Sampling Missouri Vineyards — A Weed Survey

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About me:

- I am a master's student for Reid Smeda and Dean Volenberg
- My projects:
  - Studying herbicide protocol in Missouri vineyards
  - Conducting a weed survey throughout the state of Missouri
  - Sent out a vineyard manager survey to compare to the weed survey
  - Researching the effects of 2,4-D Choline on the vineyard floor

Outline:

- **Difficulties of weed management in vineyards**
- **Diversity of Missouri vineyards**
- **What is a weed survey?**
- **Objectives**
- **Methods**
- **Data**
- **Summary**

Difficulties of weed management in vineyards:

- Weed management in grapevines (*Vitis vinifera*) is necessary to preclude both competition as well as challenges with mechanical berry harvest.
- Many growers in Missouri rely upon repeated applications of paraquat, glufosinate and glyphosate, which often results in late-season populations of annual grasses.
- Public concern regarding glyphosate safety, as well as new restrictions on the use of paraquat will require vineyard managers to consider diversifying herbicide usage and timing.

Negative effects of weeds on grapes:

- Increased competition between plants for nutrients
- Increased quantity of pests present in area
- Possible decrease in berry yield
- Decreased water availability for grapes

Diversity of vineyards in Missouri

The Missouri Wine Trail:

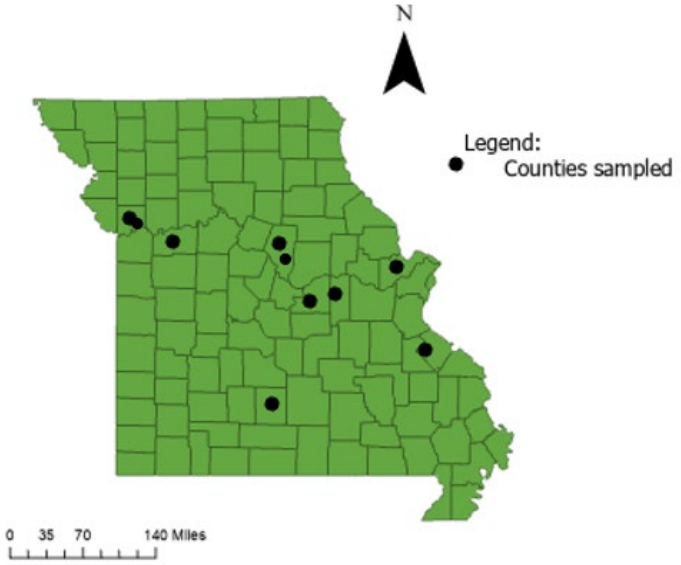
- 125 wineries and counting

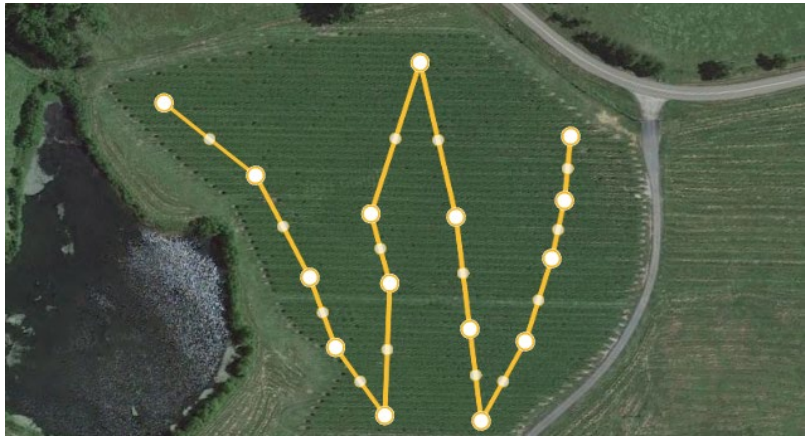
What is a weed survey?

- The identification and count of certain species in a specific area.
- Weed surveys are an important tool to periodically identify current weed species diversity and density in a crop
- Surveys can then serve as a guideline for developing effective weed management strategies

Objectives: The weed survey

- Count and identify summer annuals and perennials
- Count and identify winter annuals
- It is likely that the species composition and density will reflect certain weed management practices
- Find comparisons between the weed survey and the vineyard manager survey
- Develop more efficient herbicide practices for vineyards





Methods: The weed survey

- Ten vineyards scattered throughout the state of Missouri were chosen (August 2021 to September 2021)
- Prior to surveying, the number of sample points was established based upon the total acreage of each block (an area of the same hybrid with similar management practices)
- These points were set in a W or S shaped pattern throughout the block being surveyed
- At the vineyard, start at the desired sample point and walked to all the planned points

Methods Continued:

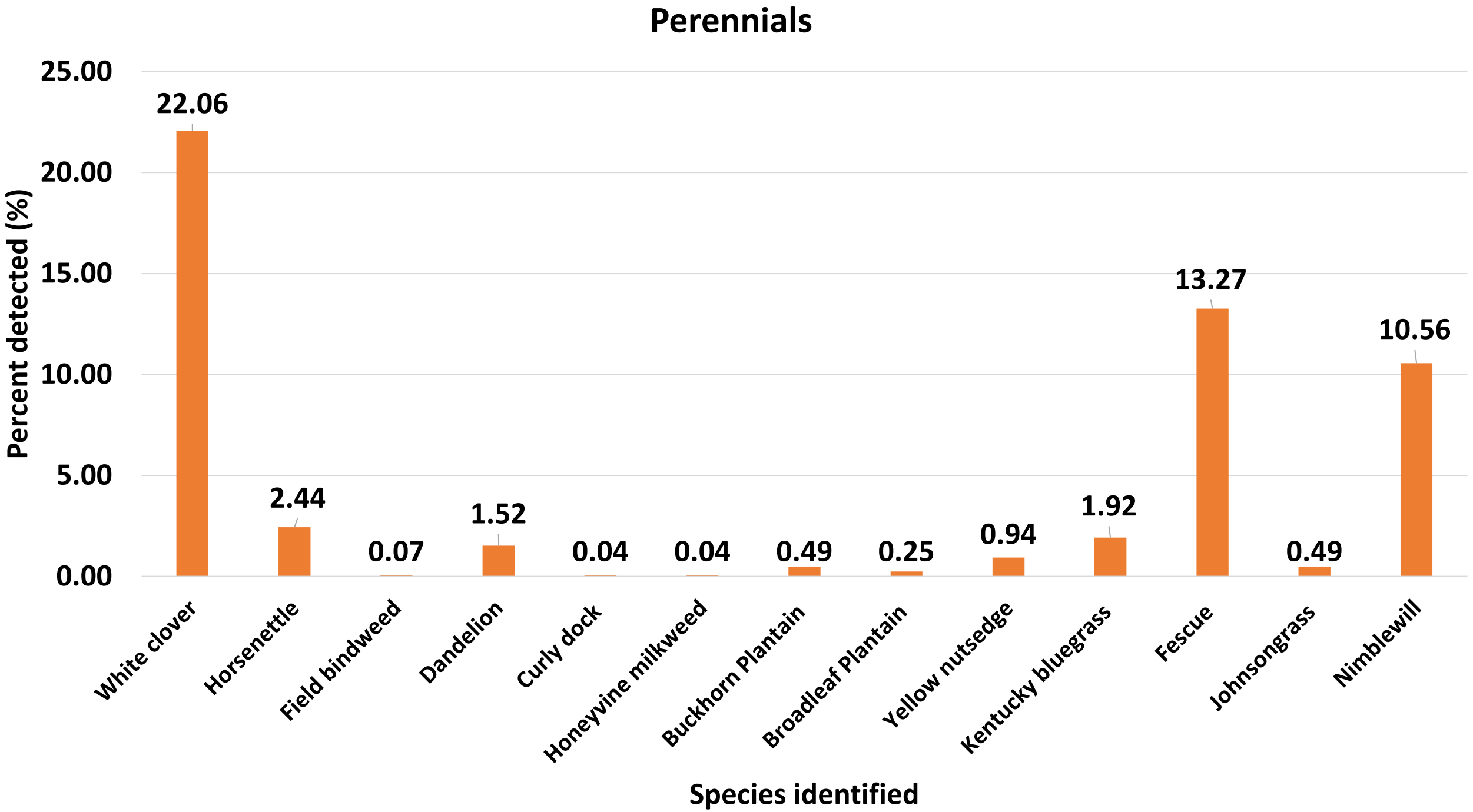
- Each sample point, consisted of 3, 0.25 m^2 sub samples, selected at random throughout a vineyard
- Species and the number of individual plants (annuals and perennials) was tallied
- Summer and winter annuals times will be surveyed at the same ten vineyards

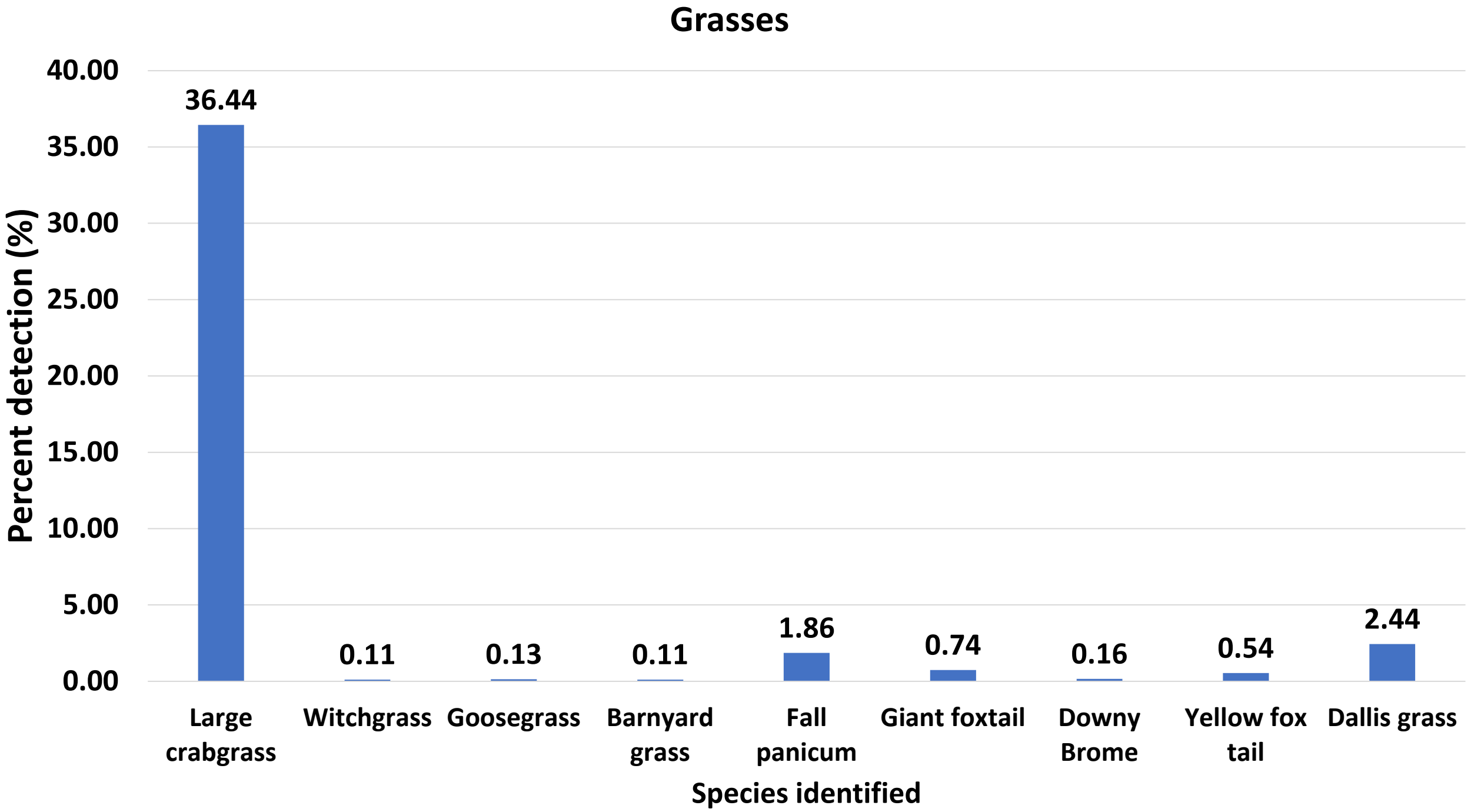
34 total species were identified:

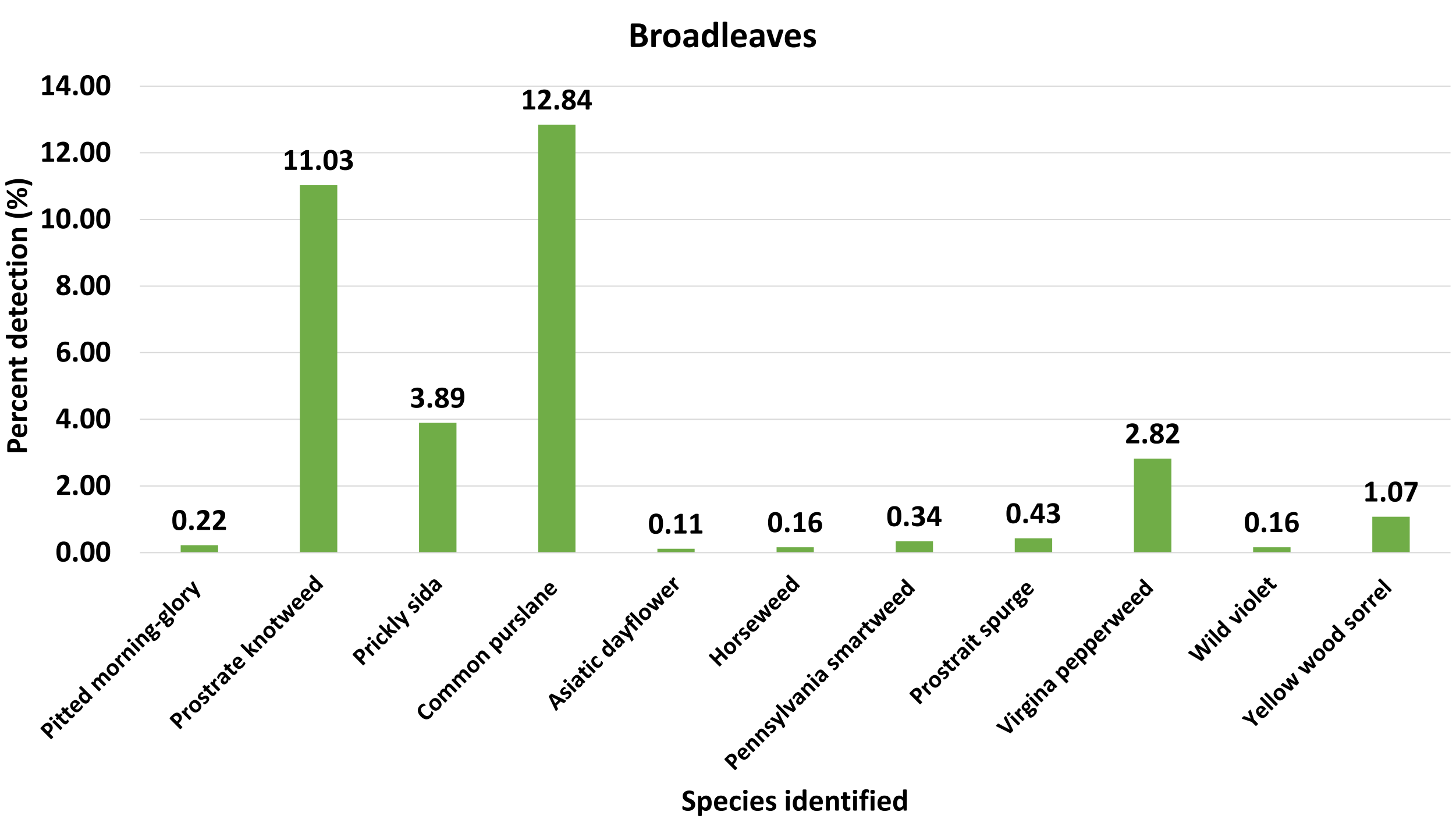
- **Perennials:**
  - White clover
  - Horsenettle
  - Field bindweed
  - Dandelion
  - Curly dock
  - Honeyvine milkweed
  - Buckhorn plantain
  - Broadleaf plantain
  - Fescue
  - Nimblewill
  - Kentucky bluegrass
  - Yellow nutsedge
  - Johnsongrass
  - Dallisgrass
- **Annuals broadleaves:**
  - Pitted morning glory
  - Ivy leaf morning glory
  - Common purslane
  - Prickly sida
  - Pennsylvania smartweed
  - Virginia pepperweed
  - Prostrate spurge
  - Prostrate knotweed
  - Asiatic dayflower
  - Horseweed
  - Wild violet
  - Yellow woodsorrel
- **Annual grasses:**
  - Large crabgrass
  - Barnyard grass
  - Fall panicum
  - Witchgrass
  - Goosegrass
  - Yellow foxtail
  - Giant foxtail
  - Downy brome

Other problematic weed species identified:

- Tree of heaven
- Virginia creeper
- Palmer amaranth


Perennials
25.00
20.00
15.00
10.00
5.00
0.00
Percent detected (%)
22.06
2.44
0.07
1.52
0.04
0.04
0.49
0.25
0.94
1.92
13.27
0.49
10.56
White clover
Horsenettle
Field bindweed
Dandelion
Curly dock
Honeyvine milkweed
Buckhorn Plantain
Broadleaf Plantain
Yellow nutsedge
Kentucky bluegrass
Fescue
Johnsongrass
Nimblewill
Species identified


Grasses
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Percent detection (%)
36.44
0.11
0.13
0.11
1.86
0.74
0.16
0.54
2.44
Large crabgrass
Witchgrass
Goosegrass
Barnyard grass
Fall panicum
Giant foxtail
Downy Brome
Yellow fox tail
Dallis grass
Species identified


Broadleaves
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Percent detection (%)
0.22
11.03
3.89
12.84
0.11
0.16
0.34
0.43
2.82
0.16
1.07
Pitted morning-glory
Prostrate knotweed
Prickly sida
Common purslane
Asiatic dayflower
Horseweed
Pennsylvania smartweed
Prostrait spurge
Virgina pepperweed
Wild violet
Yellow wood sorrel
Species identified

Clover as a cover crop:

- Nitrogen fixation
- Protects soil from erosion
- Improve soil fertility
- Improved water holding capacity

Conclusions:

- A total of 34 species were detected at the 10 vineyards (447 sample points), with 3.4 being the mean number of species found at each vineyard
- Perennials included white clover (22.1%), Fescue (12.3%), Nimblewill (10.86%), and horsenettle (2.42%)
- Annual broadleaves included common purslane (12.8%) prickly sida (3.89%) and prostrate knotweed (3.53%)
- Annual grasses included large crabgrass (*Digitaria sanguinalis*) (36.4%), Dallis grass (2.44%), and fall panicum (1.86%).

Next step:

- Survey winter annuals in March
- An electronic vineyard survey was sent out on February 19th
- Compare the physical weed survey with the electronic survey
- Provide information regarding what management practices are useful
- What new management plans vineyard managers should be looking forward to using in the future
- Which weed species vineyard managers find most troublesome

Thank you- Questions:

- I would like to thank all the vineyard owners who let me survey their vineyard, as well as those who have already participated in the electronic survey

- Please take the online survey at your earliest convenience

Citations:

- Reynolds, A.G. “Viticultural and Vineyard Management Practices and Their Effects on Grape and Wine Quality.” *Managing Wine Quality*, 2010, pp. 365–444 https://doi.org/10.1533/9781845699284.3.365.
- McGourty, Glenn. *Cover Cropping Systems for Organically Farmed Vineyards*, https://cemendocino.ucanr.edu/files/17082.pdf
- “Missouri Wine Trail .” *Explore Missouri Wine Trails*, Missouri Wines, https://missouriwine.org/news/explore-missouri-wine-trails.