In [2]:

```
from selenium import webdriver
from selenium.webdriver.chrome.options import Options
import csv
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
from bs4 import BeautifulSoup
import time
```

In [3]:

```
df=pd.read_csv('Dataset1-SanDiego_Output.csv')
df.head()
```

Out[3]:

	addressCity	addressState	area	baths	beds	latitude	longitude	price
0	San Diego	CA	NaN	NaN	NaN	32.943880	-117.237528	NaN
1	SAN DIEGO	CA	3075.0	3.0	5.0	33.004779	-117.115680	$4,200/mo
2	San Diego	CA	1454.0	3.0	3.0	32.997999	-117.070160	$2,750/mo
3	San Diego	CA	1200.0	2.5	2.0	32.737260	-117.173390	$4,000/mo
4	San Diego	CA	900.0	1.5	2.0	32.756715	-117.112220	$2,150/mo

In [4]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 840 entries, 0 to 839
Data columns (total 8 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   addressCity   840 non-null    object 
 1   addressState  840 non-null    object 
 2   area          486 non-null    float64
 3   baths         538 non-null    float64
 4   beds          539 non-null    float64
 5   latitude      840 non-null    float64
 6   longitude     840 non-null    float64
 7   price         539 non-null    object 
dtypes: float64(5), object(3)
memory usage: 52.6+ KB
```

data cleaning steps

- heatmap NA- drop NA
- 'area' columns: rename 'area in sqft'
- drop column 'addressCity' and 'addressState'
- rename 'price' column: 'monthly price in $'
- 'price' column: remove '$' and '/mo' '+/mo', remove comma
- every column = convert to numeric

In [6]:

```
#check for missing values
#before cleaning: 840 entries
df.isna()
```

Out[6]:

	addressCity	addressState	area	baths	beds	latitude	longitude	price
0	False	False	True	True	True	False	False	True
1	False	False	False	False	False	False	False	False
2	False	False	False	False	False	False	False	False
3	False	False	False	False	False	False	False	False
4	False	False	False	False	False	False	False	False
...	...	...	...	...	...	...	...	...
835	False	False	False	False	False	False	False	False
836	False	False	True	True	True	False	False	True
837	False	False	False	False	False	False	False	False
838	False	False	True	True	True	False	False	True
839	False	False	True	True	True	False	False	True

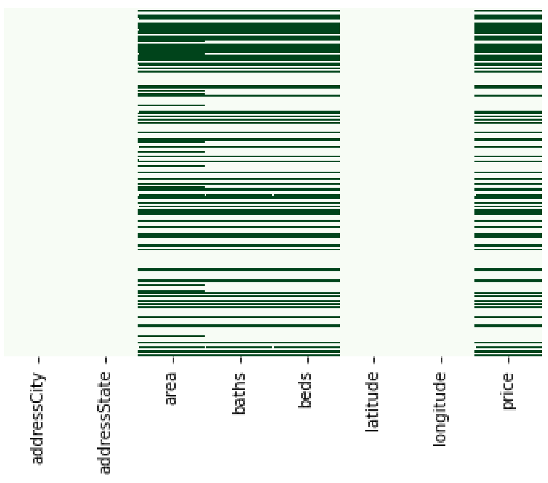
840 rows × 8 columns

In [7]:

```
#check for missing values
#same dataset missing: are, baths, beds, price
sns.heatmap(df.isna(), yticklabels=False,cbar=False,cmap='Greens')
```

Out[7]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x199bc550>
```



In [8]:

```
df=df.dropna()
```

In [10]:

```
df.info()
#after cleaning: 485 entries (more than 40% of the data were dropped)
```

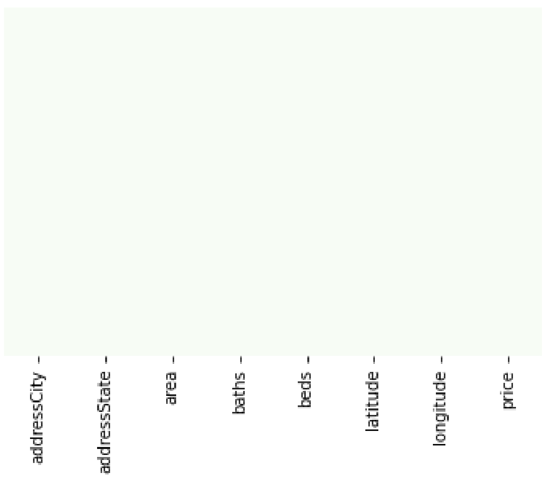
```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 485 entries, 1 to 837
Data columns (total 8 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   addressCity   485 non-null    object 
 1   addressState  485 non-null    object 
 2   area          485 non-null    float64
 3   baths         485 non-null    float64
 4   beds          485 non-null    float64
 5   latitude      485 non-null    float64
 6   longitude     485 non-null    float64
 7   price         485 non-null    object
dtypes: float64(5), object(3)
memory usage: 34.1+ KB
```

In [12]:

```python
#after dropping missing data we have no non-null values anymore
sns.heatmap(df.isna(), yticklabels=False,cbar=False,cmap='Greens')
```

Out[12]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x1bacfd60>
```



In [13]:

```python
#change column name from 'area' to 'area in sqft'
df['area in sqft']= df['area']
```

In [14]:

```python
df.head()
```

Out[14]:

	addressCity	addressState	area	baths	beds	latitude	longitude	price	area in sqft
1	SAN DIEGO	CA	3075.0	3.0	5.0	33.004779	-117.11568	$4,200/mo	3075.0
2	San Diego	CA	1454.0	3.0	3.0	32.997999	-117.07016	$2,750/mo	1454.0
3	San Diego	CA	1200.0	2.5	2.0	32.737260	-117.17339	$4,000/mo	1200.0
4	San Diego	CA	900.0	1.5	2.0	32.756715	-117.11222	$2,150/mo	900.0
7	San Diego	CA	839.0	2.0	2.0	32.751067	-117.10532	$2,100/mo	839.0

In [15]:

```python
#drop the 'addressCity' and 'addressState' column because every entry is related to San Diego and
California
df.drop(['addressCity', 'addressState'], axis=1, inplace=True)
```

In [16]:

```python
df.head()
```

Out[16]:

	area	baths	beds	latitude	longitude	price	area in sqft
1	3075.0	3.0	5.0	33.004779	-117.11568	$4,200/mo	3075.0

	area	baths	beds	latitude	longitude	price	area in sqft
2	1454.0	3.0	3.0	32.997999	-117.07016	$2,750/mo	1454.0
3	1200.0	2.5	2.0	32.737260	-117.17339	$4,000/mo	1200.0
4	900.0	1.5	2.0	32.756715	-117.11222	$2,150/mo	900.0
7	839.0	2.0	2.0	32.751067	-117.10532	$2,100/mo	839.0

In [17]:

```
#reset the index since rows were deleted during the dropping missing value process
df=df.reset_index(drop=True)
```

In [18]:

```
df.head()
```

Out[18]:

	area	baths	beds	latitude	longitude	price	area in sqft
0	3075.0	3.0	5.0	33.004779	-117.11568	$4,200/mo	3075.0
1	1454.0	3.0	3.0	32.997999	-117.07016	$2,750/mo	1454.0
2	1200.0	2.5	2.0	32.737260	-117.17339	$4,000/mo	1200.0
3	900.0	1.5	2.0	32.756715	-117.11222	$2,150/mo	900.0
4	839.0	2.0	2.0	32.751067	-117.10532	$2,100/mo	839.0

In [19]:

```
#rename column from 'price' to 'monthly price in $'
df['monthly price in $']=df['price']
```

In [20]:

```
df.head()
```

Out[20]:

	area	baths	beds	latitude	longitude	price	area in sqft	monthly price in $
0	3075.0	3.0	5.0	33.004779	-117.11568	$4,200/mo	3075.0	$4,200/mo
1	1454.0	3.0	3.0	32.997999	-117.07016	$2,750/mo	1454.0	$2,750/mo
2	1200.0	2.5	2.0	32.737260	-117.17339	$4,000/mo	1200.0	$4,000/mo
3	900.0	1.5	2.0	32.756715	-117.11222	$2,150/mo	900.0	$2,150/mo
4	839.0	2.0	2.0	32.751067	-117.10532	$2,100/mo	839.0	$2,100/mo

In [21]:

```
# remove entries with '/mo', 'mo', '+' inside the 'monthly price in $' columns

def modify_price(x):
    if '/mo' in x:
        return x.strip('/mo')
    elif '+/mo' in x:
        return x.strip('+/mo')
    elif '+' in x:
        return x.split('+')[0]
    else:
        return x
```

In [22]:

```
#apply the 'modify_price' function
df['monthly price in $']=df['monthly price in $'].apply(modify_price)
```

In [24]:

```
#modification: remove '$' sign from the 'monthly price in $' entries

def remove_dollar_sign(x):
    for i in x:
        if '$' in x:
            return x.replace('$','')
        else:
            return x
```

In [26]:

```
#apply the 'remove_dollar_sign' function
df['monthly price in $']=df['monthly price in $'].apply(remove_dollar_sign)
```

In [28]:

```
#check the current dataframe
df.head()
```

Out[28]:

	area	baths	beds	latitude	longitude	price	area in sqft	monthly price in $
0	3075.0	3.0	5.0	33.004779	-117.11568	$4,200/mo	3075.0	4,200
1	1454.0	3.0	3.0	32.997999	-117.07016	$2,750/mo	1454.0	2,750
2	1200.0	2.5	2.0	32.737260	-117.17339	$4,000/mo	1200.0	4,000
3	900.0	1.5	2.0	32.756715	-117.11222	$2,150/mo	900.0	2,150
4	839.0	2.0	2.0	32.751067	-117.10532	$2,100/mo	839.0	2,100

In [29]:

```
#drop columns: 'area', 'price' since we renamed them
```

In [30]:

```
df.drop(['area', 'price'], axis=1, inplace=True)
```

In [31]:

```
#check the current dataframe
df.head()
```

Out[31]:

	baths	beds	latitude	longitude	area in sqft	monthly price in $
0	3.0	5.0	33.004779	-117.11568	3075.0	4,200
1	3.0	3.0	32.997999	-117.07016	1454.0	2,750
2	2.5	2.0	32.737260	-117.17339	1200.0	4,000
3	1.5	2.0	32.756715	-117.11222	900.0	2,150
4	2.0	2.0	32.751067	-117.10532	839.0	2,100

In [32]:

```
#change column order
df=df[['area in sqft', 'baths', 'beds', 'latitude', 'longitude', 'monthly price in $']]
```

In [33]:

```
df.head()
```

Out[33]:

Out[33]:

	area in sqft	baths	beds	latitude	longitude	monthly price in $
0	3075.0	3.0	5.0	33.004779	-117.11568	4,200
1	1454.0	3.0	3.0	32.997999	-117.07016	2,750
2	1200.0	2.5	2.0	32.737260	-117.17339	4,000
3	900.0	1.5	2.0	32.756715	-117.11222	2,150
4	839.0	2.0	2.0	32.751067	-117.10532	2,100

In [34]:

```
# remove the comma inside the 'monthly price in $' column

def remove_comma(x):
    for i in x:
        if ',' in x:
            return x.replace(',','')
        else:
            return x
```

In [37]:

```
#apply the 'remove_underscore' function
df['monthly price in $']=df['monthly price in $'].apply(remove_comma)
```

In [40]:

```
#convert the 'monthly price in $' column to float
df['monthly price in $']=df['monthly price in $'].astype(float)
```

In [273]:

```
#check the dataframe infos- now every column is a float type
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 485 entries, 0 to 484
Data columns (total 6 columns):
 #   Column              Non-Null Count  Dtype  
---  ------              --------------  -----  
 0   area in sqft        485 non-null    float64
 1   baths               485 non-null    float64
 2   beds                485 non-null    float64
 3   latitude            485 non-null    float64
 4   longitude           485 non-null    float64
 5   monthly price in $  485 non-null    float64
dtypes: float64(6)
memory usage: 22.9 KB
```

In [42]:

```
#check the modified dataframe
df.head()
```

Out[42]:

	area in sqft	baths	beds	latitude	longitude	monthly price in $
0	3075.0	3.0	5.0	33.004779	-117.11568	4200.0
1	1454.0	3.0	3.0	32.997999	-117.07016	2750.0
2	1200.0	2.5	2.0	32.737260	-117.17339	4000.0
3	900.0	1.5	2.0	32.756715	-117.11222	2150.0
4	839.0	2.0	2.0	32.751067	-117.10532	2100.0

In [ ]:

```
#save as csv file
df.to_csv('Zillow_cleaned_data.csv')
```