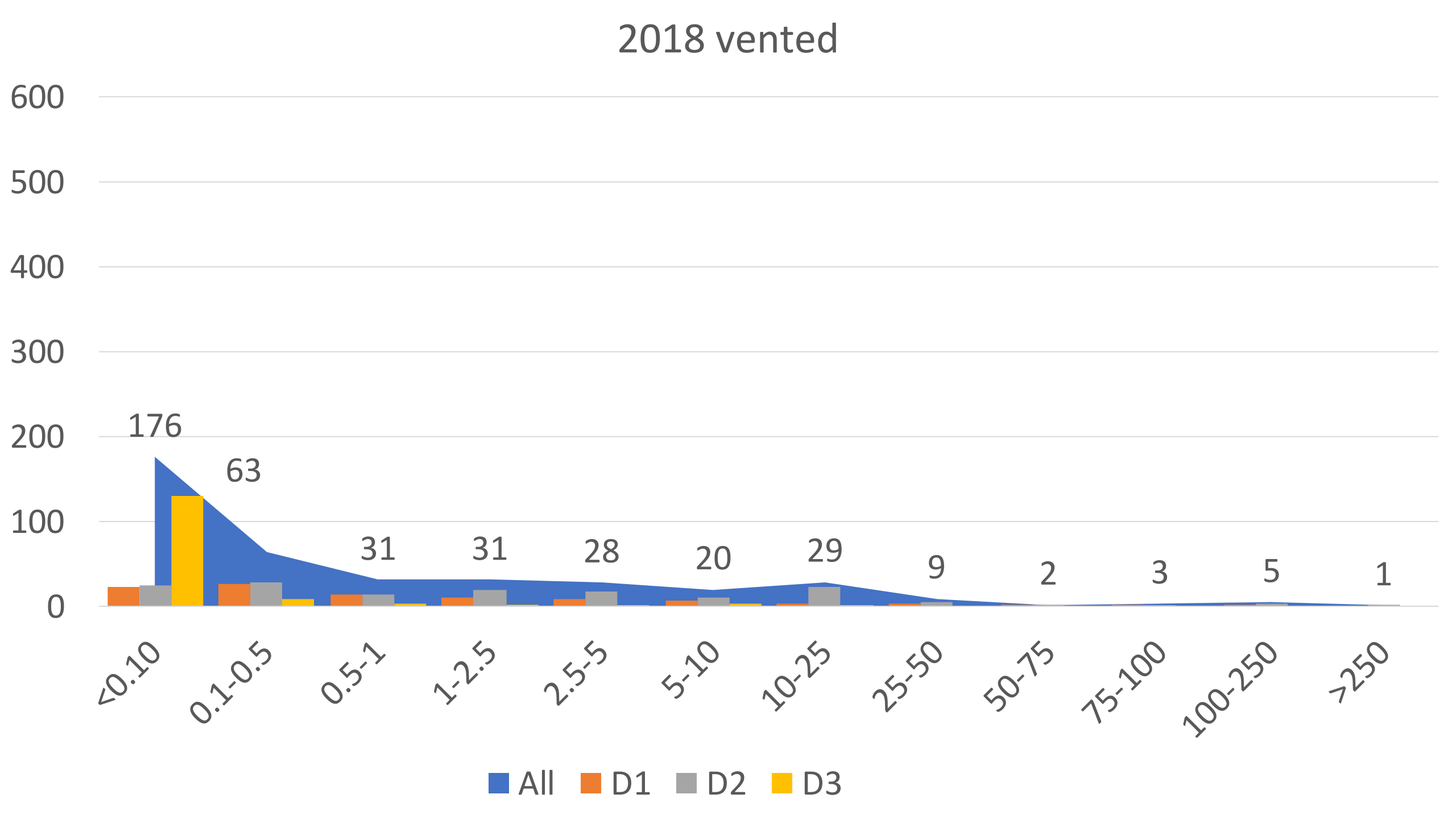
- Does not seem to be a correlation with completions (Slide 16 of previous presentation)

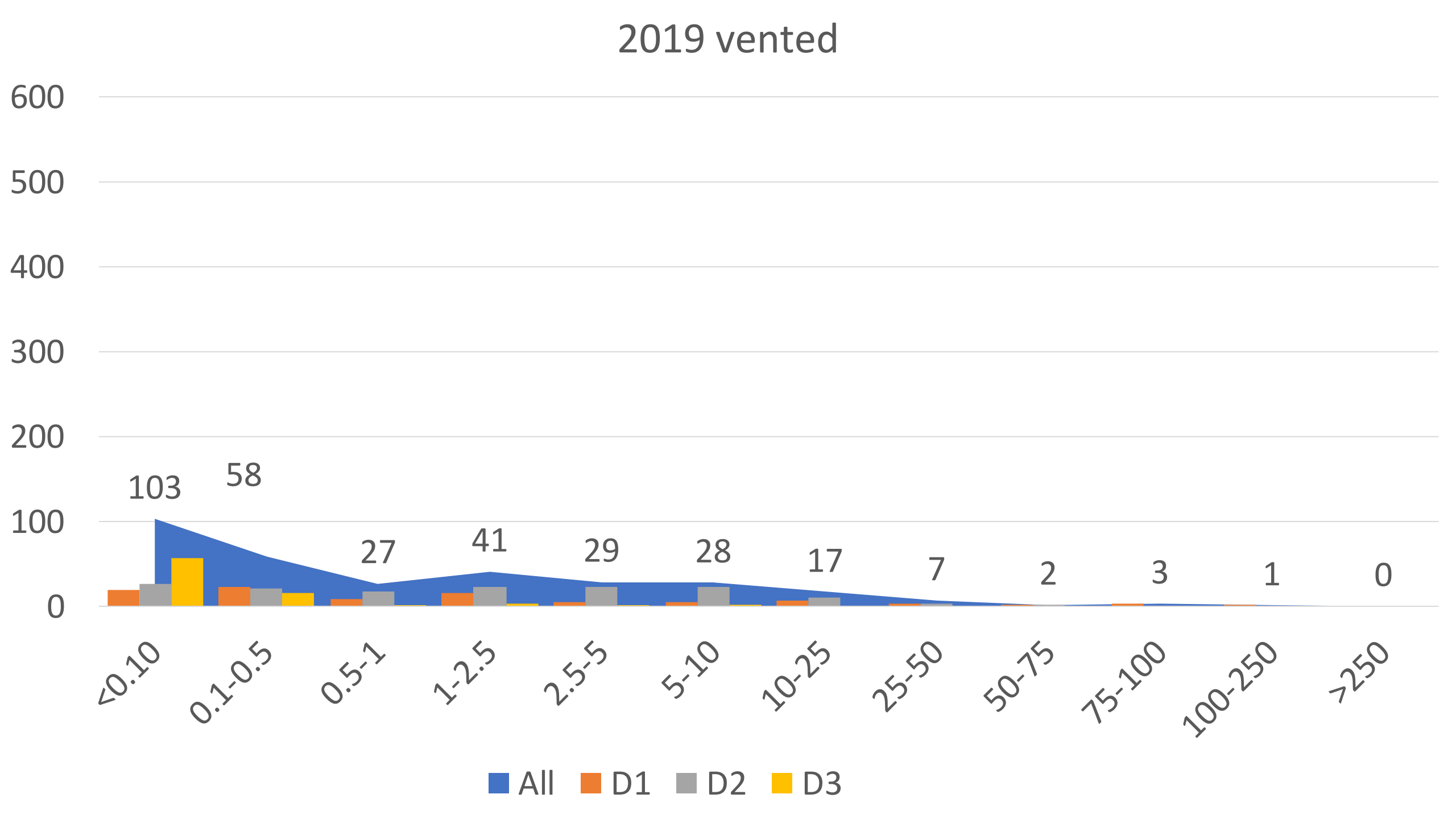
Venting by Size of Event


2015 vented
600
500
400
300
200
100
0
534
309
110
131
86
75
70
57
26
24
29
23
<0.10
0.1-0.5
0.5-1
1-2.5
2.5-5
5-10
10-25
25-50
50-75
75-100
100-250
>250
All
D1
D2
D3

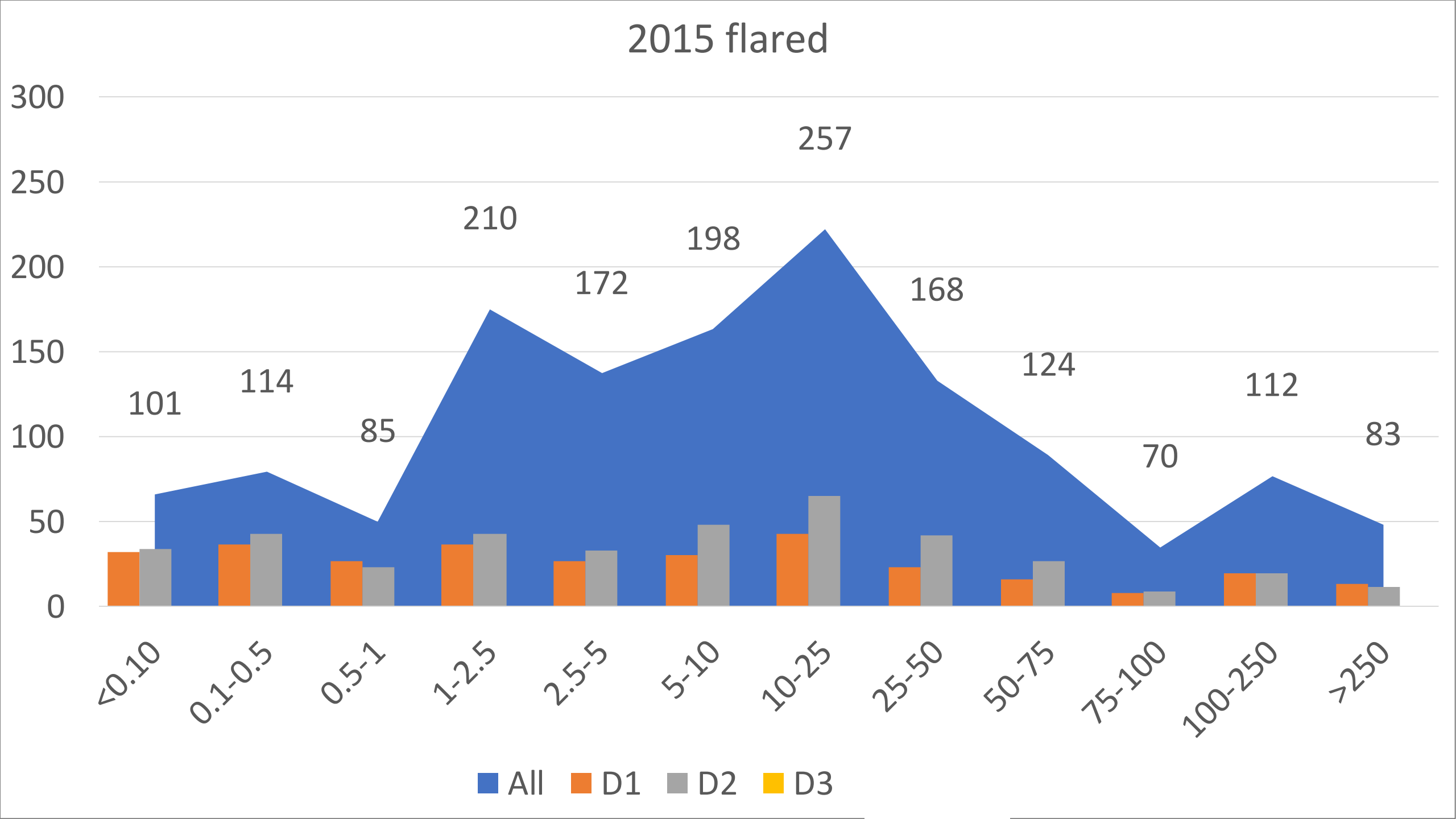

2016 vented
600
500
400
300
200
100
0
456
238
94
82
46
21
19
16
6
3
2
2
Bin (MMCF)
<0.10
0.1-0.5
0.5-1
1-2.5
2.5-5
5-10
10-25
25-50
50-75
75-100
100-250
All
D1
D2
D3

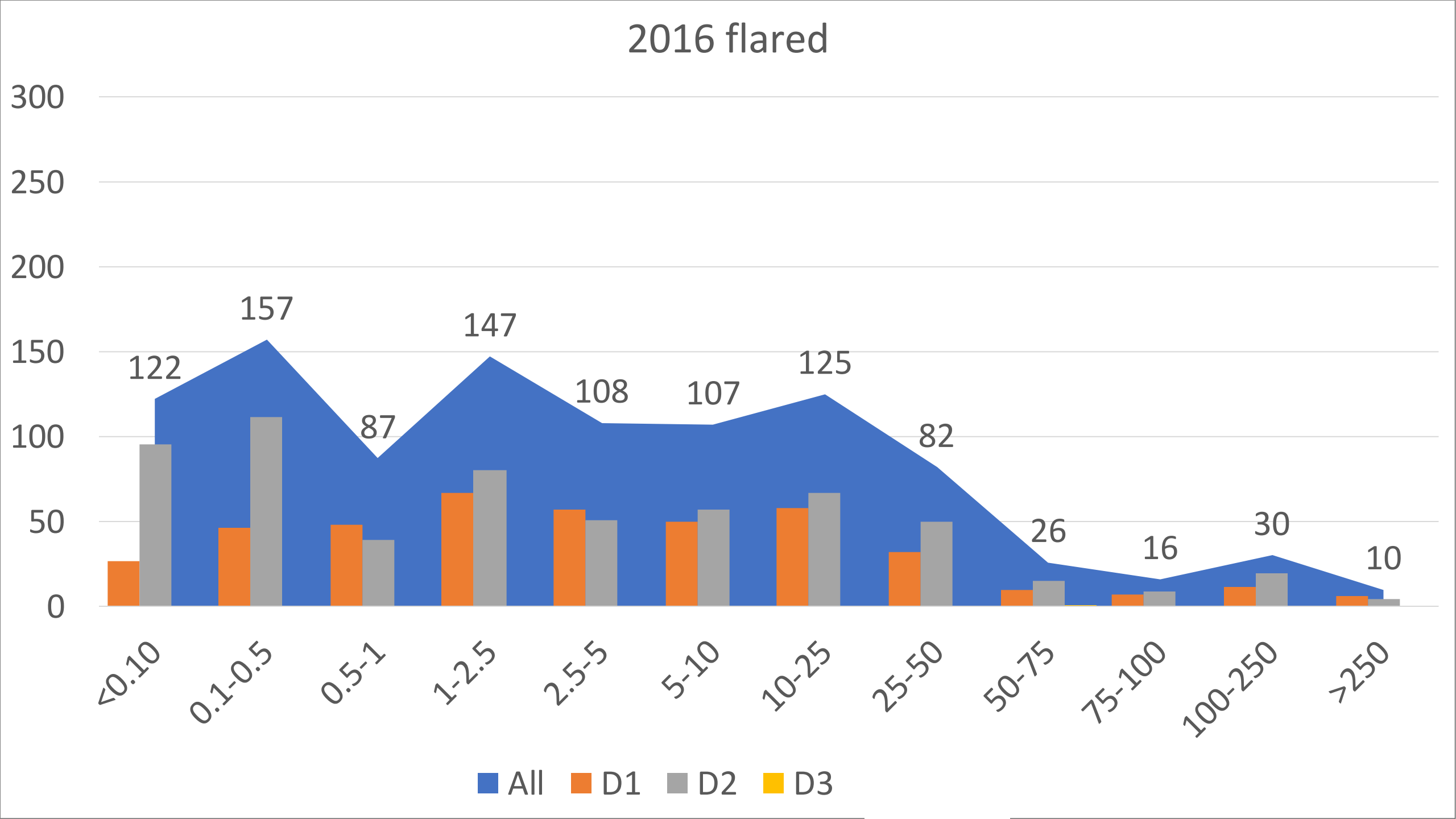

2017 vented
600
500
400
300
200
100
0
537
145
46
58
33
19
16
7
2
1
1
1
<0.10
0.1-0.5
0.5-1
1-2.5
2.5-5
5-10
10-25
25-50
50-75
75-100
100-250
>250
All
D1
D2
D3

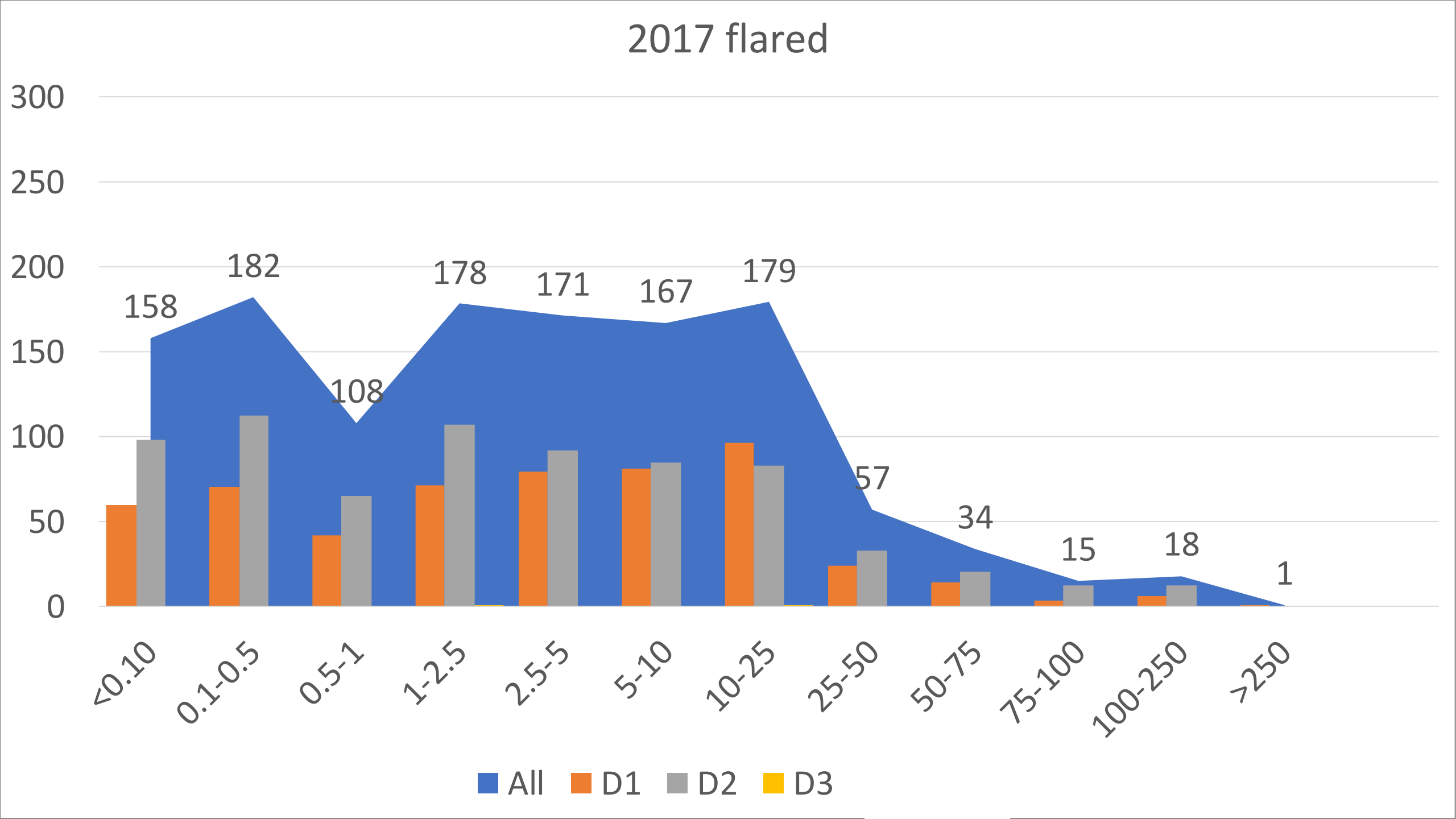

2018 vented
600
500
400
300
200
100
0
176
63
31
31
28
20
29
9
2
3
5
1
<0.10
0.1-0.5
0.5-1
1-2.5
2.5-5
5-10
10-25
25-50
50-75
75-100
100-250
>250
All
D1
D2
D3

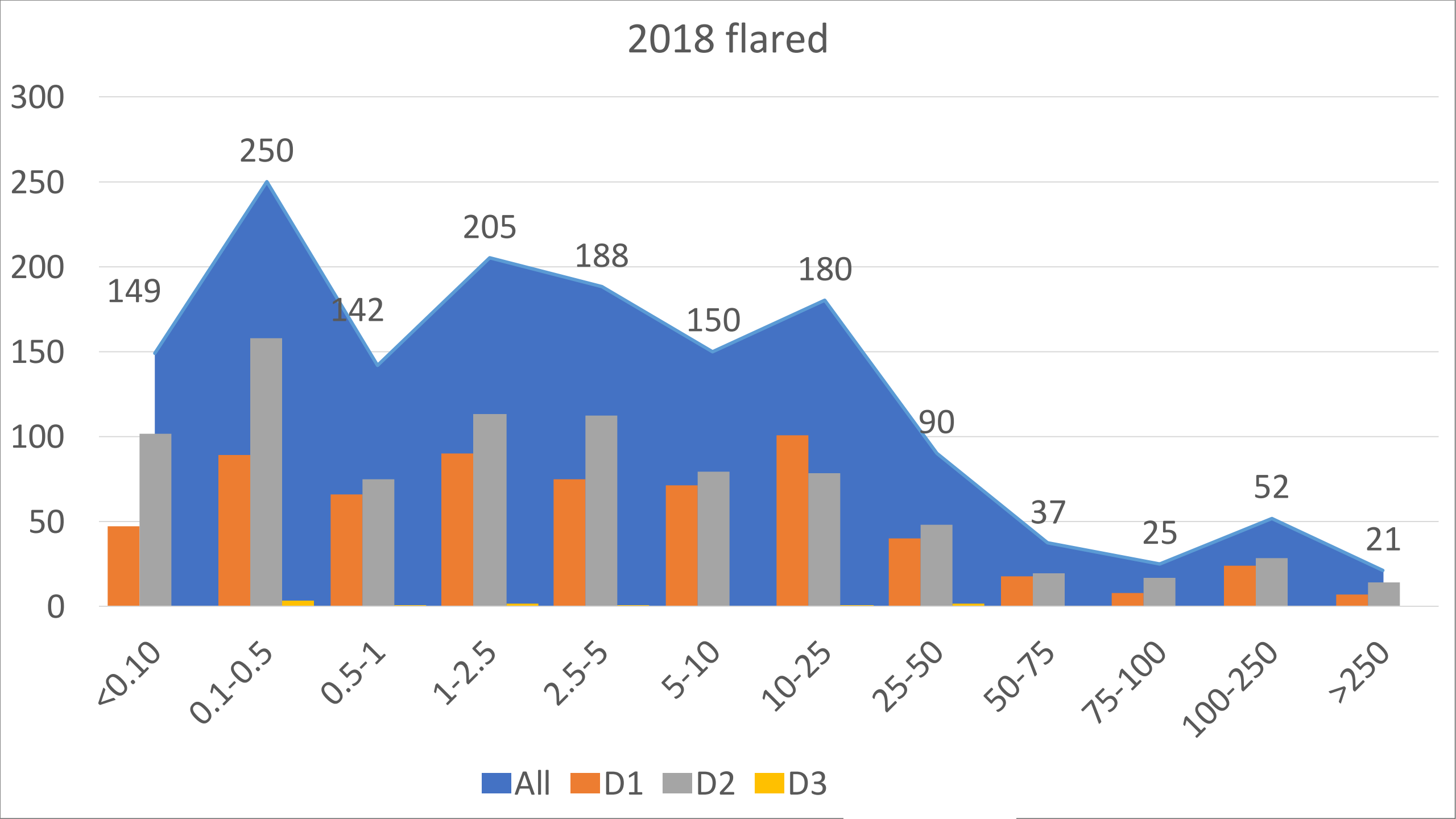

2019 vented
600
500
400
300
200
100
0
103
58
27
41
29
28
17
7
2
3
1
0
<0.10
0.1-0.5
0.5-1
1-2.5
2.5-5
5-10
10-25
25-50
50-75
75-100
100-250
>250
All
D1
D2
D3

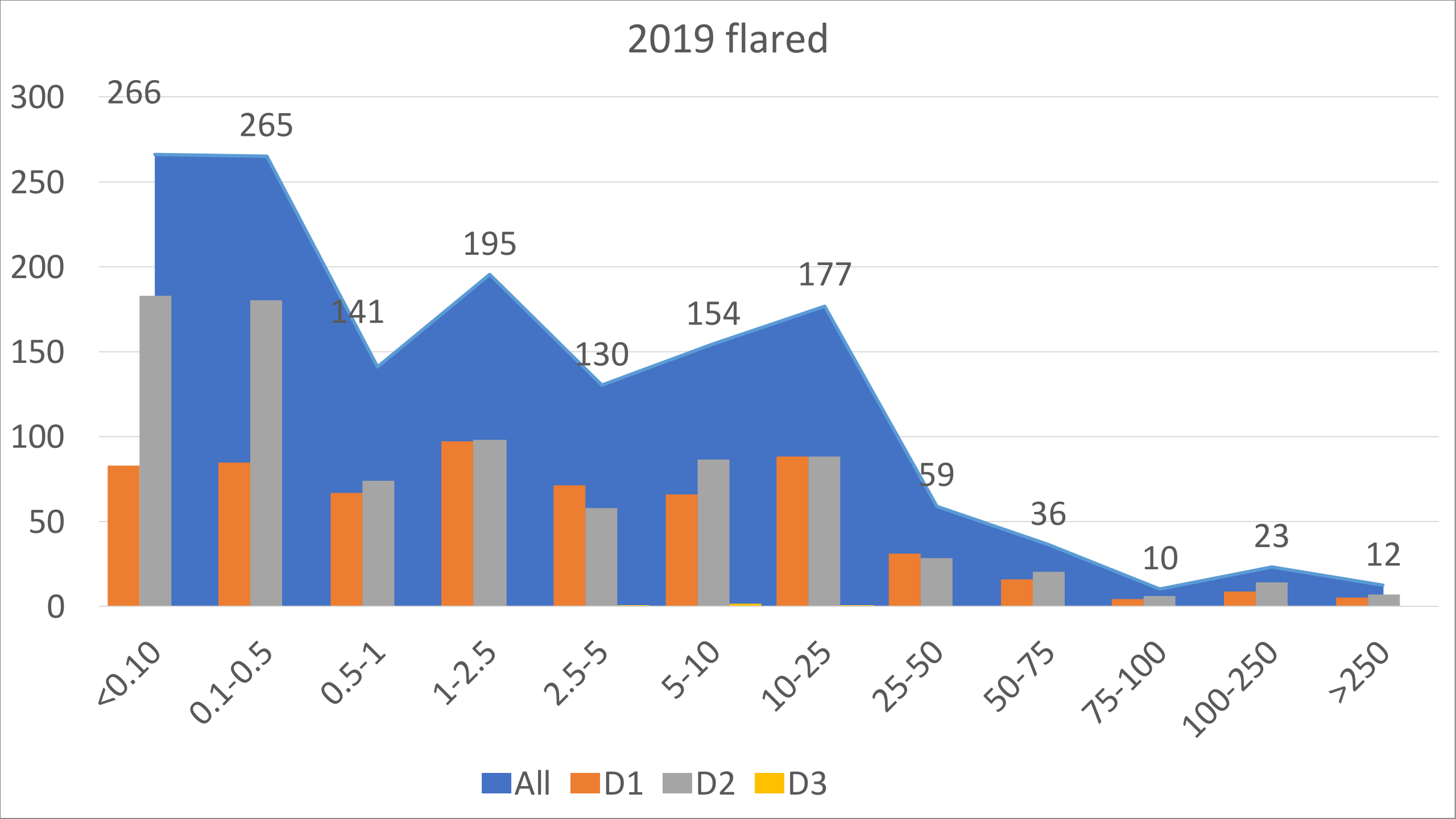
Flaring by Size of Event


2015 flared
300
250
200
150
100
50
0
101
114
85
210
172
198
257
168
124
70
112
83
<0.10
0.1-0.5
0.5-1
1-2.5
2.5-5
5-10
10-25
25-50
50-75
75-100
100-250
>250
All
D1
D2
D3

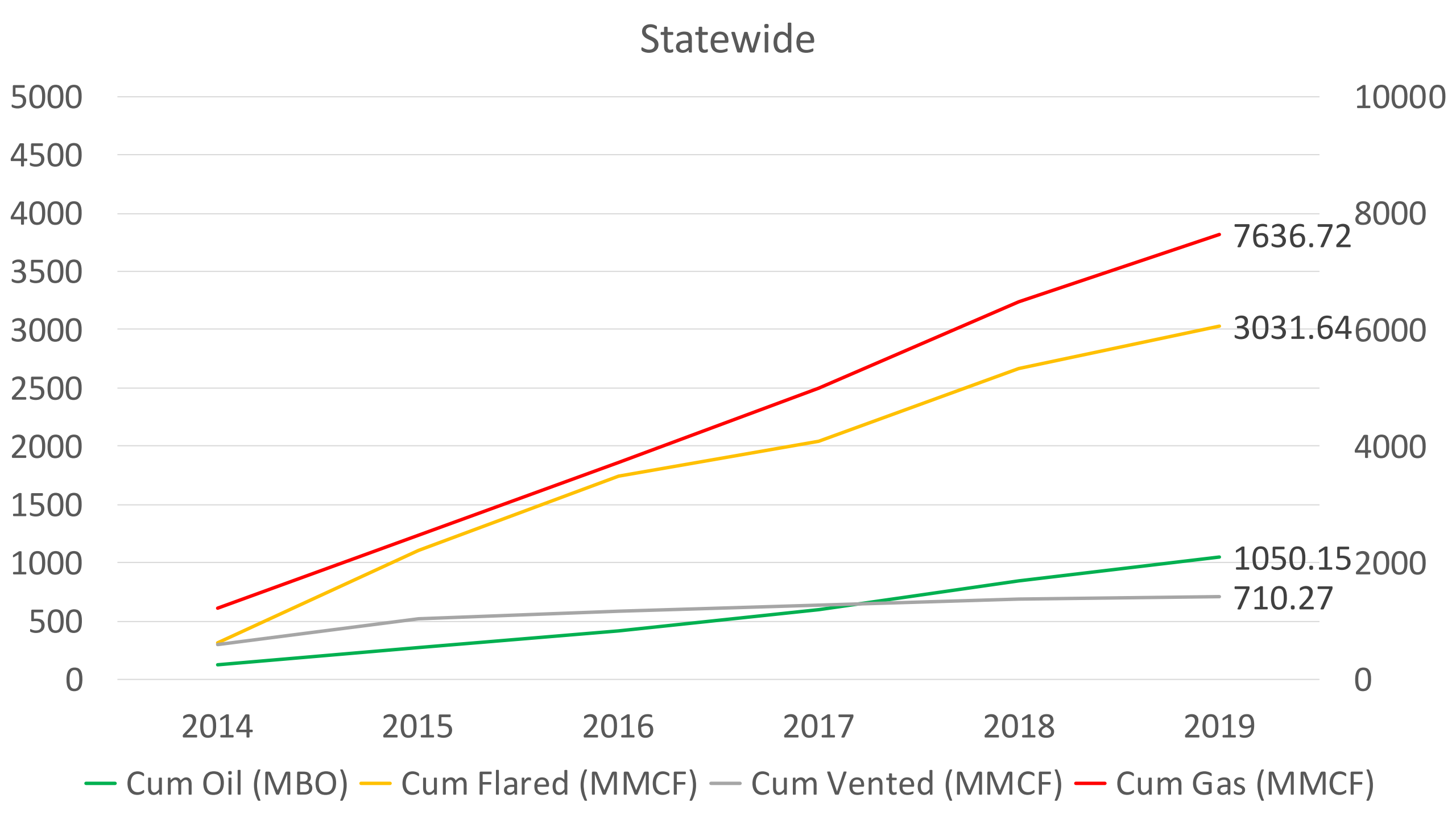

2016 flared
300
250
200
150
100
50
0
122
157
87
147
108
107
125
82
26
16
30
10
<0.10
0.1-0.5
0.5-1
1-2.5
2.5-5
5-10
10-25
25-50
50-75
75-100
100-250
>250
All
D1
D2
D3

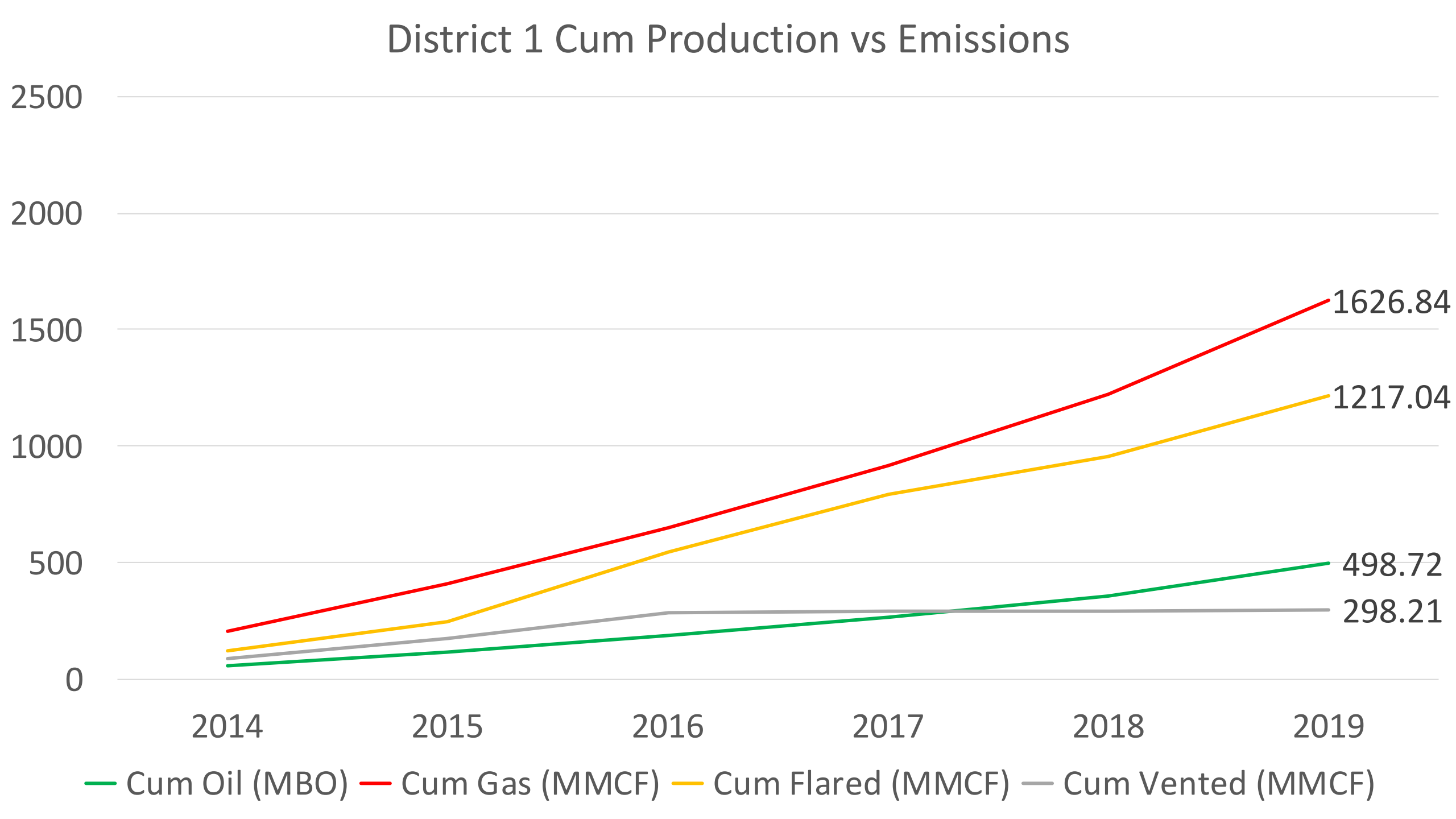

2017 flared
300
250
200
150
100
50
0
158
182
108
178
171
167
179
57
34
15
18
1
<0.10
0.1-0.5
0.5-1
1-2.5
2.5-5
5-10
10-25
25-50
50-75
75-100
100-250
>250
All
D1
D2
D3

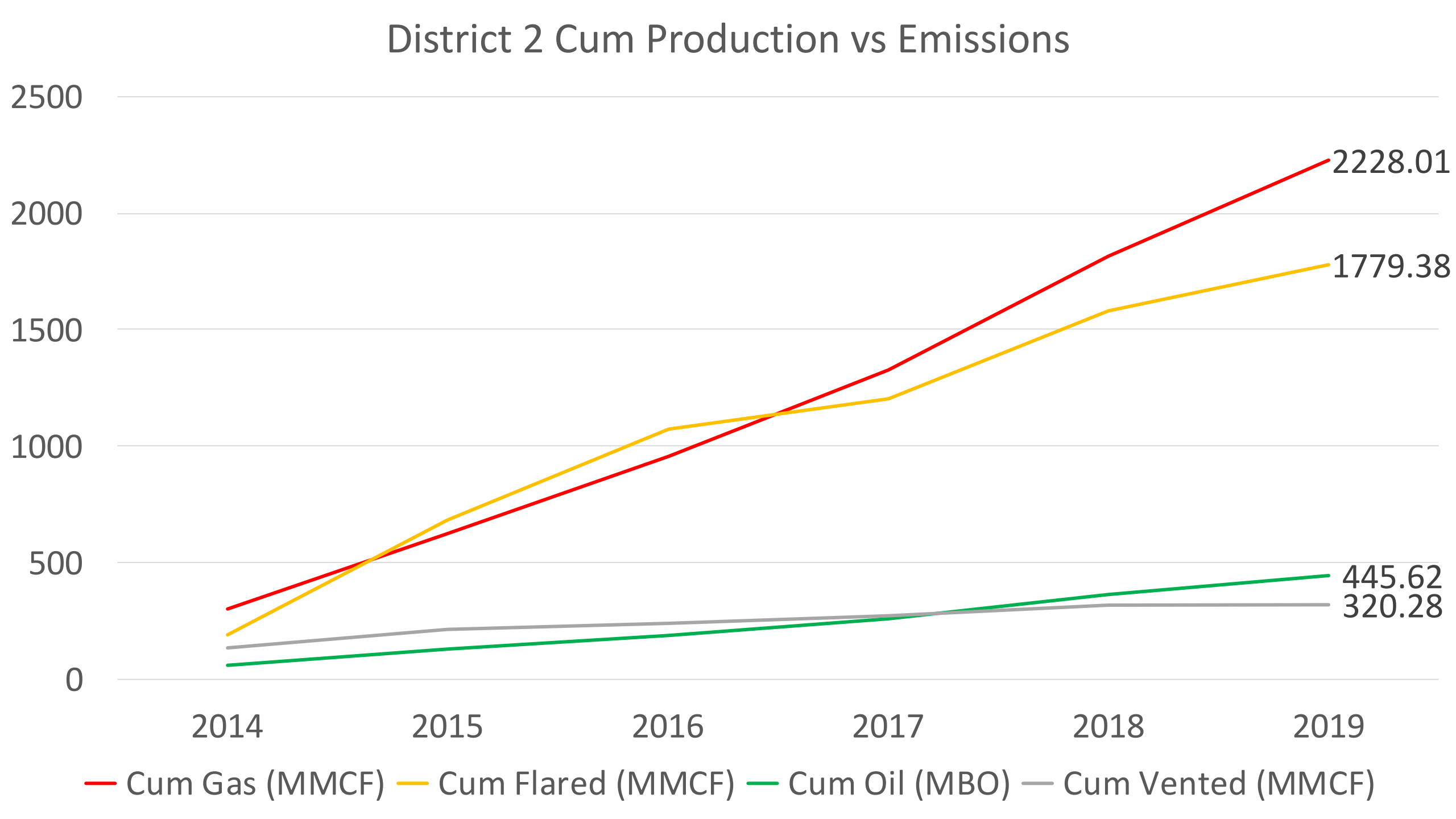

2018 flared
300
250
200
150
100
50
0
149
250
142
205
188
150
180
90
37
25
52
21
<0.10
0.1-0.5
0.5-1
1-2.5
2.5-5
5-10
10-25
25-50
50-75
75-100
100-250
>250
All
D1
D2
D3

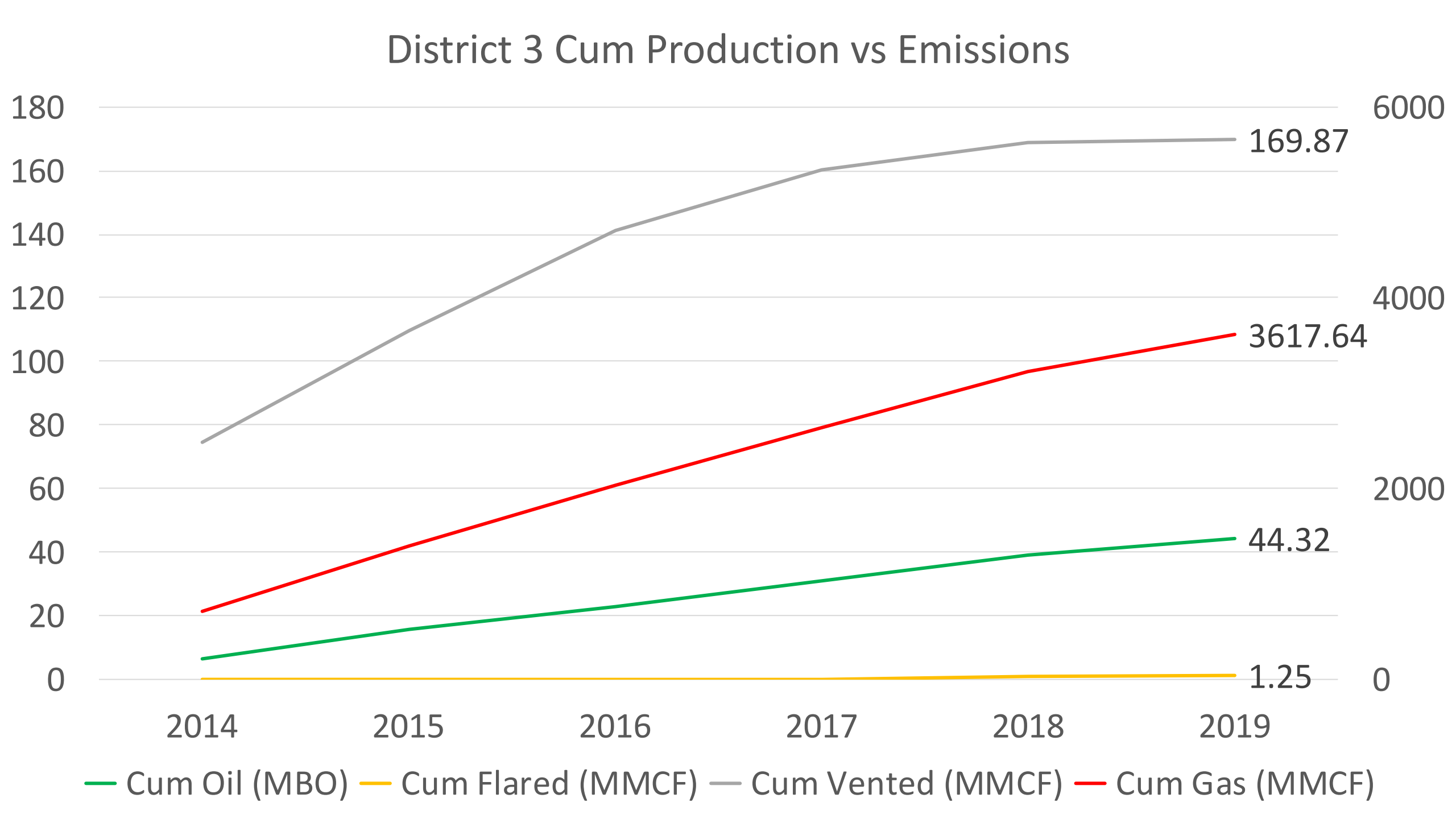

2019 flared
300
250
200
150
100
50
0
266
265
141
195
130
154
177
59
36
10
23
12
<0.10
0.1-0.5
0.5-1
1-2.5
2.5-5
5-10
10-25
25-50
50-75
75-100
100-250
>250
All
D1
D2
D3

Cumulative Production Compared to Emmissions


Statewide
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
10000
8000
6000
4000
2000
0
7636.72
3031.64
1050.15
710.27
2014
2015
2016
2017
2018
2019
Cum Oil (MBO)
Cum Flared (MMCF)
Cum Vented (MMCF)
Cum Gas (MMCF)


District 1 Cum Production vs Emissions
2500
2000
1500
1000
500
0
2014
2015
2016
2017
2018
2019
1626.84
1217.04
498.72
298.21
Cum Oil (MBO)
Cum Gas (MMCF)
Cum Flared (MMCF)
Cum Vented (MMCF)

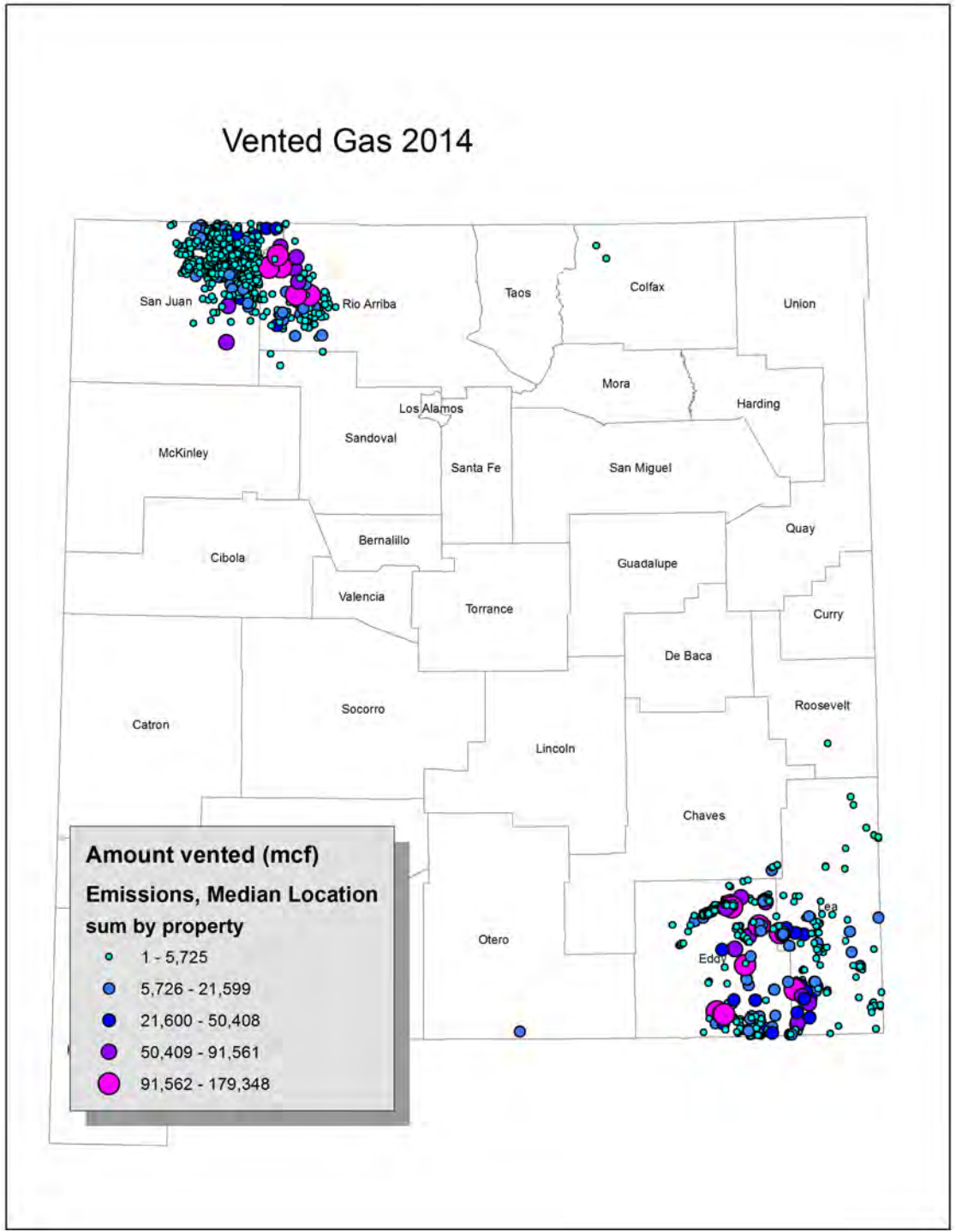

District 2 Cum Production vs Emissions
2500
2000
1500
1000
500
0
2228.01
1779.38
445.62
320.28
2014
2015
2016
2017
2018
2019
Cum Gas (MMCF)
Cum Flared (MMCF)
Cum Oil (MBO)
Cum Vented (MMCF)


District 3 Cum Production vs Emissions
180
160
140
120
100
80
60
40
20
0
6000
4000
2000
0
169.87
3617.64
44.32
1.25
2014
2015
2016
2017
2018
2019
Cum Oil (MBO)
Cum Flared (MMCF)
Cum Vented (MMCF)
Cum Gas (MMCF)

Mapped Vent and Flare Events

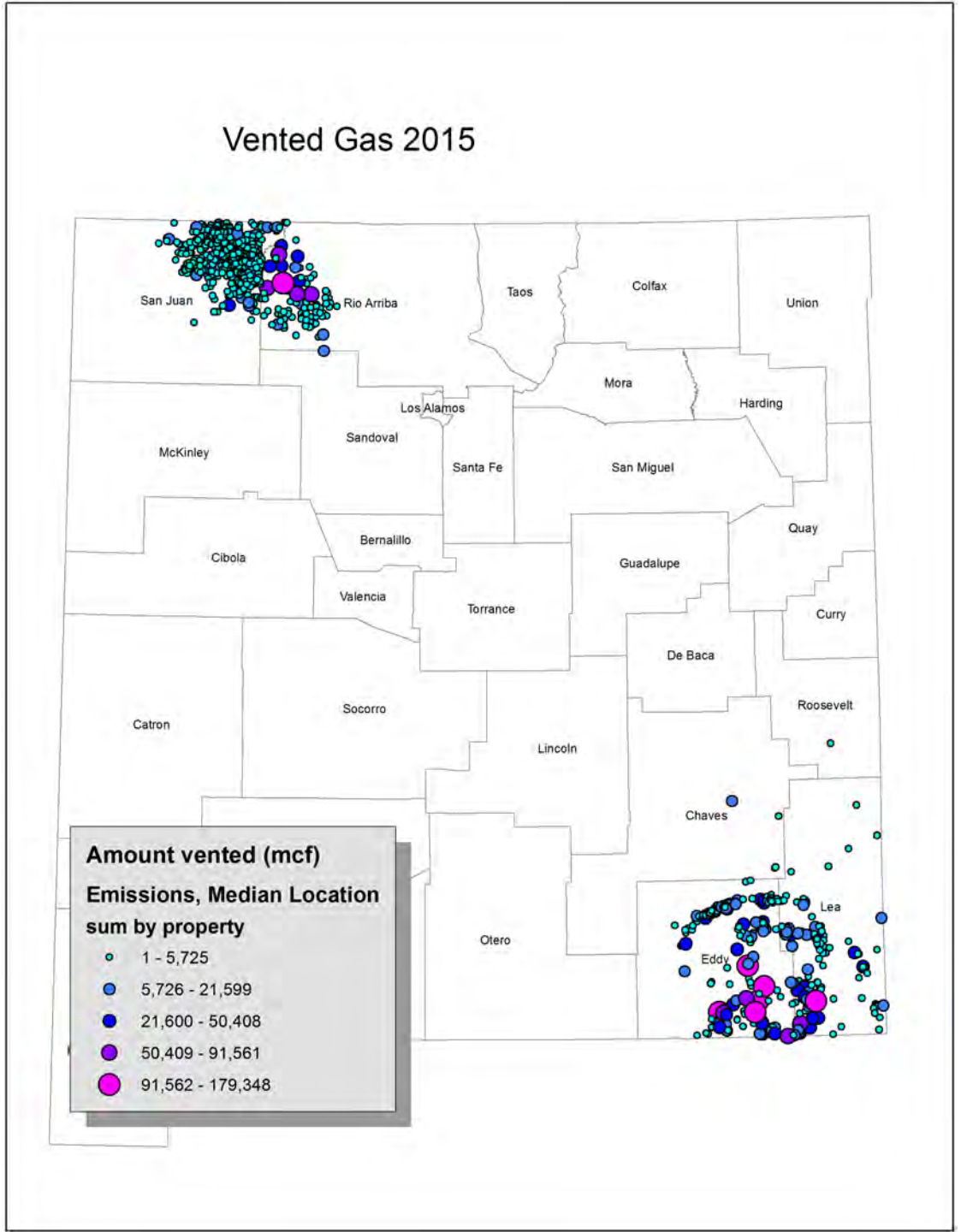
Mapping Vented Gas

- Vented Gas is greatly reduced in NW NM through 2014-2019
- Vented Gas is greatly increased in SE NM through 2014-2019



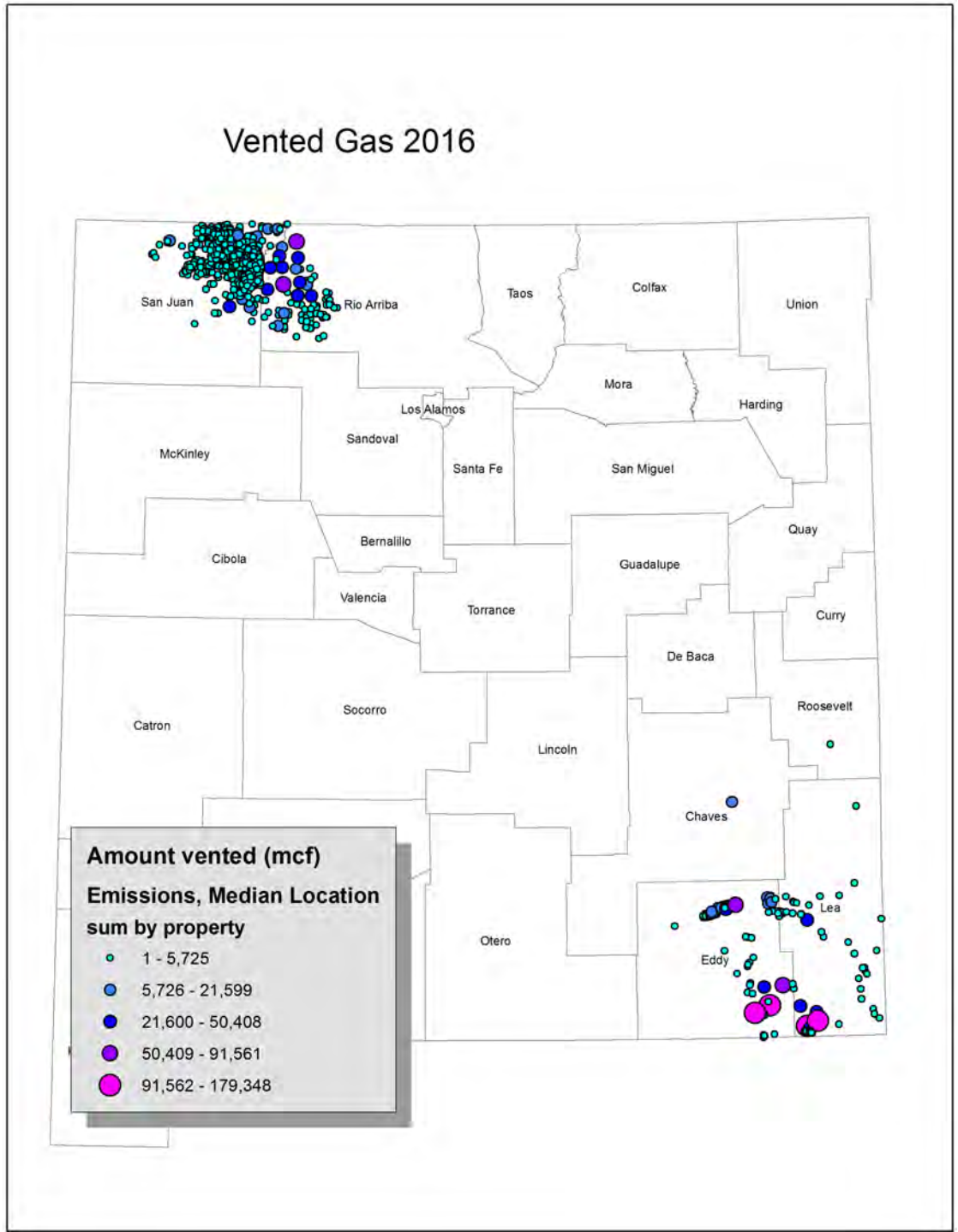
Mapping Vented Gas

- Vented Gas is greatly reduced in NW NM through 2014-2019
- Vented Gas is greatly increased in SE NM through 2014-2019



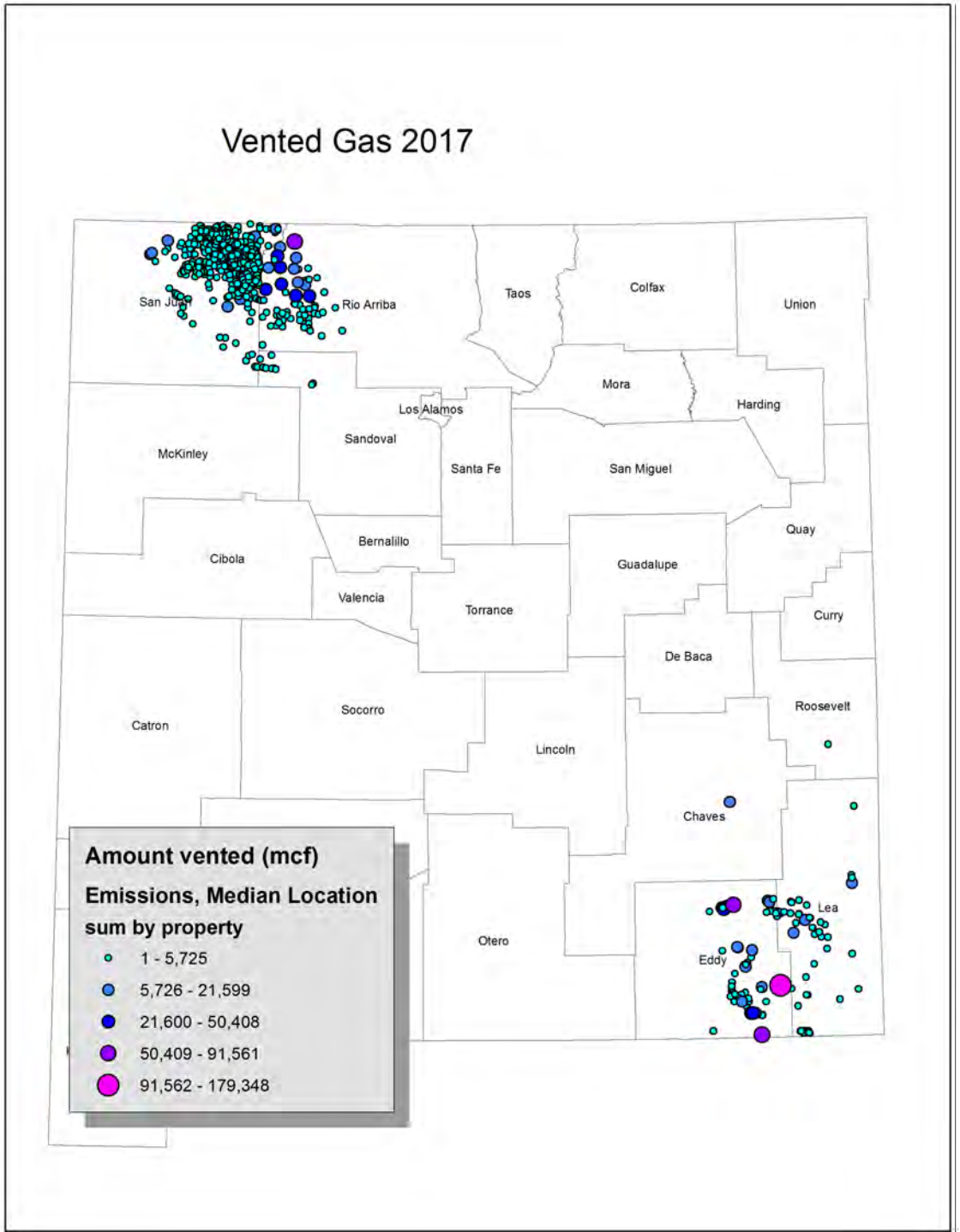
Mapping Vented Gas

- Vented Gas is greatly reduced in NW NM through 2014-2019
- Vented Gas is greatly increased in SE NM through 2014-2019



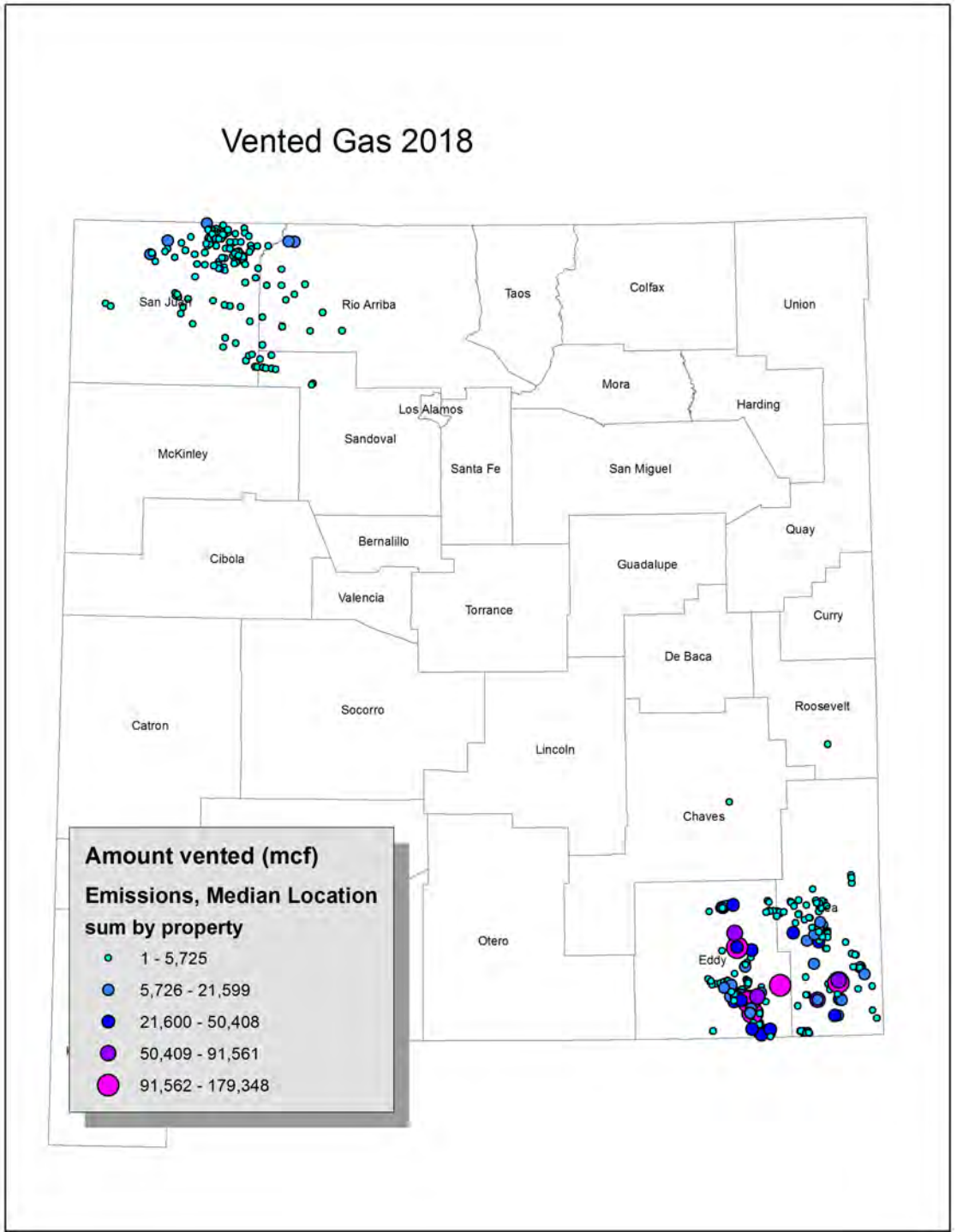
Mapping Vented Gas

- Vented Gas is greatly reduced in NW NM through 2014-2019
- Vented Gas is greatly increased in SE NM through 2014-2019



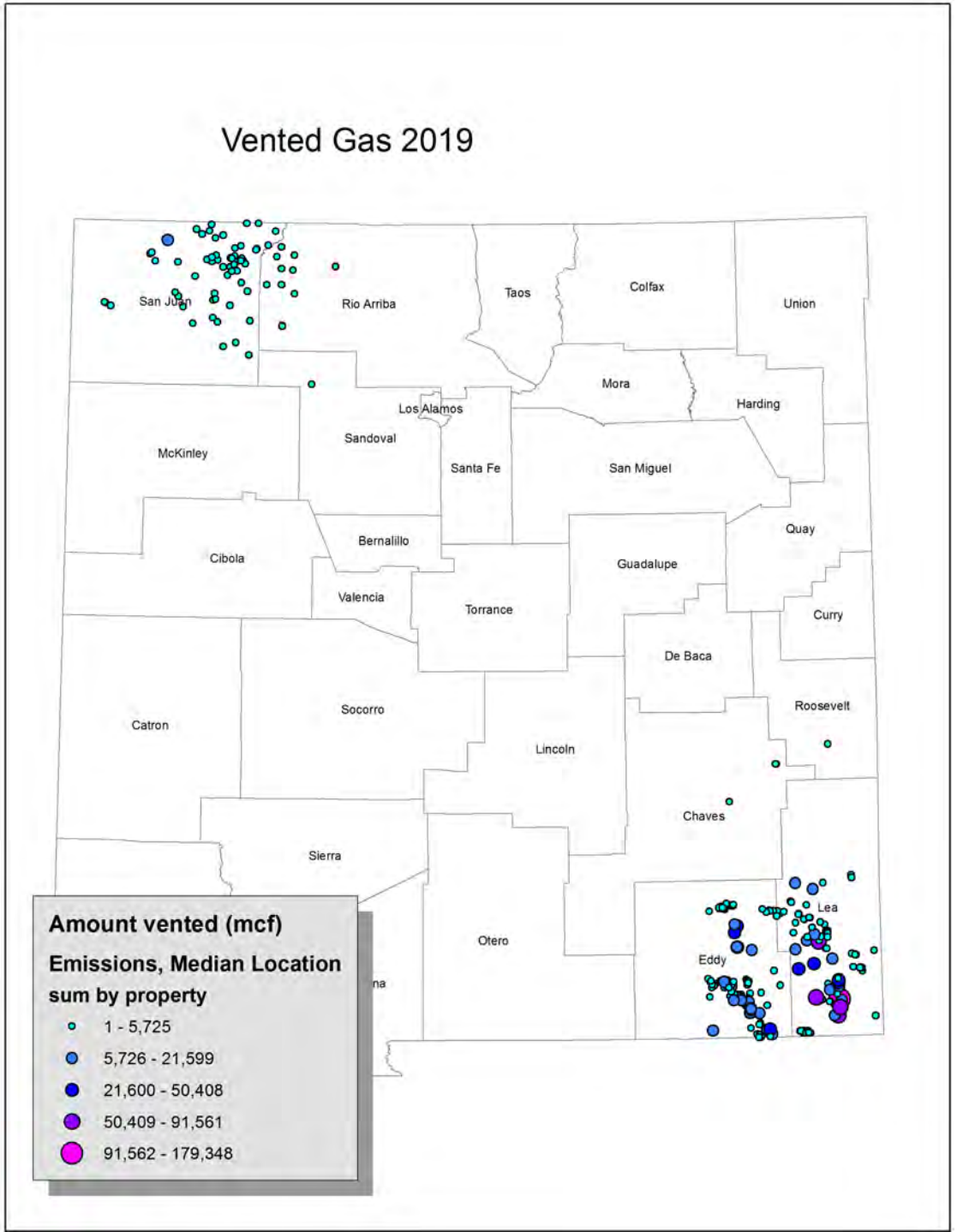
Mapping Vented Gas

- Vented Gas is greatly reduced in NW NM through 2014-2019
- Vented Gas is greatly increased in SE NM through 2014-2019



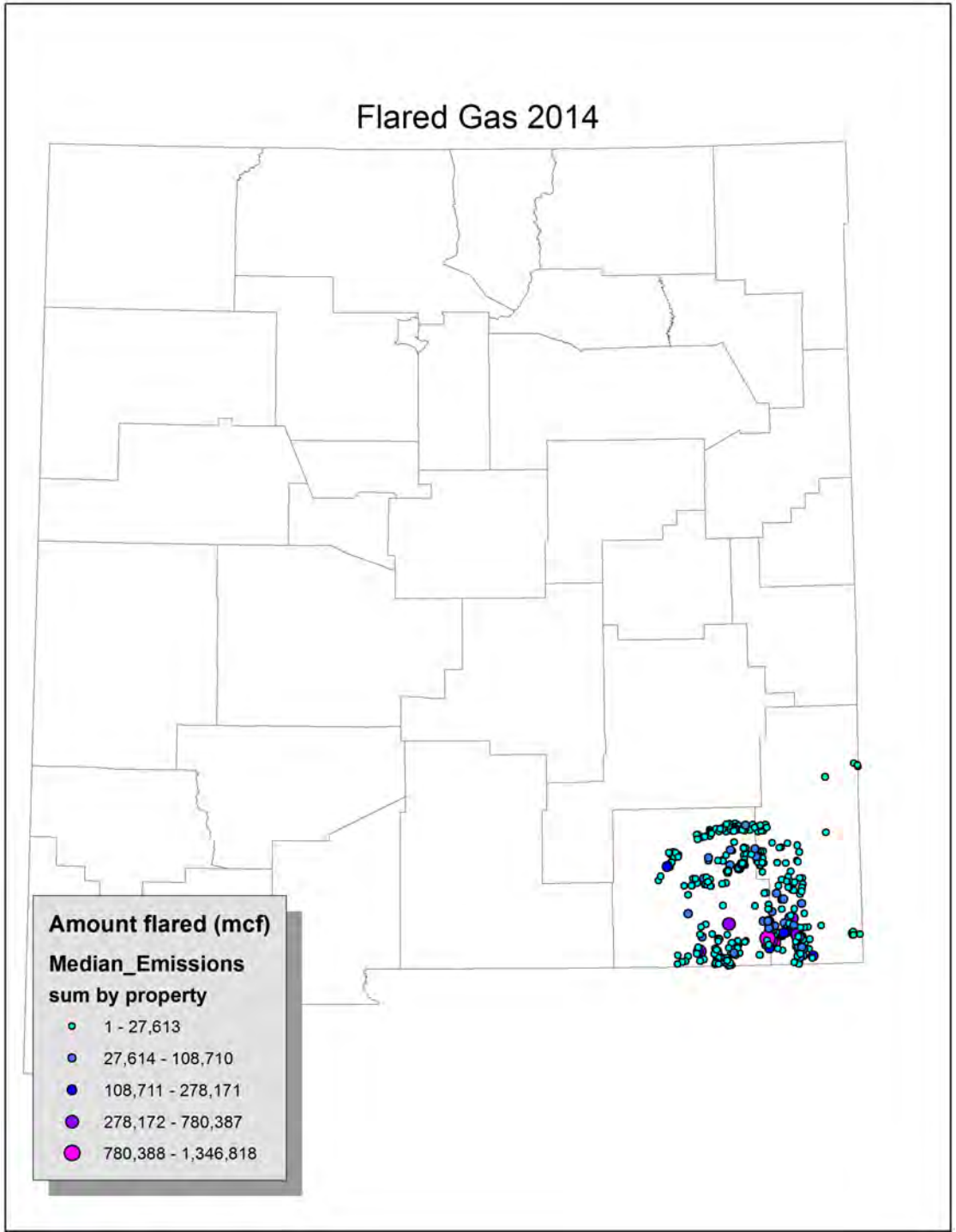
Mapping Vented Gas

- Vented Gas is greatly reduced in NW NM through 2014-2019
- Vented Gas is greatly increased in SE NM through 2014-2019



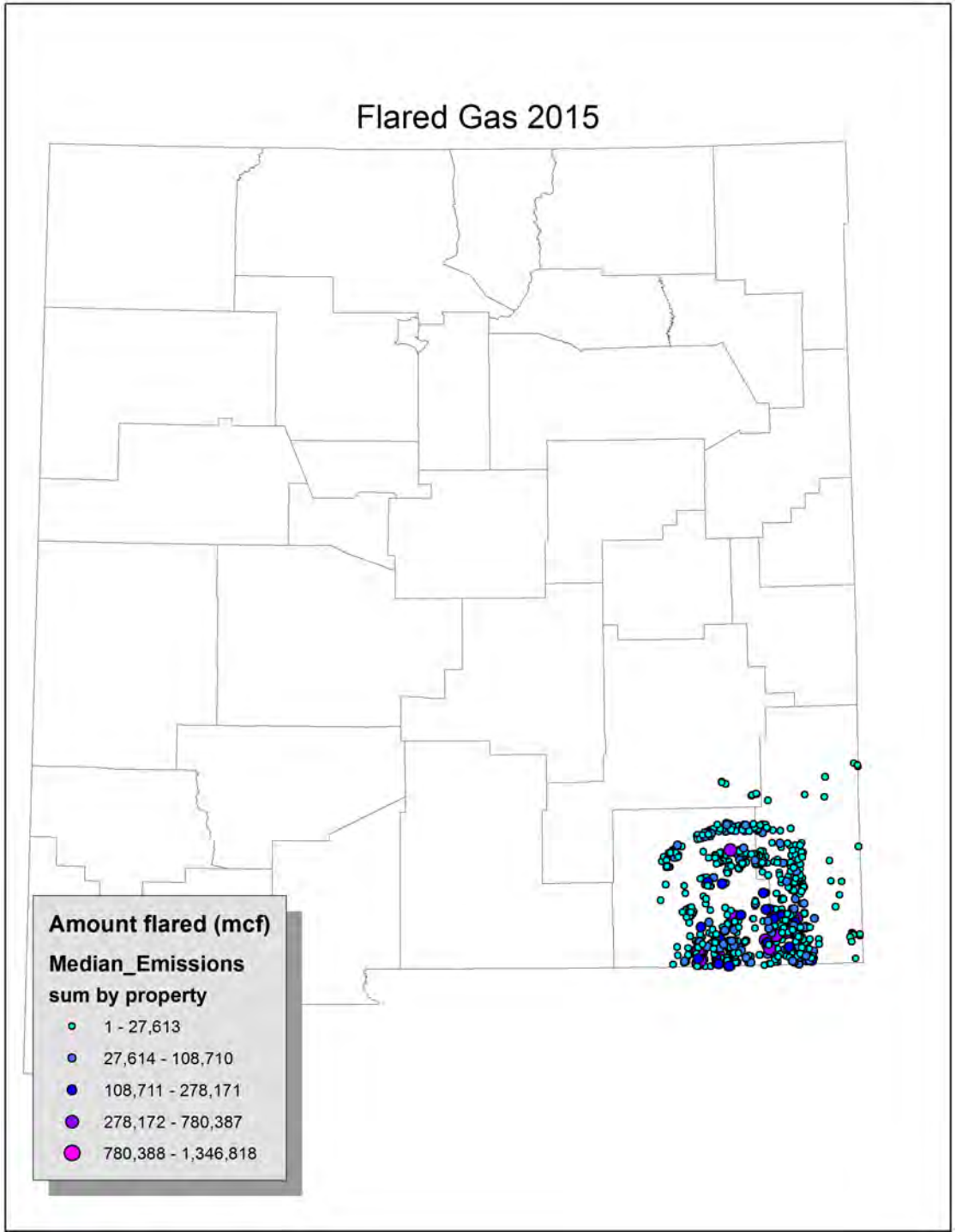
Mapping Flared Gas

- Flared gas slightly increases in NW NM through 2014-2019
- Flared gas is greatly increased in SE NM through 2014-2019



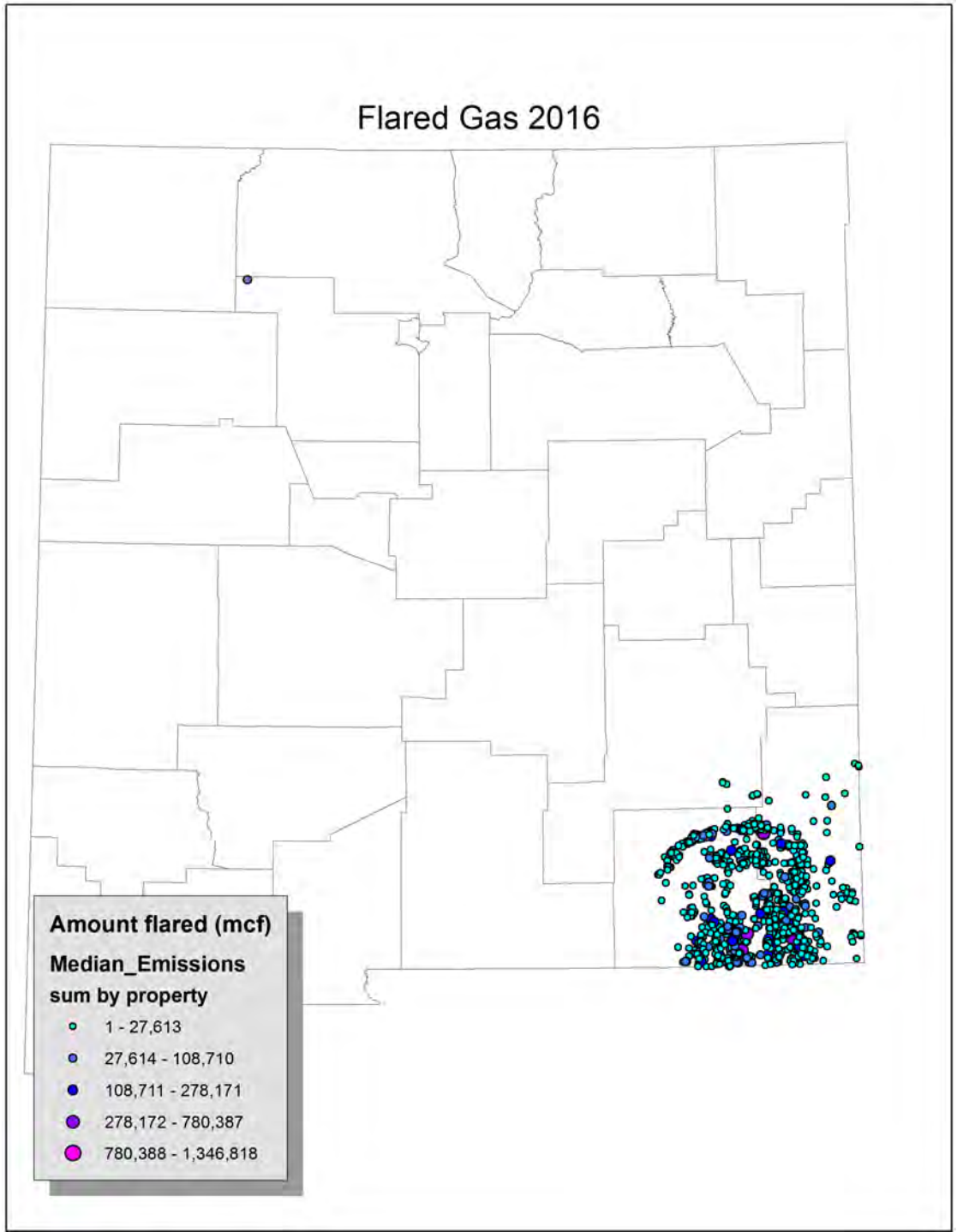
Mapping Flared Gas

- Flared gas slightly increases in NW NM through 2014-2019
- Flared gas is greatly increased in SE NM through 2014-2019



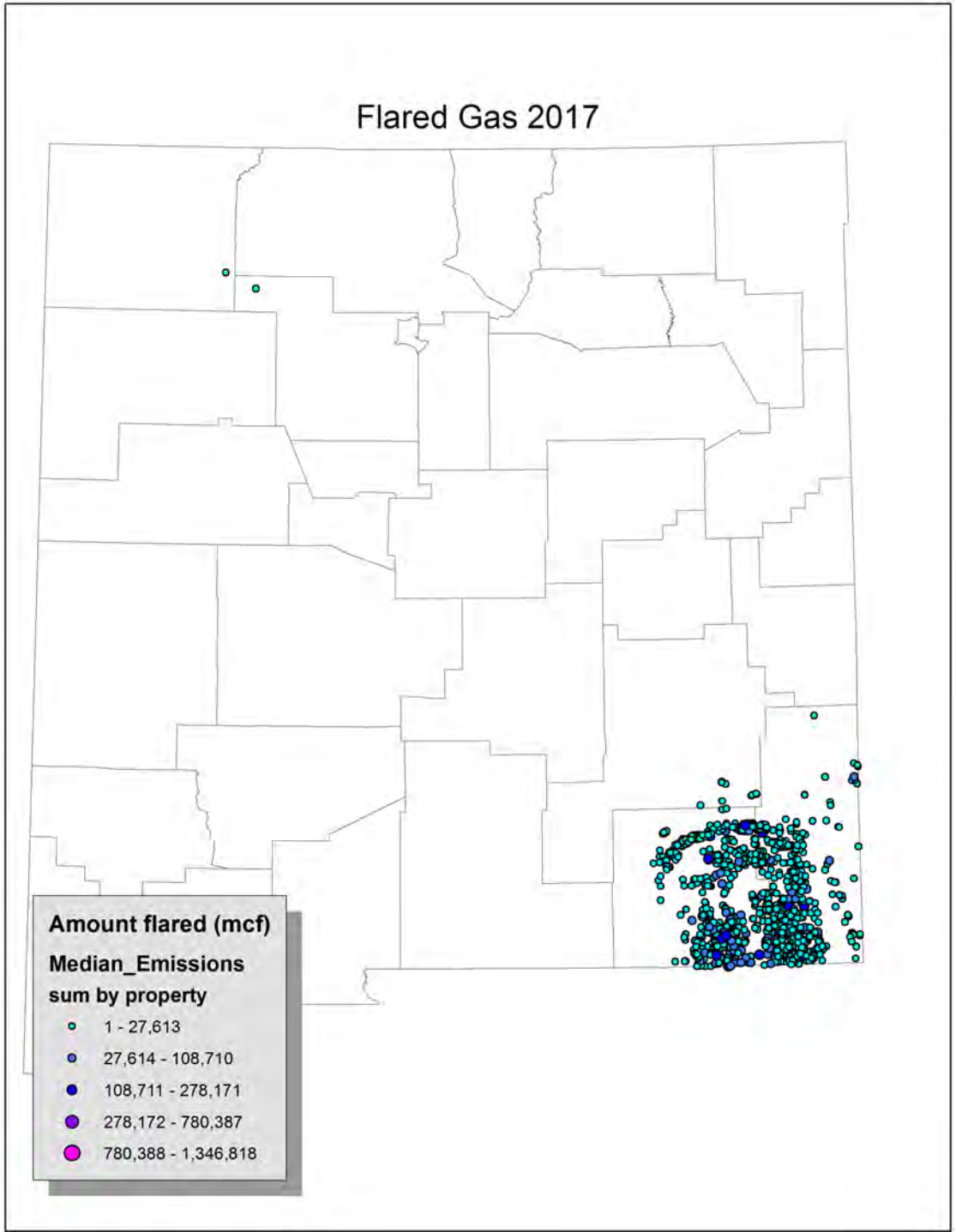
Mapping Flared Gas

- Flared gas slightly increases in NW NM through 2014-2019
- Flared gas is greatly increased in SE NM through 2014-2019



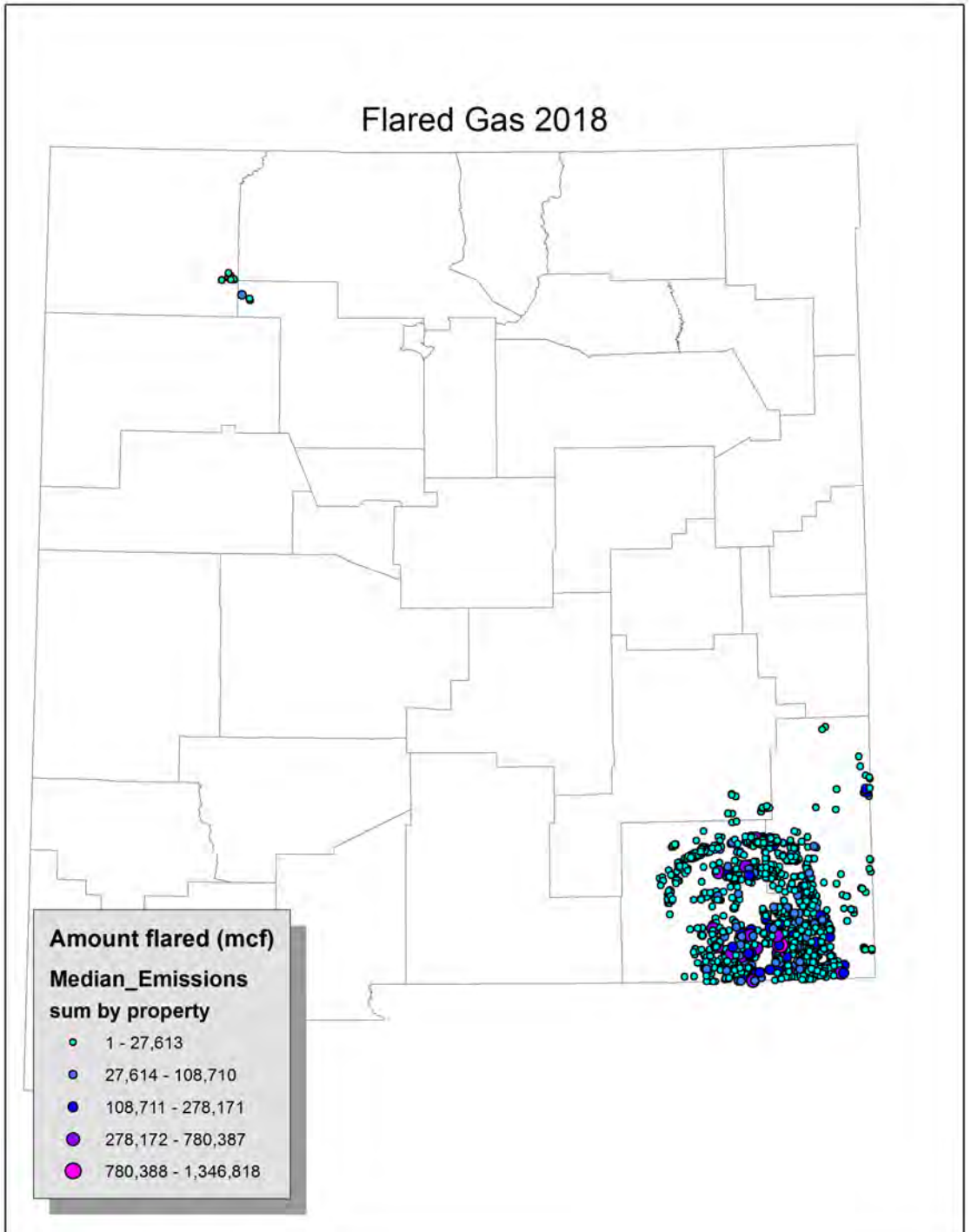
Mapping Flared Gas

- Flared gas slightly increases in NW NM through 2014-2019
- Flared gas is greatly increased in SE NM through 2014-2019



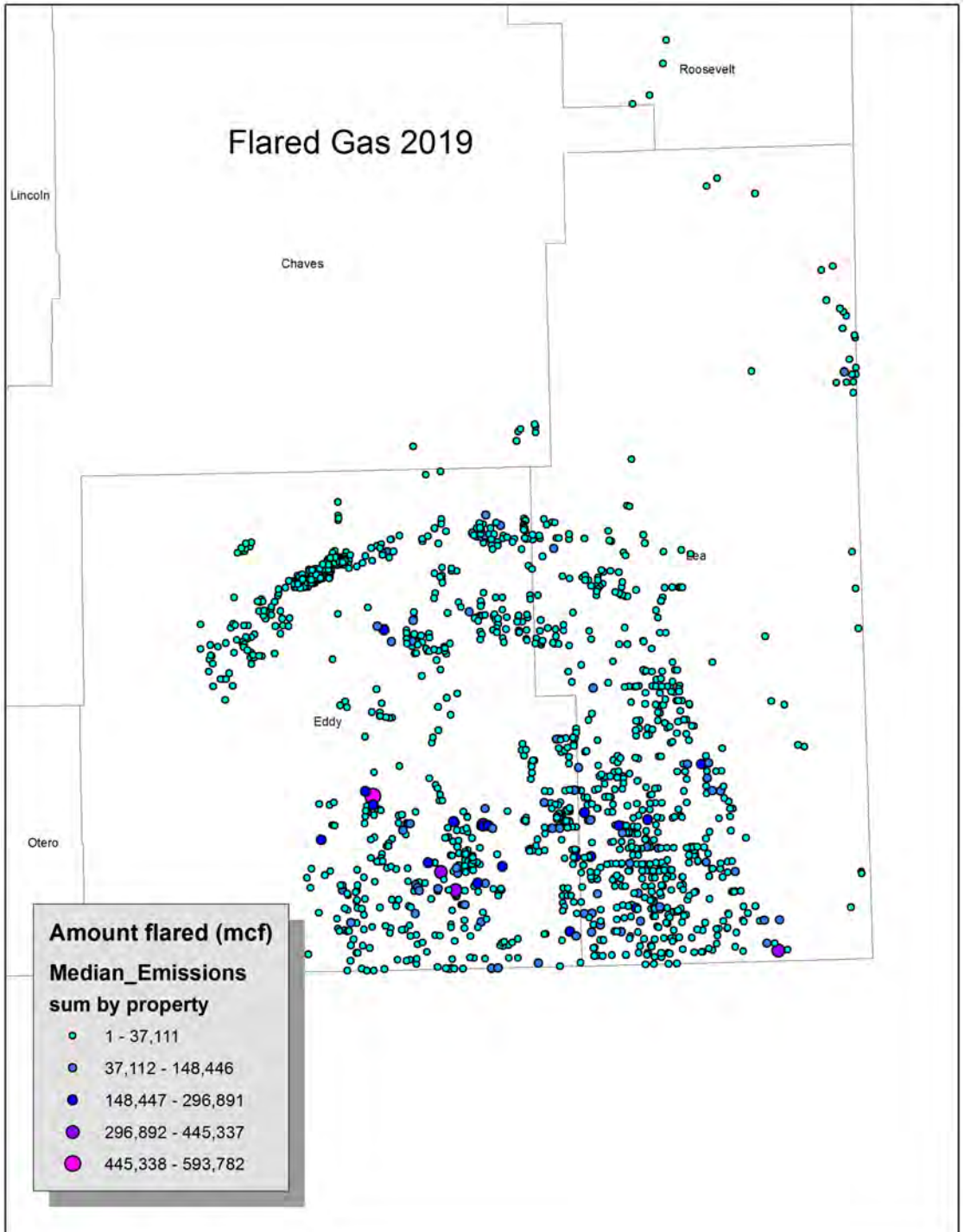
Mapping Flared Gas

- Flared gas slightly increases in NW NM through 2014-2019
- Flared gas is greatly increased in SE NM through 2014-2019



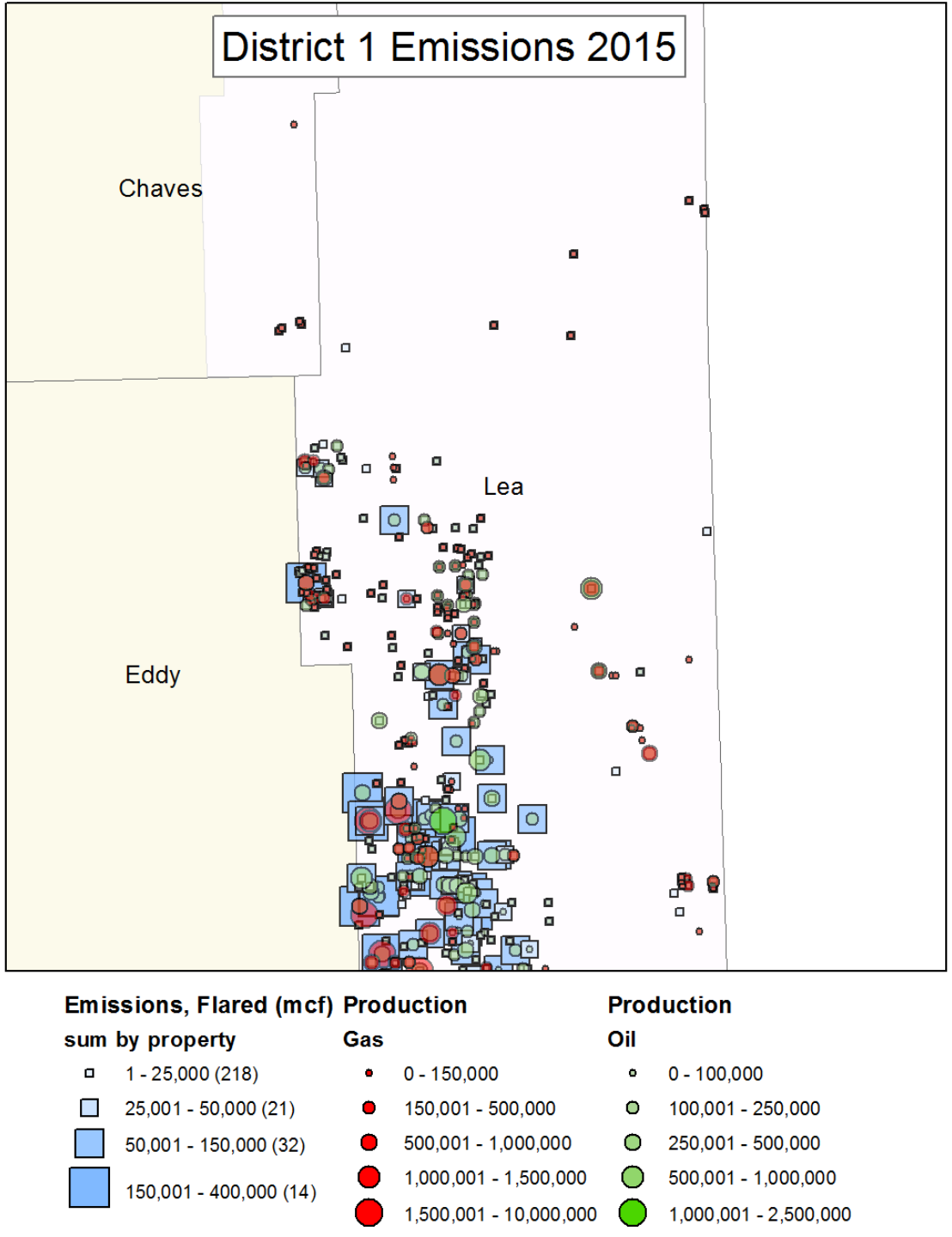
Mapping Flared Gas

- Flared gas slightly increases in NW NM through 2014-2019
- Flared gas is greatly increased in SE NM through 2014-2019

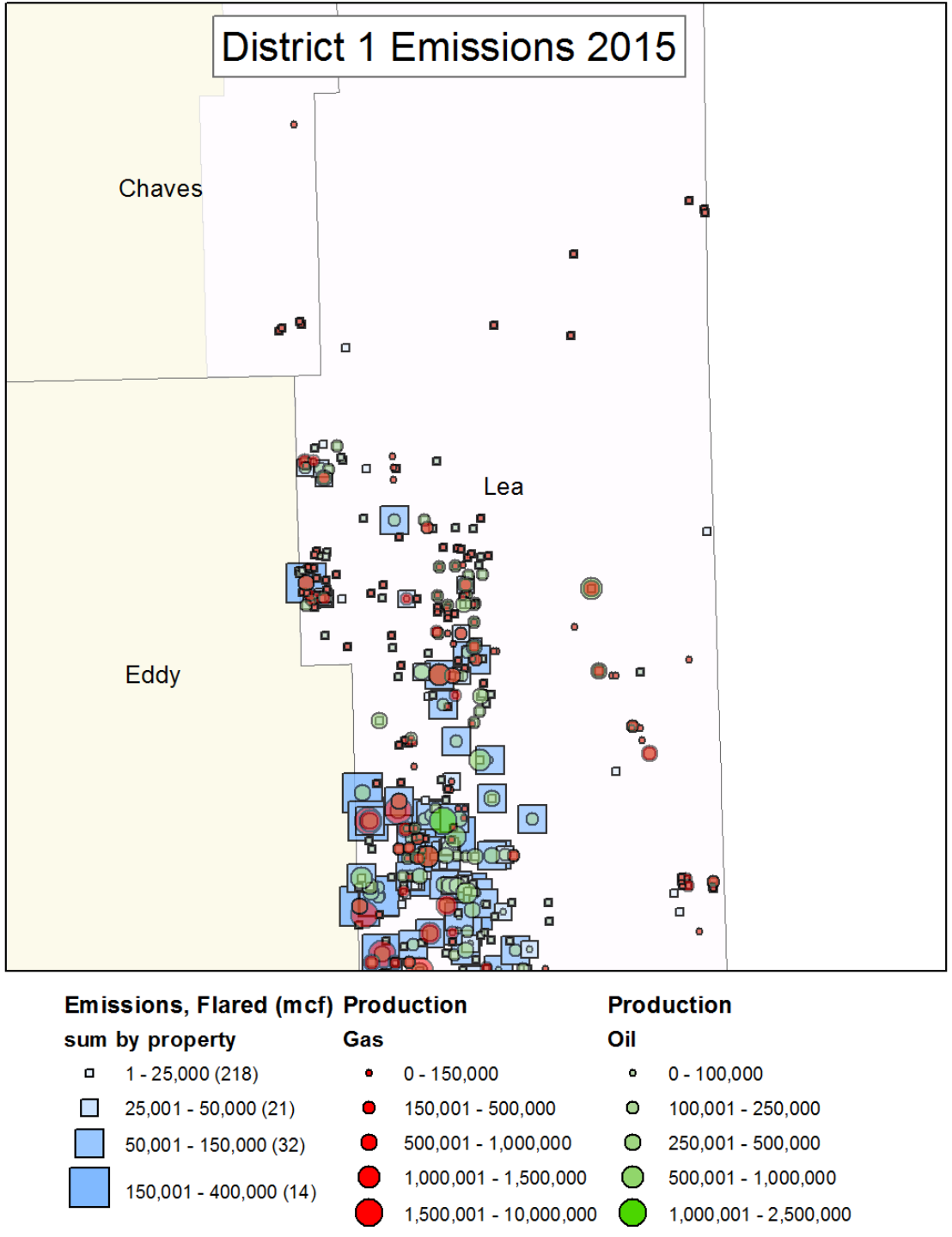


District 1

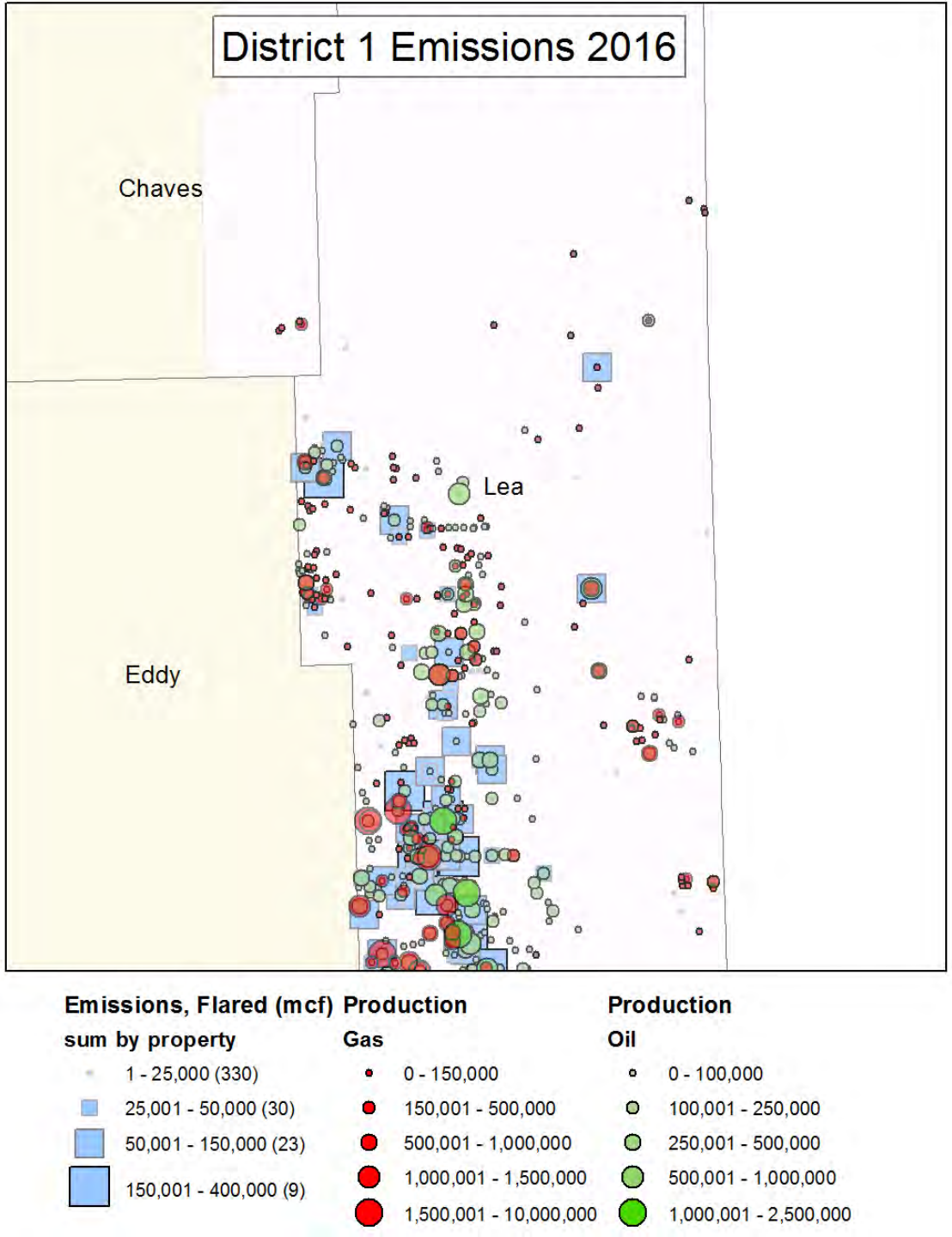
District 1 Flared



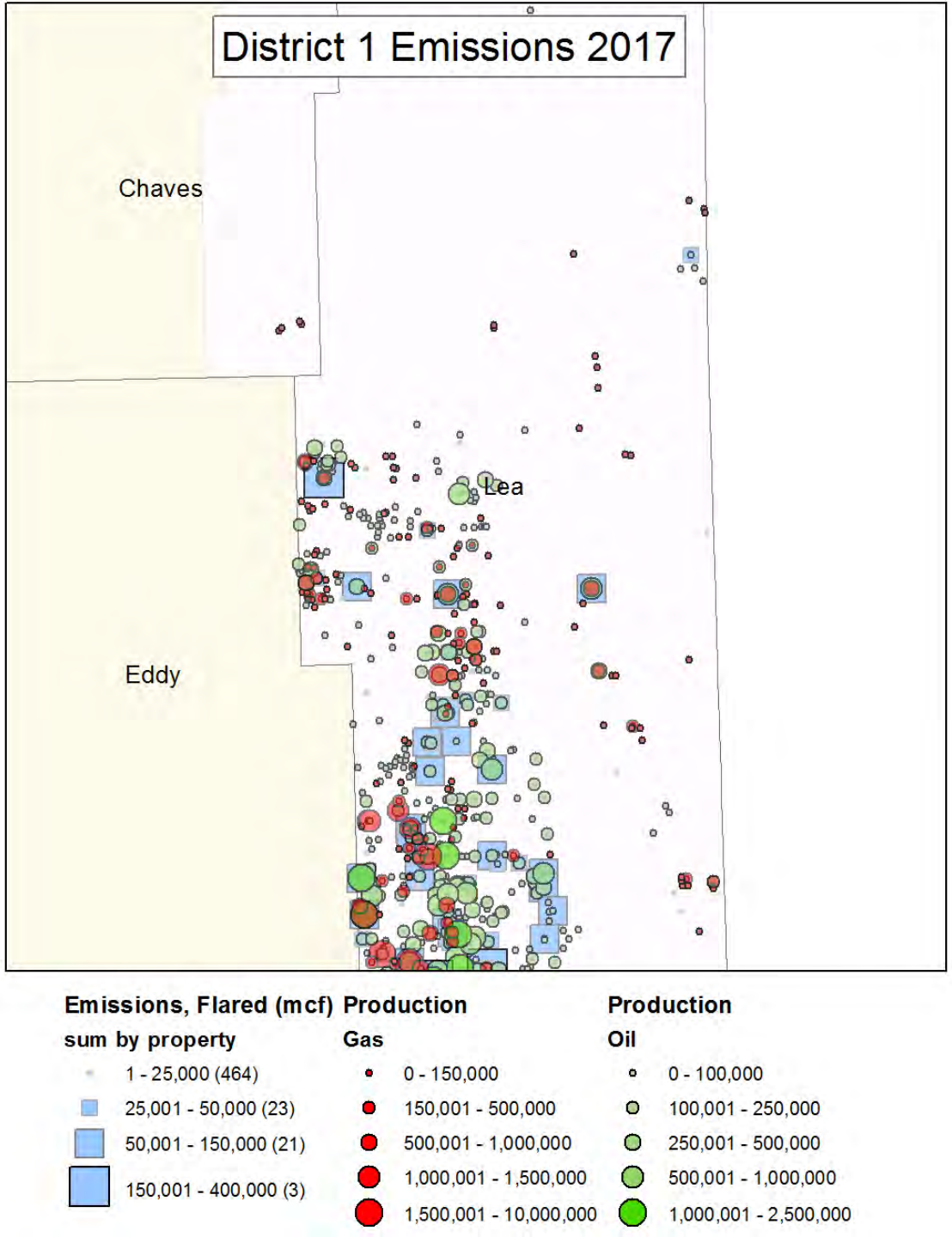
District 1 Flared



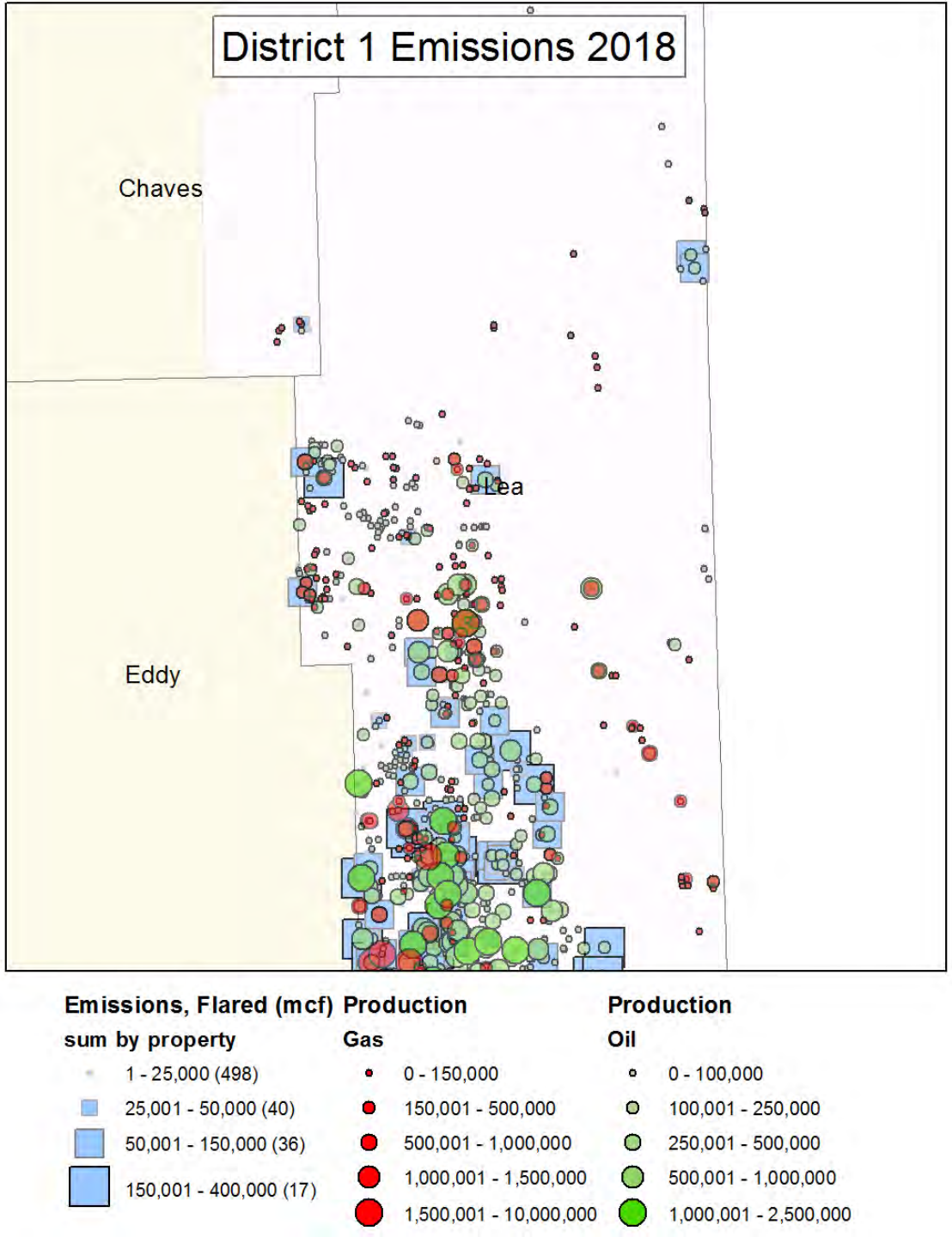
District 1 Flared



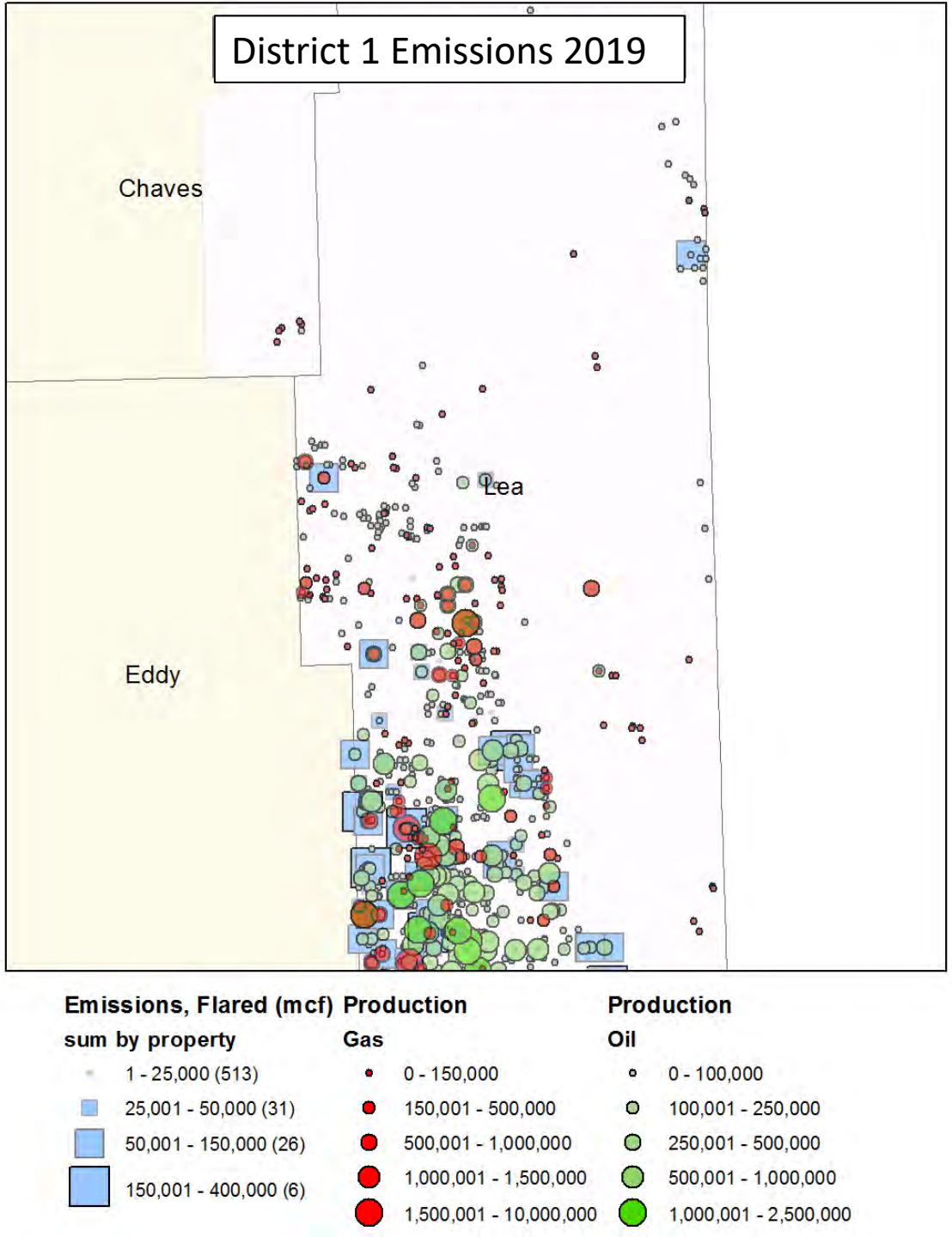
District 1 Flared



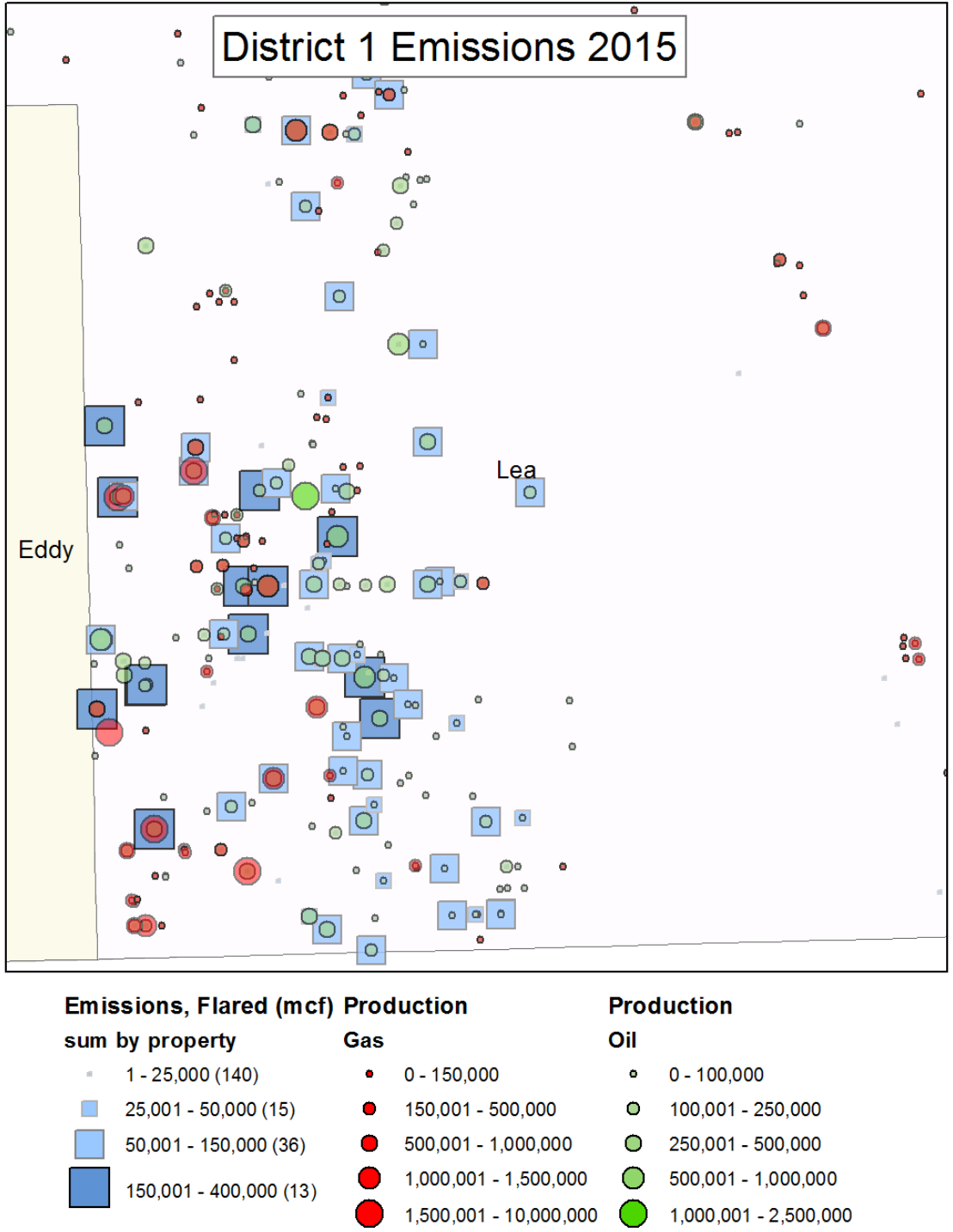
District 1 Flared



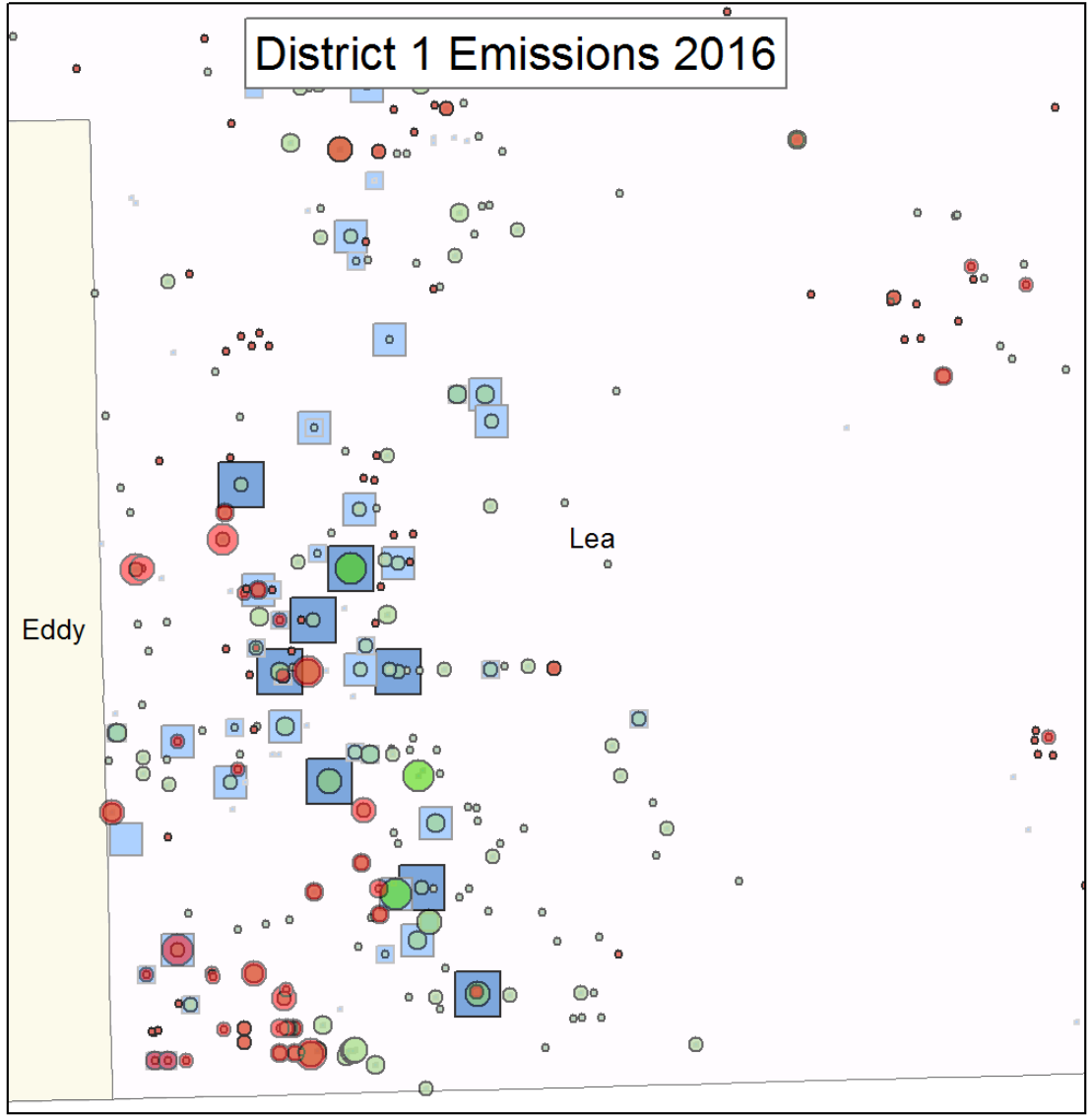
District 1 Flared



District 1 Flared (detail)



District 1 Flared (detail)

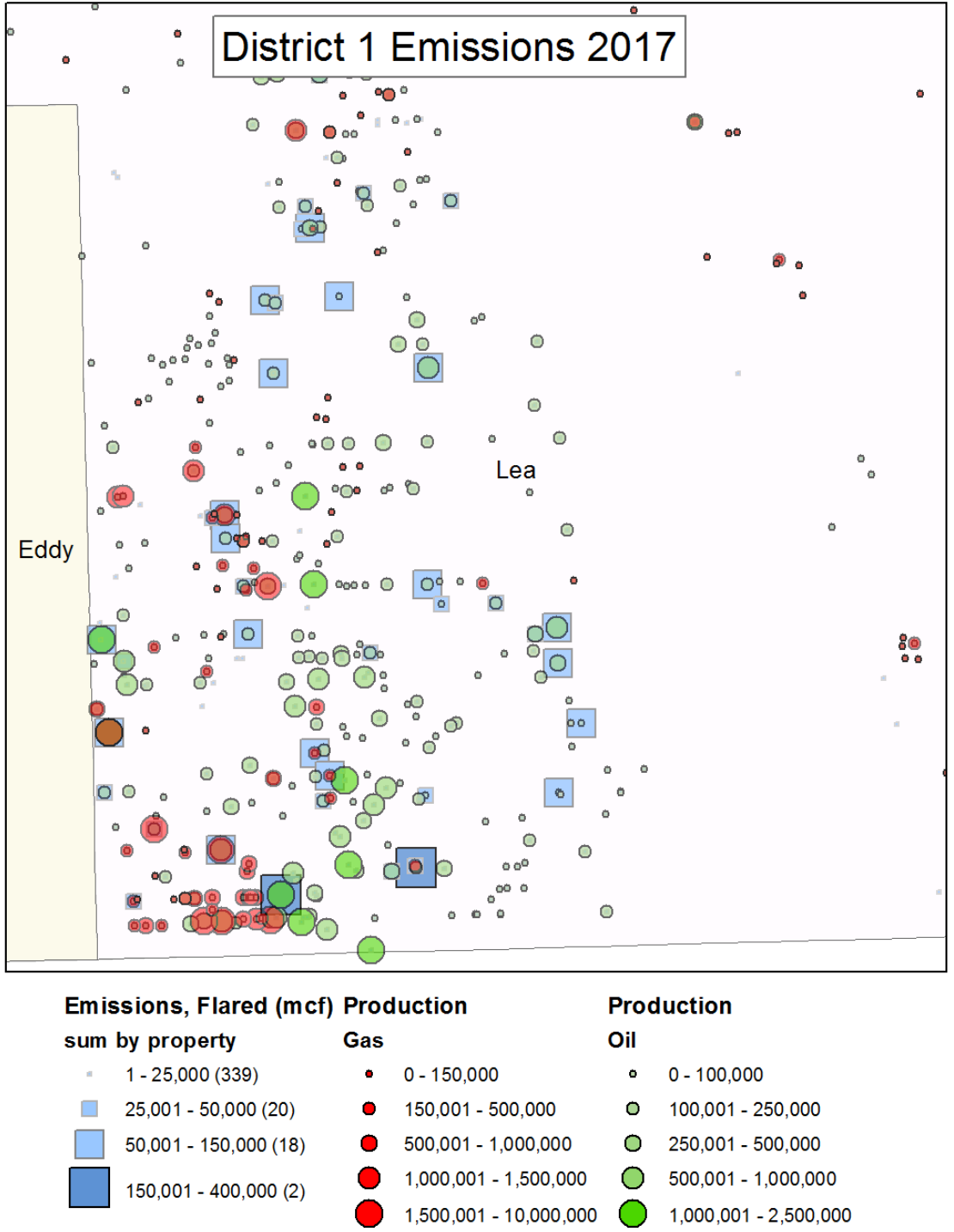


Emissions, Flared (mcf)
sum by property
- 1 - 25,000 (230)
- 25,001 - 50,000 (25)
- 50,001 - 150,000 (18)
- 150,001 - 400,000 (8)

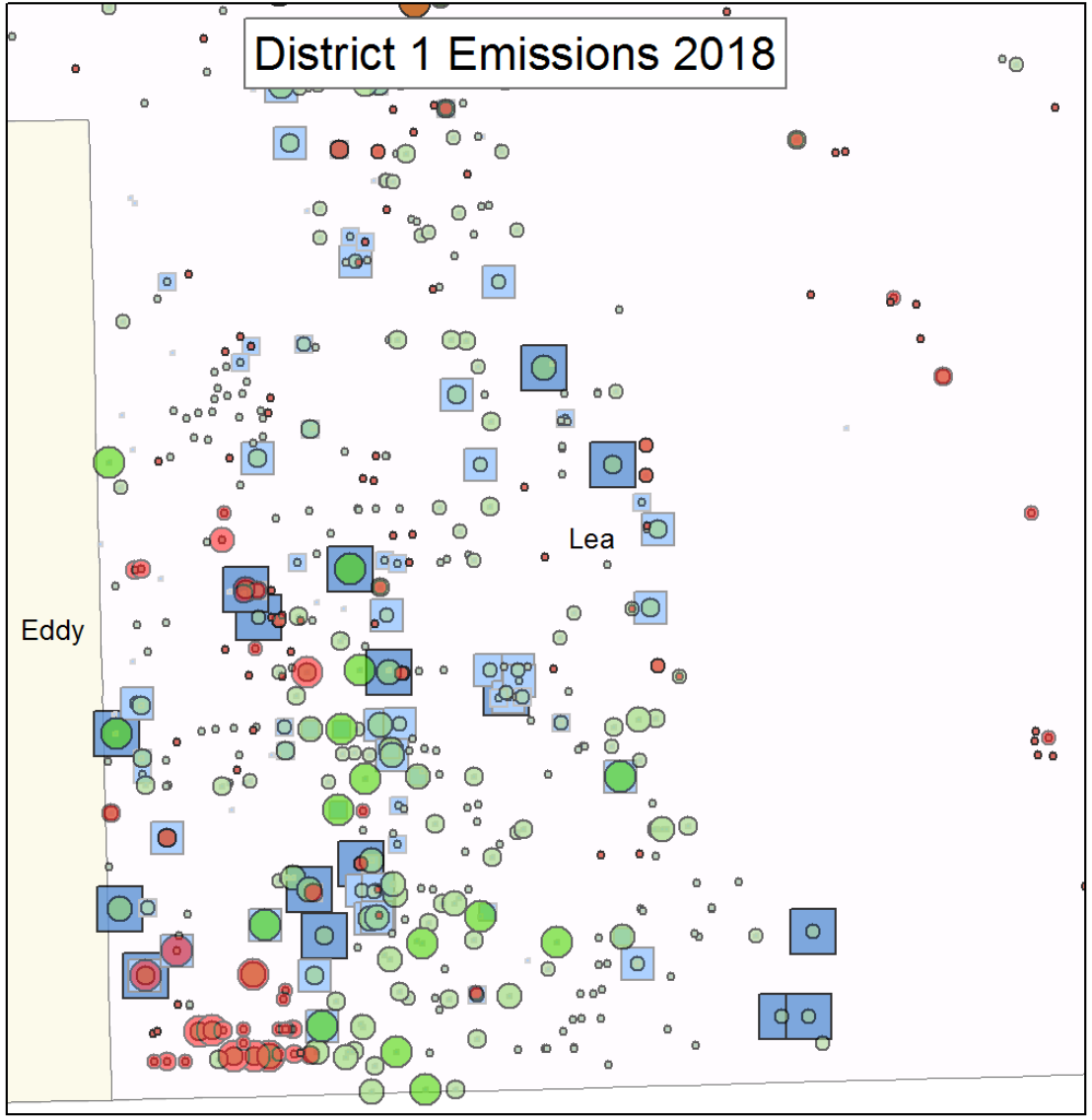
Production
Gas
- 0 - 150,000
- 150,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 1,500,000
- 1,500,001 - 10,000,000

Production
Oil
- 0 - 100,000
- 100,001 - 250,000
- 250,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 2,500,000

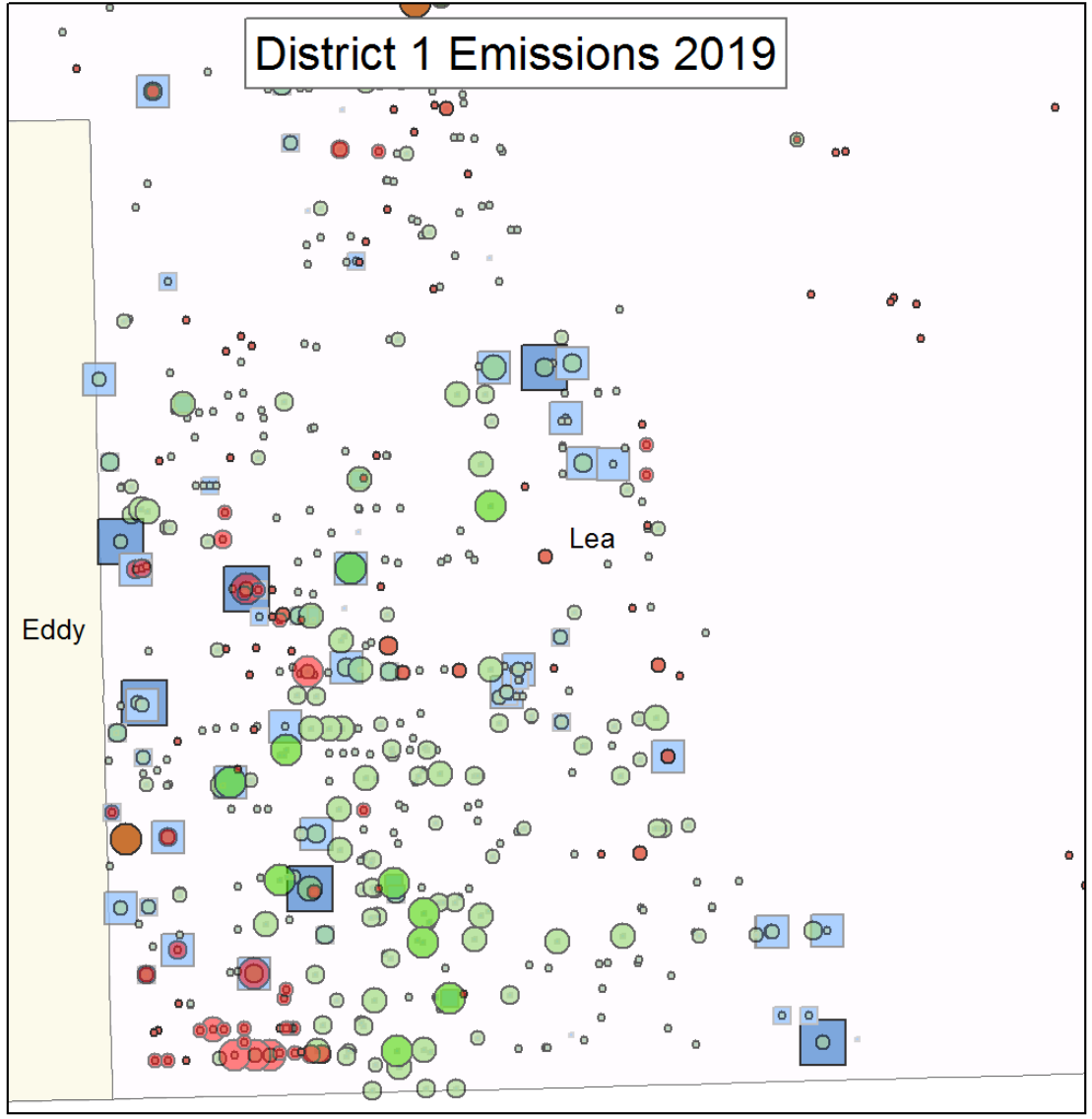
District 1 Flared (detail)



District 1 Flared (detail)



District 1 Flared (detail)

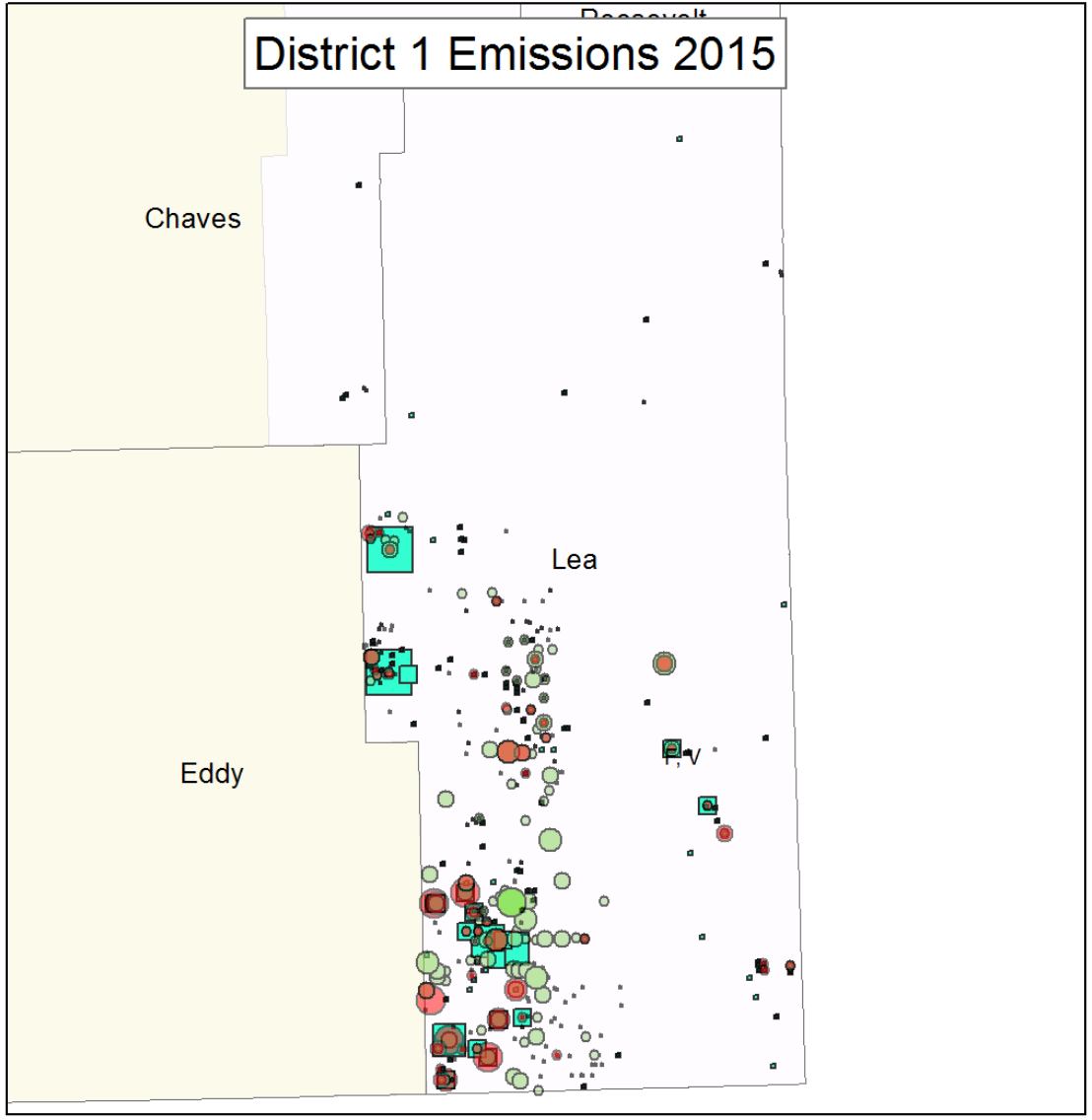


Emissions, Flared (mcf)
sum by property
- 1 - 25,000 (424)
- 25,001 - 50,000 (30)
- 50,001 - 150,000 (24)
- 150,001 - 400,000 (6)

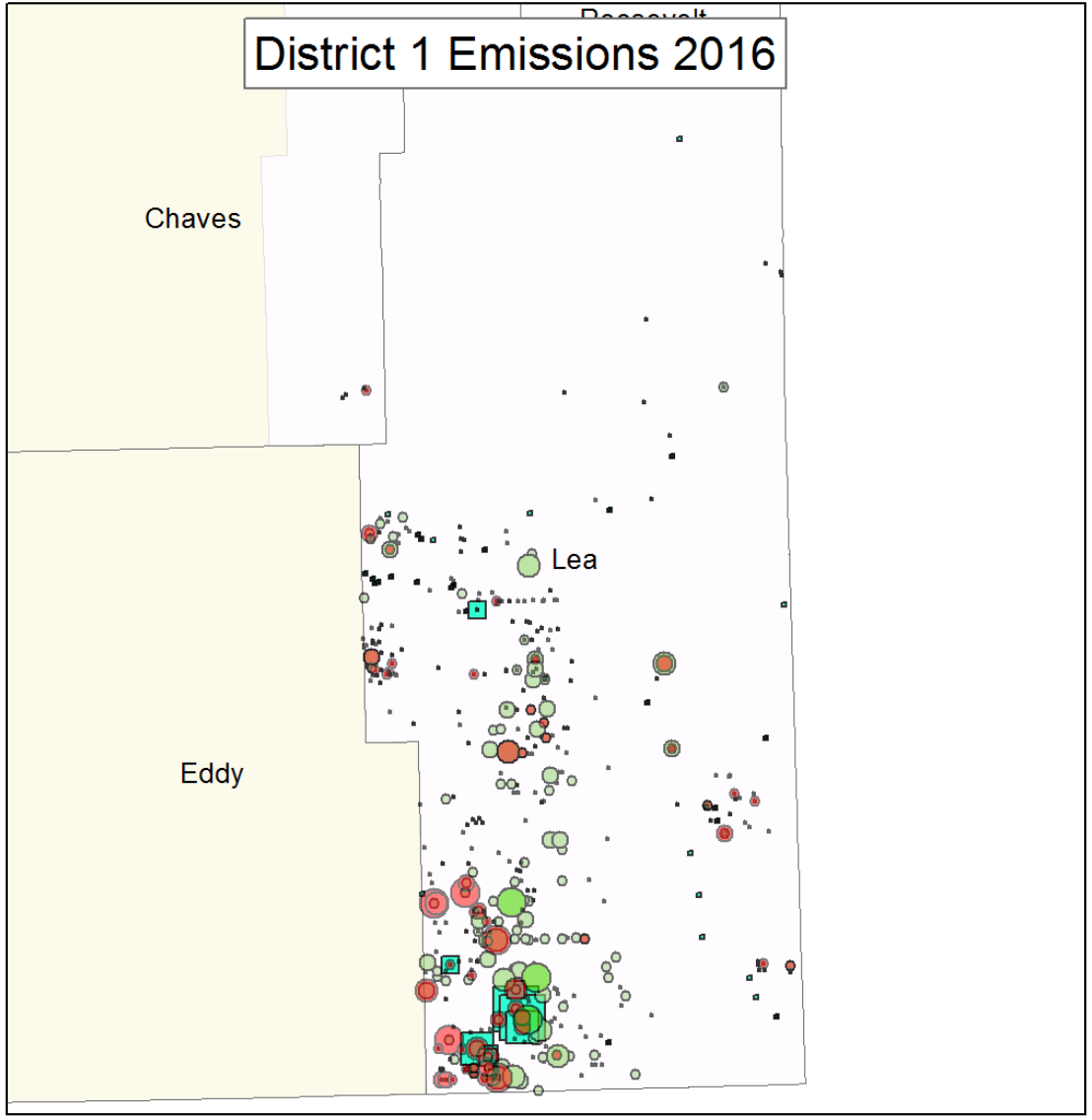
Production
Gas
- 0 - 150,000
- 150,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 1,500,000
- 1,500,001 - 10,000,000

Production
Oil
- 0 - 100,000
- 100,001 - 250,000
- 250,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 2,500,000

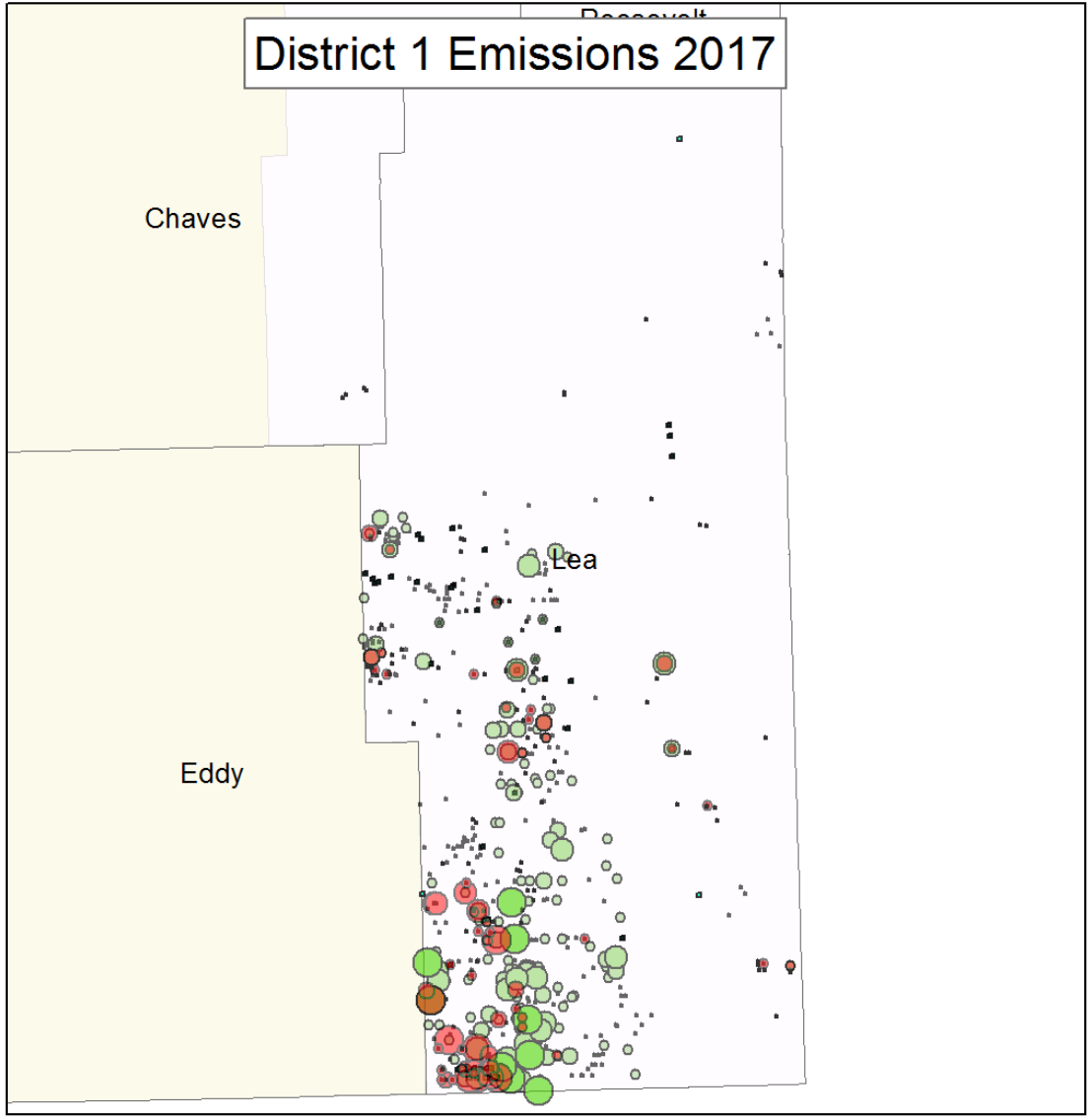
District 1 Vented



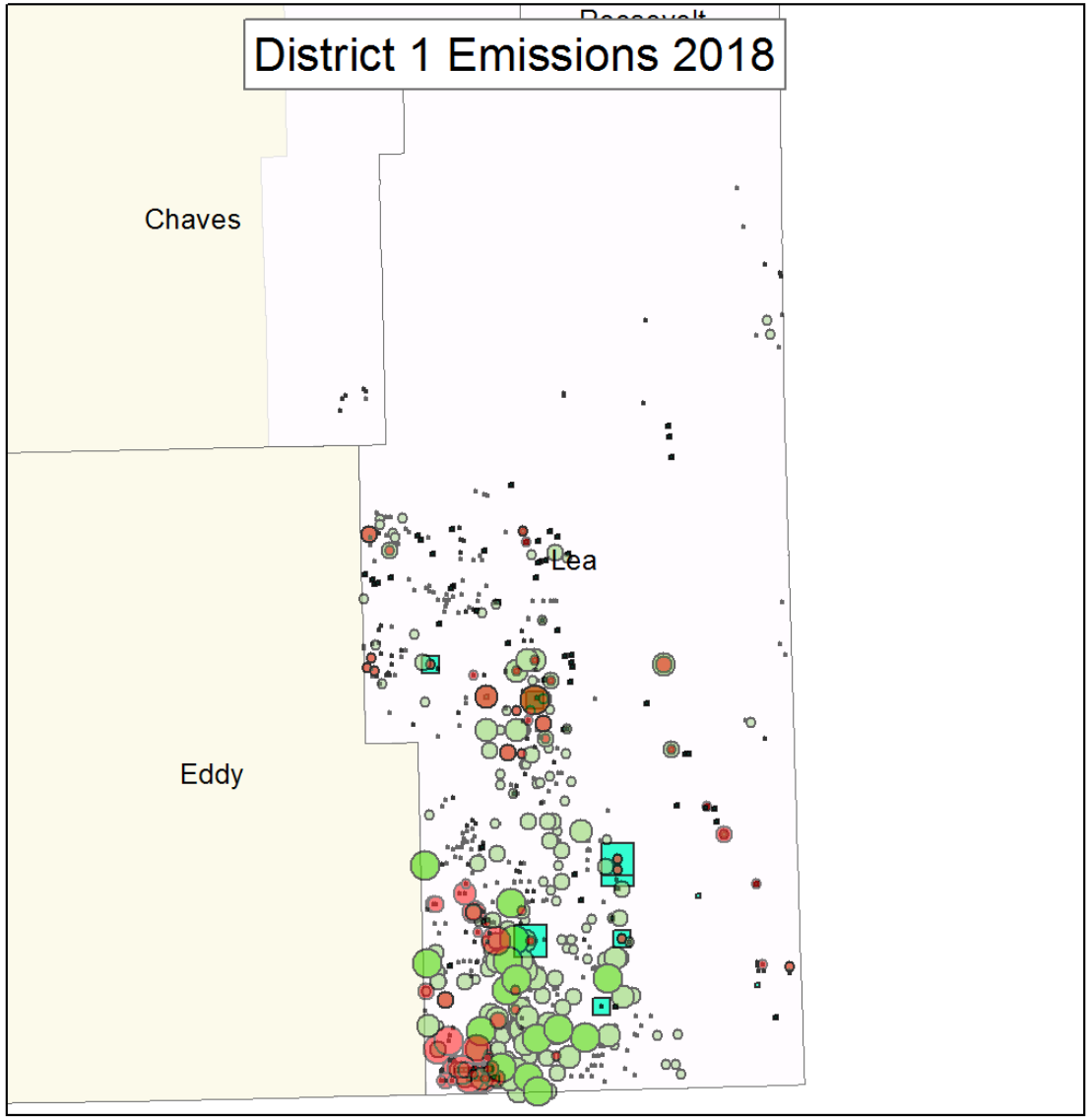
District 1 Vented



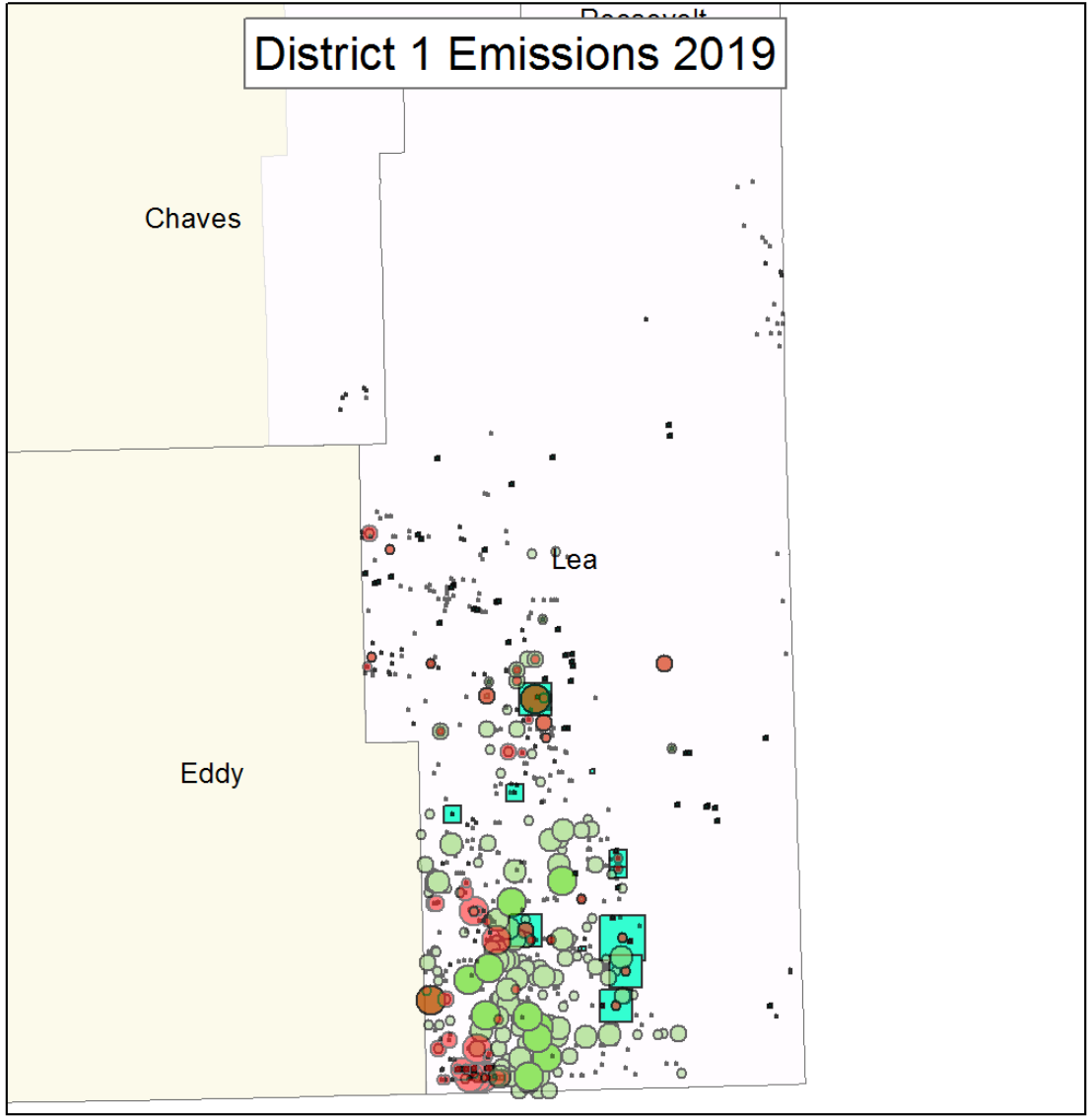
District 1 Vented



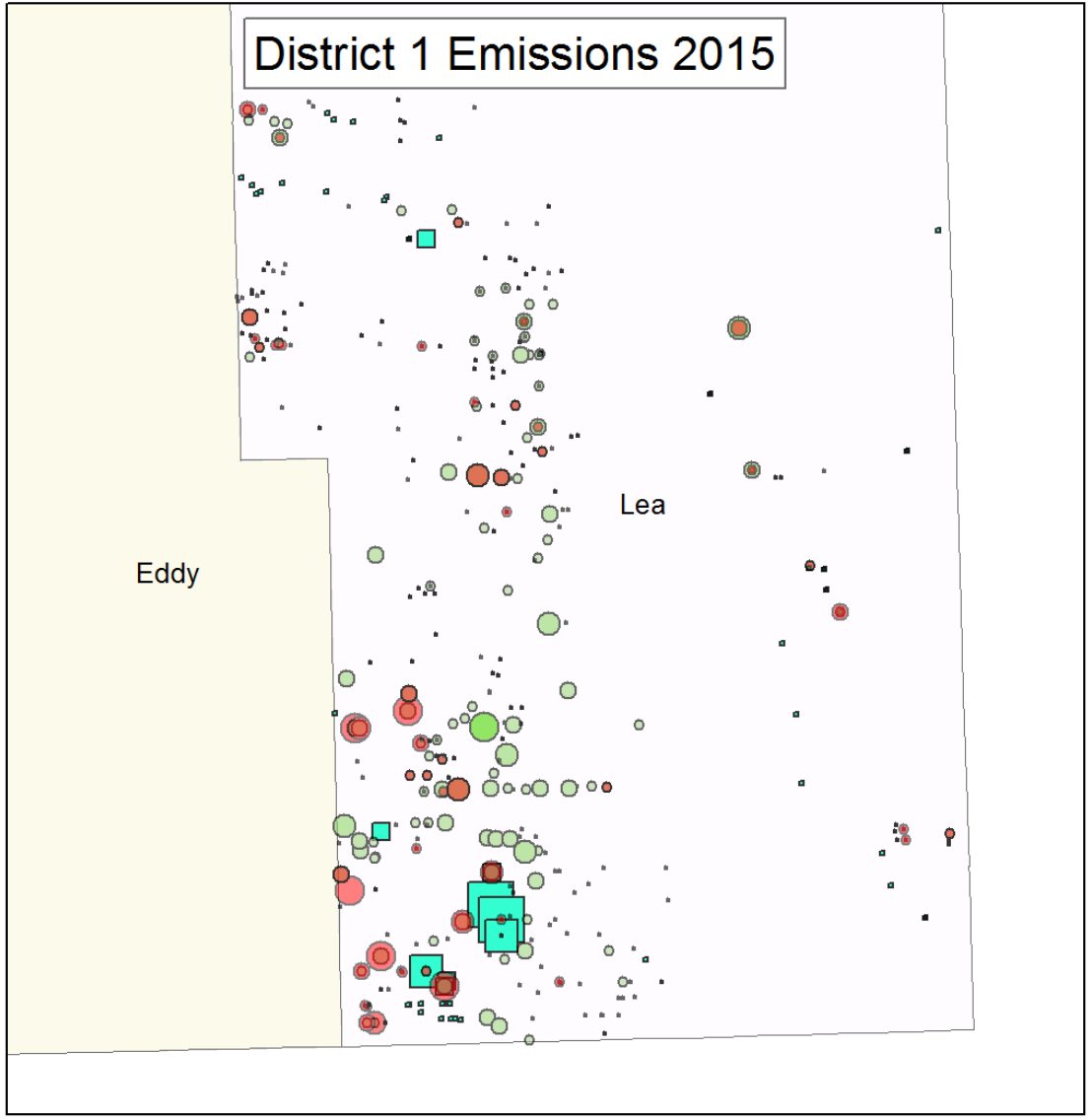
District 1 Vented



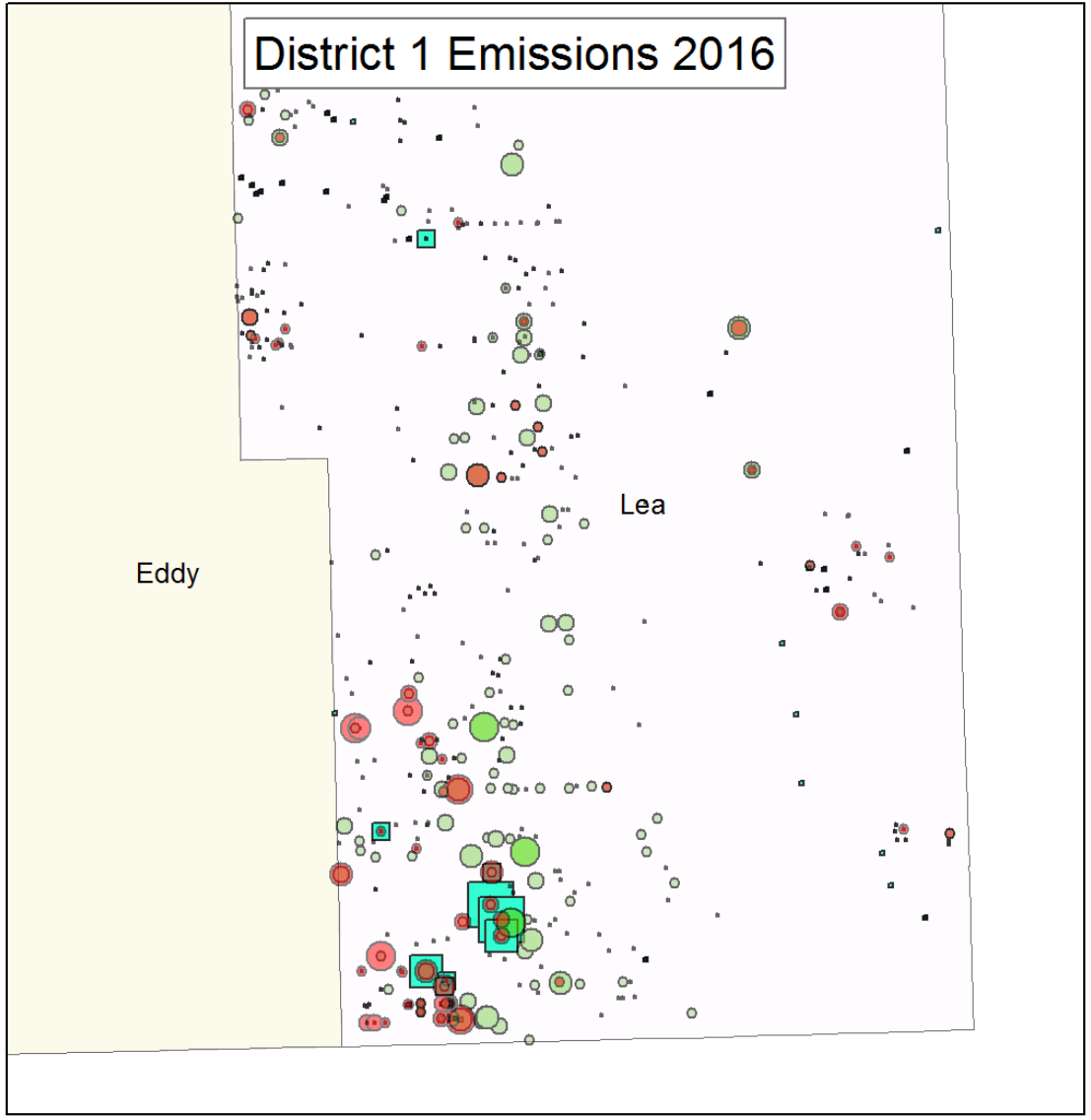
District 1 Vented



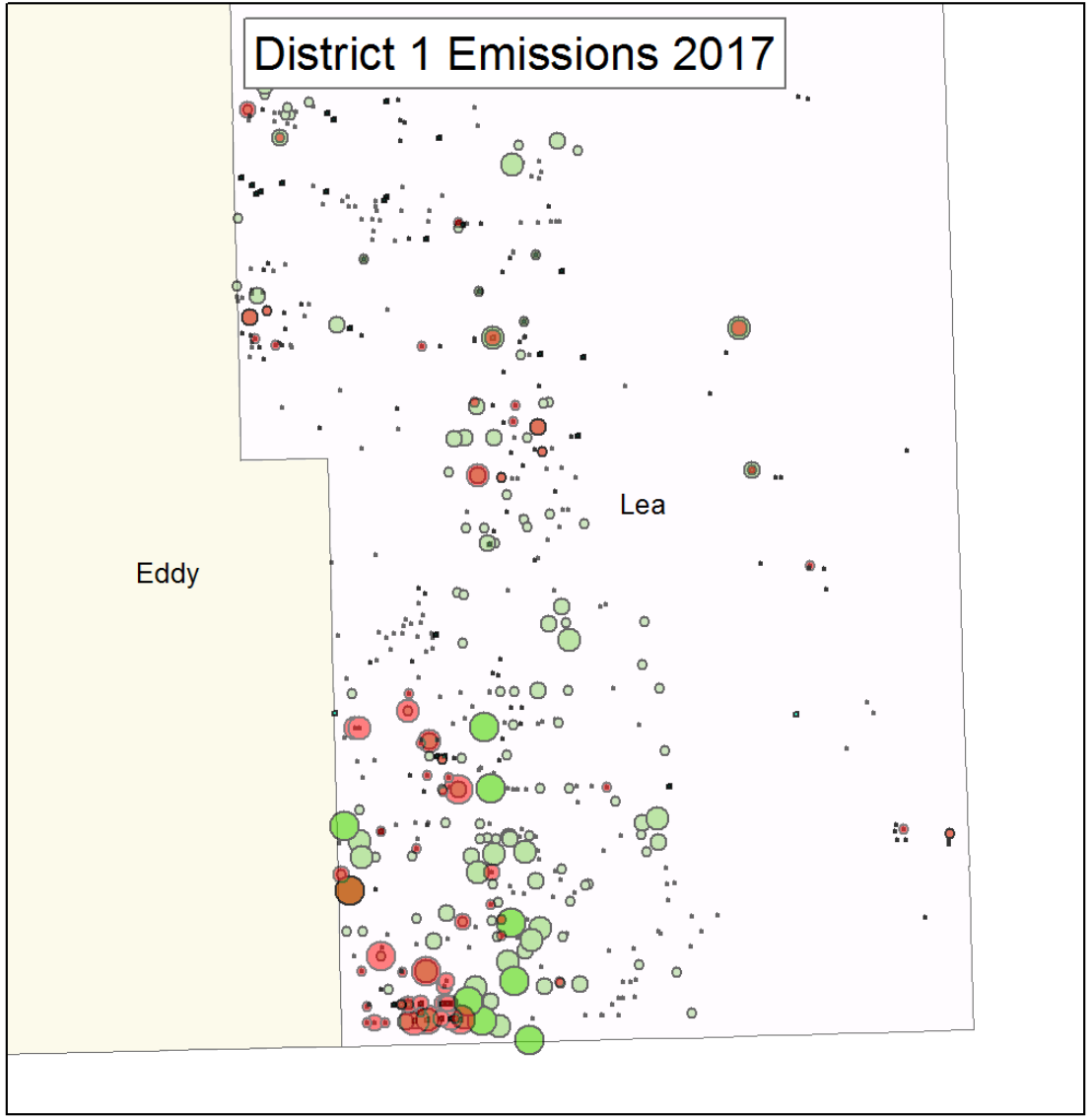
District 1 Vented (detail)



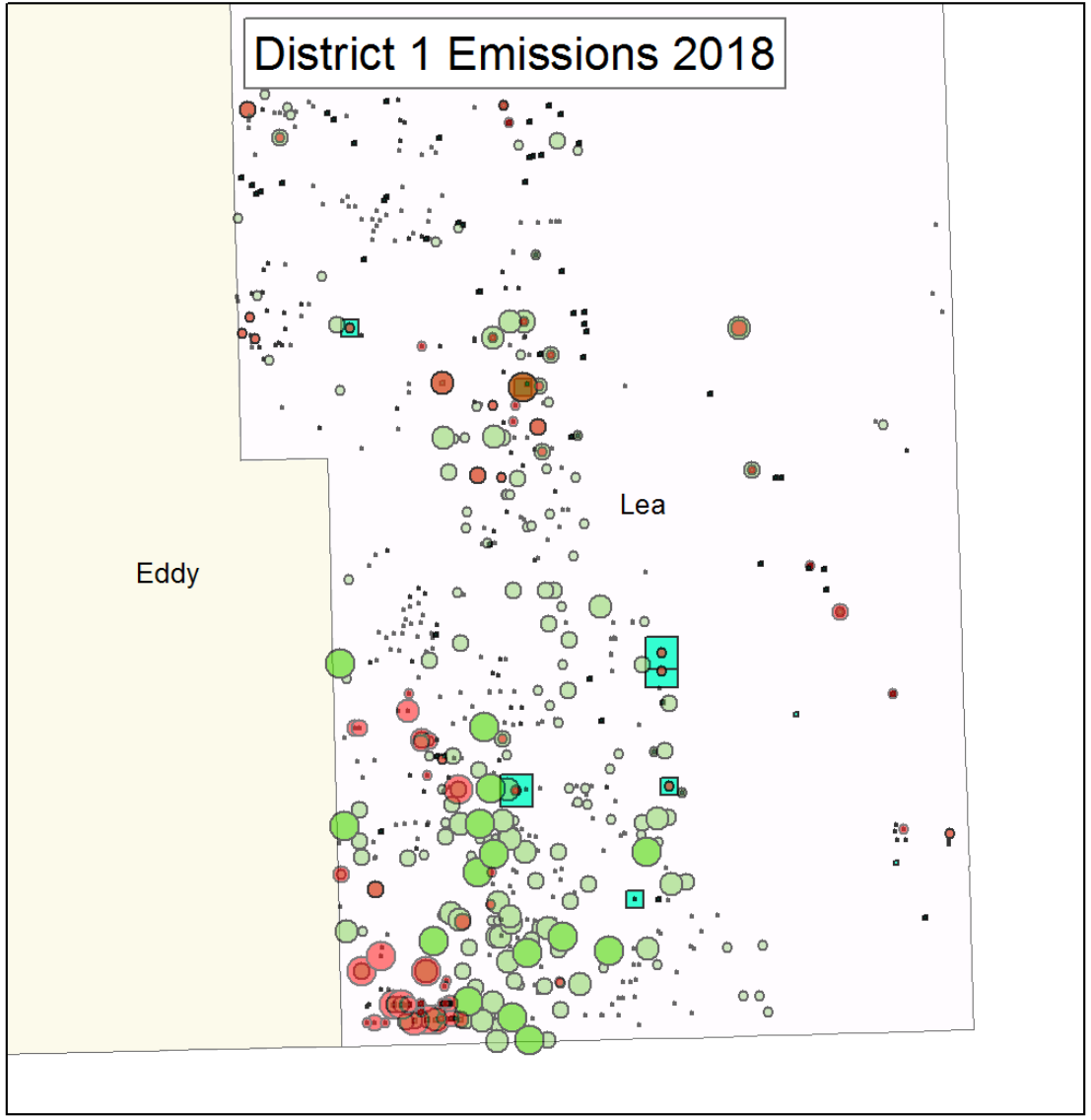
District 1 Vented (detail)



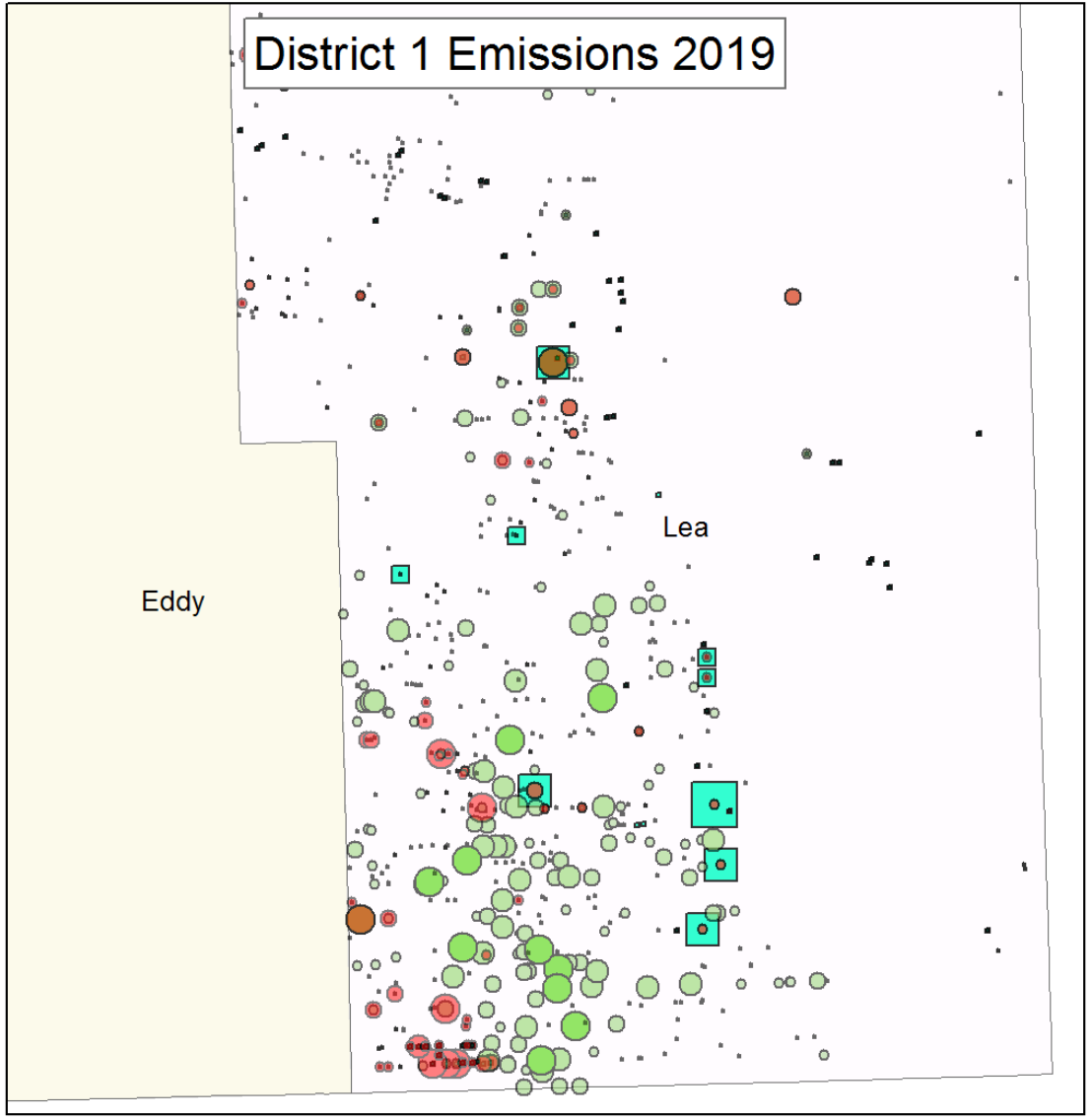
District 1 Vented (detail)



District 1 Vented (detail)

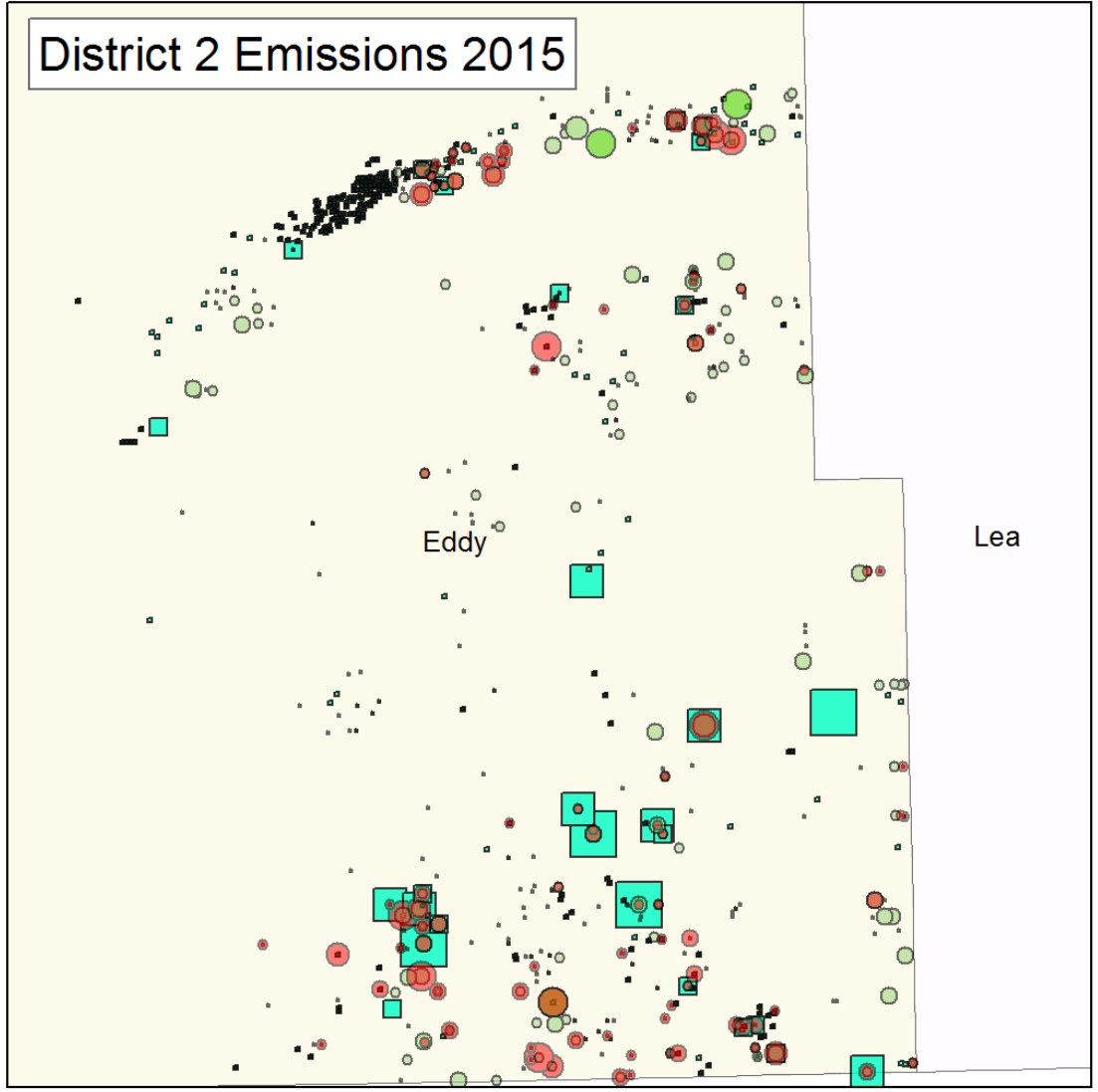


District 1 Vented (detail)



District 2

District 2 Vented (detail)

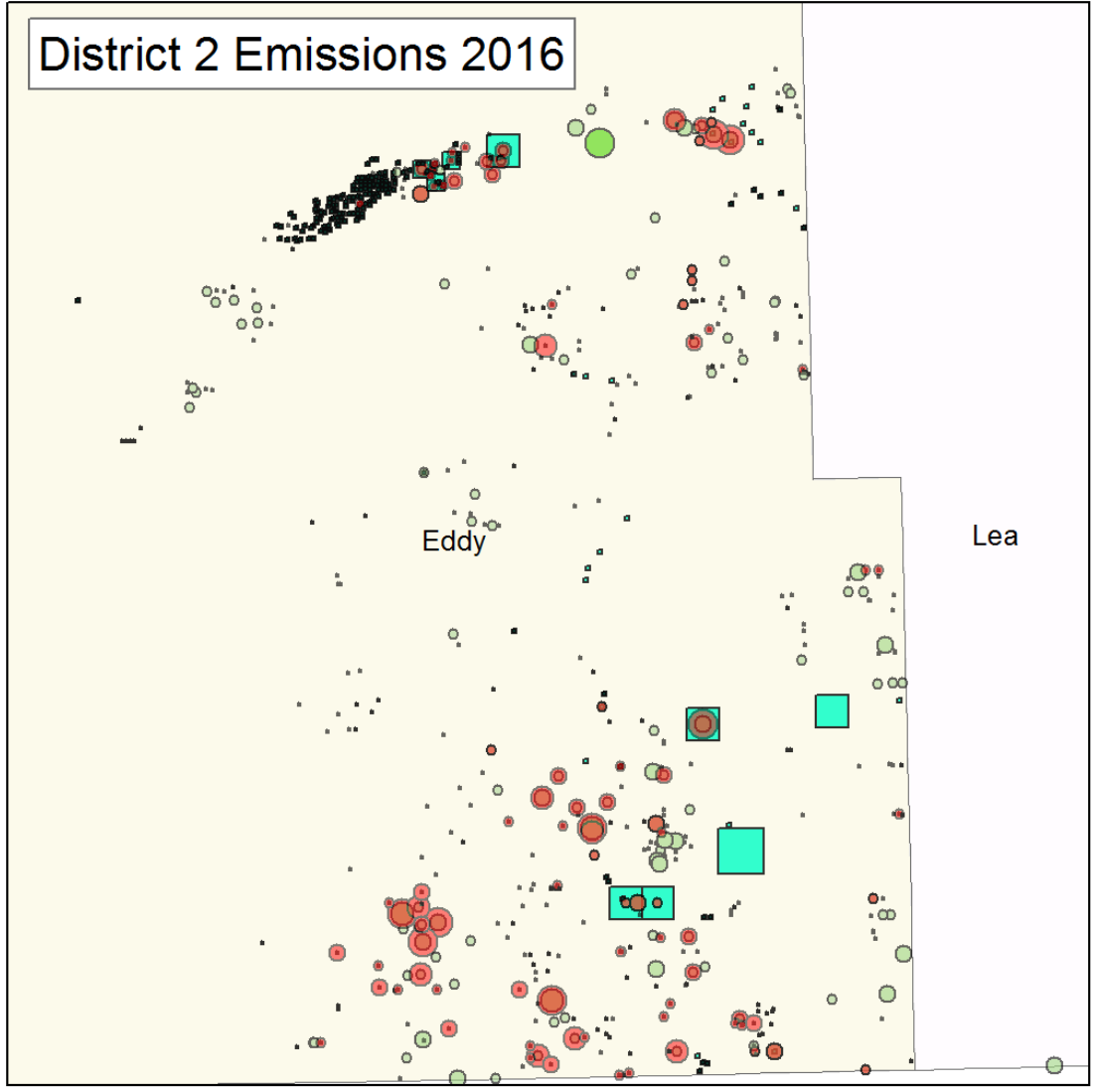


Emissions, Vented (mcf)
sum by property
- 1 - 25,000 (299)
- 25,001 - 50,000 (17)
- 50,001 - 150,000 (7)
- 150,001 - 400,000 (4)

Production
Gas
- 0 - 150,000
- 150,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 1,500,000
- 1,500,001 - 10,000,000

Production
Oil
- 0 - 75,000
- 75,001 - 200,000
- 200,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 3,000,000

District 2 Vented (detail)

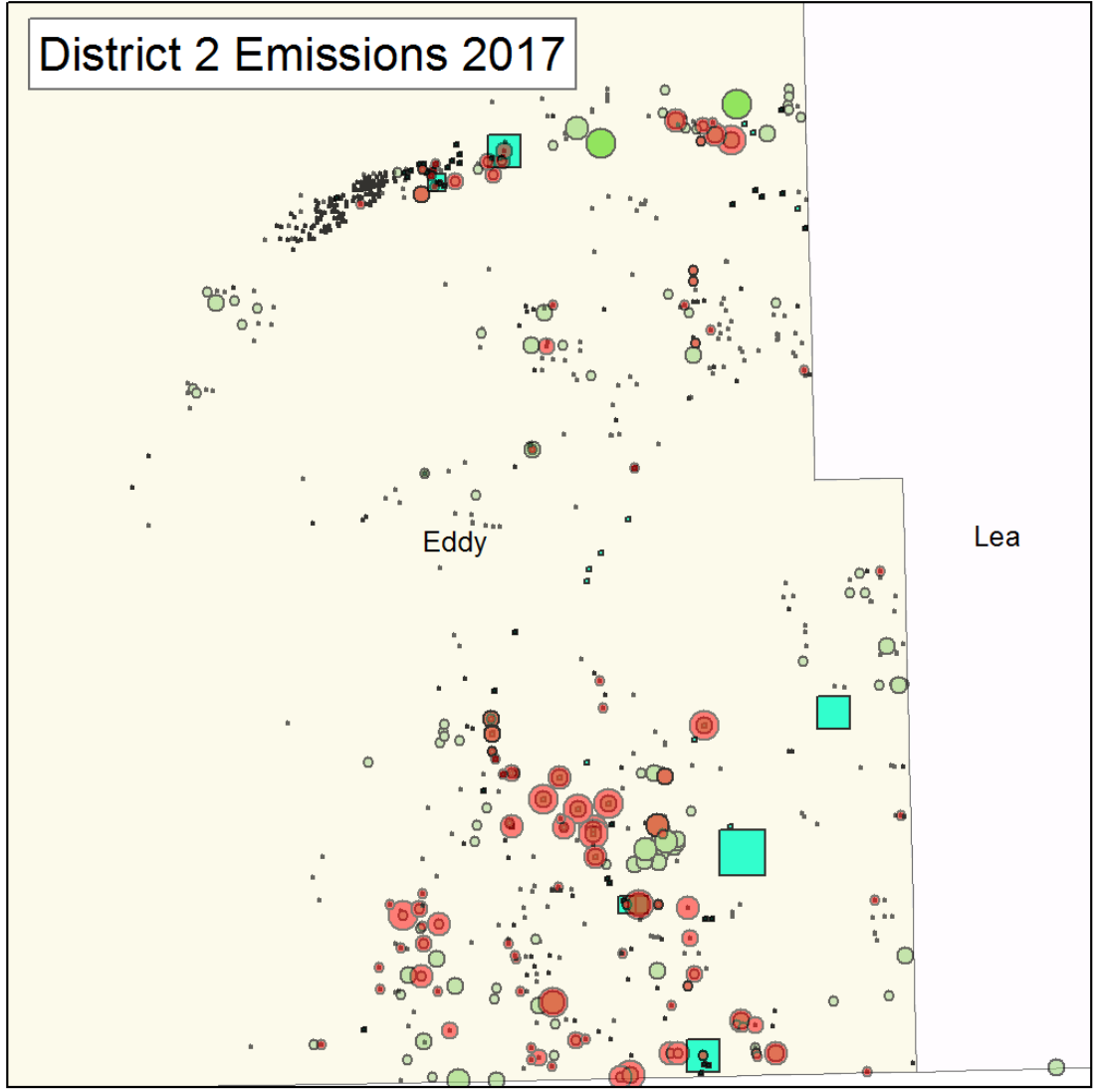


Emissions, Vented (mcf)
sum by property
- 1 - 25,000 (201)
- 25,001 - 50,000 (3)
- 50,001 - 150,000 (6)
- 150,001 - 400,000 (1)

Production
Gas
- 0 - 150,000
- 150,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 1,500,000
- 1,500,001 - 10,000,000

Production
Oil
- 0 - 75,000
- 75,001 - 200,000
- 200,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 3,000,000

District 2 Vented (detail)

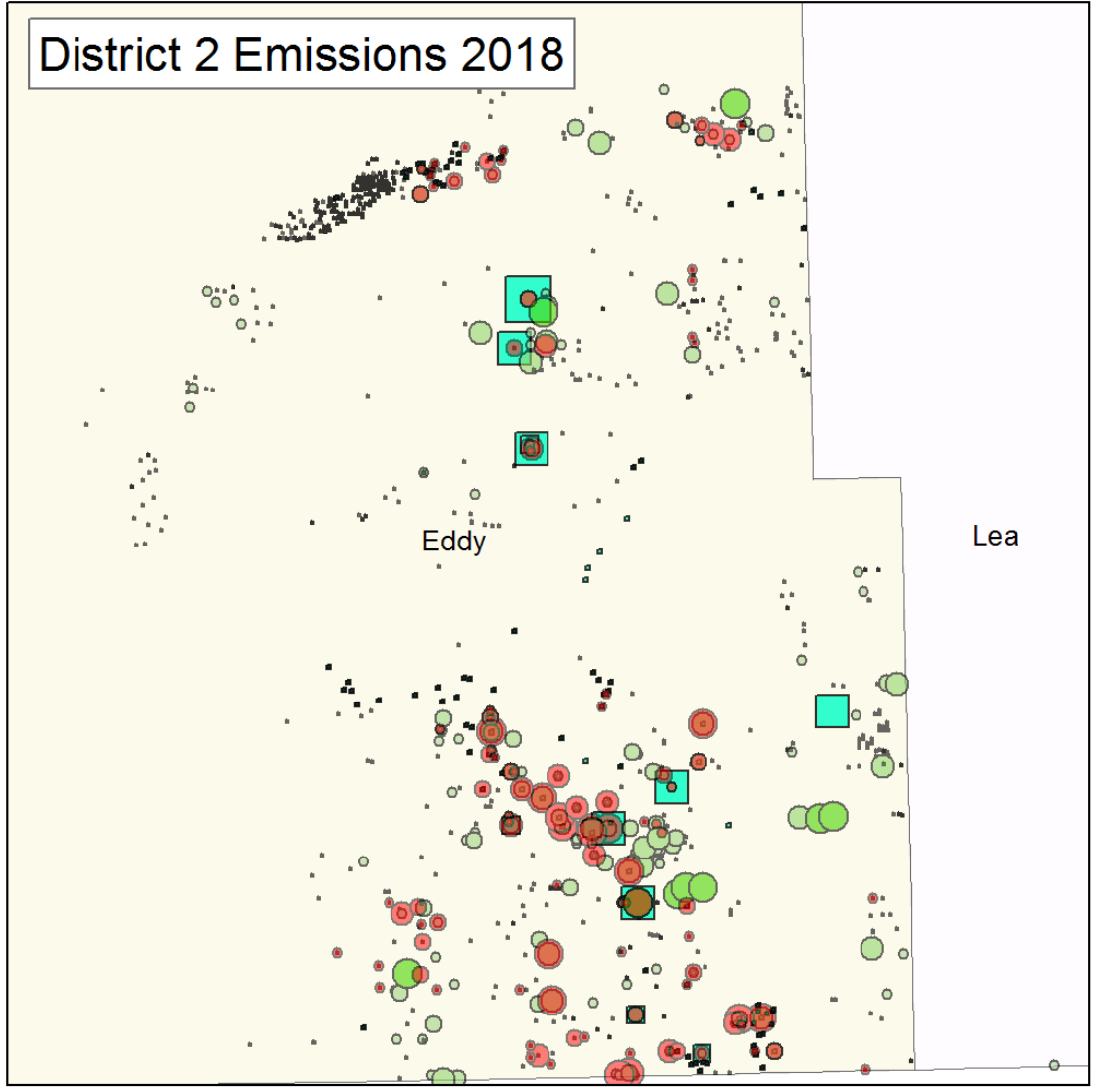


Emissions, Vented (mcf)
sum by property
- 1 - 25,000 (78)
- 25,001 - 50,000 (3)
- 50,001 - 150,000 (3)
- 150,001 - 400,000 (1)

Production
Gas
- 0 - 150,000
- 150,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 1,500,000
- 1,500,001 - 10,000,000

Production
Oil
- 0 - 75,000
- 75,001 - 200,000
- 200,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 3,000,000

District 2 Vented (detail)

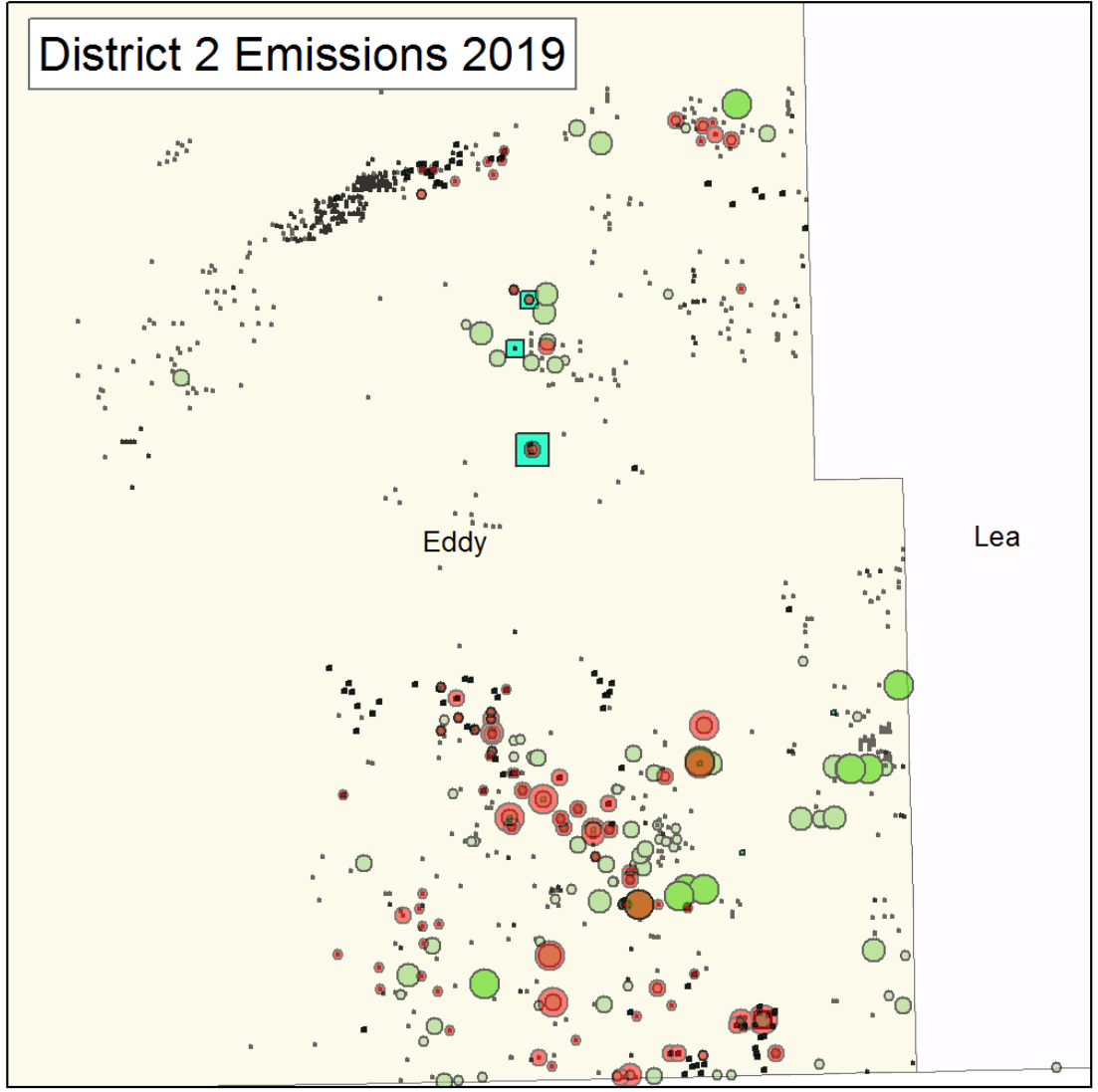


Emissions, Vented (mcf)
sum by property
- 1 - 25,000 (135)
- 25,001 - 50,000 (5)
- 50,001 - 150,000 (6)
- 150,001 - 400,000 (1)

Production
Gas
- 0 - 150,000
- 150,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 1,500,000
- 1,500,001 - 10,000,000

Production
Oil
- 0 - 75,000
- 75,001 - 200,000
- 200,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 3,000,000

District 2 Vented (detail)



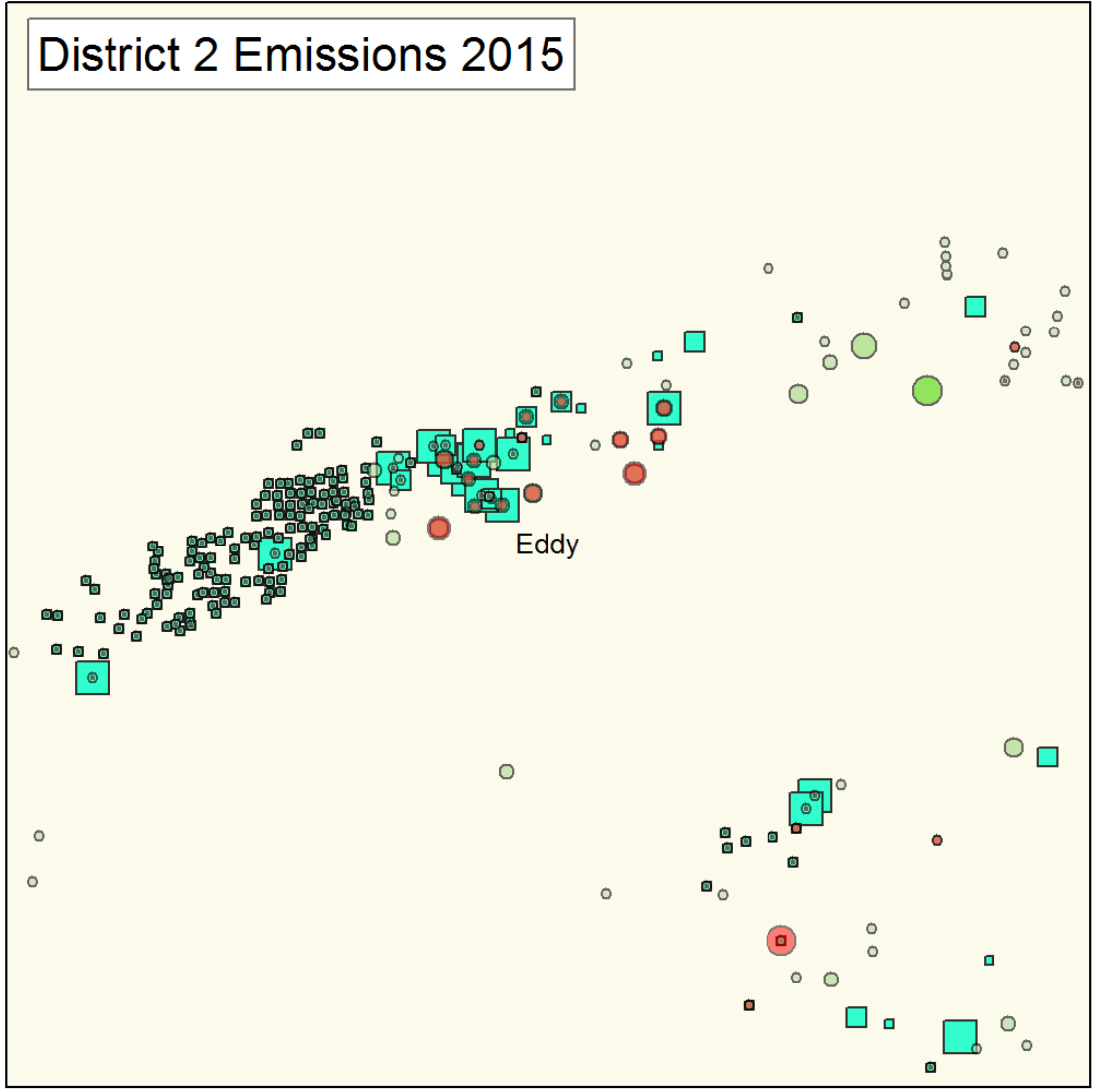
Emissions, Vented (mcf)
sum by property
- 1 - 25,000 (141)
- 25,001 - 50,000 (3)
- 50,001 - 150,000 (1)

Production
Gas
- 0 - 150,000
- 150,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 1,500,000
- 1,500,001 - 10,000,000

Production
Oil
- 0 - 75,000
- 75,001 - 200,000
- 200,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 3,000,000

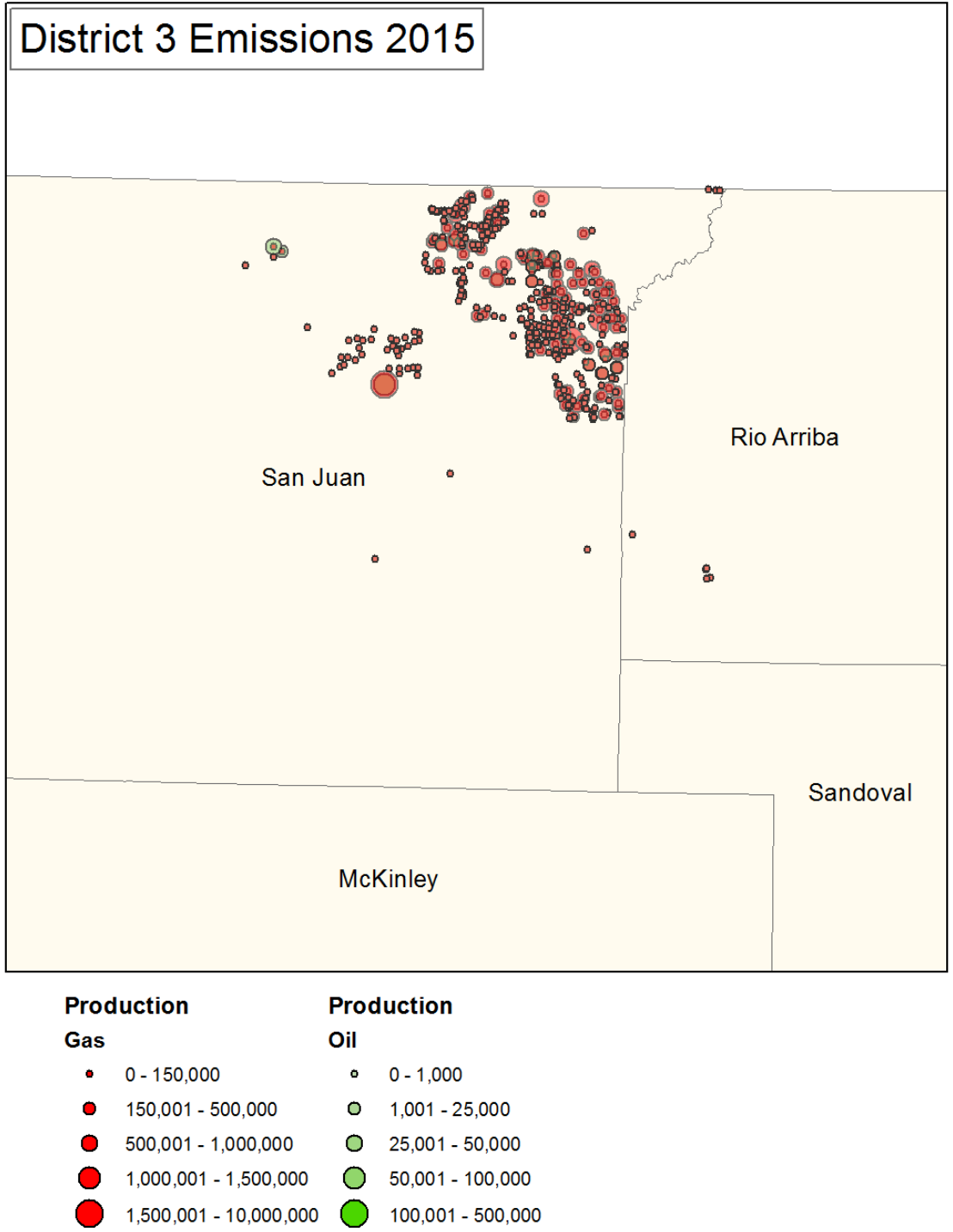
District 2 Vented (detail of northern part)

*not animated

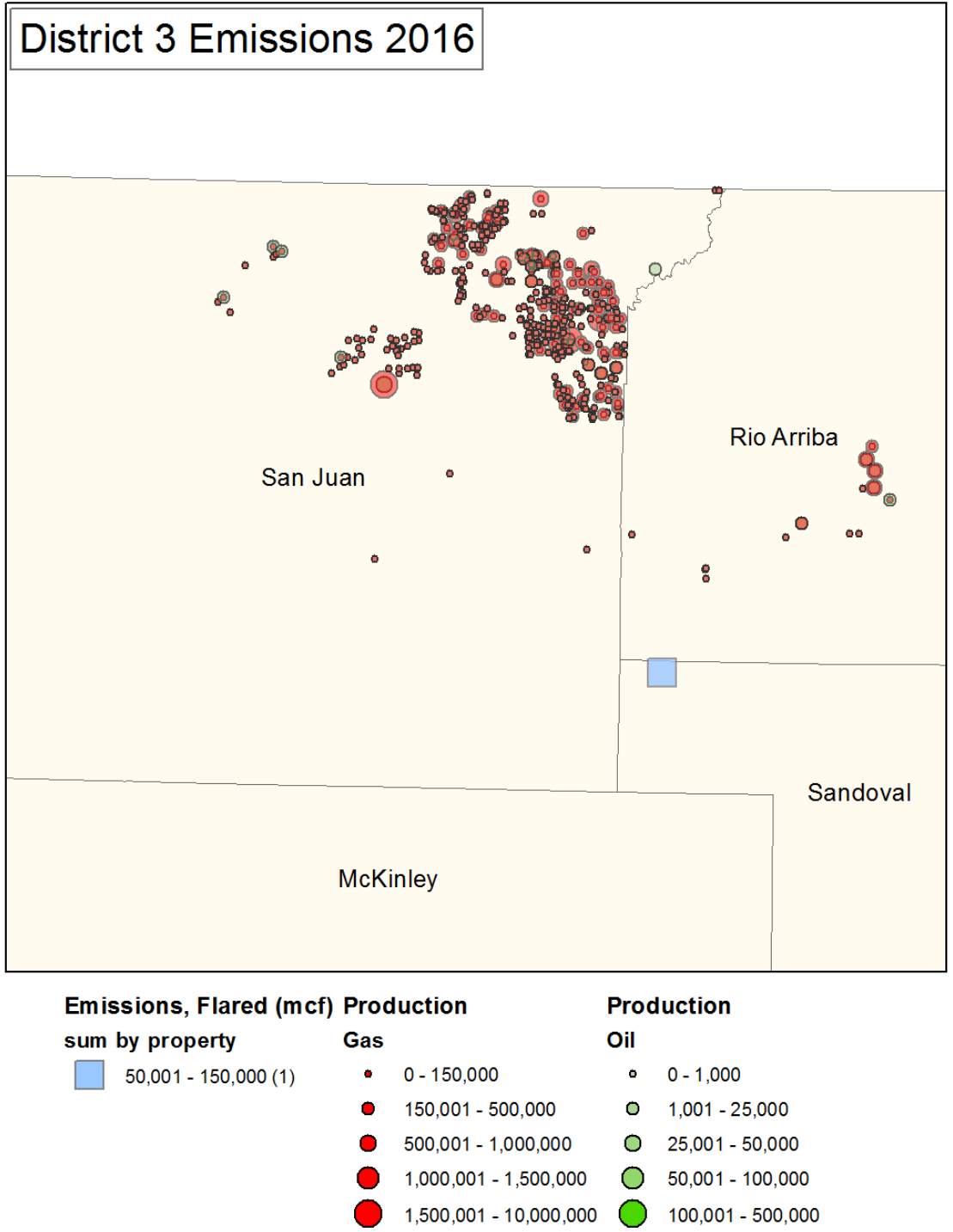


District 3

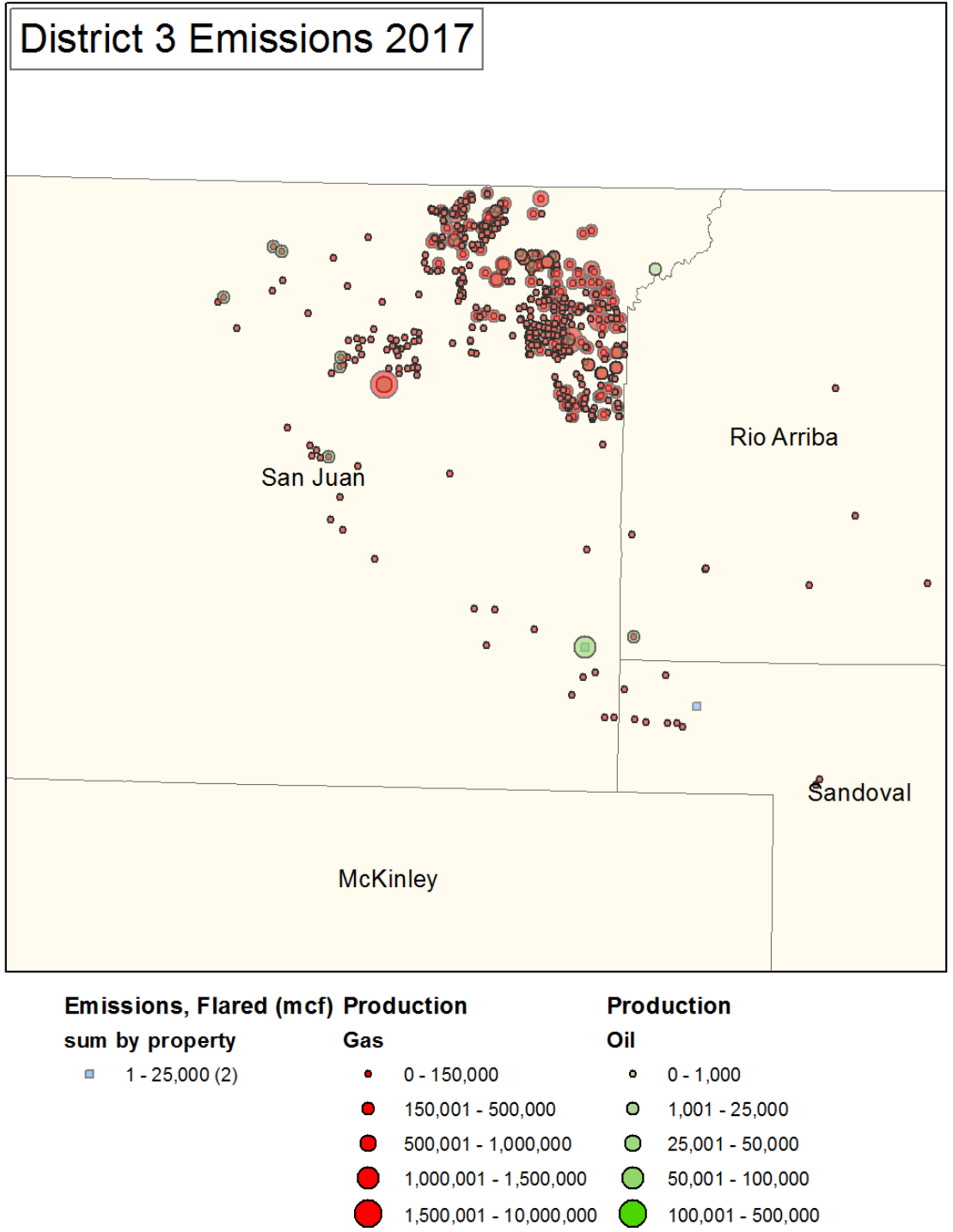
District 3 Flared very little flaring



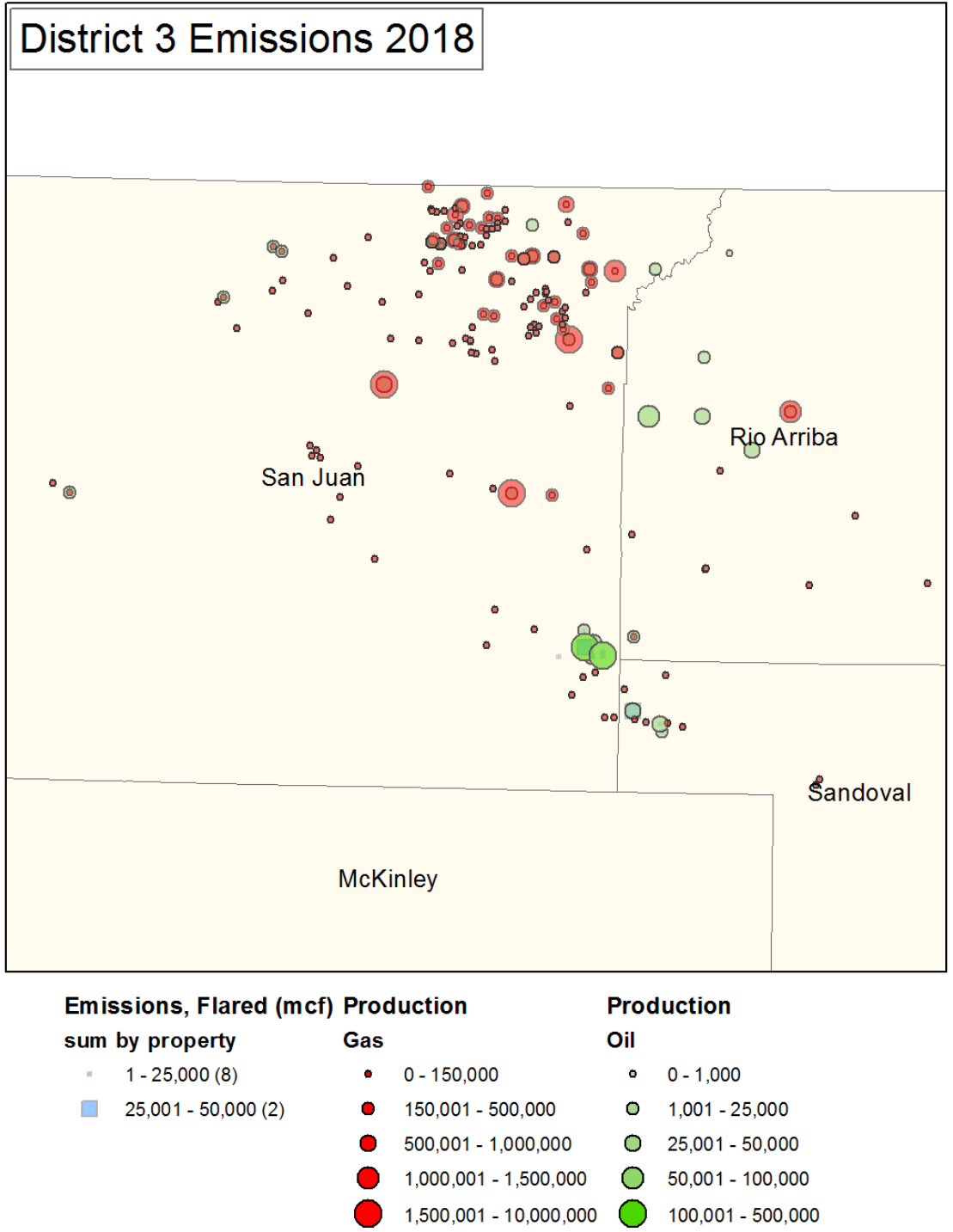
District 3 Flared very little flaring



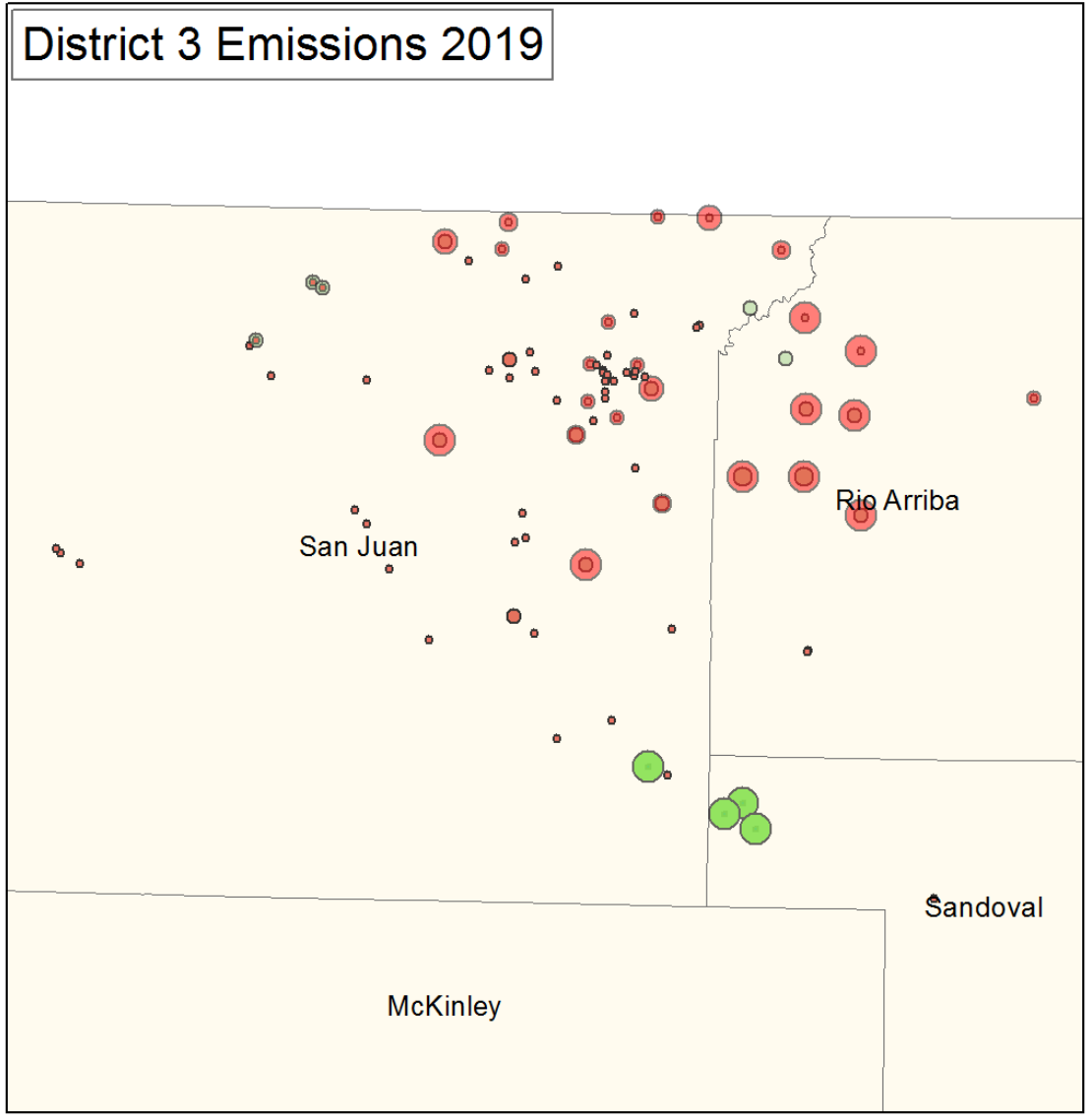
District 3 Flared very little flaring



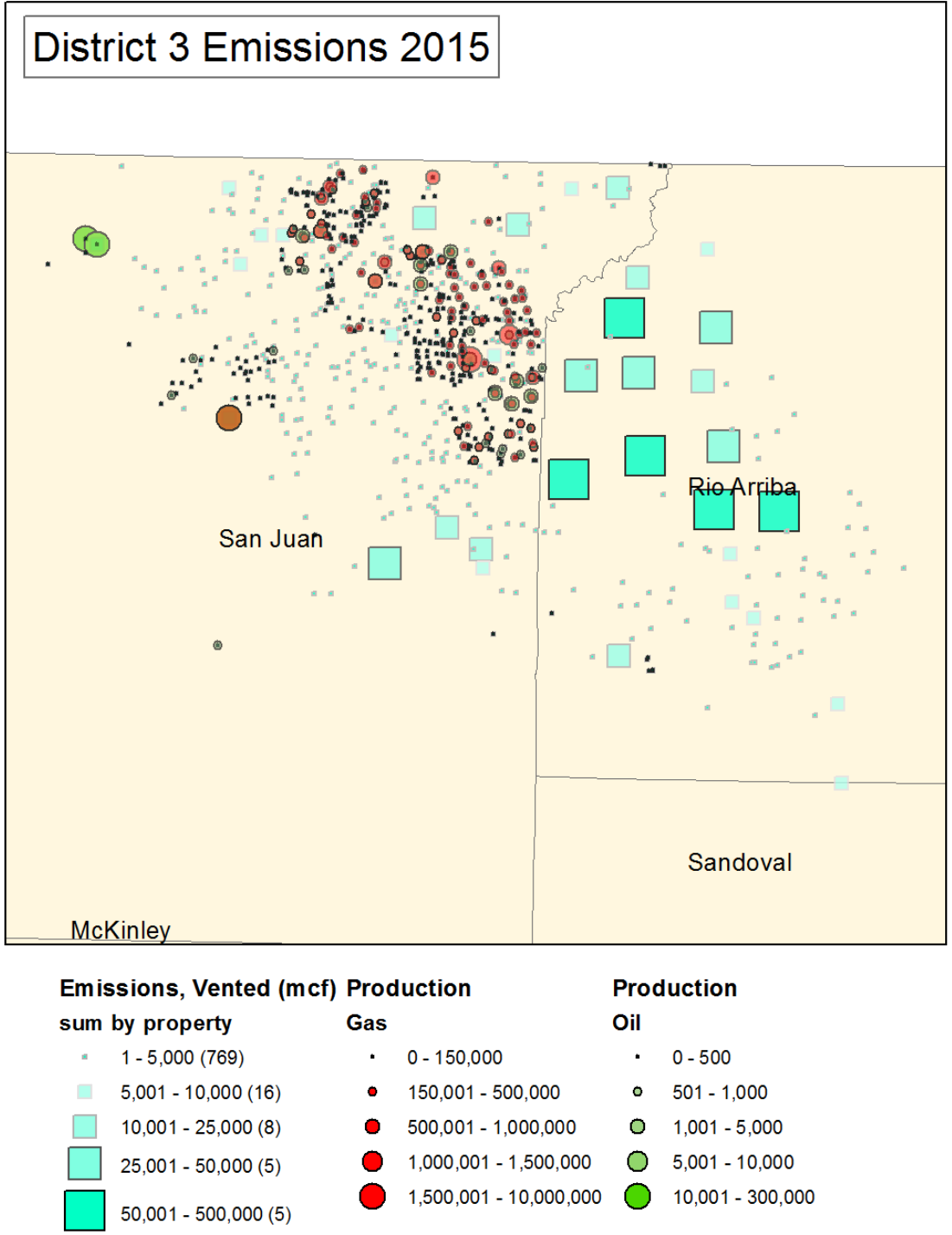
District 3 Flared very little flaring



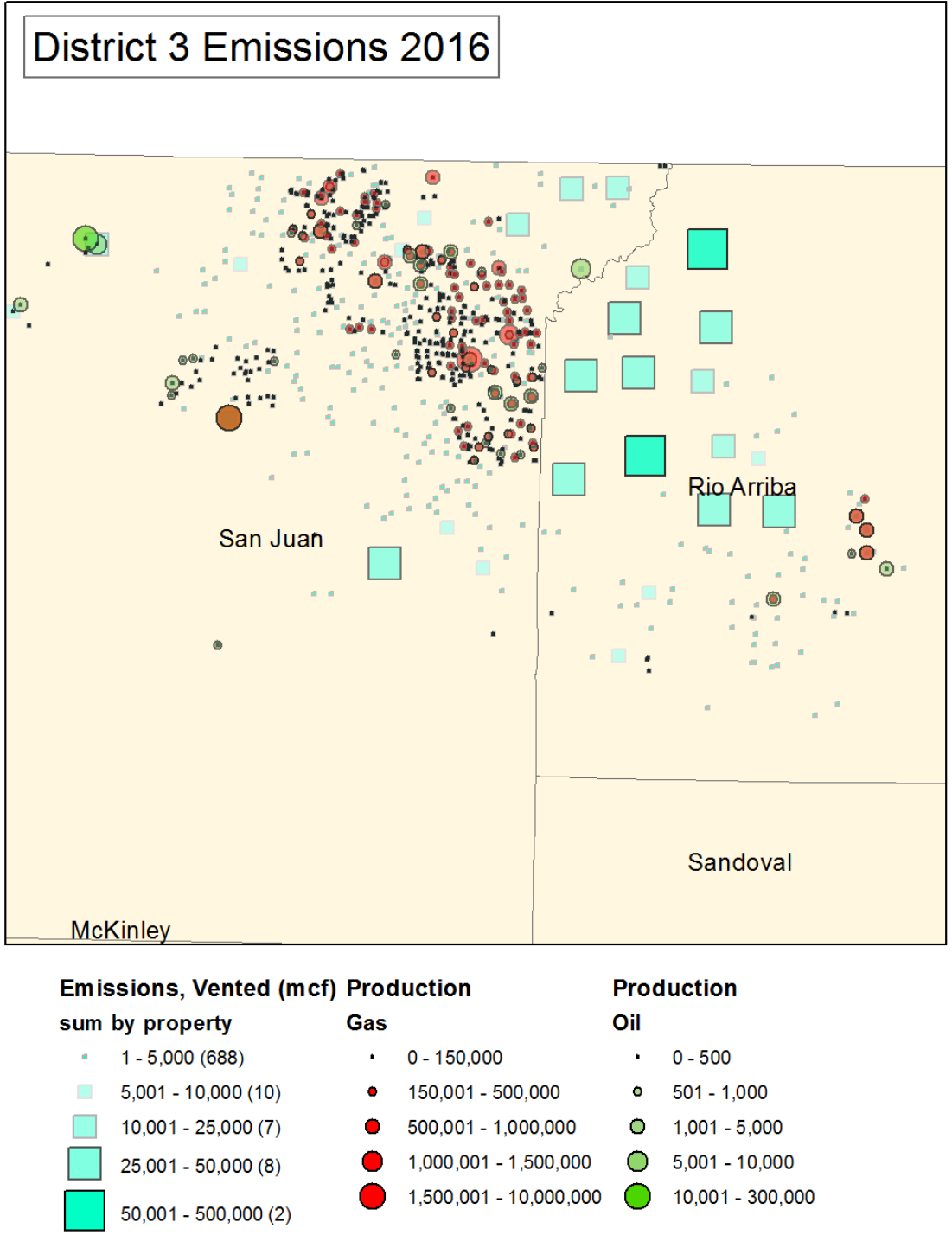
District 3 Flared very little flaring



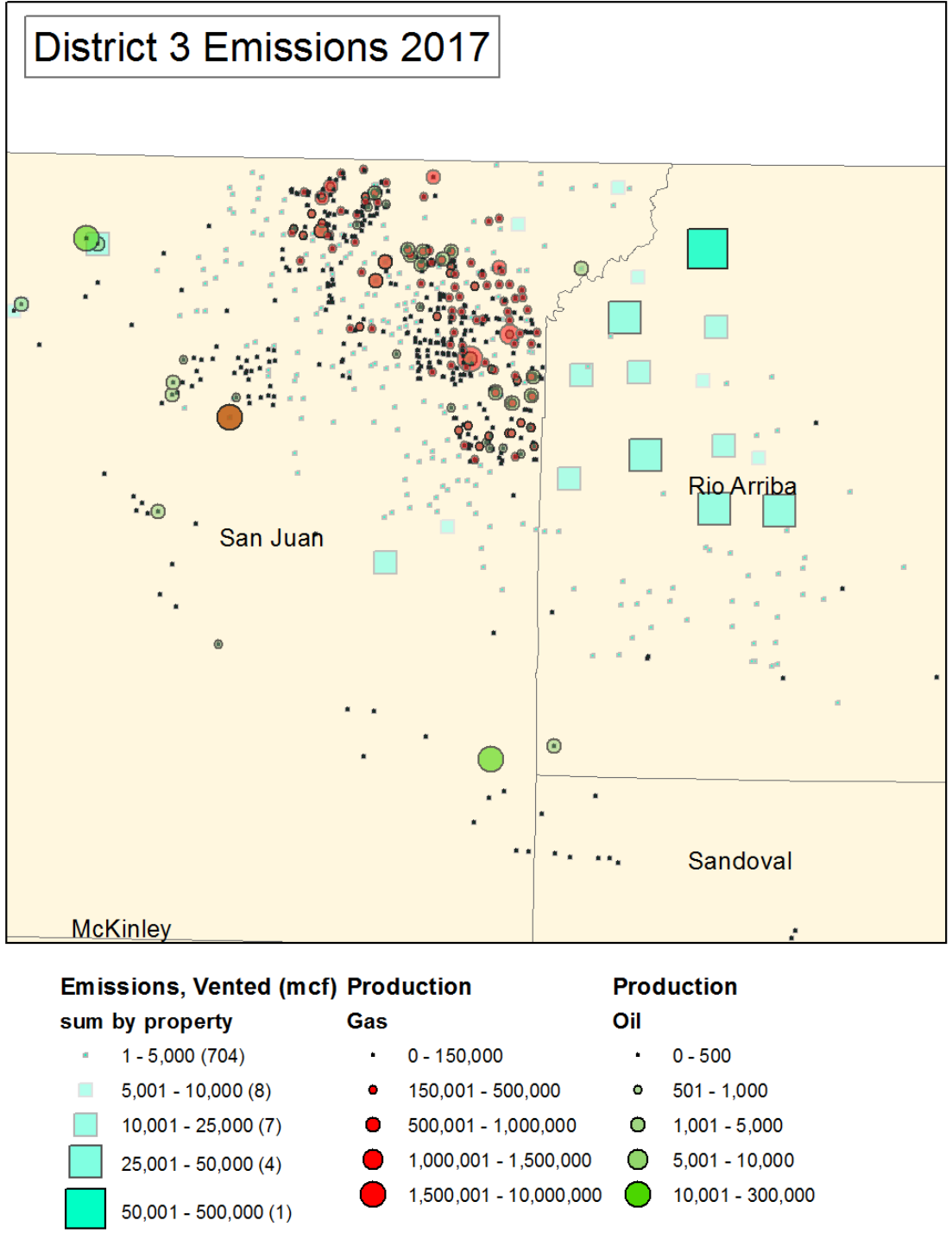
District 3 Vented



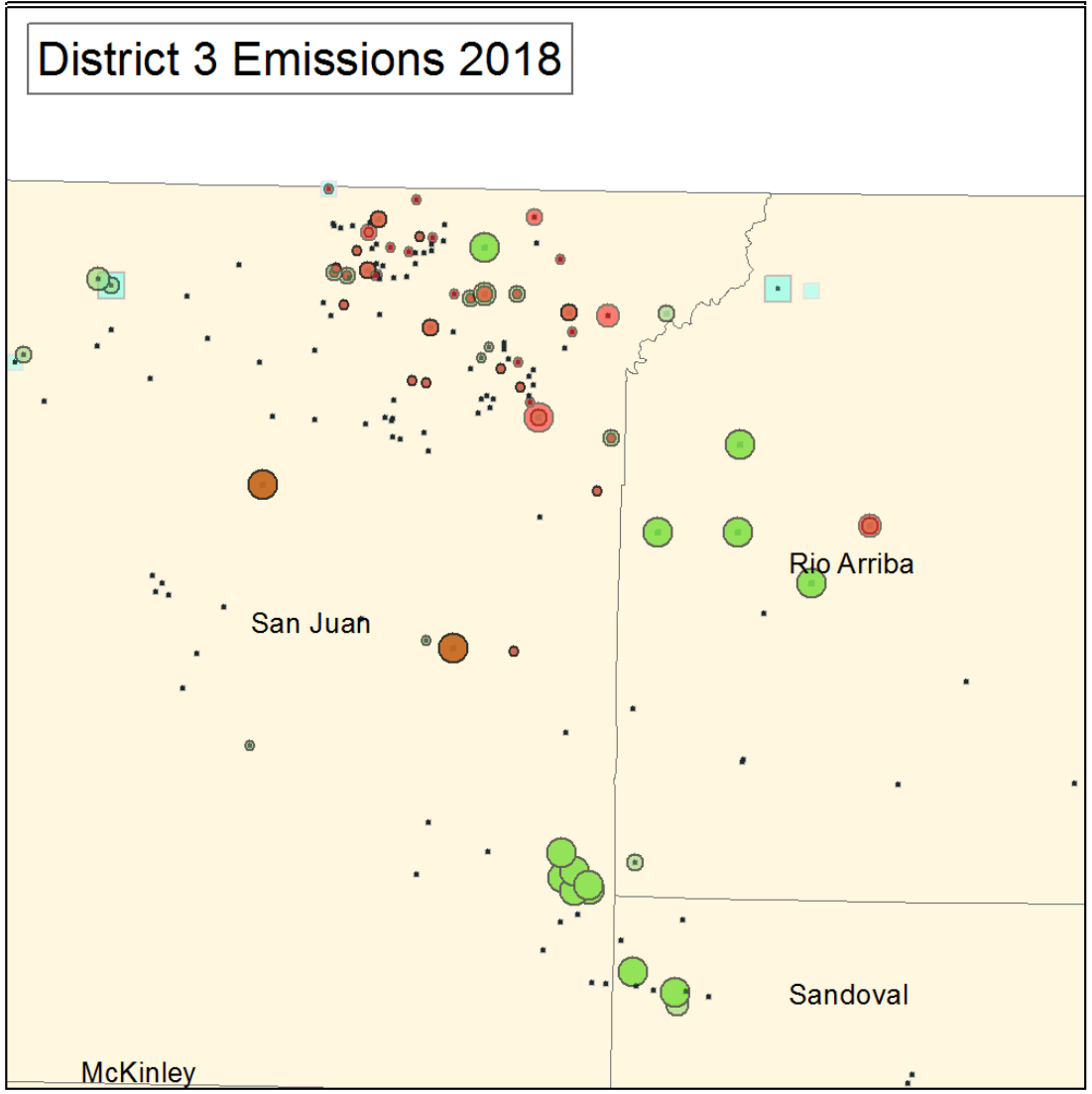
District 3 Vented



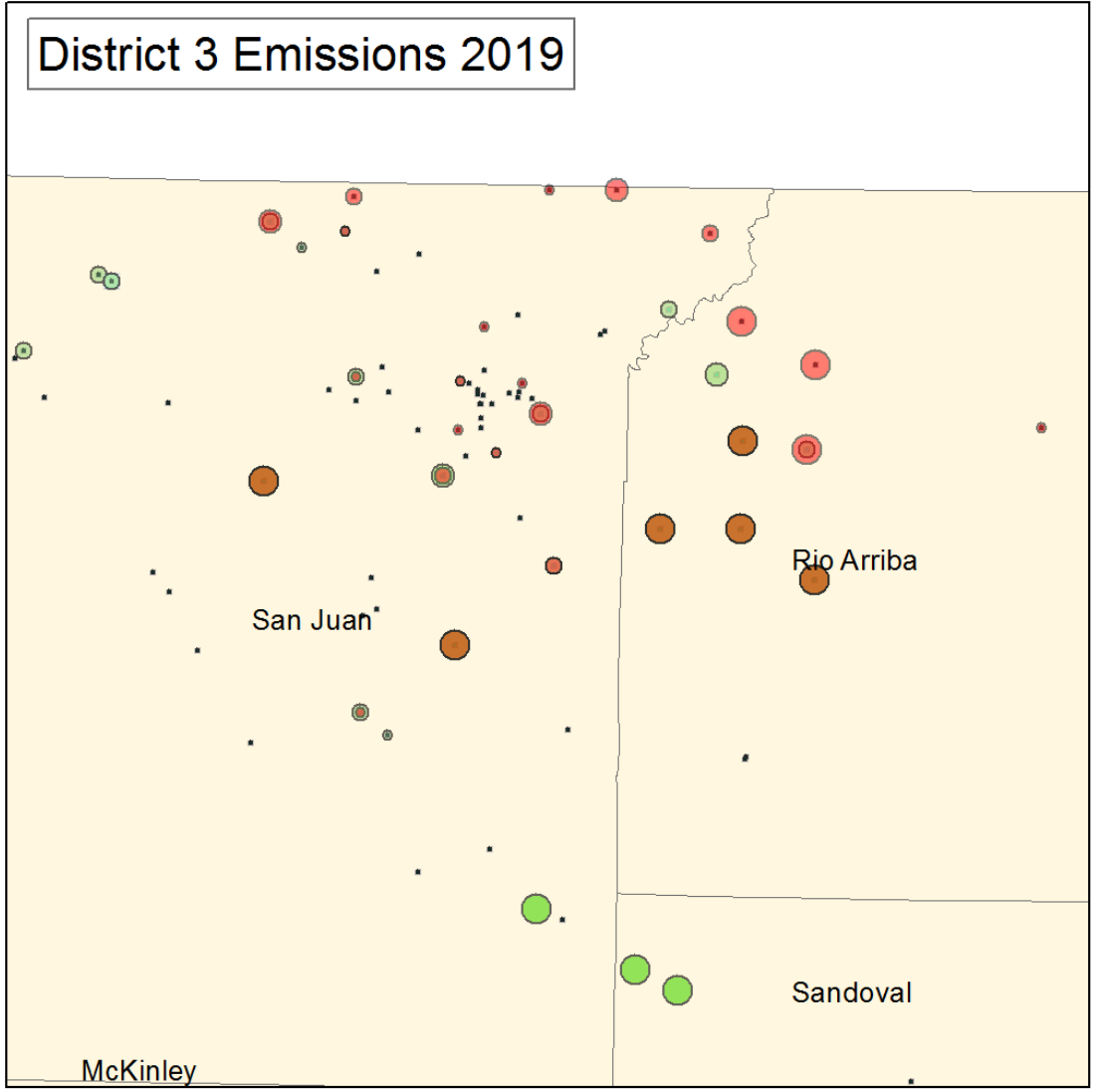
District 3 Vented



District 3 Vented



District 3 Vented



Data Issues

- Data quality needs improved - properties have no explicit spatial data so the boundaries or a median location can be inferred but this has issues*
- Should we include all APIs or just active wells?
- Data is only by property, so we don’t really know which well(s) would be involved
- Are there emissions from properties that don’t have wells (ie., other types of infrastructure) - and are these in that data set?

Future Work?

- We can do more with this data set if the MAP is so inclined
- We can draw bubble maps for individual flare and venting areas/months to determine if there are problem areas. For example, Cedar Lake has high emissions - can we figure out why
- We could mine the C-115 data along with other well files to see if particular types of processes contribute more to venting than others
- Tie data to OGRID (Plot using proxy ID's)
- Something else?