



University of California

Agriculture and Natural Resources | Cooperative Extension

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Submitted by:

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UCCE Farm
Advisor
Sutter-Yuba and
Colusa Counties

2022 California Plant and Soil Conference

February 1-3, 2022 (Tuesday - Thursday)

Virtual Event

Coordinated by

California Chapter, American Society of Agronomy
and

Cooperative Extension, UC Agriculture and Natural Resources

Registration is open (*Early Bird pricing ends on January 25th*):

https://calasa.ucdavis.edu/Conference_Registration/

UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources



Sacramento Valley Cover Crop Tour

hosted by

Western Cover Crop Council and UC Cooperative Extension

Thursday, March 3, 2022, 8:00am - 7:30pm (*includes dinner*)

Departing from the Colusa County UCCE Office, 100 Sunrise Blvd., Suite E, Colusa, CA 95932

Description

Join us for a tour of several cover crop sites in the Sacramento Valley including orchards and annual crop fields. Cover crop species, cultivars and mixes including legumes, grasses and brassicas will be showcased. You'll hear from farmers, extension specialists, and researchers on topics such as cover crop selection, equipment to manage cover crops, considerations for cover crop management, and building soil health.

Continuing education units will be offered as applicable, details to follow.

Registration Information

Until February 1 **registration is limited** to farmers, ranchers, and producers.

The \$50 registration fee includes morning refreshments, transportation, lunch, and dinner.

Complete this [interest form](#) to be notified when registration opens broadly on February 1 if space is available.

Contacts for More Information

Program Content: **Sarah Light**, UCCE Agronomy Advisor, Sutter-Yuba and Colusa Counties

Logistics and Registration: **ANR Program Support Unit**, Julia Kalika, (530) 750-1361

Save the Date!

Soil Health and Cover Crops Field Day

Hosted by
UC Cooperative Extension and the Colusa Resource Conservation District

Thursday, February 24th, 2022

9:00am – 11:00am

Registration: Not required

Location: Davis Ranches, 7681 Sycamore Slough Road, Colusa, CA

Agenda to Follow

Contact Sarah Light (selight@ucanr.edu) for more information



New Soil Health Connection Episodes online:

<https://www.youtube.com/c/TheSoilHealthConnection/videos>

Many new episodes of the Soil Health Connection have been posted online including in-field demonstrations of soil health assessments, interviews with farmers about their experiences implementing soil health practices, and information about biochar, biosolids, and grazing on cropland!



E-mail: selight@ucanr.edu
Website: <http://cesutter.ucanr.edu/SacramentoValleyFieldCrops/>
Instagram: [@sacvalleyagronomist](https://www.instagram.com/sacvalleyagronomist)
YouTube: [The Soil Health Connection](https://www.youtube.com/c/TheSoilHealthConnection)

N-Rich Reference Zone Case Study: Colusa County 2020 - 21

Sarah Light, Kim Gallagher, Taylor Nelsen, Mark Lundy

Nitrogen (N) rich reference zones were implemented on a 180 acre wheat field in Colusa County. Average grain yields are approximately 7000 lb/ac. Pre-plant aqua ammonia was shallowly shanked in at a depth of 4-5 inches and a rate of 60 lb/ac N in mid-October, 2020. Beds were listed and shaped after aqua application. Soil samples were taken after pre-plant fertilization on 11/9/20. The top 0-12 in. of soil had high starting average nitrate-N fertilizer equivalent of 164 lb/ac N. Urea was broadcast at 60 lb/ac N with a belly grinder in three 90ft x 180ft N-rich reference zones on 12/11/20. A rainfall event with a 0.5 in. of precipitation occurred two days later.

Early season conditions: The field was drill seeded with Patwin 515 HP variety on 11/13/20 on 60-inch beds with 6-inch row spacing. Severe drought conditions in the West led to heavy geese damage in wheat fields in the Sacramento Valley. The geese had eaten approximately 20% of the emerged wheat plants by early February. Tiller counts in the geese-damaged area were taken on 2/8/21 and averaged 24 tillers per square foot, which is lower than the optimum target of 30 tillers per square foot. Despite very low precipitation which reduced crop emergence, tiller counts were fine in the rest of the field. The crop received 7 inches of rainfall for the season which is 40% of historical average. Thus, the field was irrigated twice during the season using furrow irrigation. The first irrigation began on 2/25/21 and the second on 4/10/21. Both applied approximately twelve inches of water. The second irrigation was to ensure adequate moisture during grain fill.

Plant and Soil Measurements: Plant and soil measurements were taken throughout the season in order to evaluate whether the crop would respond to additional N fertilizer. Monitoring on 2/8/21 did not indicate a likely crop response. Soil samples were collected in the top 0-12 in. of soil from both the N-rich reference zones and the broader field. There was variability in the field, with the samples indicating that approximately 90 to 166 lb/ac nitrate-N fertilizer equivalent remained in the broader field.

SITE INFORMATION

Location: Colusa County

Soil type: Grandbend loam

Previous crop: Sunflower

Variety: Patwin 515HP

Seeding method: Drill seeded

Seeding rate: 120 lb/ac

Planting date: 11/13/20

Bedded: Yes (60 in.)

Pre-plant N Management

Field rate: 60 lb/ac N

N-rich zone: 120 lb/ac N

N Form: Aqua ammonia (field) + urea (N-rich zones)

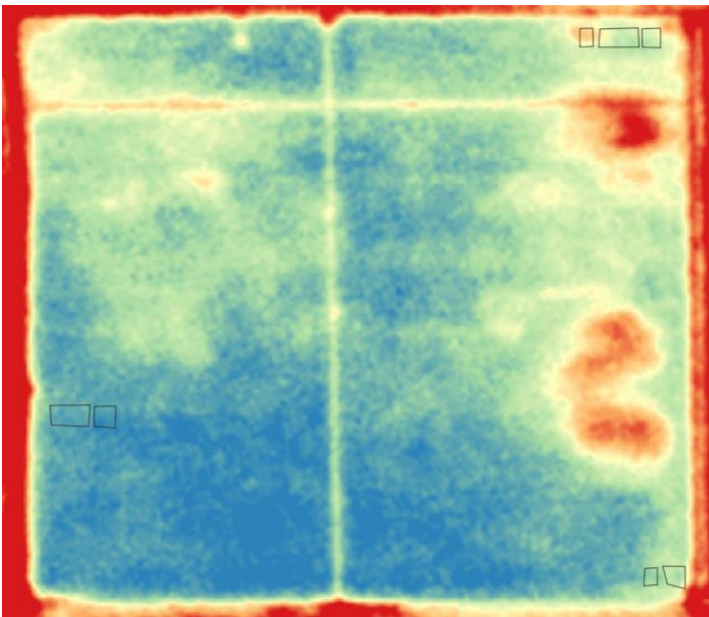


Figure 1: N-rich strips were not visible using aerial imagery on 2/27/21. The heaviest geese damaged areas are visible (red) in the east side of the field.

Canopy reflectance was also measured on 2/8/21 in both the N-rich reference zones and the surrounding field using a handheld GreenSeeker NDVI meter. The field was also monitored by drone on 2/8/21 and via satellite on 1/26/21, 2/21/21, 2/27/21, and 3/10/21. These measurements were expressed as a Sufficiency Index (SI). A SI is the ratio of the measurements taken from the broader field to the measurements taken in the N-rich reference zones. SI values less than 0.97 indicate possible crop N deficiency, and values less than 0.93 indicate likely crop N deficiency. The GreenSeeker measurements on 2/8/21 indicated that the SI was above 1 for two of the strips and between .90 and .93 for the third. However, the SI of the third strip was affected by stand establishment issues in that area of the field and was not considered representative of the field. Canopy reflectance (NDRE) was again measured on 3/31/21 using a drone to evaluate the benefit of a fertilizer application prior to the second irrigation. On this date, the SI for the field was 0.99 and [the decision support tool](#) indicated 81.8% of season N had been taken up (Figure 2).

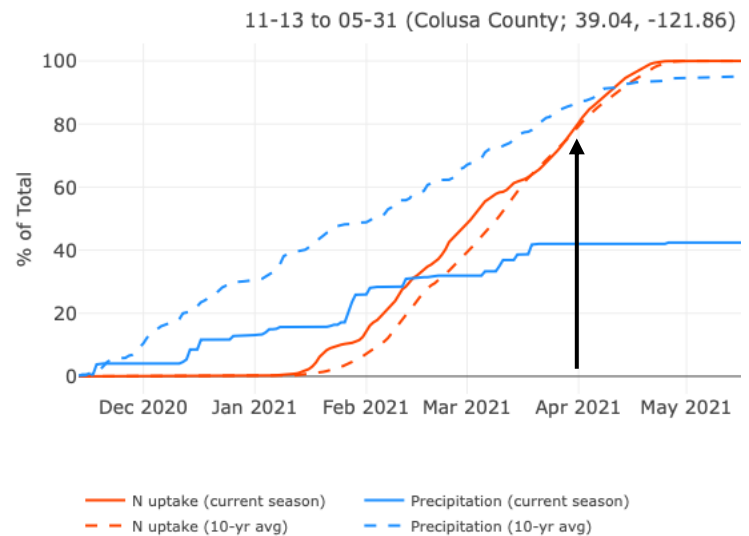


Figure 2. Wheat N uptake (red) and precipitation (blue) as a percent of average annual totals. The solid lines show the 2020-21 season while the dashed lines show the 10-year historical average.

Fertilizer recommendations and in-season management actions: The SI measured from the crop canopy on 2/8/21 indicated no crop response to addition N application. Soil nitrate levels were high throughout the field. The crop measurements on 3/31/21 indicated that there could be a minimal increase in protein with an additional 20 lb/ac N. However, the economics of the cost of the material and application via airplane were not worth the minimal increase in protein. No N was applied in-season. Soil nitrate-N levels were high throughout the season and crop monitoring indicated an adequate SI. In addition, the yield potential of the field was uncertain due to extreme drought conditions and geese damage.

End of season results: The wheat crop yielded 5475 lb/ac with 12.3% protein despite challenging conditions. There was no difference in yield between the N-rich reference zone or the broader field. Overall, the crop removed approximately 146 lb/ac N. This is 86 lb/ac N more than was applied. In addition, total N application per acre was 60 lb/ac lower than typical management practices. This reduction in fertilizer application is a cost savings of approximately \$45 per acre (@ \$0.75/lb N applied fertilizer).

There were many in-season challenges including uncertainty around stand establishment due to dry conditions throughout the entire season and heavy geese damage. Since the grower applied only 60 lb/ac N prior to planting they had the opportunity to assess whether it was worth it to spend money on an additional fertilizer application. Typically the grower might apply 120 lb/ac N for the season, all at pre-plant. Though grain yields were lower than usual, this is likely due to factors other than nitrogen. Using the decision support tools, the grower was able to save money during a difficult year and still produce a profitable crop. In the end, the field achieved close to normal yields in challenging conditions while using less N fertilizer than normal.

OUTCOMES:

- In-season N fertilizer application recommended? No
- In-season N fertilizer applied
 - None
- Yield = 5475 lb/ac
- Protein = 12.3%
- Crop N removal = 146 lb/ac N
- Total N fertilizer applied = 60 lb/ac N
 - Pre-season: 60 lb/ac N
 - In-season: 0 lb/ac N
 - 60 lb/ac less than grower's typical N rate
- Cost savings: Approximately \$45/ac

Despite a very challenging year due to external factors, wheat yield was higher than anticipated. Total crop N removal was almost 80 lb/ac N higher than fertilizer applied. No N was applied in-season and there was not a measurable reduction in yield or protein.

Winter Cover Crop Performance in a Drought Year in the Sacramento Valley

Sarah Light



University of California
Agriculture and Natural Resources | Cooperative Extension

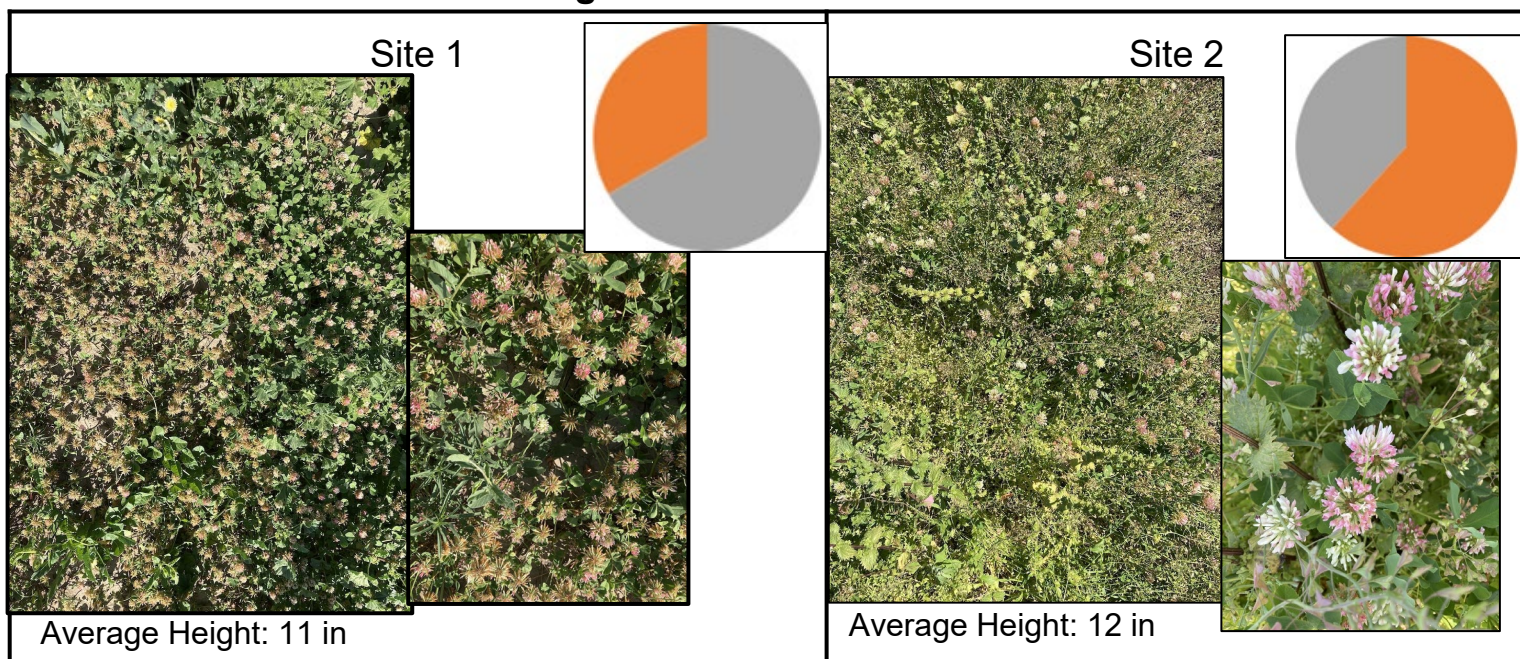
Winter cover crop species were planted using a single row push planter at 3 sites in the Sacramento Valley. Cover crop height was collected at 3 points in each plot. Percent cover (proportion of cover crops, weeds, and bare soil) was collected in three 20x20 cm quadrats. Some species had no stand establishment at Site 3, thus no data or photos are shown.

Site 1: planted 12/1/20; data collected 4/6/21; 12 inches water applied 2/25/21 (furrow irrigation)

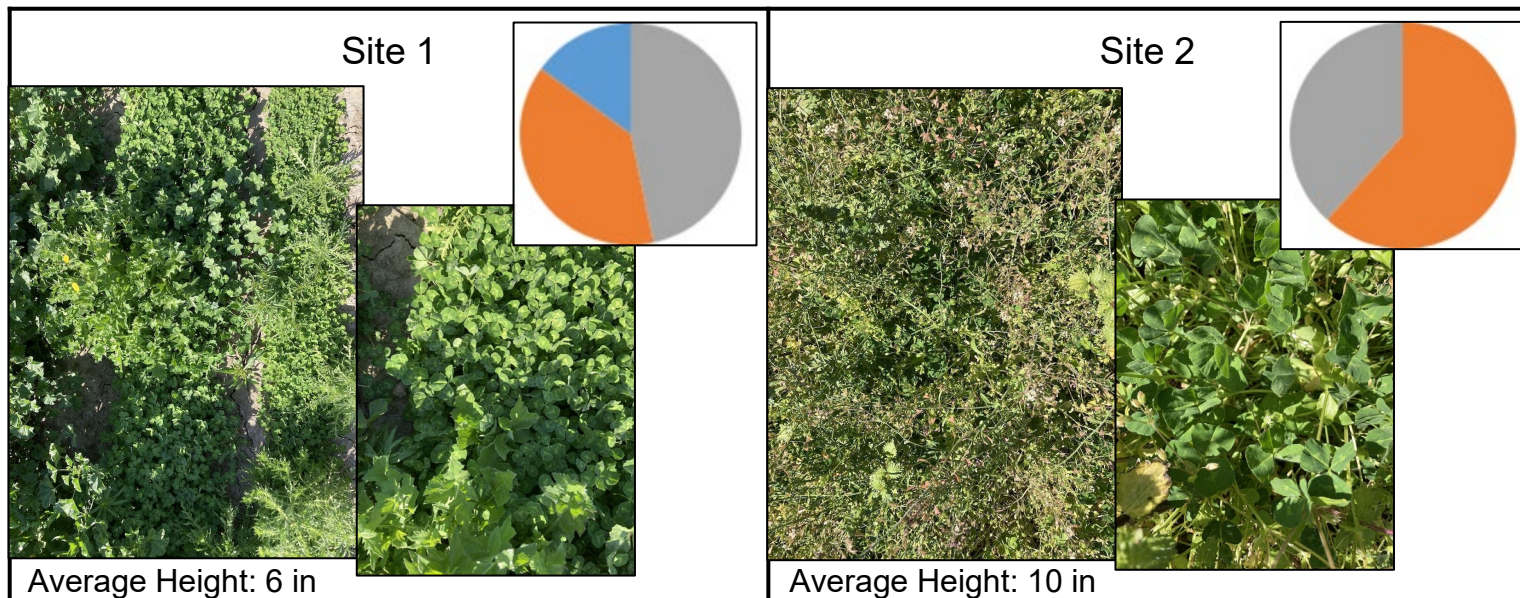
Site 2: planted 11/24/20; data collected 4/6/21; long-term soil health management practices and high starting soil organic matter; 8 inches of water applied 3/27/21 (furrow irrigation)

Site 3: planted 12/2/20; data collected 4/6/21; no irrigation

Legumes: Balansa Clover

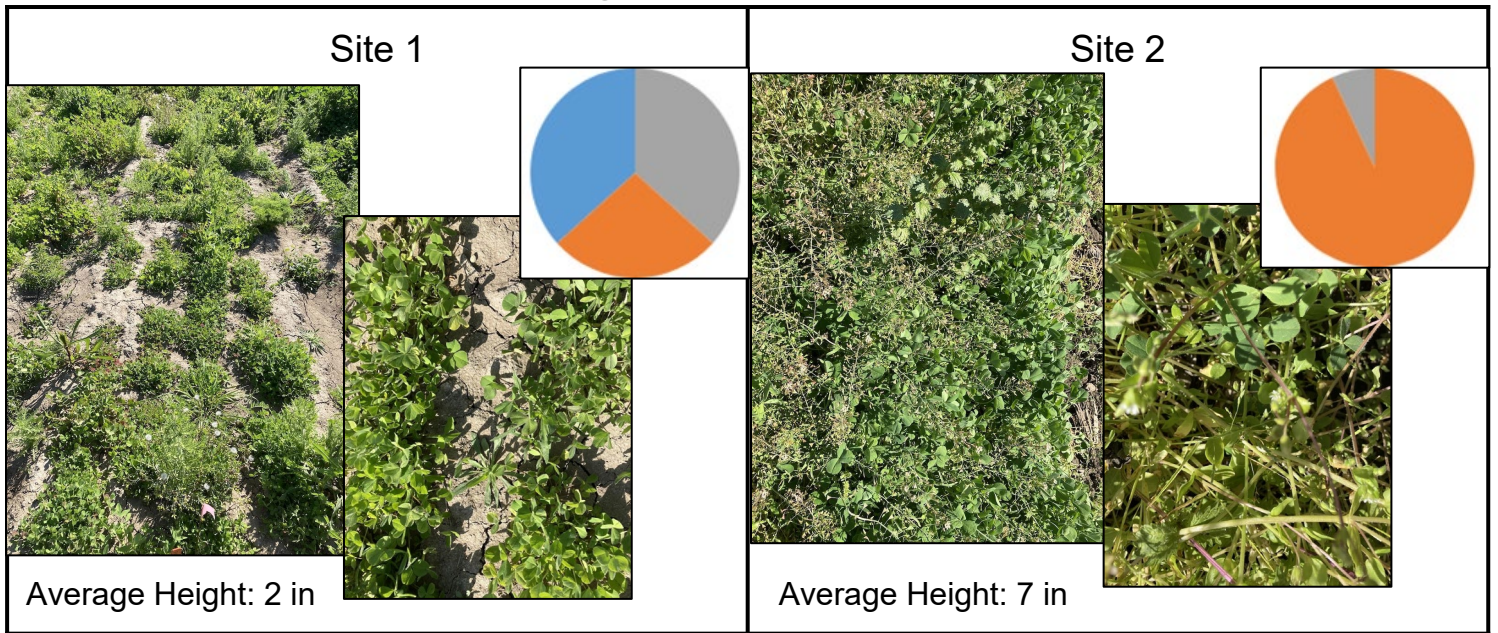


Legumes: Subclover Campeda

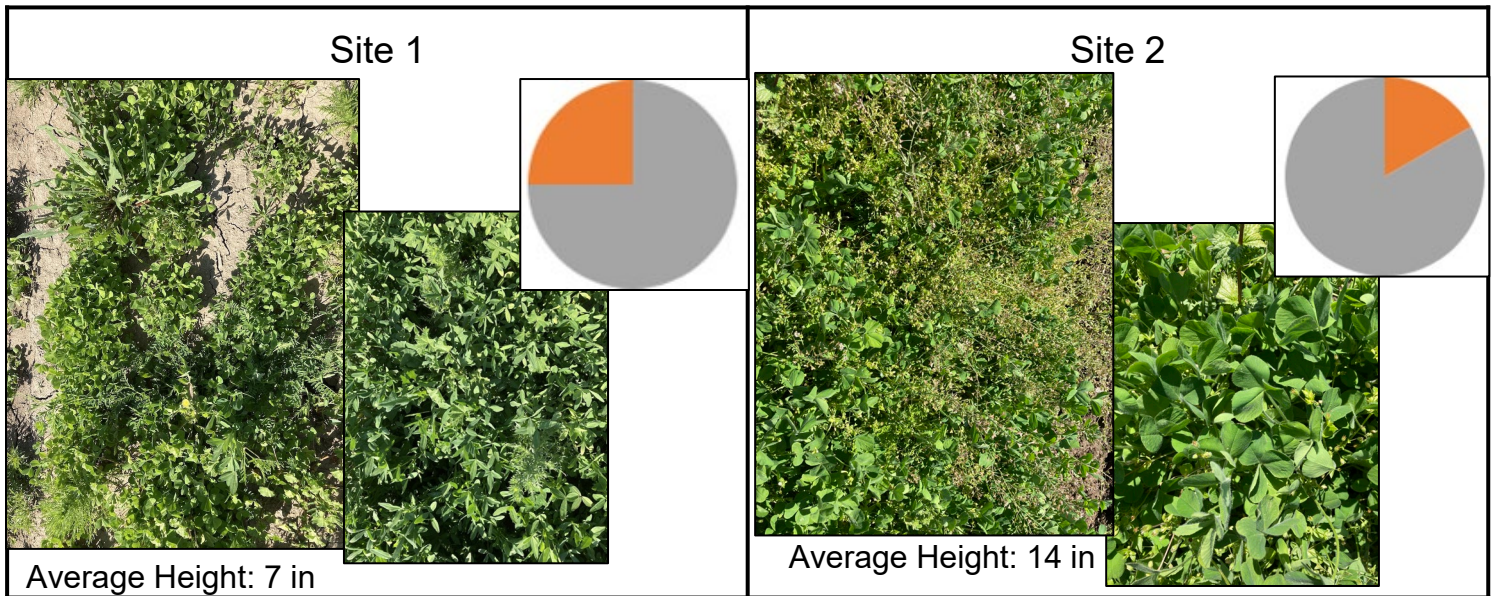


Percent Cover Key (average of three quadrants): Gray=Cover Crop. Orange=Weeds. Blue=Bare Soil

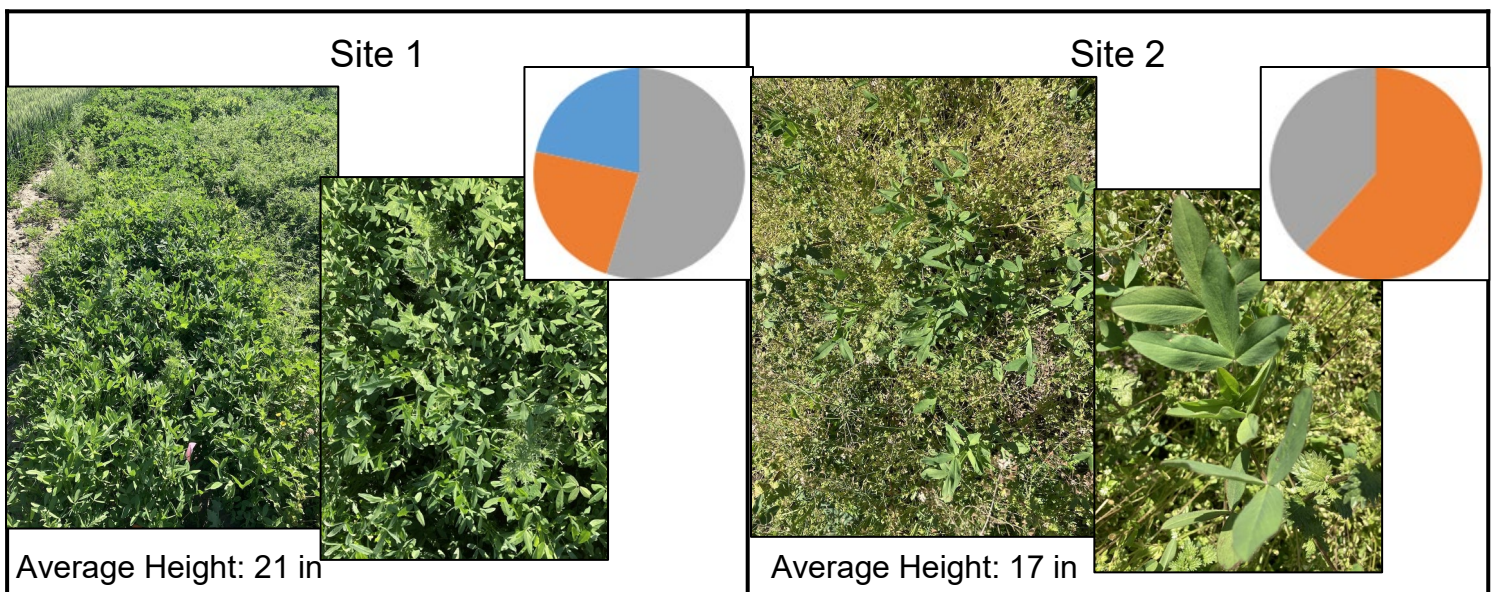
Legumes: Rose Clover



Legumes: Crimson Clover

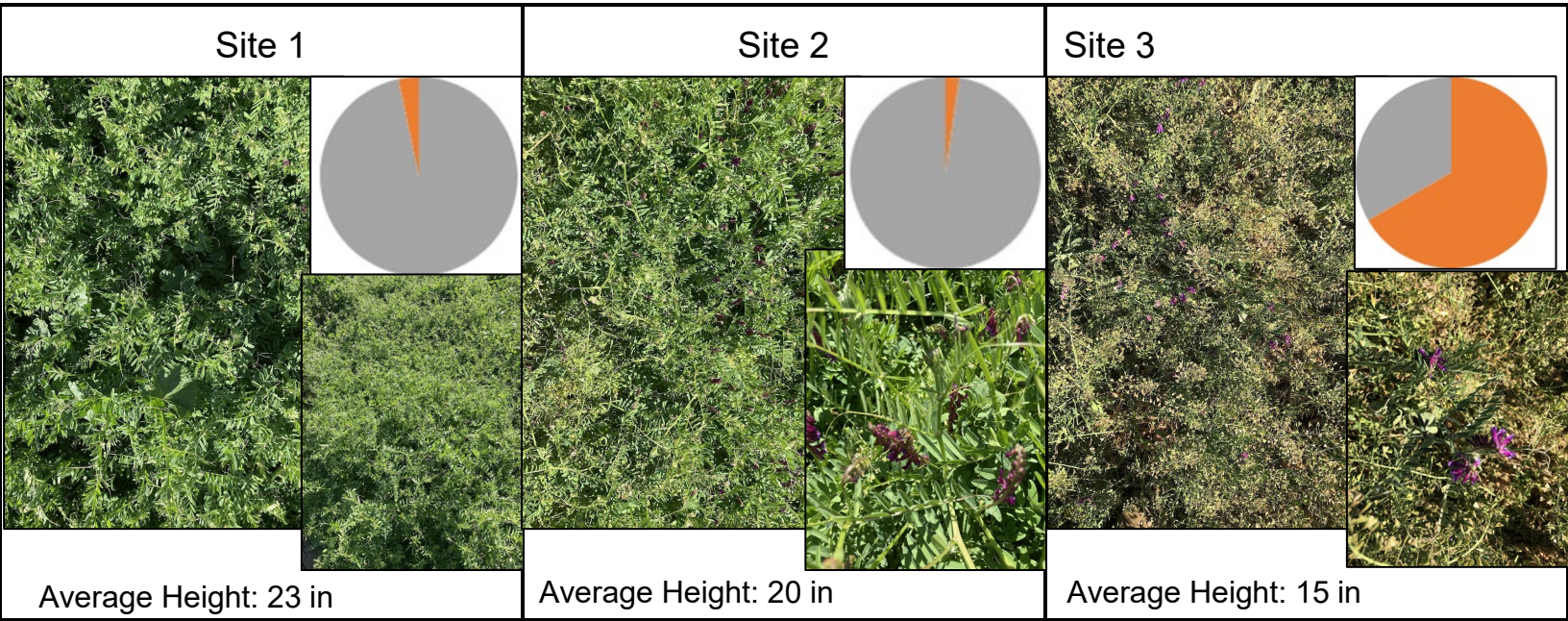


Legumes: Berseem Clover

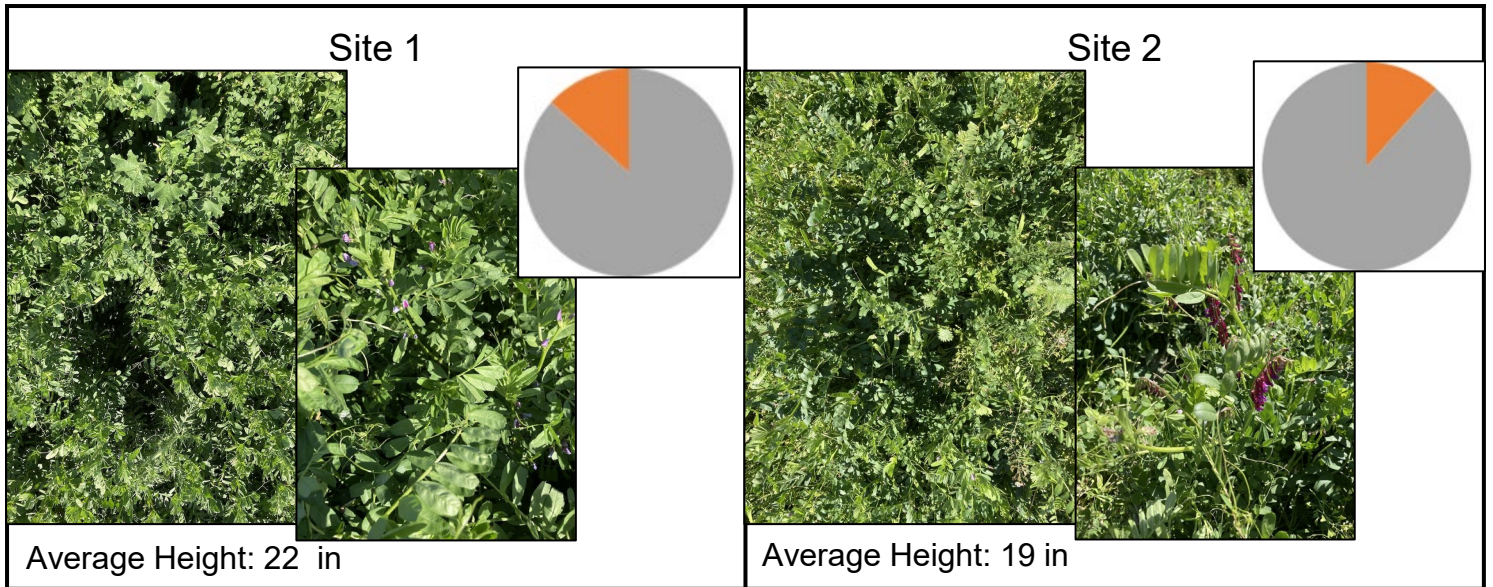


Percent Cover Key (average of three quadrants): Gray=Cover Crop. Orange=Weeds. Blue=Bare Soil

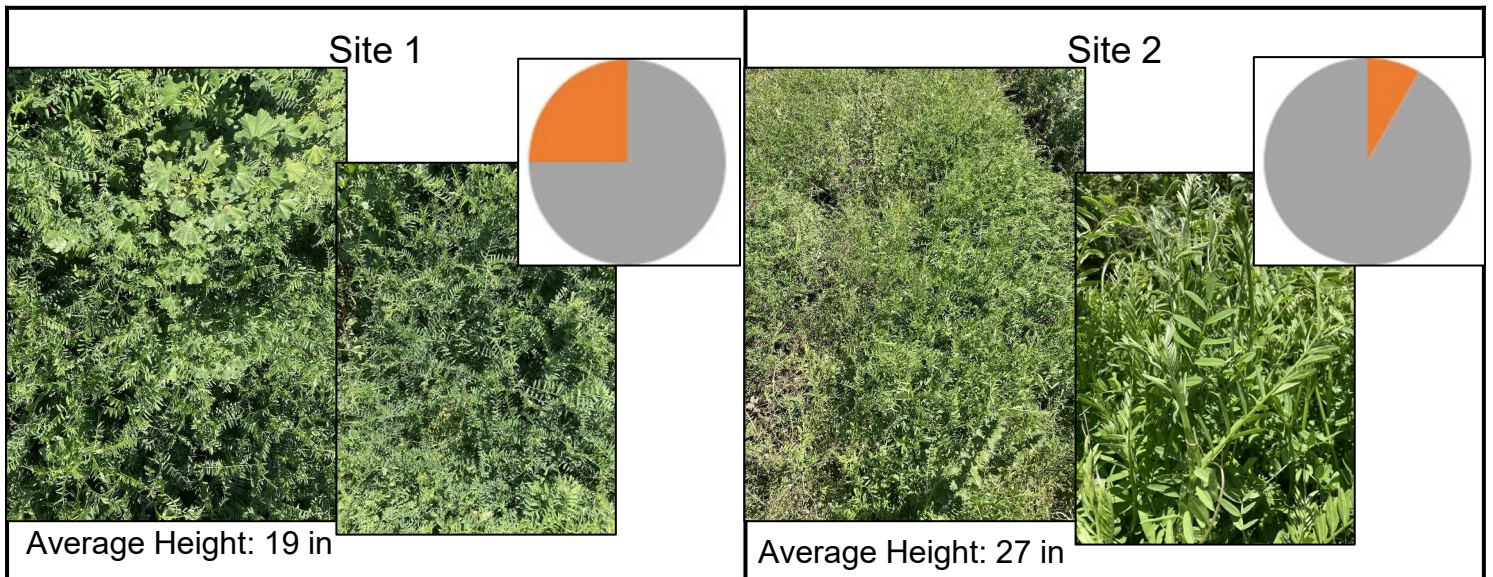
Legumes: Lana Woolypod Vetch



Legumes: Common Vetch

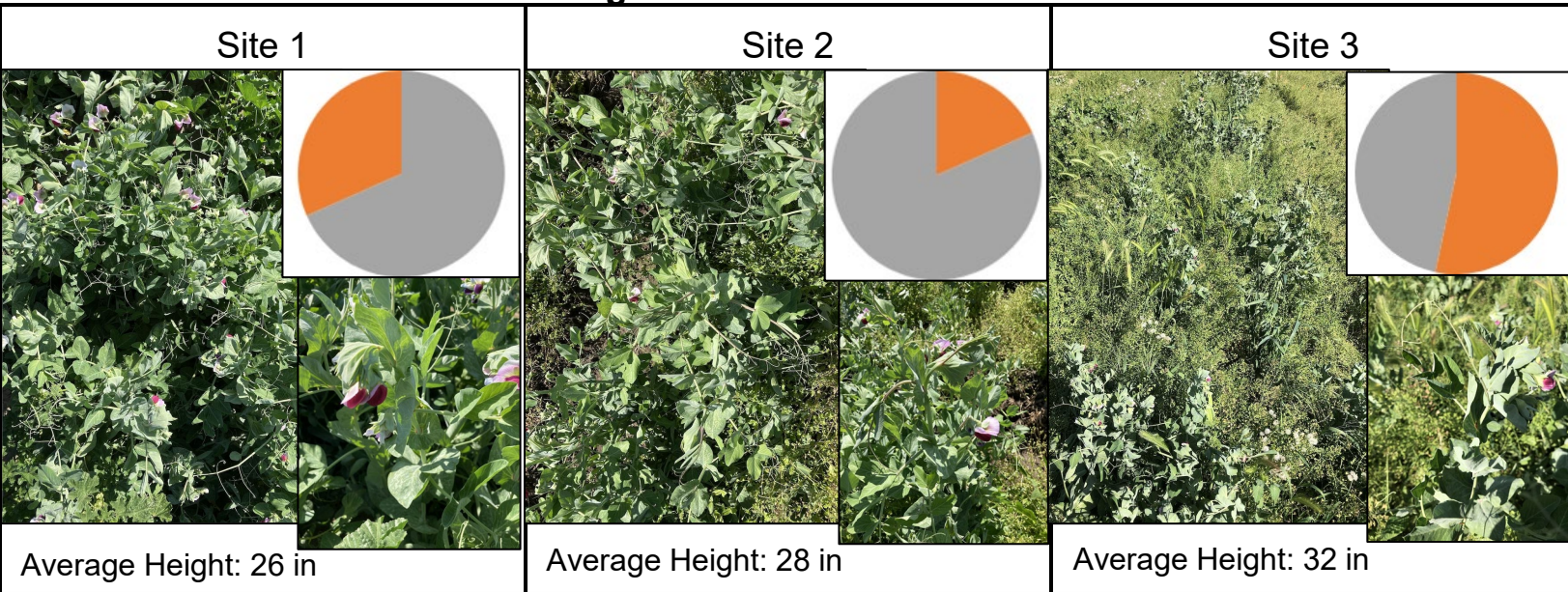


Legumes: Hairy Vetch

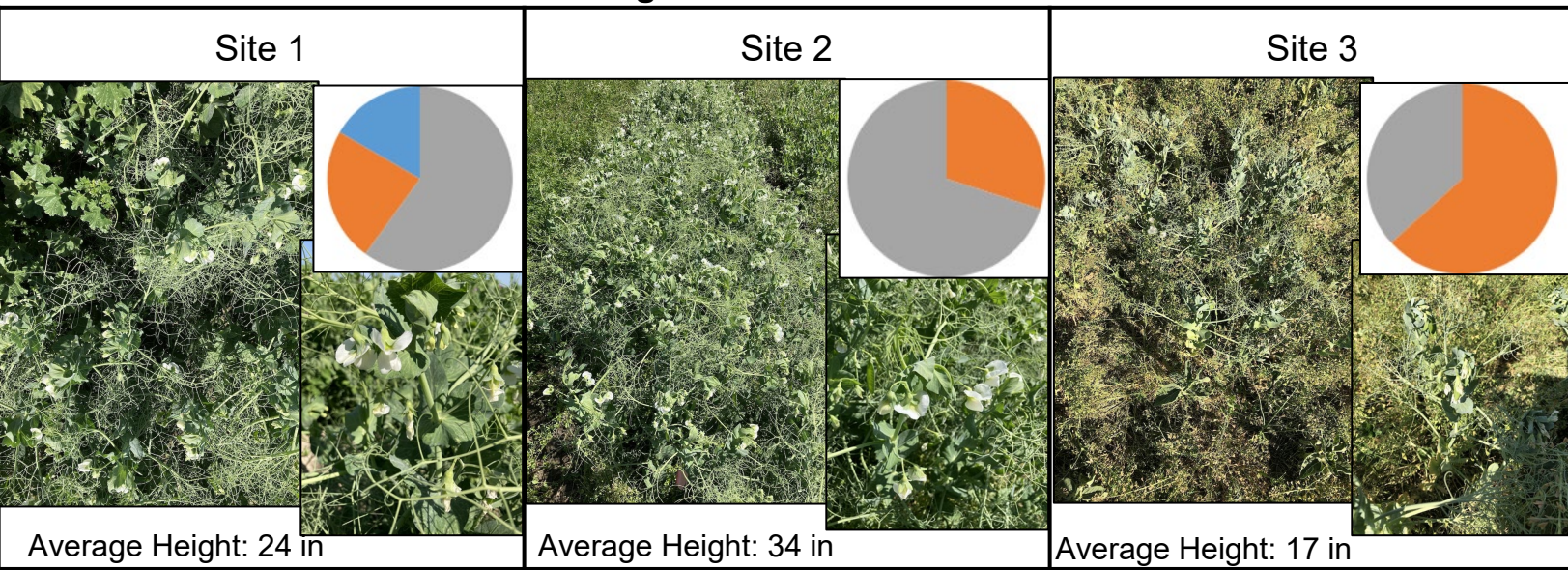


Percent Cover Key (average of three quadrants): Gray=Cover Crop. Orange=Weeds. Blue=Bare Soil

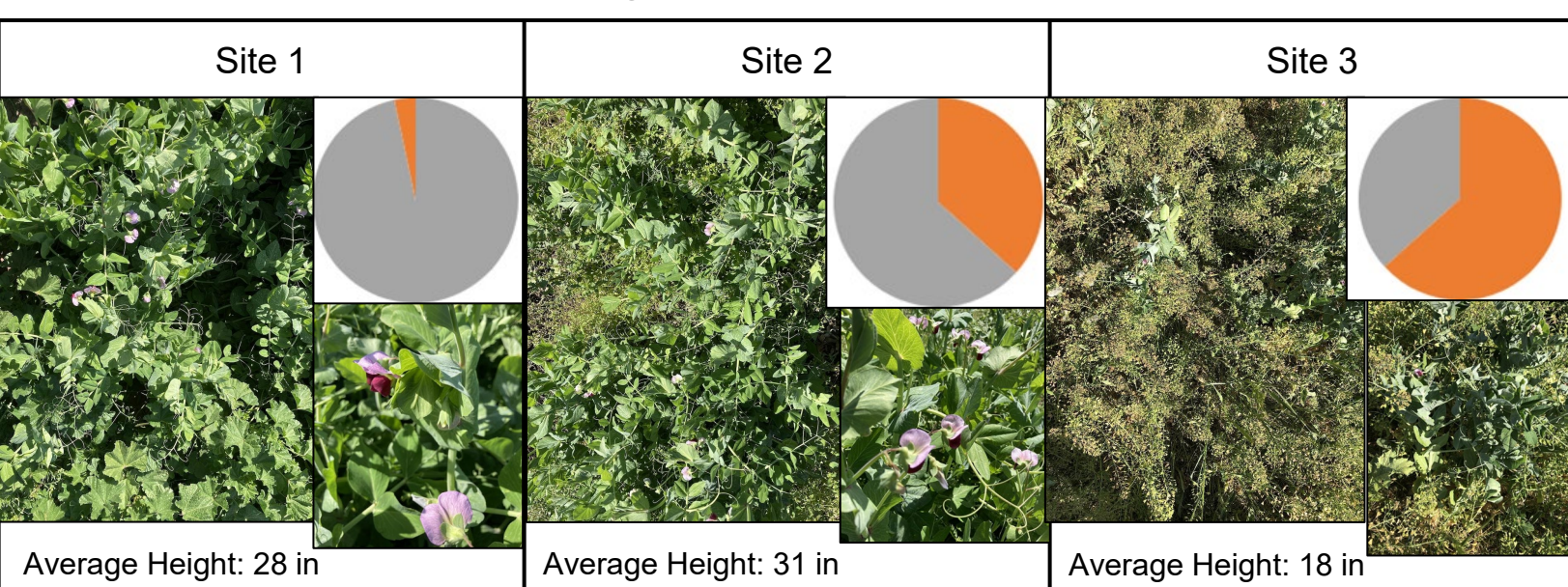
Legumes: Biomaster Peas



Legumes: Yellow Peas

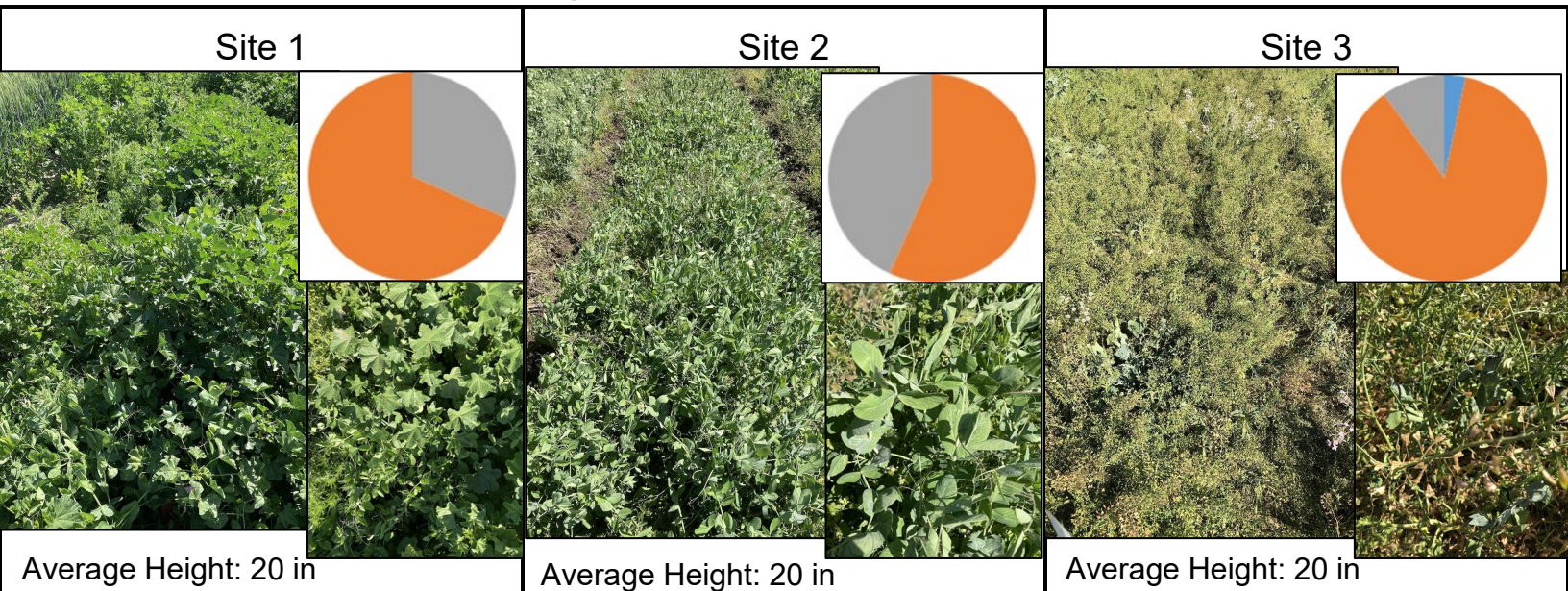


Legumes: Dundale Peas

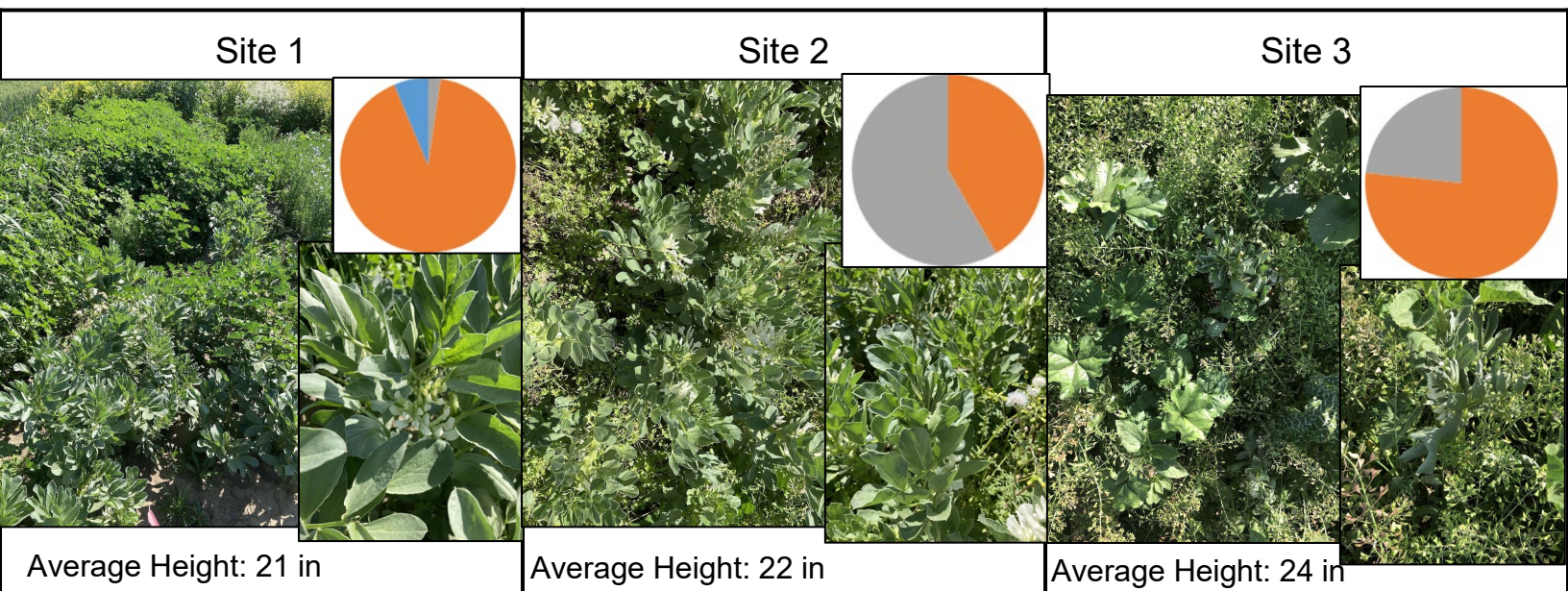


Percent Cover Key (average of three quadrants): Gray=Cover Crop. Orange=Weeds. Blue=Bare Soil

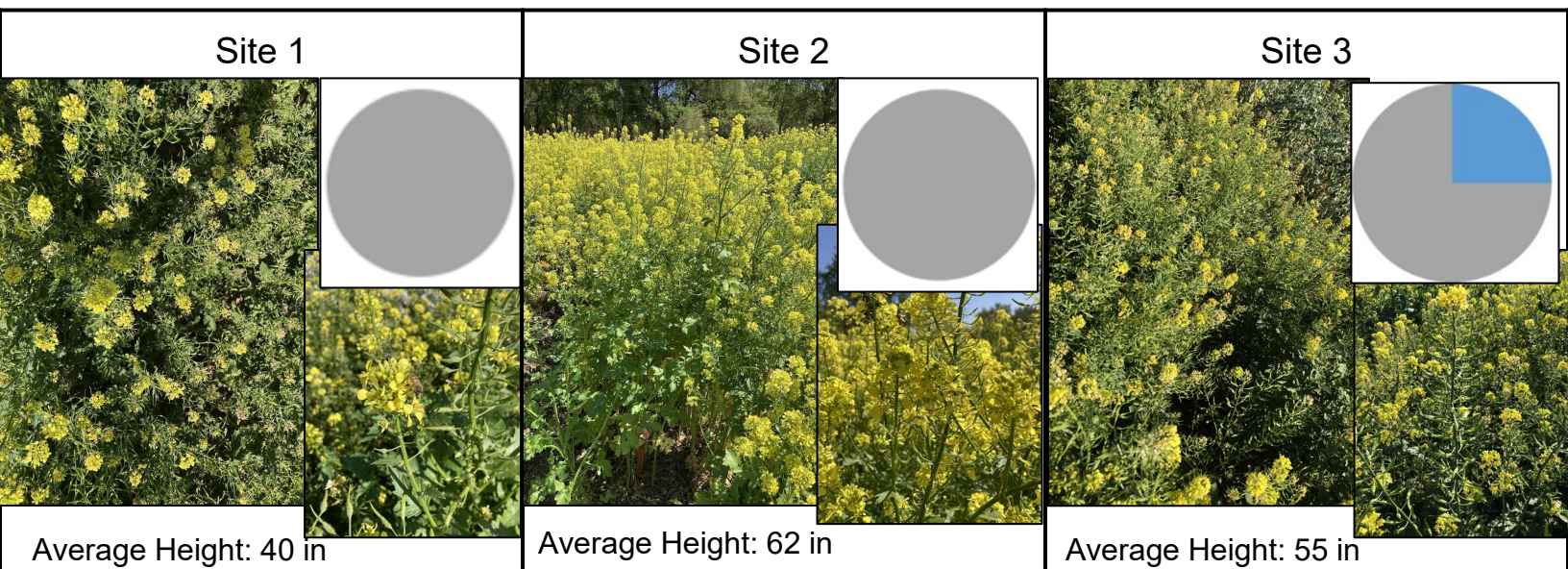
Legumes: Austrian White Peas



Legumes: Fava Beans

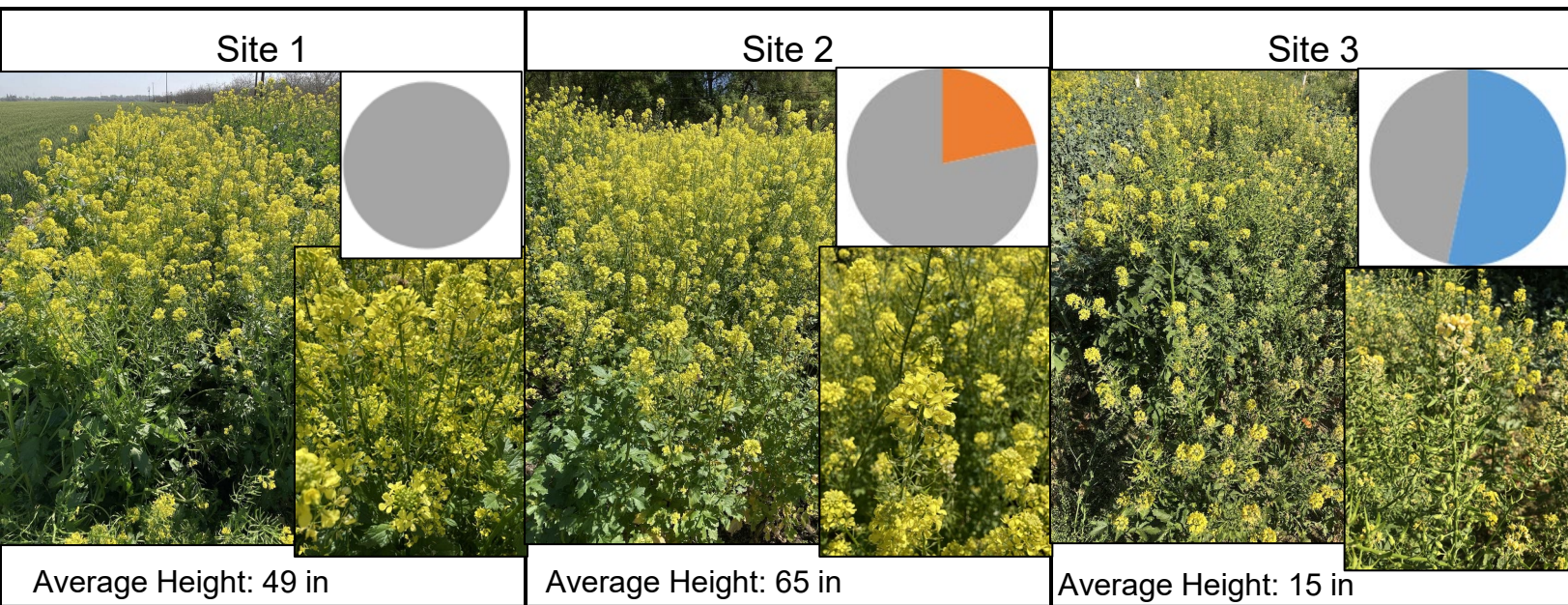


Brassicas: Martigena White Mustard

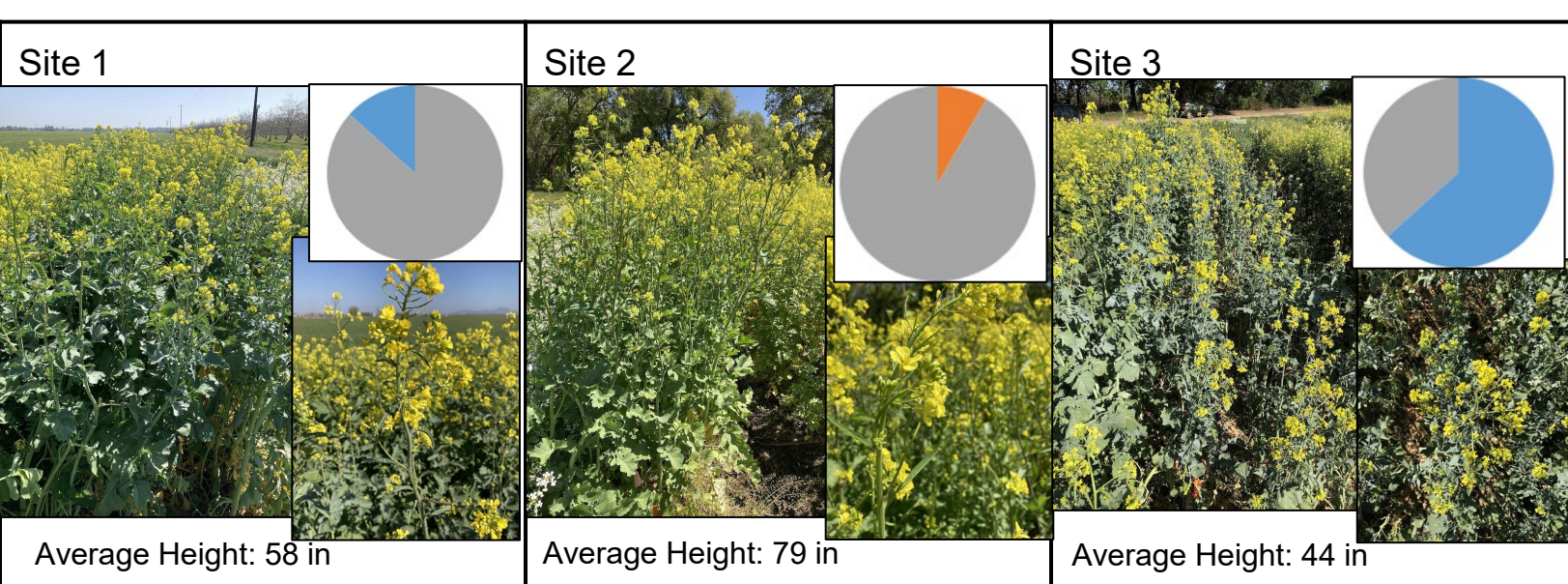


Percent Cover Key (average of three quadrants): Gray=Cover Crop. Orange=Weeds. Blue=Bare Soil

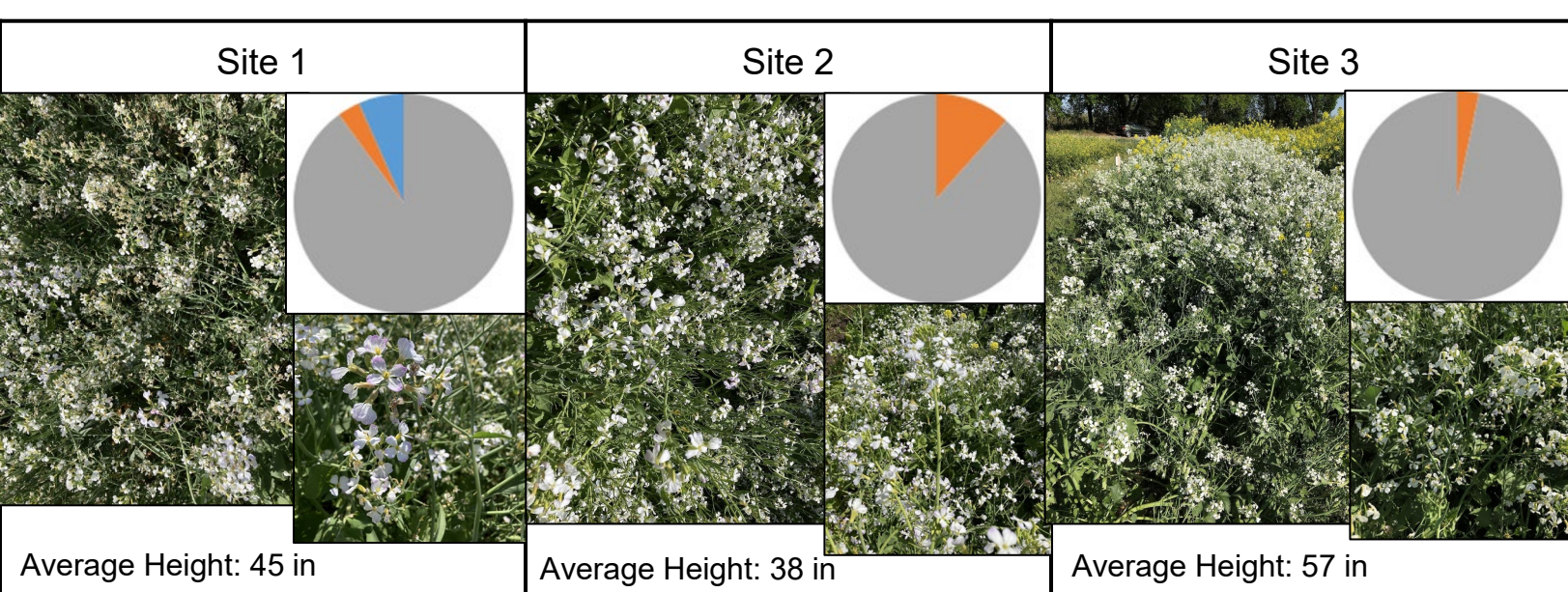
Brassicas: Yellow Mustard



Brassicas: Nemafix Mustard

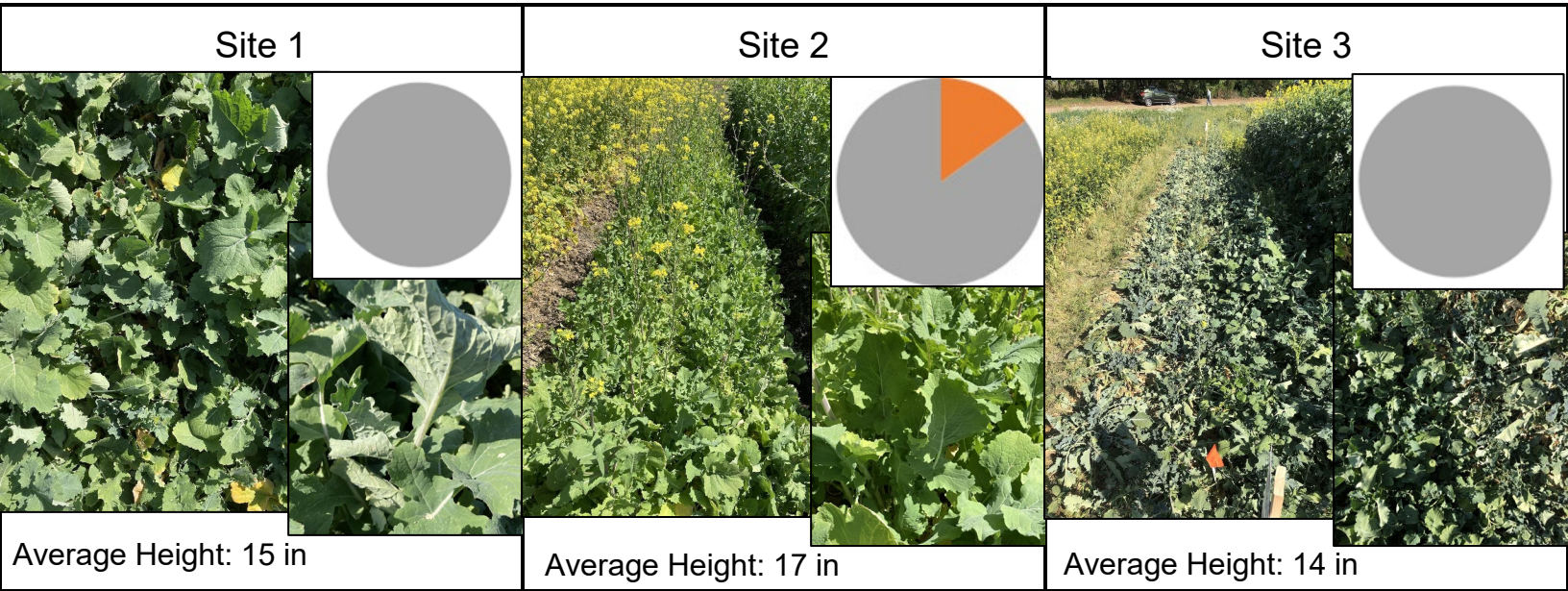


Brassicas: Daikon Radish

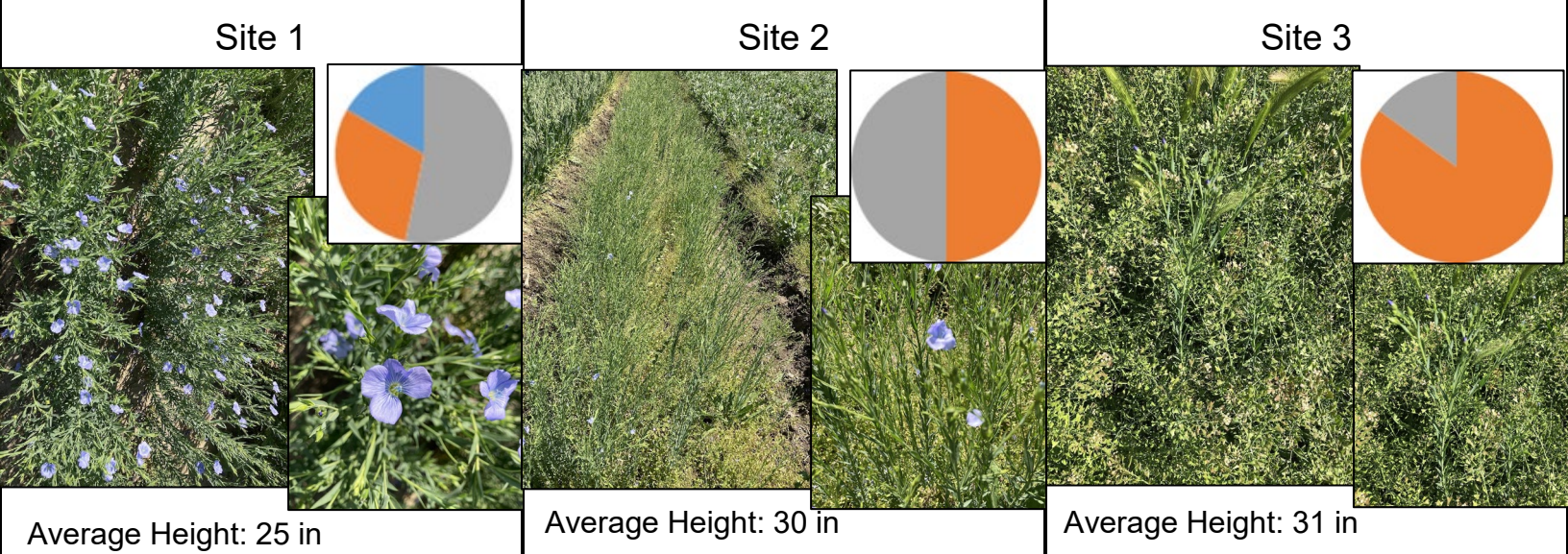


Percent Cover Key (average of three quadrants): Gray=Cover Crop. Orange=Weeds. Blue=Bare Soil

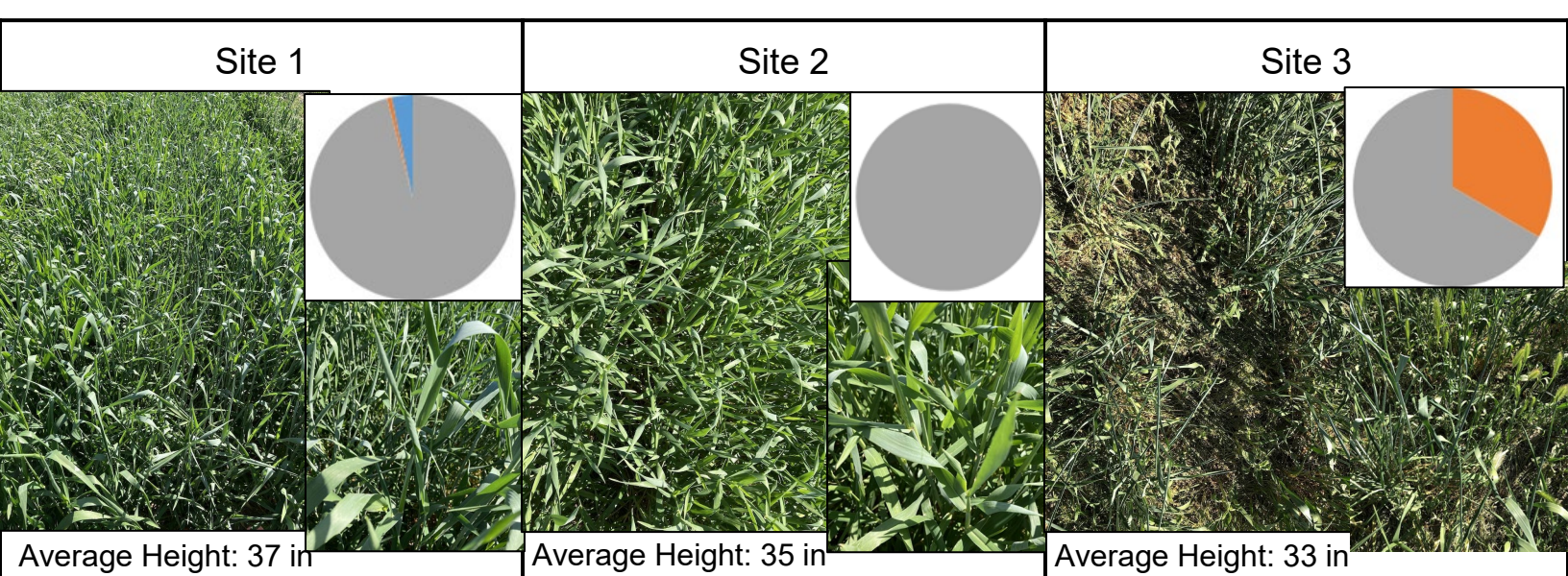
Brassicas: Purple Top Turnip



Linum: (Common) Flax

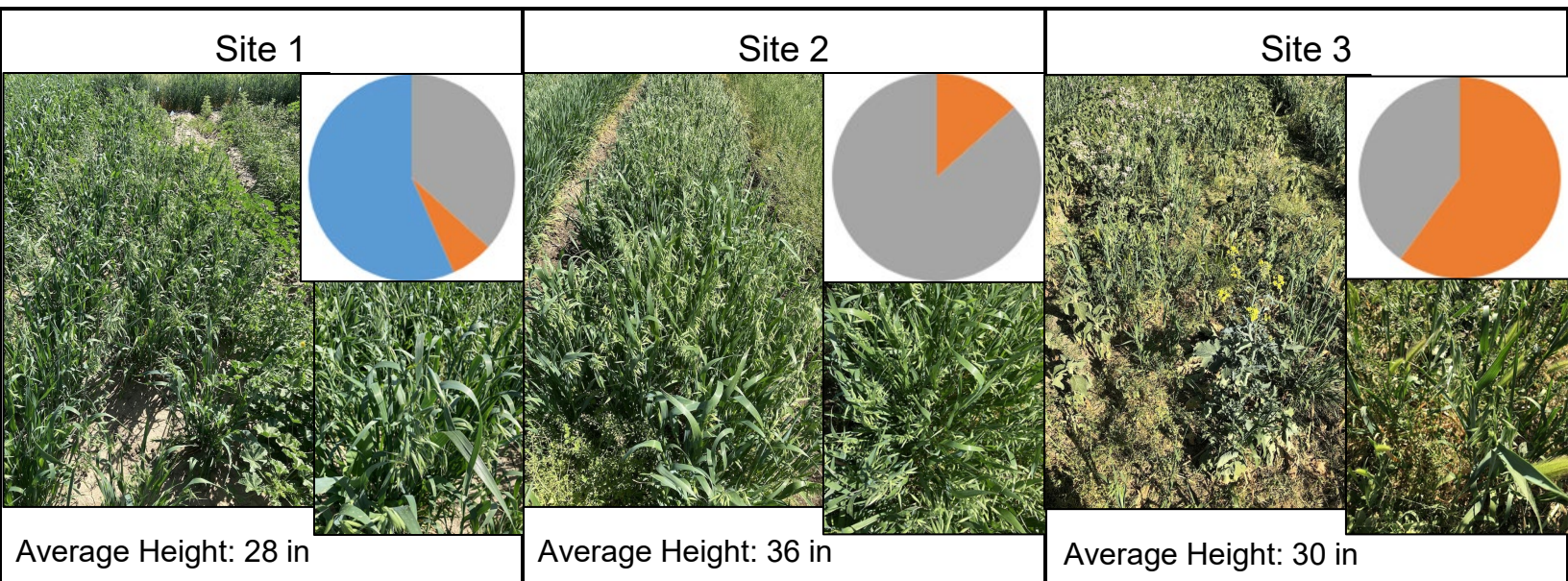


Grasses: Triticale

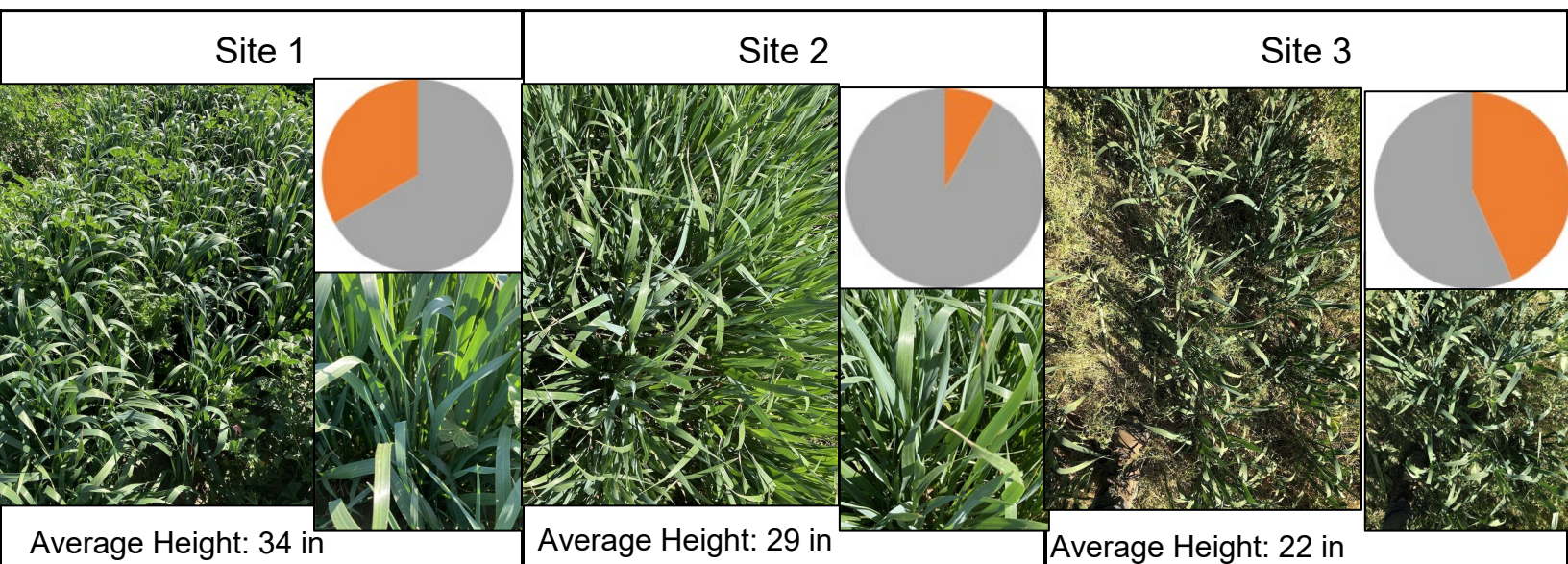


Percent Cover Key (average of three quadrants): Gray=Cover Crop. Orange=Weeds. Blue=Bare Soil

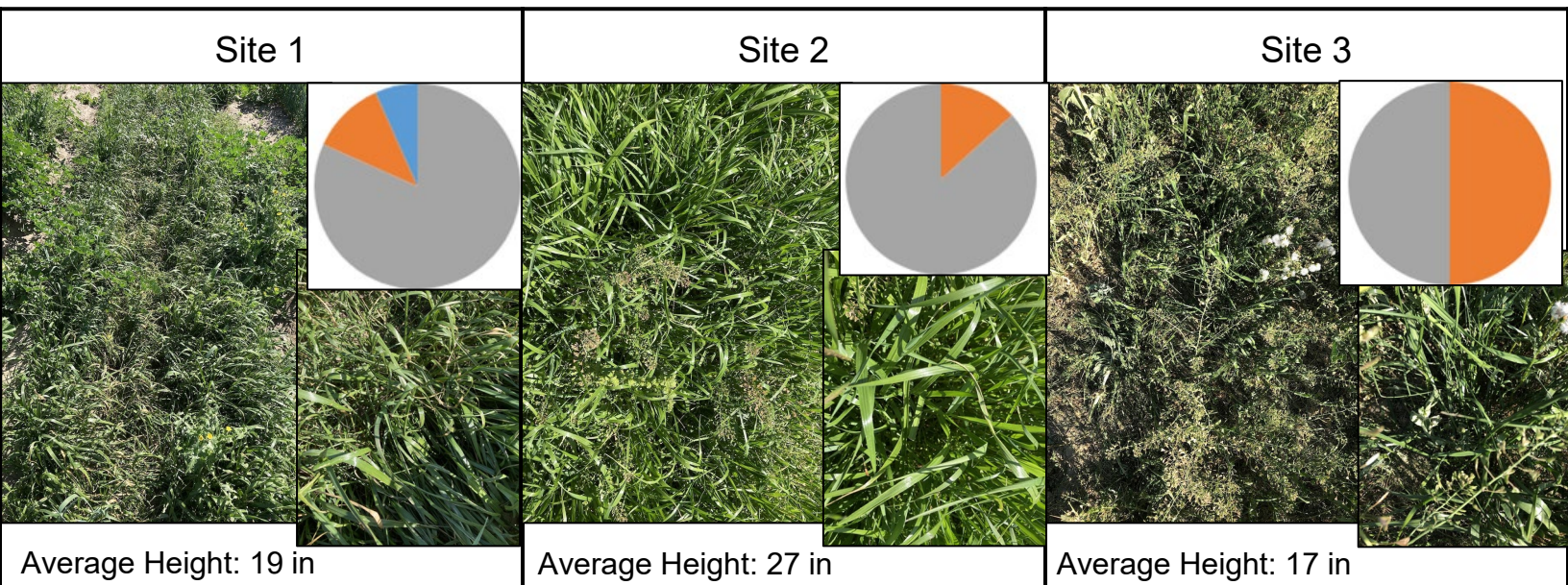
Grasses: Montezuma Oats



Grasses: Cayuse White Oats

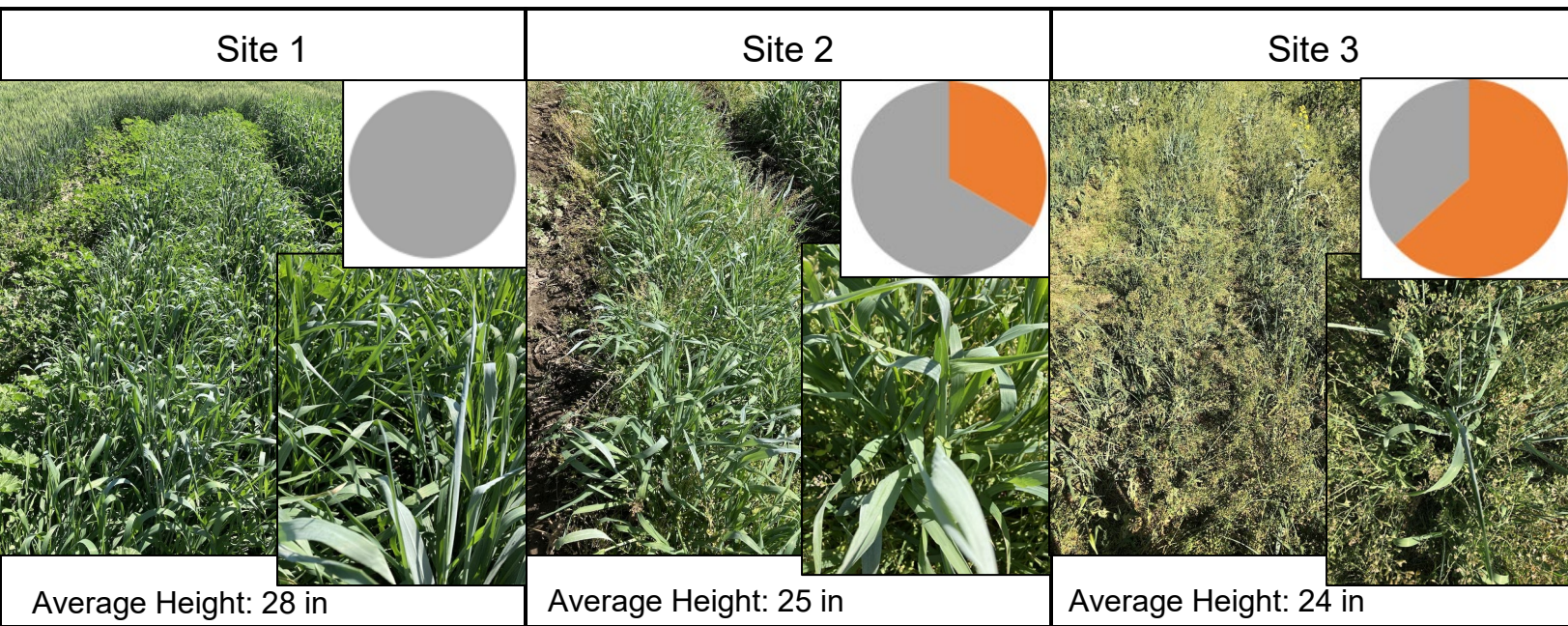


Grasses: Annual Ryegrass



Percent Cover Key (average of three quadrants): Gray=Cover Crop. Orange=Weeds. Blue=Bare Soil

Grasses: Cereal Rye Grain



Percent Cover Key (average of three quadrants): Gray=Cover Crop. Orange=Weeds. Blue=Bare Soil

Observations:

Brassicas were the most effective at outcompeting weeds, followed by grasses. Legumes were much less competitive against weeds. Legumes are less competitive in a drought year without irrigation.

The field with long-term soil health management practices and high soil organic matter (Site 2) had good stand establishment for many cover crop species even though the only irrigation was at the end of March.

For more field observations, a video tour of Site 1 can be found on the Soil Health Connection Youtube Channel, hosted by Agronomy Advisor Sarah Light and the Executive Director of the Colusa RCD, Liz Harper.

****All seed was donated by Kamprath Seed. Thank you to Tom Johnson and Kamprath Seed for supporting this work.****