

Modern Hopping Techniques in West Coast IPA

Learning from Hazy IPA to Make the Best Style
Better



#HOMEBREWCON



Homebrew Con

Recording Archive



<https://www.homebrewersassociation.org/seminars/>





Denny Conn

Author, Podcaster, Skeptic

Experimental Brewing



Drew Beechum

Author, Podcaster, Raconteur

Experimental Brewing

So Why This Talk...



- Hazies Have Been Having All The Fun
 - All the Hops, All the Glamour, Abusing the word “Juicy”
 - We Think That’s Unfair
- We both prefer a classic IPA



West Coast IPA

- Clear – minimal haze
- Crisp – whether through water or hopping
- Bitter – BU:GU ratio often around 1:1
- Prominent hop citrus/pine/tropical character

Hazy IPA

- Hazy to murky
- Soft, rich round mouthfeel
- Low “IBU” bitterness – other bitterness present
- Aggressive hop sensory with an emphasis on fruit and tropical characters



Three Schools of West Coast IPA

1

Traditional

- Crystal Malt *gasp*
 - 10% C60
- Hard bite
- No longer ubiquitous

Northwest

- Uses some crystal or Munich
- Resinous hop characters

San Diego

- Pale or pilsner focused
- All the hops



Schools

- Plenty of cross pollination and variations within the styles
- All still clear, bright, bitter and hop forward

Enter – “**THE MODERN WEST COAST**”

- Bitterness levels are dropping. Maybe. Sometimes.
- Emphasis on aroma/flavor leading to “new” styles of IPA.
- Still bitter, just a little less teeth shatteringly so!

(we don't need to discuss Brut, Cold, Black, White, Red, Brown, Sour, Milkshake, etc... that's a whole other discussion about what's an IPA)



Ways to Think About Hops

Using Your Noodle to a Better IPA



Examine Your Goals

What Are You Trying To Make?

- Picture the beer in your mind
- What's the Malt Flavor? Yeast Flavor?
- What's the Strength?
- How Bitter?
- What Flavors and Aromas are You Wanting?
 - Classic Pine and Citrus
 - Tropical



Fruity Hops

So Many New Flavors

- Do big fruit bomb hops work in a WC IPA?
- Tropical fruit mixed with citrus follows onto the classic profile
- Coconut and Woody notes seem wrong



Malt Choices

Does Malt matter in an IPA

- Absolutely!
- Stripped down bills require better malt
 - Many choices - heritage, craft, etc
- Crystal vs. Toast Debate
 - Crystal may damage hop characters due to oxidation
- Different malts provide different levels of bound thiols
-And No Oats



Water

Gypsum Brewing

- Clean, filtered water
- Sulfate lets hops shine
- Sulfate:Chloride – don't over do it
- Paler styles need less Sulfate
- Don't skimp on acid – more later



Yeast Choice

Not Just 1056 vs 1318

- Beyond biotransformation, yeast can transform hop perception.
- 1056/Cal and 1318/London are safe, understood choices
- Reduced Ester Choices:
 - Kölsch Strains
 - Lager strains (34/70, Novalager)



Choosing Hops

This used to be so easy... “I’ve got Cascade and Centennial... what else do I need?”



Hop Changes Over The Years

- Pre-Craft
 - Hops focused on alpha for bitterness or “spicy, herbal, noble” flavor characters
- Classic Craft
 - Cascade, Chinook, Centennial, Columbus/Tomahawk/Zeus
 - Embracing the “cattiness” of American hops with citrus and “dank”
- Low CoHo
 - Early 2000’s – Amarillo, Simcoe and America’s favorite Citra
 - Still citrus, but now with pineapple and tropical creeping in
- The Tropical (Current)
 - Absolute explosion – rise of Neomexicanus – big fruit bombs, coconut and vanilla
 - Yakima Chief – lists 130+ varieties, Barth Haas – 99 varieties



The Old School Way

- Clean Neutral Bittering Hop (e.g. Warrior)
 - A little Chinook for “punch” is lovely
- Choose a flavor profile and run with it
 - Citrus: Cascade, Centennial, Simcoe, Citra
 - Pine/Dank: Columbus, Chinook
 - Tropical: Strata, Citra, Brü-1



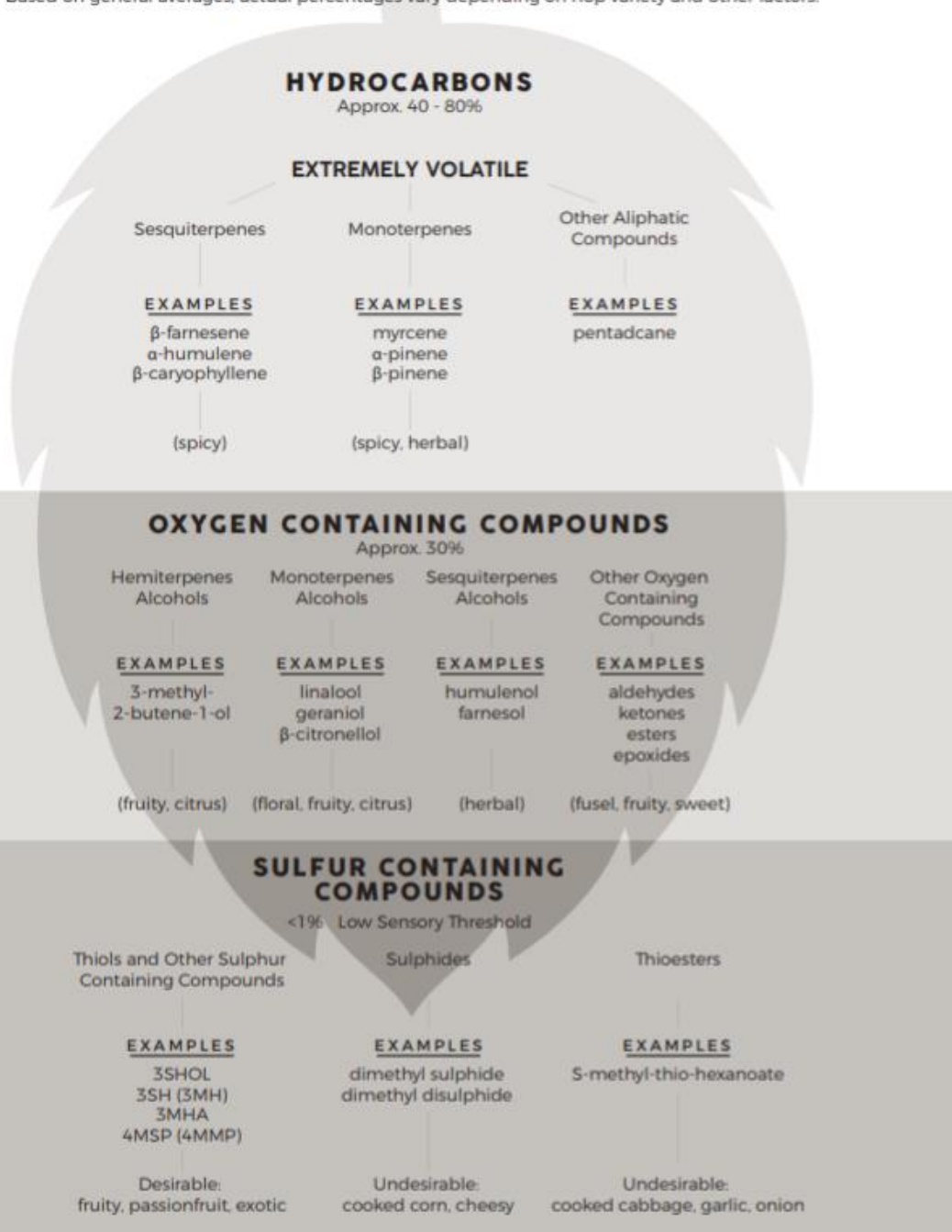
Other Thoughts

- Stop Focusing on the IBU
 - IBU is practically useless for describing hoppiness in a boldly hopped beer.
- Maximize What You Get From Your Hops, not the Amount or Varieties of
- And a good example of that.... (after a brief break)



CHEMICAL COMPOSITIONS OF THE ESSENTIAL OILS OF HOPS

Based on general averages, actual percentages vary depending on hop variety and other factors.



Hop Chemistry

- Alpha/Beta Acids
- Hydrocarbons
 - Myrcene (Resinous), Caryophyllene (Woody), Farnesene (woody, citrus)
- Monoterpene Alcohols
 - Linalool (sweet, fruity, floral), Geraniol (rosy, floral)
- Sulfur Compounds
 - Thiols like 3MH (citrus, tropical), 3MHA (guava, tropical), 4MMP (passionfruit, currants)

Credit: [ScottJanish.com](https://scottjanish.com)

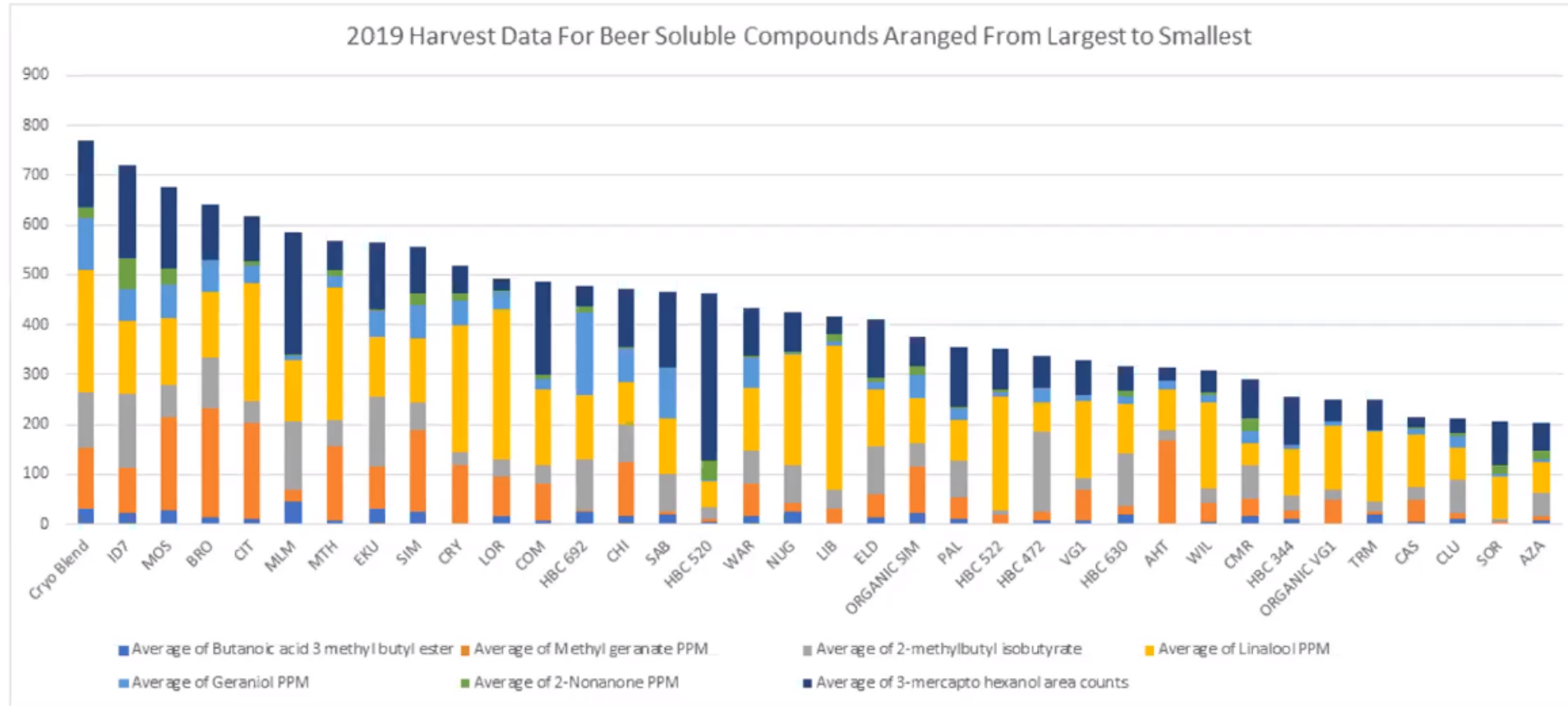


Design Philosophies

- “Survivable” Compounds
 - Research done by YCH and Tom Shellhammer.
 - How to choose hops “smartly”
 - Lean on what they deliver and lean on what “survives” the brewing process
- Survivable Compounds
 - E.g. Gerianol, linalool.
 - Survive the violence of brewing
 - Choose varieties wisely by virtue of the chemical makeup



“SURVIVABLES”



More Survivable:

1. Cryo Pop
2. Idaho 7
3. Mosaic
4. Brü-1
5. Citra

Less Survivable:

1. Triumph
2. Cascade
3. Cluster
4. Sorachi Ace
5. Azacca

(for 2019)

Survivable Philosophy

- Hops with high survivables can be used early, but will still work well late
- Use low survivable hops late, like post fermentation dry hopping
- Blend hops to maximize beneficial compounds and complexity
 - Loral is high in linalool, Talus in geraniol – work well together
 - Loral and Crystal both high in linalool, less dynamic combo

High concentrations of survivables in whirlpool and active fermentation can create conditions for beneficial biotransformation

i.e., Idaho 7 whirlpool, active fermentation dry hop with Sabro and Simcoe

Products

So many, wonderful tasty nosegays



Hop Products

- Whole Cone Hops
 - Great for filtering
 - Less processed, less damaged, shorter lifespan
- Fresh Hops
 - Now frozen! But makes a radically different beer
- T-90 pellets – most common
 - Used everywhere in the process
- T-45 pellets – what happened to them?
 - Process change to.. Something on the next slide

Concentrated Hop Products

- Deliver more hop compounds with less vegetation
- Pellets: Cryo, CryoPop, Lupomax
 - 1:2 usage ratio (ha!)
- Liquids: Spectrum, Incognito, YCH 702 (trial product)
 - Easy to add to the kettle or fermenter
- Extracts
 - Bitterness focused – hard to dissolve
- “Chemicals”: Hop oils, Terpenes
- Thiol Enhancing Products – Yeasts, Phantasm



Our Thoughts

- More processed product – More "single note" impact

Why?

- Whole Hops contain 1000s of compounds with different organoleptic impacts.
- Concentrating the "good oils" removes other more subtle compounds
- Even a product that we love like Cryo can need regular hops to give a "full" aroma/flavor picture
- Example: Thiolized Beers



Processes



Using Your Hops



- First Wort Hopping
- The Classic 60/30/10/0 schedule
- Zero Kettle Additions*

* - some use a small kettle break addition





**I'M GONNA DO A LITTLE BIT
OF THIS AND A LITTLE BIT OF
THAT.**
GREG DANIELS

This Is A Menu

- Use all, some or none of the processes we're about to run through
- Choose what makes the best beer for your face

Goals & Concerns

What Do We Want?

Goals

- Bright Hop Character
- Controlled Bitterness

Concerns

- Burn
- Creep
- Oxidation



Kettle Processes

- Boil Additions
 - <MommieDearest>“No Kettle Additions Ever”</MommieDearest>
 - We prefer a single charge – First Wort-60 minutes
 - “Backbone” bitterness
 - Kettle Break
- Wort Acidification
 - Dry Hopping raises pH.
 - Higher pH beers “taste flabby”
 - Lower pH (“more acidic”) – fresher, brighter
 - Perception impact higher in bigger beers
 - pH is imperfect in regards to perception, but it’s quick

Whirlpool Hopping

- Maximize Oil Extraction, Minimize Bitterness, Volatilization
- Use Heat and Agitation for 20-30 minutes
- Old School – right off the boil, hit it hard.
 - Still generating a fair amount of bitterness. (Zero kettlers love this)
- “Cool” School – (“coolpooling”) – drop the temp
 - 180-170°F to maximize oil extraction and minimize isomerization
 - Denny accidentally had good luck at 125°F
 - Denny has also largely moved away from whirlpooling

Dip Hopping

- Hops added to hot (150-170°F) wort in fermenter*
- About 10% of kettle volume
- Let sit about 60 minutes
- Keep fermenter sealed
- Cooled wort then added
- Linalool and geraniol rich varieties work well
- Source : <https://bsgcraftbrewing.com/dip-hopping-demystified/>

Dip Hopping

- Geraniol rich varieties

- Cascade
Centennial
Chinook
Motueka™
Styrian Golding Celeia

- Linalool rich varieties

- Amarillo®
Cascade
Centennial
Mt. Hood
Nugget
Pacifica™
Willamette



Active Fermentation Dry Hopping

- When to do – why
 - As late in the process as possible to ensure good fermentation
 - In a West Coast IPA, we're not focused on the magic of biotransformation
- Make Sure Your Yeast is Vital
 - Hop Creep – overblown at the homebrew level, possibly
 - Diacetyl formation
 - Alpha Acetolactate Decarboxylase (ALDC) as a cut out

Short Cold Dry Hopping

- Cold crash to 35-40F
- Add dry hops for 24-48 hours
- Longer times promote reabsorption of “good stuff”
- Shorter dry hop times were also rated with higher fruity characteristics from monoterpene alcohols and thiols while longer dry hopped beers were ranked higher for herbal notes from polyphenols
- Mitigates hop creep and hop burn
- Longer times and agitation can over extract and increase polyphenols
- Source : <https://bsgcraftbrewing.com/reevaluating-dry-hop-techniques/>

Multiple Dry Hops



- Double, even triple dry hops these days.
- Does it make a difference?
- Pros: Different exposure times, different characters.
- Cons: More touching of the beer, more oxidation/contamination risk.



Notes About Hop Usage

More is Not Always More

The Shellhammer Limit

- Dry hopping with more 1.1 oz/gal (8 g/L) yields diminishing returns (total)
- Citrus Aroma oils saturate at 4 g/L
- Herbal/tea aromas and bitter compounds (humulinones/polyphenols) saturate much higher
 - Hop Burn City!!!



Practicum

(aka putting all of this to good use)



Stephen Hughes
Coldfire Brewing
Eugene OR



“My philosophy with hops is to maximize flavor without overdoing it. Pair the hop profile with the ester profile of the yeast in a way that is harmonious. Bitterness, in balance (especially with terminal gravity) is a refreshing addition to any worthy style of IPA (including a hazy!). Use the best and freshest hops you can get your hands on.

Play with advanced hop products of every kind and find the right time and place to use them to improve the overall experience of the beer. Most of My IPAs have 1-3 advanced hop products in them. The idea isn't necessarily to achieve new heights of hoppiness with advanced hop products (sometimes it is), but rather to better highlight certain flavor elements and maybe diminish some others.

Minimize O₂ at every turn. And not every beer needs 4 pounds per barrel of hops.”

Stephen Hughes
Coldfire Brewing
Eugene OR



- Yeast Driven Brewer
- Choose yeast ester profile and attenuation
 - Lower attenuation, consider blending in a higher attenuating, low ester yeast.
 - Limit additions that contribute to mouthfeel or perceived sweetness
- Hops
 - Highlight yeast esters with an array of hop terpenes
 - Avoid big Pinene or Caryophyllene and fruity yeasts
 - Small early boil quantities of classics (Amarillo/Centennial/CTZ)
 - Equal amounts of tropical/citrusy (Mosaic, Citra or Galaxy)
- Whirlpool (180°F) with 1-2 varieties tropical, fruity or citrusy
- Ferment in the mid to lower range to control esters
- Dry hop reflects boil hops with maybe a unique highlight hop



Coldfire Sample IPA

1.062, 6.8% ABV – 90 min

Grist:

60% Gambrinus Pilsner

35% 2 Row Pale malt

3% Caravienna/Carahell

2% Acidulated Malt (optional for pH)

Hops:

60" CTZ 0.25#

30" Mosaic T90, Amarillo cryo 0.5#/0.25#

10" MosaicT90, Amarillo Cryo 1.25#/0.5#

Whirlpool at 170°F for 20" with Mosaic Incognito 0.5kg, El Dorado T90 4#

Dry Hop 0.75-1.75 oz/gallon

Yeast

House Strain (Similar to London III)





Coldfire Sample IPA

1.062, 6.8% ABV – 90 min

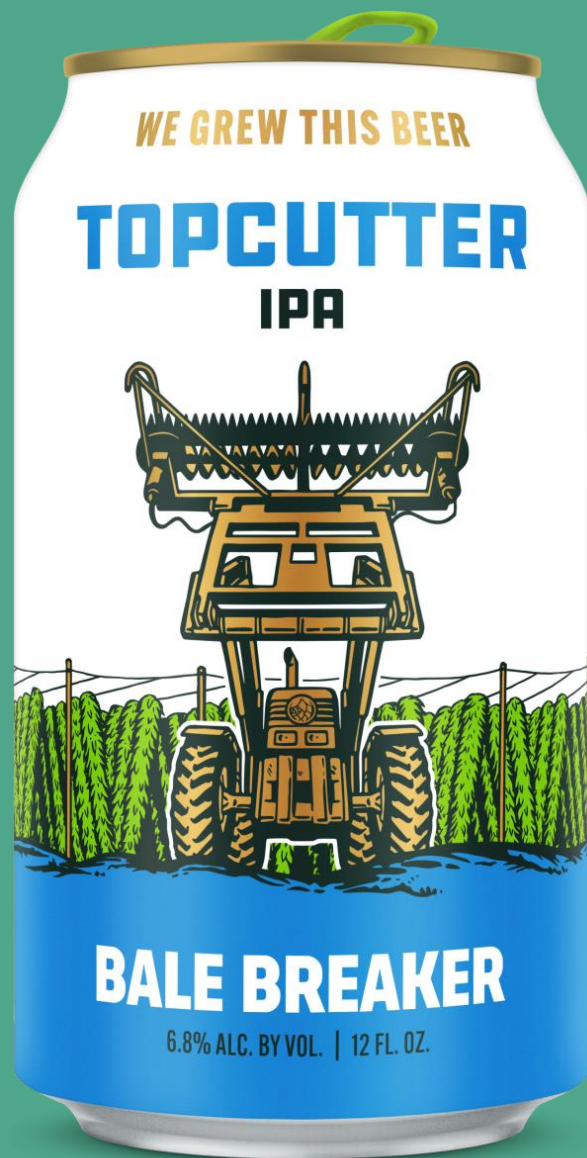
Process:

- Adjust post boil pH to <5.2
- Ferment 66-68°F
- 72°F for Diacetyl rest at 1.020
- Post Fermentation pH – 4.2-4.4
- Dry Hop – warm – 3-5 days to capture fruity hop characters.
- Post Dry Hop pH – 4.6

Classic Adjustments:

- 2-Row/Vienna + 3%C10/C40/Honey
- Bitter with extract
- Punch of Mosaic and Simcoe for hops





Kevin Smith - Bale Breaker Yakima WA

- Simple Malt Bill –
 - 2-3 malts – 90+% base
 - no “crystal” but Munich/Vienna.
 - Color from dehusked
- Water
 - 3:1 Sulfate:Chloride for darker IPAs
 - 1:1 for paler IPAs
- Hops
 - Kettle, yes.
 - Pivot on CoH levels by need. Warrior for “big smooth”, Simcoe for lower ABV, Higher CoH or harsher beers
 - Whirlpool with Cryo – 0.25-0.5oz/G (No more than 3 varieties)
 - Remove yeast, actively recirculate after 1 day, remove after 3 days.
 - Dry hop – 1-1.3 oz/gallon
 - “Clean” yeast – 63-65°F





Julian Shrago - Beachwood Long Beach, CA

- Keep malt simple – one or two without specialty malts
- Mash pH – 5.3-5.4, knockout pH 5.1-5.2
- Add gypsum and lactic acid in two steps – one for mash chemistry, one for whirlpool pH
- Hops
 - 2-3 Hot Side Additions
 - Bittering and whirlpool additions can make a fantastically flavorful and aromatic base on which to heavily dry hop
 - Dry Hop – 5oz-13oz in 5 gallons
 - Single dry hop with rousing
 - Homebrew kegs with hops – heavy CO2 flush
 - pH Rise – correct if your beer rises to 4.6+



Our Philosophy

Denny

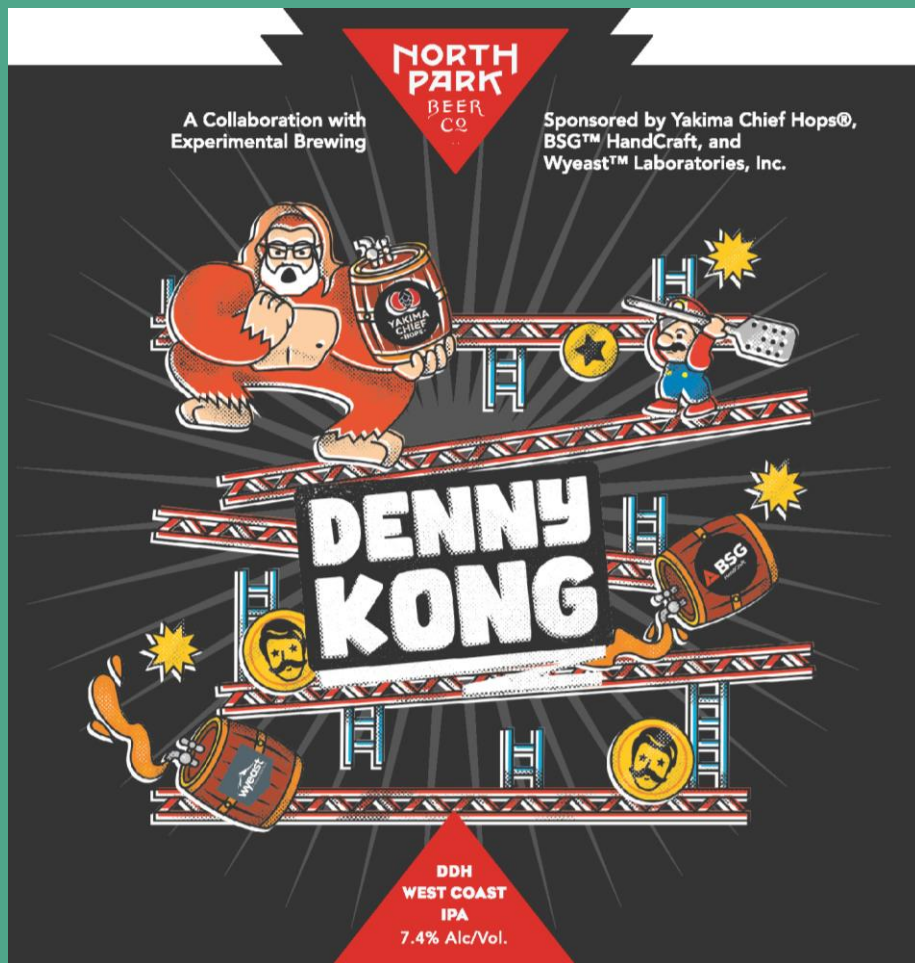
- Don't Fear the Malt
- Firm, crisp bitterness
- Blend varieties and types
- More Ca=Less haze
- Dry finish with lingering hop flavor and aroma



Drew

- Pale/Pils
- Focused Varieties
- Fewer Doses
- Fast & Fresh

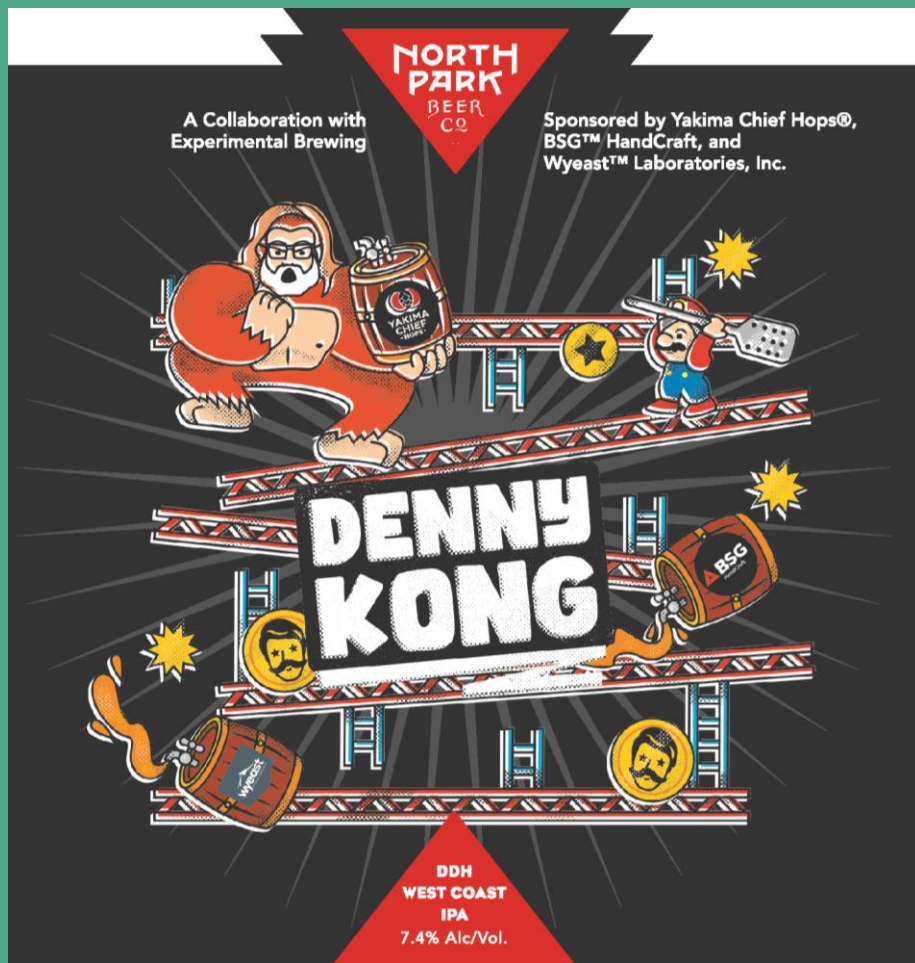




What We're Pouring For You

- Wanted to make a beer reflective of all the new hop knowledge.
- Kelsey McNair of North Park Beer Company did the hard work
- Like any discussion amongst brewers – lots of opinions





5.5G @1.065, 7.4% ABV (75% efficiency) – 90 minute boil

Grist:

11.75 lbs Rahr North Star Pilsner

1.25 lbs Weyermann Vienna

3 oz Acidulated Malt (optional for pH)

4 oz Sugar (added to boil for 15 minutes)

Hops:

0.67 oz Warrior – First Wort Hop

1.75 oz Cascade Cryo – Whirlpool (170°F) – 30 minutes

0.33 oz Citra Trial 702 – Dip Hopped

1.75 oz Cascade Cryo – Dry Hop 1

1.75 oz each – Mosaic, Mosaic Cryo, Citra, Citra Cryo, Simcoe, Simcoe Cryo – Dry Hop 2

Yeast

Wyeast 1217 – PC – West Coast IPA



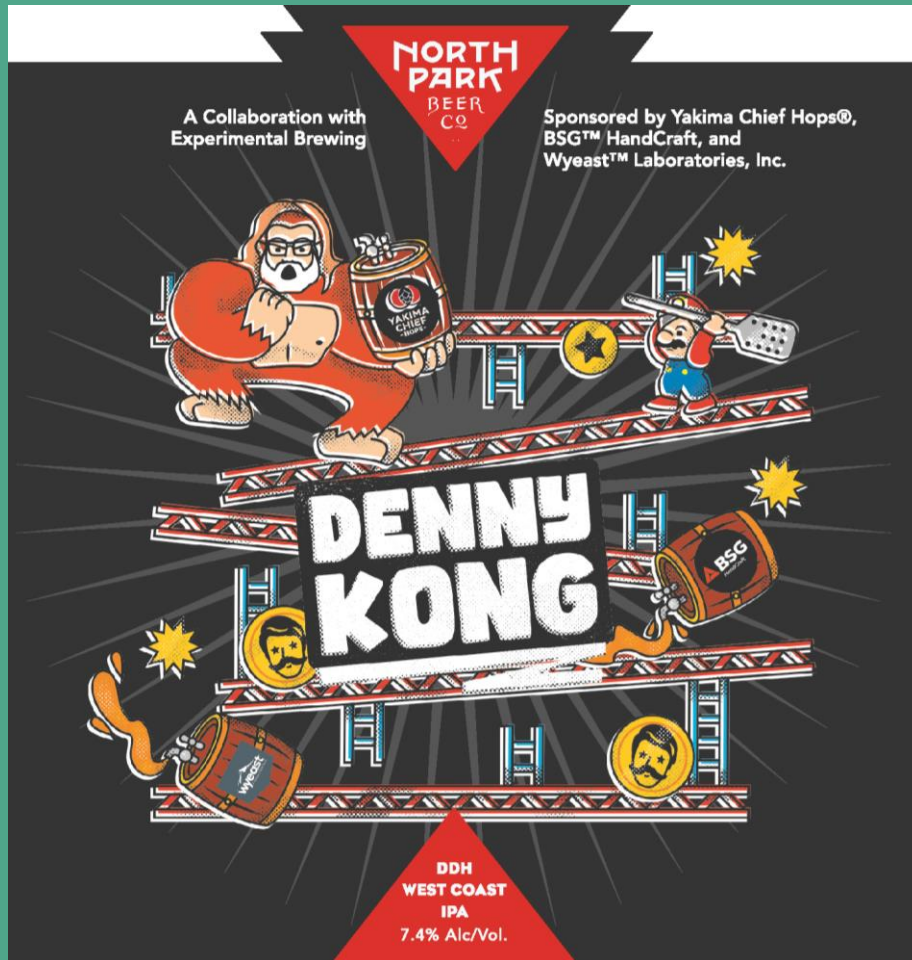
5.5G @1.065, 7.4% ABV (75% efficiency) – 90 minute boil

Mash: 152°F Single Infusion – pH 5.35

Water: Ca 50 / SO4 100 / Cl 50 / Mg 10 / Na 10

Process Notes:

- Knockout pH – 5.15
- Whirlpool is chilled to 170°F – spun for 15, rested for 15 minutes
- Trial 702 is dip hopped in 5% of the wort.
- 64°F ferment – until 1.023 – raise to 70°F
- 1.014 – remove from yeast, add first dry hops (and ALDC if desired)
- 1.010 – add second dry hops
- Rouse after 48 hours and crash to 32°F when no VDK present
- Add BioFine





**Thank You
To Our Beer
Partners**

**All The Moving Parts Provided
By**



Things to Remember

- Don't Sleep on a Well Made Hop Forward West Coast IPA
- Lots of processes and products to try, but what ultimately matters is how YOU like the beer





Questions? Fire Away!

THANK YOU!

Denny Conn – denny@experimentalbrew.com

Drew Beechum – drew@experimentalbrew.com



Related Resources

Find articles, recipes, recordings, and resources—including *Zymurgy* magazine—on [HomebrewersAssociation.org](https://homebrewersassociation.org).

- [10 Tips on Homebrewing West Coast IPA from Beachwood Brewing](#)
- [150+ IPA Recipes](#)

