

Core Statistics and Map Index for GIS Communities

For Use with
Geographic Information Systems (GIS)



ASPCA

Shelter Research & Development

ASPCA X Maps Spot project, funded by PetSmart Charities ©

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Statistics and Maps for Shelter Data Analysis

GIS analysts and a technical audience familiar with GIS software and mapping will find this information helpful in guiding analyses of community shelter intake data. Communities ready to complete GIS analysis should share this index with their analyst as an outline of the work to be completed.



This index represents the recommended set of statistics and maps to produce and review when completing a full GIS analysis of community shelter intake. While many of these maps may prove to be less informative than others, it is important at least to explore each initially. Ultimately, a subset of these maps will likely be presented to a larger group of stakeholders for review, discussion, and development of targeted next steps.

Although a non-technical audience may find many of the document's details hard to understand, describing density maps as being similar to weather forecast snow or rain maps is extremely helpful for viewers with limited GIS map viewing experience.

For mapping analysis, it is recommended that uniformly-sized grids, such as Public Land Survey System sections or user-created grid cells, as well as raster density surfaces, be utilized. Using uniformly-sized grids provides a consistent, easy-to-understand method for analyzing the intake point locations through their aggregation. Density surface maps are also important to consider since they are able to display the same data as the grids, but in the form of continuous surface created from the points.

We have found that juxtaposing the grid cell and density surface maps of the same data sets is useful when reviewing the analysis results with the community. Zip codes and census units (such as tracts) should be avoided when possible. These non-uniform units are often too large (zip codes) or too varying in size and shape (tracts) to provide a comprehensible picture of the hot spots in the community.

There is a specific reason each statistic or map has been included in this index. Each attempts to provide a glimpse into a key data subset that may help in identifying the work that will follow the analysis. The planning of targeted interventions is the most common next step. These can come in several varieties, primarily spay/neuter interventions to reduce juvenile intake, and/or safety net interventions that keep pets in the home to reduce both adult and juvenile owner surrender intake or abandonment of pets.

To determine what type of work to pursue and where in the community to pursue it, critically examine stats and maps that compare and contrast data subsets, such as stray versus owner surrender intake, which require different approaches and audiences to decrease intake. For instance, compare juvenile versus adult intake (where juveniles are likely influenced by spay/neuter but adults more by safety net programs), and unaltered versus altered adult intake (which can, in combination with litters or juveniles, help fine tune the focus of your spay/neuter efforts).

We have defined litters as three or more juveniles of the same age from the same address on the same day (and same breed for dogs). This provides a better summary of where large numbers of juveniles are from, particularly when there are many individual juveniles in the data set.

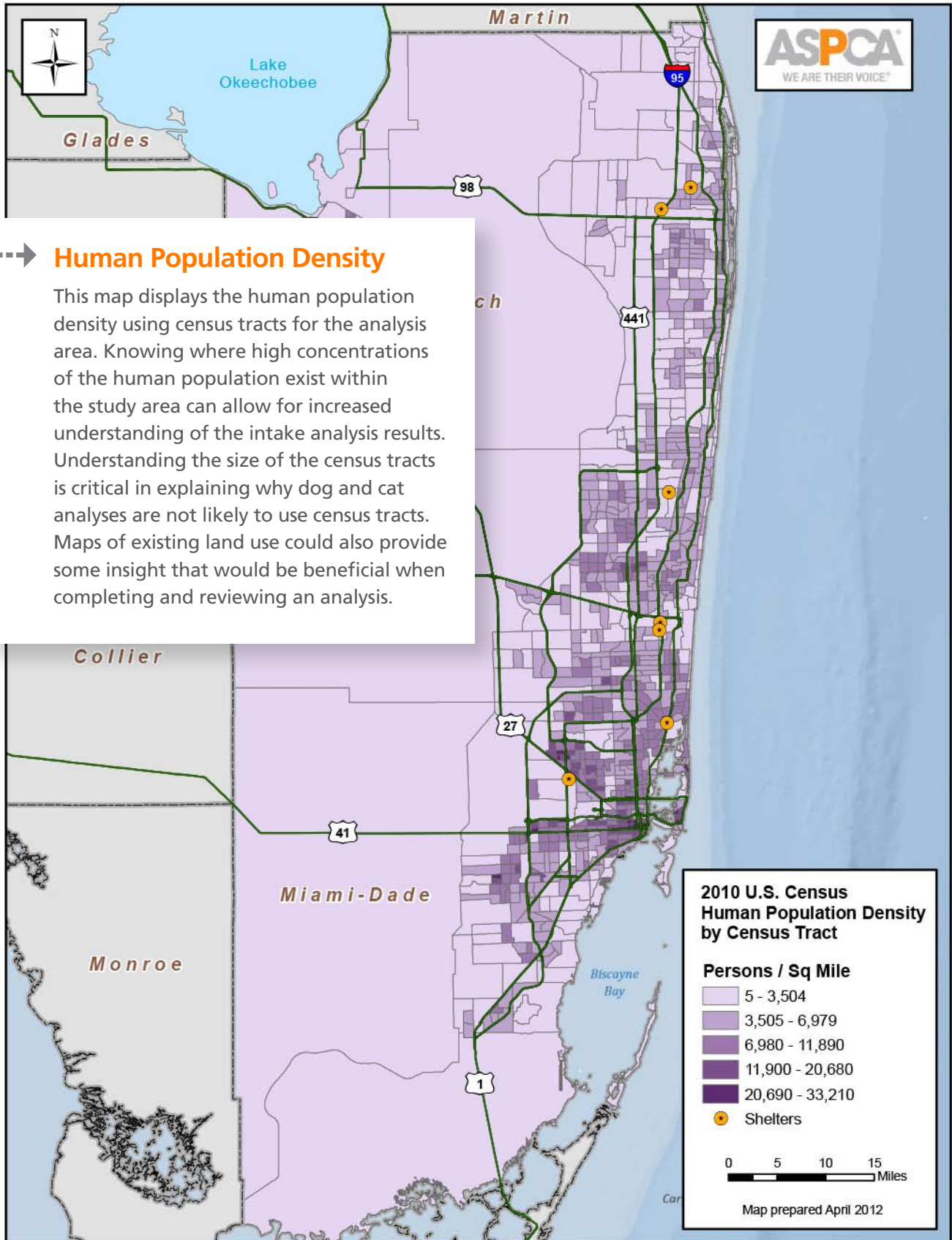
Some communities will have dog breeds of specific interest either because they have large numbers entering the shelter and/or a high euthanasia rate of those breeds. Typically these are bully breeds (pit bull or mixes or similar). These may be broken out from non-bully breeds for analysis.

Additionally, all statistics and maps are recommended to be exclusively for either cats or dogs (not both combined). The unique characteristics of cats and dogs and the varying potential patterns present in their intake data is the primary reason maps and tables of total intake (cats and dogs combined) are not as useful. Note that no maps, tables, or graphs are recommended to display total animal intake.

General Map – Human Population Density, [Page 4](#)

Cats – Statistics and Maps section begins on [Page 5](#)

Dogs – Statistics and Maps section begins on [Page 28](#)



---> **Human Population Density**

This map displays the human population density using census tracts for the analysis area. Knowing where high concentrations of the human population exist within the study area can allow for increased understanding of the intake analysis results. Understanding the size of the census tracts is critical in explaining why dog and cat analyses are not likely to use census tracts. Maps of existing land use could also provide some insight that would be beneficial when completing and reviewing an analysis.

Cats

Statistics

Prepared as tables and charts:

- **Total Intake by Month and Age**
- **Intake Summary by Altered Status, Intake Type, and Age** *(all data)*
- **Owner Surrender Intake by Month and Age**
- **Stray Intake by Month and Age**
- **Seasonal Intake by Intake Type and Age**
- **Seasonal Intake by Intake Type and Altered Status**
- **Spay/Neuter by Month**

Maps

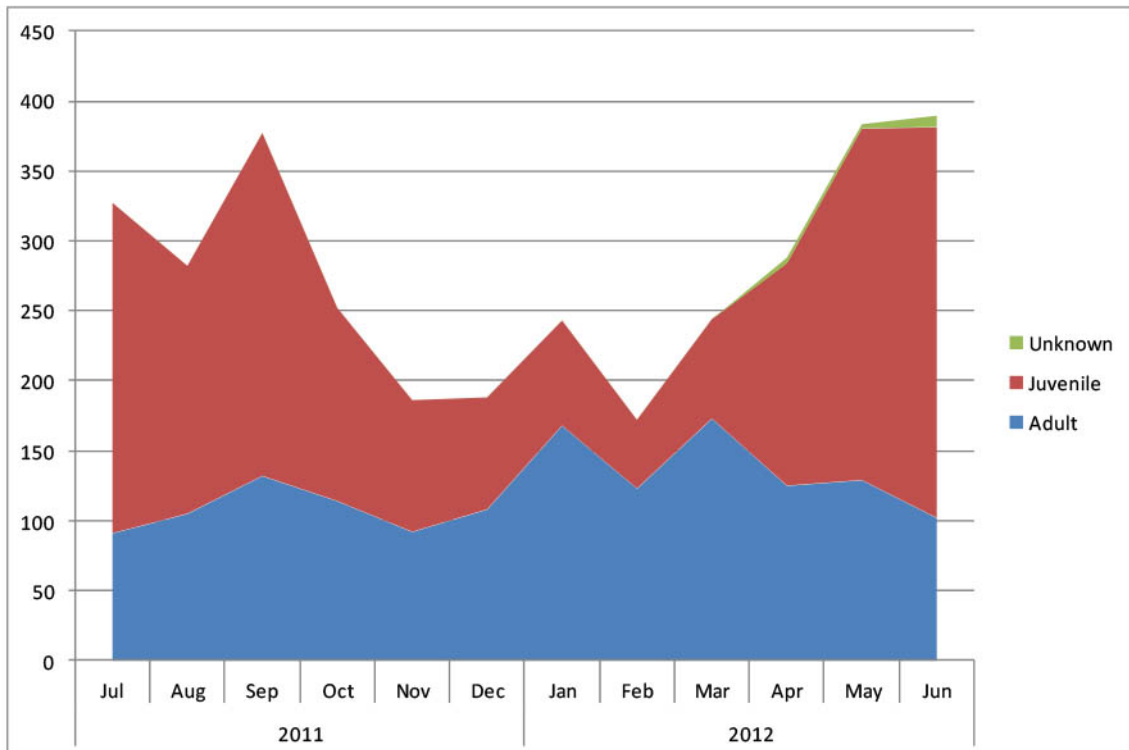
- **Total Intake** *(by Square Mile Grid or Census Units)*
- **Total Intake Density**
- **Stray Intake** *(by Square Mile Grid or Census Units)*
- **Stray Intake Density**
- **Owned Intake** *(by Square Mile Grid or Census Units)*
- **Owned Intake Density**
- **Juvenile Percent of Stray Intake** *(by Square Mile Grid or Census Units)*
- **Juvenile Percent of Owned Intake** *(by Square Mile Grid or Census Units)*
- **Unaltered Adult Percent of Stray Intake** *(by Square Mile Grid or Census Units)*
- **Unaltered Adult Percent of Owned Intake** *(by Square Mile Grid or Census Units)*
- **Total Intake with Stray vs. Owned Bar Charts** *(by Square Mile Grid or Census Units)*
- **Litters – Stray and Owned Points with Total Intake** *(by Square Mile Grid or Census Units)*
- **Litter Density**
- **Litters – Stray and Owned Points with Unaltered Adult Percent** *(by Square Mile Grid or Census Units)*
- **Adult Spay/Neuter to Adult Intake Ratio with Points Displayed**

----> **Total Intake by Month and Age**

A table and area chart of intake by month and age provides an overall view of total intake numbers and also allows for identification of possible seasonality in the data. Additionally, the table includes percentages showing the portion of intake that is adult and juvenile in each month. The chart displays the monthly data graphically and allows for easy identification of spikes in intake. Often these could include spring/summer increases for juvenile cats. It also provides a quick summary of dirty data in the "Unknown" category.

Total Cat Intake by Month

CATS	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
Total	327	282	377	252	186	188	243	172	244	288	383	389	3331
Pct of Year	10%	8%	11%	8%	6%	6%	7%	5%	7%	9%	11%	12%	100%
Adult	91	105	132	114	92	108	168	123	173	125	129	102	1462
Pct of Month	28%	37%	35%	45%	49%	57%	69%	72%	71%	44%	34%	26%	
Juvenile	236	177	245	138	94	80	75	49	71	159	251	279	1854
Pct of Month	72%	63%	65%	55%	51%	43%	31%	28%	29%	55%	65%	72%	
Unknown	0	0	0	0	0	0	0	0	0	4	3	8	15
Pct of Month	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	2%	



Total Cat Intake by Month and Age

----> **Intake Summary**

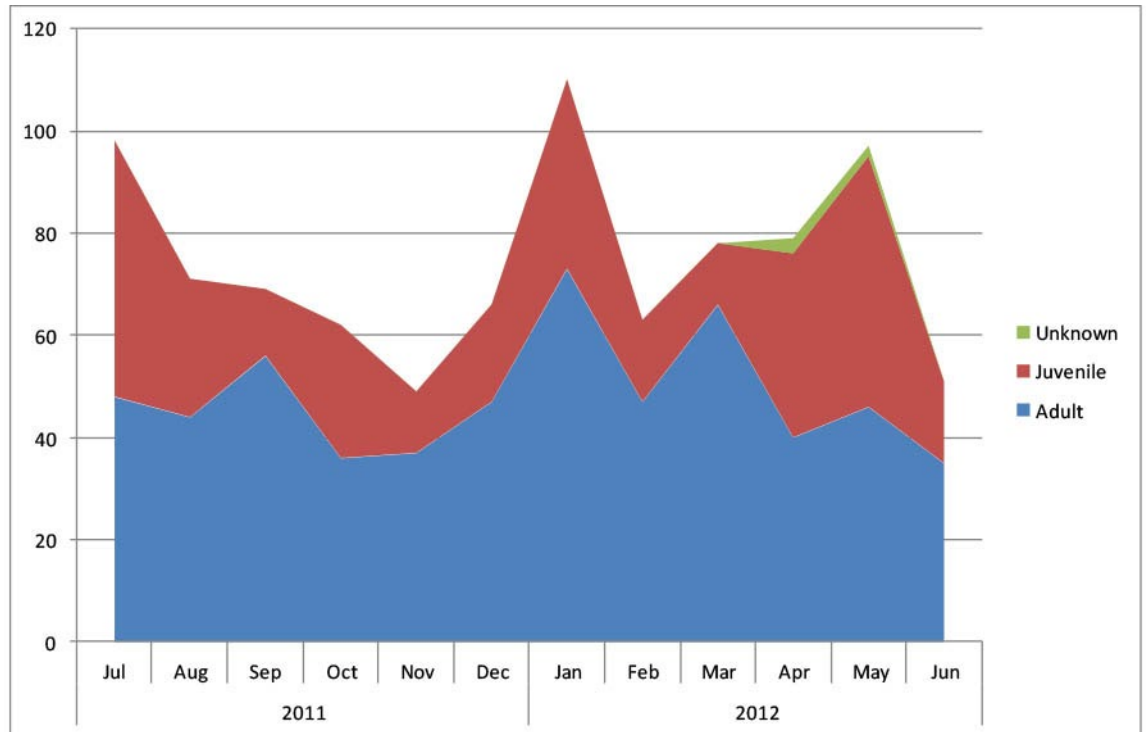
This table displays a summary of all cat intake data included in the analysis broken out by intake type, altered status, and age. It also includes a percentage stray column to help visualize the portion of each age and altered status group that is stray intake. This table also provides a clear visual of the total number of cats included in the analysis and the comparisons or contrasts between intake types.

July 2011 – June 2012 Cat Intake Summary

Status at Intake	Owner surrender	Stray	% Stray	Grand Total
Altered	273	129	32%	402
Adult	265	103	28%	368
Juvenile	4	26	87%	30
Unknown Age	4	0	0%	4
Unaltered	618	2243	78%	2861
Adult	308	747	71%	1055
Juvenile	309	1486	83%	1795
Unknown Age	1	10	91%	11
Unknown	2	66	97%	68
Adult	2	37	95%	39
Juvenile	0	29	100%	29
Grand Total	893	2438	73%	3331

----> **Owner Surrender Intake by Month and Age**

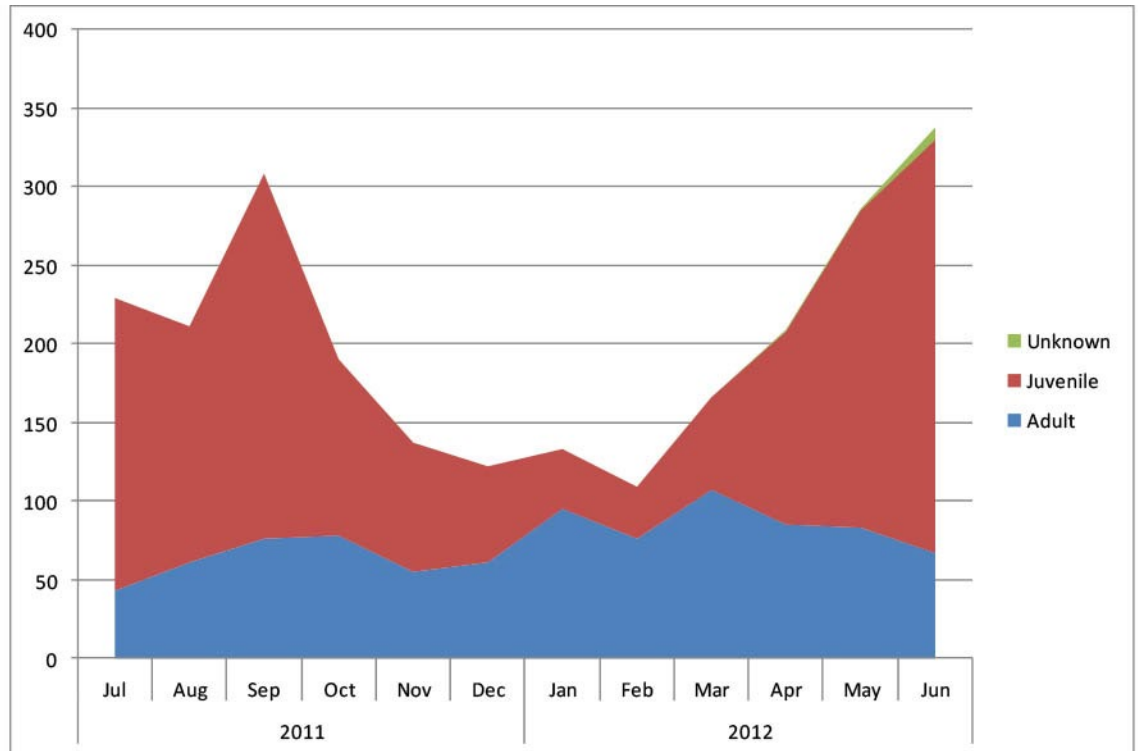
This area chart displays owner surrender cat intake by month and age. It allows easy identification of seasonality in the dataset and clearly illustrates the proportion of intake that is juvenile. It also may highlight differences in seasonality between juveniles and adults.



Owner Surrender Cat Intake by Month and Age

---> **Stray Intake by Month and Age**

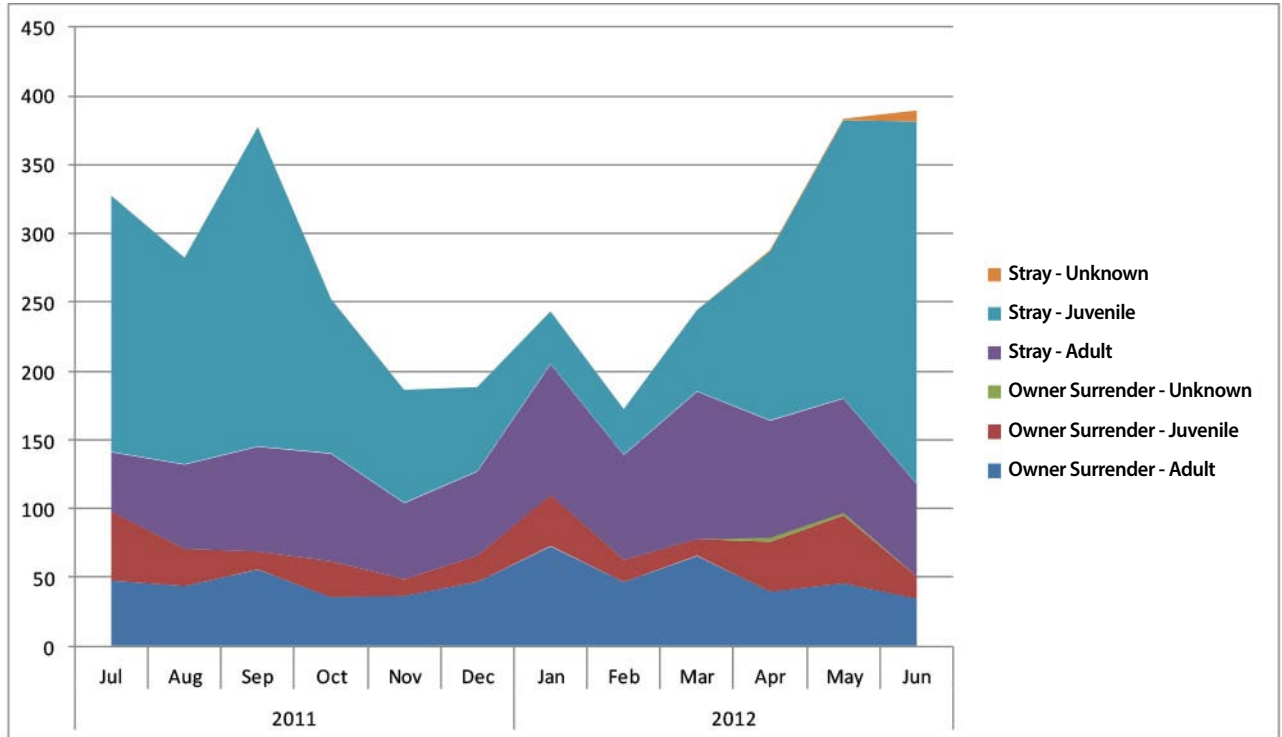
This area chart displays stray cat intake by month and age. It allows easy identification of seasonality in the dataset and clearly illustrates the proportion of intake that is juvenile. Here there is much more seasonality in juveniles than adults, which can be important in understanding intake dynamics. In conjunction with the previous example (3) it provides the opportunity to compare and contrast stray and owned cat data.



Stray Cat Intake by Month and Age

----> **Seasonal Intake by Intake Type and Age**

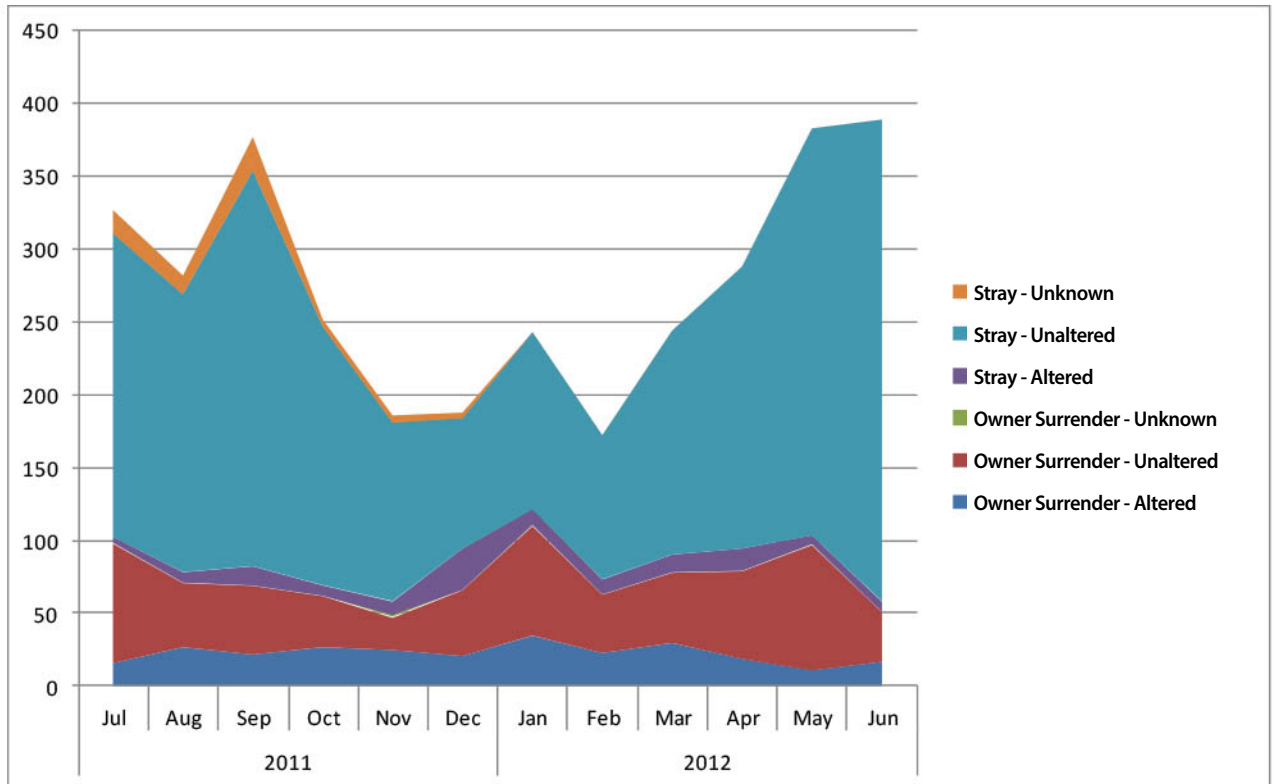
This area chart displays all cat intake by month, broken out by intake type and age. It allows for identification of seasonality in the dataset and illustrates the variations based on intake type and age and the proportion of total intake represented by each subset. This chart adds a visual that compares both stray and owned intake and the proportion of each that falls within each age group.



Cat Intake by Month, Intake Type, and Age

----> **Seasonal Intake by Intake Type and Altered Status**

This area chart displays all cat intake by month, broken out by intake type and altered status at intake. It allows for identification of seasonality in the dataset and illustrates the variations based on intake type and altered status at intake and the proportion of total intake represented by each subset. This chart adds a visual that compares both stray and owned intake and the proportion of each that is unaltered or altered at intake.



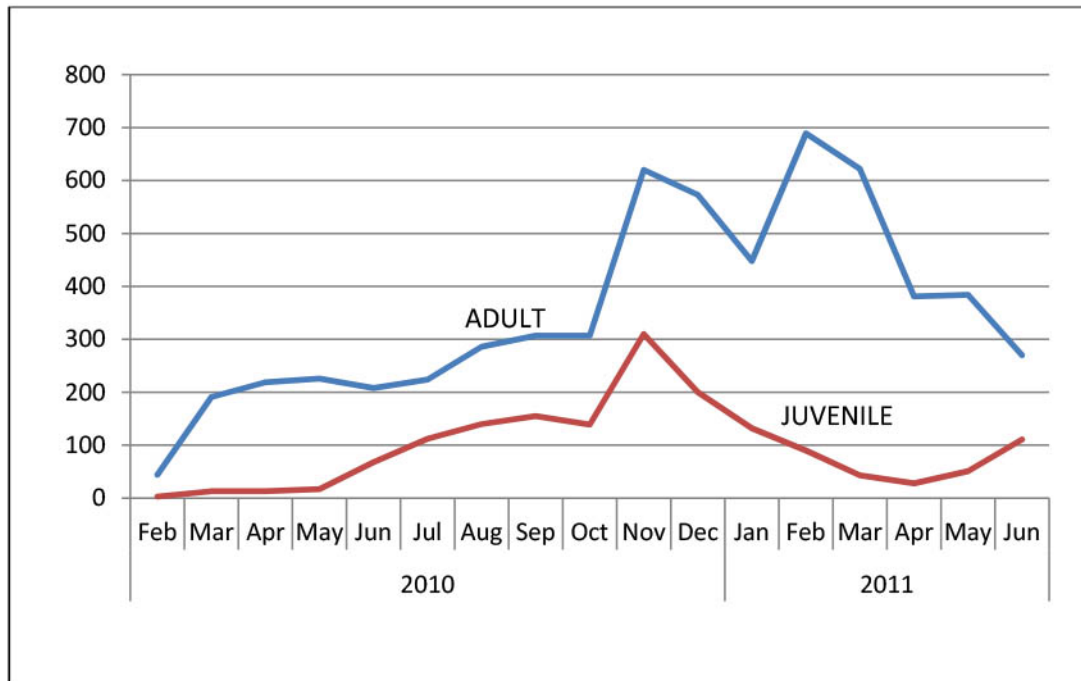
Cat Intake by Month, Intake Type, and Altered Status at Intake

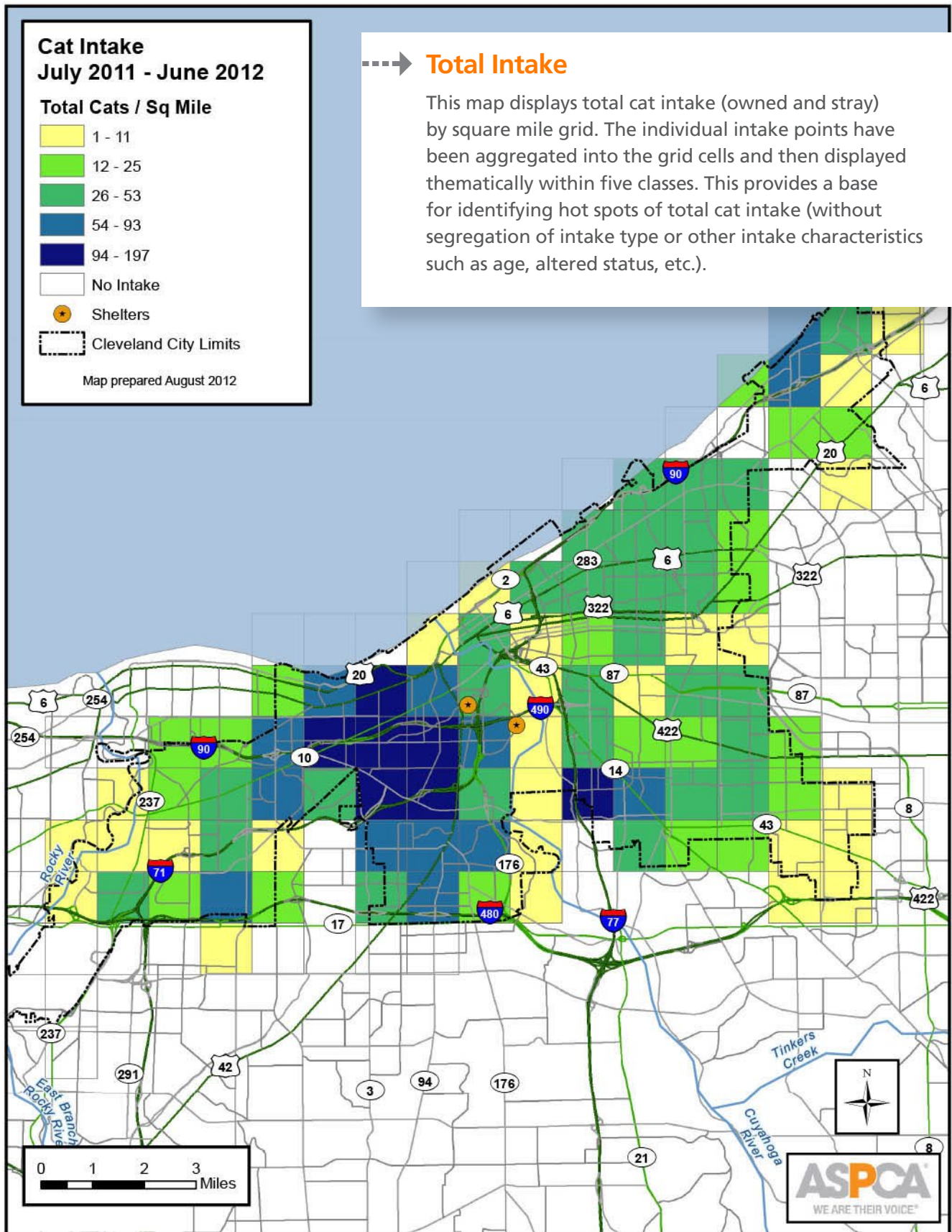
----> **Spay/Neuter by Month**

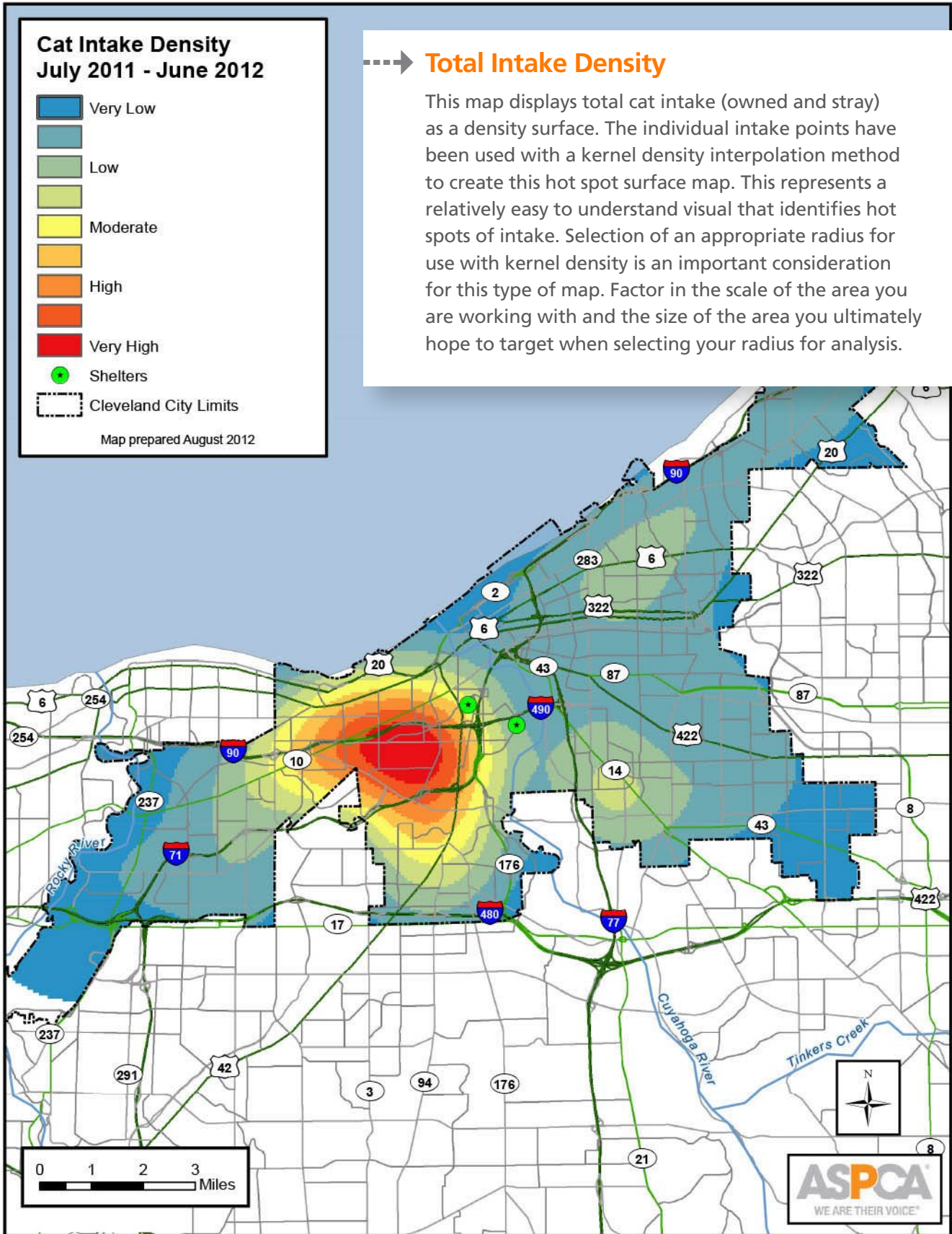
This table and chart display spay/neuter surgery data by month and age. The table provides the raw numbers broken out by age and the chart displays the adult and juvenile spay/neuter graphically over the timeframe of the data included.

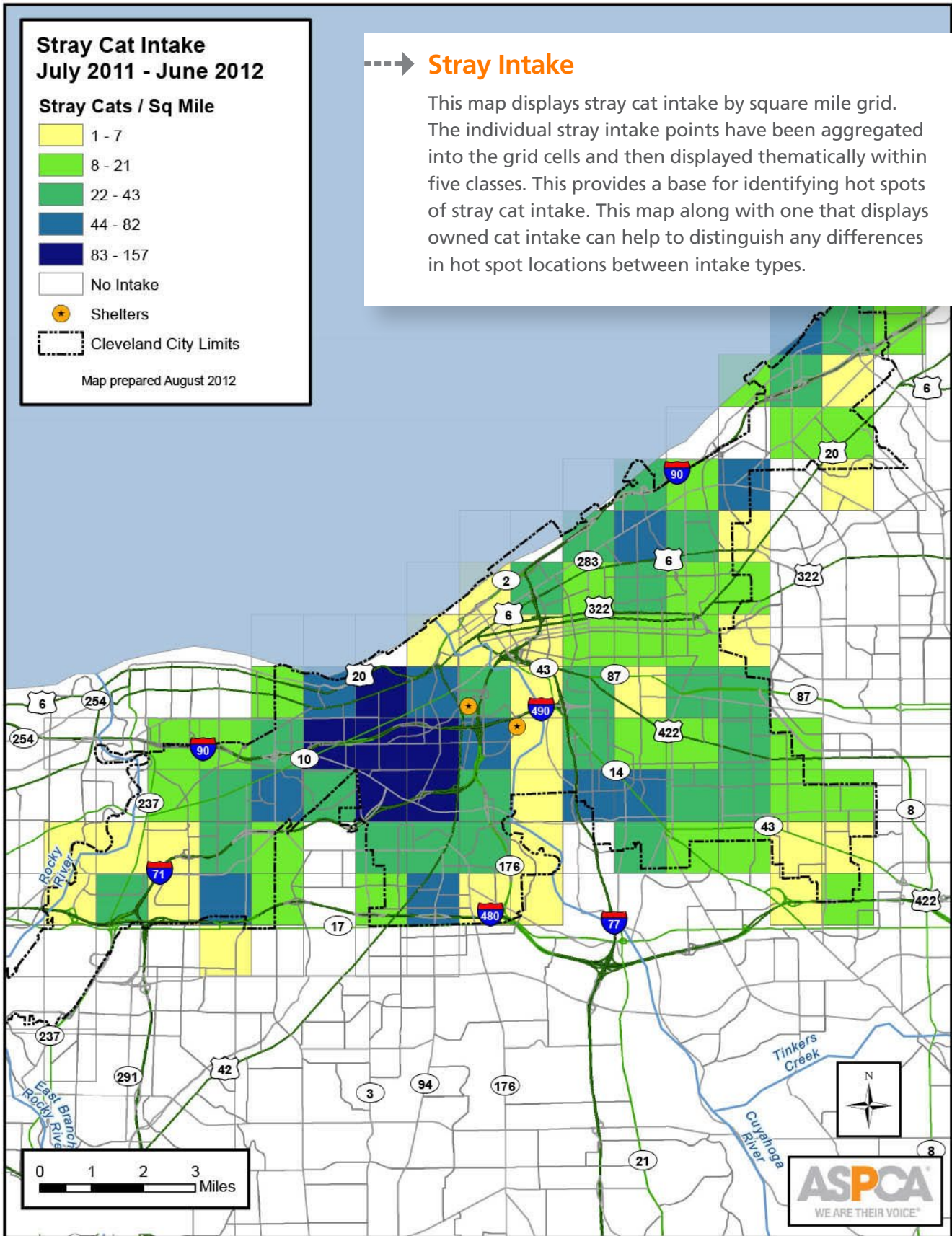
Spay/Neuter Cats by Month

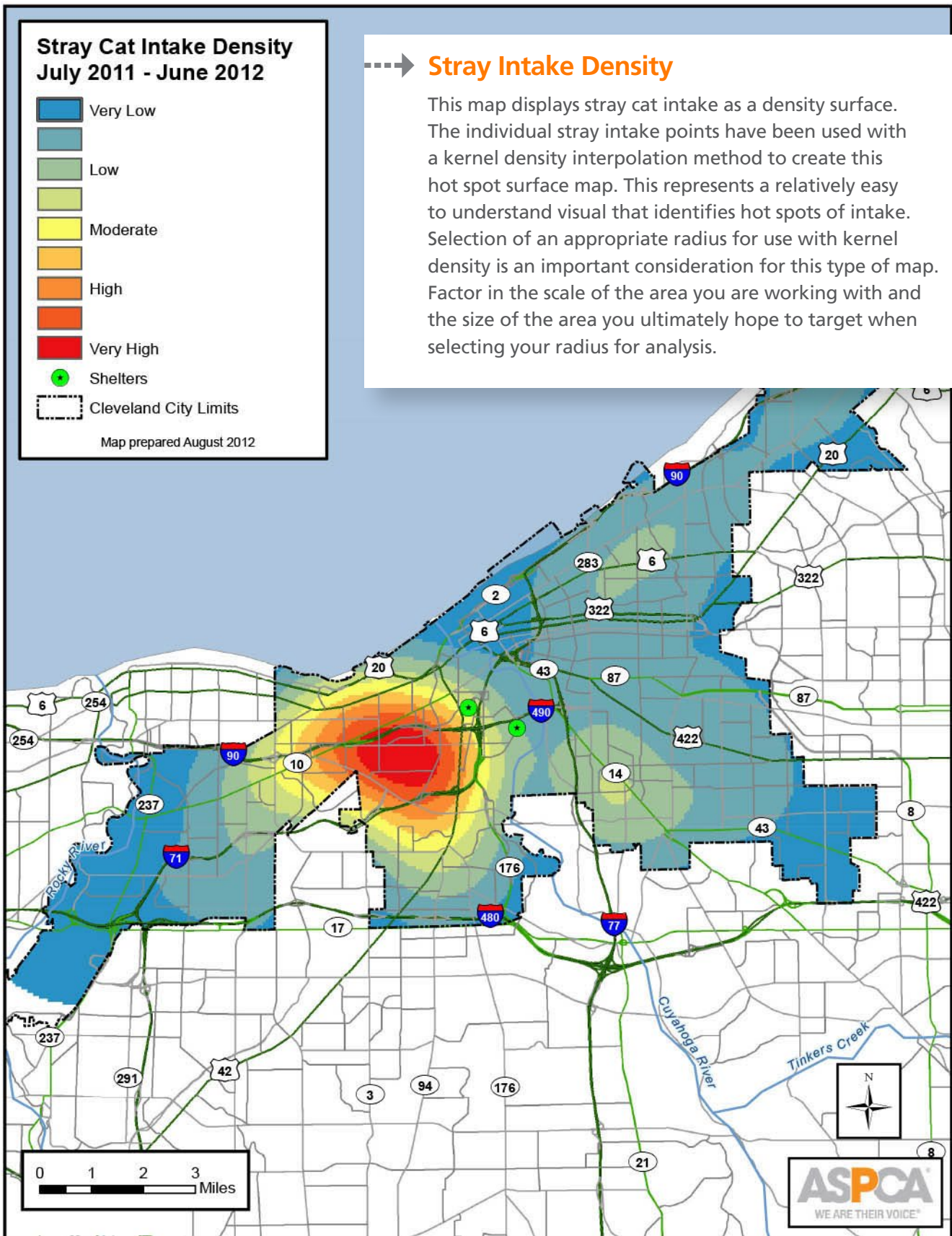
	2010												2011					
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
ADULT	44	191	219	226	208	224	286	307	307	620	573	448	689	622	381	384	270	5999
JUV	3	13	13	17	68	112	140	155	139	310	200	132	90	43	28	51	111	1625
UNK	4	7	17	5	11	13	13	8	15	10	6	8	3	10	9	3	12	154
CAT TOT	51	211	249	248	287	349	439	470	461	940	779	588	782	675	418	438	393	7778

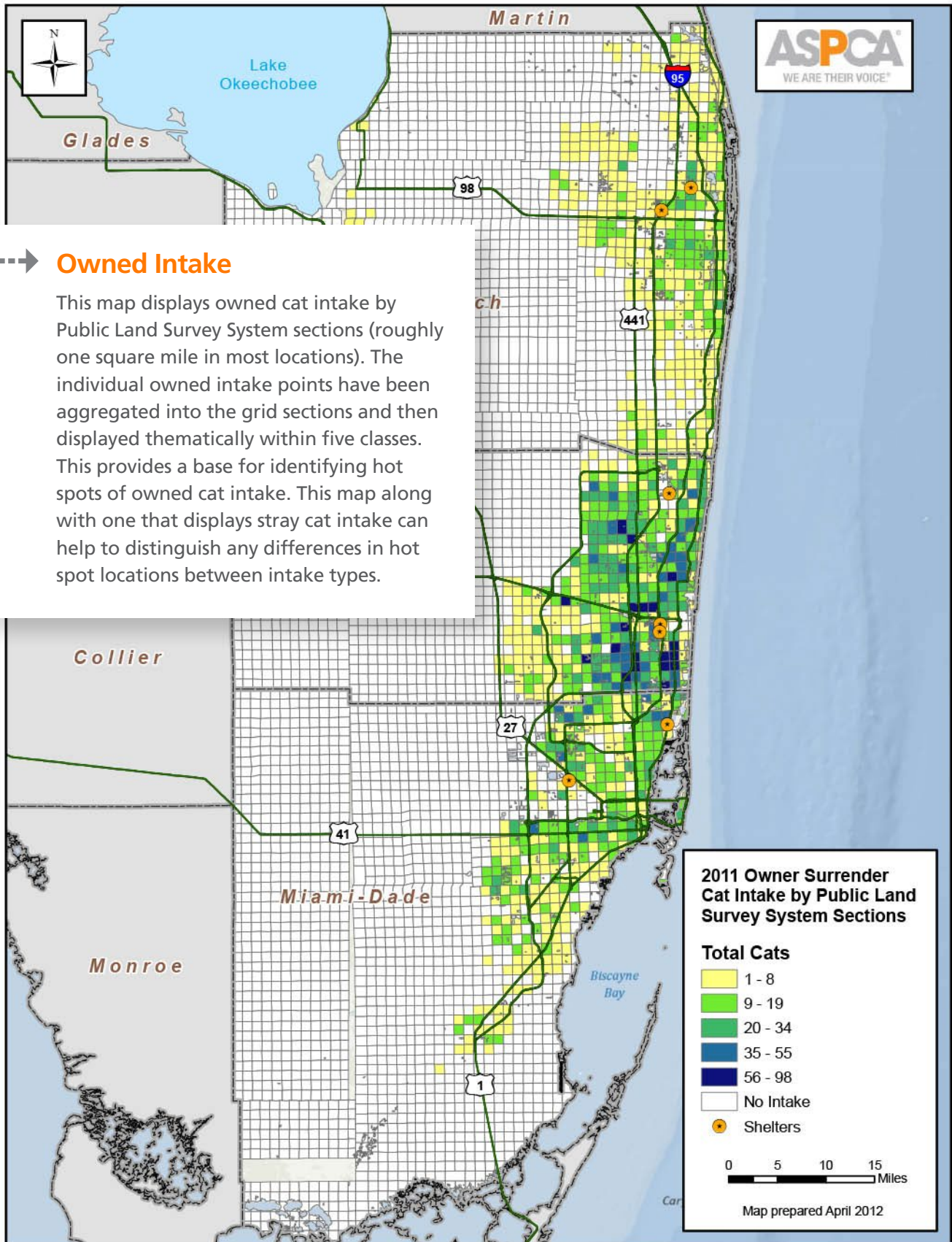






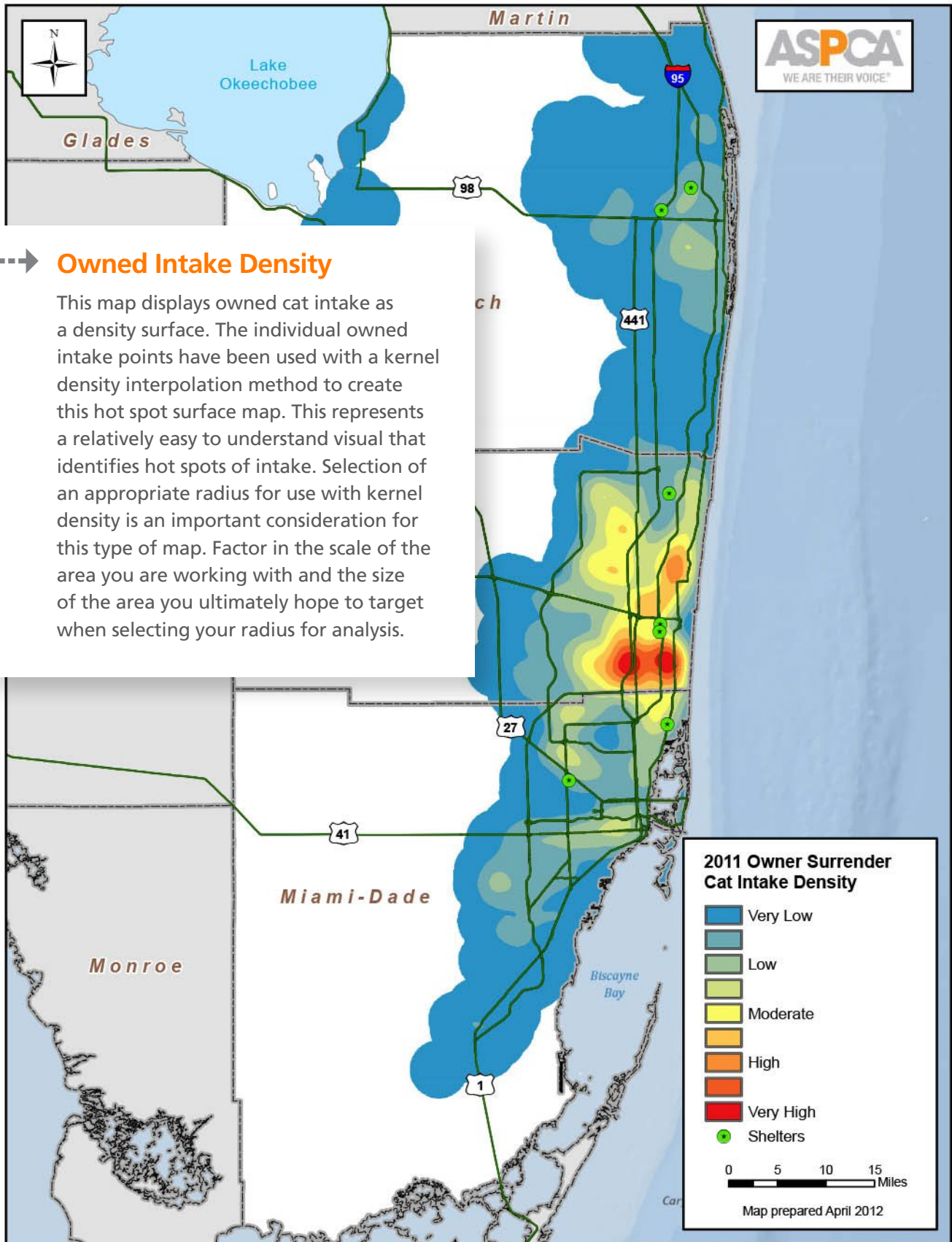






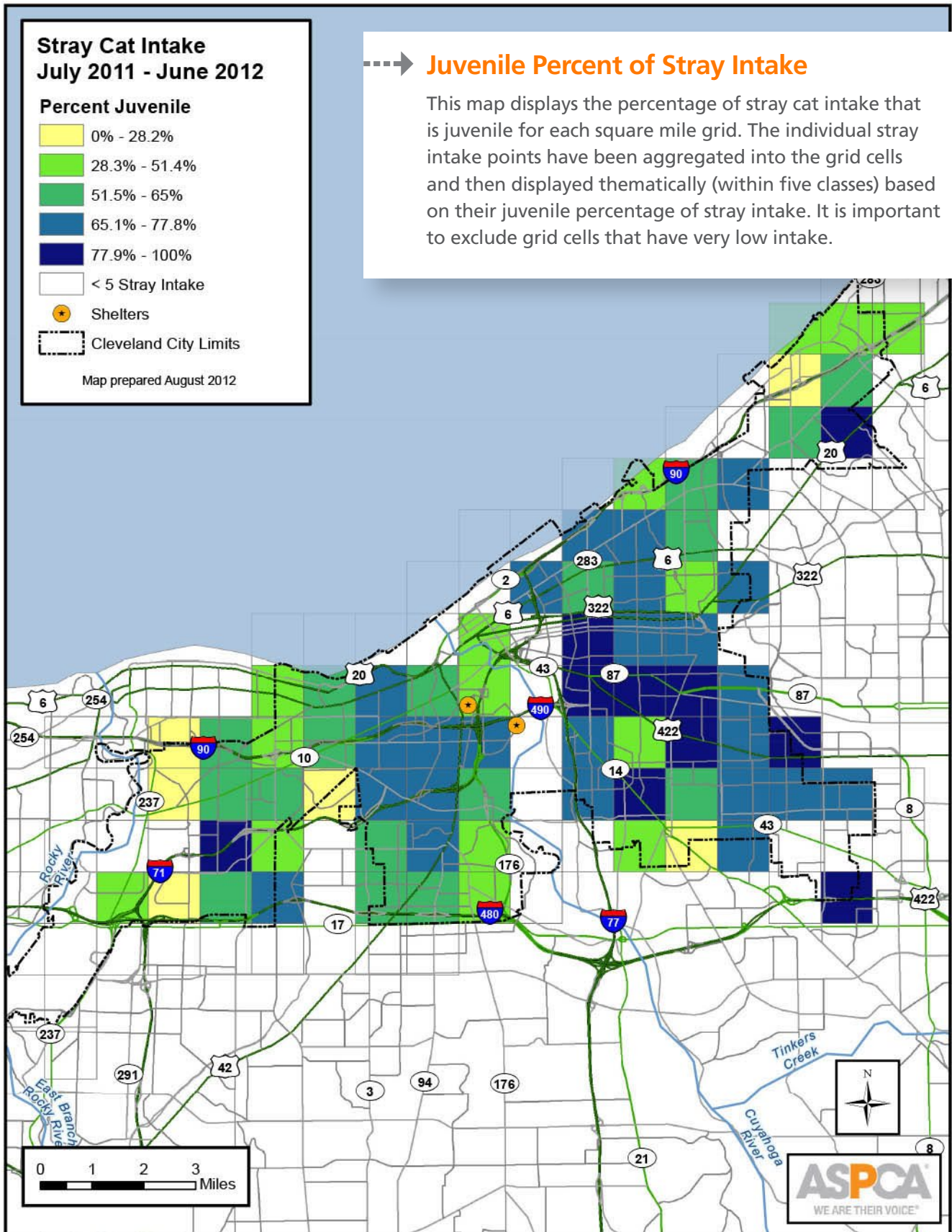
---> **Owned Intake**

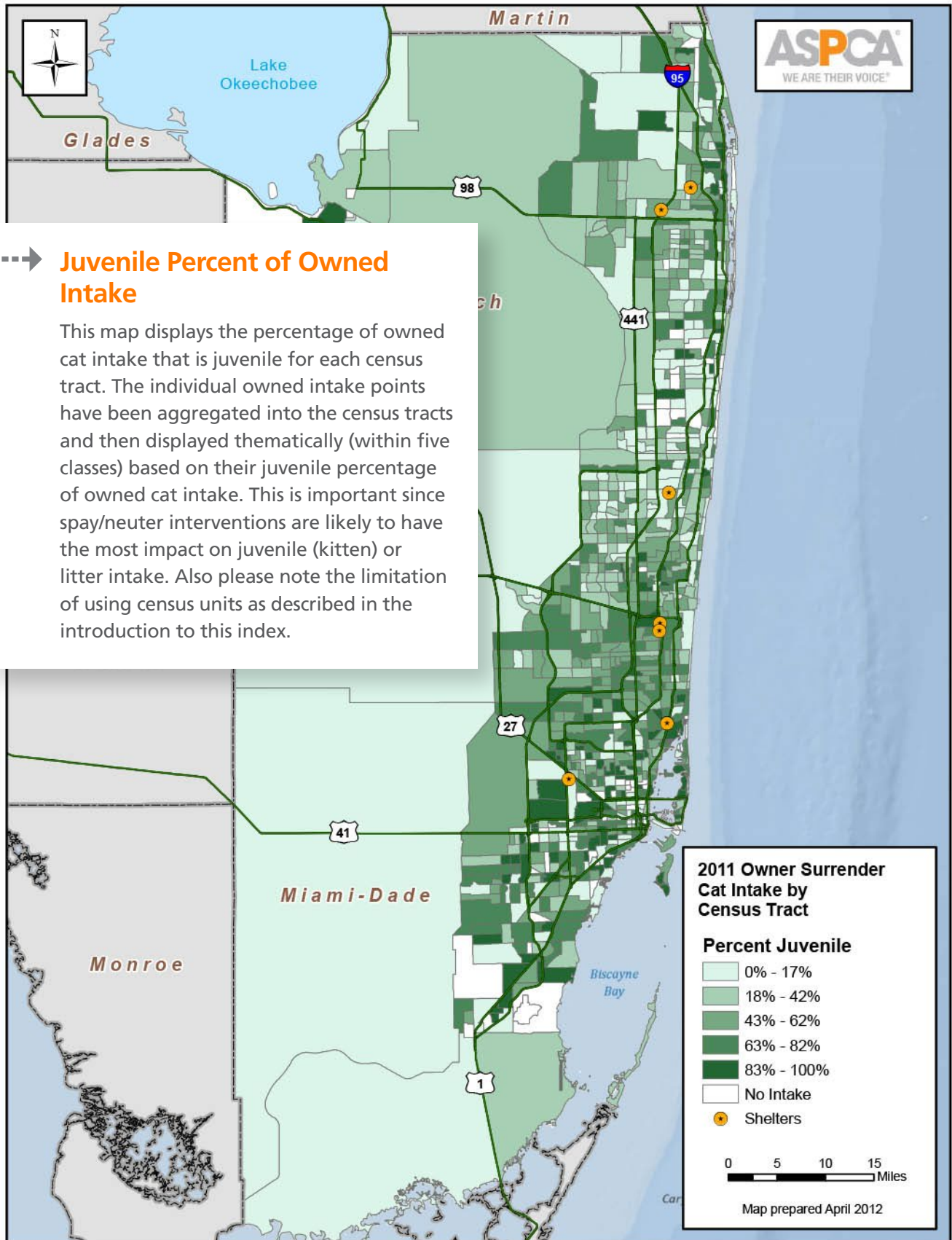
This map displays owned cat intake by Public Land Survey System sections (roughly one square mile in most locations). The individual owned intake points have been aggregated into the grid sections and then displayed thematically within five classes. This provides a base for identifying hot spots of owned cat intake. This map along with one that displays stray cat intake can help to distinguish any differences in hot spot locations between intake types.

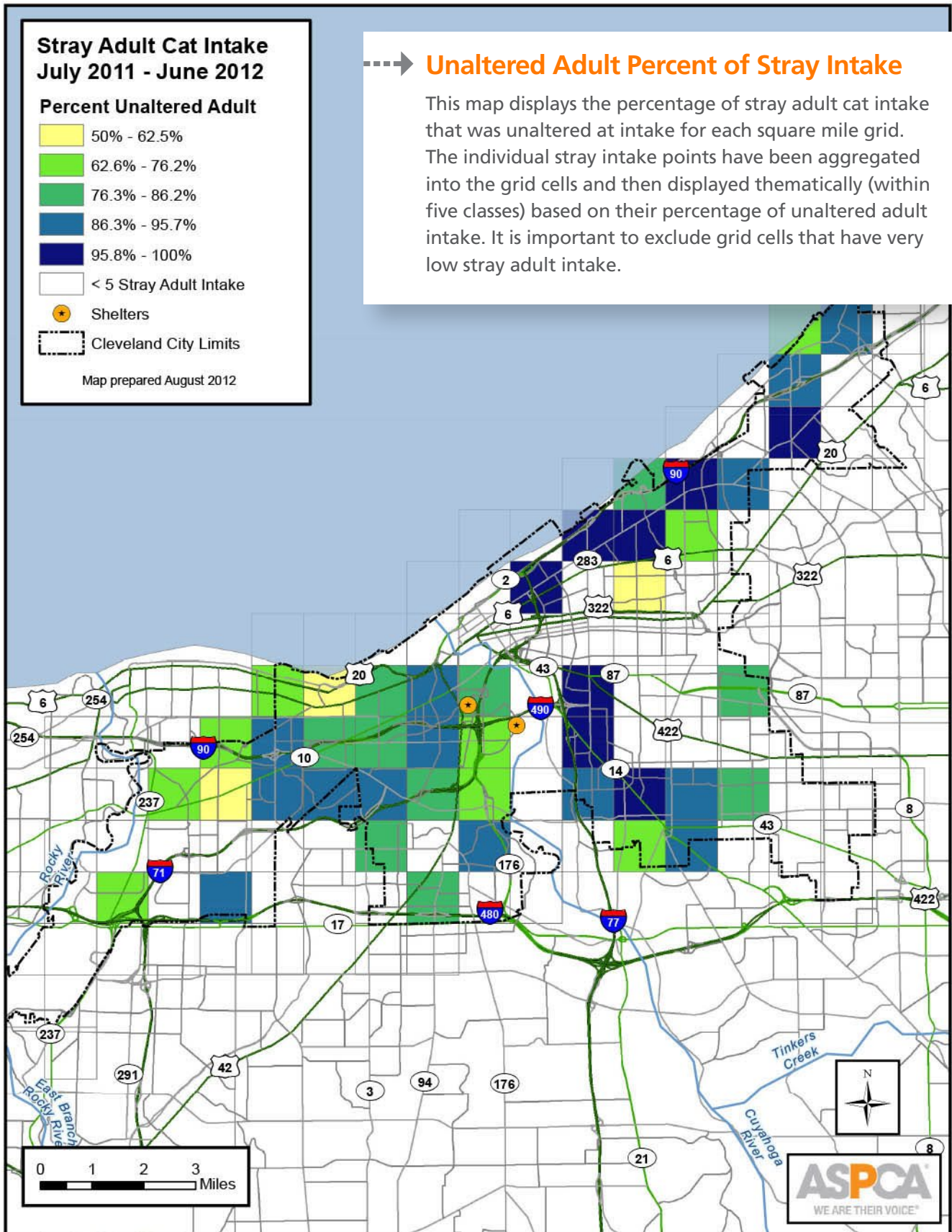


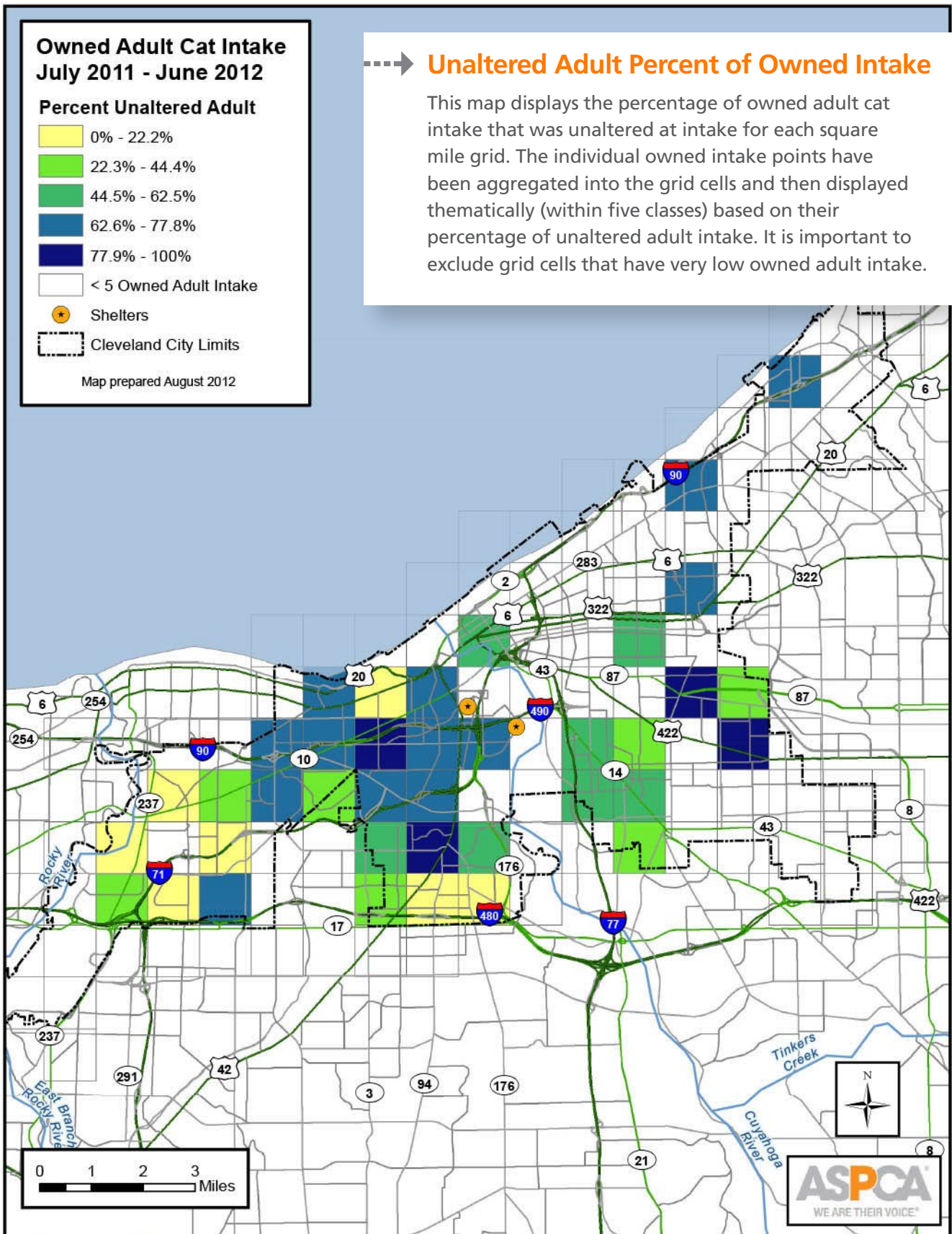
➔ **Owned Intake Density**

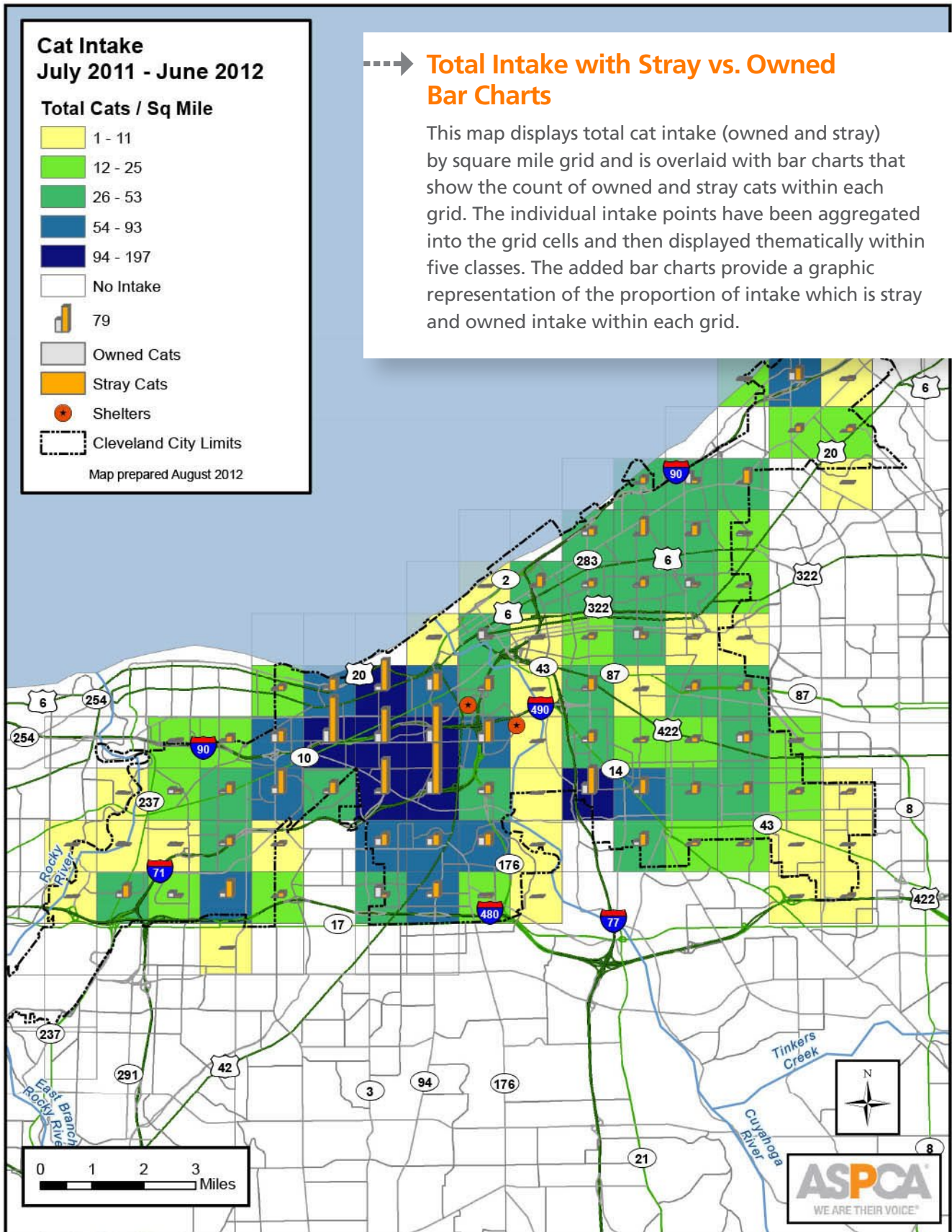
This map displays owned cat intake as a density surface. The individual owned intake points have been used with a kernel density interpolation method to create this hot spot surface map. This represents a relatively easy to understand visual that identifies hot spots of intake. Selection of an appropriate radius for use with kernel density is an important consideration for this type of map. Factor in the scale of the area you are working with and the size of the area you ultimately hope to target when selecting your radius for analysis.

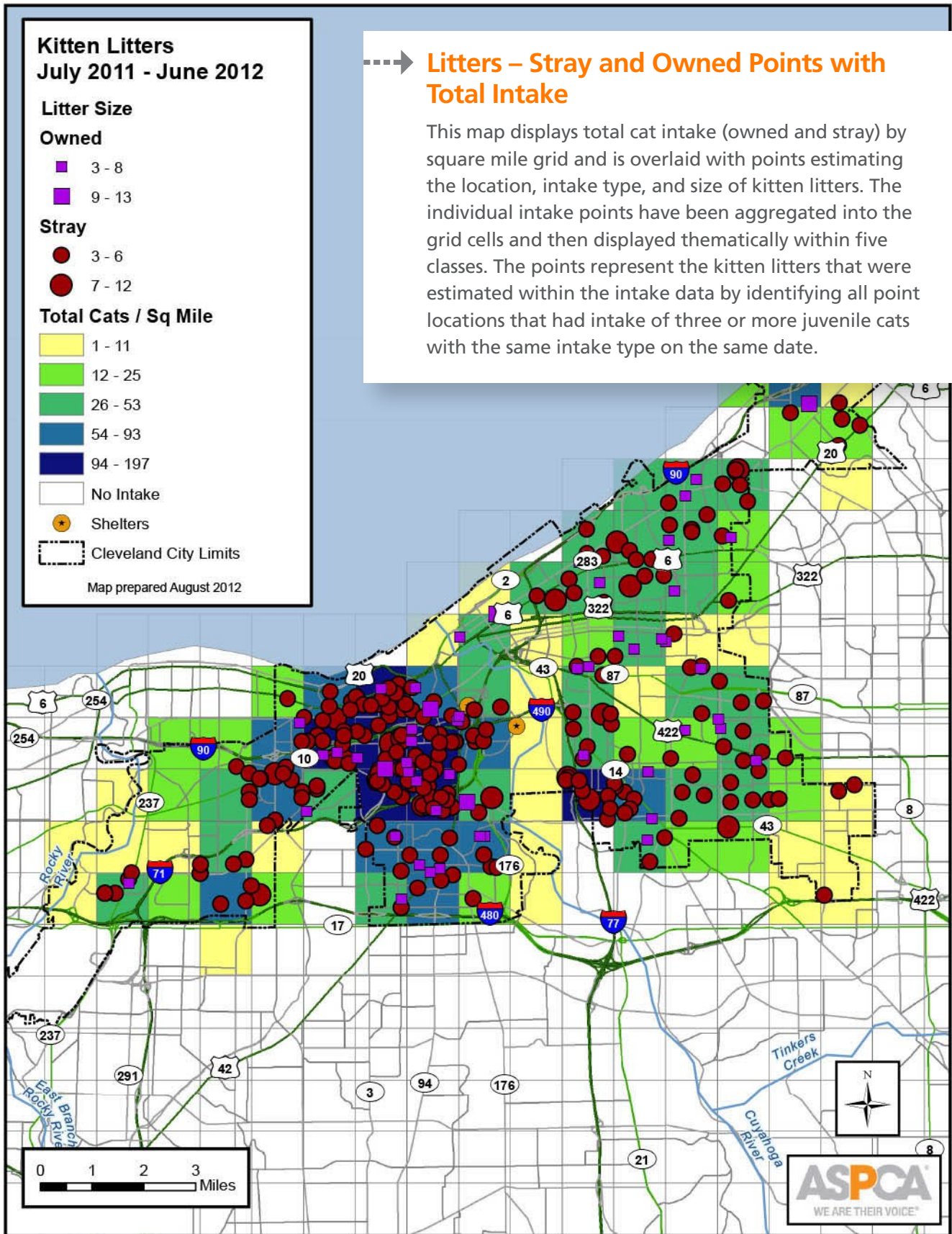


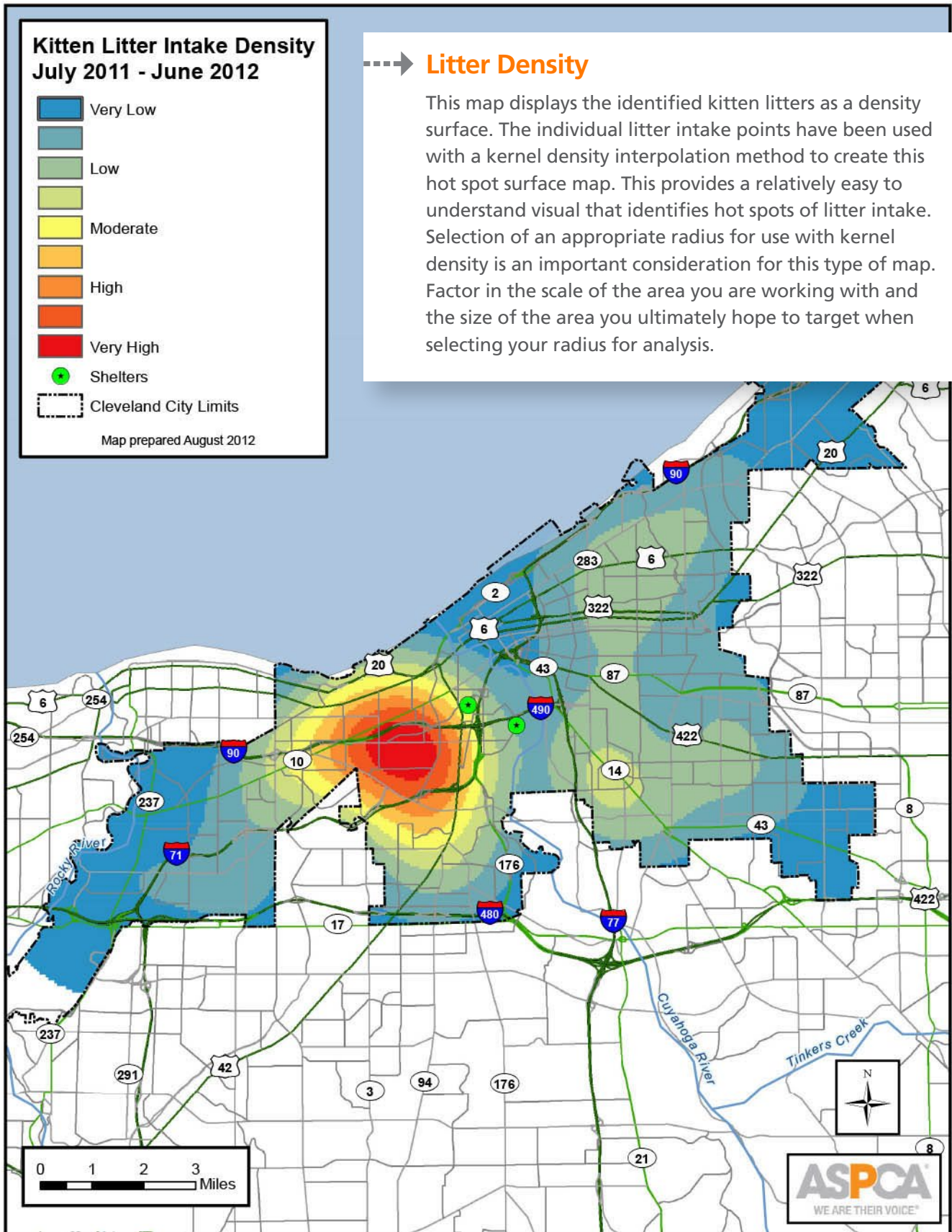


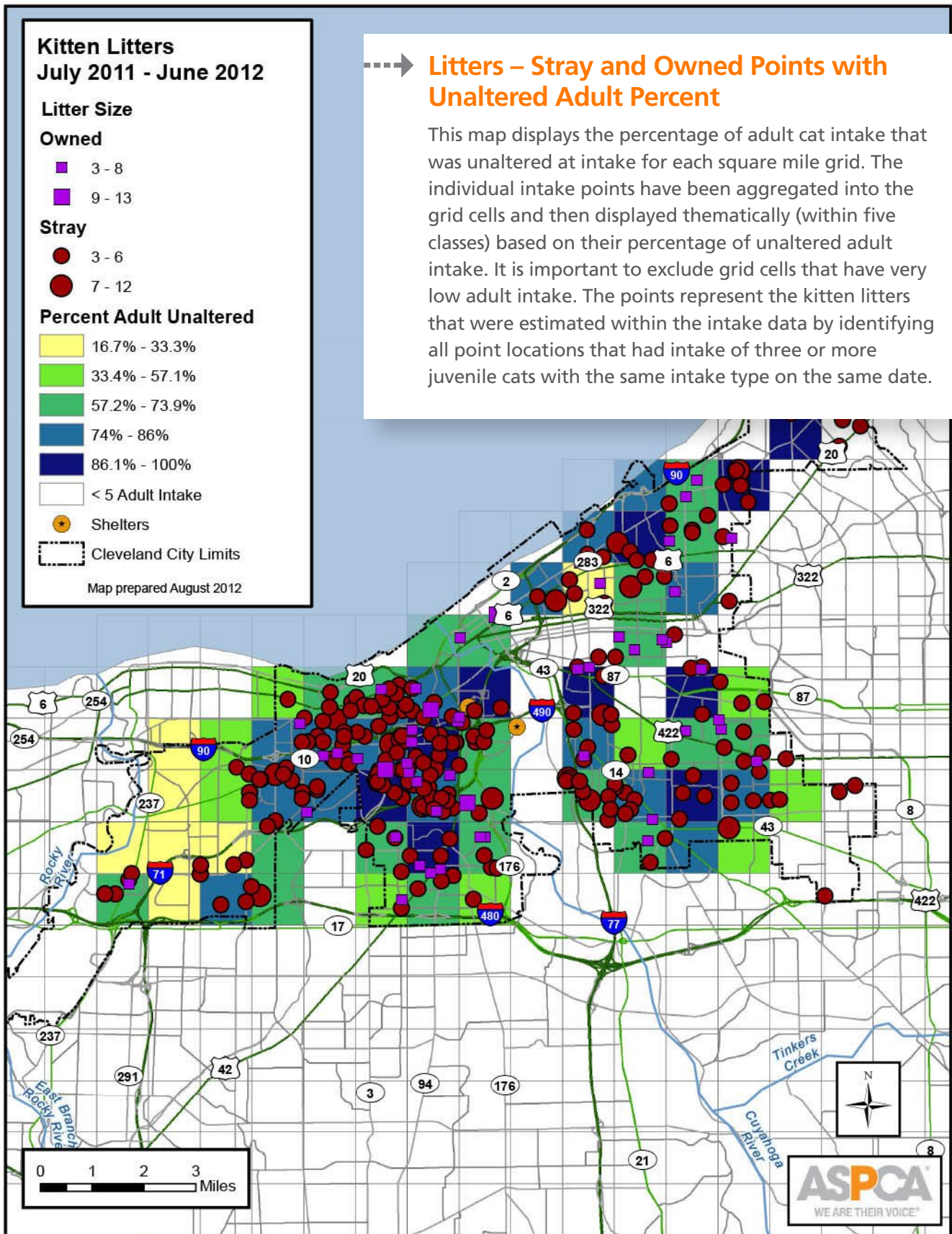






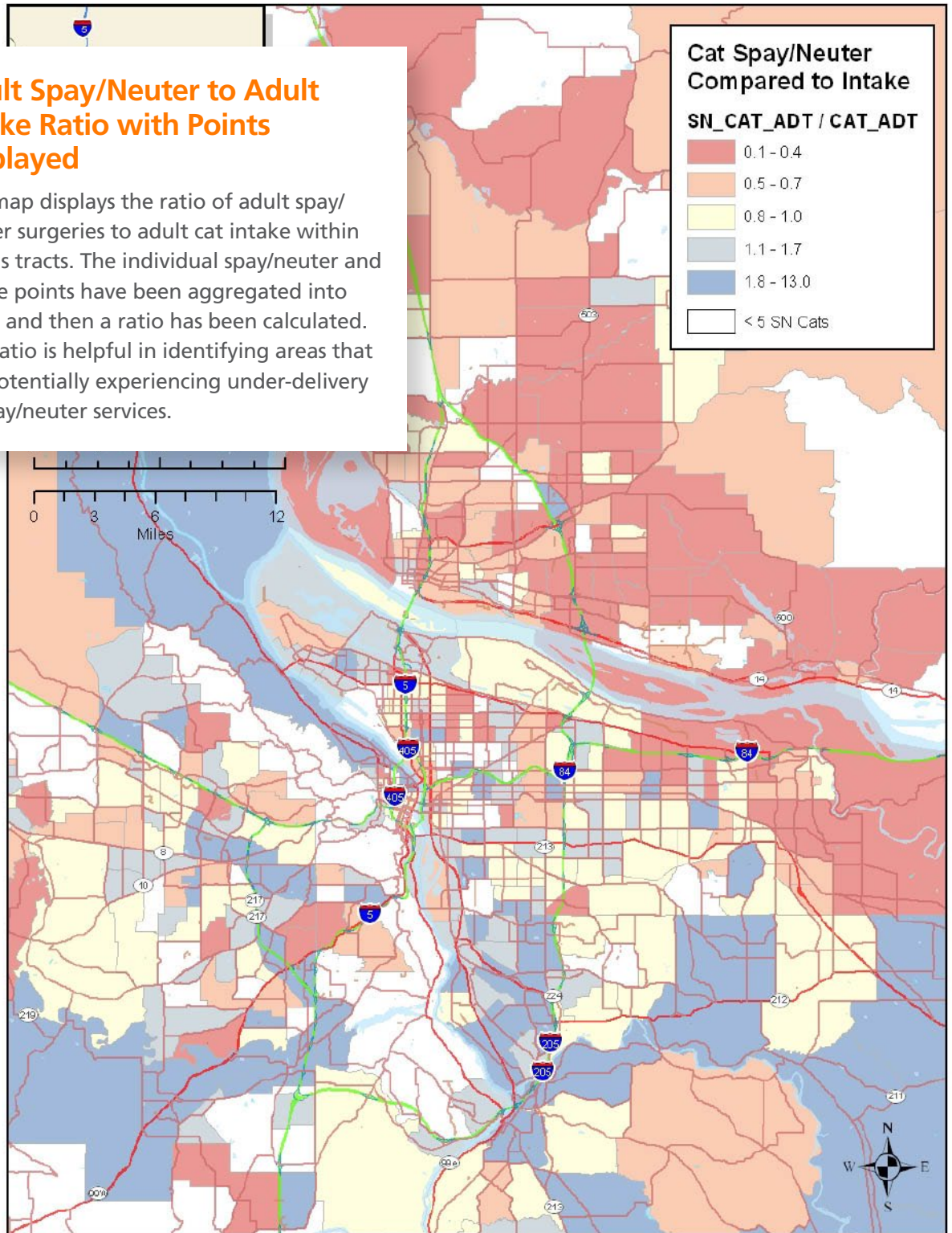






---> **Adult Spay/Neuter to Adult Intake Ratio with Points Displayed**

This map displays the ratio of adult spay/neuter surgeries to adult cat intake within census tracts. The individual spay/neuter and intake points have been aggregated into tracts and then a ratio has been calculated. This ratio is helpful in identifying areas that are potentially experiencing under-delivery of spay/neuter services.



Spay/neuter adults to adult intake ratio. Red indicates potential under-delivery of s/n services.

Dogs

Statistics

Prepared as tables and charts:

- **Total Intake by Month and Age**
- **Intake Summary by Altered Status, Intake Type, and Age** *(all data)*
- **Owner Surrender Intake by Month and Age**
- **Stray Intake by Month and Age**
- **Seasonal Intake by Intake Type and Age**
- **Seasonal Intake by Intake Type and Altered Status**
- **Spay/Neuter by Month**
- **Breeds of Concern and Non-Breeds of Concern by Month and Intake Type**
- **Total Intake by Month and Age for Breeds of Concern**
- **Seasonal Intake by Intake Type and Age for Breeds of Concern**
- **Seasonal Intake by Intake Type and Altered Status for Breeds of Concern**

Maps

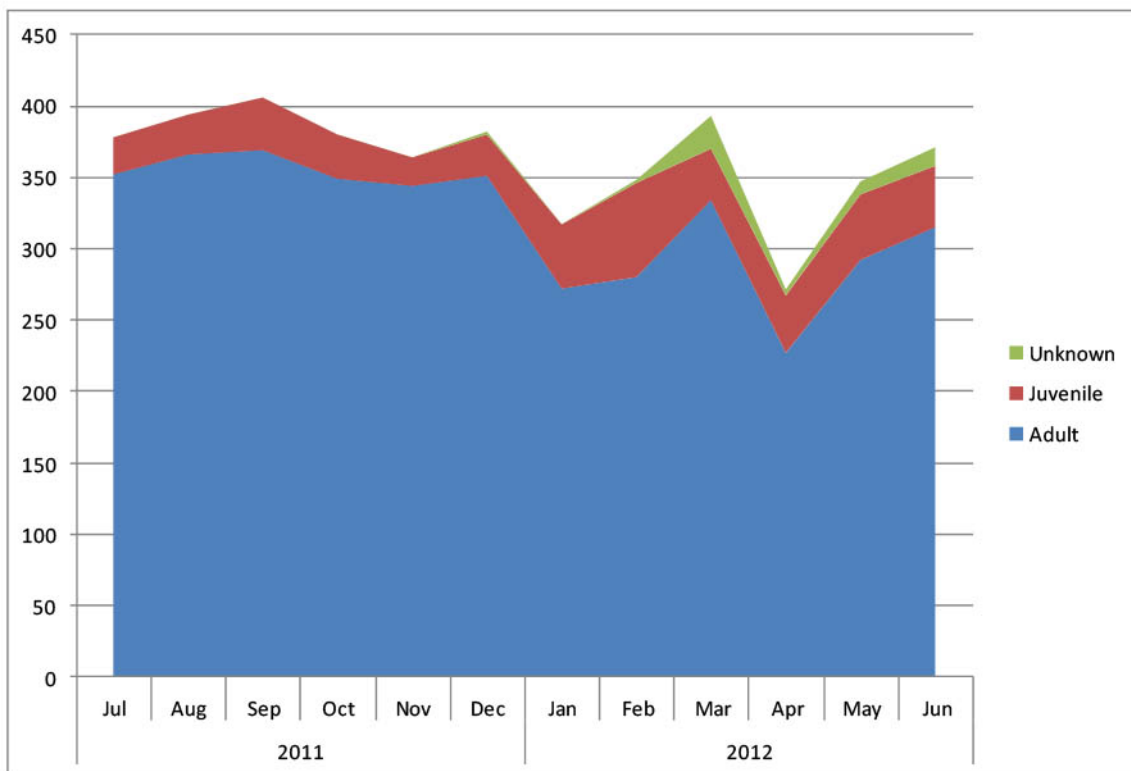
- **Total Intake** *(by Square Mile Grid or Census Units)*
- **Total Intake Density**
- **Stray Intake** *(by Square Mile Grid or Census Units)*
- **Stray Intake Density**
- **Owned Intake** *(by Square Mile Grid or Census Units)*
- **Owned Intake Density**
- **Juvenile Percent of Stray Intake** *(by Square Mile Grid or Census Units)*
- **Juvenile Percent of Owned Intake** *(by Square Mile Grid or Census Units)*
- **Unaltered Adult Percent of Stray Intake** *(by Square Mile Grid or Census Units)*
- **Unaltered Adult Percent of Owned Intake** *(by Square Mile Grid or Census Units)*
- **Total Intake with Stray vs. Owned Bar Charts** *(by Square Mile Grid or Census Units)*
- **Litters – Stray and Owned Points with Total Intake** *(by Square Mile Grid or Census Units)*
- **Litter Density**
- **Litters – Stray and Owned Points with Unaltered Adult Percent** *(by Square Mile Grid or Census Units)*
- **Adult Spay/Neuter to Adult Intake Ratio with Points Displayed**
- **Total Intake for Breeds of Concern** *(identified based on community intake)*
- **Total Intake Density for Breeds of Concern**

----> **Total Intake by Month and Age**

A table and area chart of intake by month and age provides an overall view of total intake numbers and also allows for identification of possible seasonality in the data. Additionally, the table includes percentages showing the portion of intake that is adult and juvenile in each month. The chart displays the monthly data graphically and allows for easy identification of spikes in intake. It also provides a quick summary of dirty data in the "Unknown" category.

Total Dog Intake by Month

DOGS	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
Total	378	394	406	380	364	382	317	348	393	271	347	371	4351
Pct of Year	9%	9%	9%	9%	8%	9%	7%	8%	9%	6%	8%	9%	100%
Adult	352	366	369	349	344	351	272	280	334	227	292	315	3851
Pct of Month	93%	93%	91%	92%	95%	92%	86%	80%	85%	84%	84%	85%	
Juvenile	26	28	37	31	20	29	45	66	36	40	46	43	447
Pct of Month	7%	7%	9%	8%	5%	7%	14%	19%	9%	15%	13%	11%	
Unknown	0	0	0	0	0	2	0	2	23	4	9	13	53
Pct of Month	0%	0%	0%	0%	0%	1%	0%	1%	6%	1%	3%	4%	



Total Dog Intake by Month and Age

---> **Intake Summary by Altered Status, Intake Type, and Age**

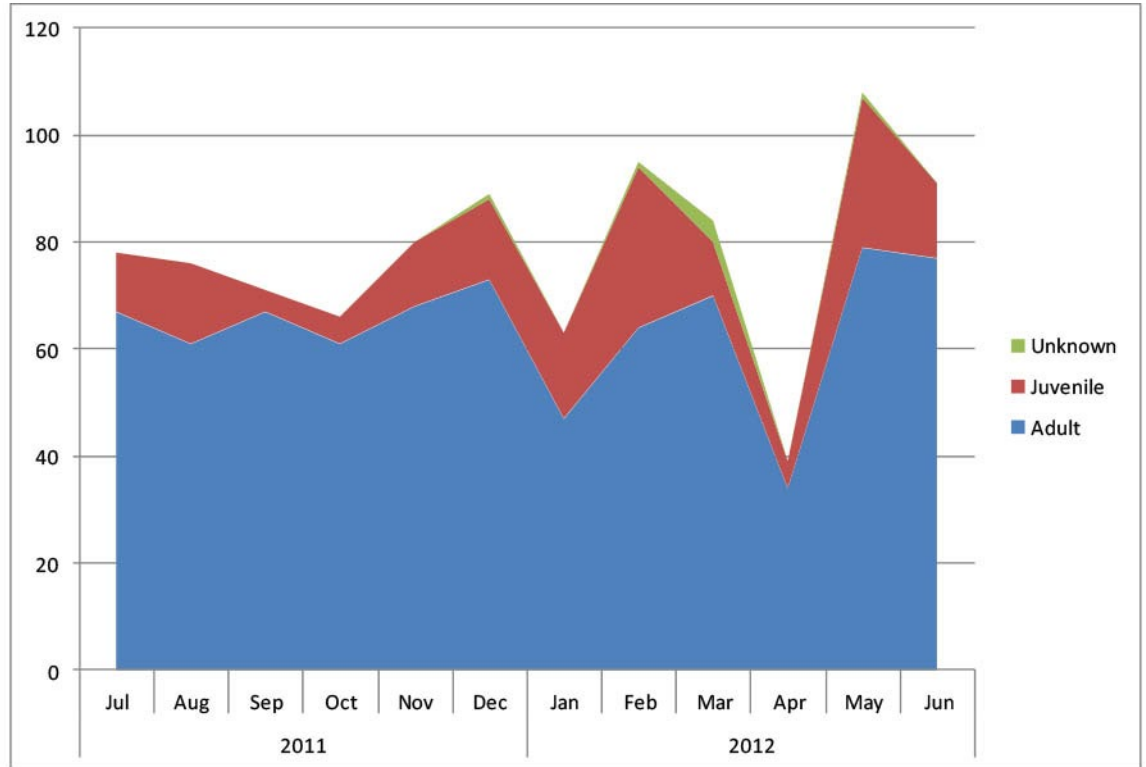
This table displays a summary of all dog intake data included in the analysis broken out by intake type, altered status, and age. It also includes a percentage stray column to help visualize the portion of each age and altered status group that is stray intake. This table also provides a clear visual of the total number of dogs included in the analysis and the comparisons or contrasts between intake types.

July 2011 – June 2012 Dog Intake Summary

Status at Intake	Owner surrender	Stray	% Stray	Grand Total
Altered	209	17	8%	226
Adult	208	17	8%	225
Juvenile	1	0	0%	1
Unaltered	585	1600	73%	2185
Adult	419	1365	77%	1784
Juvenile	160	190	54%	350
Unknown Age	6	45	88%	51
Unknown	146	1794	92%	1940
Adult	141	1701	92%	1842
Juvenile	4	92	96%	96
Unknown Age	1	1	50%	2
Grand Total	940	3411	78%	4351

---> **Owner Surrender Intake by Month and Age**

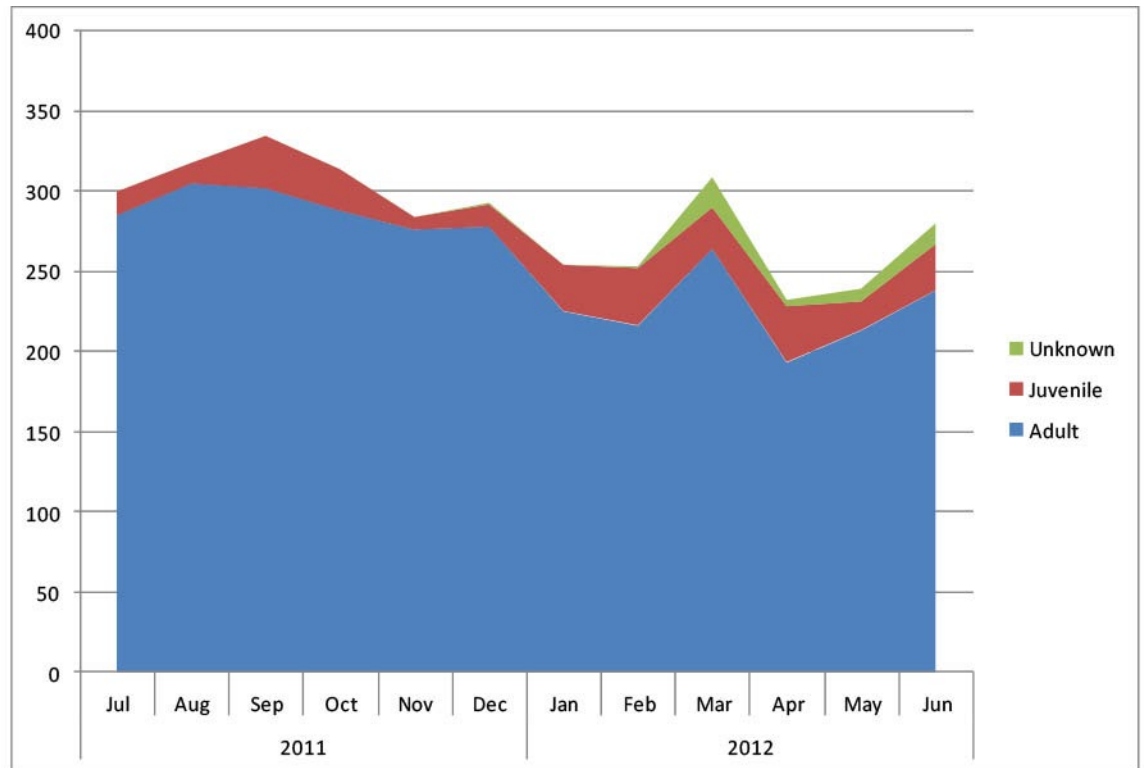
This area chart displays owner surrender dog intake by month and age. It allows easy identification of seasonality in the dataset and clearly illustrates the proportion of intake that is juvenile. It also may highlight differences in seasonality between juveniles and adults.



Owner Surrender Dog Intake by Month and Age

---> **Stray Intake by Month and Age**

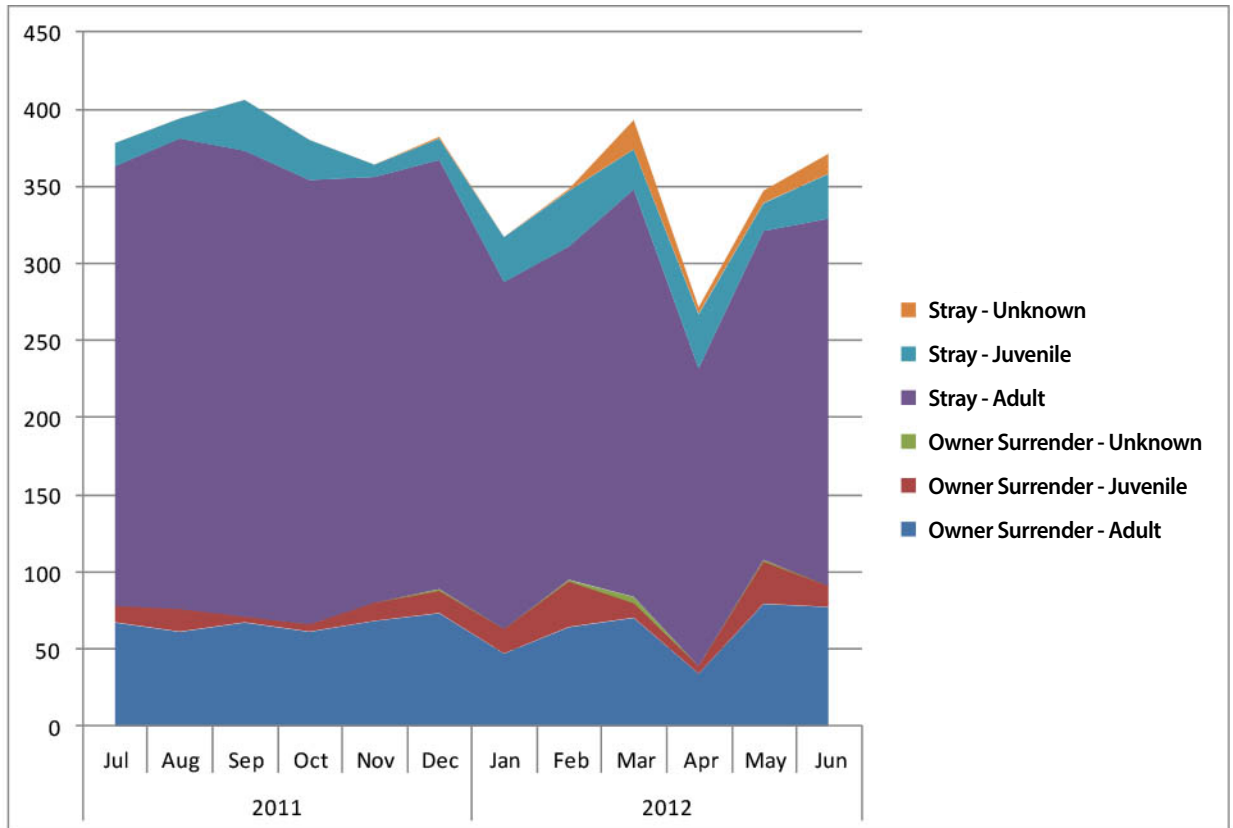
This area chart displays stray dog intake by month and age. It allows easy identification of seasonality in the dataset and clearly illustrates the proportion of intake that is juvenile. In conjunction with the previous example (3) it provides the opportunity to compare and contrast stray and owned dog data.



Stray Dog Intake by Month and Age

----> **Seasonal Intake by Intake Type and Age**

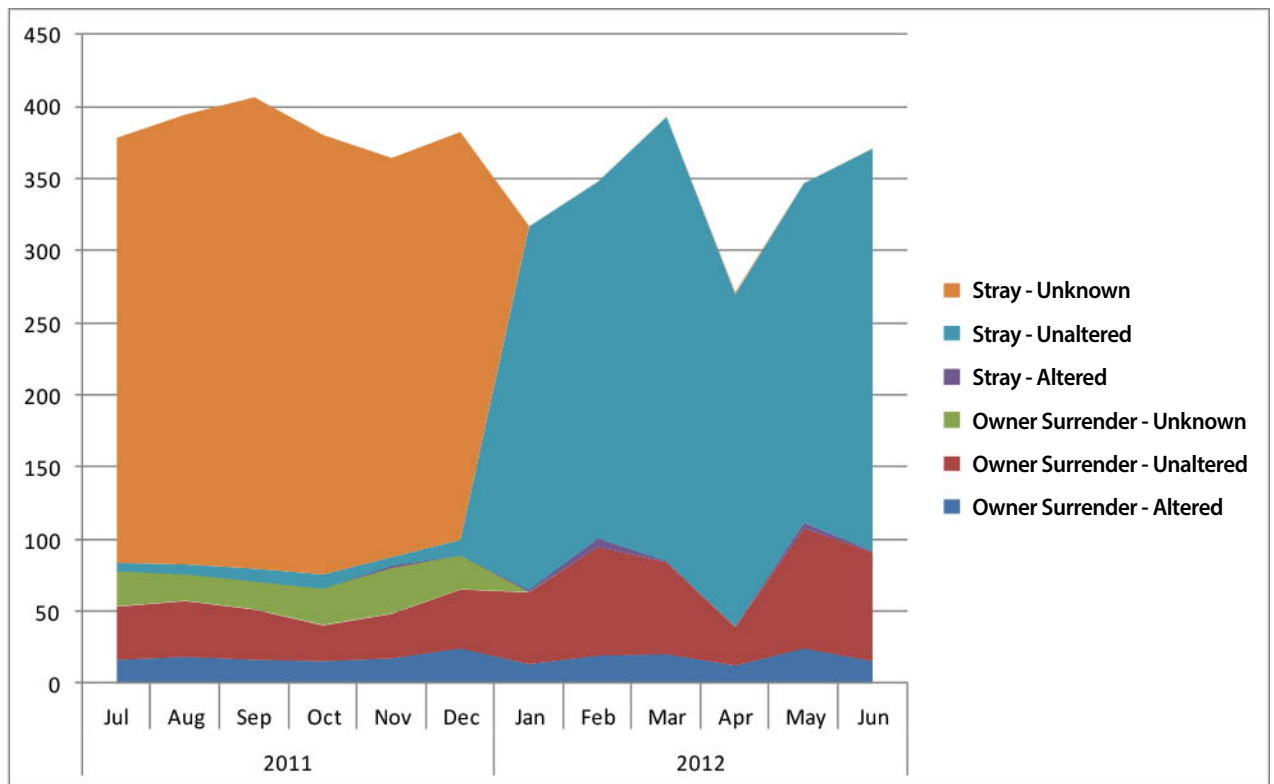
This area chart displays all dog intake by month, broken out by intake type and age. It allows for identification of seasonality in the dataset and illustrates the variations based on intake type and age and the proportion of total intake represented by each subset. This chart adds a visual that compares both stray and owned intake and the proportion of each that falls within each age group.



Dog Intake by Month, Intake Type, and Age

----> **Seasonal Intake by Intake Type and Altered Status**

This area chart displays all dog intake by month, broken out by intake type and altered status at intake. It allows for identification of seasonality in the dataset and illustrates the variations based on intake type and altered status at intake and the proportion of total intake represented by each subset. This chart adds a visual that compares both stray and owned intake and the proportion of each that is unaltered or altered at intake. This example includes a dataset that had a high number of animals with an unknown altered status in the first half of the analysis period.



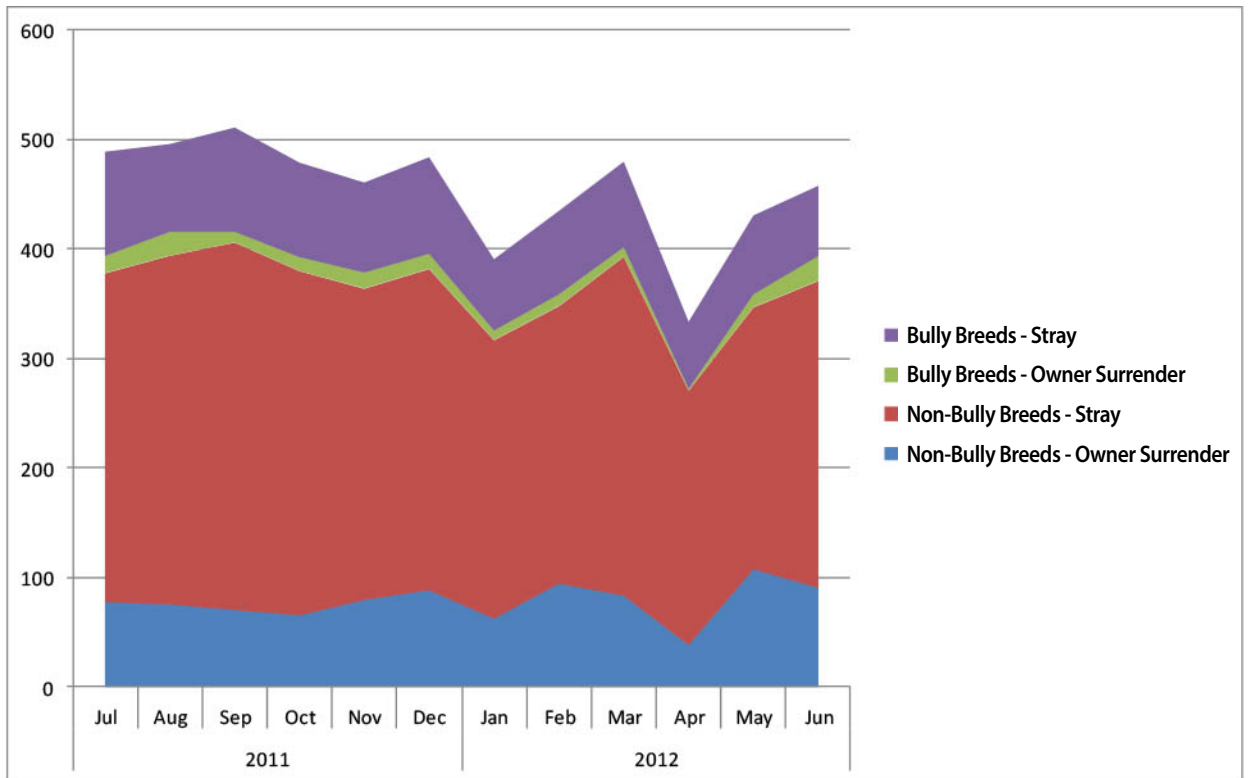
Dog Intake by Month, Intake Type, and Altered Status at Intake

----> **Spay/Neuter by Month**

We do not currently have an example table and chart for this statistic. It would appear very similar to the cat example displaying spay/neuter surgery data by month and age. The table would provide the raw numbers broken out by age and the chart would display the adult and juvenile spay/neuter graphically over the timeframe of the data included.

----> **Breeds, Non-Breeds of Concern by Month and Intake Type**

This area chart displays all dog intake by month, broken out by intake type and bully breed status. It allows for identification of seasonality in the dataset and illustrates the variations based on intake type and the proportion of total intake represented by bully breeds (a high risk group of dogs for many communities) versus non-bully breeds.



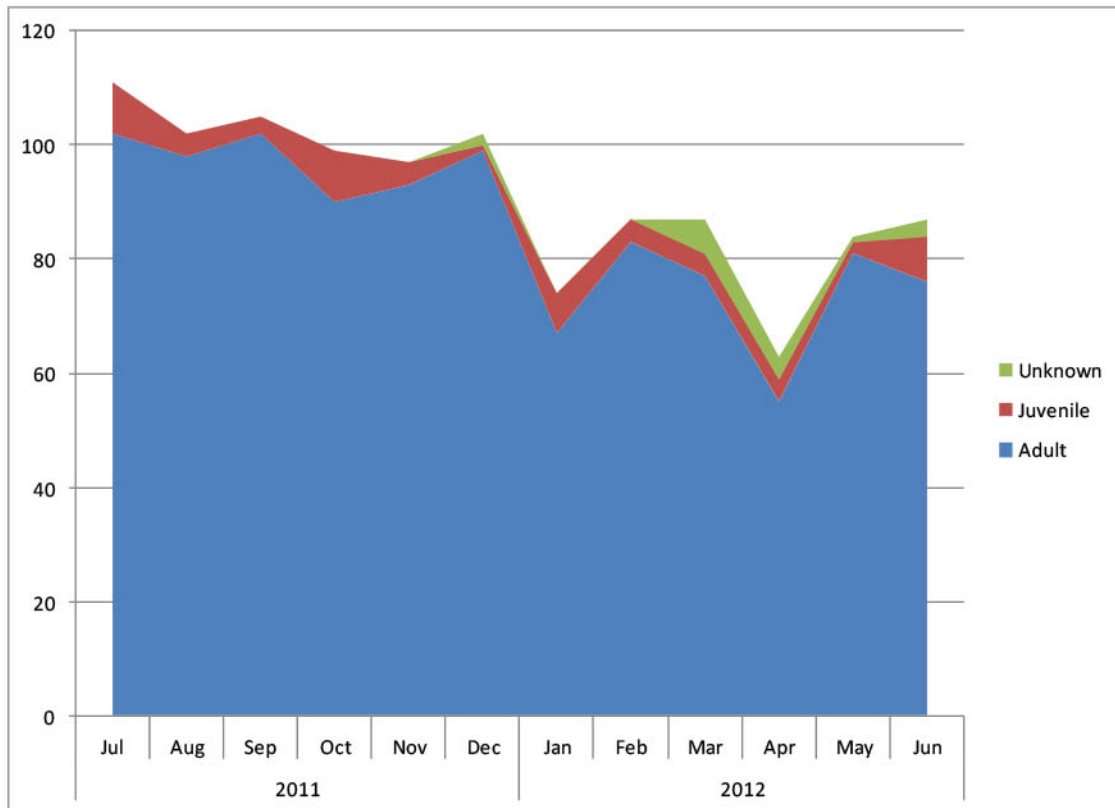
Bully Breeds and Non-Bully Breed Intake by Month and Intake Type

----> **Total Intake by Month and Age for Breeds of Concern**

A table and area chart of bully breed intake by month and age provides an overall view of total intake numbers and also allows for identification of possible seasonality in the data. Additionally, the table includes percentages showing the portion of intake that is adult and juvenile in each month. The chart compares the monthly data graphically and allows for easy identification of spikes in intake.

Bully Breed Dog Intake by Month

Pit Bulls	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
Total	111	102	105	99	97	102	74	87	87	63	84	87	1098
Pct of Year	10%	9%	10%	9%	9%	9%	7%	8%	8%	6%	7%	8%	100%
Adult	102	98	102	90	93	99	67	83	77	55	81	76	1023
Pct of Month	92%	96%	97%	91%	96%	97%	91%	95%	89%	87%	96%	87%	
Juvenile	9	4	3	9	4	1	7	4	4	4	2	8	59
Pct of Month	8%	4%	3%	9%	4%	1%	9%	5%	4%	7%	3%	9%	
Unknown	0	0	0	0	0	2	0	0	6	4	1	3	16
Pct of Month	0%	0%	0%	0%	0%	2%	0%	0%	7%	6%	1%	4%	

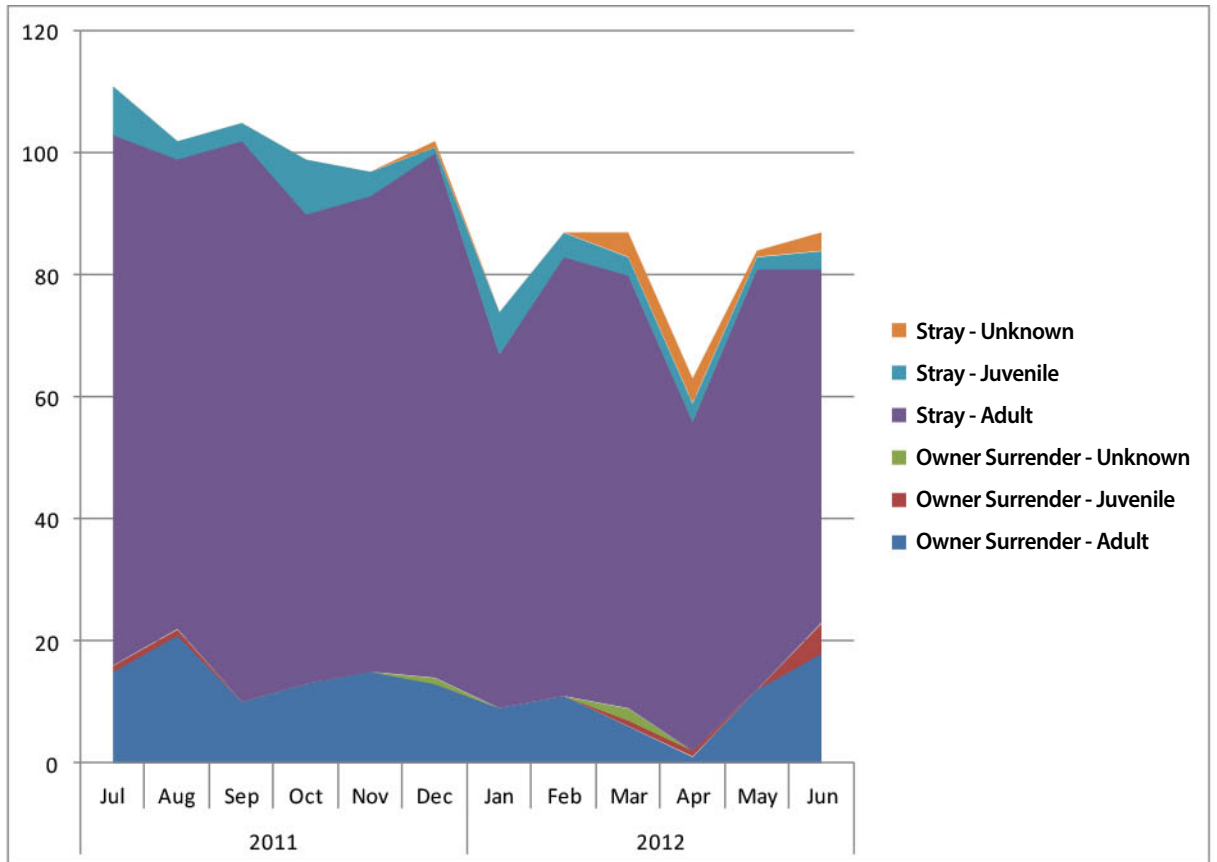


Total Bully Breed Dog Intake by Month and Age

◀ Back to Dog Index

----> **Seasonal Intake by Intake Type and Age for Breeds of Concern**

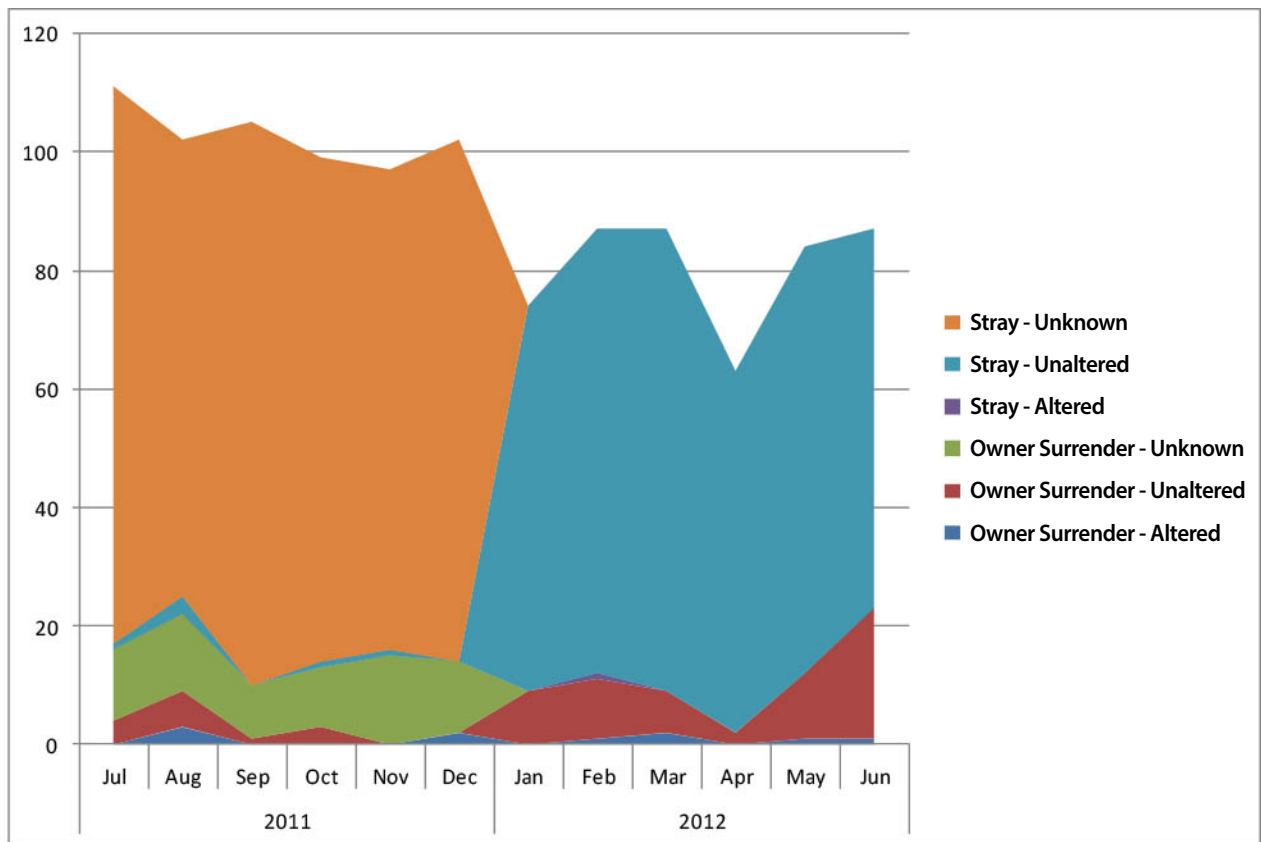
This area chart displays all bully breed dog intake by month, broken out by intake type and age. It allows for identification of seasonality in the dataset and illustrates the variations based on intake type and age and the proportion of total intake represented by each subset.



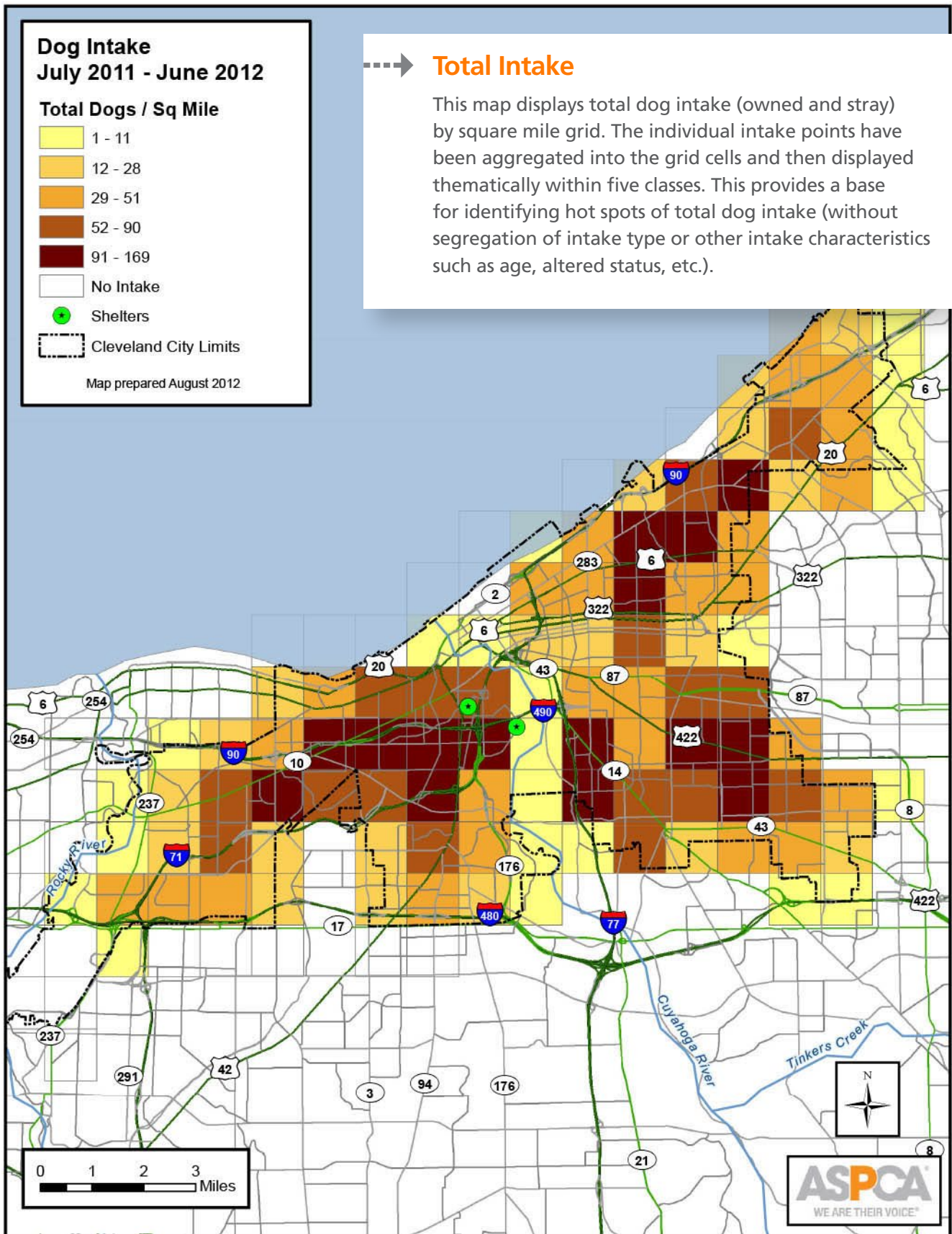
Bully Breed Dog Intake by Month, Intake Type, and Age

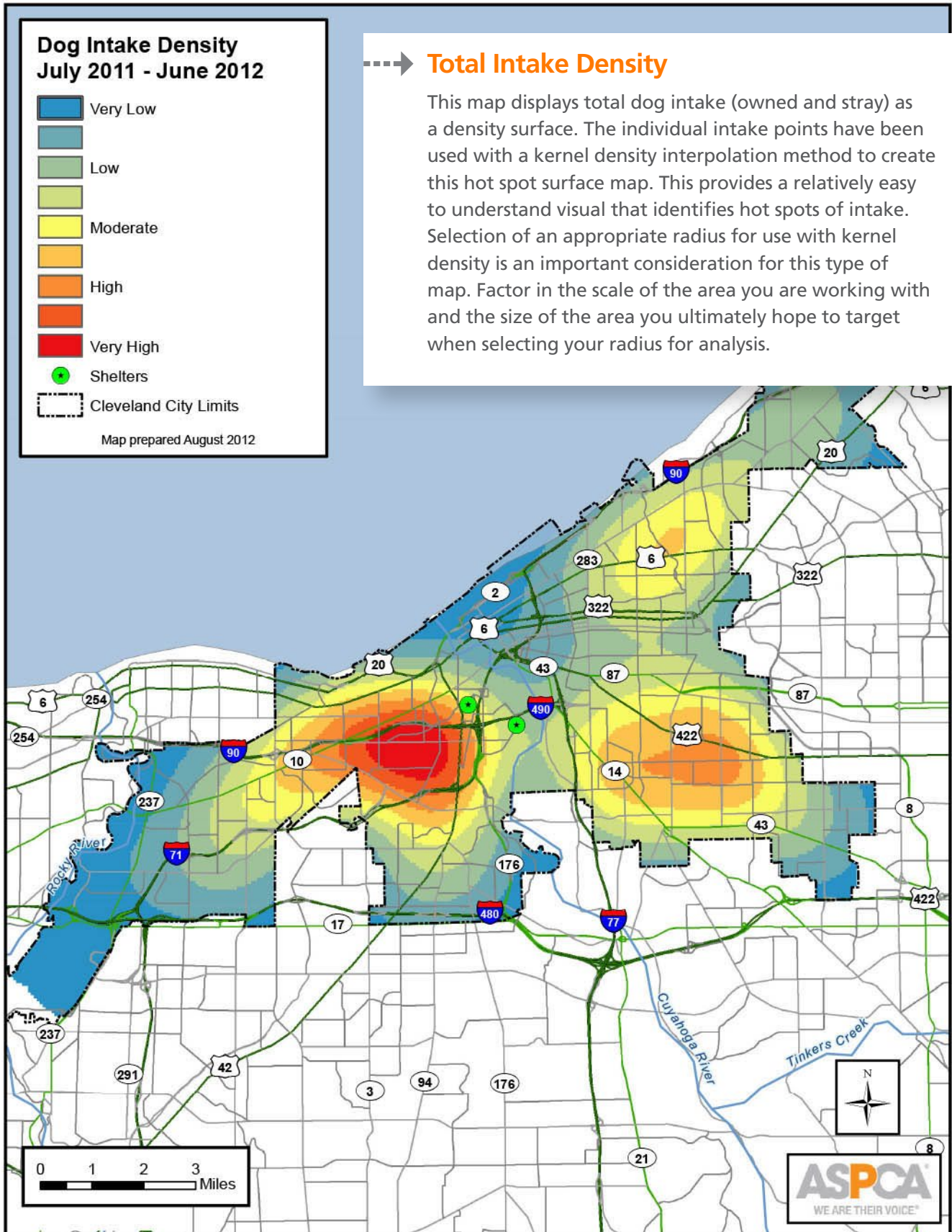
----> **Seasonal Intake by Intake Type and Altered Status for Breeds of Concern**

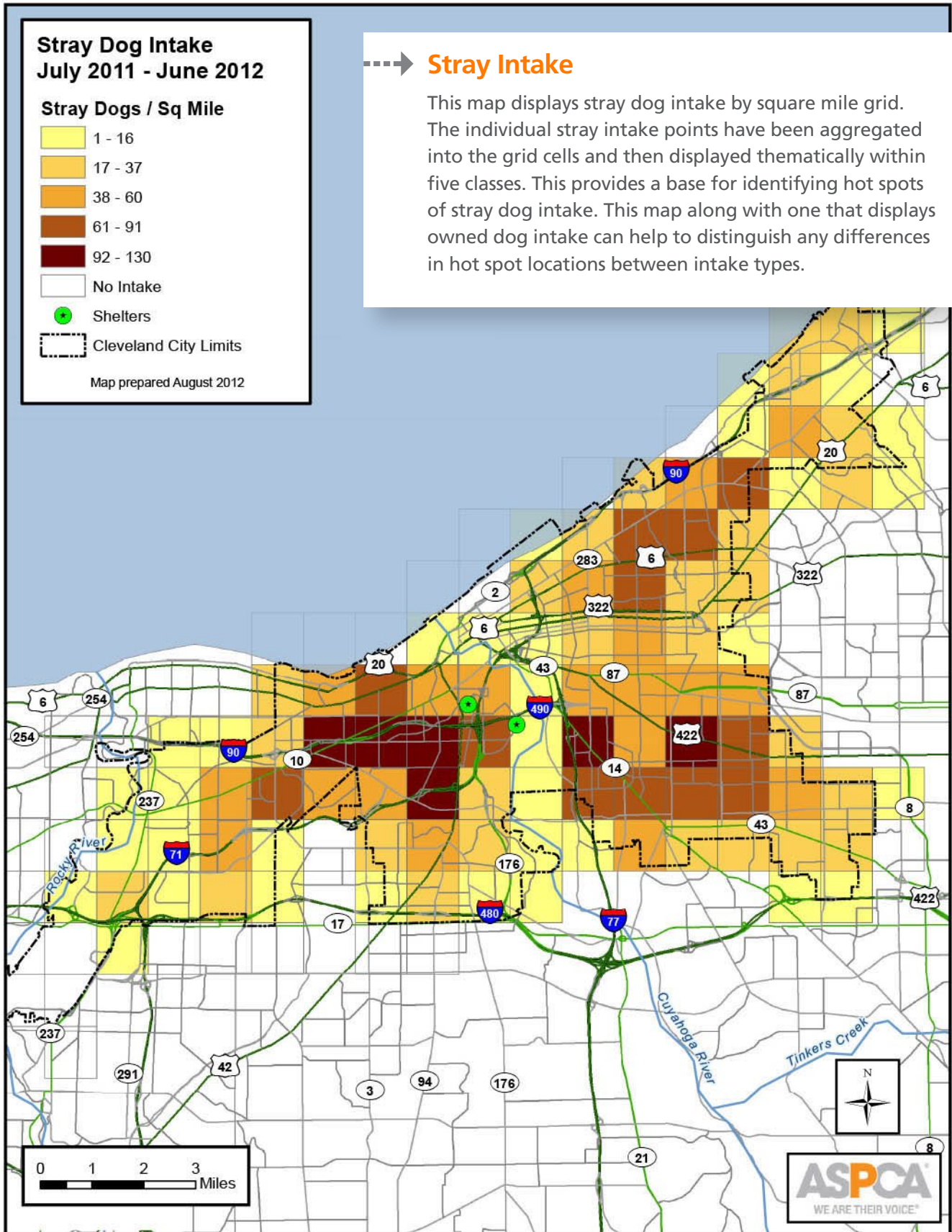
This area chart displays bully breed dog intake by month, broken out by intake type and altered status at intake. It allows for identification of seasonality in the dataset and illustrates the variations based on intake type and altered status at intake and the proportion of total intake represented by each subset. This example includes a dataset that had a high number of dogs with an unknown altered status in the first half of the analysis period.

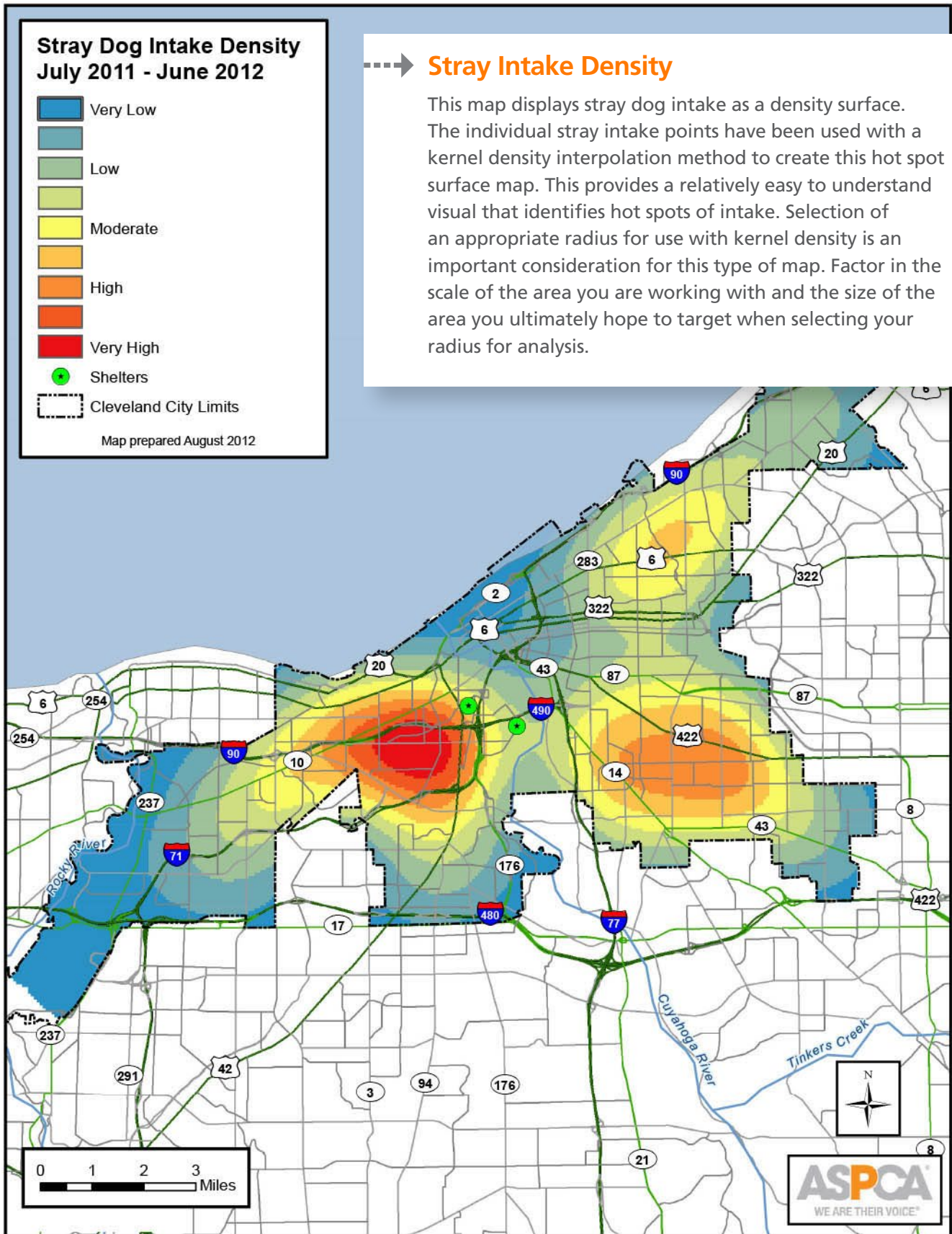


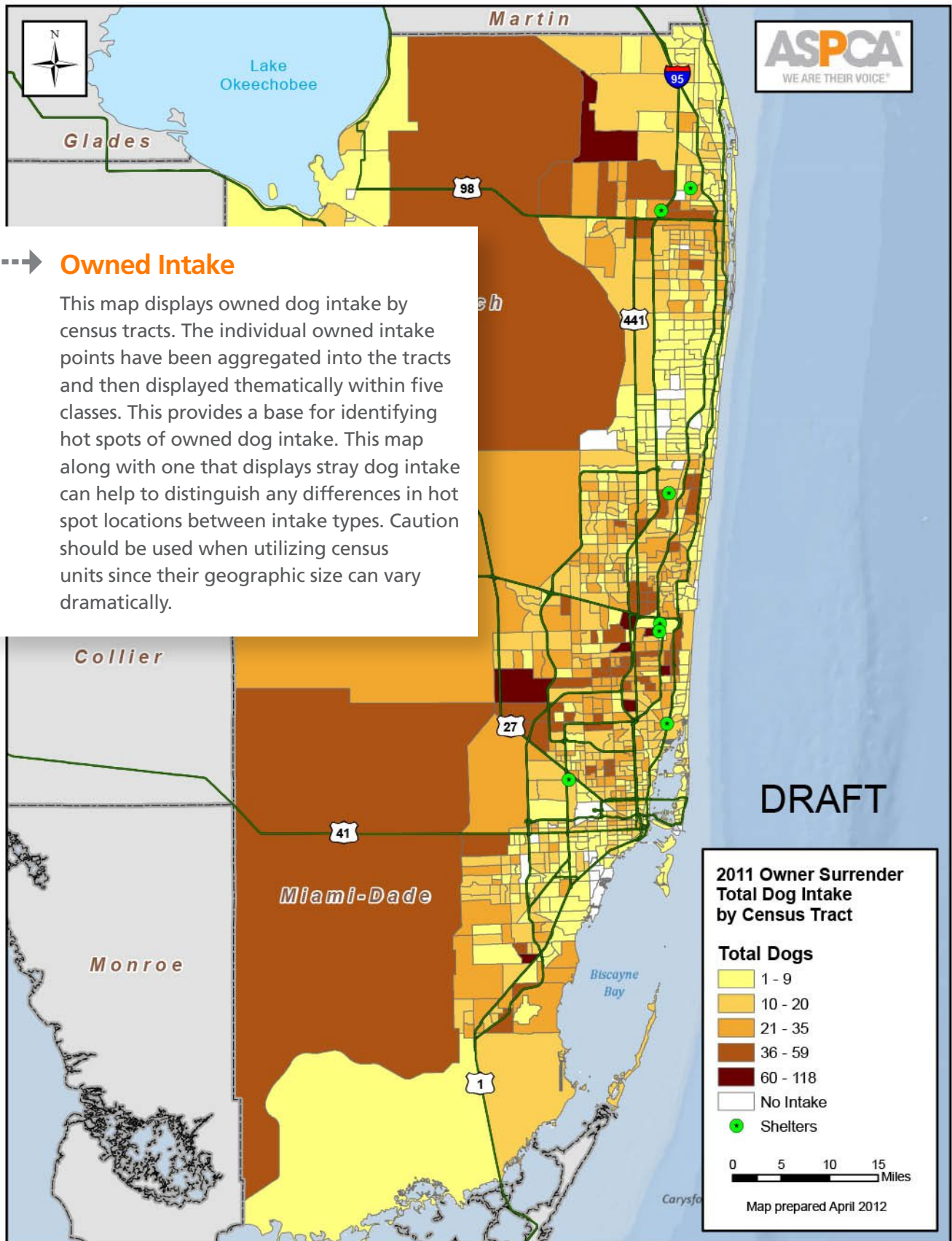
Bully Breed Dog Intake by Month, Intake Type, and Altered Status

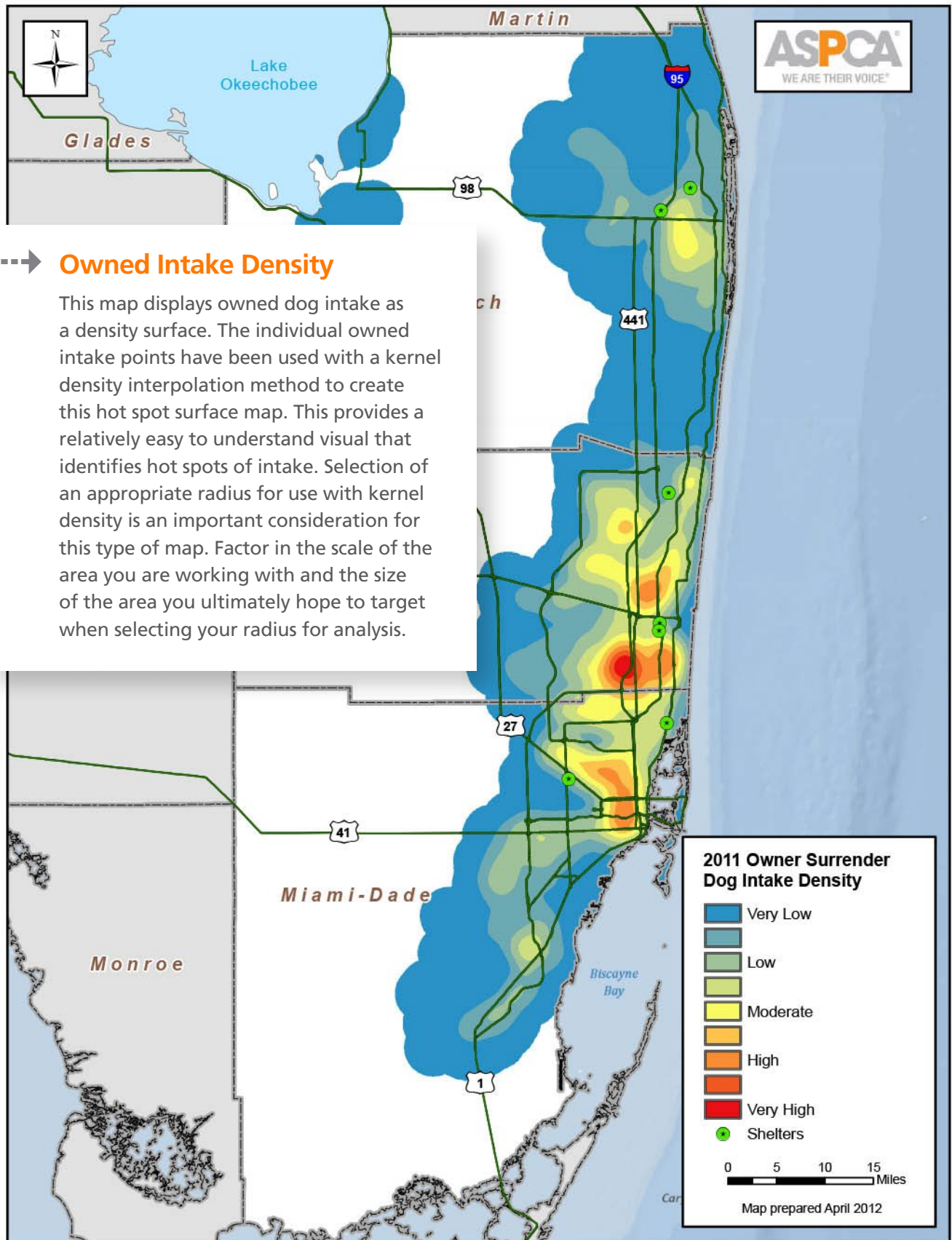


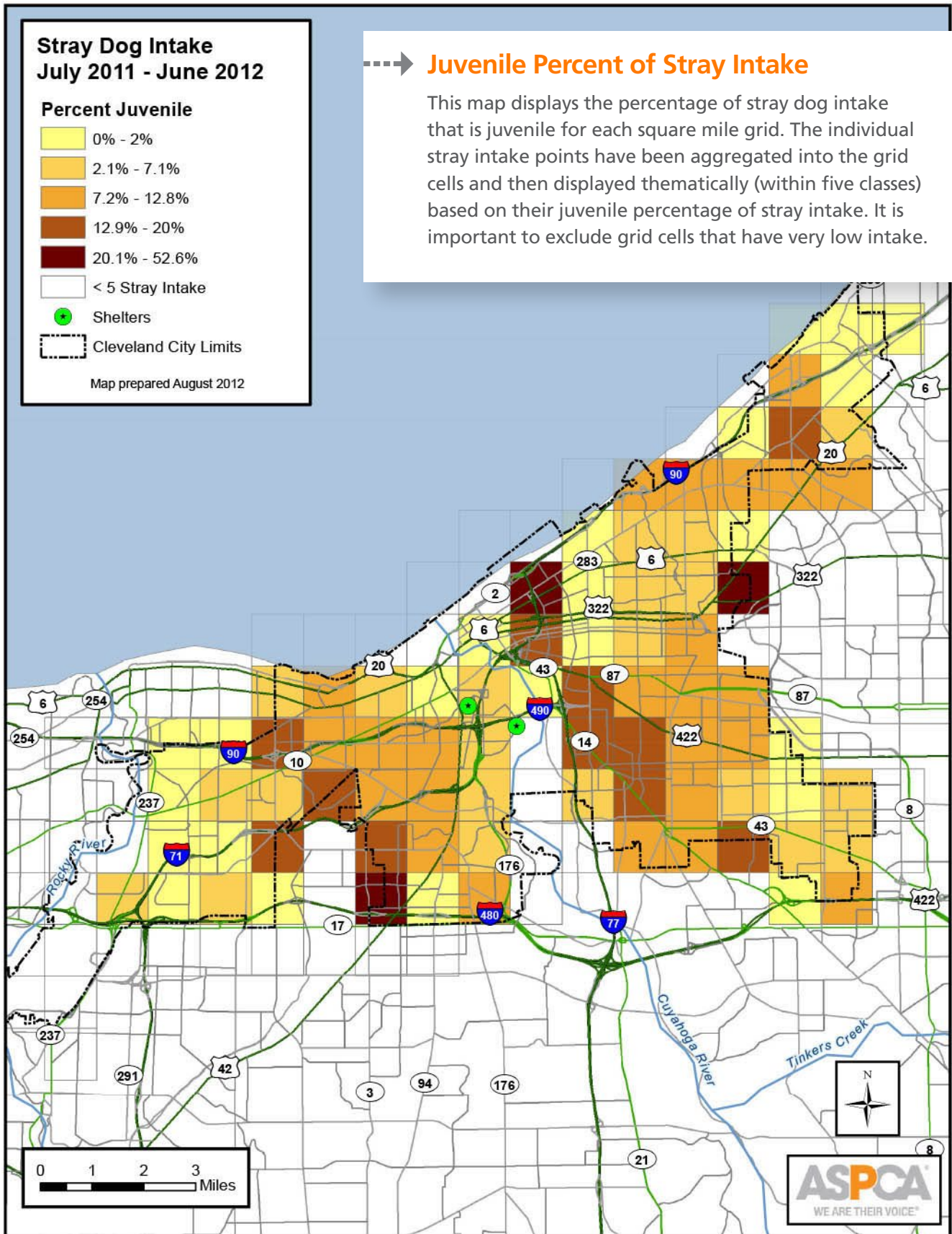


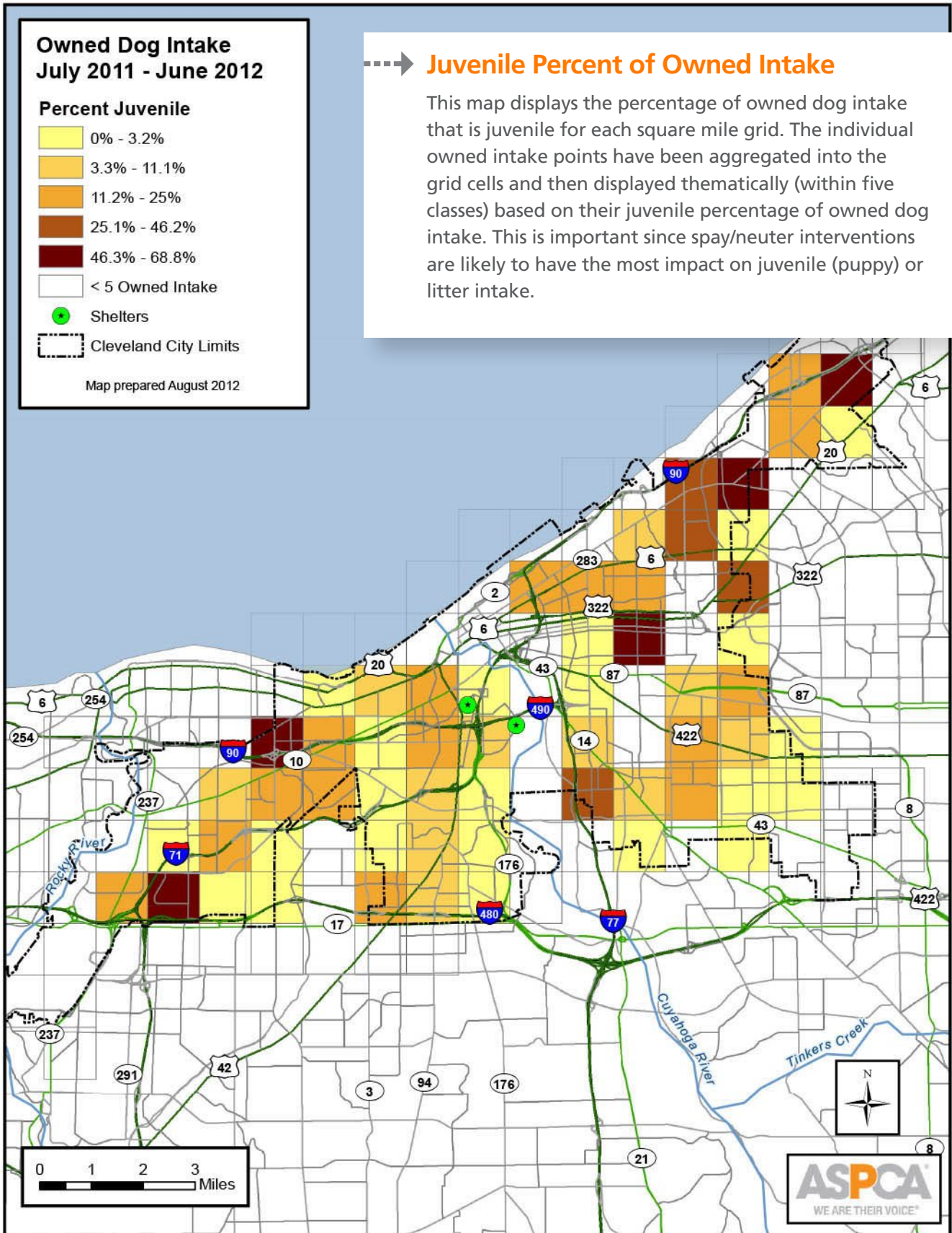


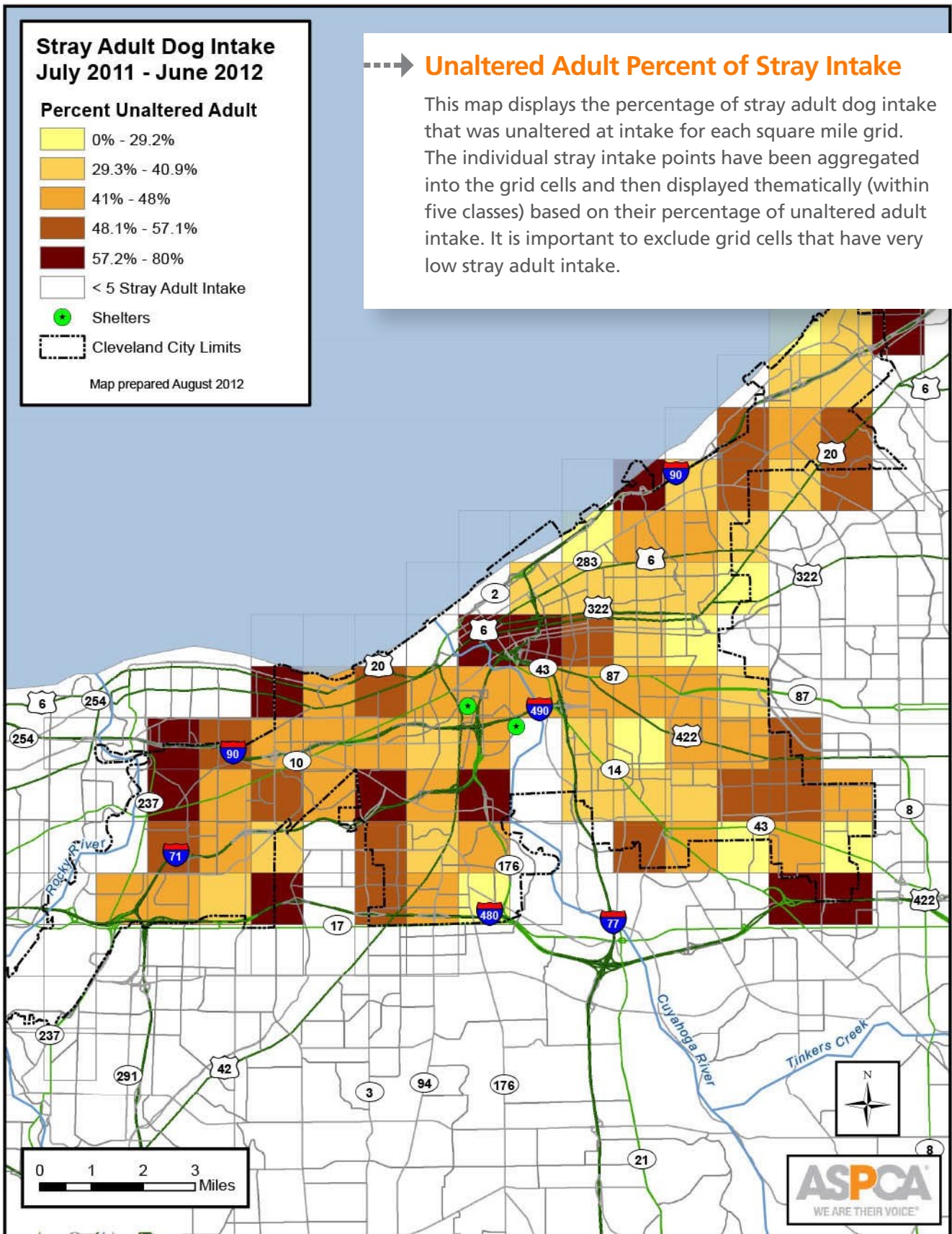


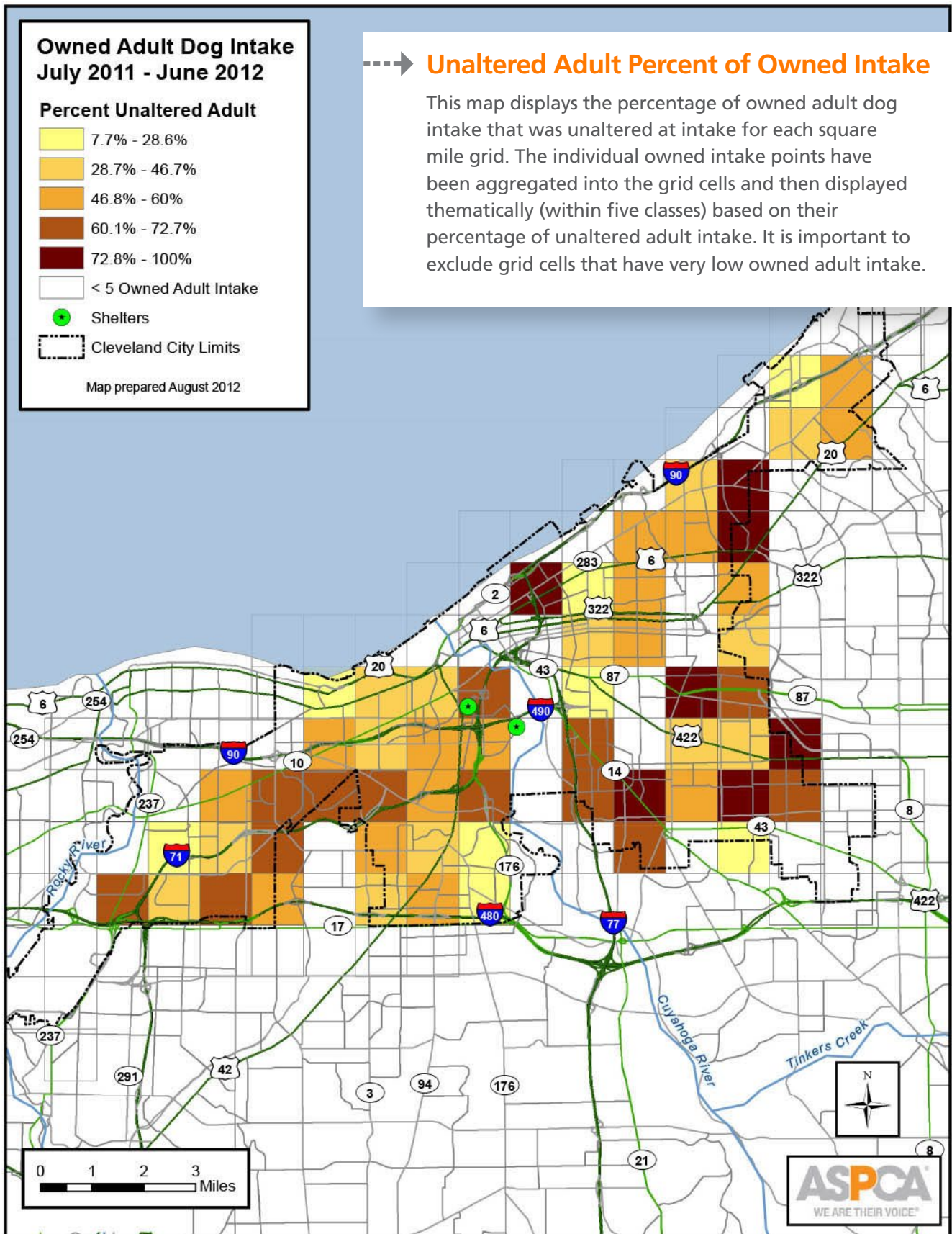


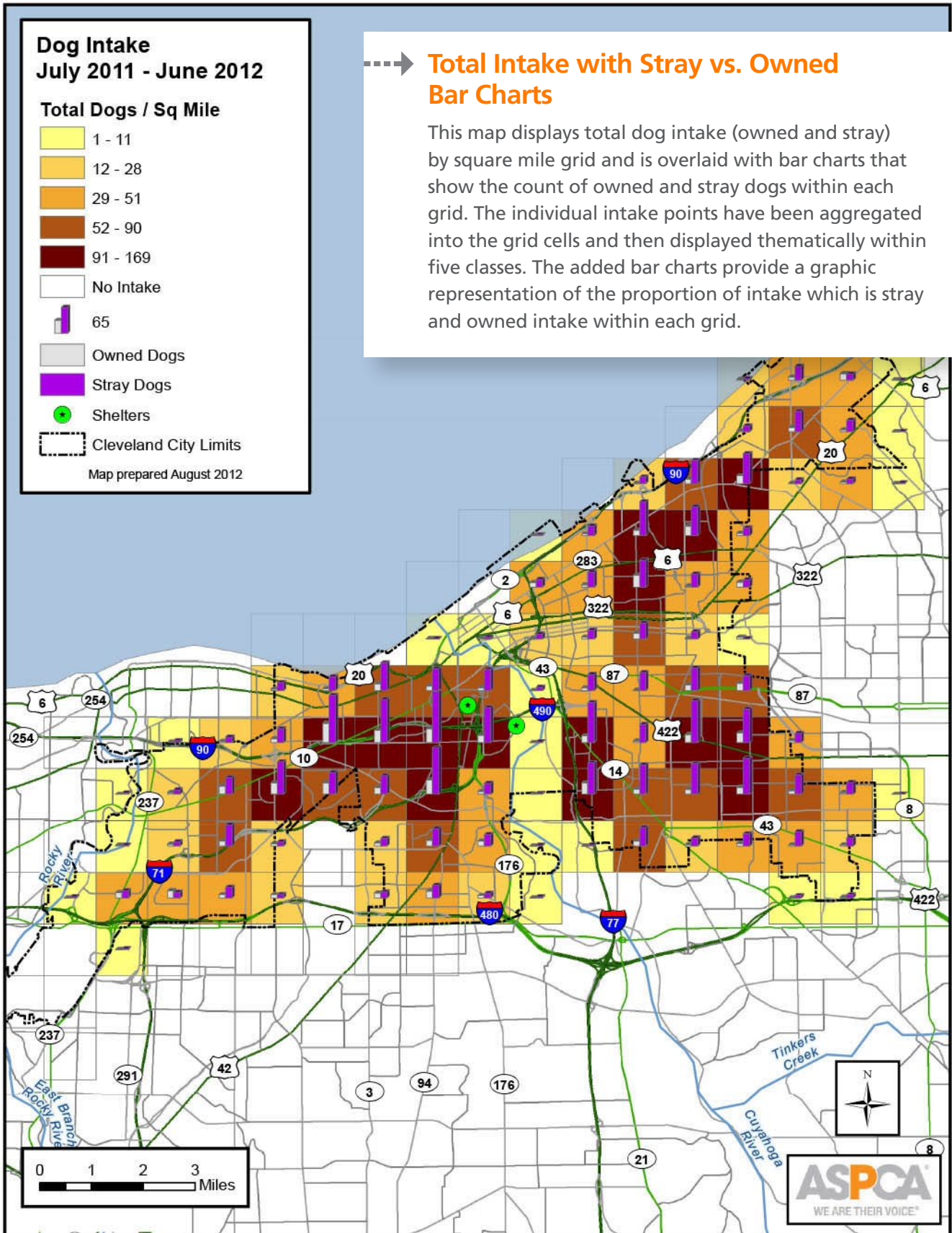


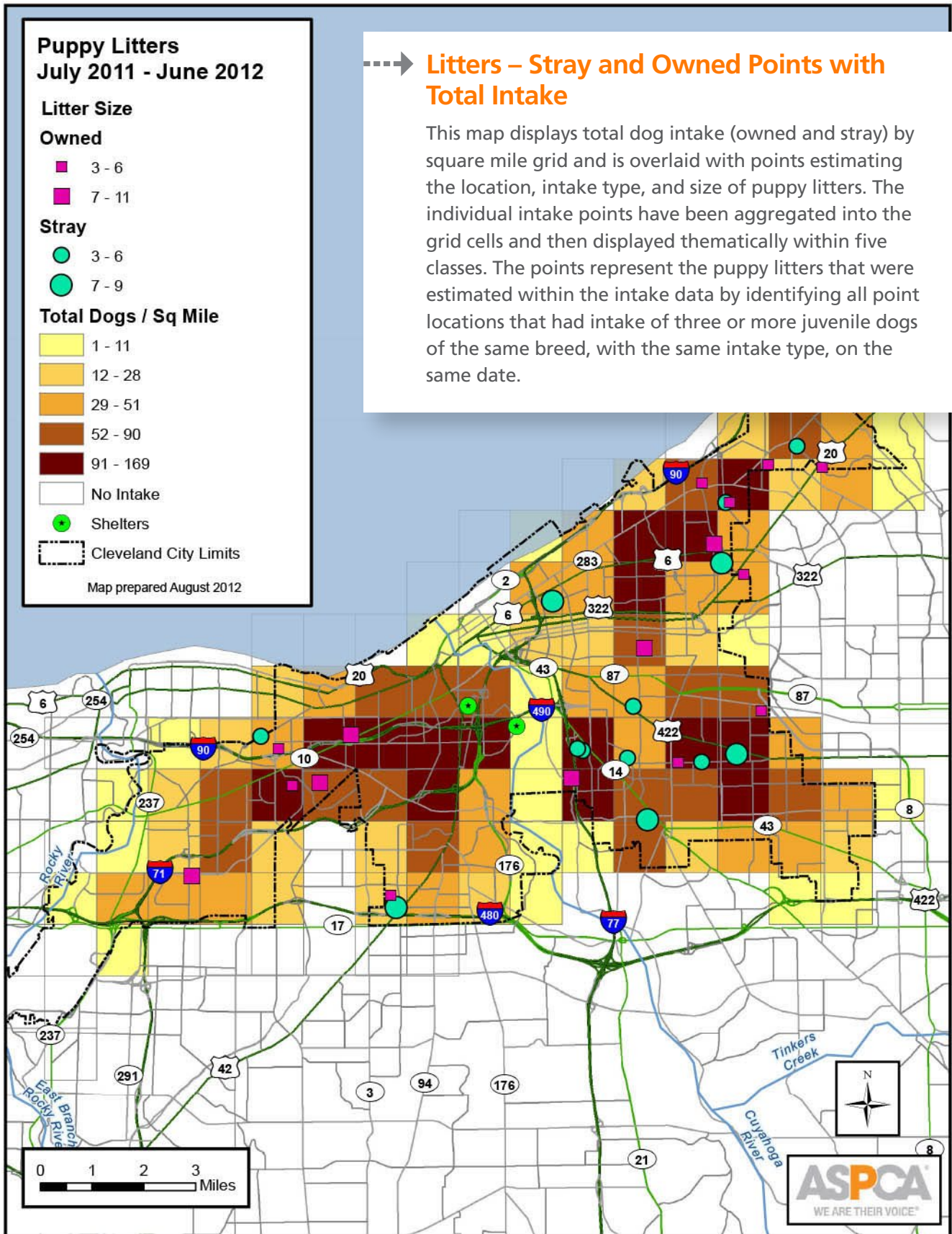


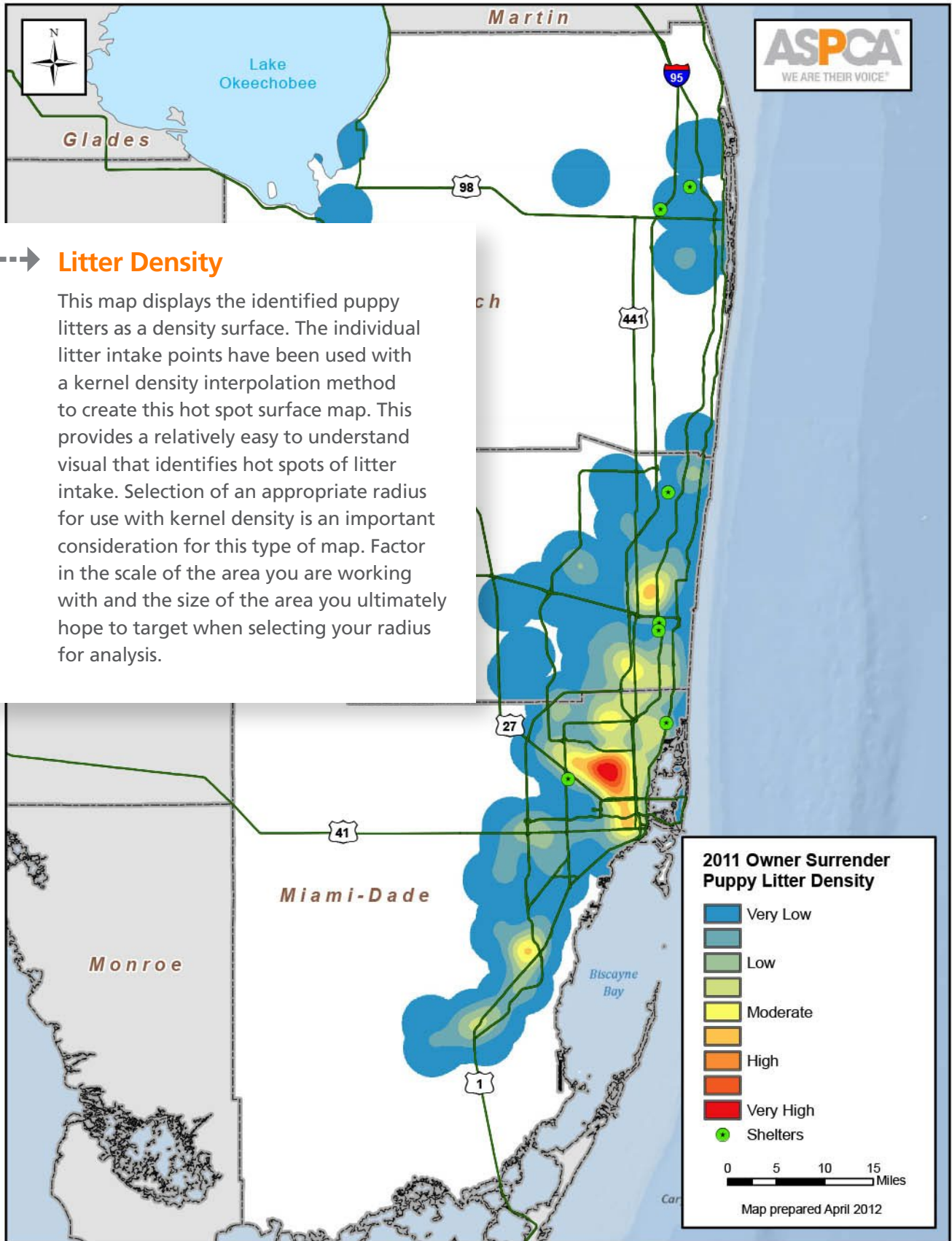


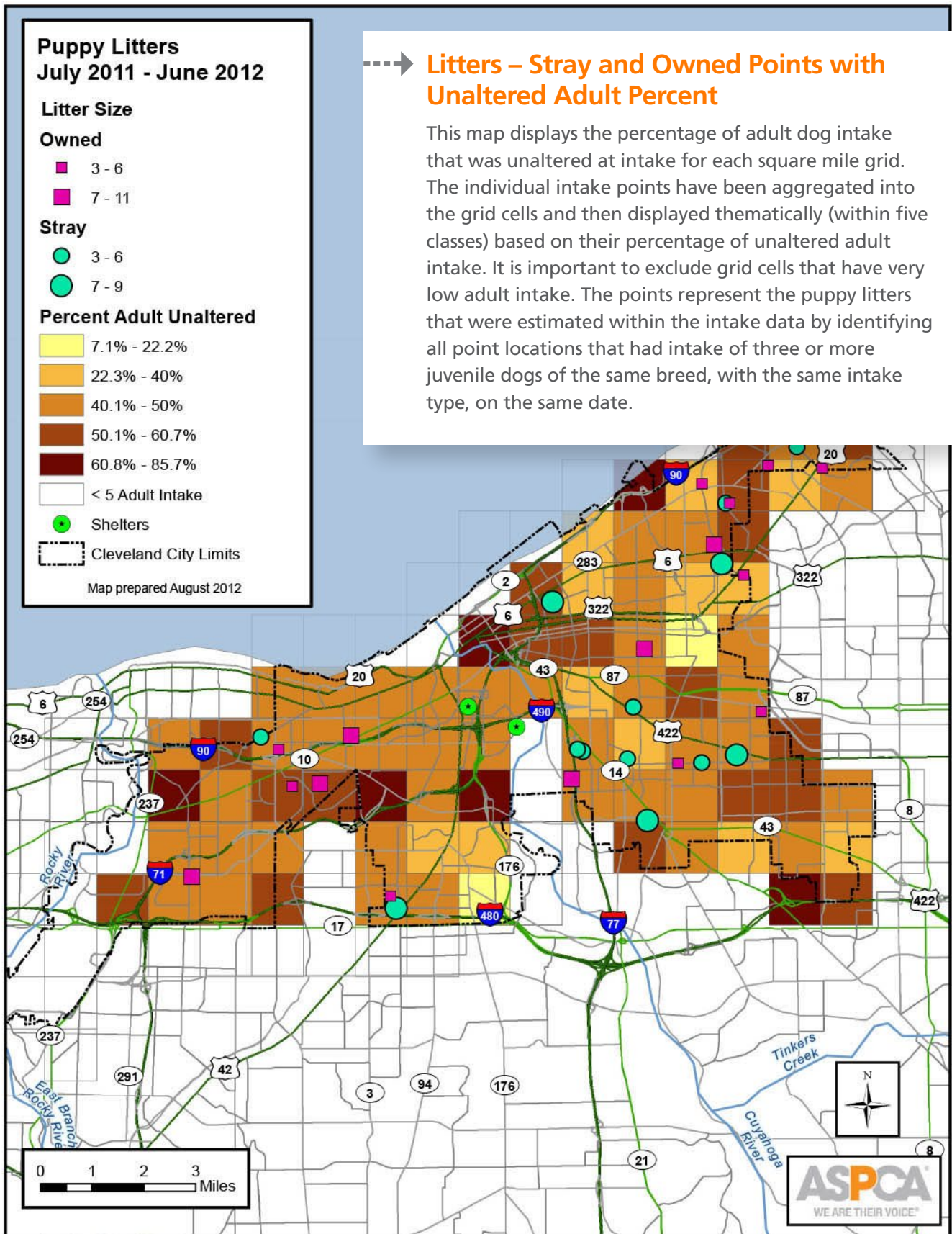










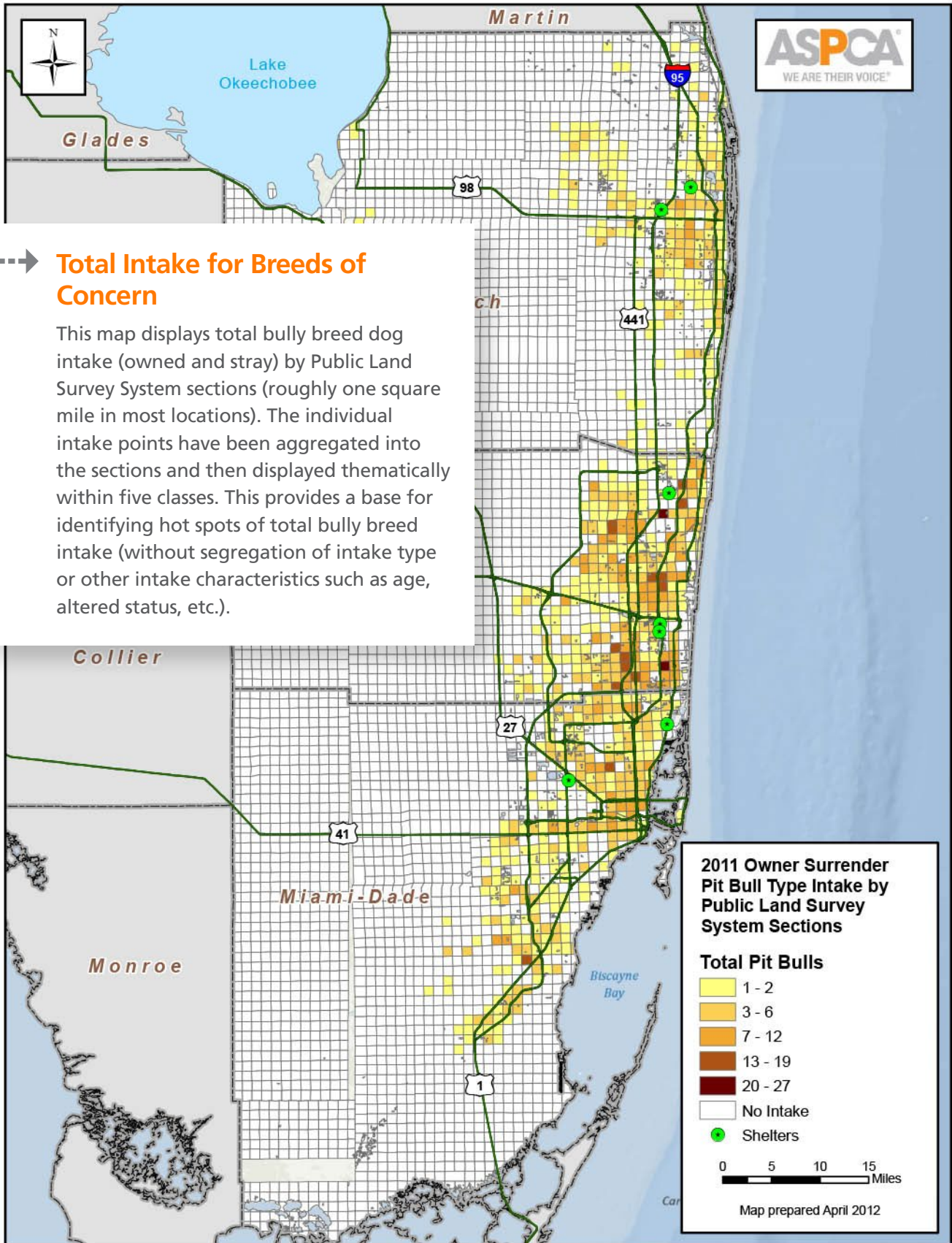


----> **Adult Spay/Neuter to Adult Intake Ratio with Points Displayed**

We do not currently have an example of this type of map. It would appear very similar to the cat example displaying the ratio of adult dog spay/neuter surgeries to adult dog intake within the selected geographic units (census tracts or grid cells).

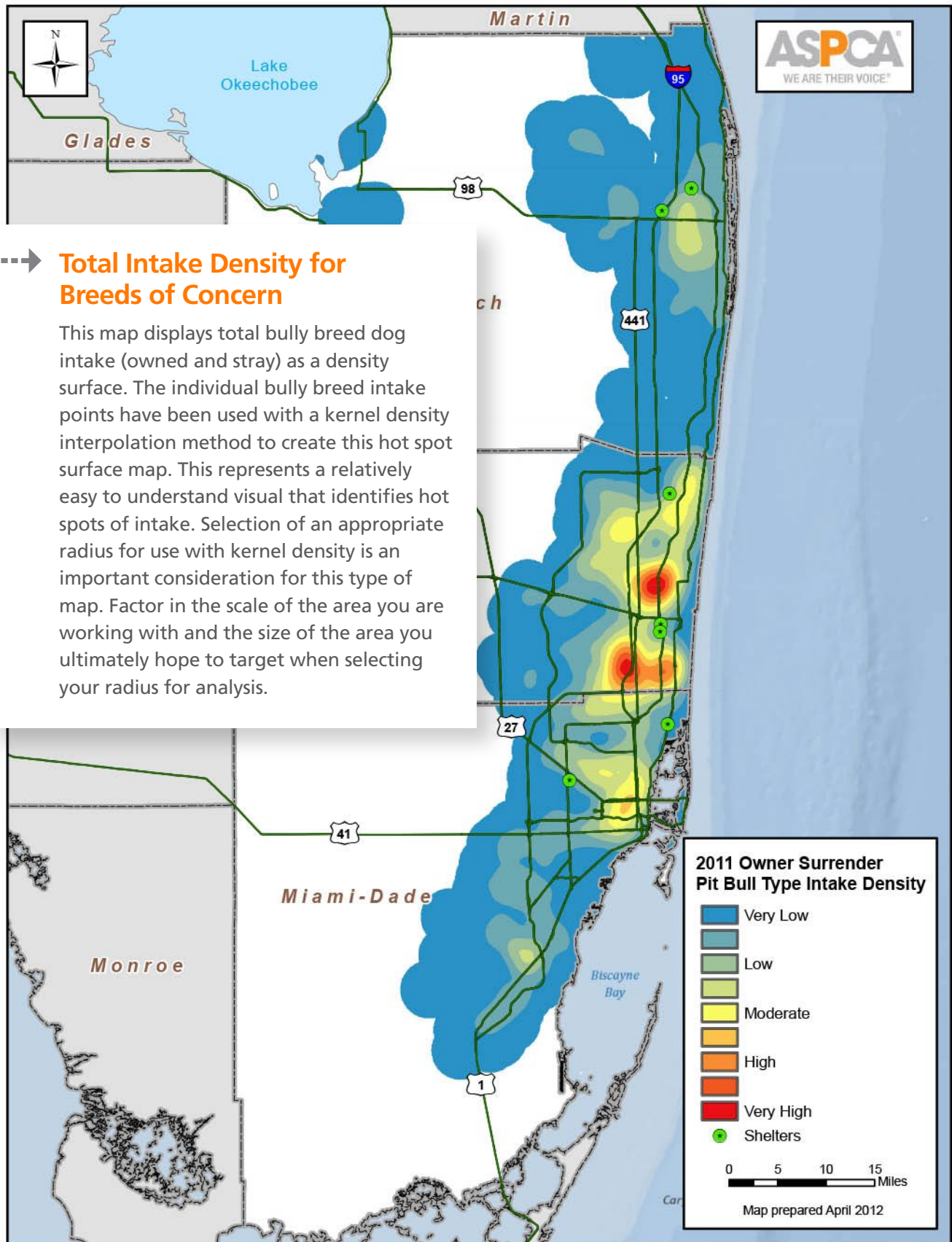
The individual spay/neuter and intake points would be aggregated into units and then a ratio would be calculated. This ratio is helpful in identifying areas that are potentially experiencing under-delivery of spay/neuter services.





---> **Total Intake for Breeds of Concern**

This map displays total bully breed dog intake (owned and stray) by Public Land Survey System sections (roughly one square mile in most locations). The individual intake points have been aggregated into the sections and then displayed thematically within five classes. This provides a base for identifying hot spots of total bully breed intake (without segregation of intake type or other intake characteristics such as age, altered status, etc.).



Notes/Considerations

- Only include counties/land area that are within the coalition boundaries – area of responsibility.
- Include the location of the community's shelters on the maps.
- It is helpful to create a flowchart that shows data loss at each step of the process from the first steps of cleaning to the final stage of geocoding.
- Include definitions of terms and categories specific to each community with the appropriate maps.
- Density maps can be developed using hot spot analysis and raster surface techniques such as kernel density.
- It is important to understand the number of points within each unit as displayed on the maps. Often bar charts help display this.
- Consider inset/subarea maps, if appropriate, based on analysis and as necessary for identification of potential intervention(s).
- Consideration of area demographics is only needed after a sub-area has been selected for an intervention.
- Be sure to allow sufficient time to review maps/analysis and in some cases conduct additional focused analysis to identify the most appropriate location for targeted work.

For a complete overview of GIS mapping and how it can help identify at-risk pet populations in your area, go to ASPCapro.org