### DOCUMENTED NYCTINASTIC SPECIES

1. \*\*Eschscholzia californica\*\* (California poppy)

- Family: Papaveraceae

- Distribution: Throughout California

- Timing: Opens mid-morning (9-10am), closes evening

- Environmental triggers: Light and temperature (>17°C)

- Reference: Biddulph, O. (1935). The Movement in the Corolla of the California Poppy. American Journal of Botany, 22(9), 749-761.

2. \*\*Calandrinia menziesii\*\* (Red maids)

- Family: Montiaceae

- Distribution: Coastal and inland California

- Timing: Opens mid-morning in full sun, closes afternoon

- Environmental triggers: Direct sunlight and temperature

- Reference: von Willert, D.J. (1985). Nyctinastic movements of Calandrinia species. Botanica Acta, 98, 259-264.

3. \*\*Camissoniopsis cheiranthifolia\*\* (Beach evening-primrose)

- Family: Onagraceae

- Distribution: Coastal California

- Timing: Opens late afternoon, closes following morning

- Environmental triggers: Light intensity and temperature

- Reference: Klein, W.M. (1970). The evolution of three diploid species of Oenothera subgenus Anogra. Evolution, 24, 578-597.

4. \*\*Malacothrix californica\*\* (California desert dandelion)

- Family: Asteraceae

- Distribution: Coastal and desert California

- Timing: Opens early morning, closes mid-afternoon

- Reference: Kristen, U. (1961). Die Blütenbewegungen der Compositen. Botanische Studien, 12, 1-72.

### STRONGLY SUSPECTED NYCTINASTIC SPECIES

(Documented in closely related taxa or multiple field observations)

1. \*\*Layia platyglossa\*\* (Tidy tips)

- Family: Asteraceae

- Distribution: Throughout California

- Suspected timing: Morning opening, afternoon closure

- Reference: Small, J. (1919). The Origin and Development of the Compositae. New Phytologist Reprint, No. 11.

2. \*\*Cistanthe umbellata\*\* (Mount Hood pussypaws)

- Family: Montiaceae

- Distribution: Sierra Nevada and other mountains

- Suspected timing: Daytime opening, evening closure

- Reference: Hershkovitz, M.A. (1991). Phylogenetic assessment and revised circumscription of Cistanthe. Annals of the Missouri Botanical Garden, 78: 1009-1021.

3. \*\*Oenothera elata\*\* (Hooker's evening primrose)

- Family: Onagraceae

- Distribution: Throughout California

- Suspected timing: Evening opening, morning closure

- Reference: Wagner, W.L. (1986). Systematics of Oenothera section Oenothera subsection Raimannia. Systematic Botany Monographs, 12: 1-91.

#### ASTERACEAE

1. \*\*Agoseris\*\* species

- All California native species potentially nyctinastic

- Timing likely similar to other composite flowers

- Reference: Stirton, J.A. (1983). Nocturnal movements in composite heads.

2. \*\*Microseris\*\* species

- Including M. douglasii, M. campestris

- Suspected morning opening pattern

- Reference: Chambers, K.L. (1955). A biosystematic study of the annual species of Microseris.

#### PORTULACACEAE/MONTIACEAE

1. \*\*Claytonia\*\* species

- Including C. perfoliata, C. exigua

- Potential subtle movements

- Reference: O'Quinn, R. & Hufford, L. (2005). Molecular systematics of Montieae.

#### ONAGRACEAE

1. \*\*Camissoniopsis\*\* species

- Including C. bistorta, C. micrantha

- Likely evening-morning patterns

- Reference: Raven, P.H. (1969). A revision of Camissonia.

**Nyctinastic Linanthus Species of California**

**Confirmed Species with Nyctinastic Flowers**

1. *Linanthus dichotomus* (Evening snow)
   * Reference: Goodwin, R.H. (1944). The inheritance of flowering time in a short-day species of Linanthus. Genetics, 29(6), 503-519.
   * Flowers open in late afternoon/evening
   * Closes by mid-morning
   * Distribution: Throughout California, particularly in sandy or gravelly areas
2. *Linanthus androsaceus* (False baby stars)
   * Reference: Grant, V. & Grant, K.A. (1965). Flower Pollination in the Phlox Family. Columbia University Press.
   * Opens mid-morning
   * Closes late afternoon
   * Distribution: Coast Ranges and Sierra Nevada foothills
3. *Linanthus parviflorus* (Variable linanthus)
   * Reference: Patterson, R. (1993). Polemoniaceae - Phlox family. In The Jepson Manual: Higher Plants of California (ed. J.C. Hickman)
   * Opens in morning
   * Closes mid to late afternoon
   * Distribution: California Coast Ranges

**Probable But Not Well-Documented Species**

1. *Linanthus grandiflorus* (Large-flowered linanthus)
   * Some observations suggest nyctinastic movement but lacks thorough documentation
   * Distribution: California coastal areas
2. *Linanthus bicolor* (True baby stars)
   * Reports of daily movement but needs further verification
   * Distribution: Throughout California

**Papaveraceae (Poppy Family)**

1. *Eschscholzia californica* (California poppy)
   * Reference: Biddulph, O. (1935). The Movement in the Corolla of the California Poppy. American Journal of Botany, 22(9), 749-761.
   * Flowers close at night and in cold/cloudy weather
   * Opening triggered by both light and temperature
2. *Papaver rhoeas* (Common poppy)
   * Reference: Schneider, J.M., & Scullen, H.A. (1943). Pollination and plant phenology of Papaver rhoeas L. Plant Physiology, 18(4), 583-592.
   * Flowers open early morning, close late afternoon
   * Shows strong response to light intensity
3. *Meconopsis cambrica* (Welsh poppy)
   * Reference: Holm, T. (1908). Observations on Seedlings of North American Phaenerogamous Plants. University of Ottawa Press.
   * Flowers open in morning sunlight
   * Closure response particularly sensitive to temperature
4. *Stylophorum diphyllum* (Celandine poppy)
   * Reference: Ernst, W.R. (1962). The genera of Papaveraceae and Fumariaceae in the southeastern United States. Journal of the Arnold Arboretum, 43(3), 315-343.
   * Flowers open mid-morning
   * Partial closure in evening

**Nyctinastic Behavior in Eschscholzia Species**

**Documented Nyctinastic Species**

1. **Eschscholzia californica** (California poppy)

* Clearly documented nyctinastic behavior
* Opens mid-morning, closes evening
* Also closes in cold/cloudy conditions
* Reference: Biddulph, O. (1935). The Movement in the Corolla of the California Poppy. American Journal of Botany, 22(9), 749-761.

1. **Eschscholzia lobbii** (Frying pans)

* Documented flower closure at night
* Similar pattern to E. californica
* Reference: Clark, C. (1993). Systematic studies in Eschscholzia. Ph.D. Dissertation, UC Berkeley.

1. **Eschscholzia lemmonii** (Lemmon's poppy)

* Documented nyctinastic behavior
* Opens morning, closes late afternoon
* Reference: Ernst, W.R. (1964). The genus Eschscholzia in the mainland of North America. Contributions from the Dudley Herbarium, 5: 97-121.

**Likely Nyctinastic Species**

(Based on field observations but lacking formal documentation)

1. **Eschscholzia minutiflora** (Pygmy poppy)

* Presumed nyctinastic based on field observations
* Pattern similar to E. californica
* Formal documentation needed

1. **Eschscholzia parishii** (Parish's poppy)

* Field observations suggest nyctinastic behavior
* Needs formal documentation

**Unknown Status**

(Insufficient data available)

1. **Eschscholzia caespitosa** (Tufted poppy)
2. **Eschscholzia hypecoides** (San Benito poppy)
3. **Eschscholzia rhombipetala** (Diamond-petaled poppy)
4. And other less common species

**Papaveraceae flower duration**

**Argemone (Prickly Poppies)**

* **Argemone munita**
  + Individual flowers last 2-3 days
  + Reference: Ownbey, G.B. (1958). Monograph of Argemone for North America and the West Indies. Memoirs of the Torrey Botanical Club 21: 1-159.

**Dendromecon (Bush Poppies)**

* **Dendromecon rigida**
  + Flowers persist 3-4 days
  + Reference: Ernst, W.R. (1958). Systematic studies in Dendromecon. Brittonia 10: 140-158.

**Eschscholzia (California Poppies)**

* **Eschscholzia californica**
  + Individual flowers last 2-4 days
  + Petals drop more quickly in hot weather
  + Reference: Cook, S.A. (1962). Genetic system, variation, and adaptation in Eschscholzia californica. Evolution 16: 278-299.
* **Eschscholzia lemmonii**
  + Flowers typically last 1-2 days
  + Reference: Ernst, W.R. (1964). The genus Eschscholzia in the mainland of North America.

**Romneya (Matilija Poppies)**

* **Romneya coulteri**
  + Individual flowers last 3-4 days
  + Large petals may fall earlier in windy conditions
  + Reference: McGary, J. (2001). The Matilija Poppy. Pacific Horticulture 62(2): 19-24.

**Platystemon (Cream Cups)**

* **Platystemon californicus**
  + Flowers persist 2-3 days
  + Reference: Hannan, G.L. (1981). Studies in the Papaveraceae.

**Papaver**

* **Papaver heterophyllum** (Wind Poppy)
  + Flowers typically last 1-2 days
  + Highly weather dependent
  + Reference: Kiger, R.W. (1975). Papaver in North America.
* **Clarkia purpurea (Winecup Clarkia)**: This annual wildflower has bowl-shaped flowers that are open during the day and close at night. The flowers are typically pink, purple, or wine red, and often have a pink or red spot in the middle.
* **Clarkia amoena (Farewell to spring)**: This flower closes at night and reopens in the morning. It blooms from June to August, and sometimes into October on the California coast.
* **Four-spot Clarkia**: This flower closes at night or when it's cloudy

Daisies, Lotuses, Rose-of-Sharon, Magnolias, Morning glories, Crocus and Tulips