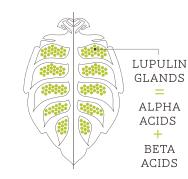
# DIEGROWN HOPS

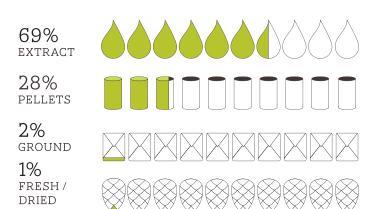
Hops and the economy of Washington state

#### WHAT ARE HOPS?

Hops are female flowers that grow on a vine. Lupulin glands inside the base of the bud cone hold Essential Oils, Alpha Acids, and beta acids, which combine to create the unique scents and bitter tastes in beer.



#### WHERE THE HOPS GO



#### HOPS IN BEER

#### ALPHA HOPS

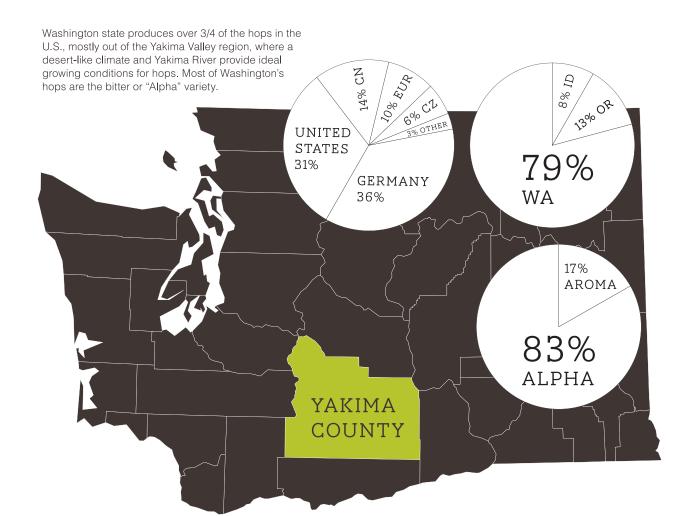
Alpha hops contain high Alpha Acids from resins in the Lupulin glands which provide the harsh, sharp, or heavy bitter flavors and scents in beer.

Aroma hops contain volatile essential oils, high Beta Acids, and lower Alpha Acids. Although present in only 0.5–3.0% of the whole cone, these oils provide the fragrances such as citrus, floral, and spice in

OF THE HOPS

GROWN IN THE U.S. ARE GROWN IN WASHINGTON

#### WHERE THE HOPS GROW



#### HOPS IN THE BEER: THE BREWING PROCESS







Hot water ("Liquor") is mixed with crushed malted barlev ("Grist"), converting the starches from the grain in sugars.



2 LAUTER

After mashing, the wort is separated from the spent grain. First wort hops can be added at this stage.



## 3 BOIL

The wort is boiled with hops at various times for the qualities of bitterness, flavor, and aroma. The longer it boils, the more bitter the beer will be. Aroma hops are added during cooling to preserve their essential oils



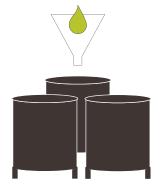


+30



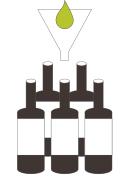
# 4 FERMENT

A brewer uses Lager or Ale yeast in fermentation. Lager yeast requires a cooler and longer fermentation, settling to the bottom when it's used up. Ale yeast needs a shorte warmer fermentation, and rises to the top.



# 5 CONDITION

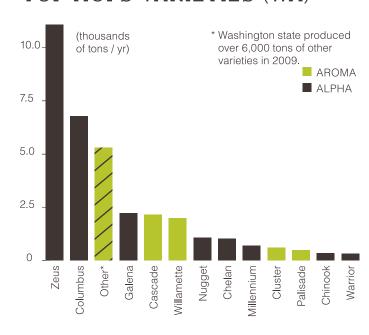
After the first fermentation, the beer is matured in a second fermentation stage. This adds natural carbonation, complexity and character.



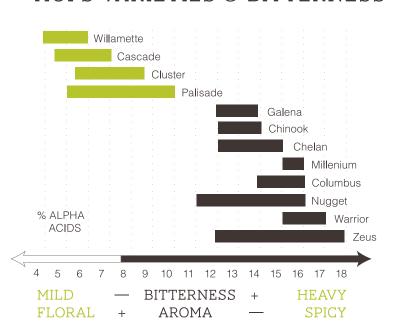
# 6 BOTTLE

Packaging into kegs, casks, bottles, or cans.

# TOP HOPS VARIETIES (WA)

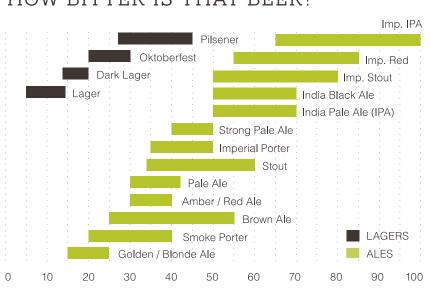


# HOPS VARIETIES & BITTERNESS

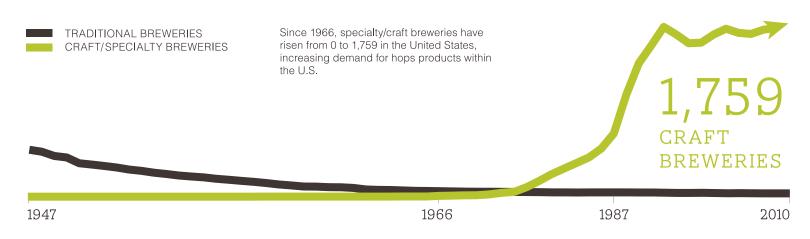


#### HOW BITTER IS THAT BEER?

INTERNATIONAL BITTERNESS UNITS (IBU), AMERICAN BEERS



### CRAFT BREWING HOPS UP



### HOPPING BREWERIES IN THE NATION

STATE	TOTAL BREWERIES	POPULATION PER BREWERY	PER CAPITA RANK (2008)
VERMONT	19	32,700	1
MONTANA	27	35,800	2
OREGON	93	40,800	3
MAINE	31	42,500	4
COLORADO	103	48,000	5
ALASKA	14	49,000	6
WYOMING	10	53,000	7
WASHINGTON	100	65,500	8

Amy J. Keeling, 2010