In [1]:
```
import os
import pandas as pd
import numpy as np
import glob
import matplotlib.pyplot as plt
import matplotlib.animation as animation
```

In [2]:
```
inputs = r'.\graphing_inputs'
outputs = r'.\outputs'
```

sample table

In [3]:
```
example = pd.read_csv("example_2015.csv")
example.columns
```

Out[3]:
```
Index(['county_id', 'was_developed', 'was_redeveloped', 'residential_units',
       'job_spaces', 'job_spaces_added', 'res_units_added', 'building_count',
       'households_count', 'households_added', 'acreage_dev', 'acreage_rede
v',
       'total_value', 'value_added_dev', 'value_added_redev',
       'res_units_added_dev', 'res_units_added_redev', 'acreage_dev_res',
       'acreage_dev_nonres', 'acreage_redev_res', 'acreage_redev_nonres',
       'value_added_dev_res', 'value_added_dev_nonres',
       'jobs_accom_food_added', 'jobs_gov_edu_added', 'jobs_health_added',
       'jobs_manuf_added', 'jobs_office_added', 'jobs_other_added',
       'jobs_retail_added', 'jobs_wholesale_added'],
      dtype='object')
```

In [4]:
```
example.head(3)
```

Out[4]:

	county_id	was_developed	was_redeveloped	residential_units	job_spaces	job_spaces_added
0	3	0	0	0.0	0.0	0.0
1	11	440	215	114552.0	173224.0	549.0
2	35	153	64	406211.0	849948.0	3435.0

3 rows × 31 columns

functions

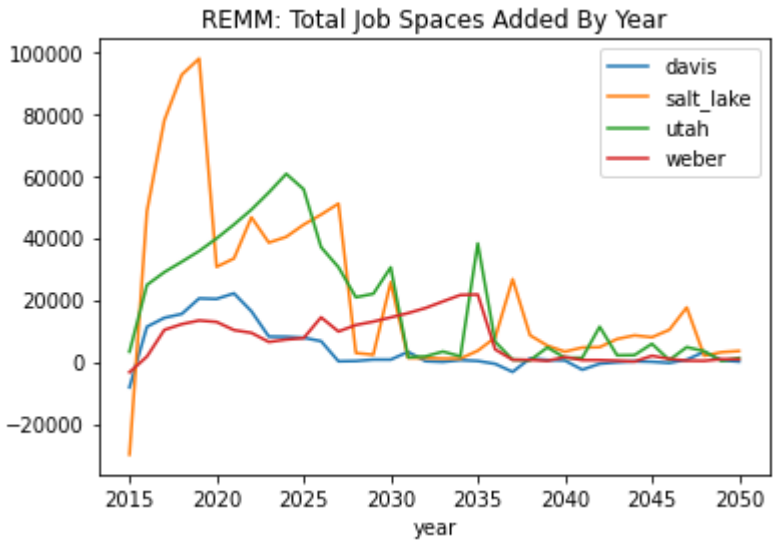
In [5]:
```
# create dataframe with values of specified attribute by year
def create_county_dataframe(field, export=False):

    # create empty list
    rows = []

    # get list of files
#     csvs = glob.glob(r'.\graphing_inputs\*_county_dev.csv')
    csvs = glob.glob(r'.\graphing_inputs\*_county_progression_metrics.csv')
    for csv in csvs:

        # get the year
#         year= csv[26:30]
        year= csv[31:35]

        # read in table
        df = pd.read_csv(csv)

        # get value for each county
        davis = float(df[df['county_id']== 11][field])
        saltlake = float(df[df['county_id']== 35][field])
        utah = float(df[df['county_id']== 49][field])
        weber = float(df[df['county_id']== 57][field])

        # form the row and append to the list
        row = (year, davis, saltlake, utah, weber)
        rows.append(row)

    # create dataframe from list of tuples, convert year col to int, filter to
2050 and earlier
    df2 = pd.DataFrame(rows, columns=["year", "davis", "salt_lake", "utah", "w
eber"])
    df2['year'] = df2['year'].astype(int)
    df2 = df2[df2['year'] <= 2050]

    # export to csv
    if export == True:
        df2.to_csv(os.path.join(outputs, "remm_yearly_{}.csv".format(field)))

    return df2
```

In [6]:
```
# create dataframe for specific parcel with values of specified attribute by y
ear
def create_parcel_dataframe(parcel_id, field, export=False):

    # create empty list
    rows = []

    # get list of files
#     csvs = glob.glob(r'.\graphing_inputs\*_county_dev.csv')
    csvs = glob.glob(r'.\parcel_data\*_parcel_devprog.csv')
    for csv in csvs:

        # get the year
#         year= csv[26:30]
        year= csv[27:31]

        # read in table
        df = pd.read_csv(csv)

        # get value for each county
        parcel = float(df[df['parcel_id']== parcel_id][field])

        # form the row and append to the list
        row = (year, parcel)
        rows.append(row)

    # create dataframe from list of tuples, convert year col to int, filter to
2050 and earlier
    df2 = pd.DataFrame(rows, columns=["year", field])
    df2['year'] = df2['year'].astype(int)
    df2 = df2[df2['year'] <= 2050]

    # export to csv
    if export == True:
        df2.to_csv(os.path.join(outputs, "remm_yearly_parcel_{}_{}.csv".format
(parcel_id,field)))

    return df2
```

job spaces added

In [7]:
```
df = create_county_dataframe('job_spaces_added')
df.set_index('year').plot(title='REMM: Total Job Spaces Added By Year')
```

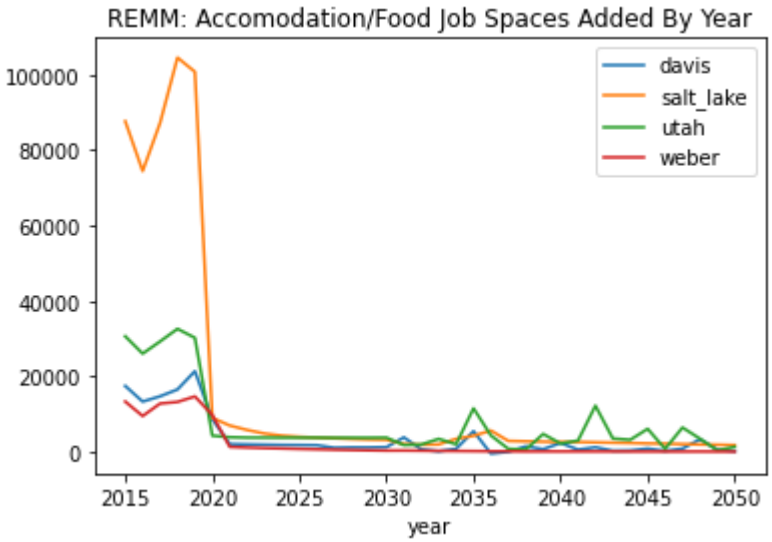
Out[7]:
```
<AxesSubplot:title={'center':'REMM: Total Job Spaces Added By Year'}, xlabel
='year'>
```



Accomodation/Food Jobs Added

In [8]:
```
df = create_county_dataframe('jobs_accom_food_added')
df.set_index('year').plot(title='REMM: Accomodation/Food Job Spaces Added By Y
ear')
```

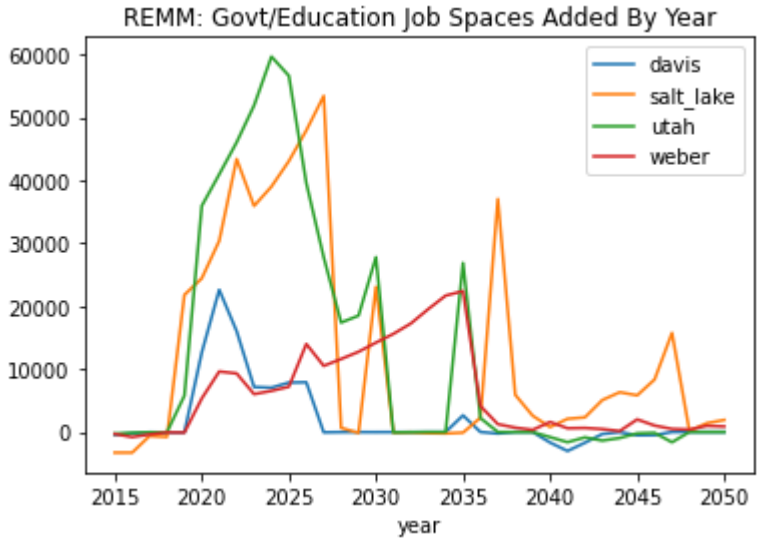
Out[8]:
```
<AxesSubplot:title={'center':'REMM: Accomodation/Food Job Spaces Added By Yea
r'}, xlabel='year'>
```



Government/Education Jobs Added

In [9]:
```
df = create_county_dataframe('jobs_gov_edu_added')
df.set_index('year').plot(title='REMM: Govt/Education Job Spaces Added By Yea
r')
```

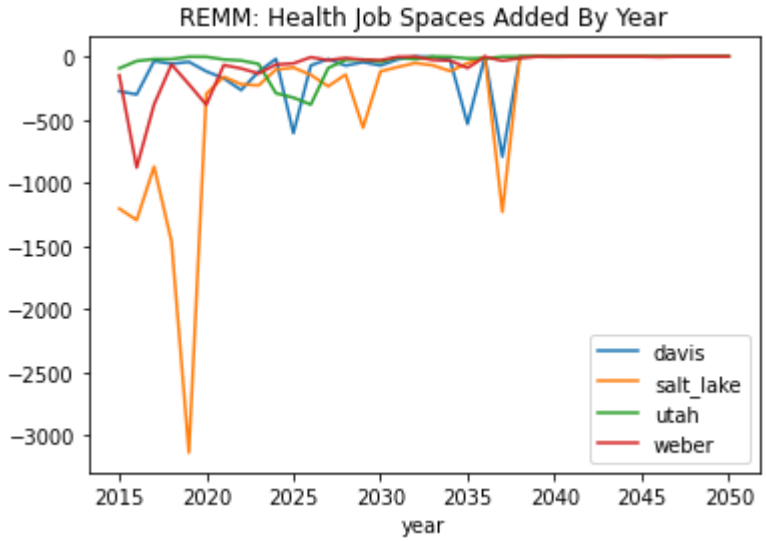
Out[9]:
```
<AxesSubplot:title={'center':'REMM: Govt/Education Job Spaces Added By Yea
r'}, xlabel='year'>
```



Health Jobs Added

In [10]:
```
df = create_county_dataframe('jobs_health_added')
df.set_index('year').plot(title='REMM: Health Job Spaces Added By Year')
```

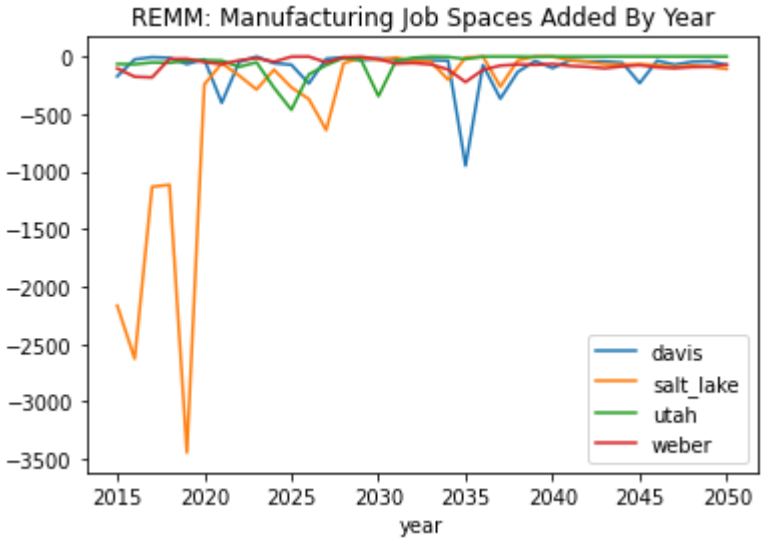
Out[10]:
```
<AxesSubplot:title={'center':'REMM: Health Job Spaces Added By Year'}, xlabel
='year'>
```



Manufacturing Jobs Added

In [11]:
```
df = create_county_dataframe('jobs_manuf_added')
df.set_index('year').plot(title='REMM: Manufacturing Job Spaces Added By Year'
)
```

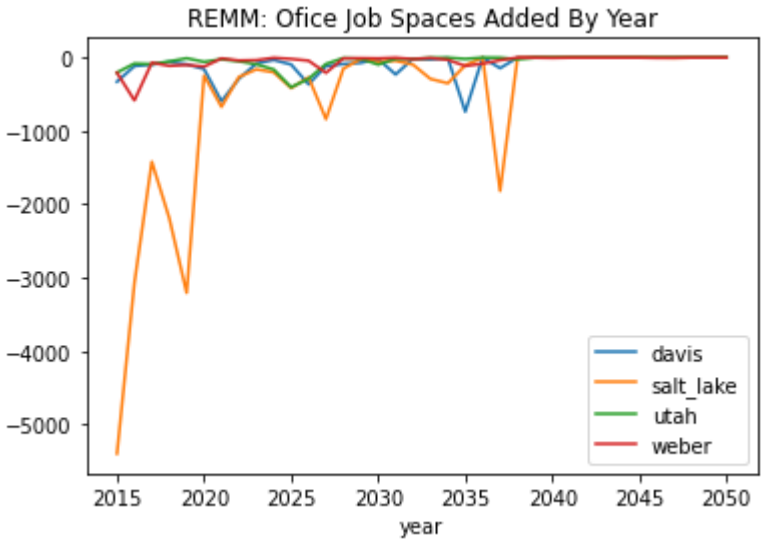
Out[11]:
```
<AxesSubplot:title={'center':'REMM: Manufacturing Job Spaces Added By Year'},
xlabel='year'>
```



Office Jobs Added

In [12]:
```
df = create_county_dataframe('jobs_office_added')
df.set_index('year').plot(title='REMM: Ofice Job Spaces Added By Year')
```

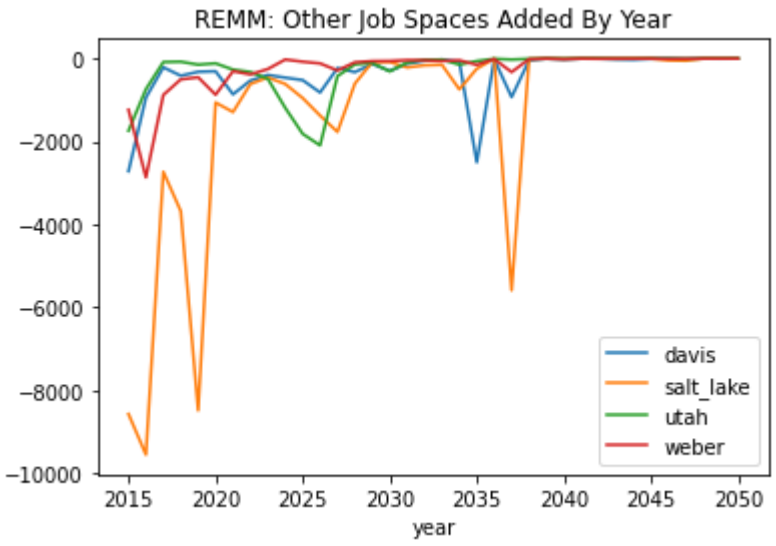
Out[12]:
```
<AxesSubplot:title={'center':'REMM: Ofice Job Spaces Added By Year'}, xlabel
='year'>
```



Other Jobs Added

In [13]:
```
df = create_county_dataframe('jobs_other_added')
df.set_index('year').plot(title='REMM: Other Job Spaces Added By Year')
```

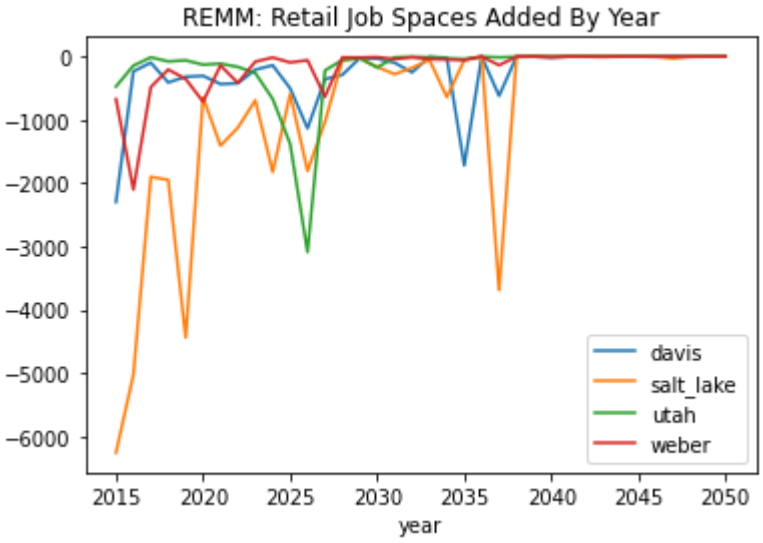
Out[13]:
```
<AxesSubplot:title={'center':'REMM: Other Job Spaces Added By Year'}, xlabel
='year'>
```



Retail Jobs Added

In [14]:
```
df = create_county_dataframe('jobs_retail_added')
df.set_index('year').plot(title='REMM: Retail Job Spaces Added By Year')
```

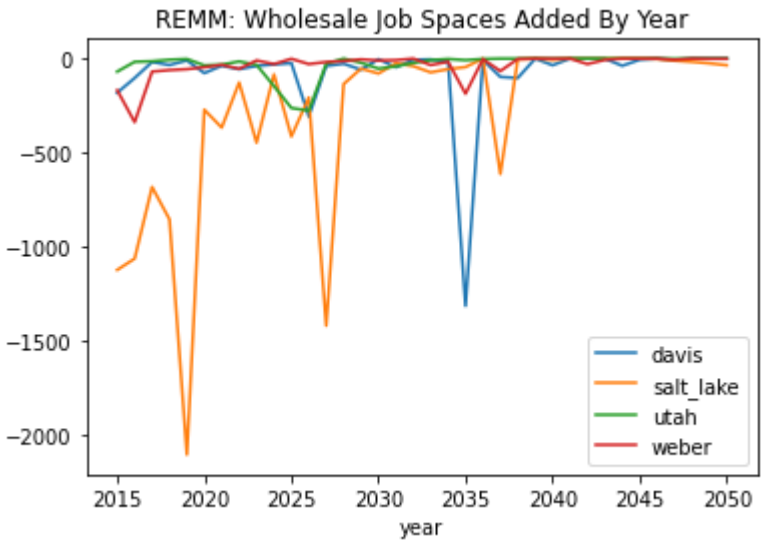
Out[14]:
```
<AxesSubplot:title={'center':'REMM: Retail Job Spaces Added By Year'}, xlabel
='year'>
```



Wholesale Jobs Added

In [15]:
```
df = create_county_dataframe('jobs_wholesale_added')
df.set_index('year').plot(title='REMM: Wholesale Job Spaces Added By Year')
```

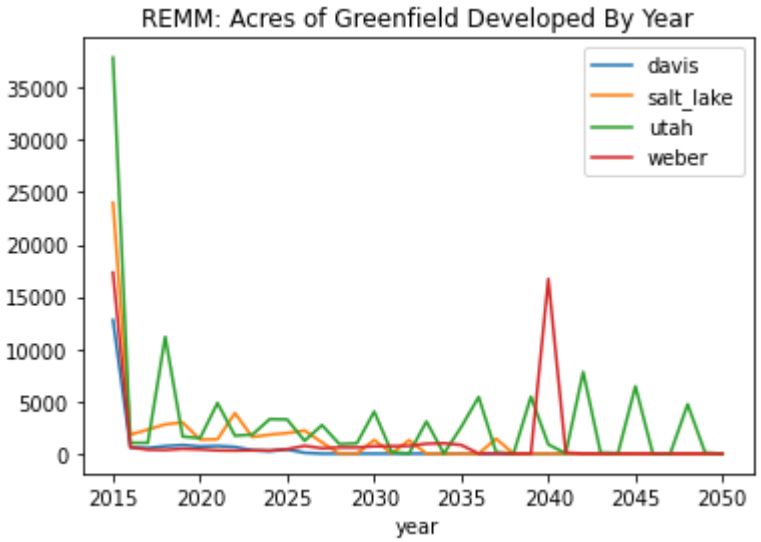
Out[15]:
```
<AxesSubplot:title={'center':'REMM: Wholesale Job Spaces Added By Year'}, xla
bel='year'>
```



acreage developed

In [16]:
```
df1 = create_county_dataframe('acreage_dev')
df1.set_index('year').plot(title='REMM: Acres of Greenfield Developed By Year'
)
```

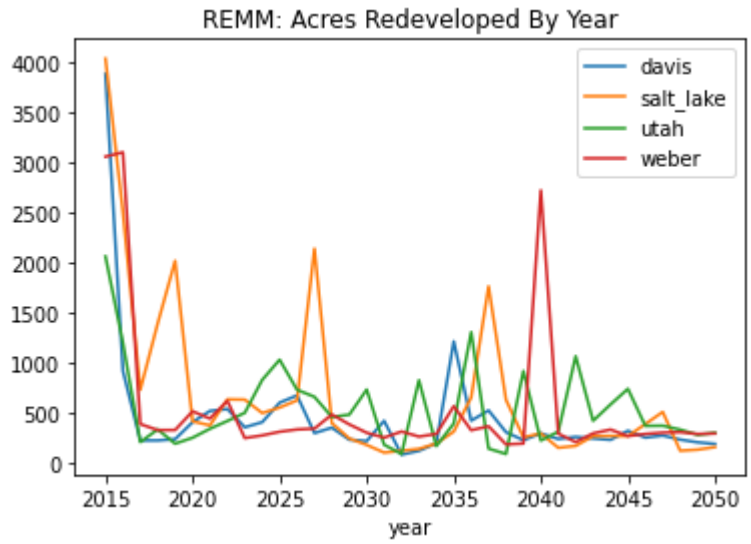
Out[16]:
```
<AxesSubplot:title={'center':'REMM: Acres of Greenfield Developed By Year'},
xlabel='year'>
```



acreage redeveloped

In [17]:
```
df2 = create_county_dataframe('acreage_redev')
df2.set_index('year').plot(title='REMM: Acres Redeveloped By Year')
```

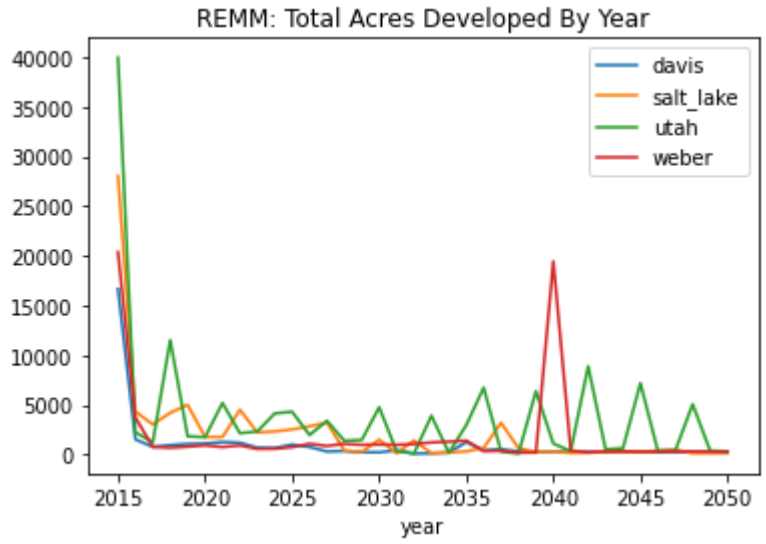
Out[17]:
```
<AxesSubplot:title={'center':'REMM: Acres Redeveloped By Year'}, xlabel='yea
r'>
```



total acreage developed

In [18]:
```
# get the total acreage developed by county (fix year)
df3 = df1 + df2
df3['year'] = df3['year']/2
df3.set_index('year').plot(title='REMM: Total Acres Developed By Year')
```

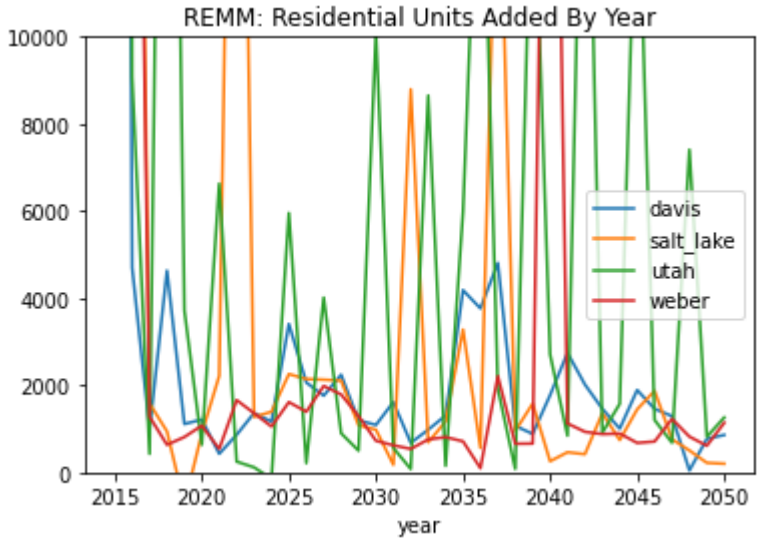
Out[18]:
```
<AxesSubplot:title={'center':'REMM: Total Acres Developed By Year'}, xlabel
='year'>
```



residential units added by year

In [19]:
```
df = create_county_dataframe('res_units_added')
df.set_index('year').plot(title='REMM: Residential Units Added By Year', ylim=(0,10000))
```

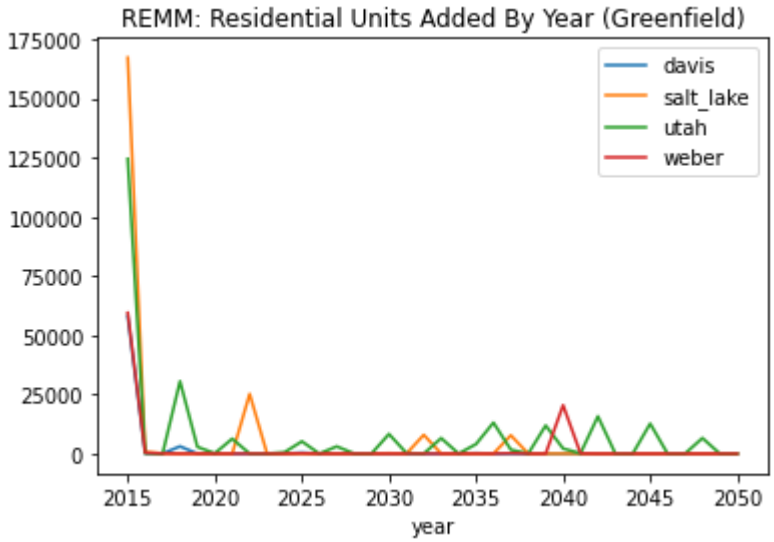
Out[19]:
```
<AxesSubplot:title={'center':'REMM: Residential Units Added By Year'}, xlabel='year'>
```



residential units added by year (development)

In [20]:
```
df = create_county_dataframe('res_units_added_dev')
df.set_index('year').plot(title='REMM: Residential Units Added By Year (Greenfield)')
```

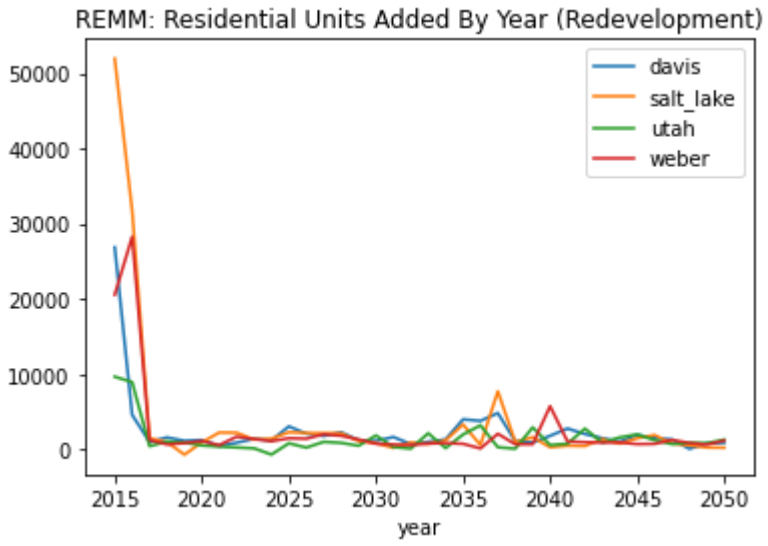
Out[20]:
```
<AxesSubplot:title={'center':'REMM: Residential Units Added By Year (Greenfield)'}, xlabel='year'>
```



residential units added by year (redevelopment)

In [21]:
```
df = create_county_dataframe('res_units_added_redev')
df.set_index('year').plot(title='REMM: Residential Units Added By Year (Redeve
lopment)')
```

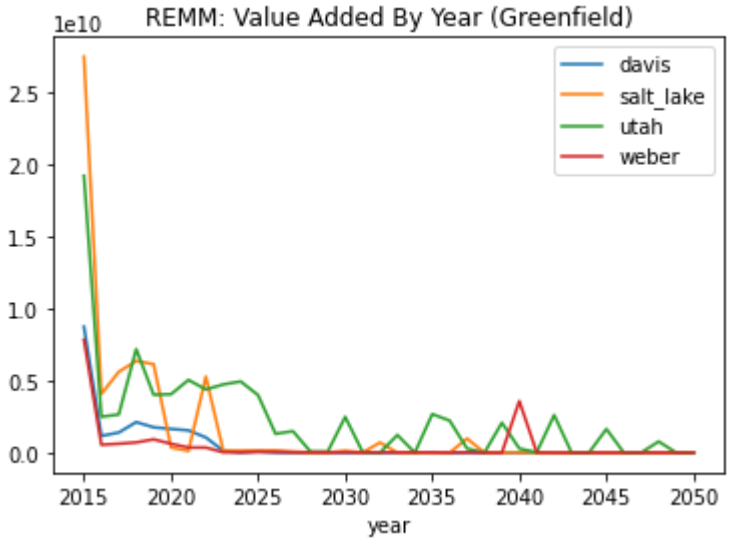
Out[21]:
```
<AxesSubplot:title={'center':'REMM: Residential Units Added By Year (Redevelo
pment)'}, xlabel='year'>
```



value added (development)

In [22]:
```
df1 = create_county_dataframe('value_added_dev')
df1.set_index('year').plot(title='REMM: Value Added By Year (Greenfield)')
```

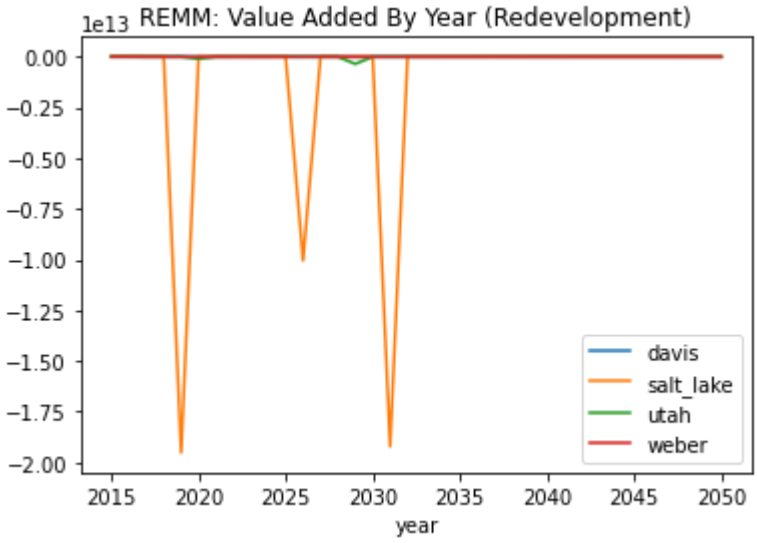
Out[22]:
```
<AxesSubplot:title={'center':'REMM: Value Added By Year (Greenfield)'}, xlabe
l='year'>
```



value added (redevelopment)

In [23]:
```
df2 = create_county_dataframe('value_added_redev')
df2.set_index('year').plot(title='REMM: Value Added By Year (Redevelopment)')
# df.set_index('year').plot(title='REMM: Value Added By Year (Redevelopment)',
ylim=(-1e10,1e10))
```

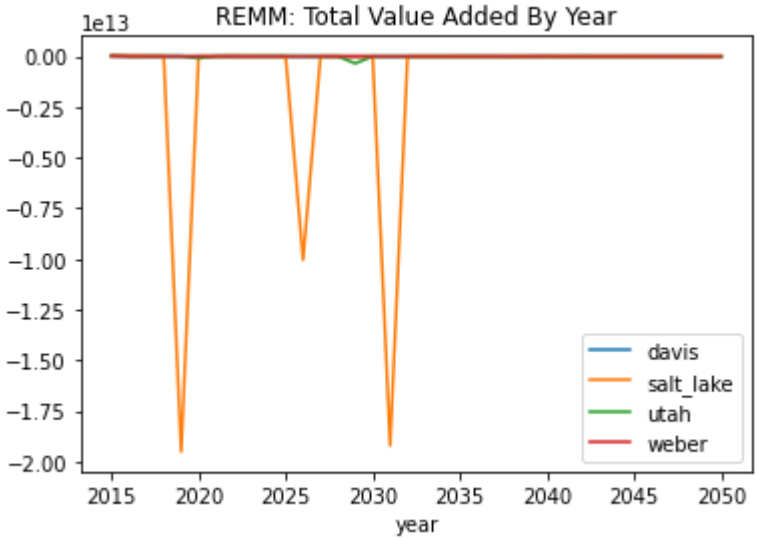
Out[23]:
```
<AxesSubplot:title={'center':'REMM: Value Added By Year (Redevelopment)'}, xl
abel='year'>
```



total value added

In [24]:
```
# get the total acreage developed by county (fix year)
df3 = df1 + df2
df3['year'] = df3['year']/2
df3.set_index('year').plot(title='REMM: Total Value Added By Year')
```

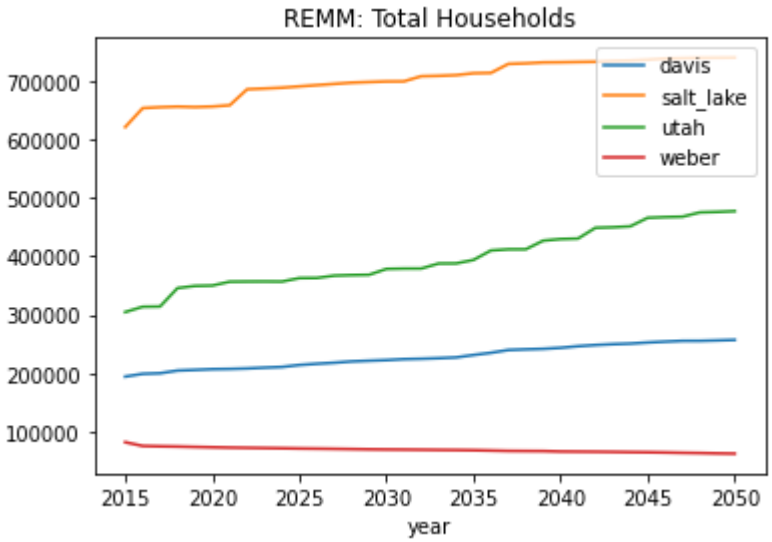
Out[24]:
```
<AxesSubplot:title={'center':'REMM: Total Value Added By Year'}, xlabel='yea
r'>
```



Total Households

In [25]:
```
df = create_county_dataframe('households_count')
df.set_index('year').plot(title='REMM: Total Households')
```

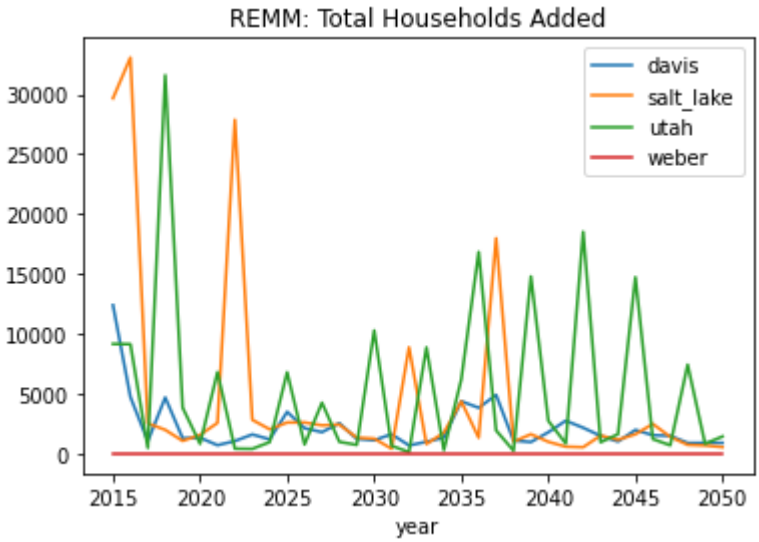
Out[25]: <AxesSubplot:title={'center':'REMM: Total Households'}, xlabel='year'>



Households Added

In [26]:
```
df = create_county_dataframe('households_added')
df.set_index('year').plot(title='REMM: Total Households Added')
```

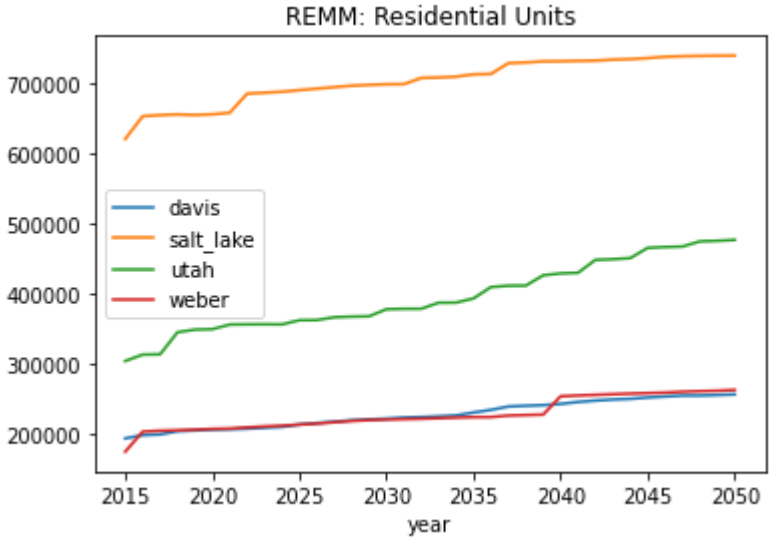
Out[26]: <AxesSubplot:title={'center':'REMM: Total Households Added'}, xlabel='year'>



Residential Units

In [27]:
```
df = create_county_dataframe('residential_units')
df.set_index('year').plot(title='REMM: Residential Units')
```

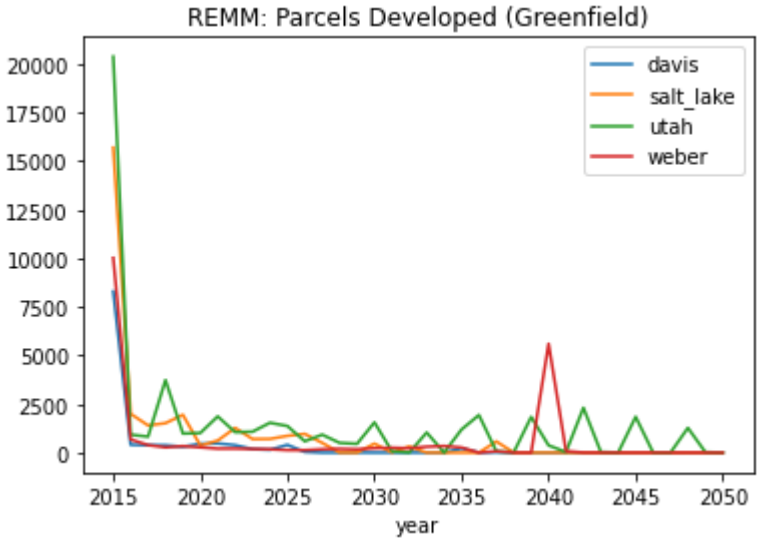
Out[27]:
```
<AxesSubplot:title={'center':'REMM: Residential Units'}, xlabel='year'>
```



Parcels Developed (Greenfield)

In [28]:
```
df = create_county_dataframe('was_developed')
df.set_index('year').plot(title='REMM: Parcels Developed (Greenfield)')
```

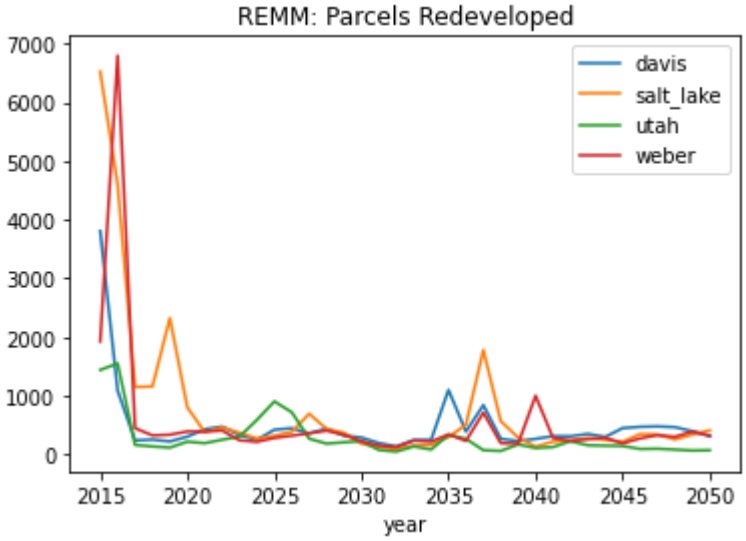
Out[28]:
```
<AxesSubplot:title={'center':'REMM: Parcels Developed (Greenfield)'}, xlabel
='year'>
```



Parcels Redeveloped

In [29]:
```
df = create_county_dataframe('was_redeveloped')
df.set_index('year').plot(title='REMM: Parcels Redeveloped')
```

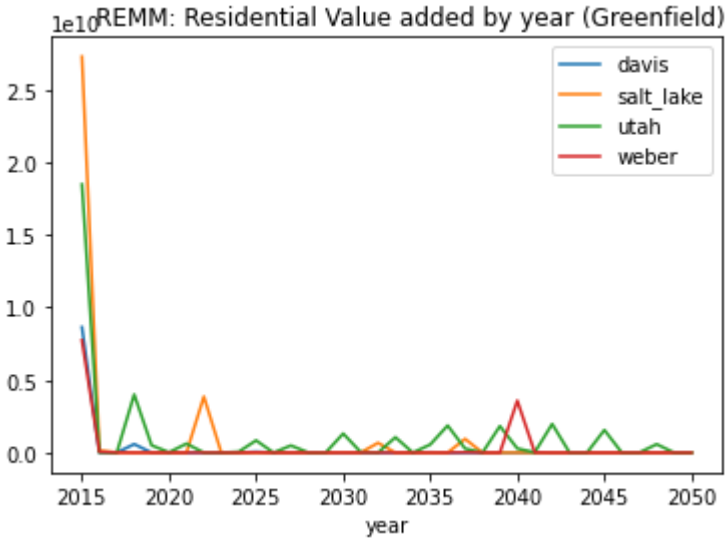
Out[29]:
```
<AxesSubplot:title={'center':'REMM: Parcels Redeveloped'}, xlabel='year'>
```



Residential Value added by year (Greenfield)

In [30]:
```
df = create_county_dataframe('value_added_dev_res')
df.set_index('year').plot(title='      REMM: Residential Value added by year
 (Greenfield)')
```

Out[30]:
```
<AxesSubplot:title={'center':'      REMM: Residential Value added by year (Gr
eenfield)'}, xlabel='year'>
```



Non-residential Value added by year (Greenfield)

In [31]:
```
df = create_county_dataframe('value_added_dev_nonres')
df.set_index('year').plot(title='                REMM: Non-Residential Value
 added by year (Greenfield)')
```

Out[31]:
```
<AxesSubplot:title={'center':'                REMM: Non-Residential Value ad
ded by year (Greenfield)'}, xlabel='year'>
```