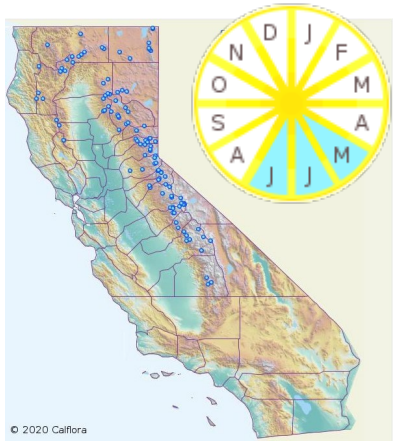
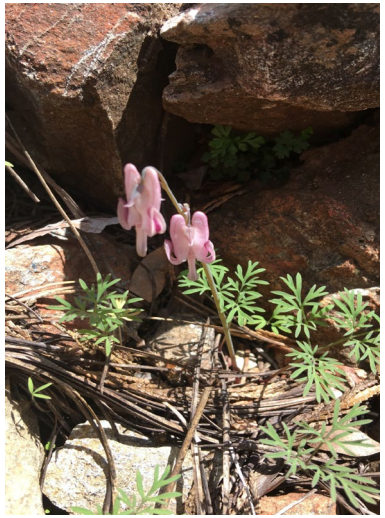
Evaluation of Effects of the Dixie Forest Fire on the Ephemeral Geophytes, *Dicentra uniflora* and *Dicentra pauciflora* (Papaveraceae) at Three Long-Term Study Sites in Butte County, Northern California

Dicentra uniflora

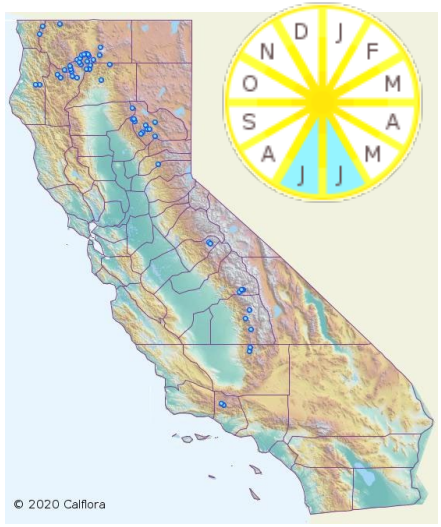


Characteristics—*Dicentra uniflora*

Ephemeral geophyte—lasts 4 to 6 weeks above ground
No pollinators observed
Reproduction by seeds and asexual by bulblets
60 to 70 seeds per fruit
Percent seed set usually 80 to 90 percent
Percent germination of buried seeds 20 to 70 percent
Percent germination of surface seeds 4 to 6 percent
Bulblets and tubers 4 to 7 cm deep in the soil
Twenty or more years to mature to flowering



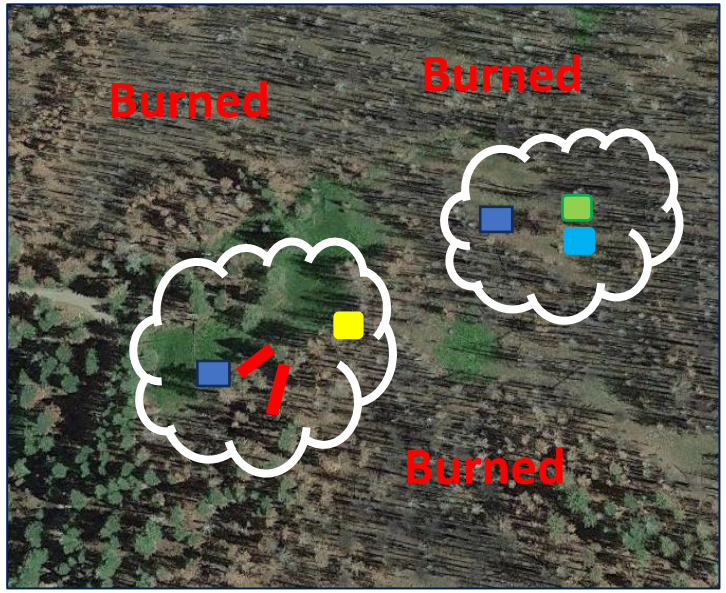
Dicentra pauciflora



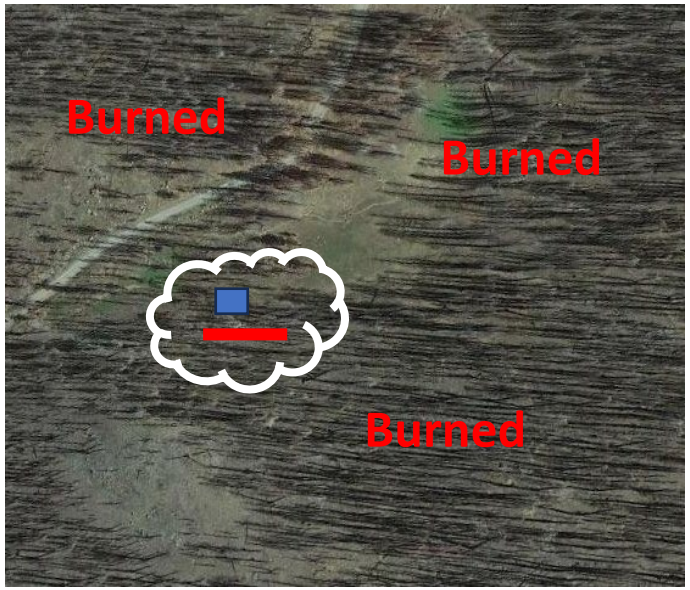
Characteristics—*Dicentra pauciflora*

Ephemeral geophyte—lasts 4 to 5 weeks above ground
No pollinators observed
Asexual reproduction by bulblets and rhizomes
25 to 30 ovules per fruit
Percent seed set 2 percent or less
Bulblets and rhizomes 1.5 to 3 cm deep in the soil
Approximately 10 years to mature to flowering

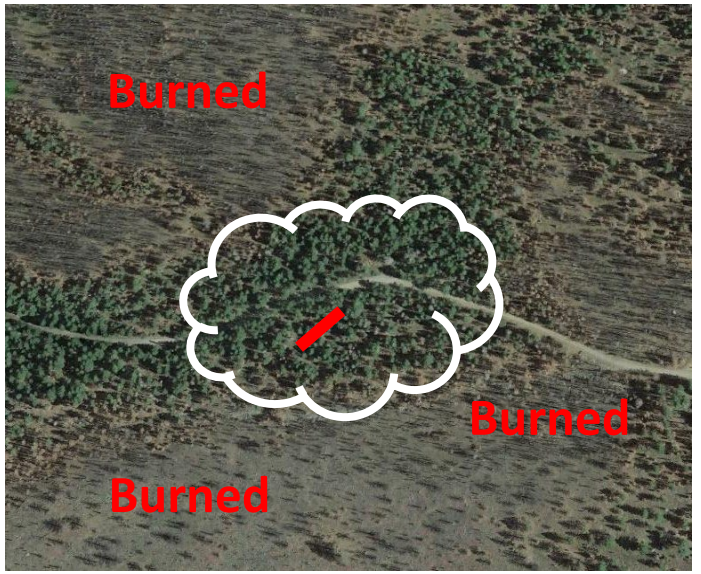
Google Earth Images 08 July 2022 Showing Sampling Plots and Dixie Forest Fire Patterns from July 2021 at the Survey Sites



Scott's John Meadow, 1745 m
Burned 25 July 2021



Summit, 1945 m
Burned 22 July 2021



Canopy, 1785 m
Burned 23 and 25 July 2021

Transects Leaves and Flowers

Scattered Seed Plots-2018
Dicentra uniflora

Bulblet Plot-2009-*Dicentra pauciflora*

Survey Sites

Rhizome Plot-2019
Dicentra pauciflora

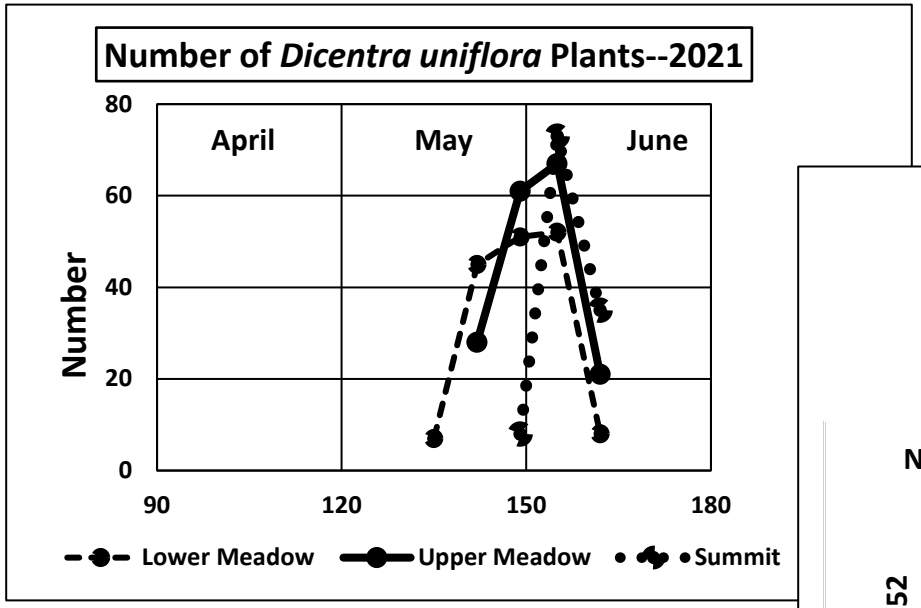
Bulblet Plot-2019
Dicentra pauciflora

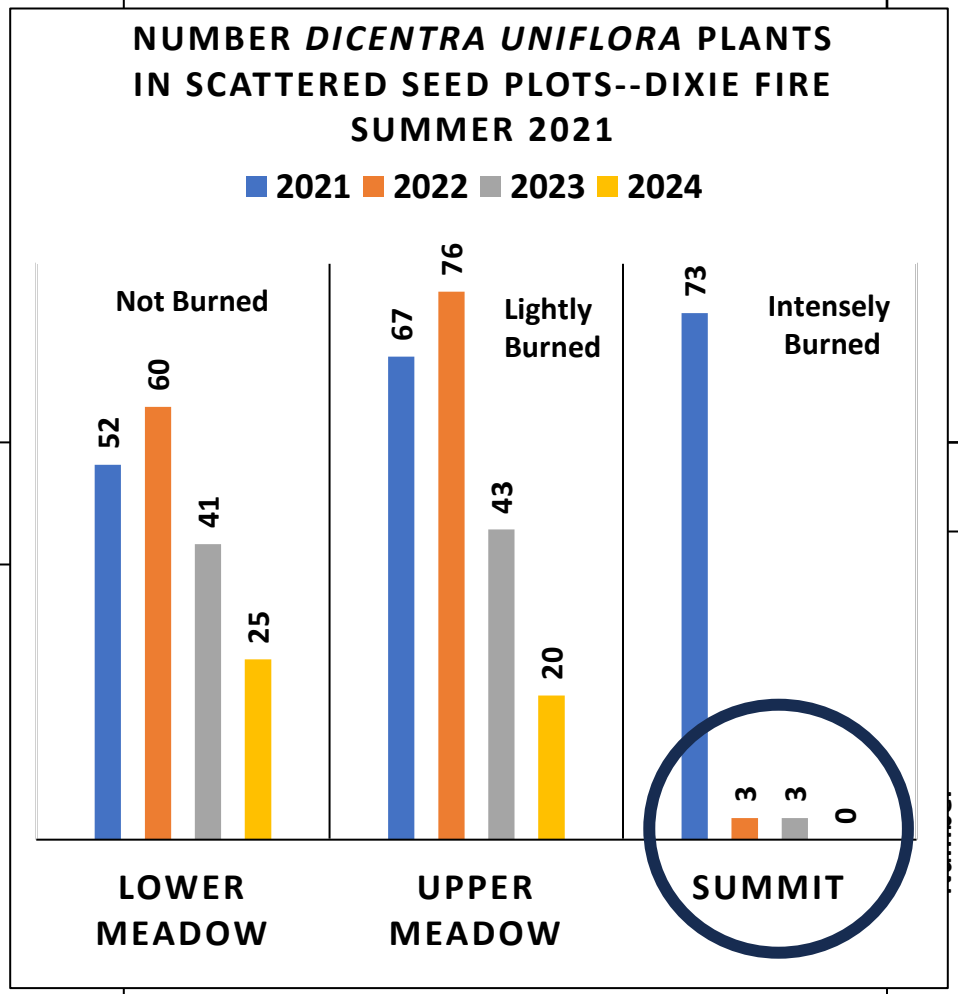
Scattered Seed Plots of *Dicentra uniflora* Planted in 2018
Photography October 2021 Post Dixie Forest Fire

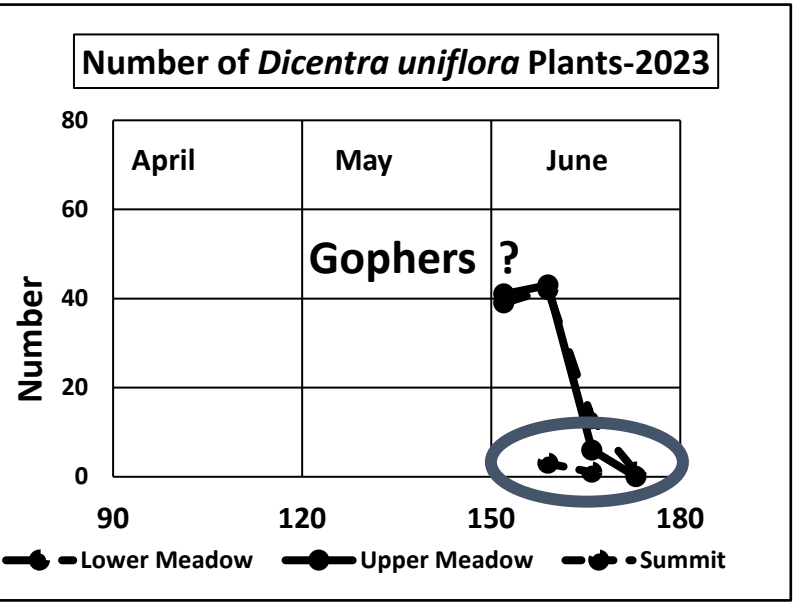
Lower Meadow
Not Burned
Fire Stopped 15 CM from the Plot

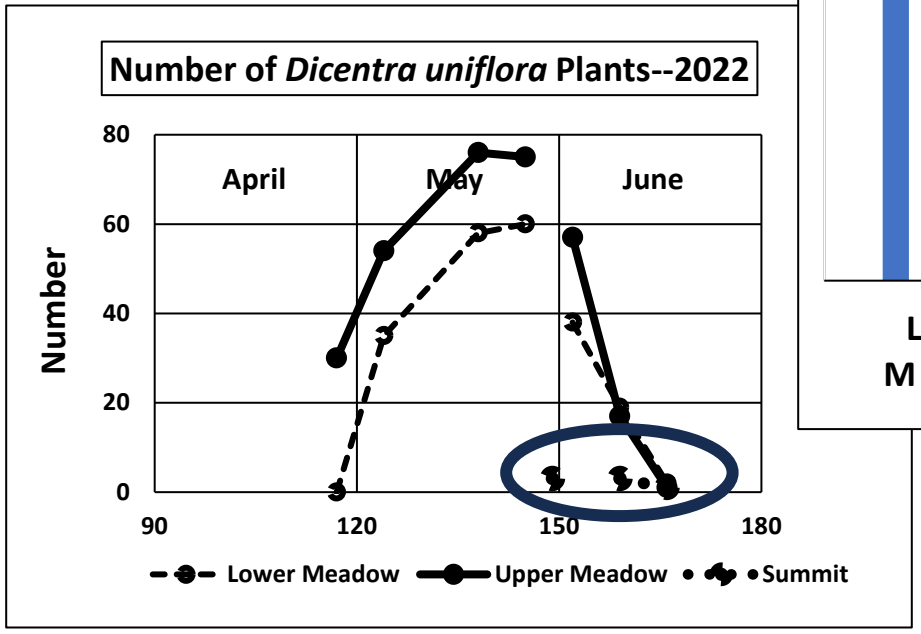
Upper Meadow
Lightly Burned

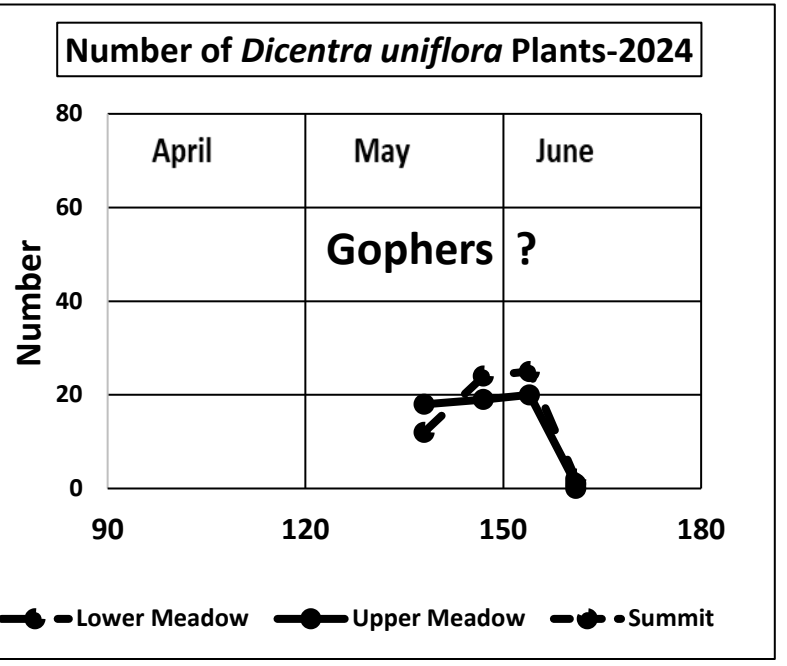
Summit
Intensely Burned


Number of *Dicentra uniflora* Plants--2021
April
May
June
Number
80
60
40
20
0
90
120
150
180
Lower Meadow
Upper Meadow
Summit


NUMBER *DICENTRA UNIFLORA* PLANTS IN SCATTERED SEED PLOTS--DIXIE FIRE SUMMER 2021
2021
2022
2023
2024
Not Burned
Lightly Burned
Intensely Burned
52
60
41
25
67
76
43
20
73
3
3
0
LOWER MEADOW
UPPER MEADOW
SUMMIT


Number of *Dicentra uniflora* Plants-2023
April
May
June
Gophers ?
Number
80
60
40
20
0
90
120
150
180
Lower Meadow
Upper Meadow
Summit


Number of *Dicentra uniflora* Plants--2022
April
May
June
Number
80
60
40
20
0
90
120
150
180
Lower Meadow
Upper Meadow
Summit


Number of *Dicentra uniflora* Plants-2024
April
May
June
Gophers ?
Number
80
60
40
20
0
90
120
150
180
Lower Meadow
Upper Meadow
Summit

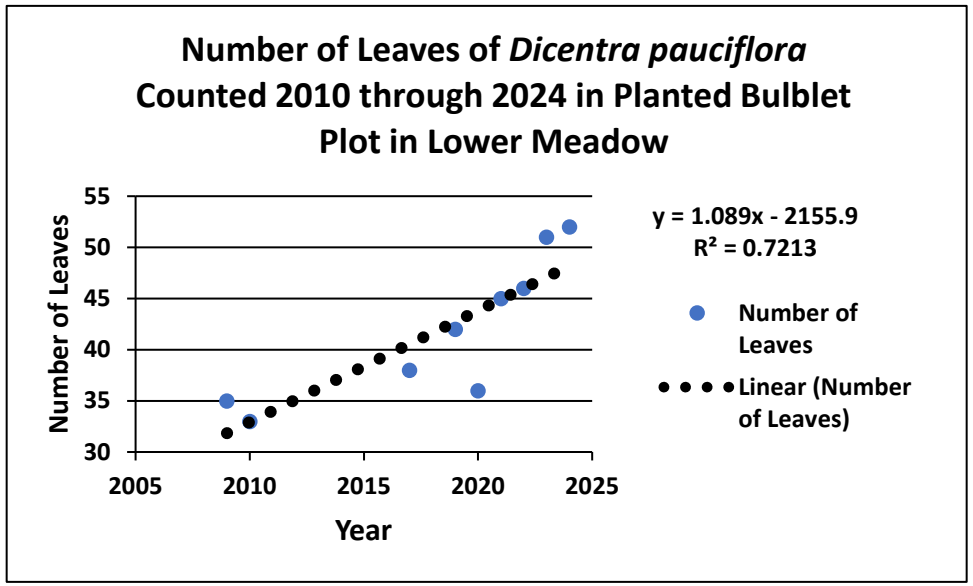
Bulblet Plot of *Dicentra pauciflora* Planted in 2009 Survived a Light to Moderate Burn in July 2021 from the Dixie Forest Fire

May 2010

May 2021

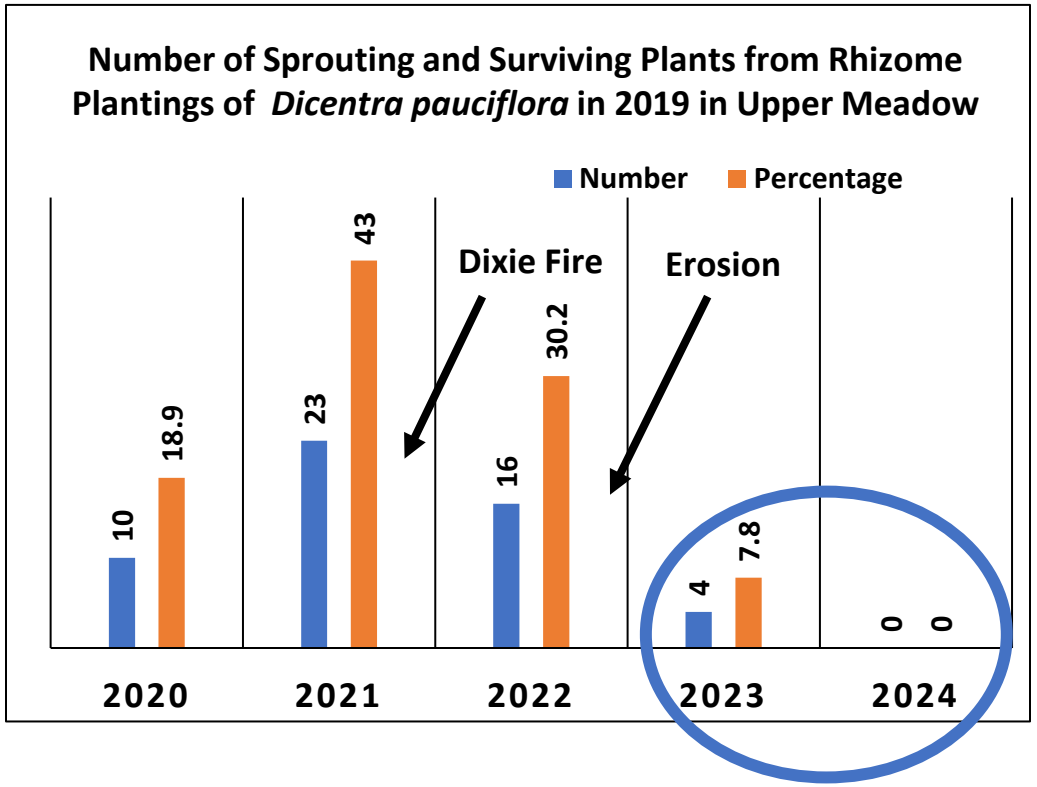
October 2021

June 2023

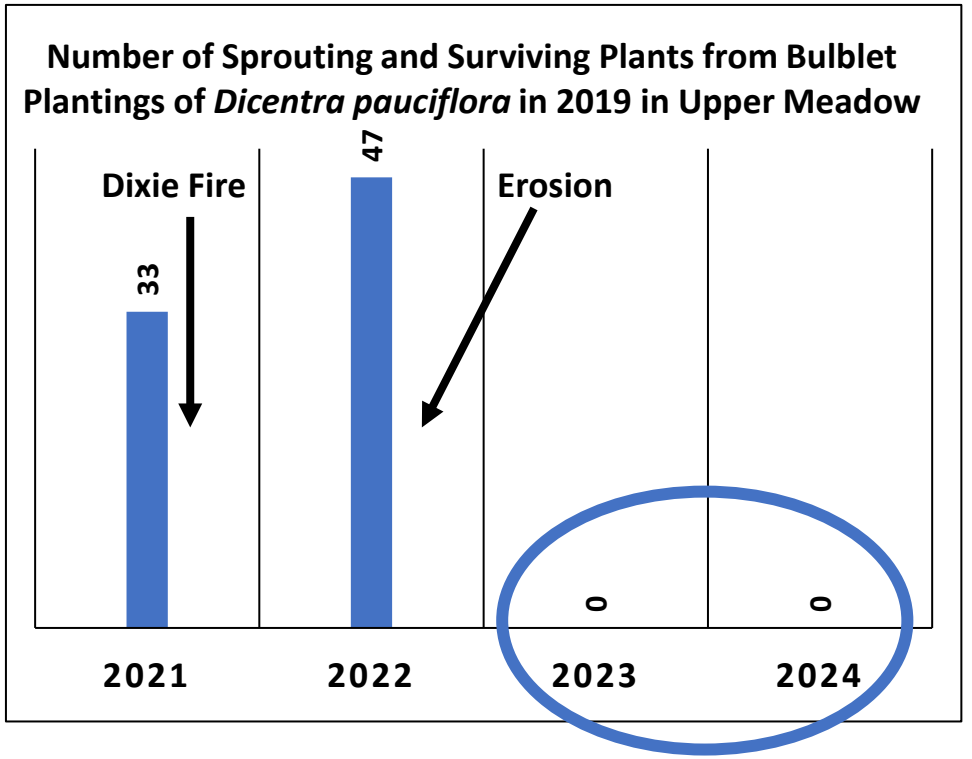


2019 Planted Rhizome and Bulblet Plots of *Dicentra pauciflora* were lightly burned with Lost of most of the Duffy covering the Plots. Heavy Rains on 12 June 2022 caused considerable Erosion to the plots and the plants were lost over the next two years in 2023 and 2024.

Planted Rhizomes *D. pauciflora* 12 June 2022 Erosion



Planted Bulblets *D. pauciflora* 12 June 2022 Erosion



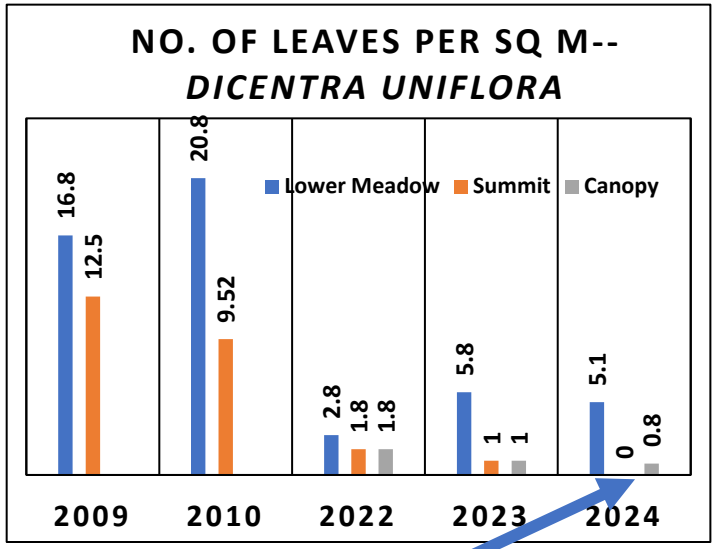
20-Meter Transects at Meadow and Summit from 2009 and 2010 and Canopy in 2022 versus Post Dixie Fire in 2022, 2023, and 2024

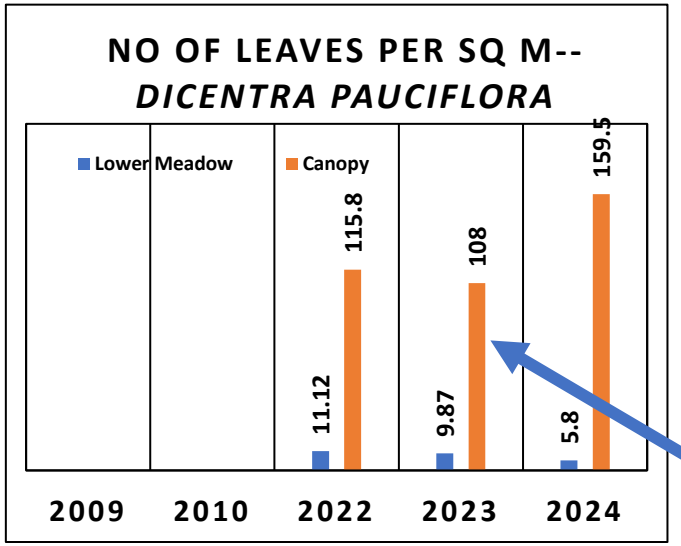
Meadow 2010

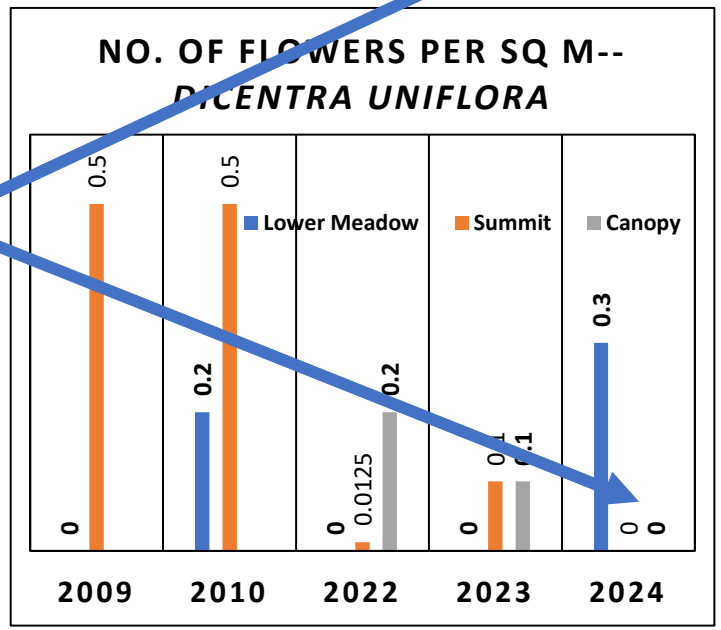
Summit 2010

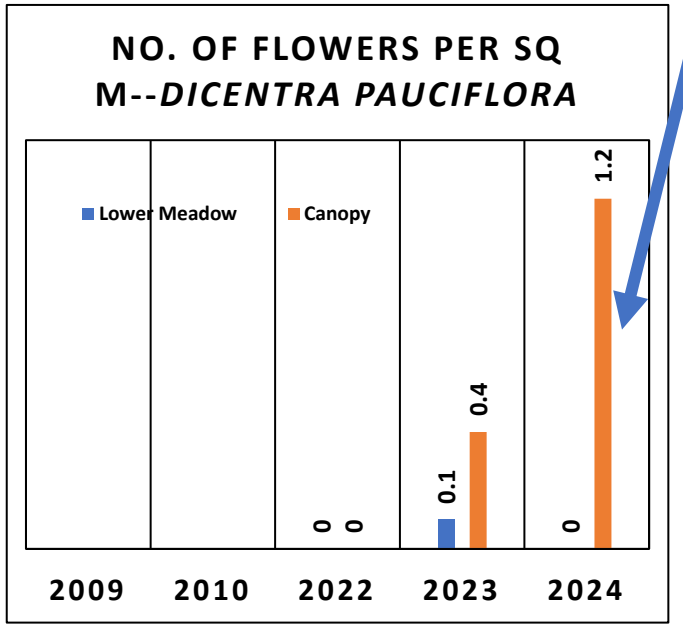
Meadow 2022

Summit 2022

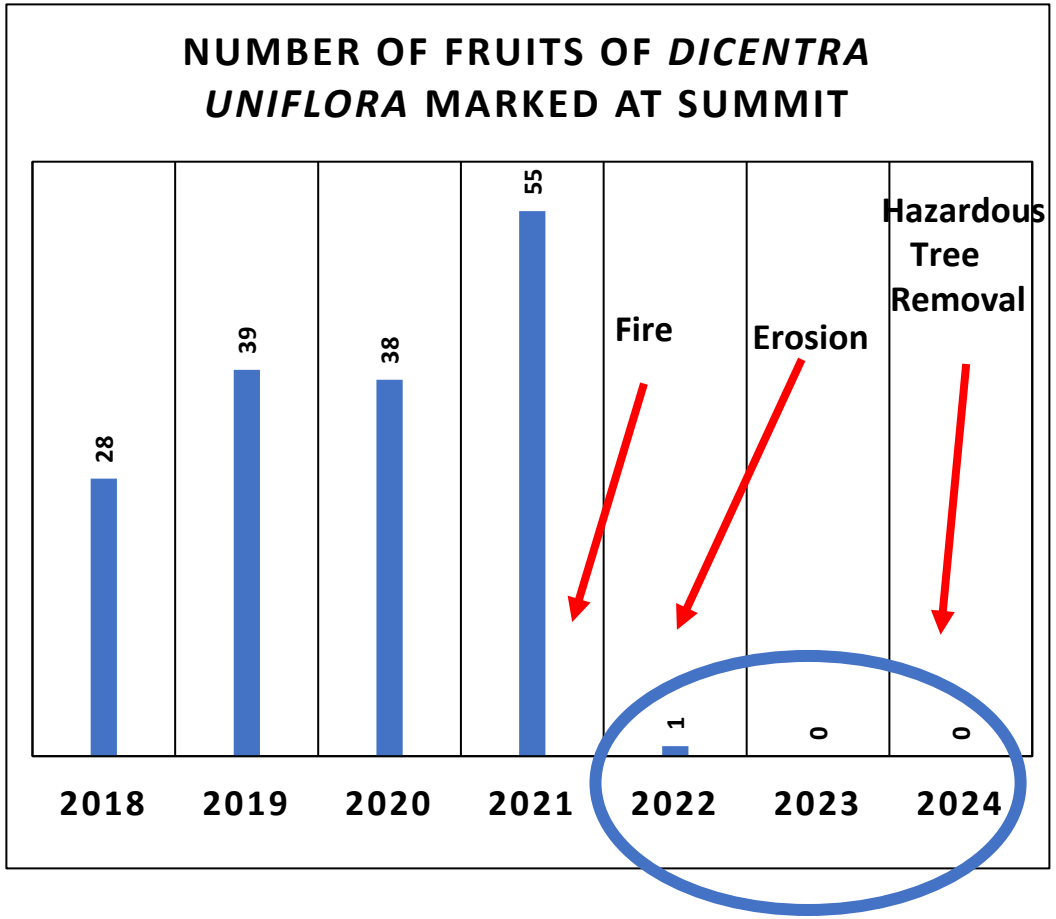


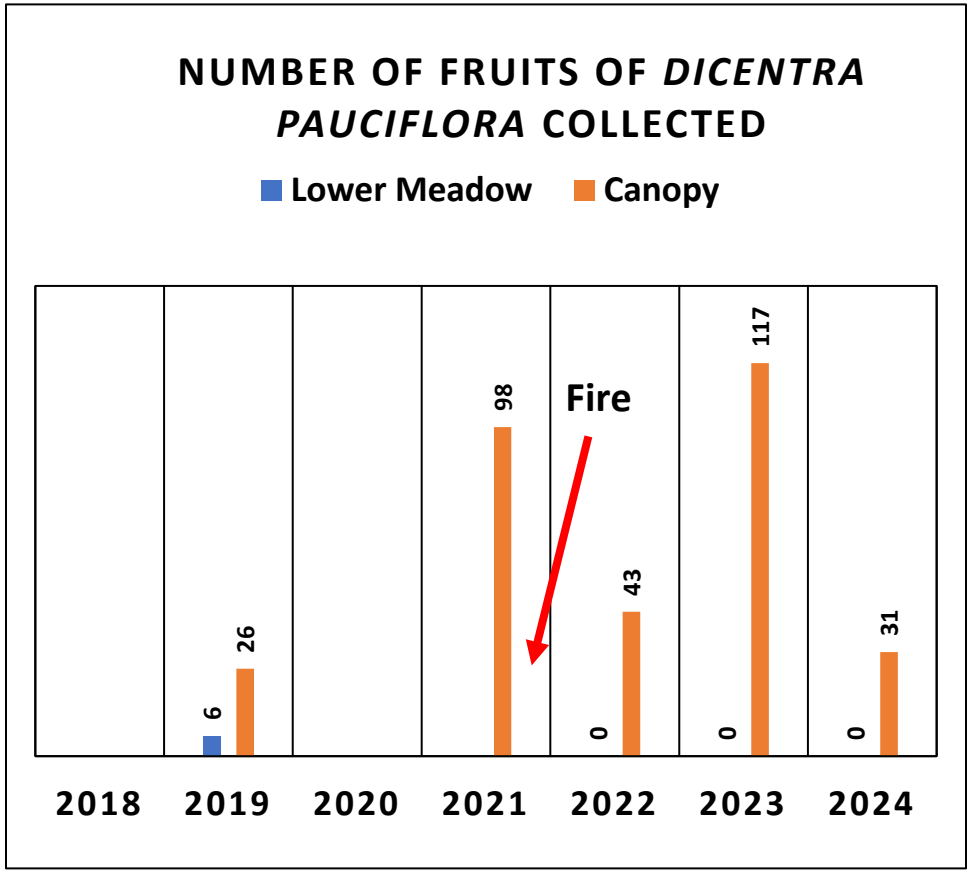






Canopy 2022


NUMBER OF FRUITS OF *DICENTRA UNIFLORA* MARKED AT SUMMIT
28
39
38
55
1
0
0
Fire
Erosion
Hazardous Tree Removal
2018
2019
2020
2021
2022
2023
2024


NUMBER OF FRUITS OF *DICENTRA PAUCIFLORA* COLLECTED
Lower Meadow
Canopy
6
26
98
0
43
0
117
0
31
Fire
2018
2019
2020
2021
2022
2023
2024

Associated Effects

Summit Site Erosion
15 June 2022

Summit Erosion
8 June 2023

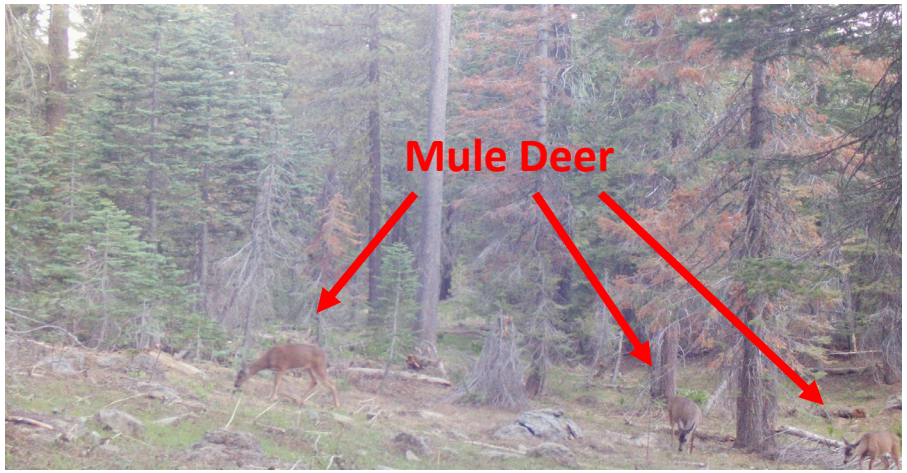
Erosion

Planted Bulblets
Lower Meadow
D. pauciflora
01 June 2023

Scattered Seed Plot
Upper Meadow
D. uniflora
27 April 2022

Gopher Activity (Blue Lines)

Herbivory on *Dicentra* Leaves and Flowers



Game Camera at Summit in 2021
Mule Deer Grazing in Vicinity of
Marked Plants with Flowers or Fruits

Black-Tailed
Rabbit Tracks
2021

Larva of *Parnassius clodius*
Feeding on *Dicentra uniflora*
Leaves and Fruits At Summit in 2018

Herbivory can result in 25 to 35 percent of the decline or loss of Flowers of *Dicentra uniflora* in a spring season.

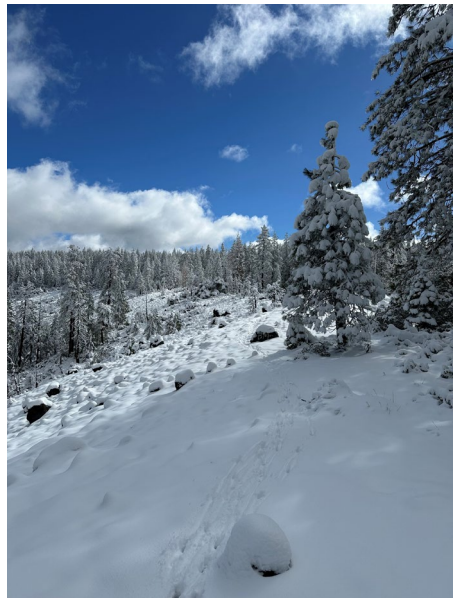
Immature Longhorn
Grasshopper 2024

Summary

Long View of Transect at Summit June 2024

1. Both ***D. uniflora*** and ***D. pauciflora*** **can Survive Light to Moderate Forest Fires.**
2. **Neither can Survive Intense Forest Fires.** Also, the **Seed Banks** of both is likely to have been **Reduced or Destroyed.**
3. Both intensely and moderately burned sites can have **Secondary Effects** such as **Erosion** which can lead to **Additional Loses**.
4. Given the **Slow Growth Patterns** and **Long Generation Time** for both to reach **Maturity** and the **Low Germination Rates** of **Scattered Seeds** and means of dispersal, **Hundreds of Years** or more may be required for an area to be repopulated.
5. **Other Species** such as the **Butterfly** would **Decline** also.
6. Areas such as Meadow and Canopy within catastrophic fire zones **Need Additional Protection** to preserve sources of **Diversity** in the forest environment for the future.
7. We cannot expect to see anything resembling the nature of the forests burned in Northern California to begin to resemble the diversity of habitats lost in our lifetimes, as shown to us by these two species of ***Dicentra***.

Transect at Summit Looking East June 2024



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References of Interest: SCHLISING, R. A. and H. E. Mackey, Jr. 2019. Biology of the ephemeral geophyte, steer's head (*Dicentra uniflora*, Papaveraceae) in the southernmost Cascade Range, Butte County, California. Madroño 66(4):148-163.
MACKEY, H. E., JR. and R. A. Schlising. 2024. Biology of the ephemeral geophyte, *Dicentra pauciflora* (Papaveraceae), Few-flowered bleeding heart, in the southernmost Cascade Range, Butte County, California. Madroño. 71(3):108-121.