

Survival and Growth of Woody Plants on Four Reclaimed Surface Mines

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History of Surface Mining Reclamation

A progression from rehabilitation  restoration

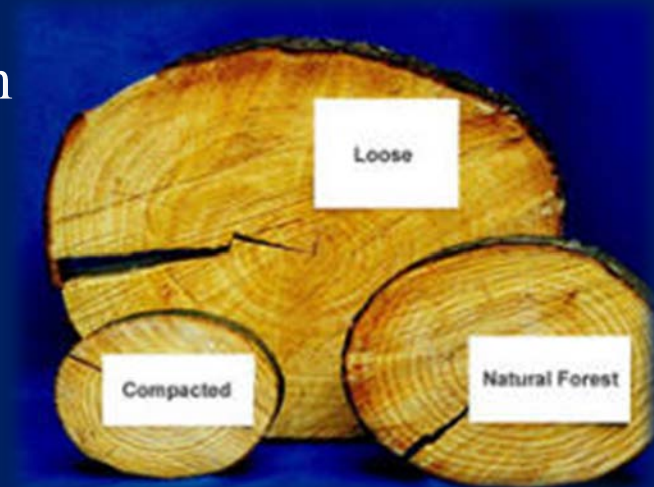


The Forestry Reclamation Approach (FRA)



Composed of 5 Steps:

1. Establish 4 ft deep topsoil rooting medium
2. Loosely grade medium
3. Plant compatible groundcovers
4. Plant two tree types
5. Proper planting techniques

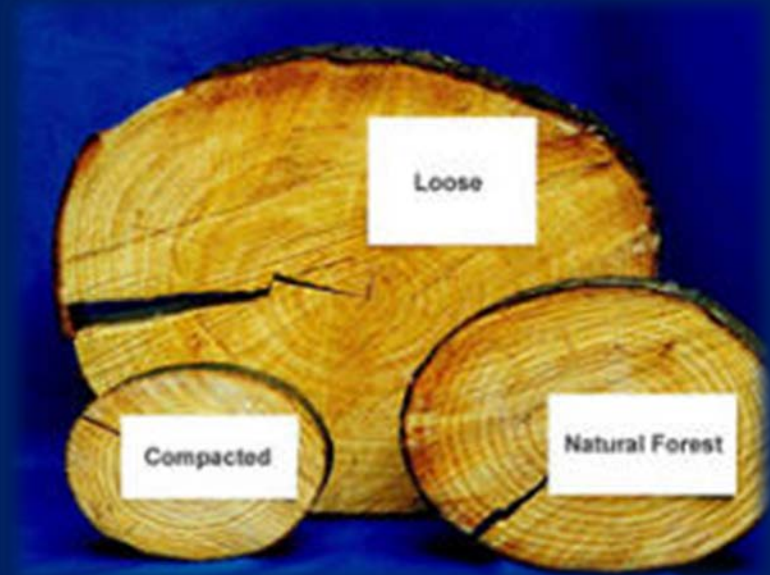


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Comparing a Mined vs Native Forests

Mined Forest



Native forest



Tree and Shrub Species for Surface Mine Reclamation Plantings in Appalachia

Objective

Determine the survival and growth of 20 tree and shrub species on WV surface mines

Tree and Shrub Species for Surface Mine Reclamation Plantings in Appalachia

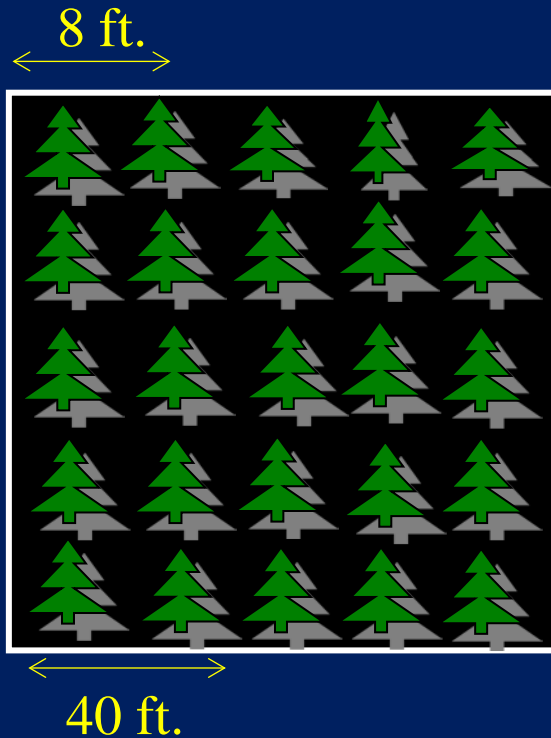
Williams Forestry established research blocks in 2008 and 2010



4 Mines in West Virginia:

- 1) Elk Run
- 2) Hobet
- 3) Fola
- 4) ICG-Birch River

Tree and Shrub Species for Surface Mine Reclamation Plantings in Appalachia



20	18	10	13	9
15	16	11	17	3
1	4	14	6	12
19	5	2	7	8



Species Included:

Tree Species A-E

1. American crabapple (*Malus coronaria*)
2. Black Cherry (*Prunus serotina*)
3. Chokecherry (*Prunus virginiana*)
4. Common apple (*Malus pumila*)
5. Common pear (*Pyrus communis*)
6. Elderberry (*Sambucus canadensis*)
7. Eastern redbud (*Cercis canadensis*)



Species Included:

Tree Species F-L

8. Flowering Dogwood (*Cornus florida*)
9. Pawpaw (*Asimina triloba*)
10. Persimmon (*Diospyros virginiana*)
11. Red Mulberry (*Morus rubra*)
12. Serviceberry (*Amelanchier arborea*)
13. Washington hawthorn (*Crataegus phaenopyrum*)
14. Wild plum (*Prunus americana*)



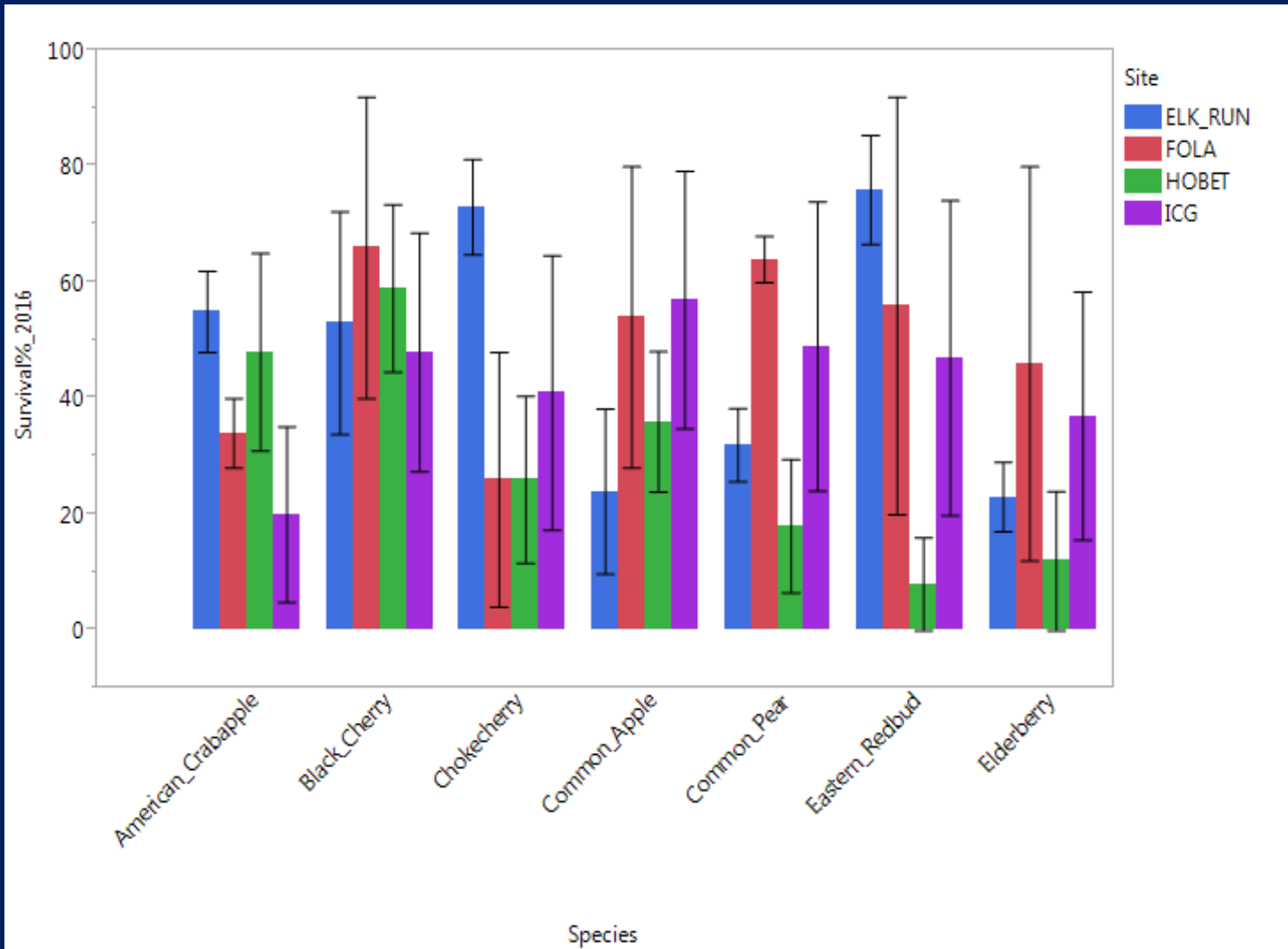
Species Included:

Shrub Species

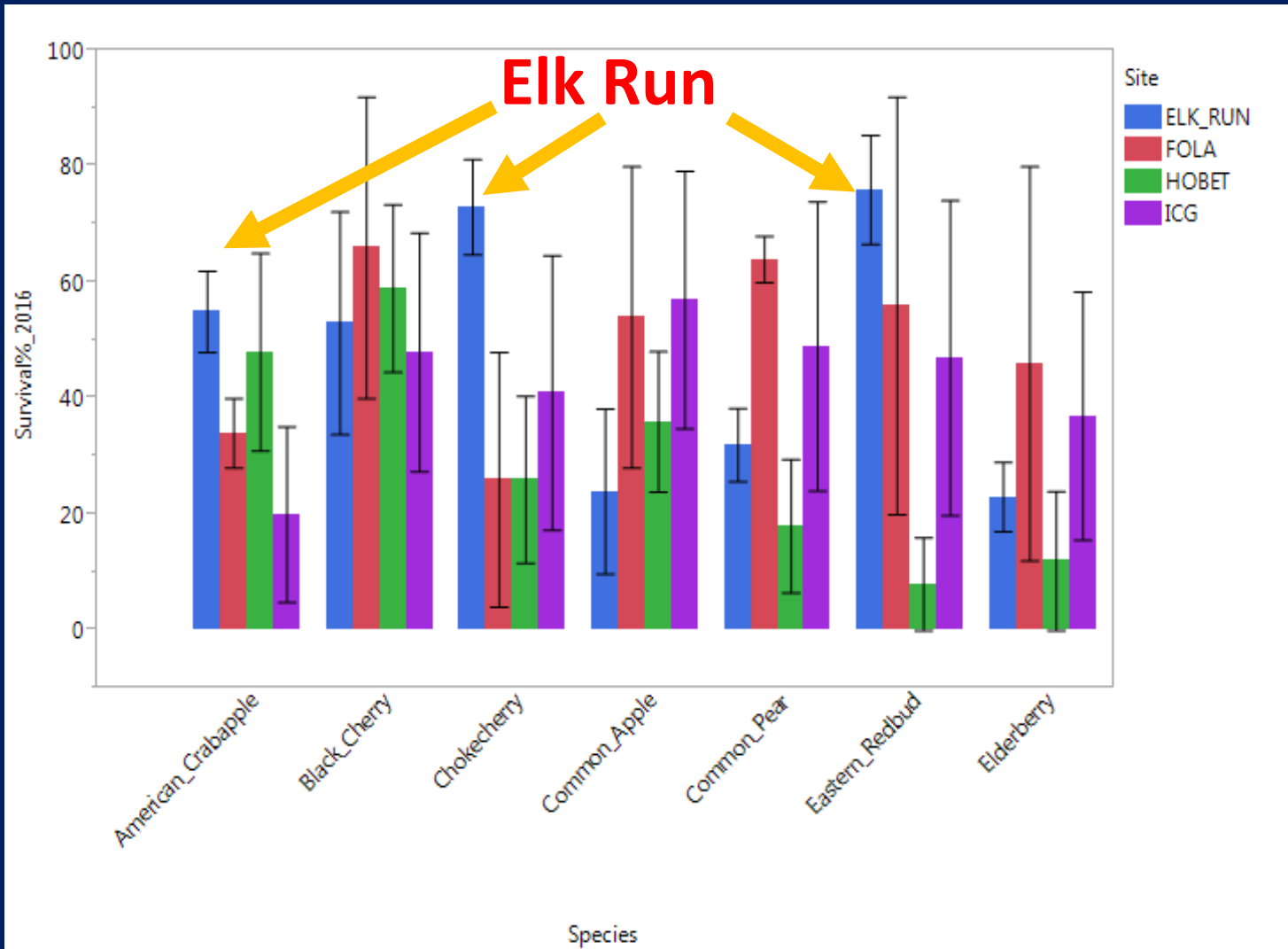
15. Black Chokeberry (*Aronia melanocarpa*)
16. Highbush blueberry (*Vaccinium corymbosum*)
17. Gray Dogwood (*Cornus racemosa*)
18. Highbush cranberry (*Viburnum trilobum*)
19. Nannyberry (*Viburnum lentago*)
20. Hazelnut (*Corylus avellana*)



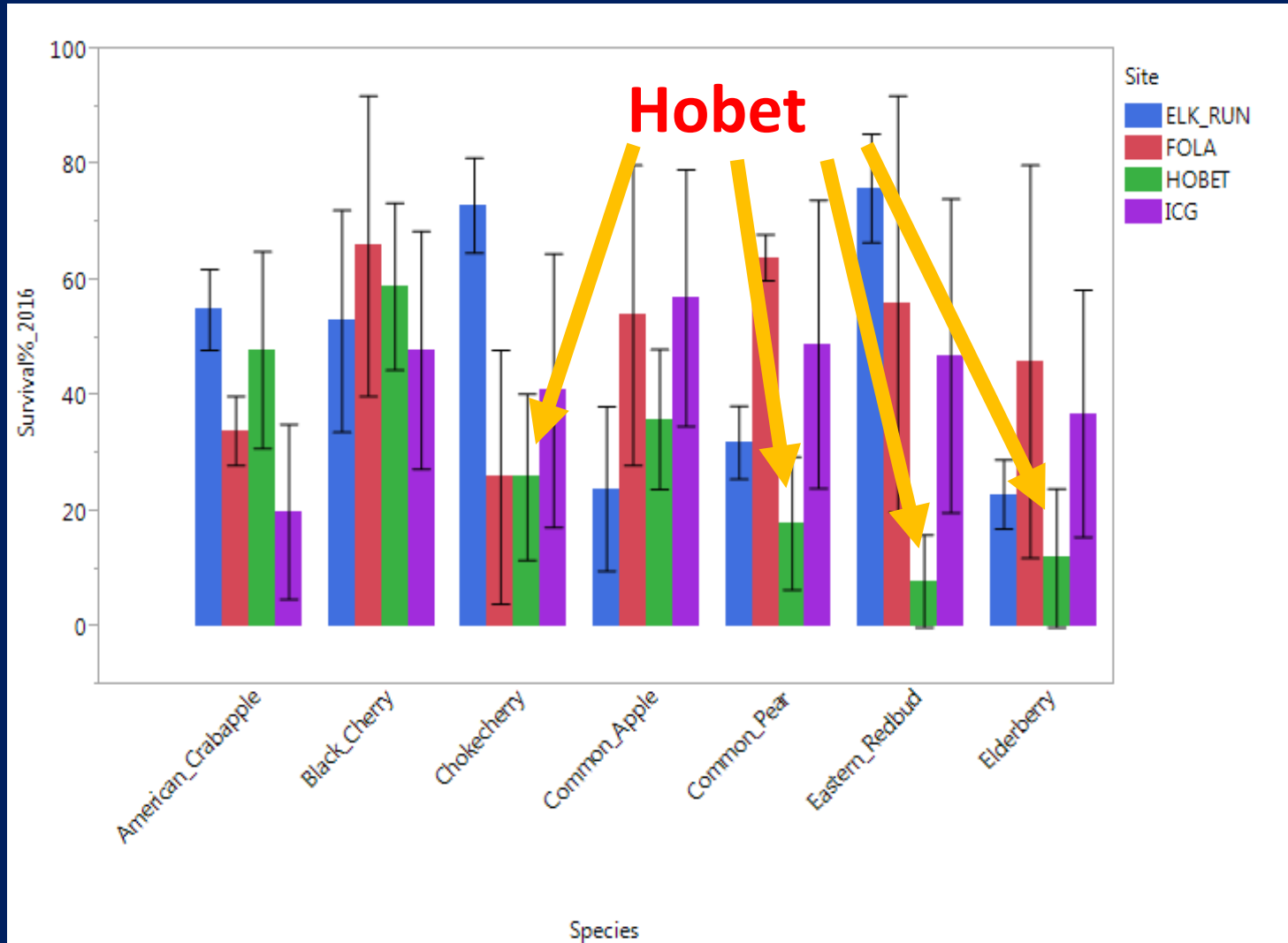
Tree Survival on Four Sites (Species A-E)



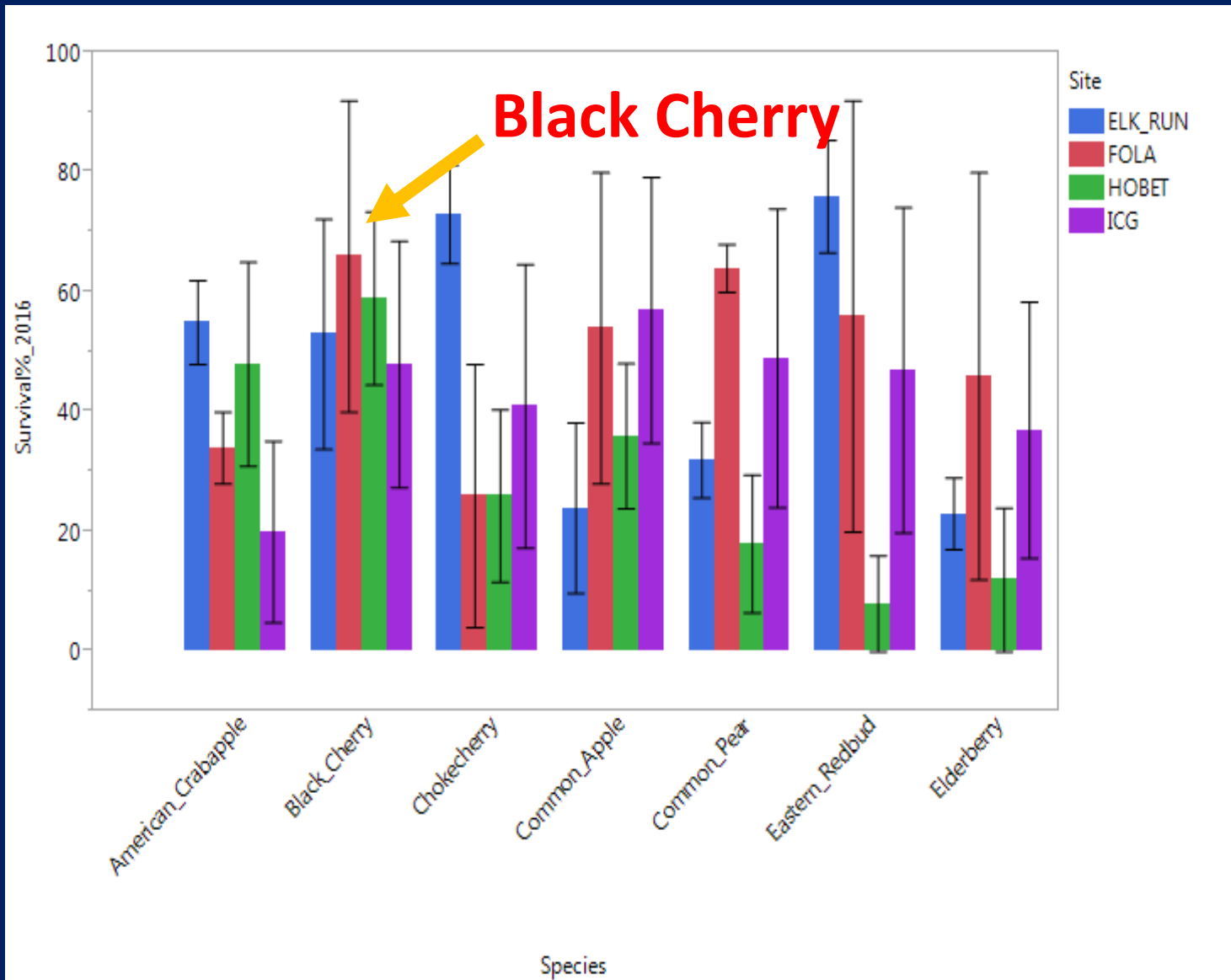
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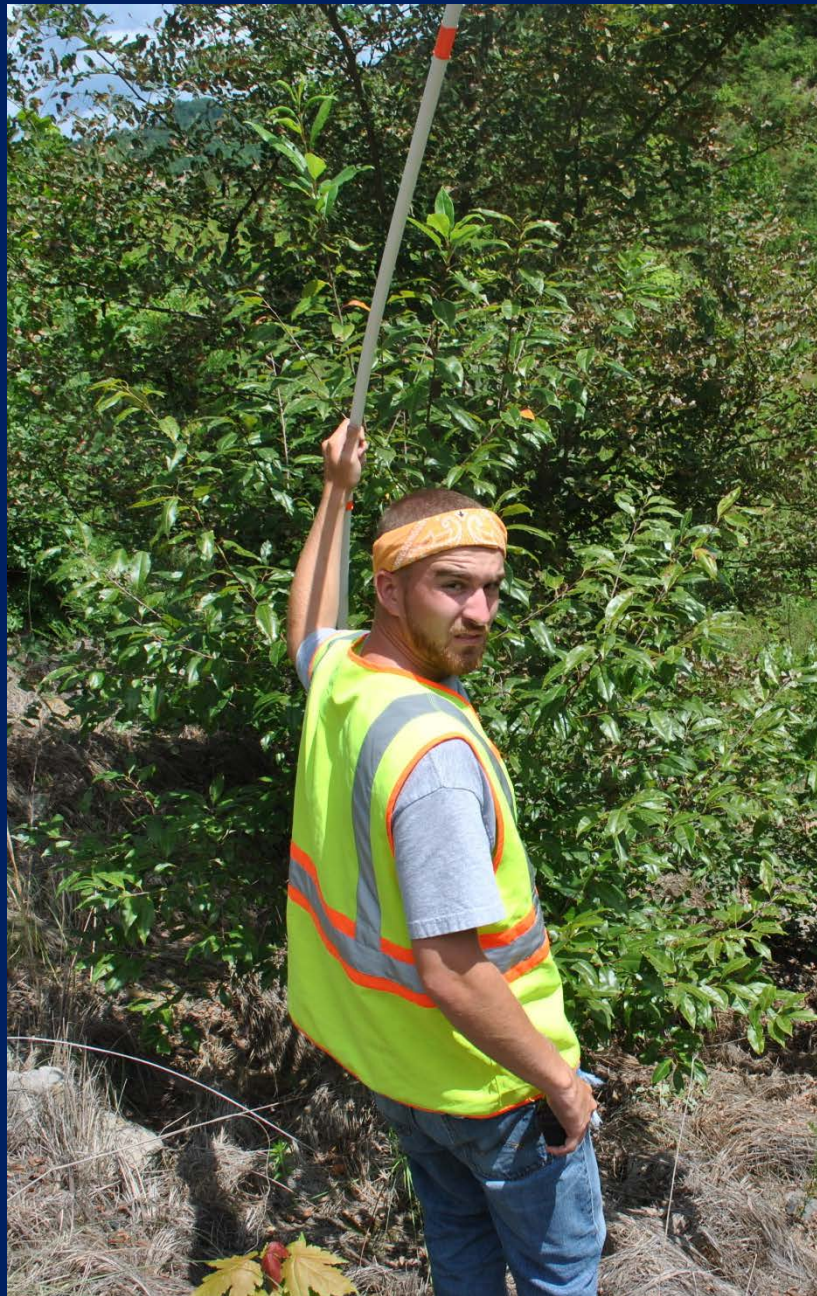


Tree Survival on Four Sites (Species A-E)



Tree Survival on Four Sites (Species A-E)



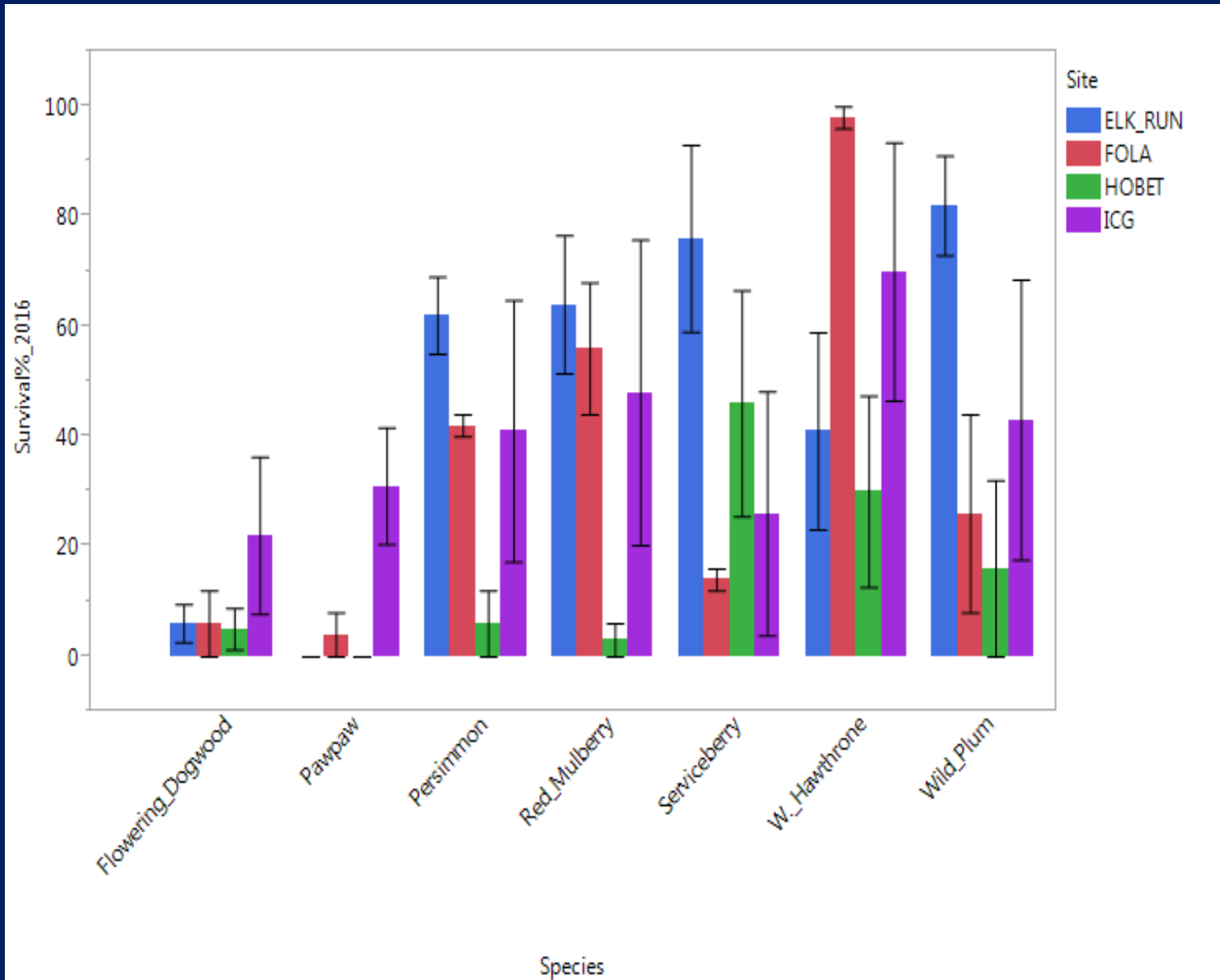


Black cherry at Fola

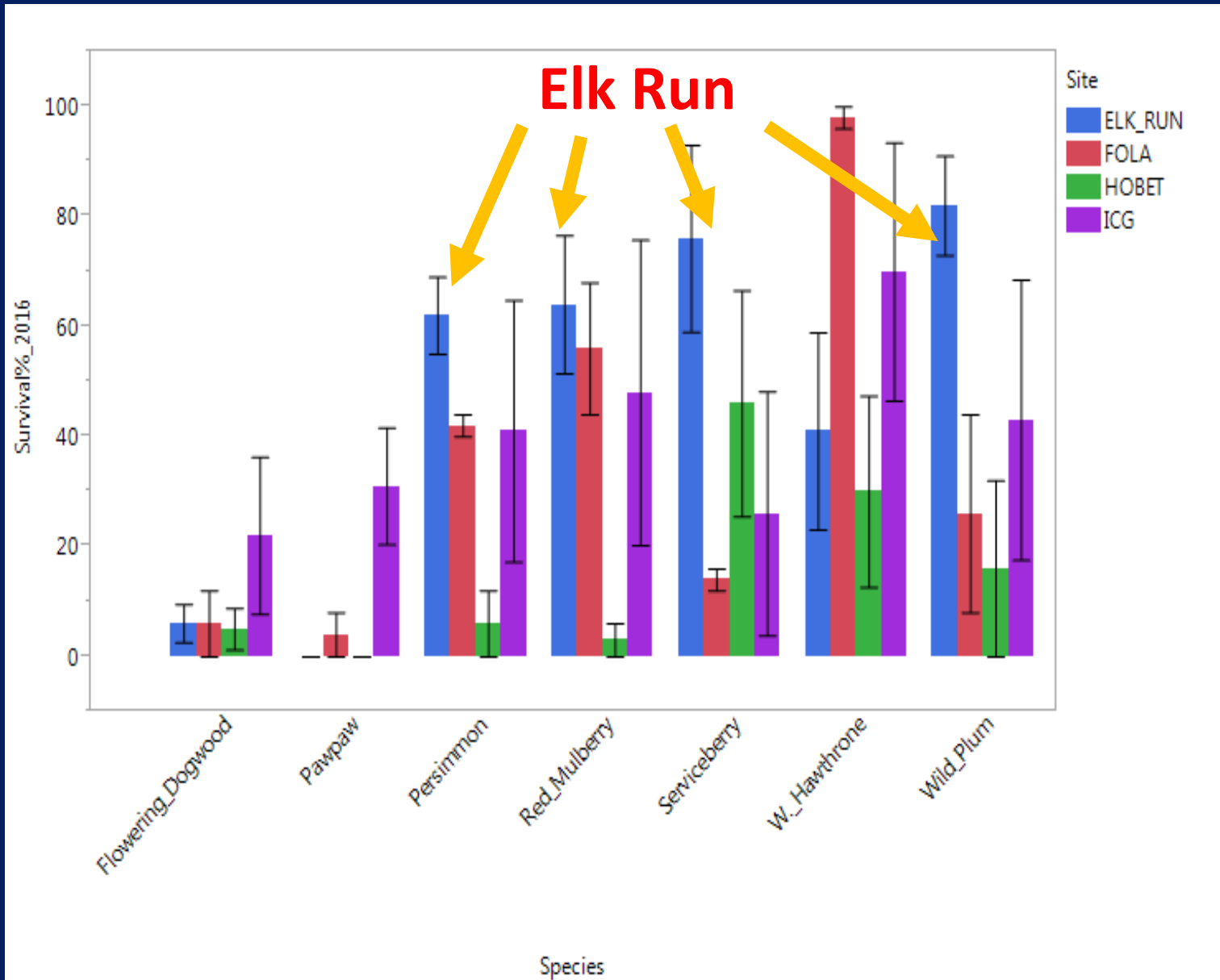


Black cherry at ICG

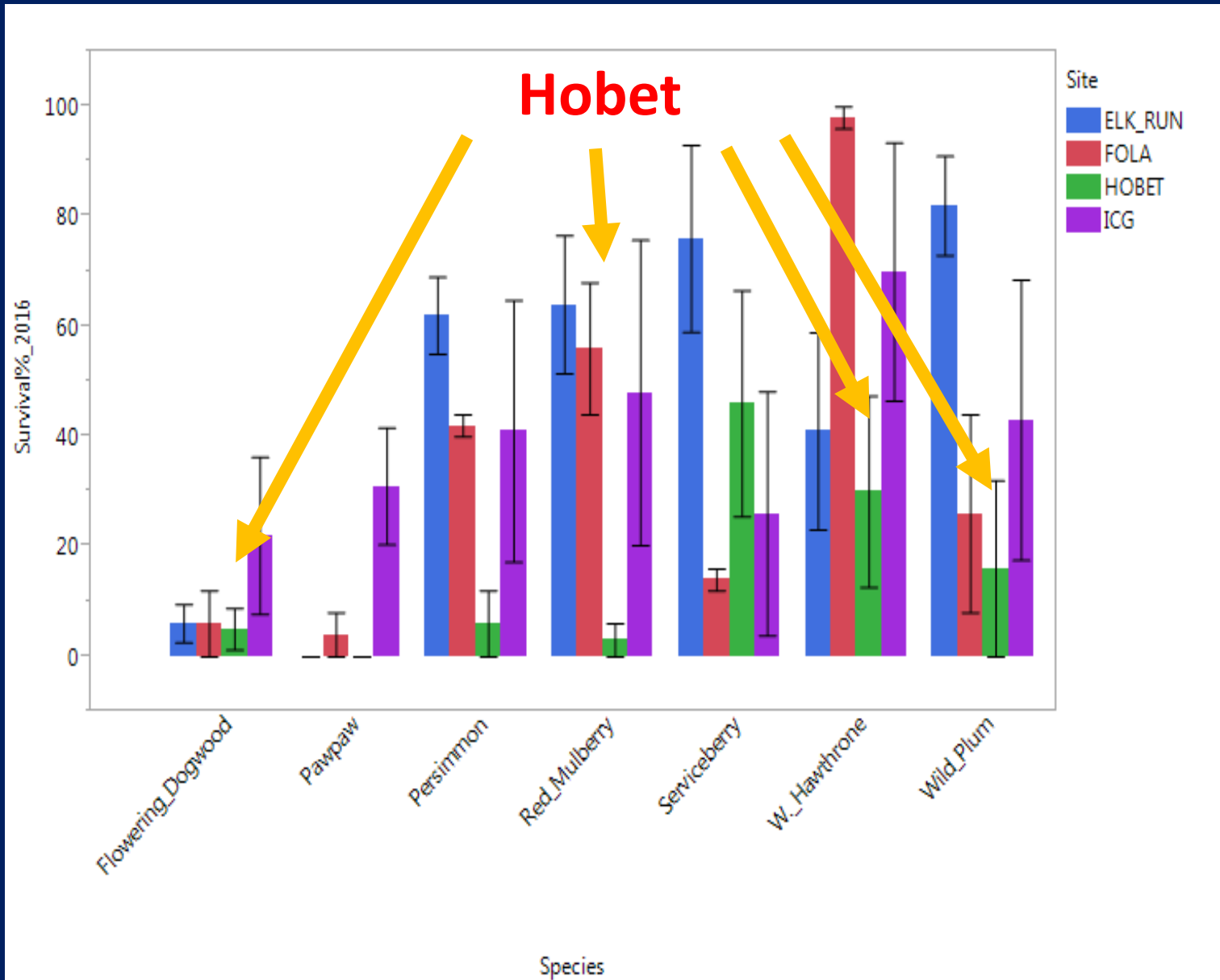
Tree Survival on Four Sites (Species F-L)



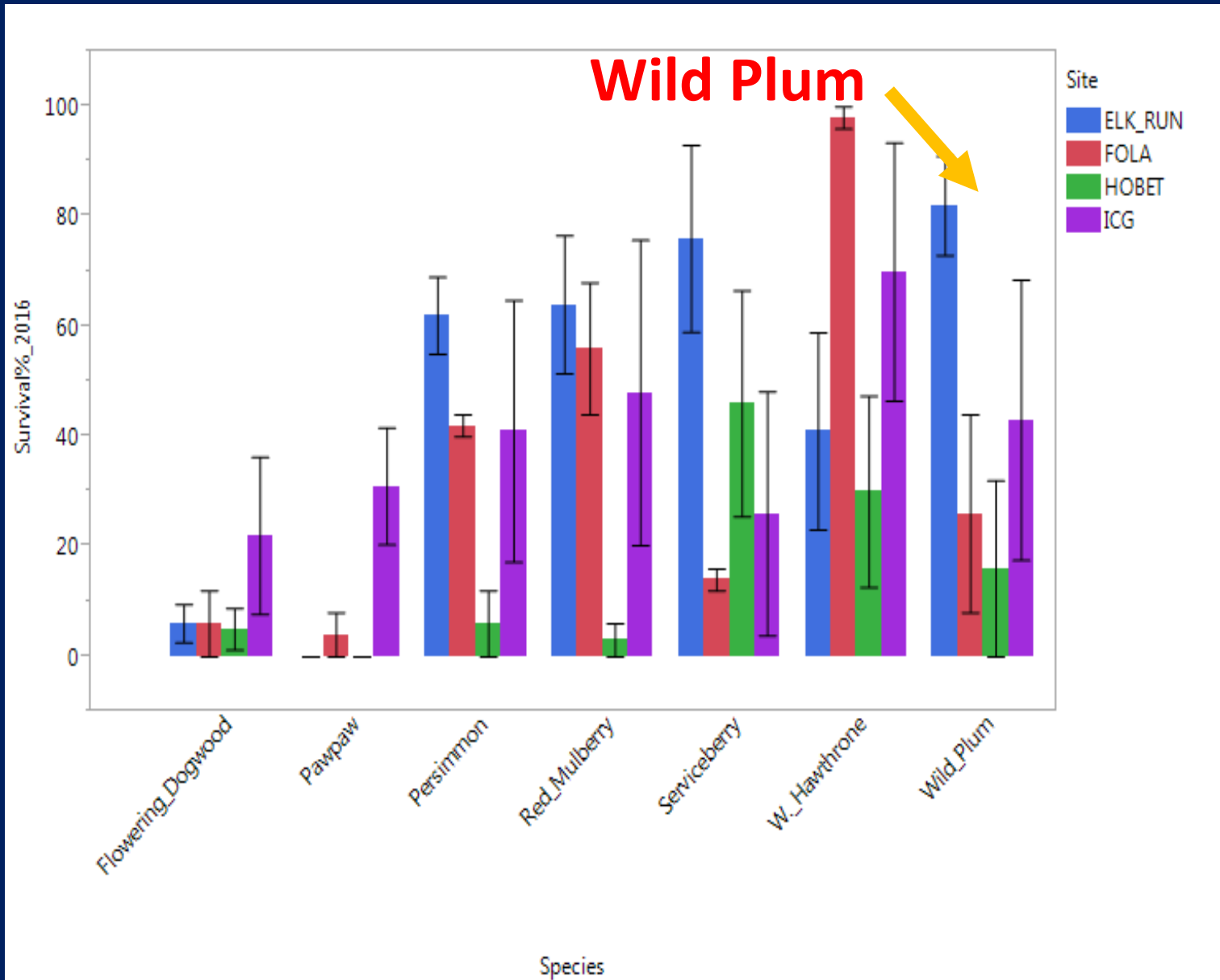
Tree Survival on Four Sites (Species F-L)



Tree Survival on Four Sites (Species F-L)



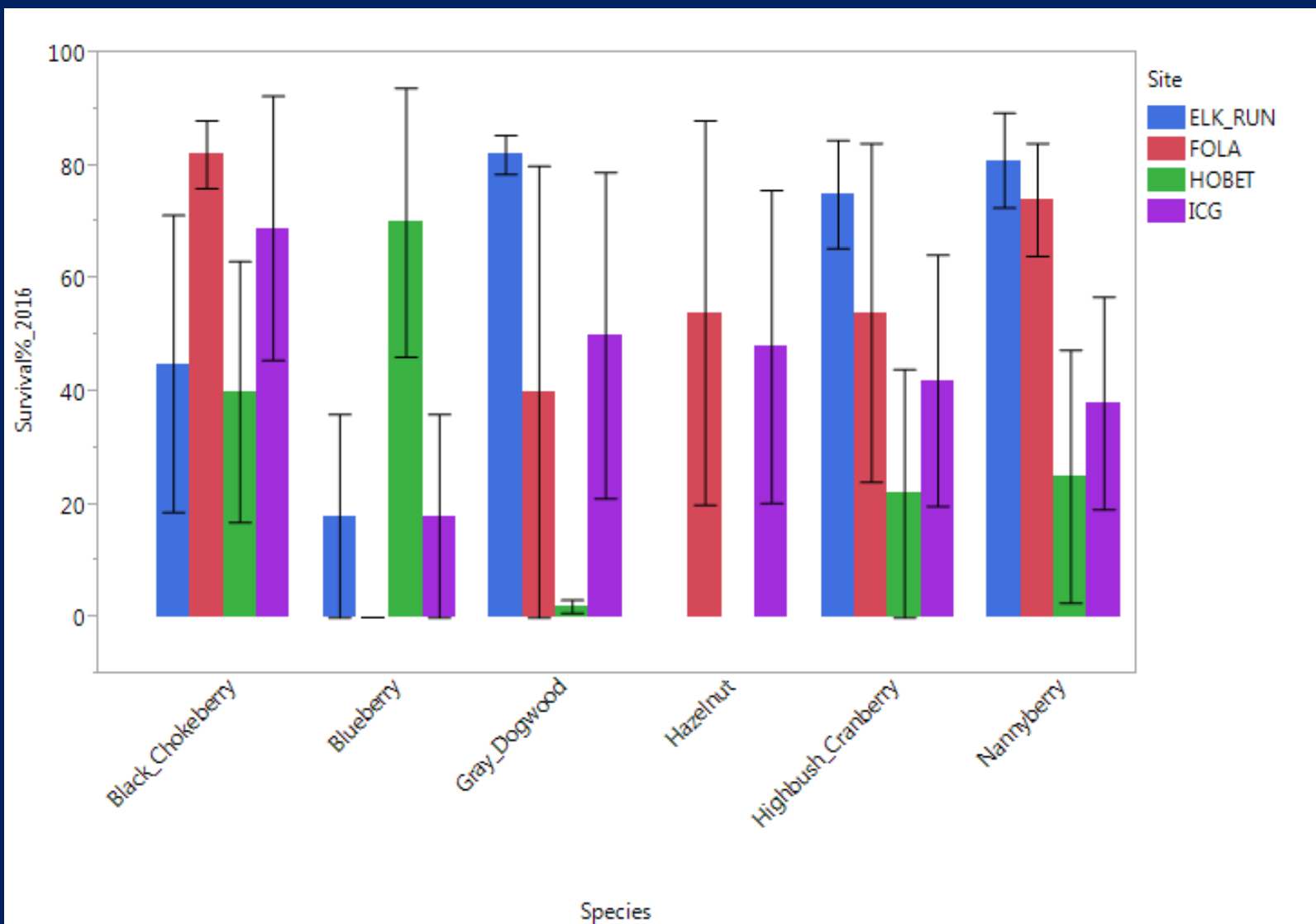
Tree Survival on Four Sites (Species F-L)



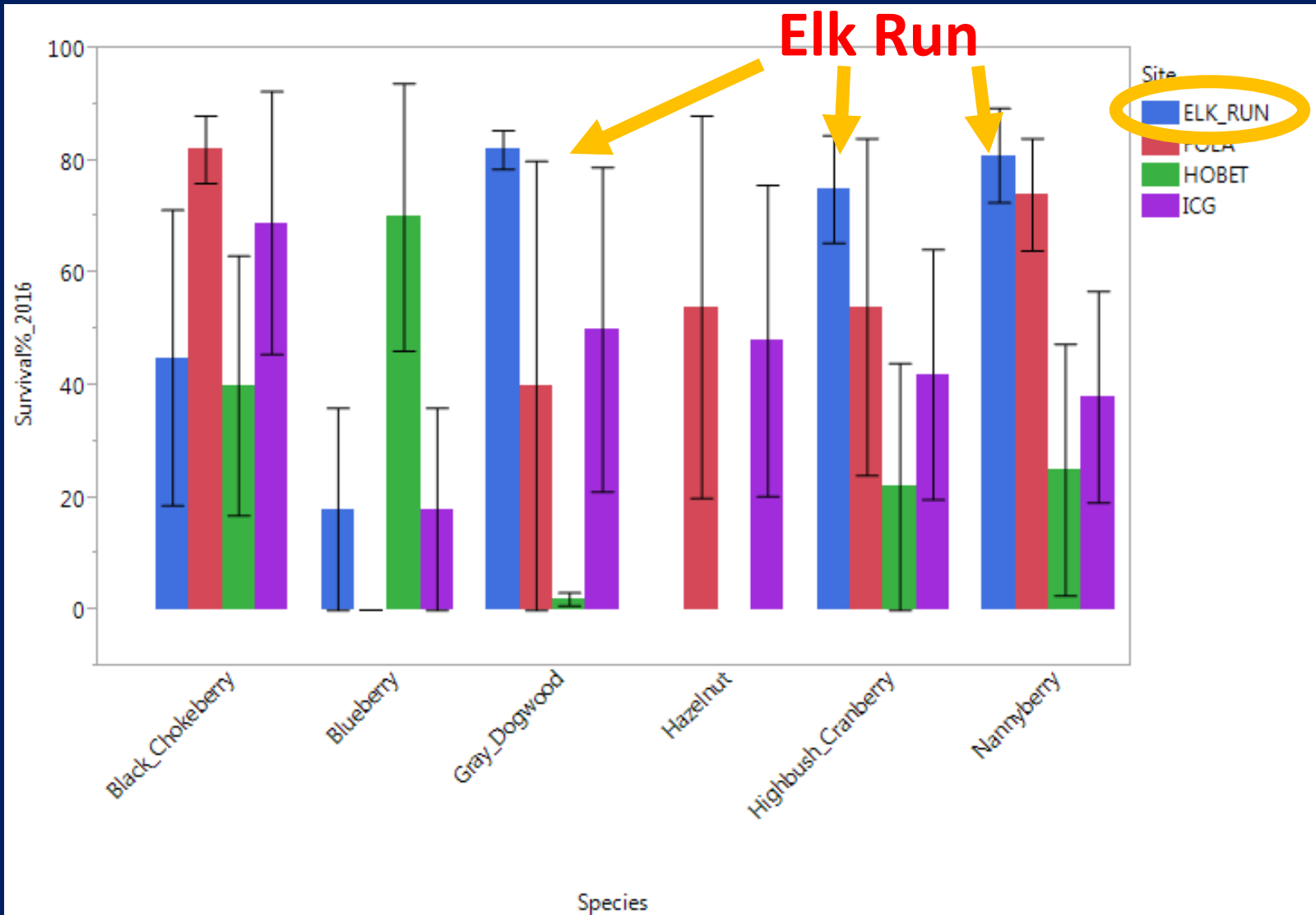


Wild plum at ICG (above)
and at Elk Run (right)

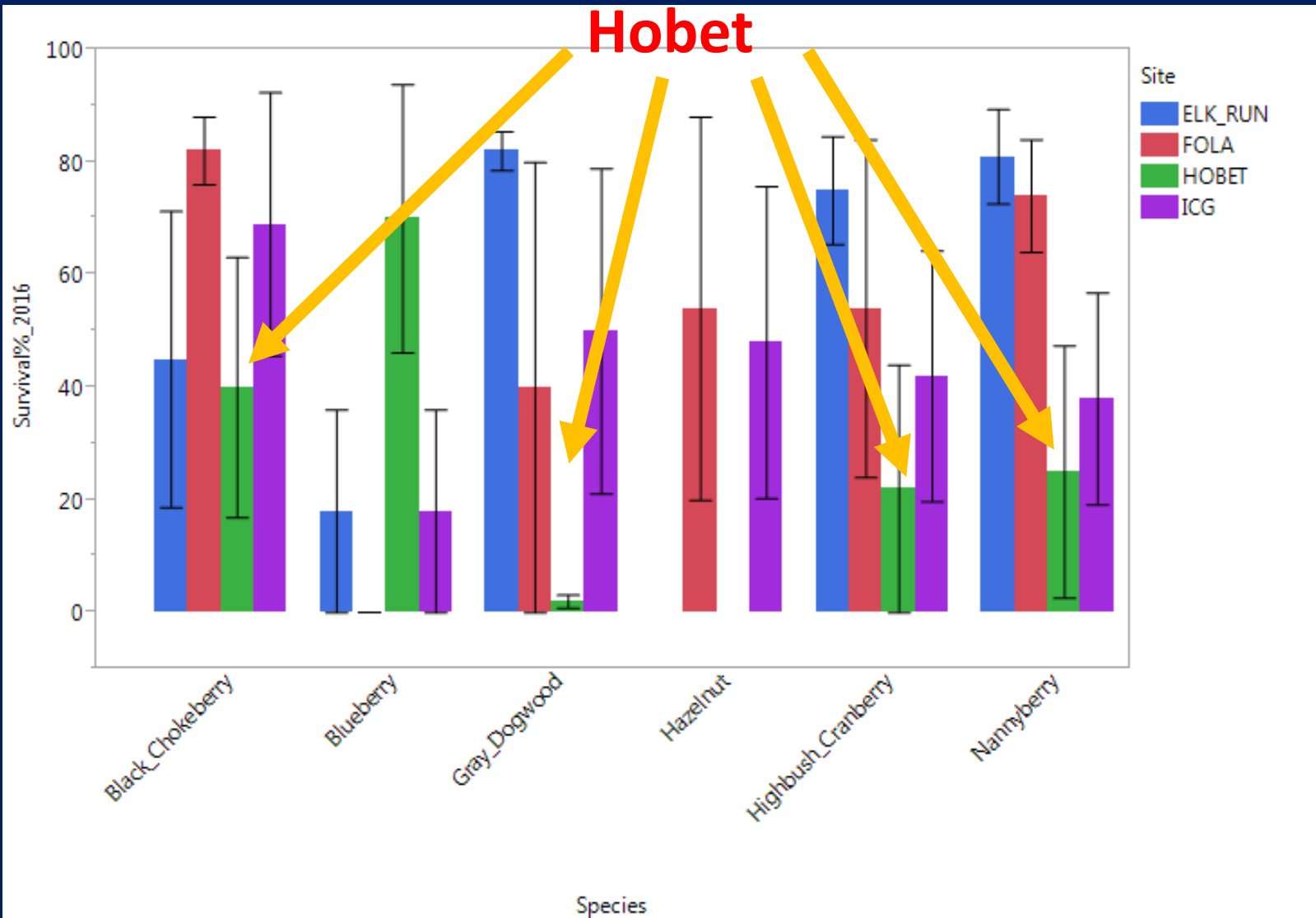
Shrub Survival on Four Sites



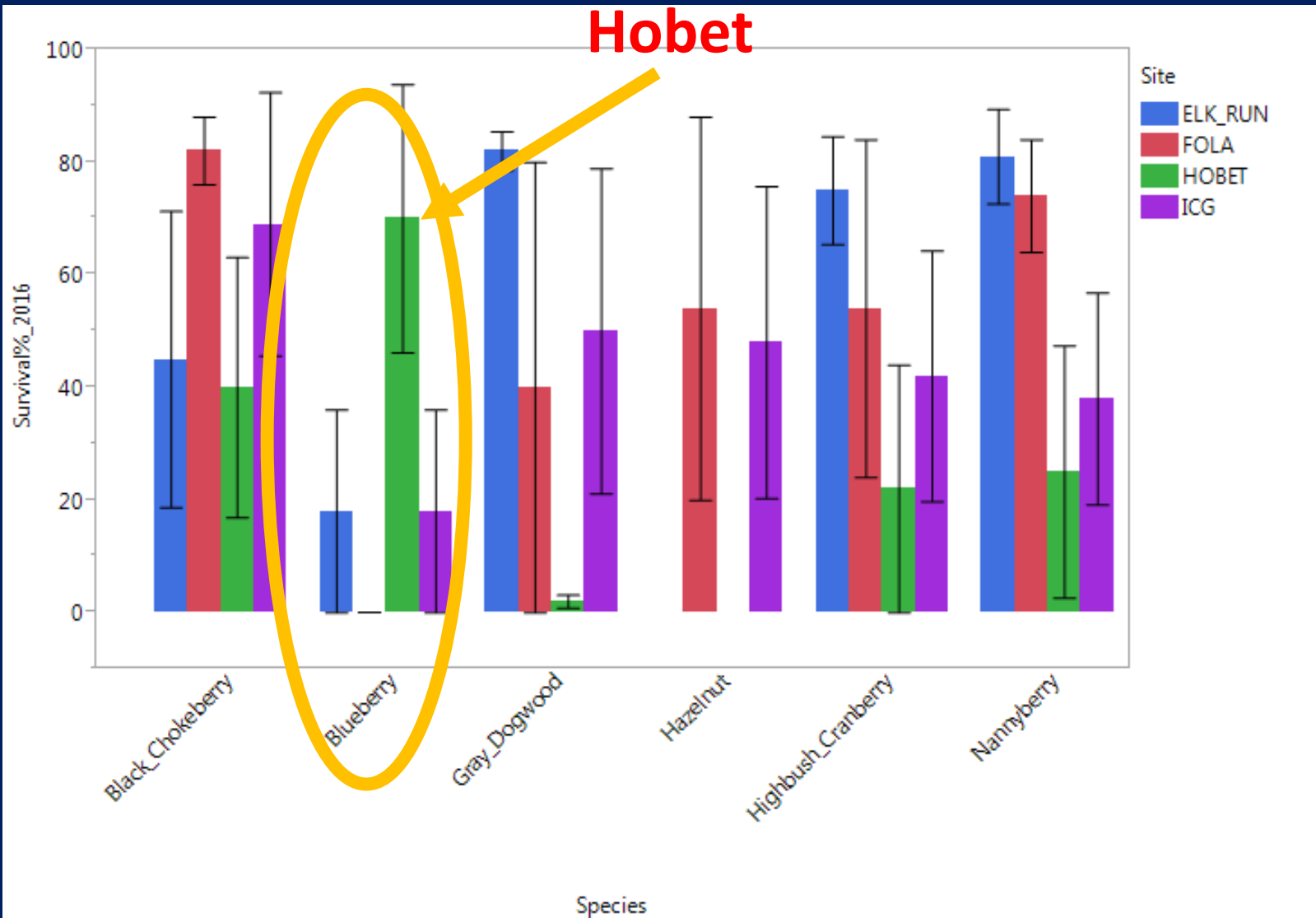
Shrub Survival on Four Sites



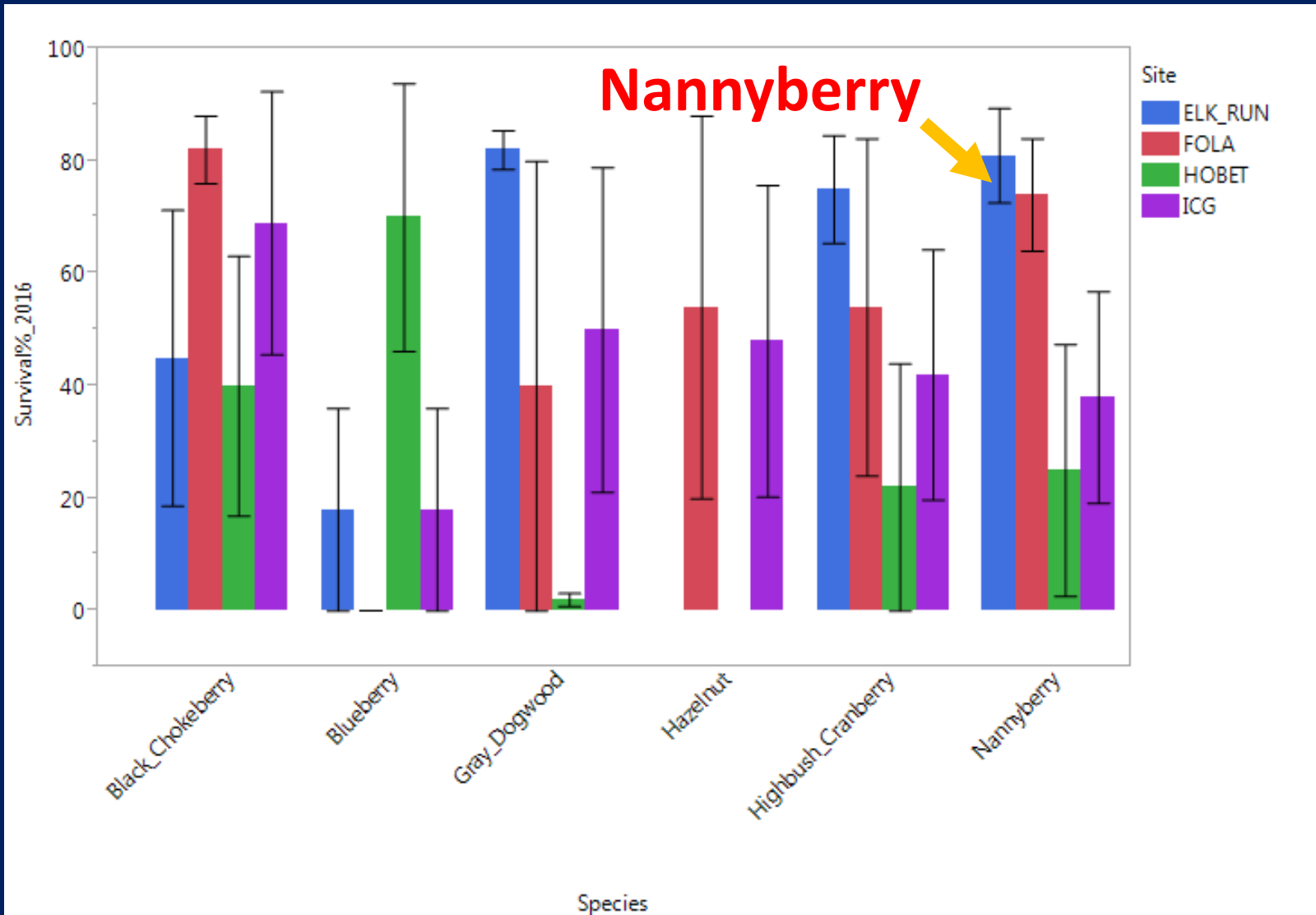
Shrub Survival on Four Sites



Shrub Survival on Four Sites



Shrub Survival on Four Sites



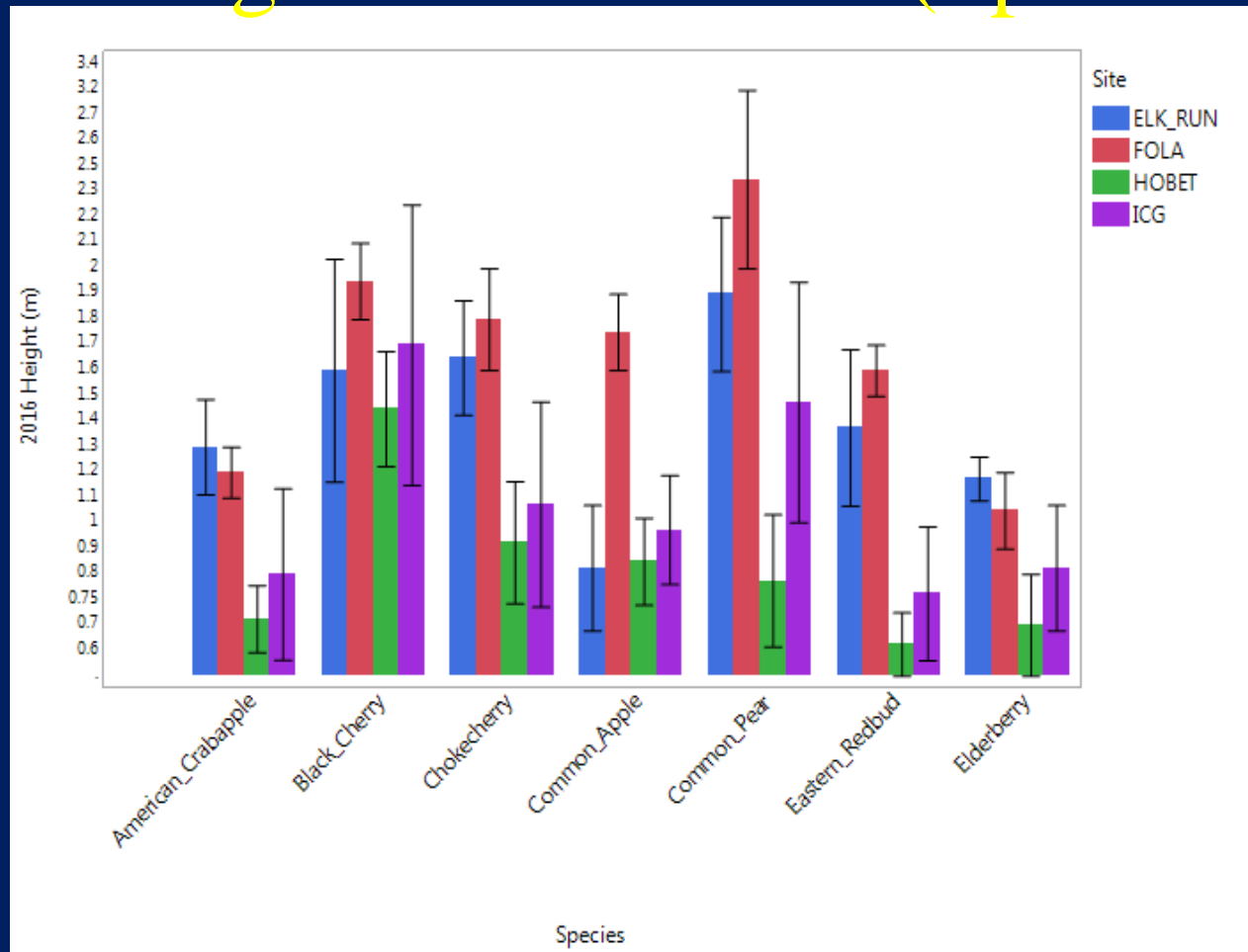
Nannyberry at Hobet



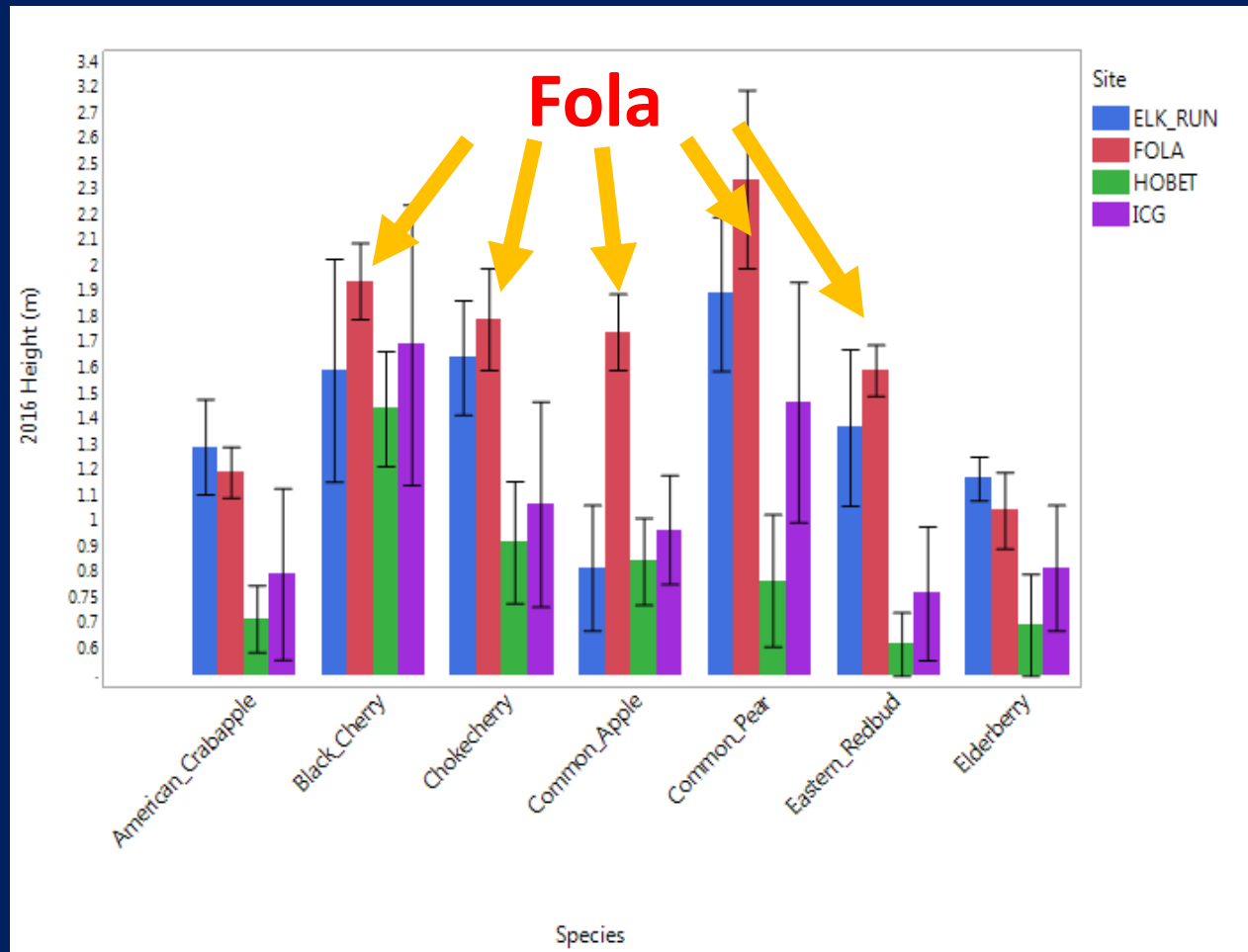
Nannyberry at Elk Run



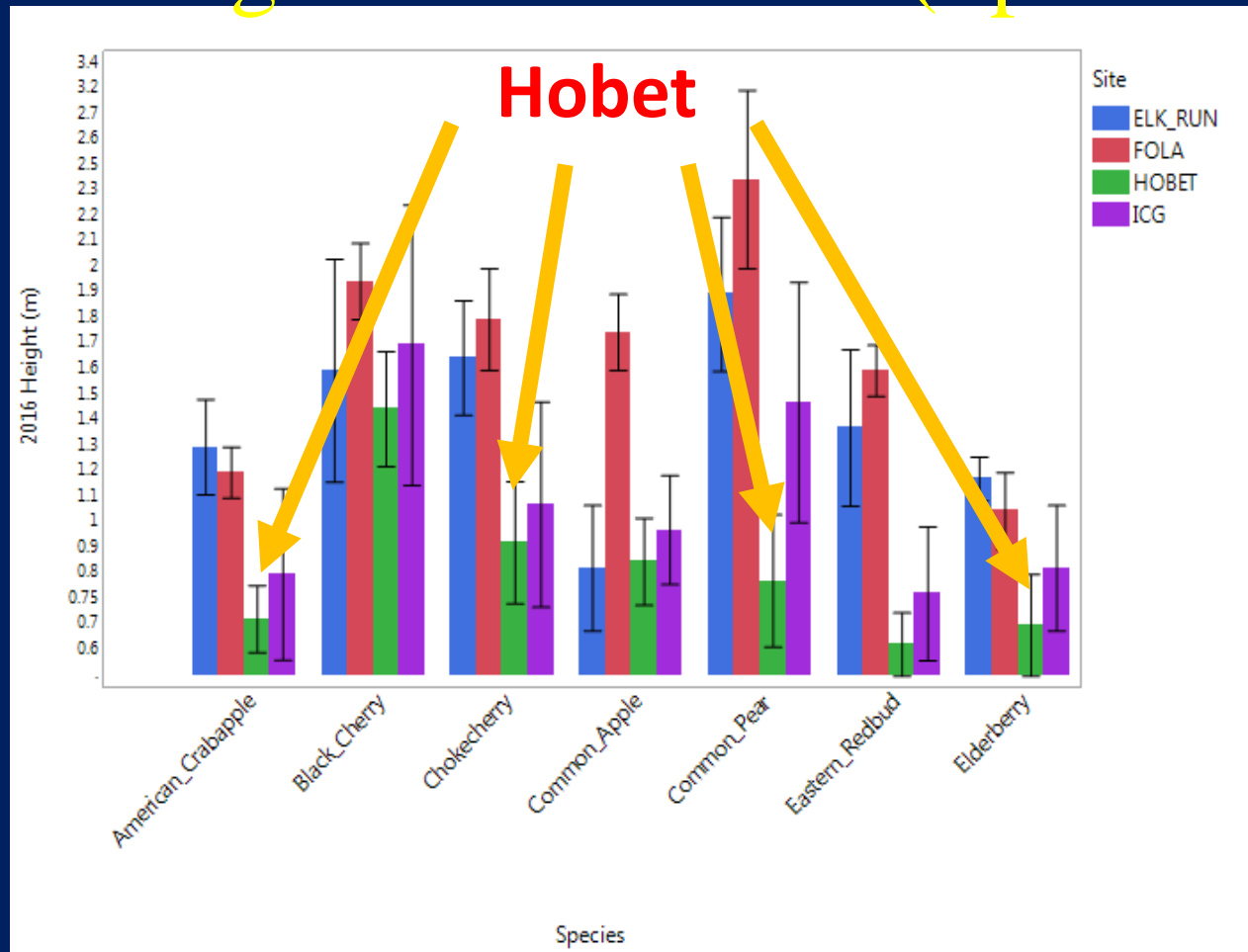
Tree Height on Four Sites (Species A-E)



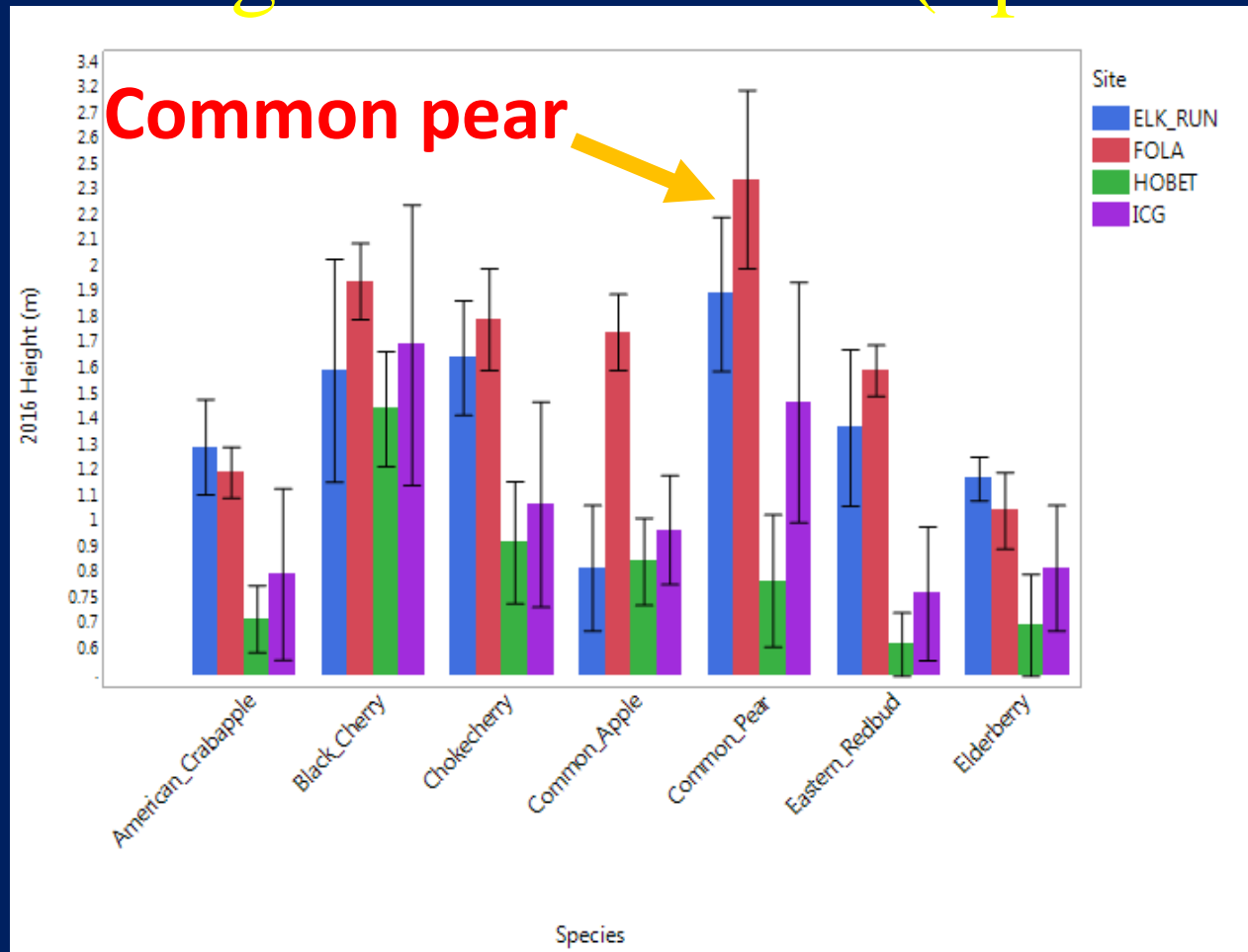
Tree Height on Four Sites (Species A-E)



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Tree Height on Four Sites (Species A-E)

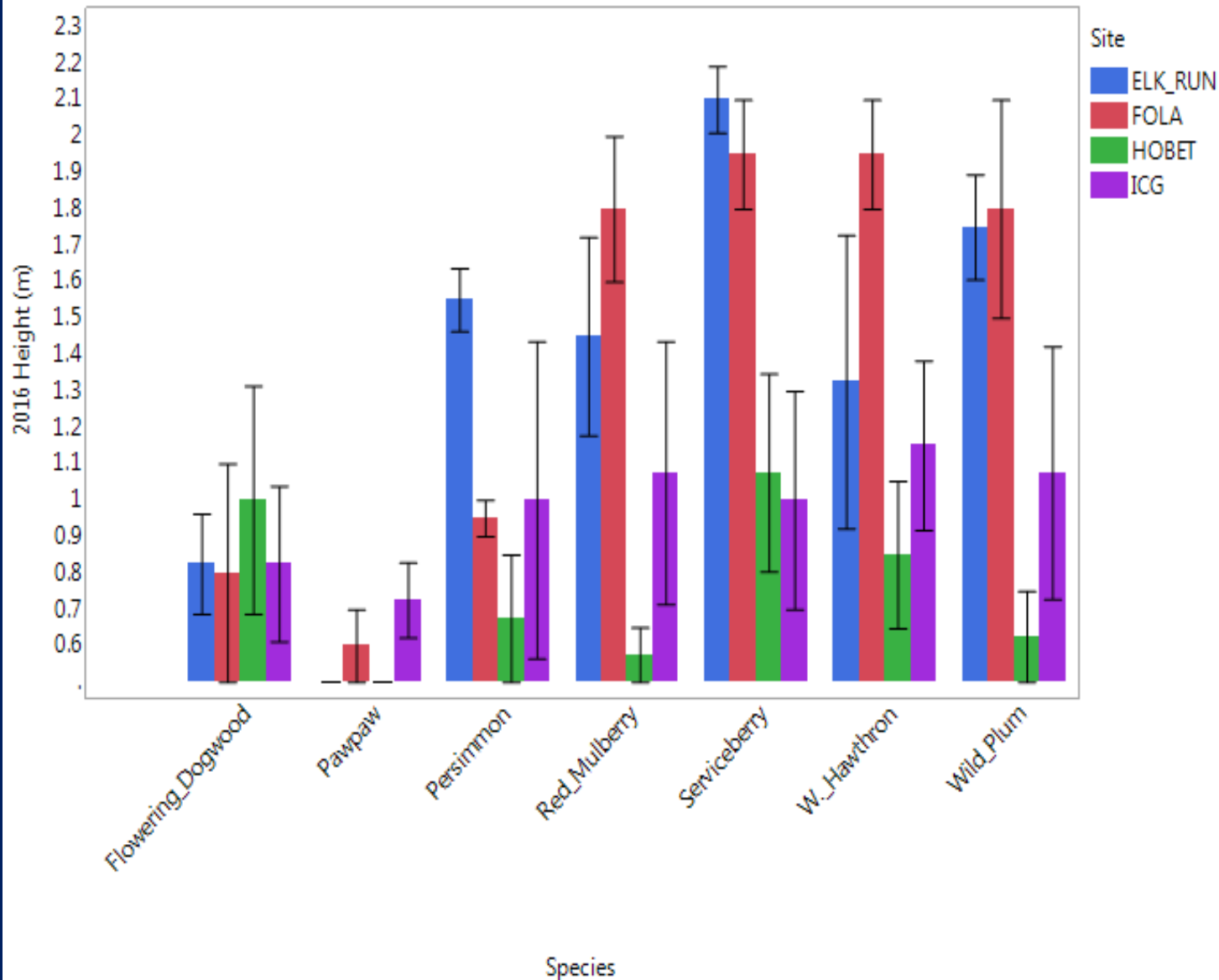


**Common
pear at Fola**

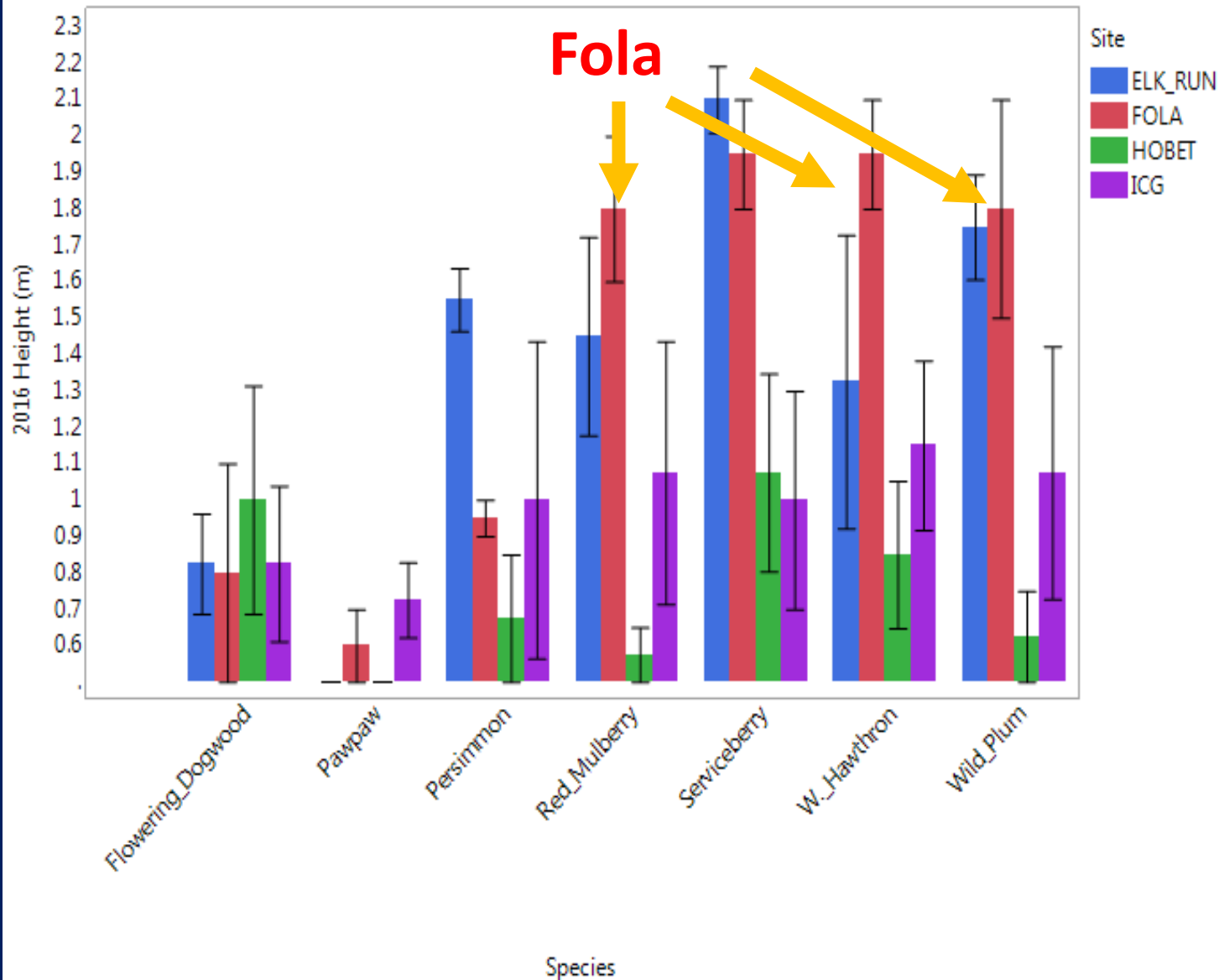


**Common
pear at
Elk Run**

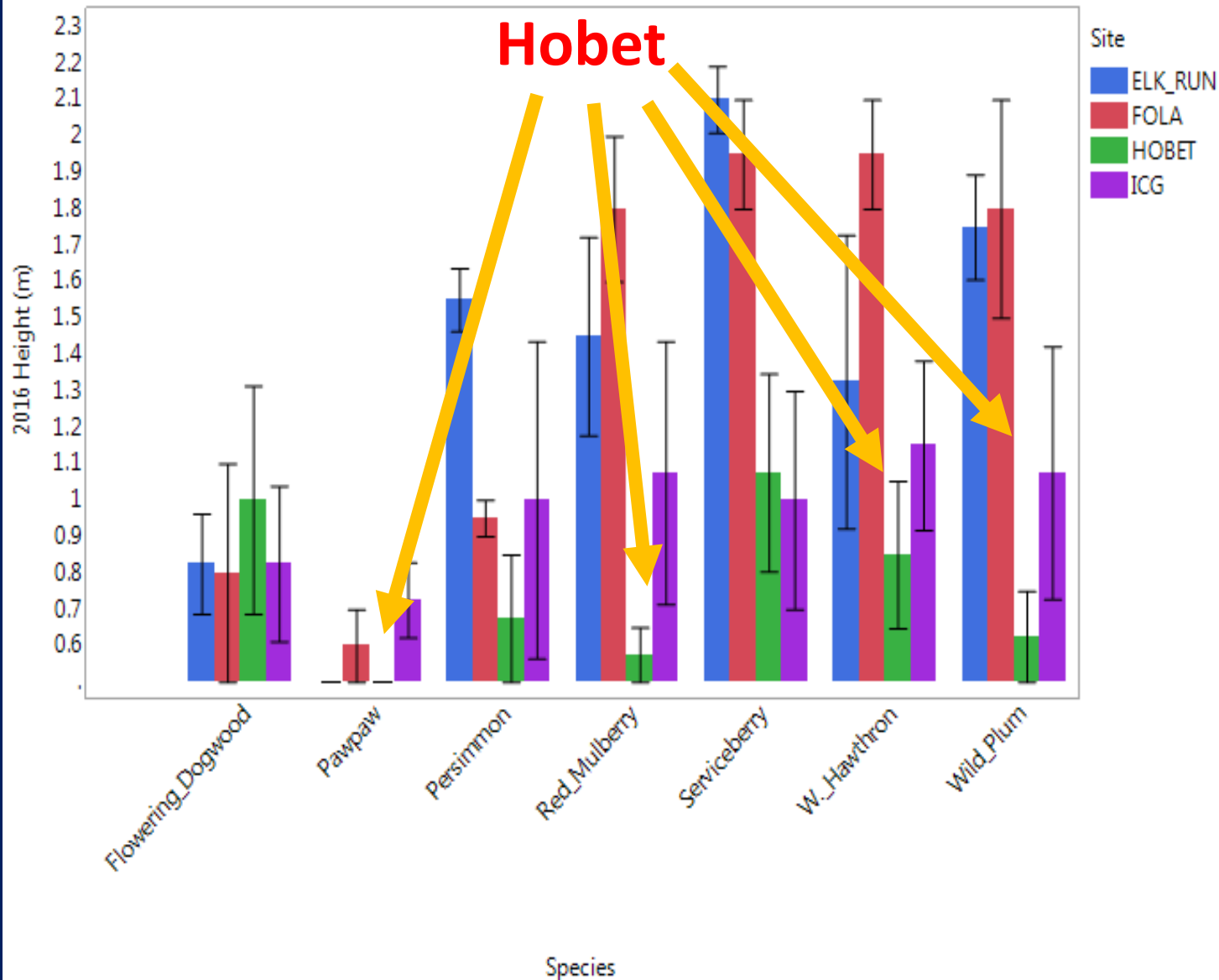
Tree Height on Four Sites (Species F-L)



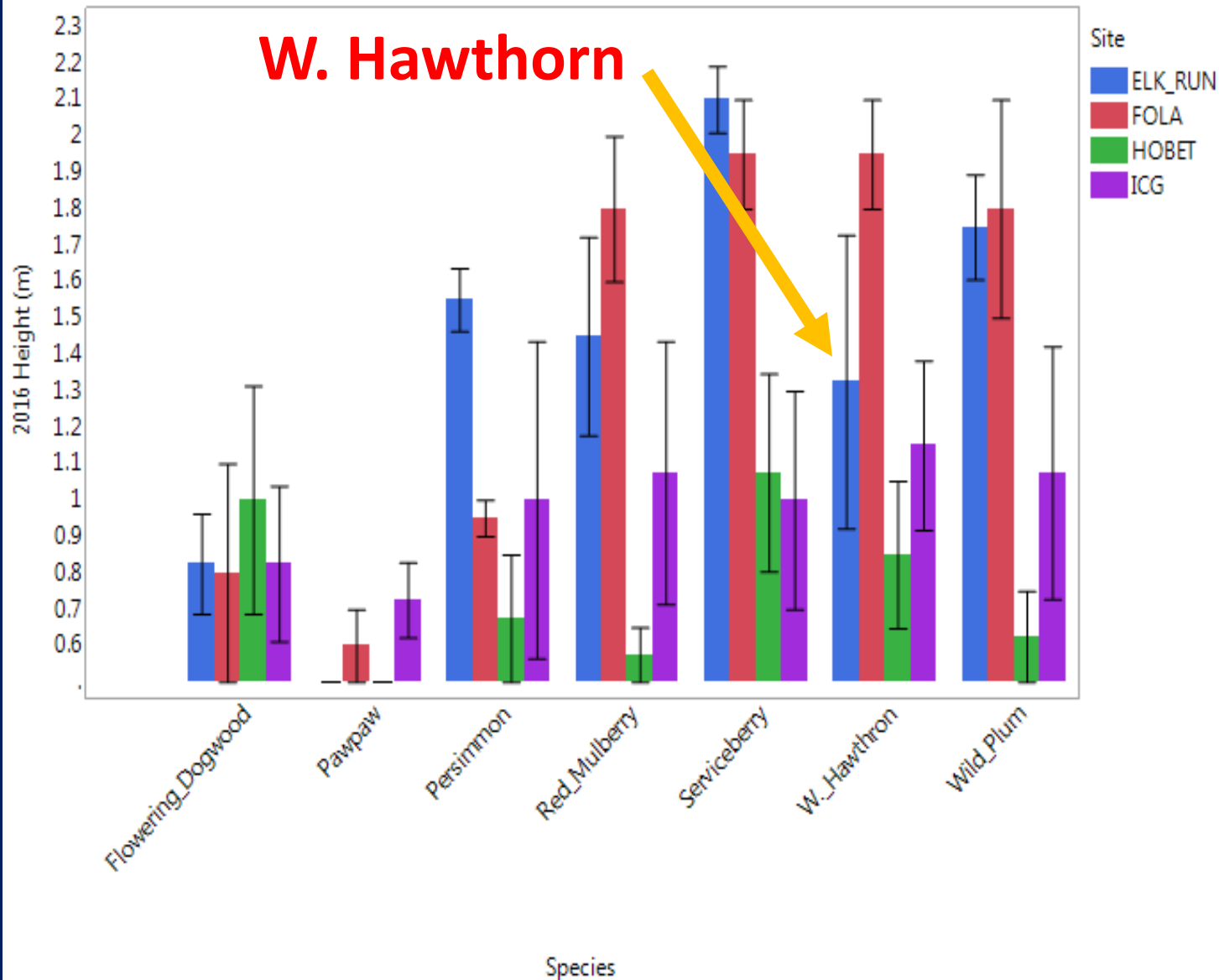
Tree Height on Four Sites (Species F-L)



Tree Height on Four Sites (Species F-L)



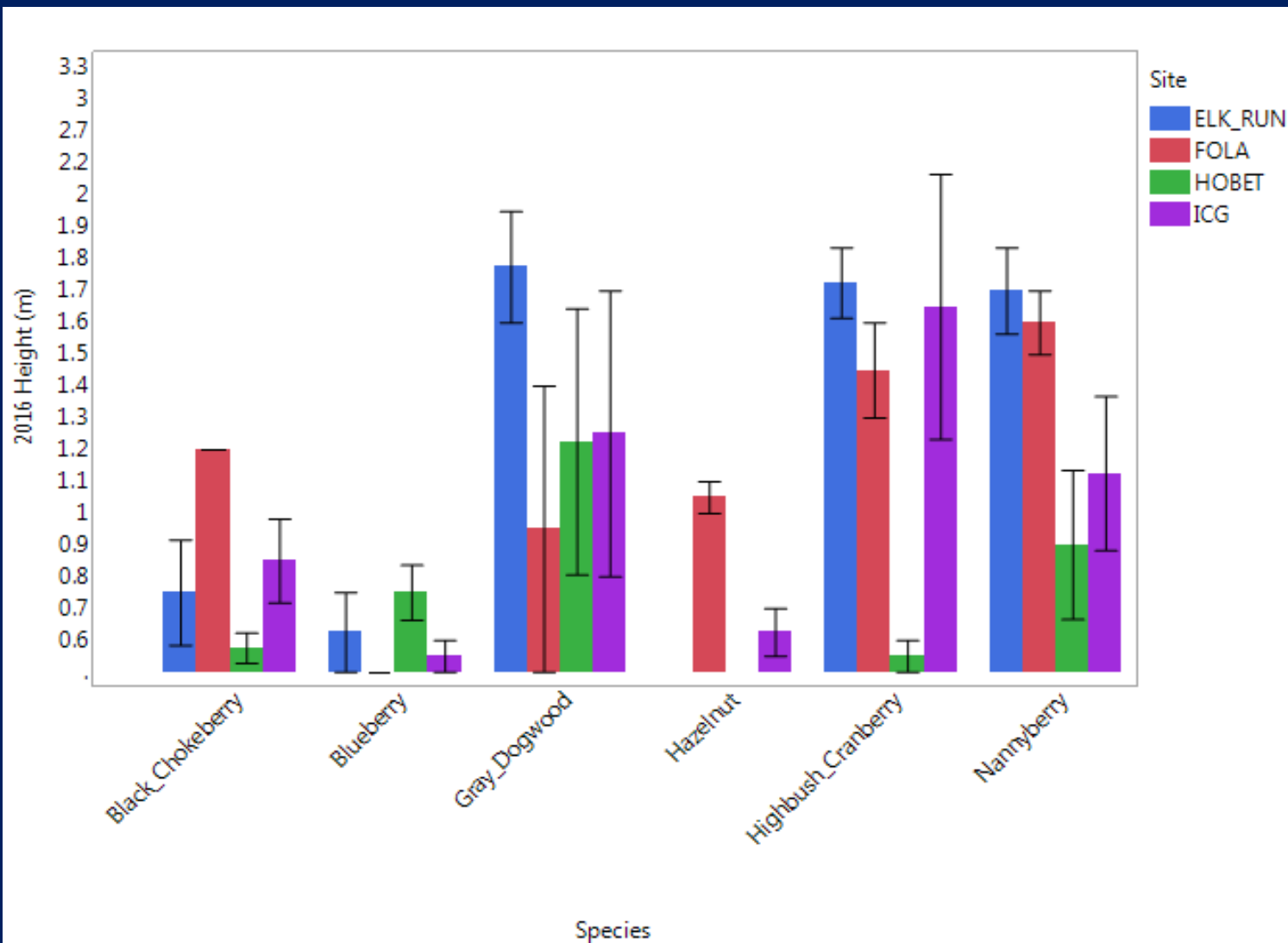
Tree Height on Four Sites (Species F-L)



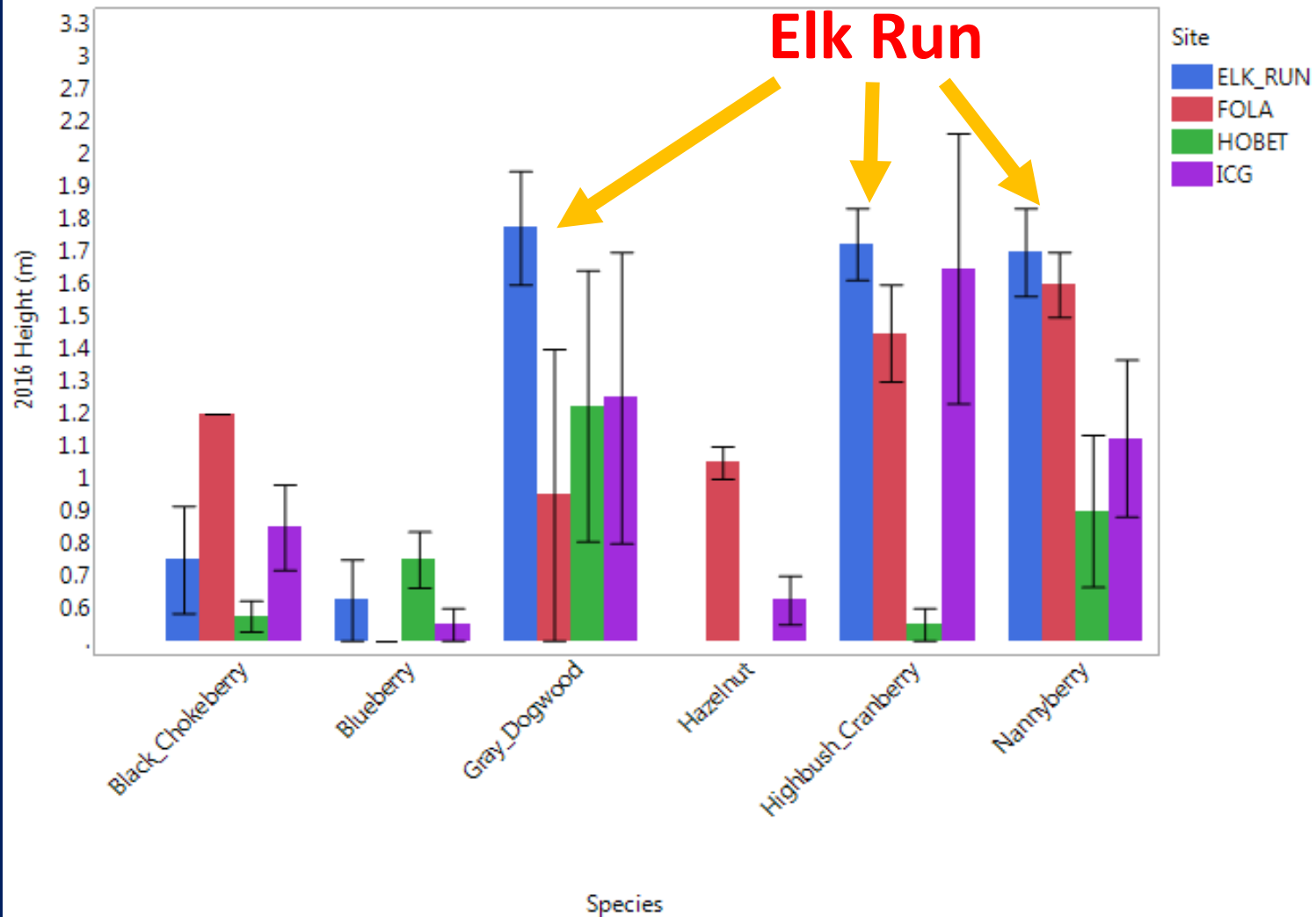


**W. Hawthorn at Elk Run
(above) and ICG (right)**

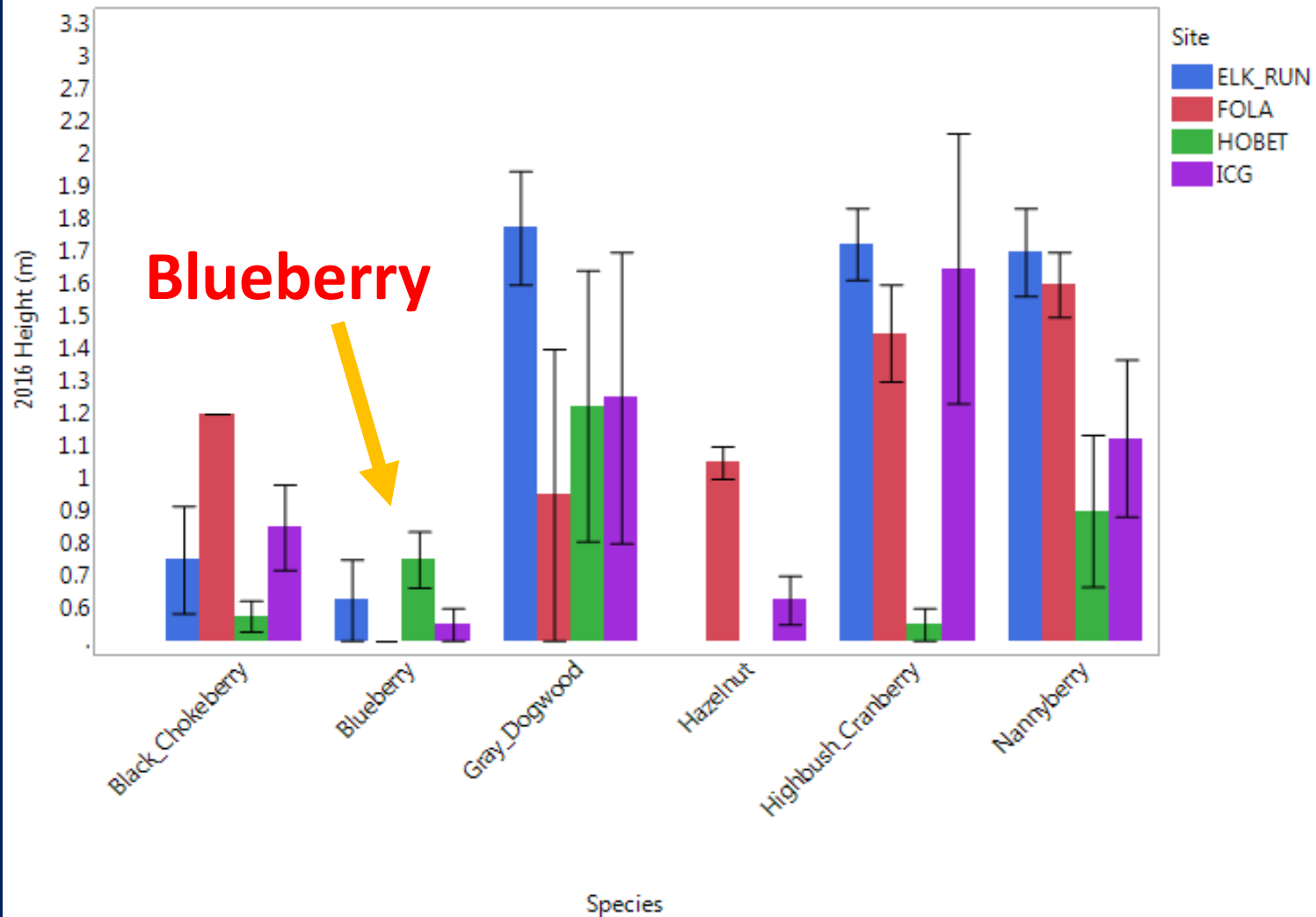
Shrub Height on Four Sites



Shrub Height on Four Sites



Shrub Height on Four Sites



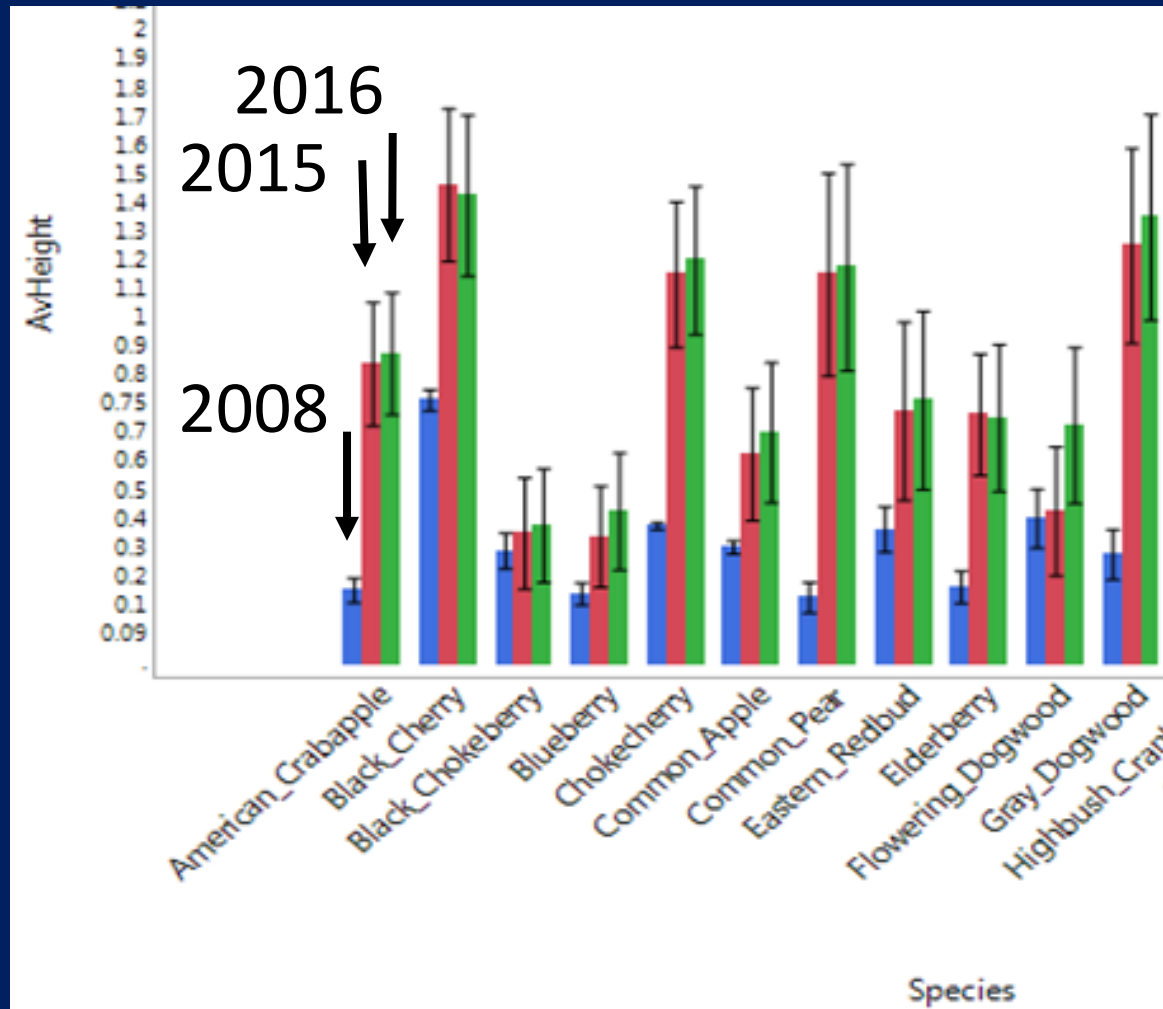
Blueberry at Hobet



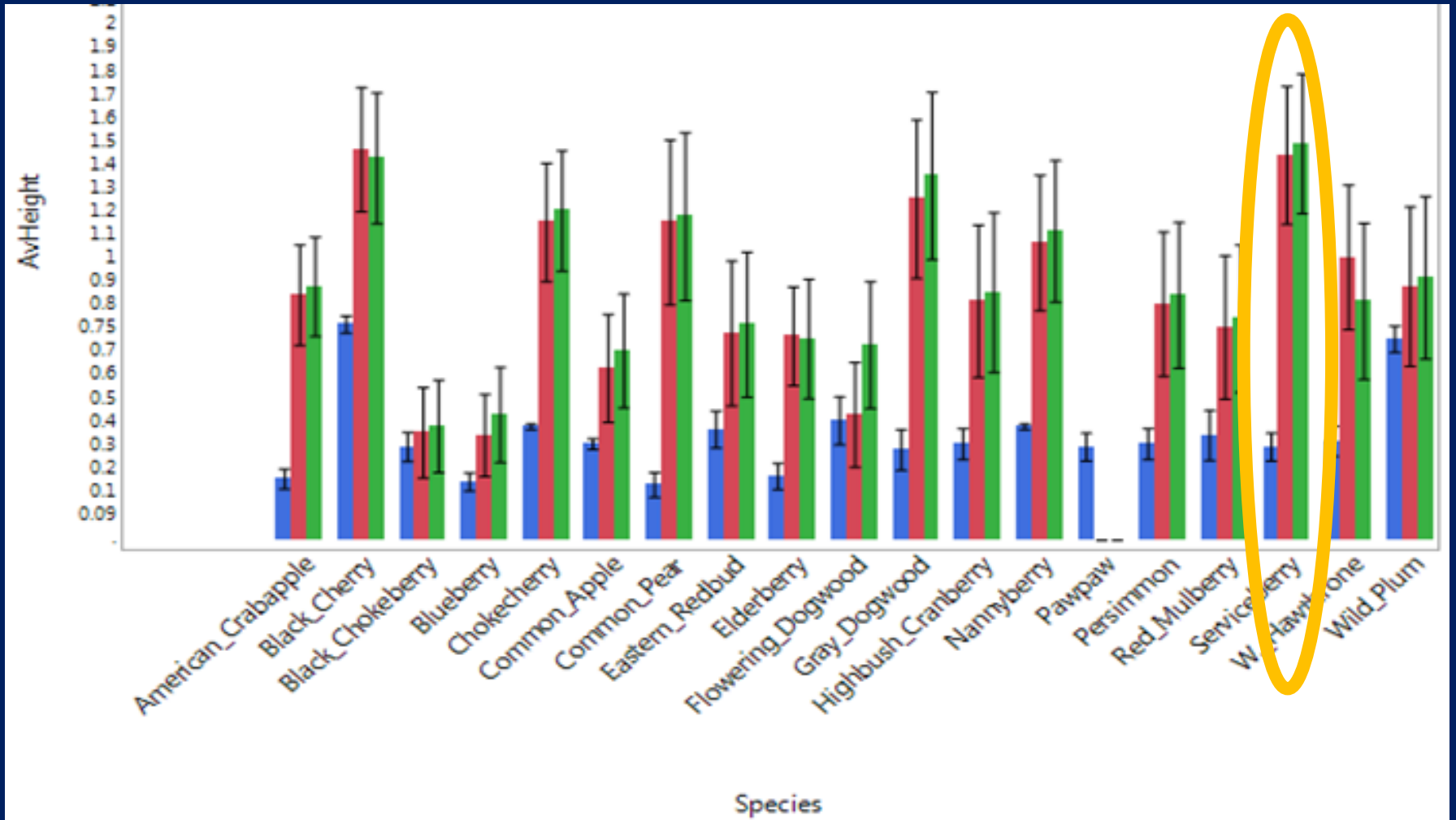
Blueberry at ICG



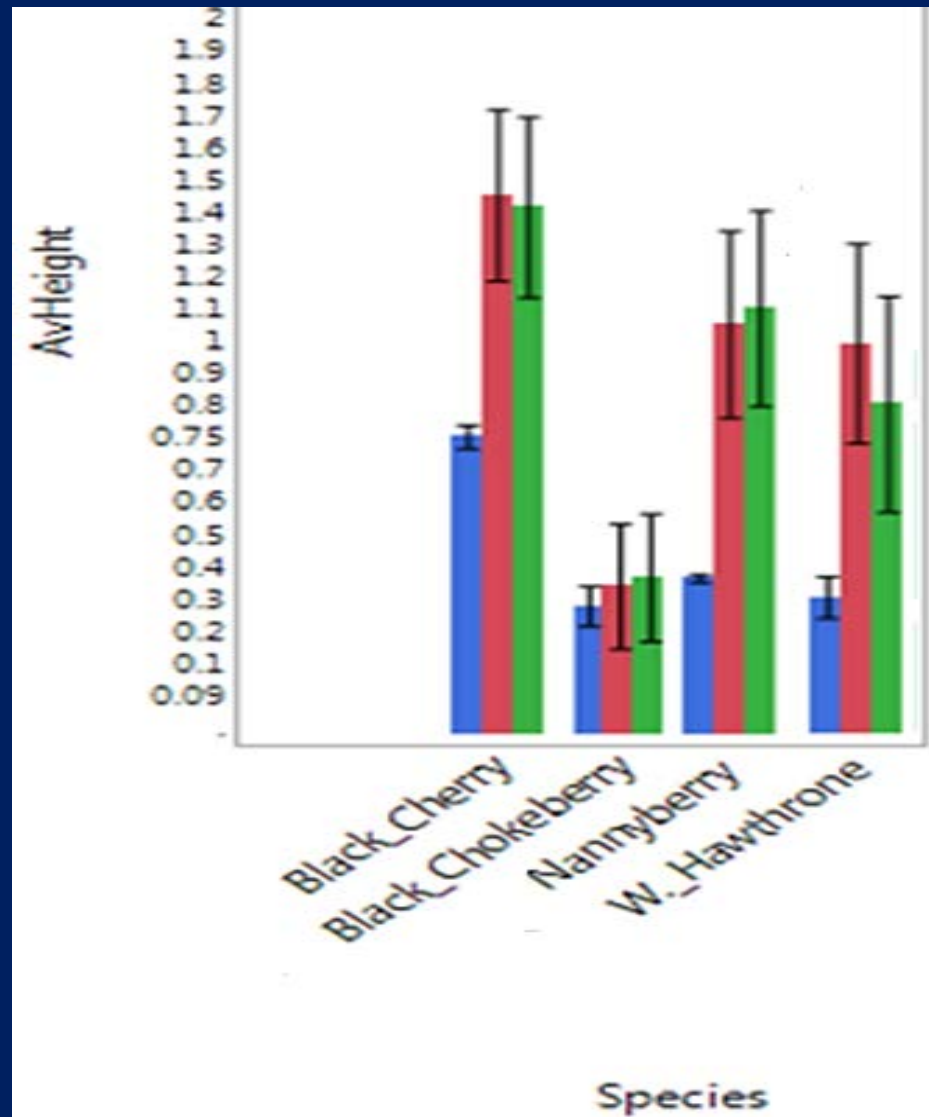
Height Growth Over Time



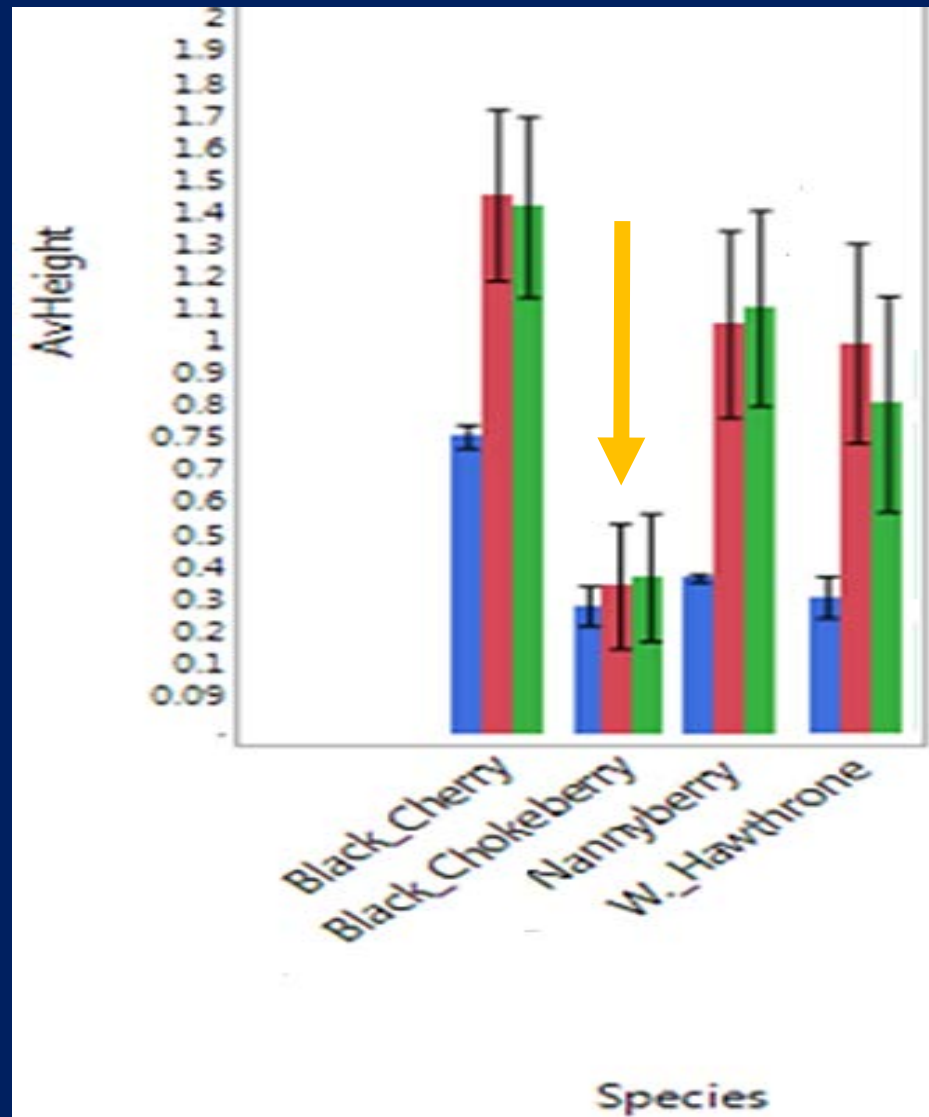
Height Growth Over Time



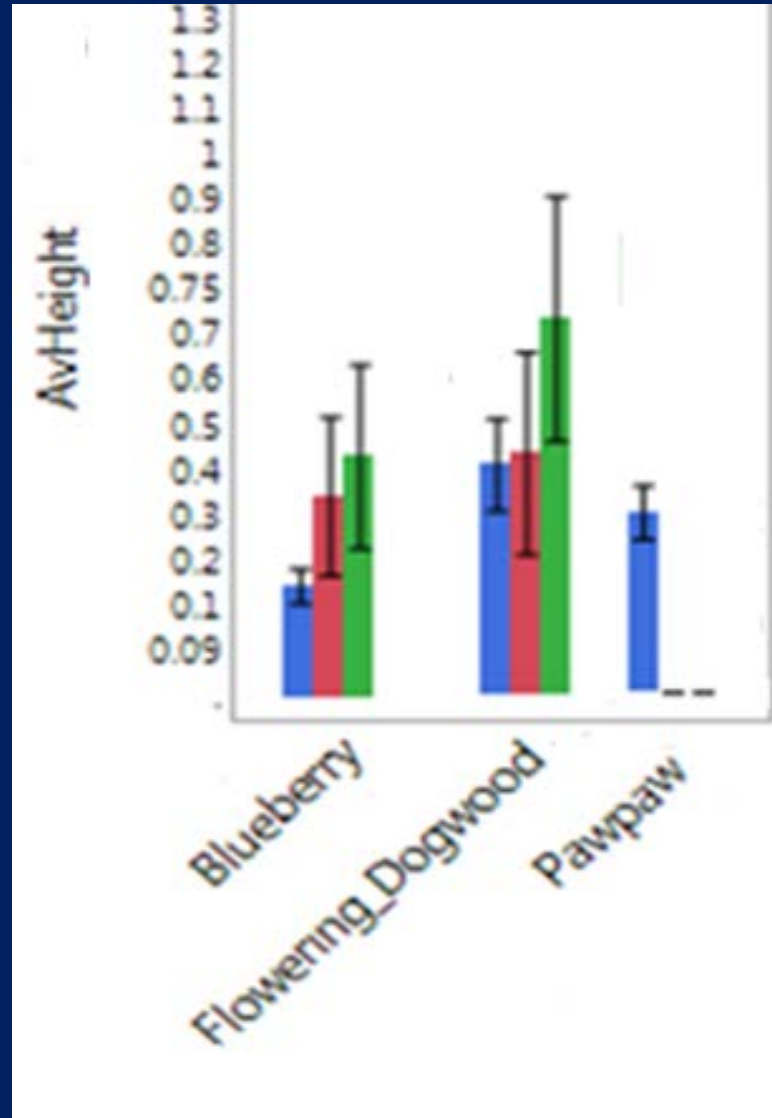
Height Growth Over Time



Height Growth Over Time



Height Growth Over Time



Conclusions

Species with $\geq 50\%$ Survival:

- Black chokeberry (56%)
- Black cherry (55%)
- Washington hawthorn (54%)
- Nannyberry (52%)
- Hazelnut (50%)



Conclusions

Species with 40-49% Survival:

- American crabapple (40%)
- Chokecherry (44%)
- Common apple (41%)
- Eastern redbud (45%)
- Gray dogwood (44%)
- Highbush cranberry (47%)
- Red mulberry (41%)
- Serviceberry (44%)
- Wild plum (44%)



Conclusions

Species with 20-39% Survival:

- Blueberry (30%)
- Elderberry (27%)
- Persimmon (37%)
- Common pear (37%)



Conclusions

Species with $\leq 10\%$ Survival:

- Flowering dogwood (10%)
- Pawpaw (9%)



THANK YOU!

Questions?

