Where to experience the beer-scene in Portland Oregon?

And how does Portland Maine compare?

Capstone Project - The Battle of Neighborhoods

By Peter J. Lindner, Ph.D.

Introduction

Portland Oregon has been regularly ranked as one of the best beer cities in the world (i.e. Readers Digest, 2019, Oregonian, 2018, SmartAsset, 2019). This is due to the large number of bars, taphouses, and breweries. Specifi cally the greater Portland area has more than 100 breweries. This project aims to answer the problem of where to go in Portland for the day to visit the most number of breweries with the least amount of travel.

This can be used to solve business problems for tour businesses (BeerQuest, BREWVANA, BrewGroupPDX), for individual Breweries to determine if there are other Breweries they can collaborate with, and for individuals who want to visit Portland, Oregon.

The output of this model can be used for any city, and for a multitude of categories from FourSquare.

Data

Using FourSquare the location of the venues with the category "Brewery" will be identified and put into a dataframe. The dataframe will include the name of the venue, the category, as well as the latitude and longitude (as shown in Figure 1)

	name	categories	lat	lng
0	Cascade Brewing Barrel House	Brewery	45.516603	-122.655837
1	Base Camp Brewing	Brewery	45.519896	-122.656464
2	Deschutes Brewery Portland Public House	Brewery	45.524544	-122.681982
3	Culmination Brewing	Brewery	45.528877	-122.643690
4	Hair of the Dog Brewery & Tasting Room	Brewery	45.515866	-122.665682
5	Hopworks Urban Brewery	Brewery	45.496928	-122.634908
6	Modern Times Belmont Fermentorium	Brewery	45.516346	-122.659457
7	Fire on the Mountain	Brewery	45.522803	-122.648332
8	Wayfinder Beer	Brewery	45.520562	-122.663460
9	Migration Brewing	Brewery	45.526289	-122.636384

Figure 1. Initial dataframe of breweries from FourSquare showing the first 10 rows.

Categories are listed despite searching for Brewery for two reasons. This is done for two reasons. One to double check that Breweries are specifically searched for, second because for some locations there can be more than one category.

Methodology

The locations are identified using the FourSquare Venue Category library (Venue Categories). For this project the category of 'Brewery' is used, through the code showed in Table 1. Other categories are also listed as potential uses of this project.

Venue	**Code**
Brewery	50327c8591d4c4b30a586d5d
Coffee Shop	4bf58dd8d48988d1e0931735
Museum	4bf58dd8d48988d181941735
Food Trucks	4bf58dd8d48988d1cb941735
Pet Café	56aa371be4b08b9a8d573508

Table 1. Example FourSquare venues and their corresponding codes.

The center of Portland, Oregon was initially determined using geolocator. Looking at the value of latitude and longitude that came out, it appeared to be the center of Downtown Portland. This value was close but instead the geographic middle of Portland Oregon was used at a value of (45.524190 -122.6373). A radius of 8000m or roughly 5 miles is used to look for the breweries.

With the locations cleanly identified in a DataFrame, the locations are then clustered using Density-Based Spatial Clustering of Applications (DBSCAN). DBSCAN is used as this is a problem of spatial locations; this problem looks to seek out the nearest cluster of where most of the brewery locations are expected to be outliers, with a few small groupings of ideal locations to visit.

From DBSCAN two keys factors are required to be identified; epsilon and minimum number of samples.

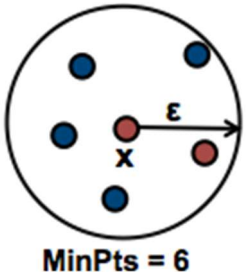


Figure 2. Example of a DBSCAN cluster showing epsilon and minimum number of points. Epsilon represents the radius from the center point X, and there is a requirement of 6 minimum points met to identify this as a cluster (DBSCAN: density-based clustering for discovering clusters in large datasets with noise - Unsupervised Machine Learning)

The minimum number of samples, min_samples, is defined as the number of samples needed surrounded by a point to be considered a core point. This value will include the sample point itself. For this study the minimum number of samples is set to a value of 3. This means the smallest cluster that can be formed will be made up of 3 breweries. This was picked as a personal preference as the author believes at least 3 locations would be needed for a good brewery tour.

The second value epsilon is a bit more difficult to identify. Epsilon is defined as the maximum distance between two locations for one to be considered clustered with the other. This does not set a maximum bound of distance on the overall cluster, but the distance from point to point. It was a bit more complicated to determine the key value of epsilon. Initially the methodology was to determine the ideal value of epsilon through a mathematical process. In this process the average distance is calculated for a set number of clustered points.

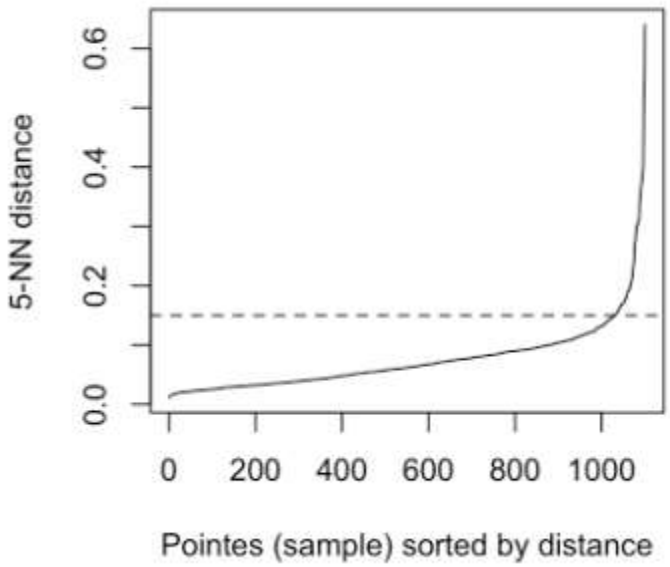


Figure 3. Example of a defining ideal epsilon (y axis) for a DBSCAN cluster. (DBSCAN: density-based clustering for discovering clusters in large datasets with noise - Unsupervised Machine Learning)

When plotted this trend will have a sudden rate of change. This sudden rate of change is identified as the ideal distance between nearest neighbors, this value is used as epsilon (DBSCAN Python Example: The Optimal Value for Epsilon (EPS)). This method worked mathematically, but didn't result in a practical finding key cluster locations. For this reason a smaller value of epsilon was chosen to solve this problem.

Each location is then assigned a cluster value. This dataframe is then combined with the data from FourSquare and combined to make

	name	categories	lat	lng	Clus_DB
0	Cascade Brewing Barrel House	Brewery	45.516603	-122.655837	2
1	Base Camp Brewing	Brewery	45.519896	-122.656464	1
2	Deschutes Brewery Portland Public House	Brewery	45.524544	-122.681982	3
3	Culmination Brewing	Brewery	45.528877	-122.643690	1
4	Hair of the Dog Brewery & Tasting Room	Brewery	45.515866	-122.665682	1

Figure 4. Data Frame showing FourSquare information and DBSCAN clustering value (Clus_DB) combined.

Results

In this section three sets of results will be identified. These will be Portland Oregon with calculated Epsilon, Portland Oregon with Best Epsilon value, and Portland Maine with the best epsilon value for comparison. First when identifiy the breweries

Portland, Oregon Brewery Clustering

From this model there were 99 breweries found within a 5 mile radius of the geographic center of Portland Oregon. These locations are depicted in Figure 5 below.

Figure 5. Brewery locations within a 5 mile radius of Portland Oregon.

Already it appears as if there are a few locations where the clustering will be higher than others. Specifically in the center by downtown Portland. When running the model the minimum number of neighbors will be set at 3 for Breweries.

Calculated Epsilon

First the ideal value of epsilon is calculated by determining the average distance between groupings of all of these 99 points. The ideal epsilon value occurs at the elbow of the curve. The elbow of the curve is determined by taking the first derivative of the epsilon value, the peak of this derivative would clearly identify the x axis value needed, to identify the peak.

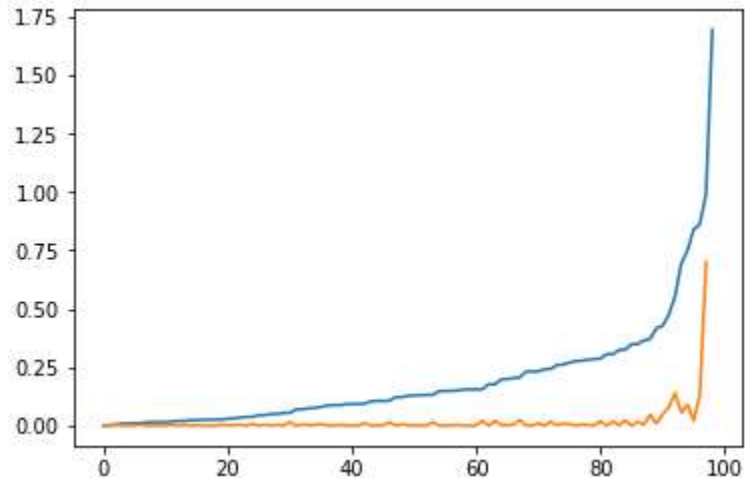


Figure 6. Epsilon values shown in blue, and the first derivative of epsilon in orange.

For this set of data the ideal value of epsilon is found to be 0.550 for an x value of 92. Running this through our model the following clustering data is resulted shown in Figure 7.

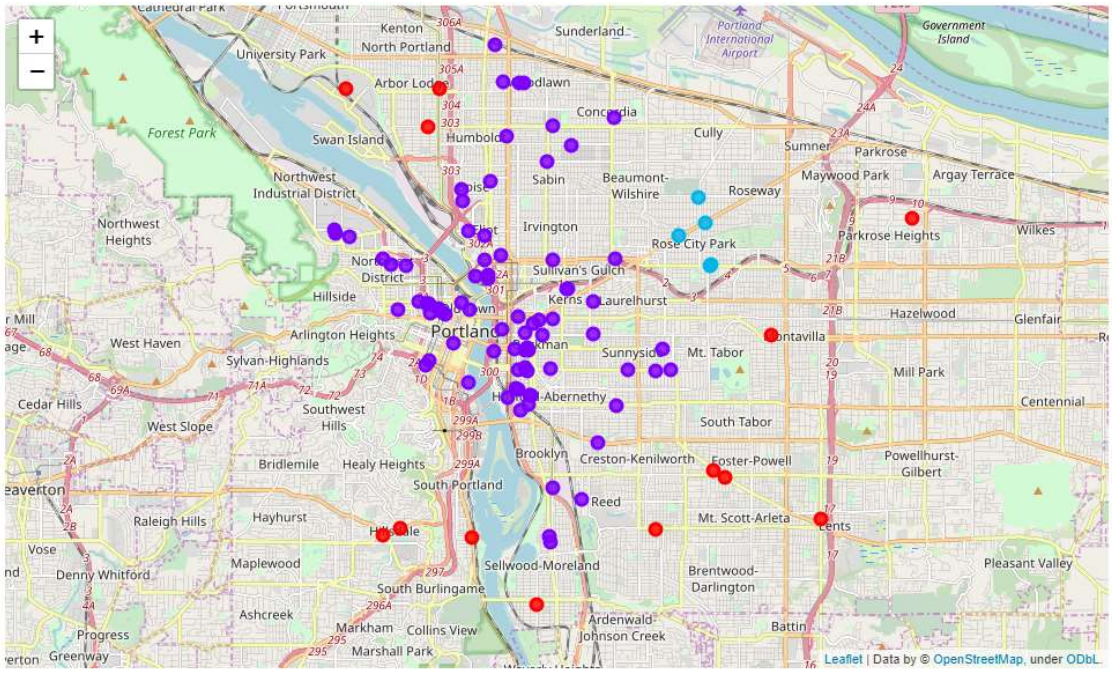


Figure 7. Portland Oregon Breweries clustered with DBSCAN with calculated Epsilon. Outliers are in Red, the main cluster is in purple, with a minor cluster in light blue.

This output although considered ideal, appears to cluster the data well from a visual standpoint, but does not answer the question of where to go. This answer would say, you can't go wrong anywhere in Portland Oregon as there are so many Breweries around.

Using this information, the value of epsilon was reduced from 0.550 and ran to identify more reasonable clusters; discussed in the next section.

Best Epsilon

Reducing the value of Epsilon to 0.1 gives the best result to answering the question of where to go to experience the beer-scene in Portland Oregon.

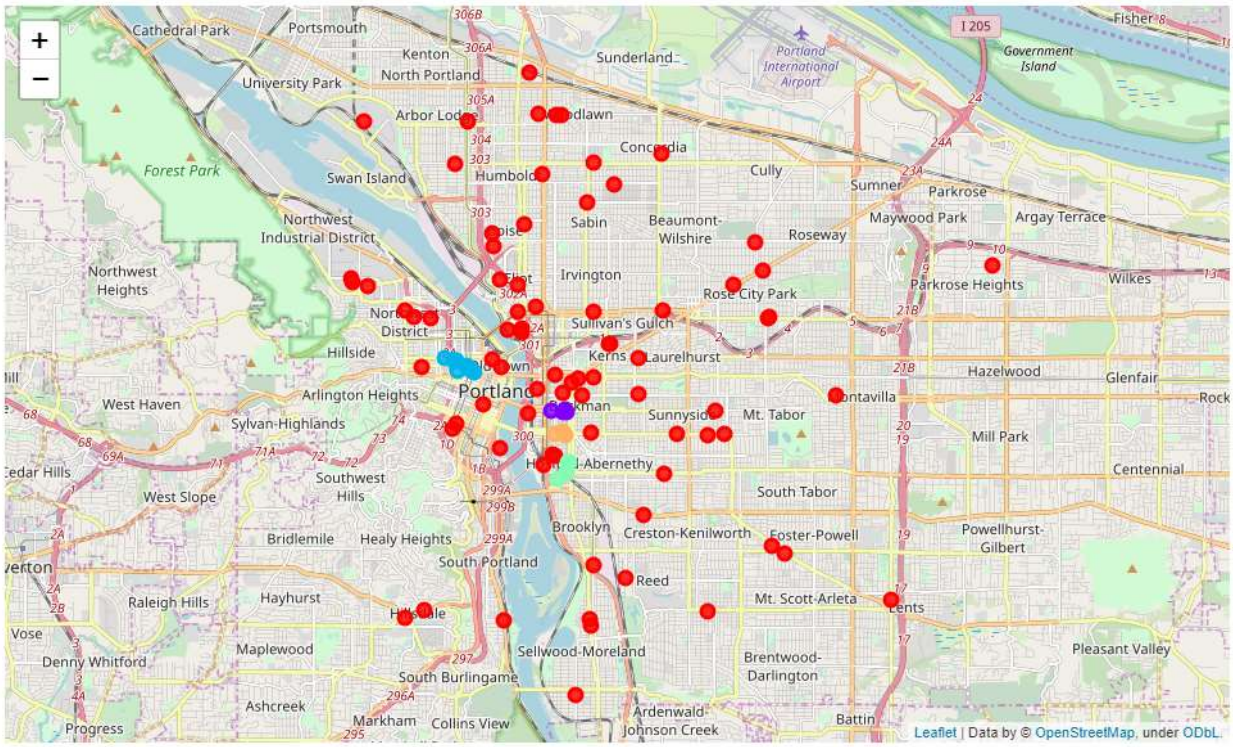


Figure 8. Portland Oregon Breweries clustered with DBSCAN with Epsilon = 0.1. Outliers are in Red, with 4 clusters in purple, light blue, orange, and green.

This resulted in the best outcome, showing 4 key areas of Portland Oregon, showing clusters of breweries of 3 or more. Below are the lists of the location

Cluster	Breweries	Zoomed Map
2	Cascade Brewing Barrel House Modern Times Belmont Fermentorium Schilling Cider House Portland Rogue Eastside Pub & Pilot Brewery	

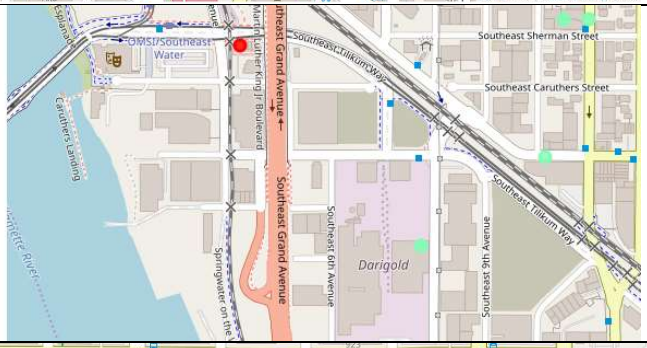
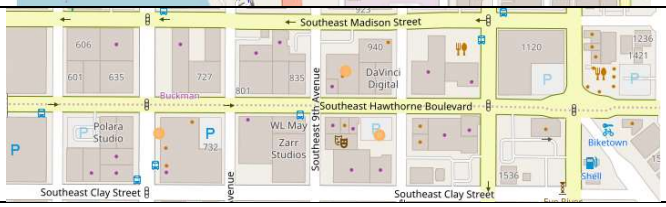
3	Deschutes Brewery Portland Public House Rogue Ales Public House & Distillery Von Ebert Brewing 10 Barrel Brewing Back Pedal Brewing Backwoods Brewing Company McMenamins Mission Theater Splash Bar & Brewing 10 Barrel Rooftop Little Big Burger	
4	Grixsen Brewing Company Baerlic Brewing Ladd Taphouse Vagabond Brewing PDX	
5	Lucky Labrador Brew Pub Eastside Distilling Away Days Brewing	

Table 2. Where to visit Breweries in Portland, Oregon. Key Clusters.

This table represents the key locations of where to visit to experience the beer-scene in Portland Oregon.

Portland, Maine Brewery Clustering

This model was also used to compare Portland Maine with Portland Oregon.

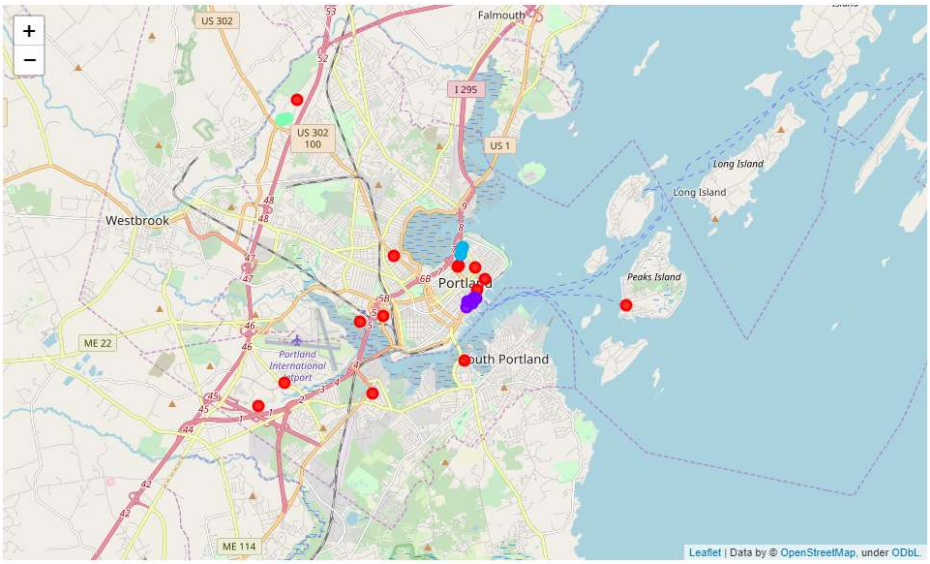
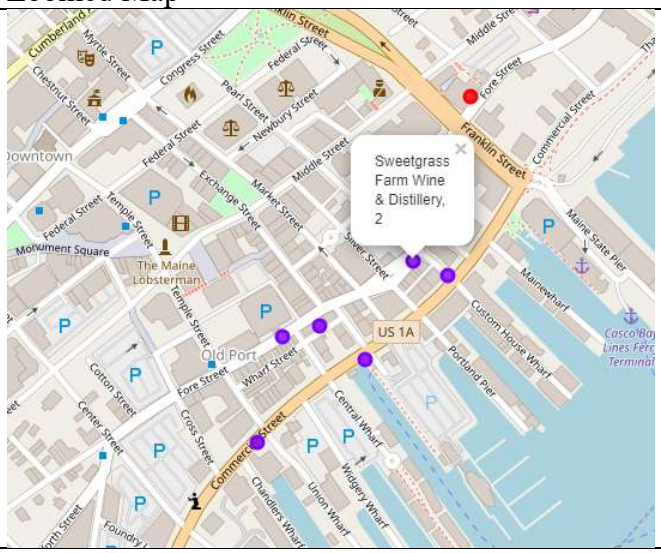


Figure 9. Portland, Maine Breweries clustered with DBSCAN with Epsilon = 0.1. Outliers are in Red, with 3 clusters in purple, light blue, and green.

Portland, Maine has 29 Breweries and we have 3 clusters. One of the clusters is pretty far from the center of town but appears to be a center for brewing (Cluster 4). The details are shown below in Table 3.

Cluster	Breweries	Zoomed Map
2	Portland Mash Tun Liquid Riot Bottling Company Gritty McDuffs Brewing Company Sweetgrass Farm Wine & Distillery The Portland Beer Hub Maine Beer Tours	

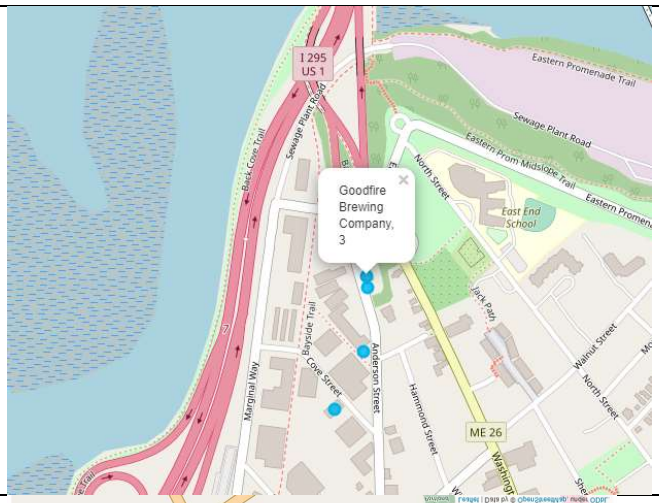
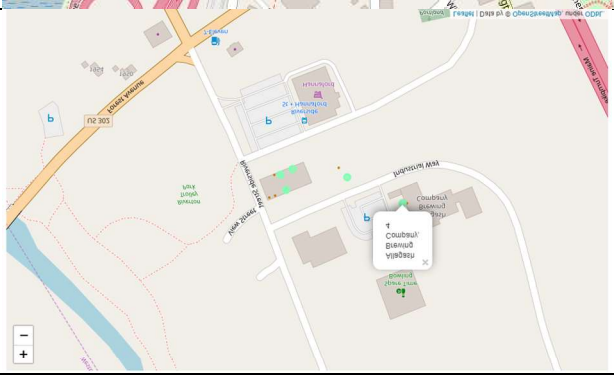
3	Lone Pine Brewing Goodfire Brewing Company Urban Farm Fermentory Brewery Extrava	
4	Allagash Brewing Company Foundation Brewing Company Austin Street Brewery Definitive Brewing Company Battery Steele Brewing	

Table 3. Where to visit Breweries in Portland, Maine. Key Clusters.

Discussion

Determining the ideal distance for Portland Oregon did not work will likely due to the large number of Breweries in the city. It would be best to program this to have a max limit number of locations that could back out a key epsilon value. Considering that when touring, time is generally a factor; i.e. its not reasonable to visit 15+ breweries in a single day. Instead if the ideal value of epsilon can be used to back out the max number of clusters being created, this can then determine the key lcoations.

For this model the value of 0.1 for epsilon seemed to work ideal. It would also be best to determine the practical distance of this epsilon value for the folium maps or for the specific data set. This can also be used to be able to identify quickly if a 'walking tour' for example is practical for a specific venue and city combination.

Conclusion

Comparing Portland, Maine to Portland, Oregon it is clear that Portland Oregon is the superior beer drinking city. Portland Maine has fewer breweries than as Portland Oregon, at 29 vs. 99 (for a 5 mile radius). Despite this Portland Maine still has a few key clusters of breweries listed in Table 3. The author of this report will be sure to visit these areas if ever in the Portland Maine area.

There are many places to go to experience the beer-scene in Portland Oregon. If there is a limit of time, or if you would like to see the greatest number of Breweries in the shortest amount of time, this study has identified 4 key clusters of Breweries to visit. The largest cluster having 10 venues listed, shown below in Table 4.

Deschutes Brewery Portland Public House
Rogue Ales Public House & Distillery
Von Ebert Brewing
10 Barrel Brewing
Back Pedal Brewing
Backwoods Brewing Company
McMenamins Mission Theater
Splash Bar & Brewing
10 Barrel Rooftop
Little Big Burger

Table 3. Largest cluster of Breweries in Portland, Oregon.

The author would suggest starting with Deschutes Brewery Portland Public House, and enjoying a Mirror Pond Pale Ale.