Pocatello and Urban Form: 125 Years of Change

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Introduction

Urban growth analysis is important for quantifying, visualizing, and taking stock of how land and the resources it provides are used. Meeting the needs of the present while not compromising future generations ability to meet their needs is the essence of sustainability (World Commission on Environment and Development, 1987). Growing in a sustainable manner is particularly important for Pocatello as its growth to the north is limited by a neighboring municipality, and is slowly funneled to a bottleneck southeastward. Remote sensing methods for analyzing growth patterns over time are hampered by a dearth of historical data, and poor resolution on time series data from satellites such as Landsat, whose 30+ years have produced the National Land Cover Dataset, but have poor accuracy when depicting low density growth, about 26% (Irwin & Bockstael, 2007). For this reason an alternative approach is necessary. This study analyzed Pocatello's growth for almost 125 years. By combining building footprints, annexation data, enumeration boundaries, as well as, aerial photography and historical rasters a comprehensive dataset showing urban form and built extents on a decadal basis was combined with census data to quantify changes in the Pocatello's size, population, and housing density.

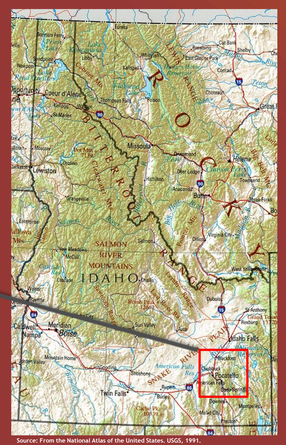
Objective 1:
Describe urban growth in Pocatello over the course of its history.

Objective 2:
Use algorithmic analysis to quantitatively assess trends in sustainability over time.

Study Area

The study area consisted of the city of Pocatello across its history from 1892 till the present. As time has progressed the city has grown larger and larger increasing ten fold in size using de jure boundaries, while the de facto built area excluding the railroad yard has increased by six-fold, while its legal boundaries have increased by an order of magnitude.

Figure 1. Pocatello Area Map



Source: From the National Atlas of the United States. USGS, 1991.

Methods

This study sought to examine Pocatello's growth on a decadal basis from its founding until today. Using a combination of modern building footprints, earlier snapshots of the city on a decadal basis were constructed back to 1941 by editing the footprint layer, as well as, adding and removing buildings when needed. For years before 1941, historic rasters were geo-referenced and building footprints extracted therefrom. This led to a detailed reconstruction buildings each decade and also the built area for each snapshot. Green space and the railroads were digitized also. Historical built extent layers were constructed and for quantitative purposes green space and the railroad yard were removed from each built extent layer to produce a new built extent layer who's area was not skewed by the pre-existing railroad and valuable sustainable green space. Relying on regression equations derived from census year data, population and households for image years were calculated. By dividing these population and households by built-up area, excluding railroad and green space, density of both were derived.

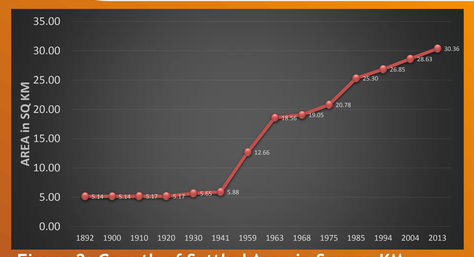


Figure 2: Growth of Settled Area in Square KM

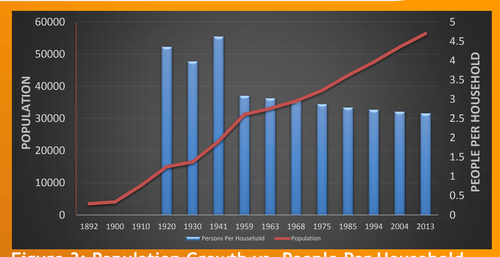


Figure 3: Population Growth vs. People Per Household

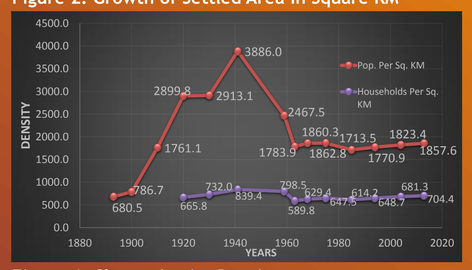


Figure 4: Change in city Density

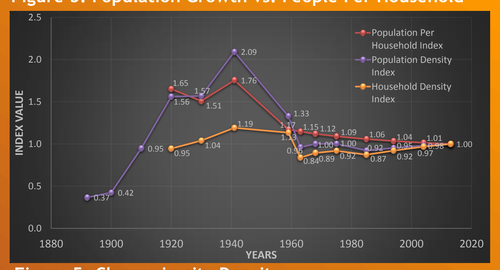


Figure 5: Change in city Density

Results

Preliminary results for the past 125 years indicate that for the first 60 or so years of its Pocatello's history it's density increased remarkably, peaking around 1941. Between 1959 and 1968 both population density and household density dropped markedly. This corresponded with the annexation of the neighboring city Alameda. Thereafter, population density stabilized with little fluctuation. However, though development has stayed relatively dense distance from the core continues to increase as areas available for development become limited. The relative consistency of household per developed kilometer, but large decrease from 1941 to 1963 reflects a decrease in persons per household. Living arrangements, rather than construction patterns lead to a decrease in sustainability as measured by density, rather than having a worse built environment.

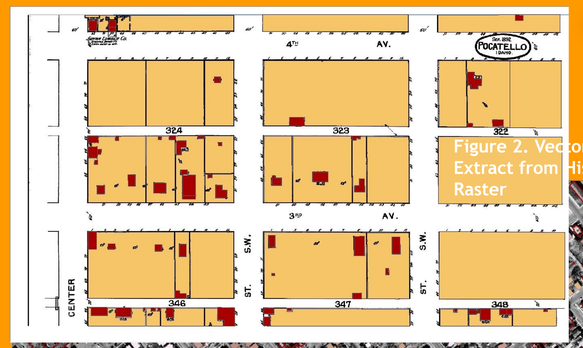


Figure 2. Vector Data Extract from Historical Raster

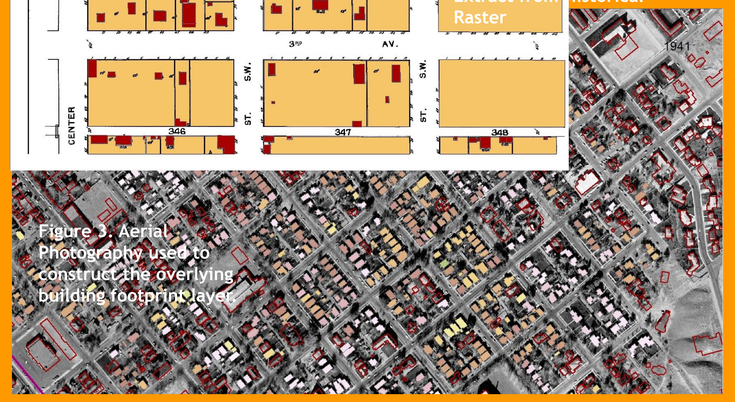


Figure 3. Aerial Photography used to construct the overlying building footprint layer.

Discussion

Pocatello's density peaks around World War II followed by a sharp decrease and leveling out in the following years. Urbanization and high density coincide with the great depression and onset of World War II. Practicality and efficiency in lean times could have played a major role. Post-war changes in urban form such as suburbanization outside of the core are apparent from the imagery and a sharp decrease in population density followed by leveling out coincide with the emergence of this urban form. Demographic changes and house hold make up seen in the data could be indicative of sociological change. A decrease in persons per household has held constant up until 2010 where it increased for the first time. Market forces, the great recession, is a possible culprit for this phenomenon, though it is still well below its peak in 1900.

Future Research

Over the next few months more detailed analysis of the cities growth will occur. Not only will city and household density be addressed from 1890 to the present, but other aspects of urban growth and form which contribute to sustainability will be analyzed. Next the creation of a sustainability algorithm will be created which will accept building footprints, built extent, city boundaries, and population demographics and will process this data to return population density, housing density, weighted housing dispersion, green space to built area ratio, distance to the nearest urban center, as well as, an overall sprawl score and sustainability score based on the above criteria.

References

Irwin, E. G., & Bockstael, N. E. (2007). The evolution of urban sprawl: evidence of spatial heterogeneity and land fragmentation. *Proceedings of the National Academy of Sciences of the United States of America*, *104*(52), 20672–20677. http://doi.org/10.1073/pnas.0705527105
World Commission on Environment and Development. (1987). Report of the World Commission on Environment and Development: Our Common Future (The Brundtland Report). *Medicine, Conflict and Survival*, *4*(1), 300. http://doi.org/10.1080/07488008808408783

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