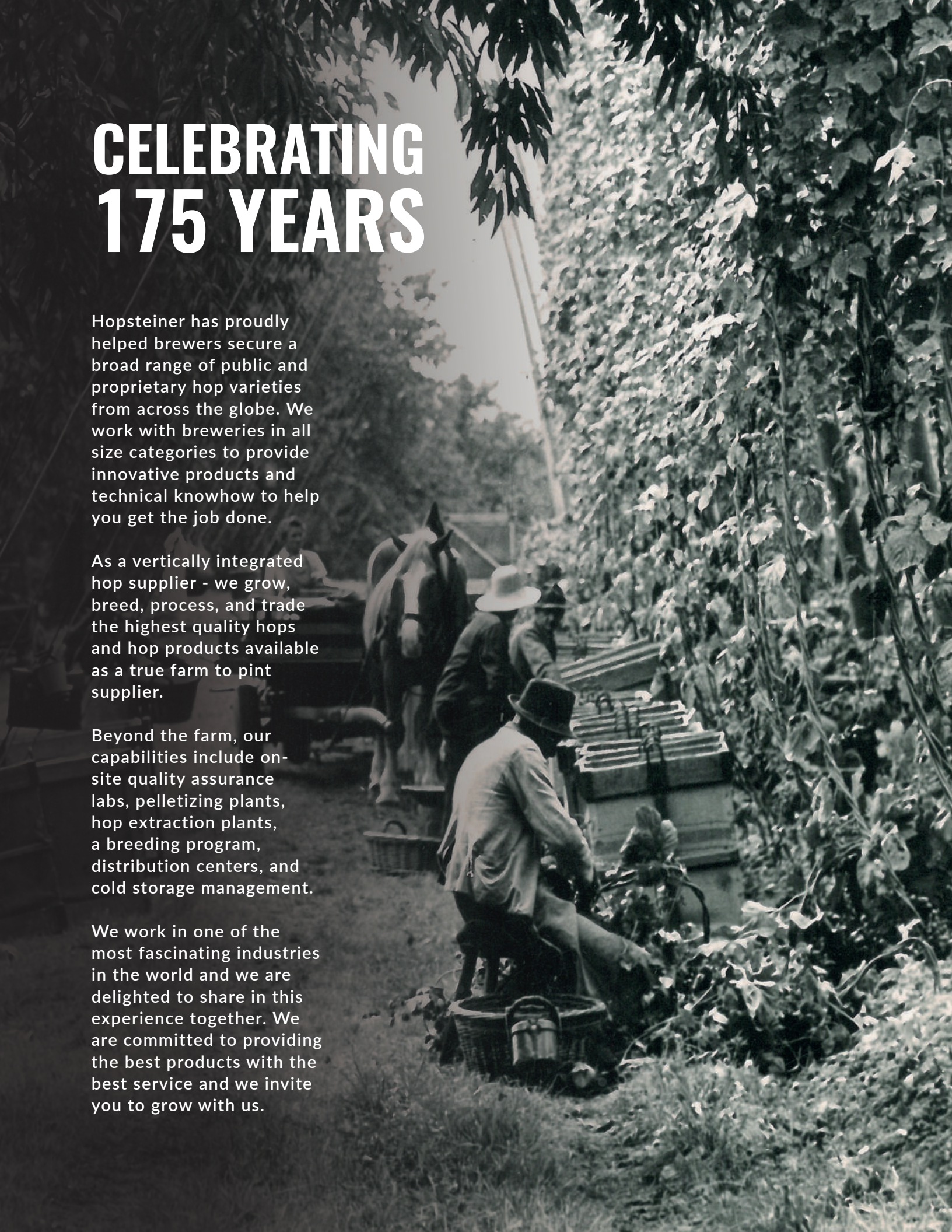
# 2021
# US HOP CROP REPORT

Hopsteiner
est. 1845

# CELEBRATING 175 YEARS



Hopsteiner has proudly helped brewers secure a broad range of public and proprietary hop varieties from across the globe. We work with breweries in all size categories to provide innovative products and technical knowhow to help you get the job done.

As a vertically integrated hop supplier - we grow, breed, process, and trade the highest quality hops and hop products available as a true farm to pint supplier.

Beyond the farm, our capabilities include on-site quality assurance labs, pelletizing plants, hop extraction plants, a breeding program, distribution centers, and cold storage management.

We work in one of the most fascinating industries in the world and we are delighted to share in this experience together. We are committed to providing the best products with the best service and we invite you to grow with us.

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GLOBAL HOP SUPPLIER

# Hop Crop Forecast

US hop acreage strung in the Pacific Northwest (Washington, Idaho, and Oregon) once again hit a record high. Approximately, 60,750 acres were strung in 2021, up 4% from 2020 (+2,100 acres). Yield estimates are expected to sit at 1,915lbs per acre, up 8% from 2020, for a production forecast at 116-million pounds.

All three Pacific Northwest States (WA, ID, & OR) increased acreage. Washington State remains the largest growing region and accounts for 71% (43,380 acres) of total US acreage, followed by Idaho at 16% (9,784 acres), and Oregon at 13% (7,571 acres) respectively. The top five hop varieties with the most acreage accounted for 53% of total US acreage strung for 2021.

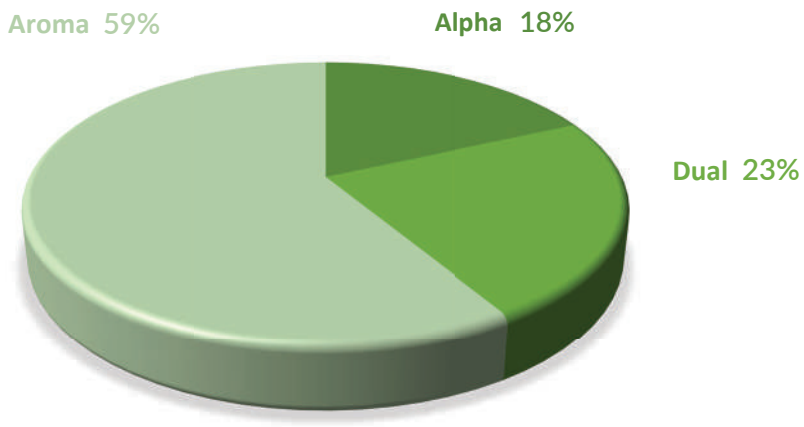
Notable variety changes with greater than 50% strung acreage differences from 2020 to 2021 are as follows: Cashmere (+59%) to 908 total acres), Mt. Rainier (+61%) 440 total acres, Tahoma™ (+103%) 486 total acres. Varieties that increased by greater than 20% are as follows: Bravo™ (+21%) to 256 total acres, Eureka™ (+21%) 790 total acres, Saaz (+27%) 380 total acres, Triumph (+41%) 55 total aces.

Notable variety decreases also reshaped acreage for 2021 with differences of 20% and greater coming from: Ahtanum™ (-27%) to 168 total acres, Centennial (-23%) 2,258 total acres, Ekuanot™ (-24%) 487 total acres, Fuggle (-48%) 18 total acres, Mt. Hood (-21%) 164 total acres, Nugget (-31%) 611 total acres, Summit™ (-32%) 438 total acres and Warrior (-38%) 177 total acres.

Proprietary variety acreage in 2021 summed to 69% of the total acreage (43,419 acres) and 31% public variety acreage (19,805 acres). Of the top ten most strung varieties in 2021, six of those ten account for proprietary varieties. With demand being heavily influenced by the craft beer industry, more aromatic hop varieties continue to increase proportionate to that of alpha varieties. However, when observed from a less traditional lenses and adding in the ever-growing dual-purpose category, today's current acreage spread makes up a 59% aroma, 23% dual, and 18% alpha split, respectively. Dual-purpose varieties can be best categorized by hops with higher-than-normal alpha ranges (10%-15% AA), yet also offer aromatic characteristics to fit a multi-use function.

International markets continue to play an important role in the US hop market. Unlike the US, craft beer abroad is still maturing, but trends show favoritism toward alluring US craft beer styles. Domestically grown proprietary varieties are well received, paving way to healthy demand for US aroma/flavor hops and further influencing acreage expansion. Although, the US hosts the most acreage of any nation, Germany follows close by with 50,955 acres strung for 2021, down roughly half a percent from 2020. Combined European acreage sums to 80,697 acres and brings the world total to an estimated 157,227 market acreage total.

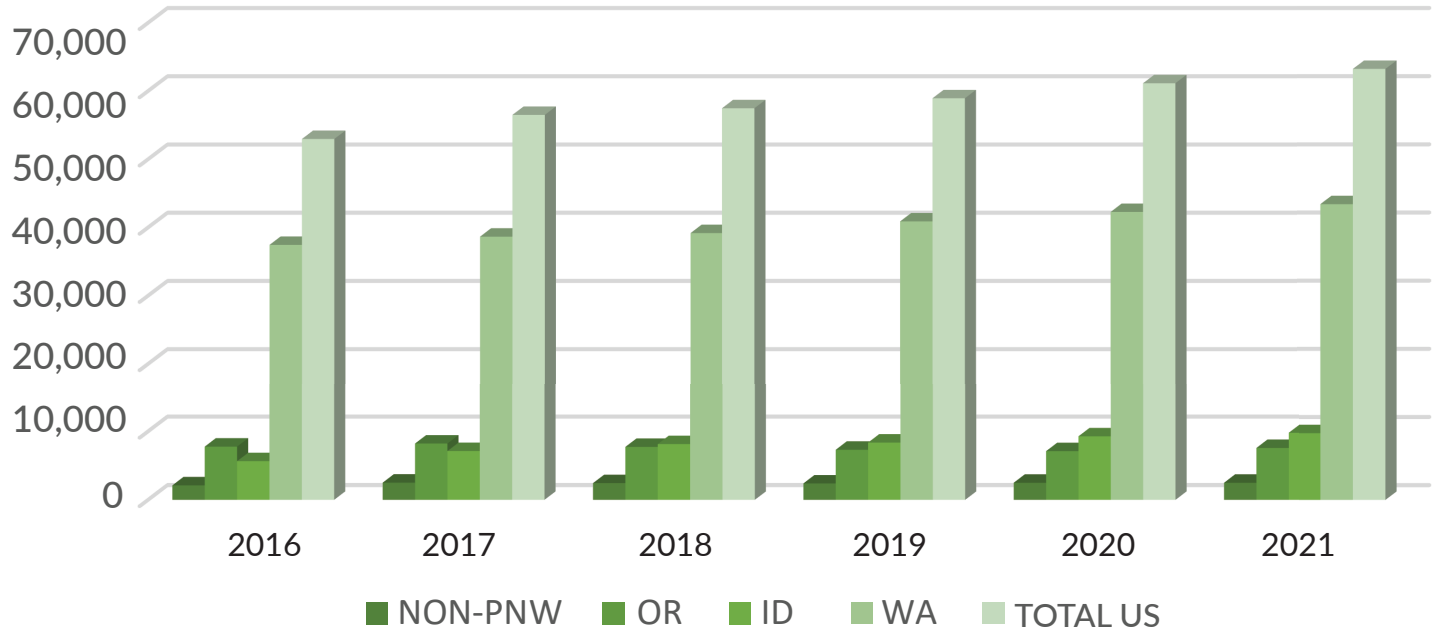
## 2021 US Hop Distribution




DATA SOURCE: HOP GROWERS OF AMERICA; U.S.D.A.; BREWERS ASSOCIATION; S.S. STEINER, INC. * INCLUDED IN THE CATEGORY "OTHER VARIETIES" TO AVOID DISCLOSURE OF INDIVIDUAL OPERATIONS

Employees stringing lines in a Calypso yard at Rosa Ranch for crop 2021

## ACRES BY STATE

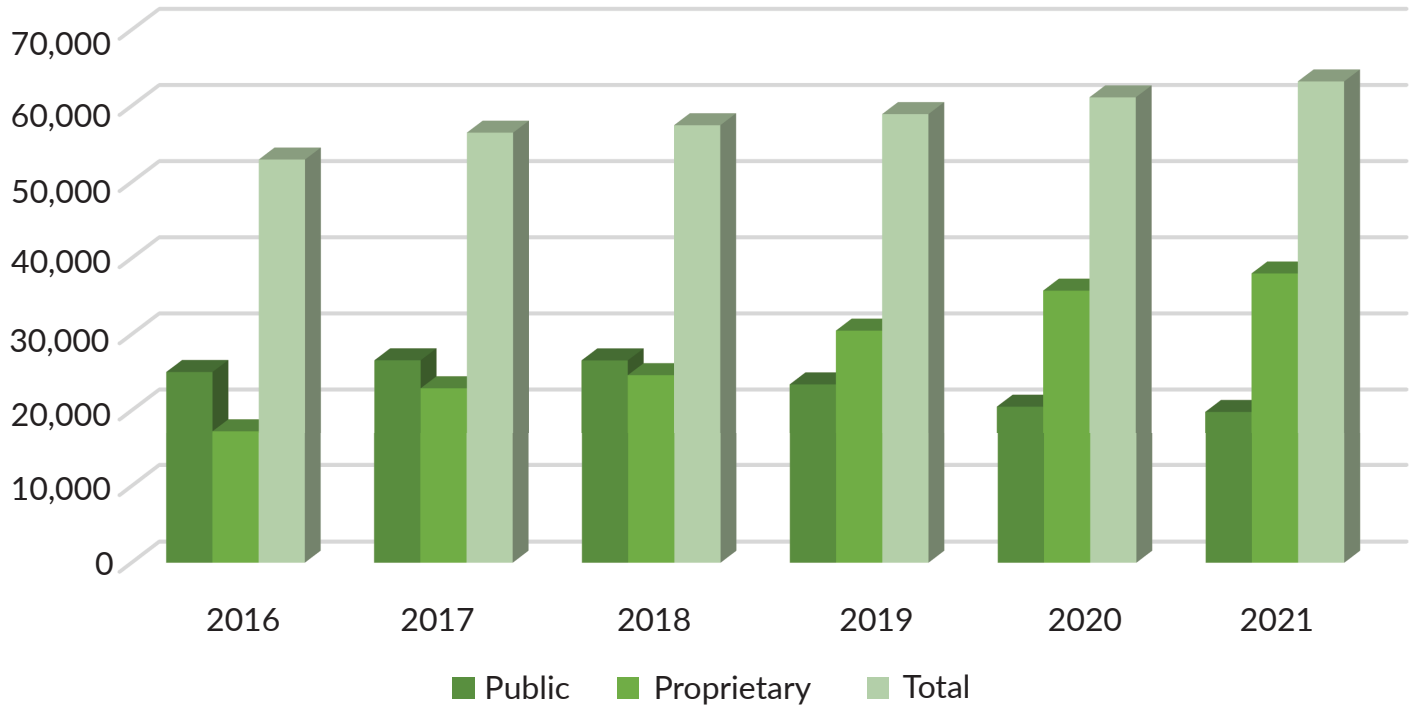


| Hop Variety | US Hop Acreage | | | | | | 2020-21 % Change |
|---|---|---|---|---|---|---|---|
| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | |
| Ahtanum™ | 155 | 371 | 255 | 261 | 230 | 168 | -27% |
| Apollo™ | 970 | 912 | 1,027 | 1,042 | 908 | 908 | 0% |
| Azacca™ | 506 | 578 | 546 | 589 | 722 | 731 | 1% |
| Bravo™ | 724 | 635 | 367 | 298 | 211 | 256 | 21% |
| Cascade | 7,581 | 7,095 | 6,174 | 5,467 | 4,038 | 4,208 | 4% |
| Centennial | 5,082 | 5,419 | 4,828 | 3,645 | 2,933 | 2,258 | -23% |
| Chinook | 1,940 | 2,455 | 2,825 | 2,337 | 1,893 | 1,826 | -4% |
| Citra® | 4,494 | 5,240 | 6,382 | 8,691 | 10,997 | 11,994 | 9% |
| Cluster | 623 | 621 | 673 | 470 | 411 | 352 | -14% |
| Cashmere | - | - | 195 | 310 | 573 | 908 | 58% |
| Comet | 163 | 205 | 218 | 322 | 423 | 448 | 6% |
| Calypso™ | 81 | 81 | 81 | 187 | 168 | 168 | 0% |
| Crystal | 737 | 711 | 618 | 444 | 285 | 290 | 2% |
| CTZ | 4,985 | 5,709 | 6,519 | 6,537 | 6,286 | 5,593 | -11% |
| Delta™ | - | - | - | 34 | 34 | 34 | 0% |
| El Dorado® | 623 | 682 | 538 | 993 | 1,584 | 1,610 | 2% |
| Ekuanot™ | - | 890 | 865 | 632 | 641 | 487 | -24% |
| Eureka!™ | - | 362 | 542 | 610 | 652 | 790 | 21% |
| Experimental | - | - | - | - | - | - | --- |
| Fuggle | 141 | 86 | 59 | 63 | 35 | 18 | -49% |
| Galena | 262 | 378 | 499 | 410 | 298 | 277 | -7% |
| Glacier | 145 | - | - | - | - | 40 | --- |
| Golding | - | 215 | 121 | 92 | 78 | 78 | 0% |
| Hallertau | - | - | - | - | 159 | 159 | 0% |
| Idaho 7 | - | - | - | 473 | 905 | 888 | -2% |
| Jarrylo™ | 131 | - | - | - | 17 | - | --- |
| Liberty | - | - | - | - | 56 | 54 | -4% |
| Loral™ | - | 186 | 172 | 125 | 164 | 195 | 19% |
| Lotus™ | - | - | - | 76 | 96 | 91 | -5% |
| Magnum | 151 | 47 | 105 | - | - | - | --- |
| Mosaic® | 2,525 | 2,714 | 2,438 | 4,108 | 5,496 | 6,374 | 16% |
| Mt. Hood | 412 | 405 | 415 | 348 | 207 | 164 | -21% |
| Mt. Rainier | - | - | 306 | 239 | 273 | 440 | 61% |
| Northern Brewer | - | - | - | - | 58 | 58 | 0% |
| Nugget | 1,646 | 1,592 | 1,433 | 1,163 | 880 | 611 | -31% |
| Other | - | - | - | - | - | - | --- |
| Pahto™ | - | - | 1,721 | 2,109 | 2,208 | 2,099 | -5% |
| Palisade® | 580 | 571 | 515 | 477 | 246 | 348 | 41% |
| Pekko™ | - | - | 92 | 279 | 801 | 1,066 | 33% |
| Perle | - | 76 | 77 | - | - | - | --- |
| Saaz | - | - | - | 140 | 299 | 380 | 27% |
| Sabro™ | - | - | - | 724 | 1,145 | 1,122 | -2% |
| Super Galena™ | 379 | 502 | 668 | 614 | 625 | 557 | -11% |
| Simcoe® | 4,331 | 4,608 | 3,988 | 4,276 | 4,113 | 4,151 | 1% |
| Sorachi Ace | - | - | 146 | - | - | - | --- |
| Strata™ | - | - | - | 253 | 484 | 889 | 84% |
| Sterling | 228 | 227 | 191 | 147 | 58 | 59 | 2% |
| Sultana™ | - | - | - | 138 | 149 | 172 | 15% |
| Summit™ | 1,769 | 1,617 | 1,574 | 1,072 | 640 | 438 | -32% |
| Tahoma | - | 217 | 209 | 230 | 239 | 486 | 103% |
| Tettnanger | 122 | 110 | 72 | - | - | - | --- |
| Triumph | - | - | - | - | 39 | 55 | 41% |
| Vanguard | - | - | - | - | - | - | --- |
| Amarillo® | - | 2,967 | 2,720 | 2,427 | 2,149 | 1,969 | -8% |
| Warrior | - | - | - | - | 283 | 177 | -37% |
| Willamette | 1,561 | 1,591 | 1,417 | 1,059 | 977 | 1,043 | 7% |
| TOTAL PNW | 50,857 | 53,989 | 55,035 | 56,544 | 58,641 | 60,735 | 4% |
| TOTAL NON-PNW | 2,106 | 2,504 | 2,433 | 2,386 | 2,489 | 2,489 | 0% |
| TOTAL US | 52,963 | 56,493 | 57,468 | 58,930 | 61,130 | 63,223 | 3% |

A dash "-" indicated throughout the table represents UNREPORTED acres.

Experimental R&D seedling nursery in Mabton, WA

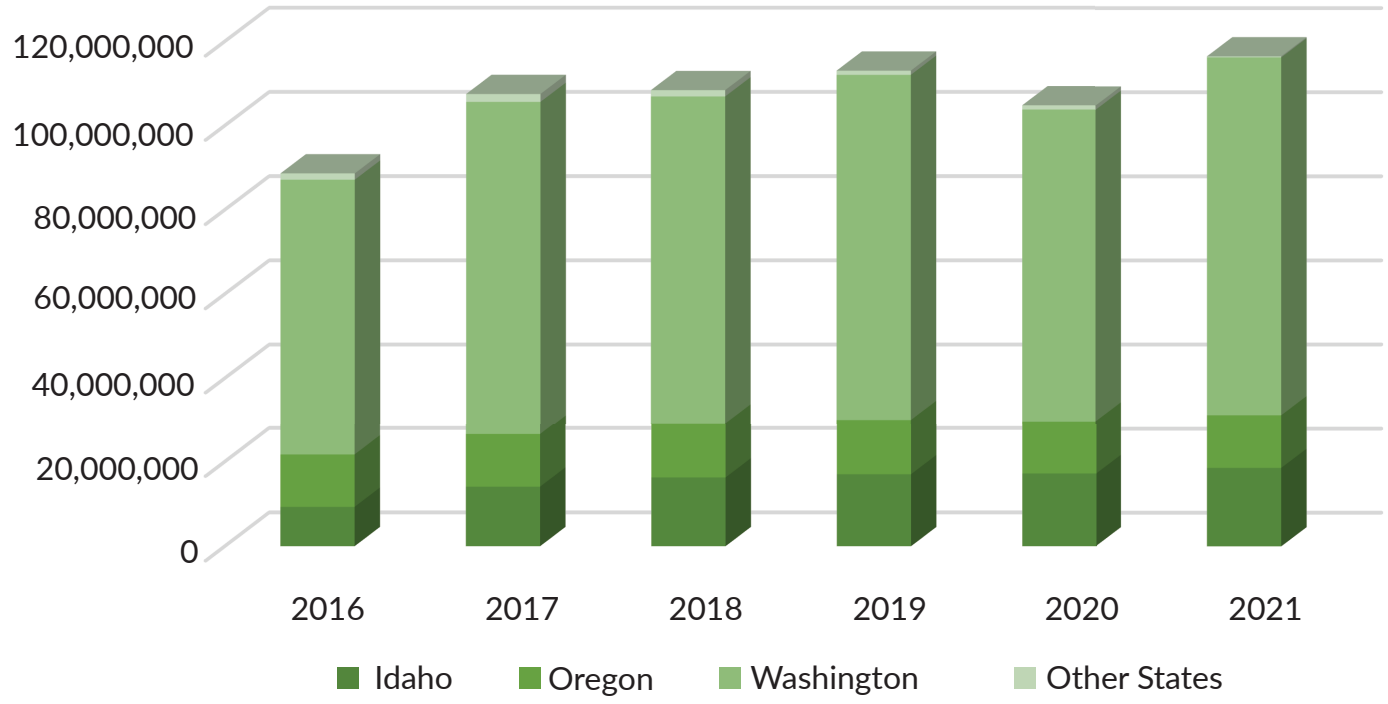
## PROPRIETARY vs PUBLIC HOP VARIETIES



| Hop Variety | US Hop Production (lbs) | | | | | |
|---|---|---|---|---|---|---|
| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
| Ahtanum | 156,900 | 390,300 | 696,200 | 736,000 | 490,800 | 448,422 |
| Amarillo® | - | 4,889,300 | 5,197,300 | 4,615,382 | 3,658,100 | 3,444,900 |
| Apollo™ | 2,080,500 | 2,276,500 | 2,716,800 | 2,801,212 | 2,091,214 | 2,388,400 |
| Azacca™ | 946,400 | 1,423,600 | 1,360,100 | 1,437,700 | 1,102,500 | 1,462,000 |
| Bravo™ | 1,886,700 | 1,862,000 | 1,105,900 | 898,225 | 475,042 | 662,300 |
| Calypso | 156,900 | 174,900 | 173,200 | 480,600 | 384,451 | 423,150 |
| Cascade | 12,822,200 | 13,886,800 | 11,589,800 | 10,116,100 | 6,191,700 | 7,284,650 |
| Cashmere | - | - | 296,200 | 526,700 | 875,600 | 1,074,500 |
| Centennial | 6,801,800 | 8,972,100 | 6,176,800 | 6,536,300 | 4,827,300 | 3,820,000 |
| Chinook | 2,903,600 | 4,282,000 | 5,269,000 | 4,729,300 | 3,104,200 | 3,821,867 |
| Citra® | 6,418,200 | 8,881,400 | 10,125,900 | 12,532,900 | 16,999,200 | 17,637,294 |
| Cluster | 1,058,800 | 1,202,900 | 1,239,800 | 853,100 | 852,800 | 709,806 |
| CTZ | 10,567,500 | 14,150,600 | 15,971,700 | 17,453,600 | 14,402,500 | 16,779,000 |
| Comet | 154,700 | 380,300 | 381,500 | 495,900 | 449,600 | 836,800 |
| Crystal | 1,425,300 | 1,352,200 | 1,201,700 | 869,400 | 600,000 | 555,150 |
| Delta | - | - | - | 75,647 | 84,221 | 75,750 |
| Ekuanot™ | - | 2,438,600 | 2,234,300 | 1,569,300 | 1,383,300 | 1,071,400 |
| El Dorado® | 1,130,300 | 1,374,700 | 961,400 | 1,778,400 | 2,440,200 | 2,841,282 |
| Eureka!™ | - | 812,300 | 1,514,000 | 1,769,900 | 1,486,577 | 2,192,900 |
| Experimental | - | - | - | - | - | - |
| Fuggle | 143,900 | 107,600 | 61,000 | 78,300 | 41,621 | 19,800 |
| Galena | 443,300 | 806,700 | 1,025,000 | 807,700 | 543,000 | 533,360 |
| Glacier | 169,300 | - | - | - | - | 24,000 |
| Golding | - | 253,900 | 140,400 | 124,300 | 78,000 | 91,502 |
| Hallertau | - | - | - | - | 97,600 | 97,600 |
| Idaho 7 | - | - | - | 1,125,300 | 1,969,300 | 2,228,666 |
| Jarrylo | 184,400 | - | - | - | 24,300 | - |
| Liberty | - | - | - | - | 128,200 | 65,880 |
| Loral™ | - | 426,900 | 404,000 | 314,400 | 307,300 | 429,000 |
| Lotus™ | - | - | - | 120,885 | 180,914 | 245,700 |
| Magnum | - | - | - | - | - | - |
| Mosaic® | 5,813,800 | 6,500,400 | 5,722,600 | 8,659,900 | 11,474,100 | 14,436,148 |
| Mt. Hood | 568,500 | 548,300 | 590,000 | 508,700 | 301,300 | 254,403 |
| Mt. Rainier | - | - | 581,100 | 513,600 | 452,775 | 564,100 |
| Northern Brewe | - | - | - | - | 83,100 | 83,100 |
| Nugget | 3,140,900 | 2,913,700 | 2,732,100 | 2,496,300 | 1,615,700 | 1,341,800 |
| Other Varieties | - | - | - | - | - | - |
| Pahto™ | - | - | 3,591,700 | 5,057,400 | 4,458,000 | 4,827,700 |
| Palisade® | 1,292,500 | 1,261,300 | 1,257,100 | 1,202,000 | 520,000 | 835,200 |
| Pekko™ | - | - | 173,800 | 337,452 | 992,400 | 1,305,850 |
| Perle | - | 88,500 | 84,200 | - | - | - |
| Saaz | - | - | - | 107,900 | 251,314 | 240,879 |
| Sabro™ | - | - | - | 1,167,100 | 2,159,500 | 2,468,400 |
| Simcoe® | 7,264,800 | 7,969,100 | 6,346,500 | 7,377,900 | 6,566,300 | 5,755,175 |
| Sorachi Ace | - | - | 152,100 | - | - | - |
| Sterling | 370,800 | 319,400 | 336,200 | 241,500 | 100,200 | 100,300 |
| Strata™ | - | - | - | 522,700 | 1,000,900 | 1,748,000 |
| Sultana | - | - | - | 424,988 | 368,382 | 483,664 |
| Summit™ | 2,914,500 | 3,342,300 | 2,874,100 | 1,946,800 | 701,400 | 700,800 |
| Super Galena™ | 904,500 | 1,291,800 | 1,962,000 | 1,731,627 | 1,662,779 | 1,638,000 |
| Tahoma | - | 380,200 | 448,700 | 450,300 | 404,872 | 861,778 |
| Tettnanger | 145,600 | 118,600 | 73,900 | - | - | - |
| Triumph | - | - | - | - | 14,200 | 82,500 |
| Vanguard | - | - | - | - | - | - |
| Warrior® | - | - | - | - | 472,300 | 472,300 |
| Willamette | 2,239,300 | 2,222,900 | 1,866,300 | 1,781,900 | 1,707,700 | 1,697,171 |
| **TOTAL PNW** | **87,139,600** | **105,621,500** | **106,906,700** | **112,041,200** | **103,810,300** | **116,277,821** |
| **OTH STATES** | 1,500,000 | 1,875,000 | 1,500,000 | 1,000,000 | 1,000,000 | 250,000 |
| **TOTAL US** | **88,639,600** | **107,496,500** | **108,406,700** | **113,041,200** | **104,810,300** | **116,527,821** |

A dash "-" indicated throughout the table represents UNREPORTED production numbers.


## ANNUAL HOP PRODUCTION IN LBS.



# PNW Climate Conditions

2021 growing conditions in the Pacific Northwest (PNW) could be summed up in just one word; peculiar. Drought conditions that have impacted agriculture and reservoir storage in the southwestern United States shifted north into all three major PNW hop growing regions. Record heat waves during the month of June (7 days over 105 degrees Fahrenheit, or 40 degrees Celsius) adversely impacted crops in PNW States, with early aroma varieties showing the most severe symptoms. Despite record setting temperatures, reservoirs provided adequate irrigation water, resulting reasonable yields and average dual/alpha variety production.

The dry climate helped mitigate disease pressure from powdery and downy mildew with little to no infections this season. This can be attributed to our newly rescoped integrated pest management principles introduced back in 2018 when red spider mites, worms, and beetles severely impacted crop quality and yield potential. Thanks to improved farming techniques and new IPM tools that include - advanced scouting practices, aerial imagery, robust plant tissue sampling, precision fertilizer applications and soil moisture probes, we have successfully been able to control these characteristically damaging pressures.

Another method of control introduced back in 2018 that we are seeing benefits from are natural predatory Persimilis mites. By introducing predatory mites, we are able to successfully manage pest pressures to minimize fewer pesticide applications, helping save on time, labor, fuel, and cost for spray. Hopsteiner and Golden Gate Ranches continue to invest in improving crop quality through sustainable practices and grower audits to help maximize efficiencies.

**Washington 2021**

The Cascade Mountain Range had record snowfall this past winter. In the month of February (peak of snow accumulation), the eastern slopes accumulated 130% of the long-term average snowfall. This excess in water storage helped fill the Yakima reservoirs to 100% of capacity in early June. It is because of this exceptionally strong winter that our Yakima Valley growers were able to get through some of the most severe heat conditions since recording began throughout the spring and summer. The WA crop appears to be slightly below average to average overall. Early aroma varieties were negatively impacted by the extreme heat wave at the end of June. Alpha hops on the other hand thrived in the high heat temperatures and all signs point to average yielding crop. Pest pressures have remained low to moderate all season, this applies to both mildew and insect pressure.

**Idaho 2021**

Drought conditions in the Treasure Valley had negatively impacted the Boise reservoirs. Mountain snowpack in southwest Idaho trended right along its 30-year average throughout the winter but early spring heat waves didn't allow for prolonged water storage. This, coupled with the fact that the Boise river basin only received 2.11 inches of rainfall (Parma), has led to abnormally depleted reservoirs, but not enough to have

Competitor varieties

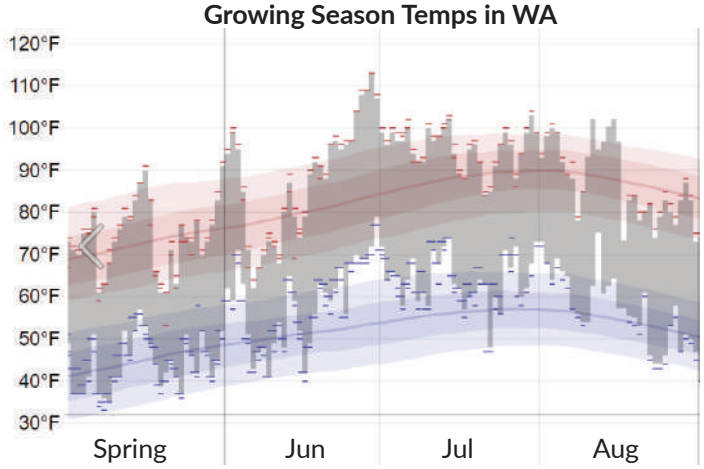
Hopsteiner varieties

influenced crops before harvest. The crop in Idaho appears strong. Reports in Idaho indicate a crop very similar to Washington. Pest pressures in Idaho have remained low to moderate all season and coming as a bit of a surprise as mites typically thrive in these warm dry conditions.

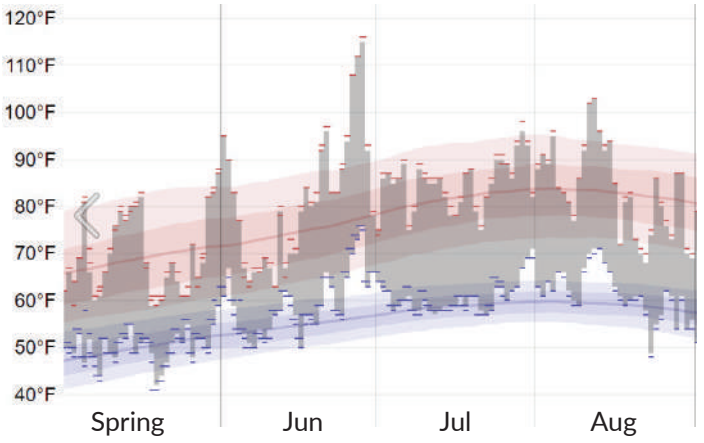
## Oregon 2021

The Willamette Valley had a relatively dry growing season, accumulating only 3.11 in. of rainfall since May (70% of average). Growers in Oregon typically see extensive spray needs for mildew throughout the season, but this year pressures have been low. This can be attributed in part to the low levels of precipitation. Reservoir storage in the Willamette Basin is concerning (38% as of 8/20/21), but this region will likely benefit from more fall and winter precipitation than Washington or Idaho. With harvest well underway, projected yields in Oregon are average. Many aroma varieties that had been impacted by the extreme heat in June had recovered from cooling temperatures.

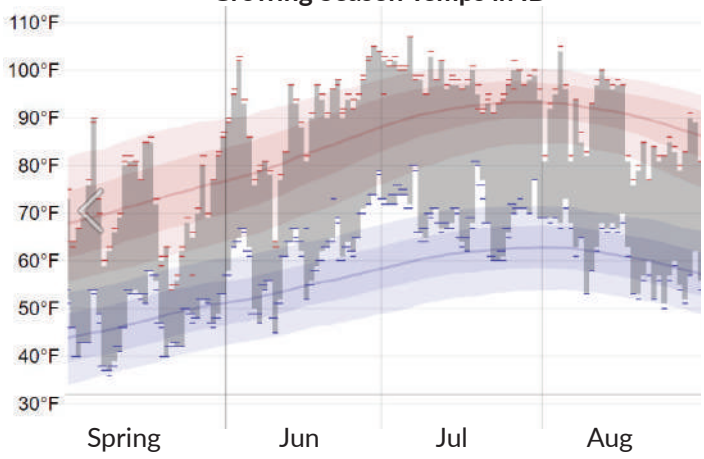
Growing Season Temps in WA




Growing Season Temps in OR




Growing Season Temps in ID



# Breeding for a more sustainable future

## HS15619

Bred to withstand the test of time. HS15619 is the next high alpha queen containing both powdery & downy mildew resistant genes.

## VISUAL EVALUATION

Cone structure starts round, then elongates to classic cone shape with checkered light green and dark green bract/bracteole coloring. HS15619 cone structure is strong with densely packed lupulin and cones compared to the size of ping-pong balls.

## GROWTH HABITS

Growth habits for HS15619 suggest aggressive development with long side-arms and cone concentration positioned at the top 2/3 of the plant. Irrigation and fertility are the same as general hop production and not variety specific; however, we do know that excessive irrigation and fertility can lead to unnecessary vegetative growth for this variety. Aggressive vegetative growth can be managed with inputs to achieve maximum yield potential.

Agronomic and brewing qualities contained here-in were measured and evaluated in the Lower Yakima Valley and are for informational purposes only. It is up to each individual grower to determine the best management practices and validate achieved brewing qualities in their respective growing region.

**FIRST YEAR PRODUCTION**

Harvest date: Sep 23–Sep 30
Harvest dry matter: 26%
Yield: 12+ bales/acre
Alpha: 15-18%
Beta: 4-5%

4 stings per hill if you have a 14'x7' hill spacing

**MATURE PRODUCTION**

Training date: May 13–20
Harvest date: Sep 1– 7
Harvest dry matter: 25%
Yield: 17+ bales/acre
Alpha: 18-21%
Beta: 4-5%
HSI: 0.240- 0.250
Cone weight mg: 200- 250

| | | | |
|---|---|---|---|
| HS09326 | Berry jam, herbal tropical fruit, grapefruit | α-acids %: 4-7<br>β-acids %: 4.5-7<br>Total oils: 2-2.6 |  |
| CONTESSA™ EXPERIMENTAL HOP #04190 | Light pear, floral, green tea | α-acids %: 3-5<br>β-acids %: 5-7.4<br>Total oils: 0.8-1.9 |  |
| Lemondrop™ EXPERIMENTAL HOP #01210 | Lemon, tangerine, green tea, melon | α-acids %: 5-7<br>β-acids %: 4-6<br>Total oils: 1.5-2 |  |
| Akoya EXPERIMENTAL HOP #99/268 | Tea, green fruit, spicy, pepper | α-acids %: 9-10<br>β-acids %: 4-5<br>Total oils: 1.5-2 |  |
| Solero EXPERIMENTAL HOP #243/42 | Tropical, mango, passion fruit | α-acids %: 9-10<br>β-acids %: 5-6<br>Total oils: 1.5-2 |  |
| TRIDENT™ SPECIALIZED HOP BLEND BY Hopsteiner | Fruity, citrus, passion fruit | α-acids %: 11-14<br>β-acids %: 4-5<br>Total oils: 1.6-3 |  |
| SULTANA EXPERIMENTAL HOP #06877 | Pineapple, pine, bright citrus | α-acids %: 13-15<br>β-acids %: 4-5<br>Total oils: 2.5-4 |  |
| Lotus™ EXPERIMENTAL HOP #06297 | Orange, vanilla, tropical fruit, berry | α-acids %: 13-17<br>β-acids %: 5.5-6<br>Total oils: 2-2.5 |  |
| CALYPSO™ EXPERIMENTAL #03129 | Tropical fruit, pear, apple, melon | α-acids %: 12-14<br>β-acids %: 5-6<br>Total oils: 1.6-2.5 |  |
| BRAV0™ EXPERIMENTAL HOP #01046 | Orange, floral, candied lime | α-acids %: 14-17<br>β-acids %: 3-5<br>Total oils: 1.6-2.4 |  |
| CALTUS EXPERIMENTAL HOP #07270 | Spicy, resinous, tangerine | α-acids %: 15-19<br>β-acids %: 4-5.2<br>Total oils: 3-4.4 |  |
| EUREKA! EXPERIMENTAL HOP #05256 | Black currant, dark fruits, herbal, pine | α-acids %: 17-20<br>β-acids %: 4.6-6<br>Total oils: 2.5-4.4 |  |


Hopsteiner.com
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FARM
FRESH
HOPS
FOR 6-GENERATIONS