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Research Topics for the Scott Creek Watershed and Environs

By James A. West

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For additional information, see "Traversing Swanton Road (2016)," by James A. West
http://arboretum.ucsc.edu/pdfs/traversing-swanton.pdf

Note: The seeds (3,000+ envelopes) for many of the research projects listed below are housed at the UCSC Arboretum, and 1,000+ herbarium vouchers, made by James A. West and colleagues from the area, have been deposited with the UCSC Herbarium, Kenneth S. Norris Center for Natural History (UCSC), Jepson Herbarium (UC Berkeley) and Hoover Herbarium (CalPoly).

Note: Due to the severe ecological damage the Scott Creek Watershed and Environs sustained from the 2020 CZU Lightning fires and the uncertainty of overall habitat recovery, future studies dealing with many of the rare taxa discussed within this document, may depend on the seed collections housed and curated at the UCSC Arboretum.

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1. *Stachys* spp. [Lamiaceae]—Underlying evolutionary mechanisms, which from an ecological perspective, define the interrelationships between four related taxa within one genus, sharing the same watershed but exhibiting different habitat preferences. What roles do inflorescence configuration, corolla alignment/size/color, and differing floral and foliage scents, play in successful reproductive strategies relative to the different habitats occupied? Do these four taxa share any pollinators and being spatially isolated via habitat preference, does this prevent interspecific gene exchange?

a) *S. chamissonis*—hydrologically active, year-round habitat (China Ladder Marsh).

b) *S. ajugoides*—seasonally wet, often poorly drained depressions.

c) *S. rigida* var. *quercetorum*—mesic to xeric (edge of chaparral) habitats.

d) *S. bullata*—highly adaptive, ranging from coastal marshes, coniferous/oak woodlands, riparian corridor, and occasionally extending up to chaparral.

2. Reproductive isolating mechanisms and native bumblebees (*Bombus* spp.) versus introduced honeybees (*Apis mellifera*).

a) Compare their overall versatility as pollinating vectors.

b) Evaluate the potential consequences of population collapse due to disease, parasites, and/or pesticides on the introduced species relative to the effects of habitat loss through agricultural conversion and/or urbanization on the native species.

c) What percentage of our native plant species are flexible enough in their basic floral structures to allow for indigenous replacement vectors with albeit less-effective capacities for pollen transference to offset the possible loss of the primary pollinator; and what are the long-term implications for speciation in a changing environment?

3. The roles of mammals, birds, and insects—intentional or otherwise—as pollinators/seed-dispersers and the co-evolutionary mechanisms involved.

a) Which plant species are generalists where pollinating vectors are concerned?

b) Which species have co-evolved with specific vectors? For example, *Castilleja subinclusa* subsp. *franciscana* (Orobanchaceae) is pollinated by hummingbirds, however *C. affinis* sensu lato is generally bee pollinated, even though this polyploid/polyphyletic complex shows evidence of *C. subinclusa* subsp. *franciscana* in its ancestry.

c) Where flower color and scent are present (e.g., with *Lupinus arboreus* [Fabaceae] and its hybrids with *L. variicolor*), do both traits have equal value in the formation of the fertile hybrid, or does one of these two attractants (visual, olfactory) exert a greater influence in the hybrid formation?

4. Chemical signatures (foliage and/or floral scents) as taxonomic markers, used in conjunction with other morphological features, to differentiate locally problematic species/hybrid complexes, e.g.:

- *Castilleja* (*densiflora* aff. *Orthocarpus noctuinus* Eastw. and C. densiflora sensu strictu)
- Layia (L. gaillardioides and L. hieracioides)
- *Madia* (*M. exigua*, *M. gracilis,* and *M. sativa*)/besides morphological characteristics, are the chemical signatures for these three species, of sufficient distinction, that

potential hybrids between any of them, can be validated thru analyzing their foliar chemistry?

- *Erythranthe* (*guttata* complex)/what role does scent or lack of play within this complex, relative to floral structure and the contrasting lip patterning, whose pigmentation within the ultraviolet spectral range, assists prospective diurnal pollinators?
- Monardella (villosa complex)
- *Pseudognaphalium* ("gianonei" pro. sp. nov.)/examine this taxon's putative hybrid origin, between P. californicum and P. stramineum , using gas chromatography, to determine if its foliage combines the chemical signatures of both parents.
- *Sanicula* ("gianonei" pro. sp. nov.)/phylogenetic relationship with Sanicula crassicaulis, sensu lato. based in part, on shared or different chemical signatures.
- *Trillium* (*chloropetalum* complex) and relationship with T. albidum.
- *Stachys* (evolutionary/phylogenetic relationships between *S. ajugoides*, *S. bullata*, *S. chamissonis*, and *S. rigida* var. *quercetorum*, based on a comparative analysis of their chemical signatures)
- Hosackia stipularis var. stipularis and Lotus balsamiferus, conspecific or distinct on a varietal level.
- Clinopodium douglasii/foliar scent distinction between populations, genetically set or the result of differences in substrate pH, degree of exposure to sunlight, aridity of habitat, and/or ambient air temperature.

5. Create a digital library/herbarium documenting the watershed's flora at all stages of development (e.g., cotyledon configuration, foliar morphology/alignment, inflorescence configuration showing flowers in all stages of development, mature capsules, seed structure/patterning and in situ habitat with associate species).

6. Habitat stability versus human-induced disruptions, and the resulting increase/decrease in patterns of biodiversity, e.g.:

a) North-northeast-facing slopes overlooking Scott Creek, between Scott Creek Bridge/Old Seaside School and the Cookhouse drainage complex, with particular emphasis on the forested slopes overlooking the Swanton Pacific/Cal Poly orchard down to the Mill Creek confluence with Scott Creek.

Google Earth coordinates: between 37.072297, -122.237957 and 37.079681, -122.248881.

b) East-facing slopes overlooking Swanton Valley, between the Big and Scott Creek confluences and Winter Creek.

Google Earth coordinates: between 37.057227, -122.227874 and 37.070187, -122.234597.

c) Coastal Prairie (Western Terrace), between Pumpkin Field and Scott Creek Marsh/comparing areas historically utilized for cultivation and in recent decades left fallow or utilized as pasture for cattle grazing, with their current level of biodiversity and the proportion of native versus introduced taxa occupying these disturbed zones relative to the margining areas, with their native floristic components still intact.

Google Earth coordinates: between 37.074119, -122.255487 and 37.045520, -122.228233.

7. Palynological (pollen) studies involving core samplings taken throughout the watershed to ascertain historic changes within the local species composition, specifically, from a hydrological, palynological, and ecological perspective.

Do a comparative study of the benched/perched marshes along the ocean facing edge of the Western Terrace, between the Cowboy Shack Gulch and Lasher Marsh Gulch drainages.

Between: 37.079592, -122.261336 and 37.060943, -122.247067.

a) Determine, if possible, the age(s) of the marshes, which act as "islands of biological diversity."

b) Determine the differences between current and pre-European occupancy native-species composition.

c) Conduct an inventory of shared and marsh-specific taxa.

d) Determine the role, if any, the underlying syncline plays in water storage/distribution patterns within this section of the Western Terrace.

e) Determine what influence the aeolian sand deposits have played in shaping the vegetational mosaics throughout this portion of the coastal prairie.

f) Determine what the cumulative impacts of agriculture and grazing crops have played in modifying/fragmenting the native vegetation, investigating its persistence along the non-cultivated margins, and the repository capacity of *Juncus* tussocks to act as mini-refugia.

g) Determine the ecological importance from a biodiversity perspective of the east-west alignment of the lower portions of the marsh-draining gulches between the coastal prairie and Highway 1, having mesic and xeric biotic profiles mirroring each other.

8. Investigate the geomorphic origins of the "vertical grasslands" and their value as refugia for rare taxa and holding succession in abeyance, using Lidar to define these areas of concentrated biodiversity coupled with in situ photography and biotic inventories, thus generating a baseline for in-depth research projects.

Note: Several of these landslide derived ecosystems exist within the Scott Creek Watershed and all of them contain populations of locally uncommon or rare native taxa. Due to the presence of perennial grasses (Agrostis, Bromus, Calamagrostis, Elymus, Festuca, Melica, etc.) that cover the exposed and fragmented siliceous mudstone, shrubby and arboreal succession is slowed down, letting herbaceous annual and perennial species gain a foothold. Three such local examples, are as follows:

1) Between 37.095930, -122.237573, elevation 900 feet and 37.098489, -122.237058, elevation 943 feet/w-facing slope overlooking Upper Seymore Field. Impacted by two major fires, 11 apart, namely the 2009 Lockheed Fire and the 2020 CZU Lightning Fire. Native taxa documented for this precipitous hillside, include: Delphinium hesperium subsp. hesperium, Cryptantha flaccida, Cirsium occidentale var. venustum, Plagiobothrys nothofulvus. Monardella villosa aff. subsp. franciscana, Lupinus latifolius, Lupinus albifrons var. albifrons, Lupinus succulentus, Malocothrix floccifera, Euphorbia crenulata, Castilleja foliolosa, Caulanthus lasiophyllus and Trifolium ciliolatum. This is a small representation of the native species found on and peripheral to this steep and morphologically complex landslide derived ecosystem, and even after the impact of the 2009 Lockheed Fire, what returned was amazing in its diversity. For a full accounting of this interconnected series of "hanging gardens", prior to and following the 2009 Lockheed Fire, consult pages 82-84 of the 2016 iteration of the Traversing Swanton Road Essay.

2) 37.085732, -122.246810, elevation 265 feet/w-facing hillside overlooking Squirrel Flat, framed by an oak/conifer woodland, part of the Schoolhouse Ridge Complex, hosting a complex array of "natives", some rare and one listed. A partial review of the botanical constituents occupying this steep but accessible habitat, is as follows: Stebbinsoseris decipiens (1B.2 listing), prior to 2020 CZU Lightning Fire but a year following the 2009 Lockheed Fire, the population for this near-endemic taxon, numbered more than 200 plants, making it one of the two largest populations for the Scott Creek Watershed. Other documented "natives" calling this "snapshot of biodiversity" home, are… Uropappus lindleyi (co-parent of Stebbinsoseris decipiens), Malacothrix floccifera, Minuartia douglasii, Silene antirrhina,

Phacelia distans (flowers dirty white in coloration), Trifolium ciliolatum, Dudleya caespitosa, Pellaea mucronata var. mucronata, Adenostoma fasciculatum var. fasciculatum, Toxicoscordion fremontii, Rafinesquia californica, Piperia elongata, Piperia transversa, Scutellaria tuberosa, Bowlesia incana, Antirrhinum kelloggii, Arctostaphylos crustacea subsp. crinita, Hesperocnide tenella, Polygala californica, Eriogonum nudum sensu lato, and Dichelostemma capitatum subsp. capitatum.

3) 37.082179, -122.245321, elevation 305 feet/w-facing edge of third terrace, grassland topped with bedding planes exposed and a landslide derived fragmented siliceous mudstone slope abutting Purdy Road. The contouring of this near vertical hillside, partially grass covered and basally cloaked in a wall of Frangula californica subsp. californica and Baccharis pilularis subsp. consanguinea shrubs, earned it the moniker, Beehive Hill. A partial listing of native taxa occupying this relatively compact but botanically rich site, is as follows: Gilia clivorum, Stebbinsoseris decipiens, Dudleya caespitosa, Clarkia purpurea subsp. quadrivulnera, Clarkia rubicunda, Sanicula arctopoides, Crassula connata, Pentagramma triangularis subsp. triangularis, Leptosiphon androsaceus, Nemophila menziesii, Nemophila parviflora var. parviflora, Oemleria cerasiformis, Oxalis pilosa, Claytonia perfoliata subsp. perfoliata and Dichelostemma capitatum subsp. capitatum.

Note: For a more comprehensive species overview for Beehive Hill and its surrounding environs, see page 153 of the 2016 iteration of the Traversing Swanton Road Essay. Using Purdy Road, between its entrance at Swanton Road and the cattleguard/slide area, as an end point, pages 141-156 in the Traversing Swanton Road Essay, will give the reader a sense of the botanical richness and geomorphic complexity, defining the Schoolhouse Ridge, and how the vertical grasslands 2 & 3, fit into this ecological jigsaw puzzle.

9. Study the slope orientation and resulting changes in vegetation patterns (mesic versus xeric) within the same drainage system using the ocean-draining gulch systems between the Lasher Marsh Gulch and Scott Creek Marsh as examples—one of the underlying mechanisms needed to establish localized biodiversity.

10. Paralleling the co-evolutional value of fire within the chaparral ecosystem, study the importance of cyclical riparian scouring to reinvigorate the established, long-lived vegetation and increase species diversity by uncovering seeds deposited and buried decades before in sandbars and adjacent stream banks.

11. Study gene-flow patterns within a given taxon, e.g., coyote mint (*Monardella villosa,* sensu lato [Lamiaceae]), which ranges elevationally from the coastal bluffs up to the chaparral and is

represented in the watershed by two well-defined subspecies (see http://digitalcommons.calpoly.edu/theses/1022/).

a) Map the distribution patterns of *M. v.* subsp. *villosa* and subsp. *franciscana* and the areas where their populations overlap.

b) Investigate what underlying ecological conditions allow the two subspecies to maintain their distinctive phenotypes and determine where their ranges overlap. (Is there a breakdown in those distinctions?)

c) In terms of speciation, is subsp. *franciscana* more recently derived, and are there any mechanical or genetic barriers evolving or in place, save physical proximity, to prevent the exchange of genetic material between the two taxa?

d) Study the local *M. villosa* complex as a series of overlapping "micro-species," originally formed by the fragmentation of larger populations and through isolation and inbreeding forming several (biochemically and morphologically) distinct sub-populations. Where two or more of the "isolates" reconnect (through some disturbance regime), intraspecific hybridization may have taken place, possibly explaining the foliar and chemical complexity displayed within some of the larger populations.

e) Are there any chromosomal differences between the two subspecies as they occur within the Scott Creek Watershed and environs and within the two subspecies themselves? Are the populations uniform as to the base number of n=20?

f) With most species comprising the genus *Monardella* possessing the base chromosome number of n=21 and *M. villosa* recorded as having n=20 with subsp. *obispoensis* a tetraploid (2n=80), how do the base differences in chromosome numbers and example of polyploidy define *M. villosa* sensu lato within the phylogeny of the genus?

g) How do the local populations of both subspp. *villosa* and *franciscana* compare with the type circumscriptions for both taxa?

h) Are the thicker leaves with their deeply impressed veins and complex capitula (comprising multiple "heads" with their subtending foliar bracts aggregated into one large capitulum or arranged in whorls and verticillate in appearance) indicative of higher ploidy levels. Are these manifestations restricted to the subsp. *franciscana*?

i) Along Swanton Road (between the entrance to Purdy Road down to the Casa Verde) are a

series of disjunct populations of *M. villosa* aff. *villosa*, within the same elevational range. Do these micro-populations constitute a cline, moving from subsp. *villosa* into subsp. *franciscana* at the mouth of the Queseria Gulch system, or are they separately derived from populations elevationally above them that currently exist or are no longer extant?

12. *Clarkia purpurea* subsp. [Onagraceae]—The flowers of *C. purpurea* subsp. *purpurea* and *C. p.* subsp. *quadrivulnera* vary both within and between populations as to contrasting pigment patterns and their placement/dimensions in terms of UV radiation absorbed or reflected and the ability of members of the Hymenoptera to perceive this part of the spectrum.

a) Is one pattern preferred over another by the prospective pollinators?

b) How does this affect both the variability within and sustainability of the populations in a changing environment?

c) Since all the Clarkia purpurea subsp. purpurea populations found within the Scott Creek region are spatially isolated and the distances that the pollinating bees travel are uncertain, does this physical disconnect potentially reinforce the distinctiveness of each local population?

> Note: All the Clarkia purpurea subsp. purpurea populations growing in the Scott Creek Watershed/Environs, have been documented with seed collections housed at the UCSC Arboretum. They need to be raised out and genotyped, to see if they form one interrelated group or have separate lineages. Have they evolved independently from taxa called C. purpurea subsp. purpurea found elsewhere in California and what relationship do they have locally with C. purpurea subsp. quadrivulnera, as to past/present interspecific gene exchange? Do a seed morphology analysis, between local populations of Clarkia purpurea subsp. quadrivulnera and subsp. purpurea, C. aff. davyi and C. aff. prostrata, and see if any taxonomically distinguishing features can be found linking this phylogenetically related group coupled with a comparison between the ovary/capsule morphologies.
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> Note: 37.043354, -122.212226, elevation 494 feet/Clarkia purpurea subsp. purpurea population of 150-200+ plants, growing on ancient eolian sand dune system, 4th terrace, overlooking the Queseria/Molino Divide. This is the largest concentrated population documented to date for the Scott Creek Watershed/Environs. While extremely variable as to overall gross morphology and flower color/patterning, the most distinctive feature observed for this population, is how it continues (late in the season) to put out and maintain new leaves and flowers, long after these annuals cease to have any apparent functional root systems and the aerial stems/inflorescences become woody. The

"prolonged life" for this annual may have to do with its capacity to absorb atmospheric moisture (fog and proximity to oceanic influences) via the possible hygroscopic nature of its stem structure and certainly warrants a research study along ecological as well as, physiological lines. Several comprehensive seed collections have been made for this unique population and further in situ documentation needs to be done.

Seed collection data: 2011-293, Clarkia purpurea subsp. purpurea, 11/01/2011, Jim West.
Seed collection data: 2011-418, Clarkia purpurea subsp. purpurea, 10/11/2011, Jim West.
Seed collection data: 2012-417, Clarkia purpurea subsp. purpurea, 10/26/2012, Jim West.
Seed collection data: 2012-418, Clarkia purpurea subsp. purpurea, 10/26/2012, Jim West.
Seed collection data: 2012-419, Clarkia purpurea subsp. purpurea, 10/26/2012, Jim West.
Seed collection data: 2013-519, Clarkia purpurea subsp. purpurea, 07/07/2013, Jim West.
Seed collection data: 2013-520, Clarkia purpurea subsp. purpurea, 07/07/2013, Jim West.
Seed collection data: 2014-338, Clarkia purpurea subsp. purpurea, 06/26/2014, Jim West.

Note: 37.098758, -122.241162, elevation 733 feet, Scott Creek side of Seymore Hill, steep grass covered slope above cattle trail leading into Upper Calf Gulch. This is the furthest inland population for Clarkia purpurea subsp. purpurea in the Scott Creek Watershed region, to date. This locally rare species is growing sympatrically with sister subspecies, quadrivulnera, and the morphological plasticity evidenced in this interior population of C. purpurea subsp. purpurea may be due to the exchange of genetic material between these two subspecies. Both Clarkia subspecies are growing sympatrically with another Santa Cruz rarity, namely Micropus californicus var. subvestitus. The Micropus varietal form has been documented with pressings residing at the Jepson Herbarium/UC Berkeley and the both the Micropus and Clarkia, are well represented via seed collections at the UC Santa Cruz Arboretum. Raising out several ex-situ batches of the Seymore Hill Clarkia purpurea subsp. purpurea collections may yield important data, as to how a given subspecies can augment its gene pool through intraspecific hybridization and how does this acquisition of new material aids in its reproductive success, relative to altering its flower alignment (densely clustered versus spread out) and petal coloration/patterning?

Seed collection data: 2002-154, Clarkia purpurea subsp. purpurea, 10/16/2002, Jim West.
Seed collection data: 2002-541, Clarkia purpurea subsp. purpurea, 10/02/2002, Jim West.
Seed collection data: 2002-542, Clarkia purpurea subsp. purpurea, 10/02/2002, Jim West.
Seed collection data: 2002-544, Clarkia purpurea subsp. purpurea, 11/06/2002, Jim West.
Seed collection data: 2007-1421, Clarkia purpurea subsp. purpurea, 07/25/2007, Jim West.
Seed collection data: 2007-1426, Clarkia purpurea subsp. purpurea, 10/30/2007, Jim West.
Seed collection data: 2009-946, Clarkia purpurea subsp. purpurea, 08/01/2009, Jim West.
Seed collection data: 2011-410, Clarkia purpurea subsp. purpurea, 10/27/2011, Jim West.

Note: Several generations of C. purpurea subsp. purpurea were raised out in the late Harry Wain's garden, from in-situ collected seed nearby (isolated population growing on eolian sand deposits, overlooking Lower Lasher Marsh drainage), the results being… that each self-sowing generation, produced inflorescences, in terms of overall morphology and flower color/conformation, of greater complexity, that far exceeded the variability of the original in situ population. Seed data documenting those ex-situ raised populations, are as follows:

Seed collection data: 2000-298, Clarkia purpurea subsp. purpurea, 08/11/2000, Jim West
Seed collection data: 2000-299, Clarkia purpurea subsp. purpurea, 08/02/2000, Jim West
Seed collection data: 2000-300, Clarkia purpurea subsp. purpurea, 08/03/2000, Jim West

Note: 37.080115, -122.261865, elevation 358 feet/Lasher Marsh Bluffs. Scattered population growing on eolian sand deposits and the first population discovered for the Scott Creek Watershed region. Growing sympatrically with a morphologically variable population of Horkelia cuneata, displaying a complex mixture of var. cuneata and var. sericea genes. Both the Clarkia and Horkelia have been documented with several seed collections and the Clarkia's presence has also been validated with two herbarium

sheets (Jepson Herbarium, UC Berkeley).

Herbarium data: JEPS81520, Clarkia purpurata subsp. purpurata, Roy E. Buck and James A. West, 9, 1982-6-11.
Herbarium data: JEPS82579, Clarkia purpurata subsp. purpurata, James A. West, 125, 1983-6-15.

Seed collection data: 2007-1424, Clarkia purpurea subsp. purpurea, 08/12/2007, Jim West.
Seed collection data: 2008-1690, Clarkia purpurea subsp. purpurea, 08/01/2008, Jim West.
Seed collection data: 2009-945, Clarkia purpurea subsp. purpurea, 08/24/2009, Jim West.
Seed collection data: 2009-947, Clarkia purpurea subsp. purpurea, 08/24/2009, Jim West.
Seed collection data: 2009-949, Clarkia purpurea subsp. purpurea, 08/24/2009, Jim West.
Seed collection data: 2009-950, Clarkia purpurea subsp. purpurea, 08/24/2009, Jim West.
Seed collection data: 2011-256, Clarkia purpurea subsp. purpurea, 06/02/2011, Jim West.
Seed collection data: 2011-335, Clarkia purpurea subsp. purpurea, 09/23/2011, Jim West.
Seed collection data: 2016-246, Clarkia purpurea subsp. purpurea, 07/25/2016, Jim West.

Note: 37.082813, -122.250776, elevation 320 feet/"Bowl Area" (landslide derived), overlooking central portion of "Old Road" (part of the original North Coast Road, mid-19th century). This population consists of three spatially discreet but interconnected micro-populations, growing on grassy slopes littered with siliceous mudstone shards, derived from the weathered bedding planes perched above the fragmented Clarkia population. Historically, this isolated population may have been more extensive in its occupancy of the area but due to competition from non-native graminoids (Avena, Bromus, Festuca species), possible grazing impacts and the 2020 Holocaust, any future studies of this population's genetics, will have to come from 10+ envelopes of seed, spanning a decade, 2000-2013, in the custodial care of the UCSC Arboretum. Point of interest, part of this populational mosaic was proximal to the first documented colony (late 1950s) of what ultimately became Trifolium buckwestiorum. While seeds and herbarium pressings have validated the "Old Road's" existence of the "Santa Cruz

clover", due to extensive 2020 CZU Lightning Fire damage and repeated vehicular activity, its existence in real time may be no more than a memory.

Seed collection data: 2002-165, Clarkia purpurea subsp. purpurea, 09/23/2002, Jim West.
Seed collection data: 2002-543, Clarkia purpurea subsp. purpurea, 10/29/2002, Jim West.
Seed collection data: 2003-301, Clarkia purpurea subsp. purpurea, 07/14/2003, Jim West.
Seed collection data: 2003-302, Clarkia purpurea subsp. purpurea, 07/14/2003, Jim West.
Seed collection data: 2007-1419, Clarkia purpurea subsp. purpurea, 07/24/2007, Jim West.
Seed collection data: 2007-1425, Clarkia purpurea subsp. purpurea, 09/12/2007, Jim West.
Seed collection data: 2009-948, Clarkia purpurea subsp. purpurea, 08/02/2009, Jim West.
Seed collection data: 2013-86, Clarkia purpurea subsp. purpurea, 08/13/2013, Jim West.

13. *Lupinus* hybrids [Fabaceae]—

a) Document the primary hybrids locally of *L. arboreus* with *L. formosus* and *L. variicolor* and the relationship of the stabilized taxon tentatively designated *L. propinquus* to both *L. arboreus* and *L. latifolius*.

The originally discovered hybrid between L. arboreus and L. formosus was never pressed but documented via digital images and those reside within the CalPoly/Swanton Pacific Ranch's data base.

Seed documentation data: 37.064206, -122.246098/2015-105, Lupinus arboreus x Lupinus variicolor, 08/19/2015, Jim West. Solitary specimen, growing adjacent to interface of erosion created gulchlet with w-fork of Cowboy Shack Gulch (aka Solar Panel Gate Gulch).Growing sympatrically with Agrostis blasdalei and Clarkia aff. davyi.

b) Determine what role, if any, have the primary hybrids played in the variability of the contributing parents through backcrossing and what evolutionary advantages/disadvantages

are conferred where sympatric interfertile taxa are both perennial, but either evergreen or seasonal above ground and shrub-like versus decumbent in mode of growth?

14. Study the role of bryophytes in

a) providing a favorable micro-habitat for seed germination.

b) creating a buffer zone between exposed rock or bark formations with their potentially less than optimal pH; and

c) through their hygroscopic capabilities, capturing atmospheric moisture, particularly between dusk and dawn.

15. Study the comparative value of dissimilar types of recent and accumulated leaf litter (e.g., *Notholithocarpus densiflorus* var. *densiflorus*, *Arbutus menziesii*, *Sequoia sempervirens*) in mitigating the erosive power of heavy and often prolonged rainfall in unstable areas.

16. Study the cumulative capacity of seasonally shed foliage from deciduous streamside trees and shrubs (e.g., *Alnus rubra*, *Sambucus racemosa* var. *racemosa*, *Salix lasiandra* var. *lasiandra*, *Rubus spectabilis*, and *Acer negundo*) in conjunction with exposed rocky debris to influence flow patterns and act as catch-basins for particles in suspension.

17. *Collinsia* spp. [Plantaginaceae]—

a) Study what isolating mechanisms, if any, allow two closely related species of *Collinsia*—namely *C. heterophylla* and *C. multicolor*—to co-exist proximal to each other along Swanton and Purdy roads without producing apparent hybrids, even though visited by at least two shared pollinating vectors, both members of the genus *Bombus*.

b) What co-evolutionary factors are in play, causing the *C. heterophylla* populations to be usually pale-flowered, while sister species *C. multicolor* remains basically uniform in coloration throughout its range?
The distributional pattern of the *C. multicolor* populations offers valuable research potential in the study of inter/intra-population gene flow with the following considerations worth investigating:

c) Virtually all flowering *C. multicolor* plants produce viable seed, which when fully mature is dispersed within the current season's population. Over the past 30+ years, I have seen neither loss of vigor nor reduction in population size and wonder if these are inbreeding populations

or if there is some gene flow from one or more of the other isolated/localized populations, via the shared pollinating vectors aka the two *Bombus* spp.?

d) Of all the *C. multicolor* populations studied within the watershed and environs, only one has produced any significant color variants—this one down the road from Mountain Lion Gulch, comprising 150+ plants and over the course of 30+ years producing just two alba individuals (with clear cell sap, flowers fading tan without any trace of anthocyanins) and one intensely concolored form.
Are these now disjunct populations of *C. multicolor* scattered along Swanton Road once part of much larger ones that have been broken up into smaller physically isolated subsets, due to the ongoing slope failures that define much of their current habitat? And do these disruptive events initiate or curtail population expansion?

e) As to the breeding patterns of *C. multicolor*, are they obligate outcrossers, or is selfing also possible? Are all the current populations documented for the Scott Creek Watershed and environs genetically identical, or have some undergone changes on a molecular level that could through continued isolation, lead to the formation of cryptic or micro-species?

f) How do the local *C. multicolor* populations compare genetically with the remaining viable populations in San Mateo, San Francisco, Monterey, San Luis Obispo, and Santa Barbara counties, some of which grow on serpentine? Are there significant differences, both on a molecular and physiological level?

Seed collection data: n-end of Swanton Road, between 37.082071, -122.248793 and 37.085670, -122.253572/Along this section of Swanton Road, C. multicolor is broken up into several populations of varying sizes, and at the interface of Mountain Lion Gulch with Swanton Road, shares habitat with C. heterophylla.

2009-965, Collinsia multicolor, 06/17/2009, Jim West.
2013-85, Collinsia multicolor, 06/23/2013, Jim West.
2014-30, Collinsia multicolor, 06/22/2014, Jim West.
2016-60, Collinsia multicolor, 06/08/2016, Jim West.
2016-61, Collinsia multicolor, 06/08/2016, Jim West.
2017-74, Collinsia multicolor, 06/05/2017, Jim West.
2018-477, Collinsia multicolor, 06/12/2018, Jim West.

2014-31, Collinsia heterophylla var. heterophylla, 06/28/2014, Jim West.
2016-192, Collinsia heterophylla, 07/07/2016, Jim West.
2017-265, Collinsia heterophylla, 07/22/2017, Jim West.

2018-474, Collinsia heterophylla var. heterophylla, 07/06/2018, Jim West.

Seed collection data: s-end of Swanton Road, 37.041830, -122.222813/population with more intensely colored flowers and foliage possessing thicker texture.

2013-84, Collinsia multicolor, 05/30/2013, Jim West.
2014-29, Collinsia multicolor, 06/26/2014, Jim West.
2016-59, Collinsia multicolor, 06/10/2016, Jim West.
2017-65, Collinsia multicolor, 06/09/2017, Jim West.

Seed collection data: w-facing hillside, between Purdy Road and dirt road leading to the lower and upper Pozzi Meadows, 37.081051, -122.245803/population survived 2009 Lockheed Fire but status following the 2020 CZU Lightning Fires, uncertain.

2013-82, Collinsia multicolor, 06/30/2013, Jim West.

Seed collection data: w-facing steep hillside above Prairie Overlook Gulch, 37.058008, -122.235816/this population shares habitat with Amsinckia lunaris , Thysanocarpus laciniatus, Delphinium decorum subsp. decorum, Galium californicum subsp. californicum, Trifolium macraei, etc.

2009-964, Collinsia multicolor, 06/21/2009, Jim West.

18. Genetics of long-lived, fire-adapted taxa—Investigate whether long-lived fire-responsive taxa, such as the local polyploid/polyphyletic burl-forming Arctostaphylos *crustacea* [Ericaceae], maintain the integrity of their complex genome (genetic sponge), or does each episode of physiological trauma (e.g., fire) give rise to new growth, some/all of which display subtle modifications on a chromosomal level?

19. Rosette-forming plants—Examine the evolutionary values conferred upon both native (e.g., *Taraxia ovata, Sanicula arctopoides*) and introduced (e.g., *Plantago lanceolata, Hypochaeris radicata*) taxa, where emerging foliage forms horizontally aligned rosettes initiated from fleshy, water-retaining rootstocks in a post-fire but pre-rainy season scenario, with an emphasis on the rosette pattern securing valuable surface space from competition, maximizing photosynthesis capabilities, and mitigating sub-surface loss of moisture—and the fleshy taproots having ample dormant buds to offset damage from the effects of fire, plus potential for subsequent

herbivory and possessing sufficient stored water to bridge the temporal gap until beginning of Fall rains.

20. *Calamagrostis rubescens* [Poaceae]—Compare the net genetic gain/loss from a heterozygous/homozygous perspective, in a long-lived native grass, whose basic mode of reproduction is asexual/vegetative (from extensive clonal colonies growing within mixed conifer/oak woodlands) and typically produces inflorescences only when disturbed by fire, landslides, or through canopy removal (with the corresponding change in the light/temperature regimen).

a) When inflorescences are produced, how successful is seed set and to what extent, with the colonies being principally clonal, is new genetic material being introduced into the existing gene pool?

21. *Quercus parvula* var. *shrevei* x *Q. kelloggii* hybrid [Fagaceae]—Do a comparative analysis focusing on:

a) ecological (parental association, habitat preferences, and role of disturbance in the broaching of reproductive isolating mechanisms.

b) morphological (bark topography, underlying vascular and epidermal patterns in foliage).

c) physiological (metabolism and growth rate behavior); and

d) molecular (chromosome numbers, mutation rates at specific gene loci, putative gene flow patterns and degree of pollen fertility); and

e) whether selfing, outcrossing and/or backcrossing are possible and historically can partially account for variability within the local *Quercus parvula* var. *shrevei* populations.

Being non-F1 hybrids in reference to the thesis that the local hybrid oaks are the product of ancient hybridization between *Q. kelloggii* and *Q. parvula* var. *shrevei*, with the locally occurring hybrid taxon being the result of two forest live-oaks each carrying the hybrid gene(s) that are necessary (double recessive) for the infrequent occurrence of the scattered/clustered juveniles, which always appear proximal to a *Quercus parvula* var. *shrevei* adult and are wholly removed from any current physical contact with the black oak.

22. *Solanum douglasii* [Solanaceae]—An in-depth investigation of the variable taxon *S. douglasii* needs to be undertaken, sampling a wide range of habitats from the coastal bluffs up to the

chaparral, to determine:

a) if all the forms in the watershed and environs are indeed *S. douglasii* or are the perennial, quasi subshrub, virgate (usually free standing/upright in growth), small-flowered taxa margining Scott Creek and primarily restricted to the riparian corridor, S. americanum and since both species are part of the Solanum nigrum complex and share the same chromosome number (n=12), are some of these plants hybrids?

b) do those plants with lilac-suffused corollas found on the immediate coast represent past hybridization with the sympatric *S. umbelliferum*, or is the distinctive anthocyanic pigmentation found on stem, foliage, and flowers a physiological response to the stressful, unshaded headland habitat?

23. *Arctostaphylos* spp.—In a post-fire scenario, where weathered (both consolidated and in places fragmented) Santa Cruz Mudstone (e.g., the "Chalks") is the principal substrate and organic material (duff) is minimal at best.

a) What is the viability of the mature fruit (drupes and stones) in the non-burl-forming *A. glutinosa* populations when compared with its burl-forming relative, *A. crustacea* sensu lato, which by occupying the lower ridgetops and interfacing with the oak/conifer woodlands, has accumulated several centimeters of protective leaf litter?

b) When the temporal length between fires exceeds 60+ years and the seasonal deposition of manzanita "fruits" encased within the duff can be profiled vertically, have the "oldest" stones via the action of humic acid been rendered inviable? Are the most recently deposited mature fruits, lacking the insulatory protection afforded by the deeper layers of organic material, destroyed by the "sustained" intensity of the fire, thereby leaving the "middle" layers of stones, giving them the opportunity to germinate in a seedbed of ash-converted duff?

c) Where the duff layer is sparse or absent (as in the "Chalks") and the triggering effects of smoke for germination not or minimally present, can the cracks/fissures in the mudstone act as refugia for replacement seedlings, and are the presence of light, sustained moisture, and mineral soil sufficient to initiate germination and facilitate growth?

24. *Pinus* spp. [Pinaceae]—Compare sub-populations of *Pinus radiata* (coastal bluffs/headlands) outside of the direct influence of *Pinus attenuata* (via wind-referenced pollen) and the sympatric sub-populations dominating the conifer/oak woodland interface with the chaparral, focusing on

a) bark topography, branch alignment and overall growth structure.

b) leaf morphology, coloration, stomatal distribution.

c) cone structure: color, size, profile/angle of attachment to branch, with particular emphasis on apophysis and umbo gestalt. (The "mucro" points back down towards the base [point of attachment] of the ovulate cones in *P. radiata*, is dominant in the hybrid, miniscule in stature, and after a few seasons reduced to a basal scar thru weathering; while in *P. attenuata*, the mucro is orientated apically, claw-like, long persisting and recessive in the hybrid.); and

d) seed and wing morphology.

e) Postulate the potential role of outlying individuals representing a hybrid population, removed from parental influence through isolation and creating new resegregates via selfing and through time, establishing a highly reticulate pattern of heterozygosity.

f) During the early stages of seasonal growth in seedling/juvenile trees, needles are often 4–5 per fascicle. Is this reflective of a shared ancestry with the 5-needle taxa of Mexico and Central America and represent a currently derived foliar morphology thru reduction?

g) Study and compare the sub-populations of this hybrid swarm–derived taxon growing in the decidedly mesic riparian corridor and often proximal to Scott Creek, with those found "higher and drier" up on the 3rd and 4th terraces as to age/longevity, overall health/disease resistance, through ring counts on dead specimens, rate of growth in dissimilar habitats and reproductive/recruitment success.

Note: A prime example of Pinus x attenuradiata occurs on the oceanside edge of the Santa Cruz Terrace, an isolated section of relatively undisturbed coastal scrub known as Dylan's Garden and displays the signature cone morphology/alignment of this poorly documented hybrid in an in situ setting, away from the interior ridge top populations of Pinus attenuata and the ancient hybrid swarm, that populates the areas in between (which suffered catastrophic damage from the 2020 CZU Lightning Complex Fires). The Google coordinates for this specimen are: 37.074109, -122.262062, elevation 172 feet.

25. *Triteleia laxa* [Themidaceae]—Do a comparative analysis of the two coastal forms to determine if there are two different breeding systems at play, with the regionally widespread Form #1 representing an outbreeding strategy, while the immediate coastal headland Form #2, in response to prevailing wind patterns, has developed an inbreeding, and consequently less variable from a morphological standpoint, reproductive system.

b) Form #1—with laterally symmetrical stamens, whitish anthers, and filaments of unequal length.

JEPS83106, Triteleia laxa, James A. West, 354, 1983-6-11

c) Form #2—with radially symmetrical stamens, blue anthers that turn brown, short, equal filaments, and darker and narrower flowers.

JEPS83117, Triteleia laxa, James A. West, 331, 1983-6-5

26. *Corallorhiza maculata* forma *immaculata* [Orchidaceae]—Examine this taxon from an ecological, morphological, and molecular perspective, to determine whether local forma *immaculata* warrants variety, subspecies, or species status and whether it is referable to var. *C. m.* var. *occidentalis*.

27. From a reproductive-isolating mechanism perspective, study the following (often) sympatric pairs of related species found within the watershed and determine if gene flow (uni- or bi-directional) is possible; and if ecologically disruptive events (fire, mass wasting, cyclical flooding) can broach otherwise well-established barriers to gene exchange.

- Baccharis douglasii/B. pilularis
- Stachys bullata/S. rigida var. quercetorum
- *Eriophyllum confertiflorum /E. staechadifolium* (N-end of Swanton Road across from Washout Turn)
- Epilobium ciliatum / E. hallianum (Beaver Flat Marsh)
- Trillium chloropetalum /T. ovatum
- Maianthemum racemosum / M. stellatum
- Festuca elmeri / F. occidentalis
- Cryptantha clevelandii / C. micromeres
- *Plagiobothrys bracteatus /P. diffusus* (grassy slope margining dirt road between Purdy Road and Seymore Hill)
- *Plantago elongata / P. erecta* (original Highway 1 roadbed overlooking Washout Turn)
- Juncus effusus var. pacificus / J. hesperius
- *Isolepis carinata / I. cernua* (Old Coast Road weathered mudstone roadbed above Washout Turn)
- *Stipa lepida /S. pulchra* (SE-facing bank below Last Chance Road/Swanton Road

interface)

- Nemophila parviflora var. parviflora / N. pedunculata
- Rubus parviflorus / R. spectabilis
- Erythranthe floribunda / E. inodora
- Collinsia heterophylla / C. multicolor
- Acmispon glaber var. glaber / A. junceus
- Sanicula crassicaulis / Sanicula "gianonei", pro. sp. nov.
- Ribes divaricatum var. pubiflorum / R. menziesii
- Galium californicum subsp. californicum / G. porrigens var. porrigens
- *Piperia elongata* / *P. transversa* (west-facing hillside overlooking Squirrel Flat/Purdy Road)
- *Claytonia perfoliata* subsp. *perfoliata* / *C. sibirica* (margins of dirt road entering lower/central portion of Little Creek sub-watershed)

28. Asteraceae, subfamily Cichorioideae—A substantial representation of both native (Agoseris, Hieracium, Malacothrix, Microseris, Rafinesquia, Stebbinsoseris, Stephanomeria, and Uropappus) and introduced (Crepis, Hedypnois, Hypochaeris, Lactuca, Lapsana, Leontodon, Picris, Sonchus, and Taraxacum) members of this subfamily occur within the Scott Creek Watershed and environs.

a) Do a comparative study/analysis from a structural/engineering perspective of the wind-dispersed (anemochory) cypselae via pappus.

b) Investigate the efficiency of the native versus introduced species-dispersal strategies; and

c) the effect of disturbance (fire, mass wasting, cyclical flooding patterns, agricultural practices) in maximizing these delivery systems/strategies.

d) Map within study area the native versus introduced taxa populations and ecological behavior (persistent versus ephemeral) over time.

29. *Cirsium* spp.—Staying within the Asteraceae but this time the subfamily Carduoideae, focusing on the genus *Cirsium*:

a) Compare the behavior (population demographics, habitat preferences, response to disturbance and competition, genetic variability between populations, and pollinator behavior) of Indian thistle (*C. brevistylum*), Venus thistle (*C. occidentale* var. *venustum*), and brownie thistle (*C. quercetorum*)—all native taxa—with the introduced bull thistle (*C. vulgare*).

30. *Quercus* spp., subgenus *Erythrobalanus*—Do an in-depth study of this group as it progresses up the Schoolhouse Ridge complex from the riparian corridor to the top of the watershed.

a) Where *Q. agrifolia* var. *agrifolia* and *Q. parvula* var. *shrevei* are sympatric, determine whether the foliar variability of both taxa is due, in part, to past hybridization.

b) Determine if there is any reduction in fertility for those trees that show some degree of intermediacy between the parental types.

c) In those areas where both taxa are growing intermixed, is there any evidence on a molecular level that shows inheritance of hybrid genes, even though from a morphological perspective, traits specific to one parent but not the other (tufted pubescence in abaxial vein-axils, number, and alignment of foliar venation) are not apparent?

d) Where *Q. parvula* var. *shrevei* enters the chaparral and undergoes both a reduction in stature and change in foliar morphology, is this still the same taxon exhibiting an ecotypic response to a pronounced xeric environment or a related chaparral live-oak (*Q. wislizeni* var. *frutescens*)?

e) Are there intergrades where these two related taxa meet and if so, is the gene flow uni- or bidirectional?

31. *Pseudognaphalium* spp. [Asteraceae]—Five native species of *Pseudognaphalium* and one putative natural hybrid (*P. beneolens*, *P. biolettii*, *P. californicum, P.* x "gianonei", pro. sp. nov., *P. ramosissimum,* and *P. stramineum*) reside within the watershed in varying combinations, often sharing the same habitat to the extent that they are growing intermixed:

a) *P.* x "gianonei" (*P. californicum* x *P. stramineum*) being the most obvious (intermediate in overall morphology and chemical signature) fertile hybrid combination observed, study this taxon's gene-flow potential (selfing, sib-crossing and backcrossing to either/or both parents), habitat preference/adaptability for colonizing new environments. Is this "new" taxon a successful chance occurrence or where the parental species ranges overlap, sporadic?

Note: See Query 103, for a more detailed exploration of this putative natural hybrid.

b) Since *P. californicum* and *P. ramosissimum* are often found growing together and blooming concurrently, are the occasional plants of *P. californicum* with pinkish-tinged phyllaries the result of hybridization or natural variation within the species?

c) Since the native *Pseudognaphalium* species have distinct chemical signatures besides

differences in foliar and floral morphology, do these species-specific "scents" (when warmed by the sun and begin to vaporize) act like pheromones and aid in attracting pollinating vectors and effectively allowing sympatrically related taxa to maintain their genetic integrity?

32. *Cirsium vulgare* (introduced) and *Madia sativa* (native) [Asteraceae]—Where populations of these grow sympatrically,

a) what role does the glandular/viscid stems and herbage of the tarweed play in trapping (like flypaper) the airborn cypselae of the thistle and concentrating an otherwise wind-dispersed taxon within a localized area, thereby increasing the invasive potential/recruitment for future generations?

b) Study the post-fire ecological impacts of this native/exotic species interaction, where the ash-enhanced growth resulted in both taxa achieving heigths/biomass in the 1.5–2(+) meters range and forming, on *M. sativa*, pappus-cloaked barriers (visually akin to walls of down).

33. *Torreya californica* [Taxaceae]—Do an in-depth study of *T. californica* found within the watershed (ca. 1000+ individuals all age catagories).

a) Map and profile population sizes, habitat preferences, associate species, and age/stature.

b) Document recruitment patterns throughout the watershed.

c) From an evolutionary and ecological perspective, analyze the post-2009 Lockheed and historical (if possible) fire responses and subsequent regenerative capabilities.

d) Since this taxon is exceedingly long-lived and can perpetuate itself both sexually and asexually, map the genetic diversity within and between populations, clarifying what proportion is clonal versus seed- derived in origin.

e) Study the number of male to female adults in any given area and see what ratio is needed to establish successful fruit set.

f) Do the resinous components found in the aril enclosing the seed change from protective (when seed is developing) to palatable (when seed is mature and ready for dispersal), and are the clues cueing in the dispersing vector(s), visual (color change) and/or olfactory?

g) Does the aril protect the seed from desiccation until suitable germinating conditions occur? Does the aril have to be ruptured first to allow the mature seed to imbibe the necessary water

to initiate germination, and is darkness or light needed to initiate germination?

h) Since many seedlings and immature adults are found growing as understory constituents under shaded or dappled light conditions, is the reduction of aerial stature offset by the establishment of an extensive root system, which when a break in the canopy cover by storm damage or the senescence of adjacent trees occurs, allows the "waiting-in-the-wings" young adults to quickly take advantage of the change in light regime and "bolt"?

34. Distribution patterns and ecological constraints:

a) Why does *Festuca subuliflora* follow *Sequoia sempervirens* downstream of the Scott Creek Bridge (albeit sporadically), while associate species farther upstream (*Clintonia andrewsiana, Scoliopus bigelovii, Boykinia occidentalis, Tiarella trifoliata* var. *unifoliata*, *Anthoxanthum occidentale, Viola ocellata*, *Viola sempervirens, Whipplea modesta,* and *Blechnum spicant*) have not expanded their ranges downstream, even though in varying combinations, this native species combo also occurs in the other sub-watersheds feeding into Scott Creek proper and also do not extend downstream beyond Mill, Big and Little Creek Bridges?

b) Going from the moist and semi-shaded riparian corridor to the decidedly xeric chaparral and coastal scrub, what ecological preferences confine *Pellaea mucronata* var. *mucronata* to the upper reaches of the watershed (principally the "Chalks"), while sister species *P. andromedifolia* extends its range all the way down to the coastal headlands?

35. Using GIS, LIDAR, and other related mapping tools, see if there is a correlation between topography, geomorphology, and biodiversity, using the following areas within the Scotts Creek Watershed and the in-situ documentation for those areas found within the essay "Traversing Swanton Road", (2016 version).

Area #1: Schoolhouse Ridge complex, between Scott and Mill Creeks, extending from Swanton Road up to the "Chalks."

Between: 37.078961, -122.245435 and 37.099994, -122.237454.

Area #2: Winter/Archibald Creeks Complex, from Swanton Road to top of ridge/former Cemex property boundary.

Between: 37.059054, -122.225144 and 37.065222, -122.199039.

Area #3: Lair Gulch complex, from Last Chance Road down to entrance into Scott Creek.

Between: 37.113051, -122.259606 and 37.097201, -122.253511.

Area #4: Magic Triangle Ridge/Synform drainage complex and the attendant 7+ "gulchlets," which coalesce into one narrow stem that enters Scott Creek just below the Scott Creek Bridge.

Between: 37.079413, -122.254668 and 37.079942, -122.248060.

Area #5: the east-northeast-oriented drainage system, beginning near the Mt. Cook area and entering Scott Creek, between the confluences of Big and Little Creeks also contains isolated chaparral disjunct, worthy of a study unto itself!

Between: 37.062599, -122.237207 and 37.063239, -122.231974.

Area #6: the complex series of landslide-derived, hydrologically active, benched spring-fed marshes, beginning with "Beaver Flat" and stepwise, descending southward down to the "Marti's Park Marsh."

37.094847, -122.257241, 37.089873, -122.256007 and 37.088006, -122.254229.

Area #7: Calf Gulch Complex

Between: 37.095094, -122.249078 and 37.098627, -122.240802.

Area #8: the bifurcate drainage system, which includes Cookhouse Gulch as one contributor and the adjacent (southeast flanking) benched, incised, and possibly rotated gulch complex, home to two uncommon native grass species *Elymus californicus* and *Festuca subuliflora*.

Between: 37.072078, -122.244197 and 37.074435, -122.240050.

36. *Lupinus formosus* var. *formosus* [Fabaceae]—Study the isolated populations of this locally rare taxon.

a) Note the extreme variability in seed-coat patterning within a given population. Is this the result, from an evolutionary perspective, of generating multiple series of seed coats varying in their surface coloration, allowing some seeds to blend into the surrounding dry grasses, exposed rocky debris, etc.—and by crypsis (camouflage) offsetting predation for at least some of the season's mature seeds?

b) Compare recruitment success between uniformly patterned *L. arboreus* seeds with those of the sympatric *L. formosus.*

c) Determine if populations of *L. formosus*, both locally and elsewhere, succeed best in grasslands where the textural variability of the surrounding vegetation can be correlated with seasonal rainfall and consequent changes in frequency/timing from year to year.

Note: This county wide uncommon lupine, is restricted to a very localized area, which forms a deltoid shaped zone principally overlooking the w-fork of the Cookhouse Gulch, with two satellite populations… one proximal to the abandoned cement reservoir above the China Ladder Marsh and the other above the "Bulb Field". One digitally documented hybrid between L. formosus var. formosus and L. arboreus, was discovered two decades ago, which has since disappeared. The photographic capture of this rare hybrid resides on the CalPoly/Swanton Pacific Ranch's digital herbarium, which through the ongoing efforts of student researchers, will eventually encompass the more than 600 native taxa residing within the Scott Creek Watershed/Environs.

#1) 37.071115, -122.250384, elevation 486 feet/the largest of the three populations, comprising 30+ plants, which are variable as to floral pigmentation and extremely so in seed coat patterning.

Herbarium data: JEPS83096. Lupinus formosus, Roy E. Buck and James A. West, 437, 1983-7-17.
Seed collection data: 2013-307, Lupinus formosus var. formosus, 08/04/2013, Jim West.

#2) 37.074552, -122.248160, elevation 424 feet/satellite population, on n-facing grassy slope above "Bulb Field".

Seed collection data: 2011-483, Lupinus formosus var. formosus, 07/25/2011, Jim West.

#3) 37.068990, -122.249009, elevation 495 feet/scattered population, growing on se-facing slope, between source of China Ladder Gulch and abandoned cement reservoir.

Herbarium data: OBI108196, Lupinus formosus var. formosus, Monika Richardson, 109, 2017-07-13.

37. *Sequoia sempervirens* [Cupressaceae]—Using the two visually distinctive Lair Gulch populations as a baseline (mesic habitat favoring forma typica versus xeric habitat occupying "golden redwood"), do an in-depth study comparing the riparian corridor and chaparral

populations of *S. sempervirens* to determine:

a) if there are genetic differences between the two ecotypes: and

b) if so, are there physiological and metabolic differences correlative to their mesic versus xeric habitats?

c) Are the differences in stature and foliar pigmentation genetically fixed and transmittable via seed?

d) Are there temporal differences in achieving reproductive maturity and are there any measurable deviations in ovulate cone size, quantity and size of seed produced and fertility, both as to pollen and seed?

e) What role has the siliceous mudstone's capacity to absorb and reflect the radiant energy from sun, played in modifying the "golden redwood's" foliar pigmentation and seasonal rate of growth?

f) Do a comparative study with the chaparral ecotype aka "the golden redwood" growing:

(1) locally along Scott Creek side of Last Chance Road/Lair Gulch Ridge,

(2) the disjunct chaparral overlooking dirt road connecting Purdy Road with Seymore Hill and flanked to the south by Lower Calf Gulch and

(3) the population bisected by the Deer Hunter's Trail, that is centrally positioned between the Scott and Mill Creek sides of the Schoolhouse Ridge. Does this ecotype of the coast redwood growing in a decidedly xeric rather than mesic environment, represent an early adaption scenario to conditions that may allow Sequoia sempervirens to survive future climate change aka "global warming"?

38. Fruit characteristics and seed dispersal strategies—Along Swanton Road, between Scott and Big Creek bridges, several native taxa can be observed during the Fall season, producing ripe fruit, which in varying degrees, is both fleshy (baccate) and/or in the red-to-orange color range. Approaching this subject from a co-evolutionary viewpoint:

a) Is fruit color falling within the red to orange end of the spectrum vector-specific relating to dispersal?

b) Can color and the ability of the epidermal surface of the ripe fruit to refract or reflect light act both as an enticement and/or a warning? *Lonicera hispidula* with intensely colored but not lustrous fruits, versus *Actaea rubra* with nitid as if varnished fruits, which contain the glycoside ranunculin?

c) If the co-evolutionary value of color-coded/vector-dispersed fruits is the establishing of new populations that are not competitive with the seed-producing parent and thereby ensuring outbreeding and the potential for increased genetic diversity, how successful within the Scott Creek Watershed is this strategy, particularly when several of the taxa involved are also long lived and expand their biomass, asexually, through rhizomes?

d) Along this relatively short section of Swanton Road, are several other plant species with fruiting bodies possessing varying degrees of succulence and coloration. Can a pattern of co-evolution be established, based on fruit color and secondarily, odor, for these taxa, and are the dispersal vectors species specific or generalist in nature?

- *Prosartes hookeri*—With pendant, semi-glossy, oblate-spheroid, reddish-orange fruits looking like reduced-in-scale cherry tomatoes, *P. hookeri* presents an interesting contradiction. The habitat for this monocot is usually the mixed conifer/hardwood semi-shaded understory, and the ripe fruits as well as the greenish-white flowers are pendant and for the most part, hidden from aerial viewing. Even though the over-arching foliage of this species is deciduous, what role does color play in fruit dispersal when it is so cryptically displayed, and is there an olfactory component involved?

- *Euonymus occidentalis* var. *occidentalis*—Also possessing pendant flowers and fruits but this time suspended by hair-thin peduncles and having the exposed seed enclosed in a reddish-orange aril, the seasonally deciduous 2–4 meters in height shrub, presents yet another question of fruit/seed dispersal.

- *Rubus parviflorus* and *R. spectabilis*—Two related and often sympatric-growing species with fruits an aggregate of orange/red/pink-colored drupelets margin both the roadside and adjacent streambanks.

- *Rosa californica*—With fleshy reddish orange "hips" aka ripened flower-tubes, this species was observed 10/29/10 growing with both hairy honeysuckle and blue elderberry, their fleshy fruits a study in contrasting colors.

- *Heteromeles arbutifolia*—Staying within the Rosaceae, with scarlet pomes on terminal corymbose panicles, this shrub offers birdlife nourishment during the bleakest time of

the year.

- *Maianthemum racemosum* and *M. stellatum*—Both sport succulent berries colored reddish orange through reddish-purple, accenting the wooded slopes overlooking the riparian corridor.

- *Arbutus menziesii*—Gives the toyon competition, with the end-of-season display of panicles laden with berries the color of blood oranges.

- *Sambucus racemosa* var. *racemosa*—Still staying within the warm end of the visible light spectrum, the cymose panicles of the red elderberry present a visual feast for end-of-season avians, and is this a generalist banquet or are certain bird species targeted?

Seed-dispersal strategies—Here is a partial listing, which ultimately could be extended to cover the entire watershed, of native taxa to study for their seed-dispersal strategies and to what extent coevolution is a key component.

- *Galium californicum* subsp. *californicum*—Fruit baccate and translucent.
- *Frangula californica* subsp. *californica*—Fruit a drupe and dark purplish brown.
- *Sambucus nigra* subsp. *caerulea*—Fruit a drupe, blackish coated with a glaucous bloom.
- *Ribes menziesii*—Fruit a berry, purplish densely covered with stiff hairs some of which are gland-tipped.
- *Cornus sericea* subsp. *sericea*—Fruit a drupe, greenish suffused with purple turning milky-white at maturity.
- *Oemleria cerasiformis*—Fruit a drupe, blue-glaucous.
- *Rubus ursinus*—Fruit an aggregate of blackish purple druplets
- *Solanum douglasii*—Fruit a black berry.
- *Solanum umbelliferum*—Fruits colored an off-white with basal portion greenish.

39. Fungal pathogens—Does a coating of dust (mudstone, in part, reduced to powder) on the adaxial foliar surface of *Agrostis hallii* [Poaceae] and related species, act as a barrier, to the establishment/ development of fungal pathogens (e.g., rusts) during the summer months, as observed along the upper section of dirt road that enters and parallels Little Creek?
Study the various taxa within a given area, where the fungal pathogens are known to occur, and analyze, from a foliar topography perspective, which conditions must be met for the fungal spores to become attached and subsequently germinate.

a) Are foliar surfaces with recessed stomatal pits, impressed veinal patterns, and various trichome modifications, more susceptible than leaves with stomata only on the abaxial surface,

adaxial surfaces which are plane and/or coated with a waxy bloom or thickened cuticle?

b) What role does exposure to the elements (sunlight, wind, and moisture-laden riparian air movement patterns) as opposed to tree trunk/canopy-induced shade and the concomitant light reduction/air flow restriction, play in conjunction with the physical conditions defining the foliar surfaces?

40. *Fritillaria affinis* [Liliaceae]—Study the local populations of *F. affinis* from both an ecological and molecular perspective.

a) Are the immediate coastal bluff populations, with their larger-in-size, thicker-in-texture, and darker-in- coloration flowers, distinct from the watershed/riparian corridor populations, both as to genetic makeup and pollinating vector/reproductive behavior? "Dylan's Garden", isolated coastal bluff ecosystem, overlooking s-end of Greyhound Rock Beach and Pelican Rock.

Google Earth coordinates: between 37.074667, -122.261958 and 37.074136, -122.262040.

b) Are the "intermediate phases" (found where the Western Terrace is bisected by the lower section of Big Willow Gulch) a subspecies in the making (with the gene-flow isolation being complete in the coastal bluff population(s)? W-facing coastal scrub overlooking lower Big Willow Gulch.

Google Earth coordinates: between 37.071065, -122.254560 and 37.070650, -122.255439.

c) Can one decide, based on morphological and molecular studies, of the transition from an outbreeding series of overlapping populations within the Scott Creek Watershed proper (forma typica) through the distinctive/isolated coastal bluff taxon and what is its relationship with the analogous North Coast subspecies *tristulis*?

41. Do a botanical distributional analysis of the Scott Creek Watershed and its environs, showing familial representation broken down by genera and species (e.g., Apiaceae, *Sanicula, Sanicula hoffmannii*) and

a) using this relatively small (30 square miles) but species-rich (10–12%+ of California's flora) coastal watershed as a baseline, do a comparative profile of the watersheds to the north and south.

b) Within the Scott Creek Watershed, is there any correlation between species distribution and

habitat specificity?

c) Examine the human footprint within the watershed where there is a known timeline (e.g., coastal prairie/Western Terrace) and determine what is the ratio of native to introduced taxa and can any trends be observed, such as:

1) Native taxa peripheral to areas formerly under cultivation recolonizing the fallow fields.

2) Other native taxa being marginalized/isolated by newly introduced and more aggressive species.

3) Sympatric genera containing species, that may or may not be genetically compatible (e.g., *Agrostis, Carex*), having their reproductive isolating mechanisms broached by the disturbance regimes (punctuated equilibrium) and new "hybrids" or genetically "enriched" species emerging (e.g., Agrostis blasdalei x Agrostis densiflora and Carex densa x Carex subbracteata).

42. *Juncus* spp. [Juncaceae]—Analyze from morphological, molecular, reproductive, ecological, and biogeographical frames of reference, the distinctive open-paniculate "form" of *J. occidentalis*, which occurs in Beaver Flat and has been observed in situ for the past 30+ years, as well as documented by herbarium pressings (UC Berkeley/Jepson Herbarium) and is represented by living material and seeds at the UCSC Arboretum.

a) Since the forma typica for *J. occidentalis*, in Beaver Flat and the rest of the Scott Creek Watershed, has a loose to densely capitate inflorescence, is the open-paniculate "form" (simulating the sympatric *J. bufonius*) an extreme variation of the type or is it indicative of a shared lineage with *Juncus tenuis*?

b) What accounts for the persistent/localized occurrence of the open-paniculate "form" in Beaver Flat but not elsewhere in the watershed? Could this be due to isolation/inbreeding of a population referencing *Juncus tenuis* genes?

c) Is the open-paniculate "form" reproductively isolated from the sympatric forma typica of *J. occidentalis* and if selfed or sib-crossed, would the F1 offspring be uniformly the open-paniculate "form" or reflect the overall Beaver Flat population in the ratio of plants with open-paniculate to closed (capitate) inflorescences?

d) Is there an efficiency differential, in terms of successful pollination/fertilization, between the open-paniculate and congested (capitate) inflorescence plants?

e) Paralleling the open versus densely congested inflorescence of *J. occidentalis* is another Juncaceae member and Scott Creek Watershed botanical component, *Luzula comosa* var. *comosa*. Do a study to ascertain if the underlying mechanisms determining both taxa's inflorescences are shared or independently derived from different environmental pressures.

43. *Claytonia perfoliata* subsp. *perfoliata* [Montiaceae]—Numerous self-perpetuating micro-populations are present throughout the watershed, which when growing sympatrically still maintain their distinctive calyx coloring/patterning:

a) Study the reproductive isolating mechanisms (obligate selfer versus outbreeder).

b) Study the gene/genes controlling pedicel, calyx, and corolla pigmentation (one or multiple, recessive/dominant).

c) Study what, if any, pollinating vectors are involved.

d) Categorize the various color patterns as to 1) frequency of occurrence; 2) variability within a given population; 3) habitat correlation with specific pattern; 4) heterozygous or homozygous for color/pattern when artificially selfed; and 5) when artificially crossed, do these variants act as microspecies?

e) When growing sympatrically with Claytonia perfoliata subsp. perfoliata, what roles have Claytonia parviflora and Claytonia rubra played in gene pool augmentation and blurring the lines between what is a valid species and a hybrid swarm?

Note: The seeds for more than two dozen variants of Claytonia perfoliata subsp. perfoliata are being curated at the UCSC Arboretum, all documenting the morphological plasticity of this taxon found within the Scott Creek Watershed region and warranting an in-depth genetic profiling. Some of these variants are worthy of rock garden status and overall, what is the evolutionary value, in one watershed of so many forms?

The below three envelopes of seed, document a dozen variants growing along Swanton Road, from the Queseria/Molino Creek divide up to the n-end of Swanton Road.

2012-18, Claytonia perfoliata subsp. perfoliata, 04/18/2012, Jim West.
2012-19, Claytonia perfoliata subsp. perfoliata, 04/18/2012, Jim West.
2012-20, Claytonia perfoliata subsp. perfoliata, 04/18/2012, Jim West.

The slide area overlooking Purdy Road (37.088358, -122.248200), hosted two robust specimens,

growing in full sun on exposed fractured siliceous mudstone. Both plants were extremely succulent, with the perfoliate discs thick/stiff in texture, with inflorescences 20+ cm in length. The seeds were large for this species in Swanton and raise the question of differences in ploidy levels amongst the watershed's numerous variants.

2015-73, Claytonia perfoliata subsp. perfoliata, 06/04/2015, Jim West.
2015-176, Claytonia perfoliata subsp. perfoliata, 06/04/2015, Jim West.
2017-80, Claytonia perfoliata subsp. perfoliata, 06/04/2017, Jim West.

The nw-facing slope overlooking Purdy Road/Squirrel Flat (37.084580, -122.246605), is populated with a variety that is uniformly viniferous in coloration. Stems, leaves, perfoliate discs, calyces and flowers that are a pale pink.

2011-182, Claytonia perfoliata subsp. perfoliata, 05/29/2011, Jim West.
2012-660, Claytonia perfoliata subsp. perfoliata, 05/01/2012, Jim West.
2014-295, Claytonia perfoliata subsp. perfoliata, 05/21/2014, Jim West.
2015-72, Claytonia perfoliata subsp. perfoliata, 05/08/2015, Jim West.

Note: Margining Purdy Road, between the cattleguard/slide area and Swanton Road, Claytonia perfoliata subsp. perfoliata exhibits a high degree of variability… in regard to stature, foliar and inflorescence gestalt, calyces pigmentation/patterning and corolla coloring. Here are nine examples of these often sympatric but self-replicating micro-populations: (1) pedicels green, calyces concolored green, corollas off-white with a pinkish suffusion; (2) pedicels bronze, calyces green with a bronze suffusion and darker apices, corollas off-white tinted with a pinkish suffusion; (3) pedicels viniferous, calyces bronze with a viniferous suffusion and darked apices, and corollas pale pink; (4) pedicels greenish-bronze, calyces green with viniferous apices, and corollas pale pink: (5) pedicels bronze-maroon, calyces bronze-maroon with pink apices, and corollas an pearlescent white; (6) pedicels green, calyces green and corollas a pearlescent white; (7) pedicels bronze, calyces green with bases and apices maroon, and corollas an opalescent pinkish-white; (8) pedicels and calyces viniferous, corollas white with a pink overlay; (9) pedicels green, calyces green with white apices, corollas white. The basal rosette of leaves and the connate-perfoliate disc subtending the inflorescences, also show a plasticity as to shape and color, from linear to linear with spathulate or rhomboidal apices and ranging in color, from unblemished grass green through viniferous, to overlaid with a glaucous bloom. The structural variations exhibited with the inflorescences proper, equal in overall design, what the floral parts do in coloration. The above foliar and floral morphs, represent a partial series of permutations that have been observed in the Scott Creek region over the past 40+ years and where sympatry with Claytonia parviflora and Claytonia rubra may occur, has past exchange of genetic material, enriched Claytonia perfoliata's diverse

morphology?

44. *Erythranthe guttata* complex [Phrymaceae]—With several components of the *E. guttata* complex (*Erythranthe* sect. *Simiola*) represented within the Scott Creek Watershed and environs, initiate a study that includes field observation, controlled garden studies, and laboratory analysis to determine:

a) The role of pollinating vectors in maintaining genetic integrity of sympatric, related taxa.

b) The importance of corolla morphology, lip patterning, and scent in attraction/facilitation of potential pollinating vectors.

c) The genetic versus environmental basis for annual/perennial growth patterns, and the related hydrological implications of cleistogamous/out-breeding reproductive systems.

d) Are there structural/morphological differences within the various subsets of the *E. guttata* complex— such as seed gestalt—that are consistent enough to warrant form, varietal, or species status?

e) Study the relationship between the nanistic, self-pollinating taxa found growing on moss-covered mudstone (upper Calf Gulch and coastal gulches abutting Highway 1) and the often-robust forms of *E. nasuta* growing on sandbars within the Scott Creek riparian corridor.

f) Do controlled artificial breeding studies with the various members of the *E. guttata* complex locally, to determine intra-specific compatibility, uni-directional versus bi-directional gene flow, foreign pollen inducing facultative apomixis; and if sufficient moisture is present, can cleistogamy be replaced temporarily with a modified out-breeding system?

Note: The UCSC Arboretum curates an extensive Erythranthe guttata complex seed collection, referencing populations within the Scott Creek Watershed/Environs. Several of the original in situ populations, due to the 2020 CZU Lightning Fires, may no longer exist, and leaving the seed collections, the only format for studying the local representation of E. guttata complex in depth. There are at least five representatives for this complex already documented, namely: E. arvensis, E. grandis, E. guttata, E. microphylla and E. nasuta. Even one or more of these five may be subject to further taxonomic revision and some of the seed documented collections, when raised out and studied, may yield new taxa. The following itemization is a partial representation of what the UCSC Arboretum houses and does not touch on the other Erythranthe species included in their collections (E. grandis and E. guttata), and such species, as E. cardinalis, E. floribunda and the E. moschata alliance.

2015-373, Erythranthe aff. arvensis/microphylla, 04/23/2015, Jim West.
2015-374, Erythranthe aff. arvensis/microphylla, 04/23/2015, Jim West.
2015-426, Erythranthe aff. arvensis/microphylla, 04/27/2015, Jim West.
2015-90, Erythranthe aff. microphylla, 04/22/2015, Jim West.
2015-91, Erythranthe aff. microphylla, 04/22/2015, Jim West.
2016-141, Erythranthe aff. microphylla, 08/14/2016, Jim West.
2017-83, Erythranthe aff. microphylla, 05/30/2017, Jim West.
2017-84, Erythranthe aff. microphylla, 06/05/2017, Jim West.
2018-478, Erythranthe aff. microphylla, 06/26/2018, Jim West.

2014-39, Erythranthe sp., 07/03/2014, Jim West.
2016-94, Erythranthe sp., 05/25/2016, Jim West.
2016-95, Erythranthe sp., 05/25/2016, Jim West.
2016-96, Erythranthe sp., 05/25/2016, Jim West.
2016-99, Erythranthe sp., 06/14/2016, Jim West.
2016-140, Erythranthe sp., 09/19/2016, Jim West.

2013-112, Erythranthe aff. nasuta, 08/26/2013, Jim West.
2015-52, Erythranthe aff. nasuta, 08/27/2015, Jim West.
2015-53, Erythranthe aff. nasuta, 06/17/2015, Jim West.
2015-54, Erythranthe aff. nasuta, 06/23/2015, Jim West.
2015-55, Erythranthe aff. nasuta, 06/28/2015, Jim West.
2015-58, Erythranthe aff. nasuta, 09/13/2015, Jim West.
2016-101, Erythranthe aff. nasuta, 05/25/2016, Jim West.
2017-85, Erythranthe aff. nasuta, 06/01/2017, Jim West.
2017-86, Erythranthe aff. nasuta, 05/30/2017, Jim West.
2018-479, Erythranthe aff. nasuta, 07/08/2018, Jim West.

45. *Carex* hybrids [Cyperaceae]—With more than 150 examples of *Carex* x "imperfecta" documented for the coastal prairie, between Lasher and Scott Creek marshes, investigate this putative hybrid link between the Multiflorae and Ovales sections from the following angles:

a) Pollen production and fertility. Do all or only some "imperfectas" produce pollen and does fertility vary from plant to plant?

b) Formulate scenarios for origin of the "imperfectas." Are all the *Carex* x "imperfectas" F1 crosses or the result of selfings and/or backcrossings of the fertile *Carex* x "nitidicarpa" (*densa* x

subbracteata) onto either parent?

c) Longevity and fertility. Does fertility change through time, and does age of plant and amount of accrued biomass have any influence?

d) Vertical versus horizontal (erect-ascending/prostrate) alignment of flowering culms. Potential differences in wind-born pollination efficiency.

e) Solitary versus clustered distribution of "imperfectas" and potential for maximizing unidirectional "hybrid" gene flow back into sympatric parental gene pool.

f) Study the role of natural/manmade disturbance patterns and the broaching of reproductive isolating mechanisms in both the formation of primary and complex crosses and the role non-Mendelian genetics (gene fragments from centromeric fission/fusion) play in the *Carex* "gianonei/imperfecta/nitidicarpa" syngameon.

g) Map the occurrences of *Carex* x "imperfecta," regarding both previous land-use activity and presence/absence of either or both parental species.

h) Chart the transformation of *C. subbracteata* to *C.* x "nitidicarpa" by examining thickness, angularity, marginal scabridity, and resistance to tearing of mature flowering culms (influence of *C. densa)*, presence of compound-congested lower 1–5(+) spikelets (reduced panicle branches derived from *C. densa*), changes in arrangement of staminate and pistillate flowers (gynaecandrous/androgynous/mixed), and overall morphological variability plus intra-populational fertility.

i) Are the *C.* "gianonei" (*C. harfordii* matrix) populations older in origin than the local *C.* x "imperfecta"/*C.* x "nitidicarpa" representatives? Chart the distribution patterns for both, within and outside of the Scott Creek Watershed, to determine if the (non-functioning pistillate) *C.* x "imperfecta" and (fertile) *C.* x "nitidicarpa" can occur in the absence of either/both *C. densa* and *C. subbracteata*.

j) Do a comparative analysis between the coastal prairie and interior (Beaver Flat, West's Spring Marsh, Marti's Park Marsh, Laguna de las Trancas drainage) occurrences of *C.* "imperfecta" and catalog the similarities/differences from both a structural and ecological perspective (at least two distinct forms of *C.* x "imperfecta" occur on a consistent basis, with Form #1 stramineous/shiny in coloration, often with an elongate rachis displaying 4 or more compound-congested spikelets and on rare occasions with perigynial scales apically awned, while Form #2 can have inflorescences with either simple or compound-congested spikelets,

are dark brown/dull in coloration, and the overall gestalt is often stiff/rigid or elongate and flexuous.

k) Where populations of both *C. densa* and *C. subbracteata* occur sympatrically, does the direction of gene flow between the two species determine whether the hybrid offspring become *C.* x "nitidicarpa" or *C.* x "imperfecta"?

46. *Juncus hesperius* x *Juncus patens* hybrids [Juncaceae]: As with the *C.* "imperfecta" hybrids, the *J. hesperius* x *J. patens* hybrids can possibly offer valuable insights into evolutionary theory and speciation, with some of the following issues needing to be addressed:

a) Determine if the hybrid is self-fertile and if so, how does this play in the hybrid genes potentially referencing back into either parental species?

b) With extremely low to non-existent viable seeds often being produced, is pollen fertility equally low or possibly higher, which could offset the poor seed production?

c) With parents having 3 (*J. hesperius*) and 6 (*J. patens*) stamens respectively, is the fertility of the hybrids variable on an individual stamen level?

d) Does longevity and increase in biomass bring about changes in the hybrid's fertility, or is this an immutable condition?

e) With both parents displaying "natural" variability as to overall gestalt, could some of this morphological plasticity be due to backcrossing with the hybrid offspring?

f) What is the trigger mechanism that allows the hybrids to occur—natural or anthropogenic disturbance? Is the gene flow uni- or bi-directional between the parents?

g) Do the F2 offspring, if they occur "naturally," display heterosis (hybrid vigor), or are they inherently weaker and prone to shorter life spans and total sterility?

h) Is the mucilaginous encasement that uniquely defines the mature/opened capsules of *J. patens*, when exposed to moisture, a recessive trait or does it carry on into the F1 and higher hybrid generations?

48. *Juncus patens*—Expanding on and relevant to the aforementioned discussion of *J. hesperius* x *J. patens* hybrids, is the following post-anthesis behavior of *J. patens,* unlike the other 10 species of *Juncus* (*J. acuminatus*, *J. breweri*, *J. bufonius*, *J. effusus* var. *pacificus*, *J. hesperius*, *J. mexicanus*, *J.*

lescurii, *J. occidentalis*, *J. phaeocephalus*, and *J. xiphioides*) occupying the watershed and its environs, the mature/opened capsules of *J. patens* when exposed to moisture, envelop the seeds in a gelatinous encasement analogous to a cluster of microscopic frog eggs. This distinctive characteristic is not made mention of in the principal literature dealing with California floristics (Abrams, Hoover, Howell, old and new Jepson, Mason, Munz and Keck, or older floras dealing with the section Genuini, such as Britton and Brown, the recent *Flora of North America* or family overviews, Heywood).

a) Is the gelatinous material derived from the seed coat or the interior wall of the capsule?

b) From a co-evolutionary perspective, does it facilitate seed dispersal, either as an adhesive or when dry, and/or act as a visual attractant to disperse the concentrated seeds in easily fractured glassine packets?

c) What is the chemical makeup of the mucilaginous secretion that the seeds are embedded in? Does it act as a fungicide and/or have pathogen-inhibiting properties?

Note: On 12/11/2012, while studying the *Juncus* populations growing along the north end of Swanton Road, I came across a *Juncus patens* with mature opened capsules not only encased in a mucilaginous "bubble," but on several inflorescences some of the embedded seeds were germinating, with the seedlings averaging 3–4 mm in length! The weight of the globular mass, specifically with those culms that are unsupported, bends them downward and in this case, they were resting on the ground.

d) Does the gelatinous encasement of the seeds act as an alternate substrate, analogous to the agar-agar used in the germination of orchid seeds, and are there two germination strategies at work? If the ripening of the capsules coincides with the rainy season, then instant recruitment while the seeds in those capsules are maturing without seasonal hydration may enter a state of dormancy, fall to the ground, and remain viable but inactive for an unknown period.

48. *Chlorogalum pomeridianum* vars. [Agavaceae]—In some ways paralleling the *Monardella villosa* subspecies (*villosa* and *franciscana*), the two varieties of *C. pomeridianum* locally (*pomeridianum* and *divaricatum*) present opportunities to study the underlying mechanics of intraspecific variation within a biogeographically defined environment. Some questions to be asking are as follows:

a) Is habitat preference, exposed edges of grassland-covered terraces versus sheltered understory of mixed hardwood/coniferous woodland, in part genetically determined? How adaptable would seedlings of both varieties be, when raised ex situ, then transplanted to their

varietal counterpart's habitat?

b) Are both varieties outbreeders, and does the vespertine blooming time aid the exposed var. *divaricatum* with a respite from the often-daily westerly wind patterns?

c) With the inflorescences reduced in stature and branching patterns often at right angles to the main axis in var. *divaricatum*, do other vectors besides moths play a role in pollination?

d) Are there measurable physiological and metabolical differences between the two varieties, considering the differing ecological conditions that both are exposed to…such as:

1) bulb size, shape, and storage capacity.

2) seed size, numbers produced, and differences in their nutritional reserves, recruitment success, and growth rate/maturation times between the two varieties under controlled conditions?

3) Are there any differences on a chromosomal level between the two varieties that would prevent successful fertilization and the establishment of intraspecific hybrids, should populations of var. *pomeridianum* and var. *divaricatum* overlap? And relevant to this question, have the two varieties in question been isolated long enough from each other to have any genetically set differences that would preclude the successful exchange of genetic material?

49. *Bromus carinatus* complex [Poaceae]—Do an in-depth study of the *B. carinatus* complex found within the Scott Creek Watershed and environs.

a) Determine which populations are obligate selfers and which are outbreeders through anemophily (wind pollination) and how these reproductive strategies relate to each population's overall gross morphology and genetic variability.

b) Does the continued presence of atmospheric moisture (fog or nocturnal condensation) such as that found in habitats with a proximity to the ocean play a co-evolutionary role in the development of a closed breeding system?

c) Several distinctive "forms" of *B. carinatus* repeatedly occur throughout the Swanton area, one of which warrants closer examination. What separates this component of the *B. carinatus* complex from the numerous other local variants?

d) In light of the following characters: 1) height: 1.5–2 meters; 2) leaf width 2.5 cm or more,

often shallowly plicate; and 3) inflorescences large and intricately branched with lower branches conspicuously retrorse in alignment, do these observable "morphologies" have corresponding underpinnings on a molecular level, which when coupled with the frequency of occurrence, could lead to the taxon being given varietal status?

e) On the Santa Cruz and Western Terraces, between Waddell and Scott Creek beaches, another distinctive phase of *B. carinatus* occurs, showing affinity to (and is possibly conspecific with) *B. maritimus*. The distinguishing attributes of this native brome being that the lowest glume is 3-veined, and the second glume has 5–7 veins with the branches of the inflorescence appressed-ascending to arcuate, equal to or shorter than the spikelets, and at maturity becoming prostrate or nearly so.

f) Several *B. carinatus* populations within the Scott Creek Watershed exhibit a consistant and distinctive trait of having the lowermost branches of the inflorescence conspicuously elongate/pendant with the spikelets concentrated apically. Is this a reflection of ancient hybridization with *B. sitchensis* and could a DNA analysis validate this hypothesis?

50. *Toxicodendron diversilobum* [Anacardiaceae]—Poison-oak has two basic growth patterns within the watershed: a free-standing, low-growing to sub-arboreal shrub and a tree-supported woody vine, which can exceed 20 m in height and have a stem diameter, six feet above ground level, exceeding 13 cm.

a) Do the free-standing and tree-supported forms exhibit physiological, metabolic, and structural (cambium-layer production, vascular transport systems) differences based on the contrasting distances between root systems and photosynthesizing foliage?

b) Is there a dropoff in successful pollination/fertilization and corresponding fruit set, when the liana-like form reaches a specific heigth threshold, and the vector-attracting floral scent is more apt to be impacted by air movement, temperature, and density of host-tree canopy?

c) Can any poison-oak seedling, given the opportunity, develop one or the other growth patterns, or is this behavior genetically determined and environmentally reinforced?

d) With long-established vines observed growing on *Aesculus, Pinus, Pseudotsuga, Quercus, Sequoia, Torreya,* and *Umbellularia* species, are there specific requirements, such as bark topography, durability, and moisture retentiveness that must be met before the attachment process begins?

e) Are there differences in the root systems and food-storage capacities of the two growth

forms? Have the ligneous aerial stems of the support-dependent variant developed supplemental storage zones due to the greater vertical differences between roots and foliage?

f) With some of the largest—both in terms of stem diameter and height reached—examples of the vine form found growing on the long-lived *Sequoia sempervirens*, is there a life-span difference between the two growth forms or does longevity reside within the root system's regenerative capacity?

g) Do the woody stems of the vine form act like vertical rhizomes, attaching themselves to the bark with modified root systems, and is any part of the exposed surface of the attached stems capable of photosynthesis?

h) Is there a difference in rate of growth, at least initially, between the free-standing and supported individuals, with the reflected light and radiant heat through convection from the bark of the arboreal support, being potential factors?

51. *Polypodium calirhiza* [Polypodiaceae]—As a bonafide temperate epiphyte, *P. calirhiza* is found throughout the watershed on a variety of arboreal hosts, in some cases forming extensive, long-established colonies while in other situations poorly represented by a barely surviving remnant.

a) With both evergreen (Pinus radiata, Pseudotsuga menziesii var. menziesii, Quercus agrifolia var. agrifolia, Quercus parvula var. shrevei, Sequoia sempervirens, Torreya californica, Umbellularia californica) and deciduous (Acer macrophyllum, Acer negundo, Aesculus californica, Alnus rubra, Sambucus nigra subsp. caerulea, Salix lasiolepis) trees observed serving, in varying degrees, as aerial habitats, is one factor for successful colonization the bark's capacity to sustain healthy bryophyte populations, with their hygroscopic nature and potential for creating "nurseries" for the wind-borne spores to develop into gametophytes?

b) Inventory the arboreal and sub-arboreal taxa found in and around the Scott Creek Watershed, categorizing the various "host" species as to suitability for *Polypodium* colonization, ranging from optimal through inhospitable. (In one notable instance, a dead, old, and massive hybrid pine (*Pinus radiata* complex) along Swanton Road had some 40+ feet above ground level developed on the horizontally aligned upper branches "moss pads" hosting *P. calirhiza* colonies.)

c) What other conditions must be met for successful colonization, even if the tree's bark topography has existing "moss pads," and can trees with seasonally exfoliating bark such as *Arbutus menziesii*, due to the structural integrity of its wood, become "hosts" after-the-fact

when the subject in question dies but continues to exist for an indefinite period?

d) Of all the tree species studied to date with persisting colonies, the most successful as to longevity of occupancy and areas on the tree's surface, both vertically and horizontally, has been *Umbellularia californica*. What characteristics—be they bark structure, biochemical makeup, branching patterns and canopy configuration, ecological preferences, proximity to riparian corridor, etc.—allow this taxon to consistently, when colonized, be a more effective host?

e) With *P. calirhiza* being an allotetraploid derived via hybridization from *P. californicum* and *P. glycyrrhiza*—and its ecological preferences ranging from terrestrial through epiphytic—are all the arboreal colonizers in the Scott Creek Watershed *P. calirhiza*? Or could some of the populations be comprised of both *P. calirhiza* and *P. glycyrrhiza* and possibly *P. californicum*, even though the latter is not considered an epiphyte?

f) Since the *P. calirhiza* populations growing on *Umbellularia californica* often reach heights of 25+ m, does this confer an advantage in the distribution of spores via air movement to adjacent trees or, at this elevation, do the air-flow patterns have a desiccating effect, resulting in the higher reach "moss pads" drying out and being less conducive for the spores to develop into the gametophyte generation?

g) Can one ascertain the age of a given colony from the branching patterns and lengths of the rhizomes?

h) What is the genetic make-up of long-established plants covering a substantial portion of a given host?

i) Are all the scattered "micro-colonies" a) clonally derived; b) the by-products of the original "colonizer" being selfed; and/or c) a combination of selfings and out-breeding between the various "micro-colonies"?

j) With wind being the primary spore-delivery vector, can any pattern of genetic change between these "micro-colonies" be correlated with their distribution along a vertical/horizontal axis of the host tree's bark topography?

52. Local woodlands often consist of a dozen or more arboreal and sub-arboreal native taxa with varying growth patterns and foliar configurations. Initiate a study on the inter-relationships between multi-layered canopy complexity, sunlight distribution patterns, and understory biodiversity. Within this comprehensive overview, examine the following

conditions:

a) Slope orientation, degree of inclination, evidence of recent and/or prehistoric mass wasting.

b) Comparing height, trunk alignment, branching patterns, and bark topography (surface conductivity/absorbency of rainfall/fog condensation) characterizing the arboreal components of the woodland being studied.

c) Examine the variations in foliage, whether deciduous or persisting for several seasons 1) fasciculate (*Pinus*) or solitary in arrangement/attachment; 2) adaxial-surface modifications such as impressed/elevated veins, various trichome modifications and/or exudates creating a waxy bloom; 3) a glossy and reflective mirror-like surface (e.g., *Arbutus menziesii*), thus redirecting some sunlight back up into the upper canopy levels.

d) The structural rigidity or flexibility of branches in their response to air movement and the corresponding changes in foliar surface orientation.

d) Study the foliar chemistry (phenolics, nitrogenous compounds, terpenes) and the corresponding behavior of the species-specific leaf litter as to breakdown rate, pH influence of current leaf drop and the buffering influences of previous litter accumulation, microbial/fungal interaction, inhibition of seed germination (allelopathy), and concentration/displacement of rainfall-derived water and leaching out/subsurface transport of the chemical constituents of the freshly shed foliage.

e) Study the air-movement patterns within the above-described woodlands and the impact they have seasonally as to pollen distribution (*Pinus*, *Pseudotsuga*, *Sequoia*) and evaporative loss both within the multilevel canopy and ground-cover constituents, accelerating the shedding of arboreal foliage and moving/mixing of differing leaf-litter types away from their primary sources.

f) Within the mixed conifer/oak woodland sensu lato, are there ecological subsets based on species-specific taxa with their distinctive foliar characteristics (e.g., *Sequoia sempervirens*, *Pinus radiata*, *Quercus agrifolia* var. *agrifolia*) that create zones hosting differing suites of understory species as well as sharing certain native vegetative components?

g) When a mature arboreal specimen (e.g., *Umbellularia californica*, *Pinus radiata*, *Quercus parvula* var. *shrevei*)—with an extensive biomass (crown/trunk) and horizontal subsurface root system—topples within this complex woodland ecosystem from either age/disease-related or storm-induced causes, does this disturbance regime have a cascading/rippling effect on the

surrounding woodland due to change in sunlight-distribution patterns, air-movement corridors and disruption of the understory's O, A, and B soil horizons, to cite just three separate but related events? How does this singular event impact/alter the woodland's biodiversity?

h) persistent (e.g., Quercus, Pinus, Umbellularia) versus seasonally replaced (e.g., Arbutus) bark and the ability to sustain over time epiphytic populations of Lichens, Bryophytes and Pteridophytes.

53. Disjunct populations—Several native taxa occur within the Scott Creek Watershed and its environs that are disjuncts relative to the area of their typification: *Agrostis blasdalei, Amelanchier utahensis, Arctostaphylos crustacea aff.* subsp. *subcordata, Clarkia* aff. *prostrata, Clarkia purpurea* subsp. *purpurea, Hippuris vulgaris, Prunus emarginata, Quercus parvula* var. *shrevei* x *Q. kelloggii*, *Nemophila* aff. *pulchella* var. *fremontii,* and *Sanicula hoffmannii*.

a) Do a genetic profiling of the local representatives of these "displaced" taxa, comparing them, where possible, with representatives from the type localities and seeing if geographical isolation has produced any changes on a molecular level.

b) From an ecological perspective, what are the similarities/differences in habitat preferences, if any, between the species occurring in the "type" site and the Swanton-area populations?

c) Are there any differences in pollination vectors between the "type" population and the "extended range" colonies found locally?

d) In the case of long-lived rhizomatous taxa, is colonial expansion solely sexual via seed dispersal or/and clonal?

e) Where closely related sympatric taxa occur, either at the originally described population's locality or the one(s) documented for the Scott Creek Watershed, is there any evidence validating the exchange of genetic material?

f) Within the local watershed and its environs, are the "disjuncts" in question expanding their range, holding their own, or is their foothold within the area shrinking?

54. *Dudleya caespitosa* [Crassulaceae]—Within the area covered by this essay, polyploid *D. caespitosa* ranges from the ocean edge of the Santa Cruz Terrace up to the "Chalks," which separate the Scott and Mill Creek drainages. The isolated inland populations are usually

localized/relictual as to habitat and considerably more homogeneous as to rosette/leaf gestalt, with corollas often paler in coloration, thinner in texture, and more elongate than the polymorphic coastal headland populations with their intensely colored, shorter in stature, and thicker in texture corollas.

a) Map the various populations as they range in elevation, from the coastal bluffs (ca. 70 ft. el.) up to the "Chalks" (ca. 700 ft. el.) and see if there are changes in ploidy levels as one progresses farther inland.

The highest numbers being on the immediate coast (where populations exhibit an extreme degree of foliar/rosette plasticity and are ecologically versatile, readily establishing themselves on both the horizontal grass/coastal scrub–dominated terrace tops and near-vertical cliff faces, the latter including seasonally wet waterfalls) and the lowest numbers belonging to the inland "isolates," which possibly represent earlier evolutionary stages of this species complex and being physically removed (out of pollination range) from the exchange of genetic material with the dynamic and still-evolving coastal populations, are literally trapped in time!

b) Analyze the corolla pigments and see if there are differences between the interior and coastal headland populations and if any correlation can be made between ploidy levels, floral pigments, and overall corolla structuring, including presence/absence of multi-branched inflorescences and pedicel lengths.

c) Compare the various "isolate" populations (Schoolhouse Ridge, "Chalks," upper Little Creek) with each other and where clines, albeit fragmented ones, occur (Schoolhouse Ridge). Is there an overarching uniformity, or do each of these "micro" populations represent a stabilized variant of the original genome?

d) Examine length of corolla and whether the diameter remains constant or narrows towards the apex, and how this along with coloration delimits the potential pollinating vectors, even between two different members of the Hymenoptera, e.g., *Apis mellifera* and *Bombus* sp.

e) Has corolla shape (the apex diameter and pigmentation—greenish yellow through red) been an important mechanism in the speciation of the genus, with hummingbirds and various hymenoptera as the co-evolutionary agents?

f) Are *Dudleya* spp. self-fertile, or are they obligate out-breeders? How does this translate out in the uniformity of some populations and the variability as to rosette patterns and inflorescence complexity of other populations?

Research Topics for the Scott Creek Watershed and Environs
James A. West (updated Jan 2019)
Note: Prior to the 1981–82 El Niño storm impacts on the Scott Creek Watershed, an isolated population of the *D. caespitosa* complex existed above the lower Big Creek Falls, growing streamside on the moss-covered granitics. If it still exists, a molecular work-up of this isolated taxon may yield some valuable data as to this polyploid's evolutionary history.
While revisiting the Big Creek sub-watershed on 05/31/2012 and scoping out the granitic, sandstone-capped cliffs directly above the old quarry, I spotted several clumps of *D. caespitosa*, ca. 25+ m above me, and for the moment out of reach but validating the continued existence of this complex taxon in this ancillary drainage system within the Scott Creek Watershed proper.
Note: Within the Little Creek sub-Watershed, the near vertical rock faces overlooking the access road, host isolated populations of Dudleya caespitosa. What is the role of bryophytes, in providing a suitable germinating medium for the establishment of a new generation of this interior form of Dudleya and is there a correlation between an exposed rock surface, a bryophyte covering and optimizing the recruitment success of a next generation of Dudleyas?

Note: The UCSC Arboretum curates more than 70 envelopes of seed, covering the majority of known Dudleya caespitosa populations residing within the area defined as the Scott Creek Watershed/Environs. The below selections cover some of the taxonomically distinct populations in need of chromosomal workups.

Area # 1) 37.097444, -122.232821/the "Chalks", complex ridge system between upper Seymore Field and Mill Creek riparian corridor. This documented population, represents the furthest inland from the immediate coast and is growing sympatrically with Pellaea mucronata, Castilleja foliolosa (yellow flowered form), Eriophyllum confertiflorum, Adenostoma fasciculatum, Arctostaphylos glutinosa, et. al.

Seed collection data: 2010-40, Dudleya caespitosa, 07/15/2010, Jim West.
Seed collection data: 2011-377, Dudleya caespitosa, 10/01/2011, Jim West.
Seed collection data: 2011-378, Dudleya caespitosa, 10/01/2011, Jim West.
Seed collection data: 2012-253, Dudleya aff. caespitosa, 09/21/2012, Jim West.
Seed collection data: 2012-255, Dudleya aff. caespitosa, 09/21/2012, Jim West.

Area #2) between 37.041853, -122.230859 and 37.091721, -122.274779/Oceanside edge of Santa Cruz Terrace, between n-end of Scott Creek Beach and the s-end of Waddell Beach. The populations found within these co-ordinates, contain the most polymorphic representatives of the polyploid D. caespitosa complex, relative to foliar size, shape and coloration and inflorescence gestalt and floral morphology.

Seed collection data: 2011-213, Dudleya caespitosa, 12/28/2011, Jim West.

Seed collection data: 2012-86, Dudleya caespitosa, 10/09/2012, Jim West.
Seed collection data: 2012-251, Dudleya caespitosa, 09/24/2012, Jim West.
Seed collection data: 2012-252, Dudleya caespitosa, 09/24/2012, Jim West.
Seed collection data: 2013-127, Dudleya caespitosa, 11/27/2013, Jim West.
Seed collection data: 2013-171, Dudleya caespitosa, 08/15/2013, Jim West.
Seed collection data: 2015-109, Dudleya caespitosa, 09/10/2015, Jim West.
Seed collection data: 2015-110, Dudleya caespitosa, 09/10/2015, Jim West.
Seed collection data: 2015-111, Dudleya caespitosa, 09/10/2015, Jim West.
Seed collection data: 2015-112, Dudleya caespitosa, 09/10/2015, Jim West.

Area #3) 37.065761, -122.222958/isolated interior population (central portion of Little Creek sub-Watershed), growing on near vertical siliceous mudstone cliff faces, overlooking dirt access road. The populations uniform, in having narrow, glaucous, strap-like leaves with acute apices. Flowers pale yellow, their texture thin and on elongate arching inflorescences, distinctly different in overall gestalt from coastal headland populations.

Seed collection data: 2007-1402, Dudleya caespitosa, 09/18/2007, Jim West.
Seed collection data: 2007-1411, Dudleya caespitosa, 08/13/2007, Jim West.
Seed collection data: 2012-349, Dudleya caespitosa, 10/12/2012, Jim West.
Seed collection data: 2015-22, Dudleya caespitosa, 03/19/2015, Jim West.
Seed collection data: 2015-242, Dudleya caespitosa, 10/07/2015, Jim West.
Seed collection data: 2015-243, Dudleya caespitosa, 10/07/2015, Jim West.

55. The carices found within the Scott Creek Watershed and environs present several unresolved, misunderstood, and inherently significant issues that offer the student of evolution and speciation an opportunity to make a valuable contribution, not only towards clarification of several key diagnostic problems but creating a baseline that brings in to focus the significance that disturbance regimes, both natural and anthropogenic, have in broaching reproductive isolating mechanisms and allowing the exchange of genetic material that otherwise would not occur.

The taxon that I have designated *C.* x "imperfecta" is a potential Rosetta Stone in understanding the possible origins of both the *C.* "gianonei" (*C. harfordii* matrix with lower 1–5+ spikelets compound-congested, spikelets androgynous and/or gynaecandrous) and *C.* x "nitidicarpa" (*C. subbracteata* matrix reflecting *C. densa* traits and fertile as to reproductive capacity) complexes.

By focusing on *C.* x "imperfecta", with its complex inflorescences displaying very specific traits that link two distantly related sections—the Multiflorae and Ovales—an important contribution can be made to the ongoing research being done relevant to this very difficult genus and in the specific case of *Carex* x "imperfecta"—a taxon that has no validated existence in either the historical or current literature. [See Queries 45. and 119. for additional data]

As an entity unto itself independent of its evolutionary relationships with *C.* "gianonei" and *C.* x "nitidicarpa", *C.* x "imperfecta" is represented by at least 200 separate plants occurring on the coastal prairie between the Pumpkin Field Marsh and the China Ladder Marsh, with localized populations documented for Beaver Flat, West's Spring, and Marti's Park Marshes. Many envelopes containing 200+ C. x "imperfecta" inflorescences have been deposited with the UCSC Arboretum, and at least two dozen living representatives of this taxon are also ensconced in the new California section with future collections/deposits planned.
Relative to the pistillately non-functional inflorescences of *C.* x "imperfecta" is another observation that may have both a structural and evolutionary bearing of this yet-to-be fully diagnosed taxon. On many of the inflorescences, post shedding of pollen and failure of the ovules to develop, a white fungus appears to invade the spikelet(s) between the inner face of the perigynial sac and the rachis.

a) Does the presence of this pathogen correlate with the "imperfect" nature of this hybrid taxon, aneuploidy, and the resulting incompatibility factors between two distantly related species? And/or is the habitat, with its proximity to protracted air-born oceanic moisture at a time when seasonal rains are over and terrestrial moisture is minimal a relevant factor? The fungal pathogen invading the mature inflorescences does not appear to affect the vigor of the plant or its overall biomass, and several of the *C.* x "imperfectas" have been continually observed/studied for more than three decades!

b) Using the coastal prairie/Western Terrace between Scott Creek Marsh and the Lasher Marsh Gulch as a living laboratory for the study of the carices, determine if the inflorescence-invading fungus is restricted to the *Carex* x "imperfectas" (and are all or only some plants colonized), or are other *Carex* species so afflicted?

c) With many of the *Carex* x "imperfectas" producing/shedding pollen,

1) What is the fertility of said pollen and does it vary from plant to plant?

2) What role does/has the hybrid pollen play(ed) in backcrossing/outcrossing with related taxa, members of the Ovales section in particular?

3) Does the inflorescence-contaminating fungus affect the pollen development/viability of the *Carex* x "imperfectas", or does the onset of this pathogen take place after the pollen has been shed and the ovules within the perigynial sac fail to develop properly?

56. *Sanicula hoffmannii* is a rare component of the Apiaceae found within the Scott Creek Watershed proper and occurs on the east-facing wooded slopes overlooking the Swanton Pacific Ranch's train station. Growing sympatrically in this general area are *S. crassicaulis* and *S.* "gianonei" pro. sp. nov. *Sanicula crassicaulis*, a tetraploid, has been theorized to be a hybrid between two diploid species, namely *S. hoffmanni* and *S. laciniata*; and the foliar morphology of *S. hoffmannii* manifests itself in numerous *S. crassicaulis* plants throughout the watershed. The influence of *S. laciniata* (at least locally) on the other hand seems less obvious, except for a very localized population given the working name of *S.* "pseudo-laciniata," growing on the upper Scott Creek side of the Seymore Hill. Incidentally, this morphologically distinct population was growing in the same general area as *S. arctopoides, S. bipinnatifida, S. crassicaulis, S.* "gianonei" pro. sp. nov., and *S. hoffmannii.*

Several interesting research projects could be developed around each of these related taxa, all of which have in varying degrees, distinctive chemical signatures. Here are a few ideas:

a) Analyze the sap, which upon exposure to air turn a milky-white in both *S. bipinnatifida* and *S. hoffmannii* for its chemical properties and see if any molecular analog appears in the sap of S. crassicaulis.

b) The chemical signature for the *S.* "pseudo-lacinata" growing on the Scott Creek facing slope of the Seymore Hill, was in all respects, markedly different from the "celery scent" chemical signature for *S. crassicaulis.*

c) If *S.* "gianone*i*" pro. sp. nov. proves to be a diploid, would a cross between it and diploid *S. hoffmannii* produce offspring that resembled *S. crassicaulis,* or is *S.* "gianonei" pro. sp. nov, a byproduct of the original hybrid cross that produced *S. crassicaulis*? (Incidentally, the TYPE for *S. crassicaulis* was taken from plants in Chile, and like other western North American taxa found both here and in South America, was its origins in California? Perhaps, both a chemical analysis of sap and structural comparison of the schizocarps of these taxa may yield some valuable clues as to their origins.)

d) Two areas worthy of research apropos of the Scott Creek sanicles are their diverse schizocarp morphology and marginal foliar trichomes. Without having any other observable

characteristics to separate our local *Sanicula* species, could one establish a phylogenetic relationship as to their evolutionary closeness?
Sanicula "gianonei" pro. sp. nov. has schizocarps clothed with sub-equal uncinated bristles and matures with a blackish coloration, and this immediately distinguishes it from the fruit of *Sanicula crassicaulis* with its hooked bristles aligned in a graduated pattern, the smallest being basal. Also, the trichomes along the leaf edges of these two taxa behave in quite the opposite fashion, becoming indurate and persistent with *S. crassicaulis* while those of *S.* "gianonei" pro. sp. nov are attenuate and translucent, eventually withering and detaching themselves in toto, leaving nary a trace of their existence.
A histological comparison of the marginal foliar trichomes between just these two mis-identified taxa would make a worthy research topic:

1. Can the same taxon produce such radically different trichomes margining its leaves, and can such an analysis aid in a taxonomic differentiation between two related species subsumed under one published name? Then add to the equation the major structural differences of the schizocarps and the consistent but distinct chemical signatures and you have, a possible resolution for Scott Creek's orphaned sanicle, which for the time being, is residing in a taxonomic limbo!
2. The "orphaned sanicle" as of 2020, has been rescued from its taxonomic limbo and is now designated… Sanicula crassicaulis Poepp. ex D.C. var. nudicaulis (Hook & Arn.) Kenny & West, comb. nov., with the full diagnostic treatment found in Reed Kenny's Master's Thesis, titled: A Floristic Study of the Cal Poly Swanton Pacific Ranch.

Sanicula gianonei, pro.sp.nov. = Sanicula crassicaulis Poepp. ex D.C. var. nudicaulis (Hook & Arn.)Kenny & West, comb. nov./The criteria used to define this widespread but repeatedly misdiagnosed taxon, center on ecology and habitat preference, biochemical signature, foliar/bract morphology and attendant cellular structure/behavior of marginal trichomes (becoming indurate and forming callosities in S. crassicaulis versus caducous/withering and detaching, with S. gianonei, pro.sp.nov.), floral pigmentation, an unblemished epigynous disc, mature schizocarp configuration, body color and alignment of the uncinated bristles. Comparison studies with the related, and where grassland meets the woodland understory, sympatric S. crassicaulis, should be undertaken, with emphasis on chromosome counts, biochemical (alkaloids, et al.) analysis using electrophoresis techniques, a histological investigation of the foliar trichomes, below ground stem and root structures and breeding systems (obligate selfer versus out-breeder) with emphasis on reproductive isolation mechanisms versus potential for reciprocal/unidirectional gene flow. Since Sanicula hoffmannii and Sanicula laciniata have been the proposed putative parents of the polyploid

Sanicula crassicaulis, study the foliar polymorphism of the latter in conjunction with S. gianonei, pro.sp.nov., *S. pseudo-laciniata, pro.sp.nov. and the rare, at least within the Scott Creek Watershed, S. hoffmannii. Focusing on the role S. hoffmannii may play in the S. crassicaulis genome, note the following features, which can be observed in situ: (1) a distinct chemical signature when stems and foliage are crushed, (2) the viniferous pigmentation found on the lower third of the petiole, (3) the free and narrowing, to the point of attachment, central lobe of the leaf, (4) the usually present glaucous bloom/blue-green pigmentation of/on the adaxial surface of the leaves, (5) the shared trait with related S. bipinnatifida, of the stem sap turning a milky-white upon exposure to the air, when the petiole is snapped in half, (6) the distinctive schizocarp morphology and (7) the phenology spectrum, with S. gianonei, pro.sp.nov., the first to flower/fruit and S. hoffmannii, the last to flower/fruit. A comparative study, based on stamen morphology, anther color, size and degree of exsertion between the various Sanicula taxa found within the Scott Creek Watershed, may also yield some valuable data from a taxonomic perspective.

Note: *Sanicula pseudo-laciniata, pro.sp.nov./this distinctive component of the S. crassicaulis complex, has only been found twice, pre- and post-2009 Lockheed Fire, growing on both sides of the upper Seymore Hill and besides the schizocarp collections, has only been documented via herbarium pressing, once….. JEPS82953, Sanicula crassicaulis, James A. West, 40-3, 1983-4-7. Although filed at the Jepson under the name, Sanicula crassicaulis, this sheet was collected and diagnosed as being distinct from S. crassicaulis sensu strictu and given the working name of S. pseudo-laciniata and warrants being studied as perhaps reflecting the diploid S. laciniata contribution to the tetraploid S. crassicaulis, with S. hoffmannii being the other diploid parent. Sanicula “pseudo-laciniata”, besides having a chemical signature distinct from S. hoffmannii, S. gianonei, pro.sp.nov. and S. crassicaulis, has leaves with laciniate/serrulate margins and flowers with bright yellow petals and anthers.
Note: While populations Sanicula gianonei, pro.sp.nov. are scattered throughout the Scott Creek Watershed/Environs, the below listed three are representative for both the taxon’s genotypic uniqueness and habitat preference.

#1) Between 37.079773, -122.246856, elevation 103 feet and 37.067212, -122.230827, elevation 68 feet/Scott Creek riparian corridor, from Swanton Pacific Ranch Apple Orchard down to confluence of Big and Little Creeks. Principally growing on either side of Scott Creek, in association with Acer negundo and in alluvium deposits enriched with the decomposed leaf little from Acer, Alnus and Sambucus species. Within the area defined by the above Google Earth coordinates, several hundred plants of Sanicula gianonei, pro.sp.nov. exist and all are uniform as to the morphological criteria set out in the above paragraph and this also holds true for the remaining populations found scattered throughout the Scott Creek Watershed /Environs.

Schizocarp collection data: 2007-153, Sanicula gianonei, pro.sp.nov., 06/16/2007, Jim West.
Schizocarp collection data: 2007-155, Sanicula gianonei, pro.sp.nov., 07/07/2007, Jim West.
Schizocarp collection data: 2007-158, Sanicula gianonei, pro.sp.nov., 06/08/2007, Jim West.
Schizocarp collection data: 2008-387, Sanicula gianonei, pro.sp.nov., 08/29/2008, Jim West.
Schizocarp collection data: 2008-395, Sanicula gianonei, pro.sp.nov., 07/27/2008, Jim West.
Schizocarp collection data: 2008-430, Sanicula gianonei, pro.sp.nov., 06/05/2008, Jim West.
Schizocarp collection data: 2009-62, Sanicula gianonei, pro.sp.nov., 07/01/2009, Jim West.
Schizocarp collection data: 2009-63, Sanicula gianonei, pro.sp.nov., 06/21/2009, Jim West.
Schizocarp collection data: 2009-259, Sanicula gianonei, pro.sp.nov., 08/01/2009, Jim West.
Schizocarp collection data: 2009-260, Sanicula gianonei, pro.sp.nov., 05/26/2009, Jim West.
Schizocarp collection data: 2009-261, Sanicula gianonei, pro.sp.nov., 07/13/2009, Jim West.
Schizocarp collection data: 2011-399, Sanicula gianonei, pro.sp.nov., 06/22/2011, Jim West.
Schizocarp collection data: 2012-363, Sanicula gianonei, pro.sp.nov., 07/16/2012, Jim West.
Schizocarp collection data: 2012-540, Sanicula gianonei, pro.sp.nov., 06/09/2012, Jim West.
Schizocarp collection data: 2013-432, Sanicula gianonei, pro.sp.nov., 06/18/2013, Jim West.
Schizocarp collection data: 2013-433, Sanicula gianonei, pro.sp.nov., 06/13/2013, Jim West.
Schizocarp collection data: 2014-298, Sanicula gianonei, pro.sp.nov., 05/27/2014, Jim West.
Schizocarp collection data: 2014-299, Sanicula gianonei, pro.sp.nov., 05/27/2014, Jim West.
Schizocarp collection data: 2017-87, Sanicula gianonei, pro.sp.nov., 06/17/2017, Jim West.
Schizocarp collection data: 2018-490, Sanicula gianonei, pro.sp.nov., 09/09/2018, Jim West.

#2) 37.088702, -122.248651, elevation 142 feet/extensive population growing within Aesculus californica grove, proximal to Purdy Road slide area/cattle guard.

Schizocarp collection data: 2002-547, Sanicula gianonei, pro.sp.nov., 10/01/2002, Jim West.
Schizocarp collection data: 2007-159, Sanicula gianonei, pro.sp.nov., 06/26/2007, Jim West.
Schizocarp collection data: 2009-61, Sanicula gianonei, pro.sp.nov., 06/02/2009, Jim West.

#3) 37.070856, -122.256162, elevation 210 feet/Extensive buckeye grove which defines the lower portion of Big Willow Gulch before it drains under Highway 1 and via a 100+ foot waterfall, enters the Pacific Ocean.

Schizocarp collection data: 2007-157, Sanicula gianonei, pro.sp.nov., 06/30/2007, Jim West.

Note: the following herbarium pressings, regardless of being accessioned as Sanicula crassicaulis, are bonafied Sanicula gianonei, pro.sp.nov. and were collected within the Scott Creek Watershed/Environs.

Herbarium data: UCSC008761, Sanicula, Dylan M. Neubauer, 47, 2014-3-18.
Herbarium data: JEPS82008, Sanicula crassicaulis, Roy E. Buck and James A. West, 144, 1983-3-6.
Herbarium data: JEPS82009, Sanicula crassicaulis, Roy E. Buck and James A. West, 149, 1983-3-6.
Herbarium data: JEPS82010, Sanicula crassicaulis, Roy E. Buck and James A. West, 177, 1983-4-3.
Herbarium data: JEPS82012, Sanicula crassicaulis, Roy E. Buck and James A. West, 172, 1983-3-27.
Herbarium data: JEPS83051, Sanicula crassicaulis, James A. West, 298, 1985-1-22.

57. Long-lived, rhizomatous Asteraceae (e.g., *Eurybia radulina*, *Solidago elongata* and *Symphyotrichum chilense*)—

a) Is there a correlation between low-viability cypselae (achene) production in these species and their capacity to form long-lived, rhizomatous colonies with the principal emphasis on vegetative expansion and/or the seasonal impact of diurnal lepidoptera and their larval stage using the developing cypselae as a primary food source?

b) What impacts on the population's overall genetic diversity does this have, if many of the "established colonies" are possibly clonal?

c) Do some of these pistillately non- or poorly functioning "populations" act as males, passing on some of their genetic material via vectors to other populations that have fully functional reproductive parts?

d) Is this compromised gene-flow pattern a permanent condition, or does it vary throughout the flowering season and from year to year?

e) Is it a physiological response to a set of environmental conditions that are site specific and do not necessarily reflect the taxa throughout the Scott Creek Watershed and its environs?

f) *Solidago elongata*, an uncommon species countywide, tends to frequent old marshes in the Swanton area (e.g., Beaver Flat, West's Spring, China Ladder), and all the populations studied to date follow the pattern of low-viability cypselae counts and extensive asexual/vegetative colonization. Map this species within the watershed/environs and determine if some/all the

"populations" are principally clonal with little genetic variability and examine the mature capitula for evidence of larval activity.

g) This same methodology should also be applied to the far more ubiquitous *Symphyotrichum chilense* populations, which exhibit the same pattern of poor "seed set" and form extensive "colonies" via rhizomes.

58. Photo-documentation of area burned by Lockheed fire—The Schoolhouse Ridge Complex, unique not only from an ecological/botanical perspective but a geomorphological one as well, was severely impacted by the 2009 Lockheed Fire. Two days after the fire was being defined "officially under control," I spent five consecutive days photo-documenting with 1,000+ images all aspects of this anthropomorphic-induced holocaust, showing the after-effects on this previously designated botanical "hotspot."

While, both the pre- and post-fire "native" plant inventories have been meticulously recorded in the accompanying essay, no follow-up series of photos, paralleling my original 5 sets have been done. With a before/after botanical overview of this complex and diverse ridge/gulch/grassland/riparian corridor series of interconnected ecosystems already in place, a second series of photos would create an important baseline from a successional perspective.

59. *Clarkia* spp. [Onagraceae]—With the Scott Creek Watershed and environs hosting multiple populations of *Clarkia* aff. *davyi*, *Clarkia* aff. *prostrata*, and *Clarkia purpurea* subsp. *purpurea*—all three taxa of rare or uncommon status within Santa Cruz County—an in-depth study is needed to clarify their taxonomic status relative to the original typification. (see Query # 12 for Clarkia purpurea subsp. purpurea population data).

a) If the *C.* aff. *prostrata* is found to possess a chromosome number of n=26, is this the result of hybridization between *C. speciosa* (n=9) and *C. davyi* (n=17)? Or is this local taxon distinct from the putative hybrid described from San Luis Obispo County and a valid/undescribed species in its own right?

b) Since most of the populations of these three *Clarkia* species are self-contained and isolated from each other, are there inter-populational differences genetically coded, or are they remnant fragments of a once more continuous distribution pattern?

c) With Andrenid bees being the principal pollinating vector for the local clarkias and no intermediates/ hybrids found where populations of *Clarkia* aff. *davyi* and *Clarkia* aff. *prostrata* overlap, and their phenologies being concurrent, is the difference in chromosome numbers the principal reproduction isolating mechanism?

d) With the UCSC Arboretum custodian of 50+ in situ seed/capsule collections for *C.* aff. *davyi*, 30+ in situ seed/capsule collections for *C.* aff. *prostrata,* and 30+ in situ seed/capsule collections for *C. purpurea* subsp. *purpurea,* plus several dozen ex situ raised collections drawn from populations within the overview of this Essay, it is very important to consider that several of these populations are no longer extant or accessible, and the recruitment of those still in existence are subject to the vagaries of seasonal weather patterns, competition from fellow travelers of the non-native variety, and various challenges from indiscriminate herbivores.

Note: Due to the local rarity and uncertain taxonomical status of these two related taxa, the following listed Google Earth co-ordinates, and habitat descriptions for each of the documented populations, will allow future researchers, the ability to map the two species as they naturally occur within the Scott Creek Watershed/Environs and study the spatial relationships between each population.

Clarkia aff. prostrata populations [prostrate/decumbent/spreading horizontal mode of growth/flowers concolored with base of petals pale yellow/seeds uniformly dk brown without encrustations/some populations documented with herbarium pressings and the majority by seed collections housed at the UCSC Arboretum].

#1) 37.072598, -122.257489, elevation 348 feet/w-edge of Pumpkin Field Marsh, growing on eolian sand deposits intermixed with siliceous mudstone which blankets the edge of the Western Terrace. Cirsium quercetorum, Heterotheca sessiliflora subsp. bolanderi, Grindelia hirsutula and Sidacea malviflora subsp. malviflora are some of the sympatric associate taxa.

Seed collection data: 2009-953, Clarkia aff. prostrata, 07/27/2009, Jim West.
Seed collection data: 2016-179, Clarkia aff. prostrata, 08/28/2016, Jim West.
Seed collection data: 2018-673, Clarkia aff. prostrata, 07/08/2018, Jim West.

#2) 37.076354, -122.260366, elevation 354 feet/w, sw-facing edge of coastal prairie, between Gulches #3 & #4. Associate native species include: Wyethia angustifolia and Armeria maritima subsp. californica.

Herbarium data/JEPS81509, Roy E. Buck and James A. West, 17, 1982-6-11.

Seed collection data: 2016-158, Clarkia aff. prostrata, 07/25/2016, Jim West.

#3) Between 37.070487, -122.255087, elevation 358 feet and 37.070694, -122.254572, elevation 360 feet/w-facing edge of Western Terrace overlooking lower Big Willow Gulch. A sampling of the

native flora growing in association with Clarkia aff. prostrata, includes: Acaena pinnatifida, Berberis pinnata subsp. pinnata, Heterotheca sessiliflora subsp. bolanderi and Hosackia gracilis.

Herbarium data/UCSC010577, James A. West, 2016-5-1, s.n.
Herbarium data/UCSC010578, James A. West, 2016-5-1, s.n.

Note: ex situ population (2000-21) of Clarkia aff. prostrata raised in Harry Wain's garden, the original seed collected in situ, growing on eolian sand deposits, edge of Western Terrace overlooking Lower Big Willow Gulch. Plants prostrate, flowers concolored and seeds dark brown without encrustrations. The below listed collection documented incorrectly on seed envelope as Clarkia davyi.

Seed collection data: 2000-21, ex situ raised, see above note, 08/11/2000, Jim West.

Seed collection data: 2007-183, Clarkia aff. prostrata, [mislabeled as C. davyi], 06/30/2007, Jim West.

Seed collection data: 2007-185, Clarkia aff. prostrata, 07/28/2007, Jim West.
Seed collection data: 2009-6, Clarkia prostrata, 09/24/2009, Jim West.
Seed collection data: 2009-7, Clarkia prostrata, 09/24/2009, Jim West.
Seed collection data: 2009-243, Clarkia prostrata, 06/28/2009, Jim West.
Seed collection data: 2011-239, Clarkia aff. prostrata, 08/15/2011, Jim West.
Seed collection data: 2011-449, Clarkia aff. prostrata, 07/18/2011, Jim West.
Seed collection data: 2011-450, Clarkia aff. prostrata, 08/27/2011, Jim West.
Seed collection data: 2011-485, Clarkia aff. prostrata, 08/27/2011, Jim West
Seed collection data: 2012-431, Clarkia prostrata, 09/07/2012, Jim West.
Seed collection data: 2013-87, Clarkia aff. prostrata, 06/30/2013, Jim West.
Seed collection data: 2013-89, Clarkia aff. prostrata, 10/06/2013, Jim West.
Seed collection data: 2015-63, Clarkia aff. prostrata, 07/11/2015, Jim West.
Seed collection data: 2016-159, Clarkia aff. prostrata, 07/19/2016, Jim West.
Seed collection data: 2016-160, Clarkia aff. prostrata, 07/19/2016, Jim West.
Seed collection data: 2016-180, Clarkia aff. prostrata, 08/25/2016, Jim West.
Seed collection data: 2016-248, Clarkia aff. prostrata, 06/14/2016, Jim West.

Clarkia aff. davyi (erect mode of growth, bicolored petals, seeds gray encrusted)

Population #1: 37.079987, -122.260784, elevation 383 feet/w-facing eolian sand impacted slope

across from Lasher Marsh drainage and Clarkia purpurea subsp. purpurea. Growing sympatrically with Horkelia cuneata var. sericea. The locally rare variety of Horkelia cuneata, was pressed and resides at the Jepson Herbarium (UC Berkeley).

Population #2: 37.082552, -122.263853, elevation 305 feet/n-end of Swanton Road, grass covered slope overlooking (in part) "Washout Turn". Growing sympatrically with scattered tussocks of locally rare Festuca roemeri var. klamathensis (=Festuca idahoensis?).

Population #3: Between 37.087874, -122.258380, elevation 598 feet and 37.088130, -122.258181, elevation 598 feet/e-edge, w-facing eolian sand derived slope, overlooking Laguna de las Trancas. This is the largest single population of Clarkia aff. davyi in the Scott Creek region, averaging 50-60(+) individuals seasonally. Perhaps due to the acrid smell of the immature broken stems or how the mature post-anthesis plants become indurate, this continually studied population for more than four decades, has not been impacted by the cattle grazing.

Population #4: 37.086771, -122.264054, elevation 472 feet/grass covered slope paralleling Las Trancas Arroyo and margined on the east and south by a mixed Pinus/Quercus woodland. Growing sympatrically with a localized population of Micropus californicus aff. var. subvestitus and Microseris paludosa.

Population #5: 37.085688, -122.265233, elevation 332 feet/remnant grass covered terrace face, overlooking n-end of Swanton Road, before it enters Highway 1. Growing sympatrically with Grindelia hirsutula and scattered plants of Stebbinsoseris decipiens. Overarching this small and isolated Clarkia aff. davyi colony, were two robust examples of the Pinus attenuata x Pinus radiata syngameon, now (2020) deceased due to the CZU Lightning Fire complex.

Population #6: 37.063888, -122.245833, elevation 398 feet/w-facing gulchlet draining into the central portion of Solar Panel Gate Gulch aka w-fork of the Cowboy Shack Gulch. The substrate is principally eolian sand deposits mixed with siliceous mudstone fragments. Growing sympatrically with the Clarkia aff. davyi, is a localized population of Agrostis blasdalei, which along with the Clarkia was documented with mature inflorescences/fertile caryopses and deposited with the UCSC Arboretum.

Population #7: 37.072614, -122.254483, elevation 389 feet/eolian sand impacted section of the Western Terrace (coastal prairie), between central portion of Big Willow Gulch ("Frog Pond") and the e-edge of Pumpkin Field Marsh. Associate species include… Heterotheca sessiliflora subsp. bolanderi and Wyethia angustifolia. This population has not been seen in recent years but was documented via several seed collections and deposited with the UCSC Arboretum. Clarkia aff. davyi populations [erect mode of growth/bicolored flowers/seeds gray

encrusted/some populations documented with herbarium pressings and the majority with seed collections housed at the UCSC Arboretum]. The C. aff. davyi and C. aff. prostrata populations found within the area circumscribed by the designation, Scott Creek Watershed/Environs, need to be studied carefully. Due to competition, mainly from non-native species (grazing has not affected the observed populations to any marked degree), the low growing C. aff. prostrata has shown the greatest decline while the erect growing C. aff. davyi, has continued to prosper (the area overlooking the Laguna de las Trancas, in particular). When evaluating the earliest of the seed collections and the data on the envelopes, despite labels written on said seed conveyances, the concolored versus bicolored flowers and dk brown versus gray encrusted seeds, quickly separate the two, yet to be taxonomically defined, species.

Note: Supplemental data, relative to herbarium pressings and seed collections housed at the UCSC Arboretum.

#1) 37.079987, -122.260784, elevation 383 feet/w-facing eolian sand impacted slope across Lasher Marsh drainage from Clarkia purpurea subsp. purpurea population and growing sympatrically with Horkelia cuneata var. sericea. The Horkelia was pressed and now resides at the Jepson Herbarium, U.C. Berkeley.

Herbarium data/JEPS82782, Roy E. Buck and James A. West, 322, 1983-6-5.

Seed collection data: 2002-317, Clarkia aff. davyi, 11/12/2002, Jim West. [This collection, from area between Lasher Marsh and Gulch 1, may be C. aff. prostrata. Conflicting data on spreadsheet entered envelope, refers to concolored flowers and dark seeds].

Seed collection data: 2016-161, Clarkia aff. davyi, 07/25/2016, Jim West

#2) 37.082552, -122.263853, elevation 305 feet/n-end of Swanton Road, grass covered slope overlooking (in part), Washout Turn. Growing sympatrically with scattered tussocks of locally rare Festuca roemeri var. klamathensis (= Festuca idahoensis ?).

Seed collection data: 2007-182, Clarkia aff. davyi, 07/08/2007, Jim West.
Seed collection data: 2011-454, Clarkia aff. davyi, 07/30/2011, Jim West.
Seed collection data: 2016-162, Clarkia aff. davyi, 07/21/2016, Jim West.
Seed collection data: 2016-171, Clarkia aff. davyi, 08/30/2016, Jim West.
Seed collection data: 2017-176, Clarkia aff. davyi, 07/26/2016, Jim West.

#3) between 37.087874, -122.258380, elevation 598 feet and 37.088130, -122.258181, elevation 598 feet/e-edge, w-facing eolian sand derived slope, overlooking Laguna de las Trancas. This is the largest single population for Clarkia aff. davyi in the Scott Creek Watershed, averaging 50-60+ individuals seasonally.

Herbarium data/UCSC010581, James A. West, 2016-4-30, s.n.
Herbarium data/UCSC010582, James A. West, 2016-4-30, s.n.

Seed collection data: 2002-105, Clarkia pseudo-davyi, 09/24/2002, Jim West.
Seed collection data: 2009-54, Clarkia aff. davyi, 09/19/2009, Jimk West.
Seed collection data: 2009-941, Clarkia aff. davyi, 07/08/2009, Jim West.
Seed collection data: 2009-952, Clarkia aff. davyi, 08/03/2009, Jim West.
Seed collection data: 2011-363, Clarkia aff. davyi, 09/03/2011, Jim West.
Seed collection data: 2011-452, Clarkia aff. davyi, 07/30/2011, Jim West.
Seed collection data: 2013-88, Clarkia aff. davyi, 06/30/2013, Jim West.
Seed collection data: 2015-70, Clarkia aff. davyi, 07/12/2015, Jim West.
Seed collection data: 2016-164, Clarkia aff. davyi, 07/07/2016, Jim West.
Seed collection data: 2016-165, Clarkia aff. davyi, 07/07/2016, Jim West.
Seed collection data: 2016-170, Clarkia aff. davyi, 09/07/2016, Jim West.
Seed collection data: 2016-173, Clarkia aff. davyi, 07/27/2016, Jim West.
Seed collection data: 2016-175, Clarkia aff. davyi, 08/12/2016, Jim West.
Seed collection data: 2016-249, Clarkia aff. davyi, 06/10/2016, Jim West.
Seed collection data: 2017-260, Clarkia aff. davyi, 07/07/2017, Jim West.
Seed collection data: 2017-263, Clarkia aff. davyi, 08/29/2017, Jim West.
Seed collection data: 2018-641, Clarkia aff. davyi, 08/31/2018, Jim West.
Seed collection data: 2018-674, Clarkia aff. davyi, 06/24/2018, Jim West.
Seed collection data: 2018-675, Clarkia aff. davyi, 07/11/2018, Jim West.

#4) 37.086771, -122.264054, elevation 472 feet/grass covered slope paralleling Las Trancas Arroyo and margined on the east and south by a mixed Pinus radiata/Quercus agrifolia woodland. Growing sympatrically with localized population of Micropus californicus aff. var. subvestitus.

Herbarium data/UCSC010579, James A. West, 2016-4-30, s.n.
Herbarium data/UCSC010580, James A. West, 2016-4-30, s.n.

Seed collection data: 2002-101, Clarkia pseudo-davyi, 10/25/2002, Jim West.
Seed collection data: 2002-331, Clarkia pseudo-davyi, 09/26/2002, Jim West.

Seed collection data: 2002-883, Clarkia pseudo-davyi, 10/25/2002, Jim West.
Seed collection data: 2003-312, Clarkia pseudo-davyi, 07/29/2003, Jim West.
Seed collection data: 2016-166, Clarkia aff. davyi, 07/11/2016, Jim West.
Seed collection data: 2016-172, Clarkia aff. davyi, 08/14/2016, Jim West.

#5) 37.085688, -122.265233, elevation 332 feet/remnant grass covered terrace face, overlooking n-end of Swanton Road before it enters Highway 1. Growing sympatrically with Grindelia hirsutula and scattered plants of Stebbinsoseris decipiens. Overarching this small and isolated Clarkia aff. davyi colony, are two robust examples of the Pinus attenuata x Pinus radiata hybrid syngameon.

Herbarium data/UCSC008889, Dylan M. Neubauer, 80, 2014-5-28.

Seed documentation data: 2007-180, Clarkia aff. davyi, 07/09/2007, Jim West.
Seed documentation data: 2007-2144, Clarkia aff. davyi, 11/06/2007, Jim West.
Seed documentation data: 2009-951, Clarkia aff. davyi, 07/08/2009, Jim West.
Seed documentation data: 2014-89, Clarkia aff. davyi, 02/04/2014, Jim West.
Seed documentation data: 2015-69, Clarkia aff. davyi, 07/12/2015, Jim West.
Seed documentation data: 2016-163, Clarkia aff. davyi, 07/11/2016, Jim West.
Seed documentation data: 2016-169, Clarkia aff. davyi, 09/11/2016, Jim West.

#6) 37.063888, -122.245833, elevation 395 feet/w-facing gulchlet draining into the central portion of Solar Panel Gate Gulch aka w-fork of Cowboy Shack Gulch. The substrate is principally eolian sand deposits mixed with siliceous mudstone fragments. Growing sympatrically with Clarkia aff. davyi, is a localized population of Agrostis blasdalei (also documented with mature inflorescences/fertile caryopses and deposited with the UCSC Arboretum).

Seed documentation data: 2002-58, Clarkia pseudo-davyi, 09/20/2002, Jim West.
Seed documentation data: 2002-108, Clarkia pseudo-davyi, 11/13/2002, Jim West.
Seed documentation data: 2007-179, Clarkia aff. davyi, 07/21/2007, Jim West.
Seed documentation data: 2009-942, Clarkia aff. davyi, 07/05/2009, Jim West.
Seed documentation data: 2011-453, Clarkia aff. davyi, 07/18/2011, Jim West.
Seed documentation data: 2013-90, Clarkia aff. davyi, 10/06/2013, Jim West.
Seed documentation data: 2013-199, Clarkia aff. davyi, 07/17/2013, Jim West.
Seed documentation data: 2015-68, Clarkia aff. davyi, 08/07/2015, Jim West.
Seed documentation data: 2015-67, Clarkia aff. davyi, 08/21/2015, Jim West.
Seed documentation data: 2016-168, Clarkia aff. davyi, 09/15/2016, Jim West.
Seed documentation data: 2016-177, Clarkia aff. davyi, 08/06/2016, Jim West.

Seed documentation data: 2016-178, Clarkia aff. davyi, 08/06/2016, Jim West.

#7) 37.072614, -122.254483, elevation 389 feet/eolian sand underpinned section of Western Terrace, between central portion of Big Willow Gulch ("Frog Pond") and e-edge of Pumpkin Field Marsh. Sympatric associate species include, Heterotheca sessiliflora subsp. bolanderi and Wyethia angustifolia. This population has not been seen in recent years but was documented via several seed collections and deposited with the UCSC Arboretum.

Seed documentation data: 2002-63, Clarkia aff. davyi, 10/19/2002, Jim West.

60. Effects of insect herbivory on certain members of the Asteraceae—Several genera within the Asteraceae, while producing sexually functioning capitula, are repeatedly targeted by what appears to be species of diurnal lepidoptera (or some other members of the Class Insecta), whose larval stage often destroys substantial portions of the developing ovules, rendering the mature inflorescences with a minimal amount, if any, of viable seed. Within the Scott Creek Watershed and environs, the following taxa over the course of several seasons have been observed bearing the ravaging effects of this yet to be determined "spoiler":

- Heterotheca sessiliflora subsp. bolanderi
- Pseudognaphalium biolettii
- Pseudognaphalium californicum
- *Pseudognaphalium* "gianonei" pro. sp. nov.
- Pseudognaphalium ramosissimum
- Pseudognaphalium stramineum
- Solidago elongata
- Symphyotrichum chilense
- Symphotrichum subspicatum

a) Determine the family/genus/species of insect that is causing the damage to the developing ovules. Is the species a generalist in choice of host plant, or are there more than one egg-laying species involved, each specializing in a specific taxon possibly due to the host plant's distinguishing chemical signature?

b) With *Pseudognaphalium* spp. being relatively short-lived non-rhizomatous perennials, how does the substantial ovule destruction affect the host species' recruitment capacity and the subsequent resegregation of genetic material?

c) Since the *Solidago* and *Symphyotrichum* spp. create extensive "clonal" populations via

rhizomes and are exceedingly long-lived, and if the ovule destroying larvae infestation is cyclical—does the longevity of the rhizomatous species offset the short-term loss of sexual reproductive capacity?

d) Within a given area, are all representatives of the Asteraceae, targeted by the egg-laying insects or is there a co-evolving interplay between "predator and prey," where those taxa previously attacked make genetically transmitted changes in their biochemistry, rendering future generations less palatable to predation.

61. *Arctostaphylos crustacea* subsp. *crinita*—With the current circumscription of this taxon at variance with the polymorphic populations found within the Scott Creek Watershed, revisit the subspecies from a molecular perspective and determine if this taxon is a "genetic sponge."

a) Are both clades represented in the Scott Creek Watershed genome of *A. crustacea* subsp. *crinita* (with *A. andersonii*, *A. glutinosa* [referencing both *A. andersonii* and *A. canescens* genes], *A. sensitiva,* the ancestral influence of *Arctostaphylos uva-ursi,* and the current association with *A. crustacea* subsp. *subcordata* [where the inferred presence of the former and documented existence of the latter occur sympatrically on the Schoolhouse Ridge] morphological fingerprints appearing throughout the population)?

b) Leaving the Scott Creek "Chalks," where tetraploid *A. crustacea* subsp. *crinita* co-exists with at least four diploid species, do a genetic profiling of the lower-elevation, isolated *A. crustacea* subsp. *crinita* populations that occur within several disjunct chaparral communities and see if they possess fewer complex parentages and earlier speciation patterns.

c) As one progresses up the Schoolhouse Ridge towards the "Chalks," the overall gestalt/physical profile of individual *A. crustacea* subsp. *crinita* plants is so variable that one can take fewer than 30 steps and observe what appears to be two or three dozen distinct taxa, all linked by a basal burl. Are all these "phases" of *A. crustacea* subsp. *crinita* basically the same on a molecular level, or are some of the more extreme (divergent from the type) foliar/floral patterns supported by equally distinct genetic fingerprints?

d) Is pollen fertility lower in this taxon due to its polyphyletic origin, which incorporates species from two different clades?

62. *Castilleja affinis* complex—Examine the putative polyphyletic nature of the *C. affinis* complex residing within the Scott Creek Watershed and environs to determine if the following taxa's genes, in varying degrees, are represented within the genome of *C. affinis*, an extremely variable taxon.

a) *C. subinclusa* subsp. *franciscana* (upswept apices of calyx/exserted galea from below lower lip, pedicellate flowers).

Castilleja subinclusa subsp. franciscana/this visually striking paintbrush, has only been documented in Santa Cruz County, from one localized area on the North Coast. When first discovered in the mid-1970s, this taxon was growing adjacent to another hummingbird pollinated species, namely Aquilegia formosa. Subsequent brush removing activities destroyed the shared habitat for both species, and the Franciscan paintbrush has not been seen since in Santa Cruz County. Fortunately, three separate herbarium pressings were made for this taxa and its genetic material appears to reside within our polychromatic Castilleja affinis subsp. affinis complex.

#1) 37.080602, -122.257272, elevation 489 feet/base of the "Magic Triangle", the exposed portion of the syncline, which bisects the Swanton Pacific Ranch/Old H-H Ranch, from the Scott Creek Marsh up to the n-end of Swanton Road.

Herbarium data: UCSC006143, Castilleja subinclusa subsp. franciscana, Randall Morgan, s.n., 1978-6-12.
Herbarium data: JEPS81530, Castilleja subinclusa subsp. franciscana, R. Doug Stone, Roy E. Buck and James A. West, 458, 1982-5-13.
Herbarium data: JEPS83086, Castilleja subinclusa subsp. franciscana, James A. West, 372, 1985-4-17.

b) *C. applegatei* (combination of glandular herbage with wavy leaf margins).

c) *C. latifolia* (leaves and bracts oblong/sub-entire and thick).

d) *C. foliolosa* (occasional forked trichomes).

e) *C. wightii* (bracts/calyces yellowish in coloration, galea barely exserted, inflorescences congested and along with multi-branched stems and herbage, sticky-glandular).

In the early 1980s, comprehensive collections/pressings were made from the Swanton area and deposited with the UC/Jepson Herbarium for study/diagnostic usage and incorporated into Dr. Lawrence Heckard's ongoing *Castilleja* studies. All the above-described characteristics, in various combinations, were found in the specimens collected… some as solitary examples, while others reappeared throughout the watershed.

63. DNA investigations—Within the area defined by this essay, there are several native taxa or related sets of taxa that need relationship clarification on a molecular level. Some of these problematic areas, which could provide lines of research in systematics, speciation, co-evolution, and reproductive isolating mechanisms, are as follows:

a) The relationship between *Luzula comosa* var. *comosa* and *L. subsessilis*, which have overlapping seed size/shape and style lengths.

b) *Triteleia laxa*: (the widespread forma typica) versus the distinctive coastal headland form, as to habitat, stature, flower shape/color, filament/anther presentation and breeding behavior.

c) The relationship of the localized *Brodiaea* aff. *elegans* complex (growing across the exposed grass-covered crest of the Seymore Hill) relative to the *B. terrestris* subsp. *terrestris* populations, scattered throughout the lower elevation grasslands within the Scott Creek Watershed and the coastal prairie aka Western Terrace.

d) Revisiting the *Fritillaria affinis* complex locally, from both an ecological and molecular perspective and elucidating the status of the distinctive coastal bluff isolate, which shows affinities to the taxon found north of San Francisco Bay formerly classified as *F. lanceolata* var. *tristulis*.

e) Clarify the annual/perennial dimorphism displayed in the local populations of *Erythranthe grandis*, which can have what purports to be annual growth status (E. arenicola), growing on seasonally wet waterfall/cliff faces overlooking the gulchlets draining under Highway 1, while a perennial form with rhizomes (E. grandis), grows locally in continually moist ditches and coastal marshes?

64. Differing forms of two genera in the Asteraceae/Tribe Astereae—The Scott Creek Watershed and environs plays host to two genera within the Asteraceae/Tribe Astereae that have elevationally differing forms that parallel each other, namely: *Corethrogyne filaginifolia* var. *filaginifolia* and var. *californica* and *Heterotheca sessiliflora* subspp. *bolanderi* and *echioides*.

a) What are the evolutionary advantages/selection pressures in having the immediate coastal forms being low-growing in stature and with few- or single-flowered inflorescences compared with the more interior/higher-elevation relatives, with often rigidly erect growth patterns and inflorescences with numerous, smaller in stature, flowers?

b) Are both forms of each taxon independently derived from a previously existing species, or is one of the two existing forms older and the other form derived from it?

c) Within a given locale, even if the two forms are interfertile should their ranges overlap, if one of the two forms were to disappear, is the other form genotypically stable enough that it would breed true to its type even if it were the derived form?

d) Following up on the previous question, what constitutes a species if closely related taxa capable of gene exchange when occurring sympatrically show no intermediacy when geographically separated?

e) Factoring in the different chemical signatures of the two *Heterotheca* subspecies, what other differences exist on a molecular level between these two sets of related taxa that allow for exchange of genetic material where both types occur sympatrically, but when isolated over time could theoretically result in speciation?

65. *Isolepis* spp. [Cyperaceae]— On the ocean side of the Santa Cruz Syncline, mainly on what is termed the Western Terrace, two forms lumped as one species occur, but not sympatrically. The principal form of *I. cernua* locally is perennial, occurring mainly on wet seeps/cliff faces overlooking the ocean.

The singularly uncommon annual form has only been found twice. One occurrence (1a) is in exposed, seasonally moist bedding planes (siliceous mudstone) that constituted the original Highway 1 (Old Coast Road/north end of Swanton Road above Washout Turn). There *I. cernua* co-occurs with *I. carinata*, and the two species share flowering times, growing so intermixed that one could easily mistake the two taxa as one polymorphic entity. The second occurrence (1b) is along a seasonally moist dirt road between Big Willow Marsh and the Frog Pond, where *I. cernua* grows without *I. carinata*.

a) Are these two phases of *I. cernua* one and the same species or are they two distinct taxa on a molecular as well as a morphological level?

b) Where *I. carinata* and *I. cernua* occur together, is there any gene flow between these two related taxa?

c) What are the ecological underpinnings that allow two related annual species, one uncommon and the other rare (*I. carinata* and *I. cernua*), to co-exist in such proximity, while the two forms of I. *cernua*, at least in the area covered by this essay, display no evidence of sympatry?

d) A visual/microscopic analysis of the achenes should be done, to see if the two taxa can be

separated by achene morphology alone and if hybrids can occur, do these shared differences allow for the putative hybrids to be separated out from the parental achenes?

Population (1a)/37.083633, -122.263678: The only area documented to date, where both the annual form of Isolepis cernua and Isolepis carinata grow, not only sympatrically but so comingled, that often the two species appear as one. Whether two related taxa growing in such proximity and with a shared phenology, hybridize, remains an unanswered question. The extensive collection of nutlets from the above discussed population, when raised out, may provide some answers to the possibility of interspecific hybridization.

Achene collection: 2012-68, Isolepis cernua (annual form), 05/19/2012, Jim West
Achene collection: 2014-157, Isolepis cernua (annual form), 08/03/2014, Jim West.
Achene collection: 2014-177, Isolepis cernua (annual form), 06/14/2014, Jim West.
Achene collection: 2014-178, Isolepis cernua (annual form), 06/14/2014, Jim West.
Achene collection: 2014-179, Isolepis cernua (annual form), 06/18/2014, Jim West.
Achene collection: 2015-23, Isolepis cernua (annual form), 05/19/2015, Jim West.
Achene collection: 2015-26, Isolepis cernua (annual form), 05/17/2015, Jim West.
Achene collection: 2015-152, Isolepis cernua (annual form), 03/29/2015, Jim West.
Achene collection: 2015-153, Isolepis cernua (annual form), 03/29/2015, Jim West.
Achene collection: 2015-154, Isolepis cernua (annual form), 03/29/2015, Jim West.
Achene collection: 2015-155, Isolepis cernua (annual form), 03/29/2015, Jim West.
Achene collection: 2015-181, Isolepis aff. cernua, 05/12/2015, Jim West.
Achene collection: 2015-182, Isolepis aff. cernua, 05/12/2015, Jim West.
Achene collection: 2016-74, Isolepis cernua, 05/25/2016, Jim West.
Achene collection: 2018-685, Isolepis cernua, 06/11/2018, Jim West.

Achene collection: 2014-174, Isolepis carinata, 06/14/2014, Jim West.
Achene collection: 2014-175, Isolepis carinata, 06/14/2014, Jim West.
Achene collection: 2014-176, Isolepis carinata, 06/21/2014, Jim West.
Achene collection: 2016-75, Isolepis carinata, 05/28/2016, Jim West.
Achene collection: 2018-684, Isolepis carinata, 06/13/2018, Jim West.

66. *Rumex salicifolius* complex [Polygonaceae]—With four members of this complex occurring within the Scott Creek Watershed/Environs, (*R. californicus, R. crassus*, R. salicifolius and *R. transitorius*), and two of these taxa found growing sympatrically, several taxonomic issues need to be addressed:

a) On a molecular level, are each of these three taxa sufficiently distinct to warrant species status?

b) What vectors (wind, insects, or autogamy/self-fertilization) act as pollinating mechanisms?

c) Where these taxa occur sympatrically, as with *R. californicus* and *R. transitorius* along Swanton Road, is gene flow (reciprocal or unilateral) possible, or are these two "species," reproductively isolated?

d) Two non-native *Rumex* species (*R. conglomeratus* and *R. crispus*), both vertically aligned taxa, are also growing sympatrically with *R. californicus* and *R. transitorius*. Is gene exchange possible, and if so, is there any evidence of such hybridization in the Swanton Road populations?

e) If a large sampling of achenes from the sympatric plants of *R. californicus* and *R. transitorius* growing along Swanton Road were raised out, would the offspring of both taxa come true to type?

Achene collection data: 2014-139, Rumex californicus, 08/05/2014, Jim West.
Achene collection data: 2015-281, Rumex californicus, 07/07/2015, Jim West.
Achene collection data: 2015-285, Rumex californicus, 08/27/2015, Jim West.
Achene collection data: 2017-328, Rumex californicus, 07/30/2017, Jim West.
Achene collection data: 2018-691, Rumex californicus, 08/31/2018, Jim West.

Achene collection data: 2014-132, Rumex transitorius, 09/18/2014, Jim West.
Achene collection data: 2014-133, Rumex transitorius, 10/05/2014, Jim West.
Achene collection data: 2014-135, Rumex transitorius, 08/05/2014, Jim West.
Achene collection data: 2014-138, Rumex transitorius, 07/30/2014, Jim West.
Achene collection data: 2015-282, Rumex transitorius, 07/07/2015, Jim West.

67. Do a comparative study of the climbing (scandent) native taxa within the Scott Creek Watershed from an engineering perspective and investigate the structural efficiency of the various solutions each species has arrived at—the differing strategies being as follows:

- *Antirrhinum kelloggii* (aerial stems supported by elongate, filiform pedicels).
- *Calystegia purpurata* subsp. *purpurata* (aerial stems twining).
- *Lathyrus vestitus* subsp. *vestitus* (tendrils derived from rachis).
- *Lonicera hispidula* (aerial stems long lived, sub-ligneous with age, and bearing a strong resemblance to the lianas of the tropics).
- *Toxicodendron diversilobum* (aerial stems often reaching 15–20+ meters and attached to tree trunks by adventitious rootlets).

- *Clematis lasiantha* (climbing stems sub-ligneous and anchored by petioles of the opposite compound leaves).
- *Galium porrigens* var. *porrigens* (scandent, multi-branching aerial stems retrorse-scabrous along stem edges); and
- *Marah fabacea* (usually branched tendrils, emerging out of stems opposite leaves).

Recently observing the California man-root in situ, I noticed that the usually trichotomous tendrils behaved in two concurrent patterns. When the tendril branch was not in contact with any surface, it remained more-or-less straight without any coiling, while a sister tendril branch in direct contact with any supporting structure immediately started coiling around said anchor and ultimately the entire tendril branch formed a spring-like coil, giving both stability when no air motion was present but flexibility during peak periods of turbulence.

68. Starting with the documented existence of *Juncus hesperius* x *Juncus patens* hybrids and the raising from in situ collected seed an F2 generation:

a) Investigate whether the variability of the local parental populations is wholly the result of intraspecific gene flow, or do the sympatric occurring F1 hybrids (due to their longevity/potential for selfing, outbreeding, and apomixis) have some influence on either or both parents?

1) Do DNA profiling of both parents growing proximal to any given hybrid and look for hybrid genes or fragments thereof, within the parental genomes.

2) Investigate whether some or all hybrid inflorescences begin with pollen/stigmas maturing at differing times, with the gradual development of the inflorescences shifting to a self-pollinating mode, and ultimately some flowers displaying apomictic behavior—or, in sequential terms, possibly mixing it up.

69. *Acmispon americanus* var. *americanus* [Fabaceae]—This relatively low-growing native annual acts as a weed suppressor, fixes atmospheric nitrogen, and provides a food source for pollinating bees. In addition, it requires minimal water in summer, offering managers of orchards and similar agricultural venues a local taxon relatively easy to obtain seed from, and once established, self-sowing. This is a research project eminently worthy of consideration, with the in-situ behavior of said taxon easily observed from Swanton Road and the adaption from a naturally occurring environment to orchard use presenting few if any ecological problems.

70. Do an ecological, morphological, and molecular review of the reduced-in-stature coastal

headland/bluffs (between Greyhound Rock and Scott Creek beaches) taxon, tentatively placed within the *Elymus glaucus* subsp. *virescens* [Poaceae] circumscription and compare with

a) the type from the Olympic Mountains; and

b) coastal headland populations north of San Francisco Bay (e.g., Bodega Bay, Sonoma County).

c) Is absence or presence of an awn (1–7 mm) on glumes and lemmas the principal character used to distinguish subsp. *virescens* from subsp. *glaucus*, and if so, does the gross difference in overall stature between the immediate coastal bluff taxon and the ca. one-mile inland form (separable from subsp. *glaucus*, not in stature but by absent awns on glumes/lemmas) represent an ecological rather than genetically imposed difference?

d) If the coastal bluff taxon is a genetically stable and separable from subsp. *glaucus* on either a species or subspecies level, are the populations (looking like short-awned to awnless *Elymus glaucus* subsp. *glaucus* plants) between the north end of Swanton Road and the Last Chance Road the result of introgressive hybridization between these two taxa?

Note: For additional data, see Query #90.

71. Native *Trifolium* [Fabaceae] in the Scott Creek Watershed/Environs that need taxonomic clarification and have already been documented via seed and/or herbarium vouchers:

> a) *T. willdenovii*/two distinct forms occur within the area. On the coastal headlands is a low-growing form consistently producing mature seeds, pale yellow in coloration—while in the interior portion of the watershed, a robust form occurs with uniformly blackish seeds. Are these two related but ecologically and morphologically separated taxa, minor variants of *T. willdenovii*, or are they sufficiently distinct on a genetic level to warrant a varietal designation?
>
> Note: See Query #96, for additional material relative to this taxon and its dimorphic seed coloration.
>
> b) *T. oliganthum*/an isolated population of a taxon superficially resembling *T. oliganthum* but genetically representing an undescribed variety of *T. willdenovii* occurs along Purdy Road, paralleling Squirrel Flat. (This variety was discovered by Randall Morgan growing along seasonally moist, forested roadsides in Bonny Doon.) While matching in both the ecology and gross morphology, the Swanton population needs to be raised out and genetically profiled.
>
> Note: Between 37.084517, -122.246599, elevation 117 feet and 37.083421, -122.247216, elevation 110 feet/margining inner edge of Purdy Road, sharing habitat with Trifolium dianthum (T. variegatum complex). Sympatric natives, include: Collinsia multicolor, Luzula comosa var. laxa, Claytonia perfoliata subsp. perfoliata, Heuchera micrantha, Berberis pinnata subsp. pinnata, etc. Road grading may have compromised if not eradicated this taxonomically in-need-of-clarification population, so the seed collections have to be raised out for study, pressings made and seed banking done.

Seed collection data: 2015-325, Trifolium sp., 08/11/2015, Jim West.
Seed collection data: 2015-326, Trifolium sp., 06/27/2015, Jim West.
Seed collection data: 2015-327, Trifolium sp., 06/22/2015, Jim West.
Seed collection data: 2015-328, Trifolium sp., 06/22/2015, Jim West.
Seed collection data: 2015-329, Trifolium aff. oliganthum, 05/12/2015, Jim West.
Seed collection data: 2015-330, Trifolium aff. oliganthum, 05/12/2015, Jim West
Seed collection data: 2015-332, Trifolium aff. oliganthum, 06/03/2015, Jim West
Seed collection data: 2015-333, Trifolium aff. oliganthum, 05/08/2015, Jim West.
Seed collection data: 2015-334, Trifolium aff. oliganthum, 05/30/2015, Jim West.
Seed collection data: 2016-154, Trifolium aff. "silvestre", 07/17/2016, Jim West.
Seed collection data: 2017-96, Trifolium "silvestre", 06/24/2017, Jim West.
Seed collection data: 2018-665, Trifolium aff. oliganthum, 06/21/2018, Jim West.

c) *T. obtusiflorum*/following the 2009 Lockheed Fire, along the seasonally moist margins of the dirt road accessing the Little Creek sub-watershed, a distinctive form of this locally uncommon native clover was documented. It may represent what Randall Morgan referred to as "var. cruzense" (unpublished). Eleven years have passed since the fire and the clover population has not been seen again, therefore it is important to raise out a population of this potentially distinct variety of *T. obtusiflorum* and determine its identity.

Note: 37.067904, -122.214742, elevation 298 feet/Trifolium obtusiflorum aff. var. cruzense. Randall Morgan, in his monographic overview of the California clovers, discovered and validated on a genotypical level, a new variety of T. obtusiflorum. This new variety, var. cruzense, grows proximal to springs and zones of concentrated moisture along logging roads as opposed to streamsides, where the forma typica of T. obtusiflorum resides. The year following the 2009 Lockheed Fire, a localized population of this recently described variety, was discovered growing along the damp edges of the dirt road access to the upper reaches of the Little Creek and was documented with a seed collection, residing with the UCSC Arboretum. Subsequent to the discovery and documentation of this analog to Randall Morgan's originally described population, a decade has passed, and the population has not returned. Whether the repeated impacts resulting from vehicular activity over the years destroyed the colony or the buried seeds need a new disturbance event to initiate germination, remains to be seen. The below listed seed collection, needs to be raised out and studied on both a morphological and genetic level, to determine, if this isolated population is the recently described var. cruzense and make both herbarium pressings for distribution and obtain enough seed for possible cryogenic storage.

Seed collection data: 2010-32, Trifolium obtusiflorum aff. var. cruzense, 09/07/2010, Jim West.

d) *T.* "mini-macraei"/a genetically distinct component of the *T. albopurpureum* complex was discovered on the coastal bluffs overlooking the north end of Greyhound Rock Beach and was given the working name of *T.* "mini-macraei" by Randall Morgan. The TYPE population has been documented by both herbarium pressings and seed collections. Within the same general coastal headland habitat, several other localized populations of this potentially new species of clover have been discovered and documented with extensive seed collections (growing on CalPoly/Swanton Pacific Ranch property).
Note: A worthwhile research project would be as follows: with the forma typica populations of *T. macraei* occurring farther inland and at higher elevations from the exposed coastal bluffs *T.* "mini-macraei," (unpublished) populations, is there a distinct genetic breakoff point (ecologically) between *T.* "mini-macraei" and the robust, large-headed typical form occupying the elevationally higher grass land and can one chart a series of transitional forms linking T. macraei forma typica with T. "mini-macraei"?

Note: See Query #104, for a detailed overview dealing with this potentially new to science taxon.

72. Entering the Little Creek sub-watershed via the dirt road, two species of *Iris* [Iridaceae] can be observed. Occupying the lower shaded, seasonally moister habitats is *I. douglasiana,* with the lower portion of its stems colored a vibrant pink. Ascending elevationally to drier/xeric habitats, *I. fernaldii* appears and is distinguished by its grayish-green, narrower in profile foliage and tannish lower stems.

a) Since these two taxa are interfertile, can one chart the possible genetic flow/exchange between these related species as one observes the replacement of the lower-elevation *I. douglasiana* with the drier, more heat- and light-tolerant *I. fernaldii*?

b) If hybrids do occur, are they in the transitional zones and is the gene exchange uni- or bi-directional? With marked changes in seasonal moisture, light intensity, and substrate (the *I. fernaldii* growing on the decomposed quartz/diorite, which radiates far more absorbed heat than the shaded duff supporting the *I. douglasiana* populations), if hybrids can be observed, are they more tolerant of the two ecological preferences of their parents?

73. Within the Scott Creek Watershed proper, four species of the genus *Nemophila* [Boraginaceae] occur and have been documented via herbarium pressings and seed collections. The four taxa are:

1) *N. menziesii* sensu lato—locally variable, not only as to floral coloration but corolla size, with some plants exhibiting aspects of gynodioecity (reduced, non-functional stamens but functional styles/stigmas).

2) *N. parviflora*— found in a diverse series of habitats, ranging from mesic thru xeric. It is the most plastic as to overall gross morphology, with corollas variable as to size and some even showing a pinkish/lavender tinge.

3) *N. pedunculata*— uncommon in the county and locally displays subtle variations, from colony to colony, as to coloration/markings of the corolla.

4) *N.* aff. *pulchella* var. *fremontii*—superficially like *N. p.* var. *fremontii*. May be a related but undescribed taxon. At least ten very localized colonies, all morphologically uniform.

At the mouth of Gianone Barn Gulch (which empties into Scott Creek), *N. parviflora, N. pedunculata* and *N.* aff. *pulchella* var. *fremontii* grow sympatrically, without evidencing any exchange of genetic material. Potential research inquiries might include:

a) What is the underlying causation, for some local populations of *N. menziesii* sensu lato to produce out of a normal colony, several plants that are gynodioecious, and how does this uni-directional gene flow affect the genetic plasticity of the parent colony?

b) Are all the *N. pedunculata* colonies, regardless of differences in floral coloration/patterning, the same species as to genetic makeup?

c) Genome profiling to determine the identity of the *N. pulchella* var. *fremontii* analog.

d) What factors are in play between these four species, that when growing in various combinations sympatrically and having concurrent flowering times, evidence no hybridization?

74. A valid population of native *Cardamine oligosperma* [Brassicaceae] (6 stamens, mature siliques spreading and clothed with short stiff trichomes) has been documented for the Schoolhouse Ridge overlooking Squirrel Flat

(Hoover Herbarium - OBI). However, given the above criteria, the majority of *C. oligosperma* found in the Scott Creek Watershed (along Swanton Road for example) with (4[6] stamens and glabrous erect/ascending siliques) appear to be the non-native *C. hirsuta*.

Since both related taxa have the same chromosome number (2*n*=16), has hybridization between these two relatives been going on unnoticed for several years, producing a series of populations that share (combine) traits attributable to either putative parent? From both an ecological and evolutionary biology perspective, a worthwhile research project could examine what is the percentage of valid *C. oligosperma* relative to the introduced *C. hirsuta* in the watershed, and are there hybrids occurring that are passing for either parent?

Google Earth co-ordinates: 37.084819, -122.246228

Herbarium data: OBI80930, Cardamine oligosperma, Jim West, 2015-2-21.
Herbarium data: OBI80931, Cardamine oligosperma, Jim West, 2015-2-21.
Herbarium data: UCSC011005, Cardamine oligosperma, Jim West, 2015-2-21.
Herbarium data: UCSC011006, Cardamine oligosperma, Jim West, 2015-2-21.

75. Are the scattered and morphologically variable populations of what appear to be *Plagiobothrys bracteatus* [Boraginaceae] one or more localized cryptic species masquerading as one taxon? Occupying such diverse ecological niches as Fourth Terrace grasslands (Scott Creek side of Seymore Hill), seasonally wet roadside ditches/micro-vernal pools, and infrequently trodden horse trails, herbarium vouchers and nutlet collections have been made for all the currently documented populations.
Adding to the confusion, one possibly mis-diagnosed collection determined to be *P. hispidulus* (Hoover Herbarium - OBI) also may exist within the watershed. Recollecting nutlets and documenting with herbarium pressings, all the still extant populations for this or these borages would be a valuable learning experience.

Note: See Query #106, for more detailed data relative to population locations and nutlet collections.

76. Do an in-depth examination of the rhizomatous *Juncus* species and determine if an intergrading hybrid complex incorporating *J. balticus* subsp. *ater, J. breweri, J. mexicanus* and *J. lescurii* exists and if any of the afore-mentioned taxa occur as valid species. Using the following diagnostic criteria, where does the species concept end and the hybrid complex begin, locally?

a) habitat—coastal marsh versus grassland/prairie

b) culms—tortile/compressed versus terete, narrow, or broad in width, erect or arcuate in overall growth pattern and distinctive coloration (e.g., dark green)

c) well-developed leaf blades on upper sheaths—present or absent

d) rhizome—slender or thick, branched or not, scaly, or not and distance between culms

e) perianth—size and coloration

f) stamens—number of and relative size/length of anther to filament

g) mature capsule—size/shape relative to perianth parts.

h) seed—morphology (size, shape, and any other distinguishing features)

Margining the Scott Creek Marsh is an extensive population that appears to be a derivative of both *J. breweri* and *J. balticus* subsp. *ater* that has tentatively been called *J. lescurii*. It has erect, tortile-compressed, dark green culms 1.5+ meters in height, and complex, multi-branched inflorescences, displaying flowers with perianth parts dark brown and nitid, 5–8 mm long. Growing some distance above the marsh and margining an isolated spring/seep, a reduced-in-stature population of a rhizomatous *Juncus*, sharing the tortile-compressed culms and analogous inflorescence gestalt, but having the culms arcuate as with *J. breweri*.

Are these two populations of the same hybrid derivation, or is the lower-growing, arcuate-culmed taxon *J. breweri* and the erect Scott Creek Marsh population the hybrid?
Both visually distinctive taxa occur elsewhere within the Scott Creek Watershed/Environs, with the erect form primarily restricted to the benched marshes margining the edges of the Western Terrace. The low-growing, arcuate form extends along Last Chance Road (the upper Gianone Barn Gulch Marsh) and the Laguna de las Trancas.

Returning to the Swanton Pacific Ranch's coastal holdings, another member of this rhizomatous mélange occurs proximal to the Morehus Arroyo and along the south-facing slope of the synform overlooking the China Ladder Marsh. This taxon has erect, thin, tortile-compressed, pale culms, and pale perianth parts 4-5 mm long. While no basal blades on the upper sheaths are apparent, is this taxon closer to *J. mexicanus* or J. balticus subsp. ater?

77. The Phacelia magellanica complex, is represented by at least two related taxa in the Scott Creek Watershed, namely Phacelia californica and Phacelia imbricata. While the forma typica of each species is separable by such characters as foliar morphology, presence of glandular versus eglandular trichomes, lobes of calyces overlapping or not in physical contact, the flower color for both taxa can range from white through lavender. A thorough study needs to be done for this complex locally, which can be found residing in several different habitats, ranging from riparian sandbars to near vertical road banks and determine which populations represent the valid species and if hybrid populations do exist, are some of them passing for either

parent? As with species in the genus Nemophila, can cotyledon and seed morphology be used, in combination with other characters, to taxonomically delimit species boundaries of these related taxa? Seed collected from each of the documented local populations of this complex, should be raised out and the F1 generation studied from both a morphological and genetic basis, to determine where parental variability ends, and interspecific genetic exchange begins.

Note: Within the lower/central portion of the Little Creek sub-watershed, between 37.064863, -122.225961 and 37.066522, -122.218888, a fragmented and variable population of putative Phacelia californica/imbricata intergrades occur. Growing on siliceous mudstone banks, usually erect to erect-ascending in mode of growth and occasionally exceeding 1m in height, with inflorescences often possessing a mixture of glandular and eglandular trichomes and calyces spanning the morphological range of the two putative parents. Flower color, off white thru pale lavender. Over the past three decades, various manifestations of this "neither one or the other" Phacelia, have appeared along Scott Creek, growing on adjacent sandbars, suggesting that the primary source may or was, in the upper reaches of the Scott Creek Watershed proper.

Seed collection data: 2007-1219, Phacelia californica/imbricata intergrades, 09/19/2007, Jim West.
Seed collection data: 2011-341, Phacelia californica, 09/27/2011, Jim West.

78a. The ubiquitous native annual plantain, Plantago erecta, locally exhibits a wide range of vegetative traits, which may or may not be wholly ecological in origin. Populations growing on remnant eolian sand deposits, which are positioned along the edges of the Santa Cruz Terrace (1st Terrace) overlooking s-end of Greyhound Rock Beach/Pelican Rock, are distinctive as to foliar morphology (overall shape, thickness, indument and alignment), with inflorescences and seed metrics larger than inland populations. These traits alone, make this immediate coastal headland variant worthy of being used as annual component for rock/dish gardens and seeing, if on a molecular level, these observable characteristics have a genetic basis warranting varietal status. A comprehensive sampling of the various "forms" existing within the Scott Creek Watershed/Environs coupled with a DNA analysis, would be valuable to see if all of these visually distinctive "forms" are the same on a genetic level or have one or more valid varietal forms been subsumed under one name?

Population #1: 37.074496, -122.262256/"Dylan's Garden", isolated, exposed terrace edge, circa 80' above s-end of Greyhound Rock Beach.
Seed collection data: 2009-673, Plantago erecta, 07/02/2009, Jim West.
Seed collection data: 2018-645, Plantago erecta, 06/13/2018, Jim West.

Population #2: 37.083509, -122.264197/n-end of Swanton Road, established on exposed siliceous mudstone bedding plane which formed original "Old Coast Road" and growing with locally rare, Plantago elongata.

Seed collection data: 2016-271, Plantago erecta, 05/17/2016, Jim West.
Seed collection data: 2018-643, Plantago erecta, 06/11/2018, Jim West.

Seed collection data: 2016-123, Plantago elongata, 08/14/2016, Jim West.
Seed collection data: 2016-124, Plantago elongata, 08/16/2016, Jim West.
Seed collection data: 2018-647, Plantago elongata, 06/09/2018, Jim West.

78b. The genus Plantago is represented in the Scott Creek Watershed/Environs by four native (P. elongata, P. erecta, P. maritima, P. subnuda) and three introduced (P. coronopus, P. lanceolata, P. major) species. These seven related taxa cover a wide range of profiles: annual (P. elongata, P. erecta) versus perennial (P. maritima, P. subnuda + the three introduced species; widespread (P. erecta + the three introduced species) versus localized (P. elongata, P. maritima with P. subnuda sparsely found as far inland as the Marti's Park Marsh but most commonly growing in moist sandy habitats along Greyhound Rock Beach. With such a diverse assemblage of related species found within one defined area, the opportunity to study some of the following queries is made easier.

(a) Do all these species produce seeds that when exposed to moisture become gelatinous and does this trait facilitate dispersal and/or inhibit pathogenic problems during germination?

(b) Can one use seed number, size, and overall structure, to aid in building a taxonomic overview of our local species (both native and introduced)?

(c) With P. maritima and P. subnuda both growing in maritime environments that are daily exposed to salinity (ocean spray, fog, accumulated salt build-up in soil), what physiological responses have allowed P. subnuda to extend its range into a freshwater marsh while P. maritima remains, at least locally, confined to the near vertical oceanic influenced cliffs?

(d) While no hybrids have been observed locally where two or more species grow sympatrically (e.g., P. elongata and P. erecta), is this due to a disparity in chromosome numbers and can artificially created inter-specific hybrids be made and if so, would they be fertile or sterile?

(e) Non-native P. lanceolata occurs over a wide range of habitats and exhibits several ploidy levels while remaining basically constant in overall morphology, while locally, native P. erecta displays a diverse series of ecotypes, raising the question: Do all these local forms share the same chromosome number and even if they do, is the distinctive type found in Dylan's Garden overlooking the s-end of Greyhound Rock Beach interfertile with the reduced in stature interior grassland form?

(f) If the Dudleya rosette patterned coastal cliff analog aka P. maritima was selfed, would this uniquely succulent taxon (relative to all the other local plantains), show any variation in its foliar makeup?

(g) Since the local individual populations of P. elongata, P. erecta, P. maritima and P. subnuda appear to be morphology stable and no apparent pollinators have been observed, are these taxa obligate selfers or is outbreeding via some not recognized vector/pollinating agent (anemophily/wind-pollinated) facilitating the copious number of fertile seed filled capsules observed?

79. The "native" Poaceae documented to date for the Scott Creek Watershed/Environs, are represented by 17 genera and 47 species. In terms of taxa worthy of horticultural/ornamental merit, five species of the genus Melica occupy a wide range of habitats, from coastal bluffs up to chaparral margins. The quintet comprises M. californica, M. harfordii, M. imperfecta, M. subulata and M. torreyana. Throughout the Watershed, two sometimes three of these species grow sympatrically and in several instances, forms intermediate to either parent exist. The most common combination of shared attributes occurs where M. californica and M. torreyana co-exist and individual plants looking like M. torreyana but with larger than normal spikelets, occur. Two collected examples have been documented growing on roadbanks in association with North Coast Scrub (Artemisia californica, Baccharis pilularis, etc.), one along the n-end of Swanton Road and the other growing near the Scott Creek side summit of the Seymore Hill. Whether these two examples of putative interspecific gene flow are hybrids or merely less than typical forms of either sympatric species warrants the collected caryopsis being raised out and studied, both as to F1 population variability and possible DNA profiling. An analogous example of sympatry and possible byproducts of hybridization occurs again along a road bank in the upper reaches of the Little Creek sub-watershed and in this instance, the parents of the putative hybrids are M. imperfecta and M. torreyana. Mature inflorescences for all of these "maybe" hybrids have been deposited with the UCSC Arboretum and would make for an interesting project, namely: Testing the limits of species variability where two related species co-exist, and patterns of intermediacy occur. In terms of morphological plasticity, M. torreyana holds the record within the Watershed, with greatly reduced, densely cespitose plants displaying inflorescences 5cm in length (from basal florets to apex) and at the other extreme,

plants producing inflorescences, measuring circa 1 meter, from base of stem to tip of the branched panicle.

80. On the west facing (Scott Creek side) of the Seymore Hill, two varieties of the same species occur, separated by less than 140 feet in elevation. The two related taxa are Micropus californicus var. californicus and Micropus californicus var. subvestitus, with the former being widespread in the Santa Cruz Mountains and the latter, rare in Santa Cruz County. With the two varieties separated by less than a walking distance of 800-900 feet and neither population observed producing examples of the other variety, this raises some interesting questions: (a) Since both populations have been documented with herbarium pressings and copious cypselae collections, would these two varieties of M. californicus, one common and the other rare, when raised out, come true to type? (b) If the two varieties are interfertile, what degree of proximity is necessary to share genetic material and what is/are the pollinating vector(s) or are both varieties obligate selfers? (c) With the underlying causation explaining the local rarity of var. subvestitus a worthwhile research topic, would the selfing of var. californicus produce a percentage of var. subvestitus in the offspring and possibly explain the origin of var. subvestitus? (d) Does the spreading versus appressed indument, clothing the receptacular bracts, have any significance in facilitating the dispersal of the enclosed achenes? (e) Are all populations of var. subvestitus genotypically the same or do their origins differ, with possible backcrossing to var. californicus and selfings within the intraspecific hybrids creating a reticulate pattern of resegregates?

The Google Earth coordinates for the Seymore Hill populations of each variety of M. californicus are as follows:

Micropus californicus var. californicus/37.100269, -122.244204, elevation 606 feet.

Cypselae collection data: 2008-1600, Micropus californicus var. californicus, 05/09/2008, Jim West.
Cypselae collection data: 2009-719, Micropus californicus var. californicus, 06/12/2009, Jim West.
Cypselae collection data: 2009-721, Micropus californicus var. californicus, 05/27/2009, Jim West.
Cypselae collection data: 2009-725, Micropus californicus var. californicus, 05/14/2009, Jim West.

Micropus californicus var. subvestitus/37.098760, -122.241102, elevation 739 feet.

Cypselae collection data: 2008-997, Micropus californicus var. subvestitus, 05/09/2008, Jim

West.

Cypselae collection data: 2009-612, Micropus californicus var. subvestitus, 05/14/2009, Jim West.

Cypselae collection data: 2011-257, Micropus californicus var. subvestitus, 06/02/2011, Jim West.

Cypselae collection data: 2014-342, Micropus californicus var. subvestitus, 05/25/2014, Jim West.

81. Of the three species of Trillium (T. albidum, T. chloropetalum and T. ovatum) found growing within the area circumscribed by the Traversing Swanton Road Essay, only T. chloropetalum displays multiple forms that differ both in color of floral parts and scent.

Are each of these color/scent variants, in reality "micro-species", reproducing via autogamy and thereby stabilizing the traits defining each population and only sharing genetic material with other sympatric populations, when some ecological disturbance brings the still unknown pollinating vector(s) near another genetically isolated population?

Seeing, post anthesis, the anthers arching over and often touching the stigmas, does this mechanical behavior validate the autogamy mode of reproduction or is it a "last ditch/backup" effort to produce seed when the still unknown pollinator is not available? Does this duality of out breeding coupled with the "last ditch/backup" autogamy scenario, allow for adding new genetic material to the population's genomic base while through the selfing mode, stabilized the newly added genetic material? Whatever pollinating strategies are present in the Scott Creek Watershed's Trillium populations, seed set is above average, and populations are expanding both vegetatively and via seedling recruitment.

Since ants transport the Trillium seeds back to their nests to feed on the oil rich elaiosome attachments, does this behavior move some sympatric populations closer to each other?

Initiate a biochemical analysis, focusing on both floral pigments and scent, to determine if these two physical attributes operate in tandem or separately, in the reproductive needs of the species and if chemical "signatures" exist that could validate ancestral genetic exchange from other still existing Trillium species, thereby accounting, in part, for the current diversity of floral traits now existing in the Scott Creek Watershed and the North Coast in general. Using the Gazos Creek populations, including T. albidum (with its lemony scent and thickened cream-colored petals) as a counterpoint to the Swanton Trillium mélange, many parallels can be drawn and create a study plan, considering the distance between these two Trillium rich

areas, what factors have allowed identical patterns of color/scent and foliar patterning, to repeat themselves?

Lastly, with the consistent pattern of the post-anthesis overarching anther/stigma behavior and to date, no pollinating vector observed that could mechanically facilitate pollen transfer (Hymenoptera species), have the original co-evolved pollinating vectors long since become extinct and is autogamy the primary driver perpetuating these "micro species"?

82. Within the Scott Creek Watershed, between the fractured siliceous mudstone banks overlooking the s-end of Swanton Road and the biodiverse Schoolhouse Ridge, Agoseris grandiflora exists in several discernable forms and are all these ecotypes, or is there more than one genotype within this morphological spectrum?
As one ascends Swanton Road, between the Queseria/Molino drainages, a robust form of A. grandiflora occurs, with erect 40cm+ scapes akin to drinking straws topped with fruiting capitula, often 5-7cm across. Growing on the Schoolhouse Ridge/upper Pozzi Meadow is a conspicuously reduced in stature form that blends in with its equally low growing sympatric cousins…. Agoseris heterophylla, Microseris bigelovii and Stebbinsoseris decipiens. Between these two physical extremes, are several other variations in stature, each occupying different ecological niches within the watershed. Since all of these "forms" have been documented with cypselae collections and deposited with the UCSC Arboretum, an interesting study, would be to raise out all of these differing populations under one controlled environment, and see if the extreme examples remain constant, relative to their in-situ counterparts, and if so, then do a DNA profiling, to see if the observable differences have a genetic basis.

#1) 37.040917, -122.224009/Agoseris grandiflora "robust type", growing on nw-facing fractured siliceous mudstone roadbank, overlooking Scott Creek Marsh.

Cypselae collection data: 2007-1156, Agoseris grandiflora, 05/29/2007, Jim West.
Cypselae collection data: 2009-689, Agoseris grandiflora, 05/16/2009, Jim West.
Cypselae collection data: 2013-200, Agoseris grandiflora, 05/30/2013, Jim West.
Cypselae collection data: 2014-96, Agoseris grandiflora, 08/17/2014, Jim West.

#2) 37.087476, -122.248596/Agoseris grandiflora "robust type", growing on slide area overlooking Purdy Road. Robust plants, simulating population along s-end of Swanton Road, overlooking the Scott Creek Marsh. On this same interior fractured siliceous mudstone slide area, two other unrelated taxa, Claytonia perfoliata subsp. perfoliata and Clarkia rubicunda, also exhibit atypical "robustness".

Cypselae collection data: 2015-192, Agoseris grandiflora, 17/17/2015, Jim West.

#3) 37.083243, -122.242350/Agoseris grandiflora "reduced in stature type", growing on both sides of grassy slopes, forming gulchlet which begins at the Upper Pozzi Meadow (Schoolhouse Ridge) and drains into Mill Creek. Individual plants and small clusters 3-5, scattered in amongst Agoseris heterophylla, Microseris bigelovii and Stebbinsoseris decipiens. Raise out and compare with the "robust types" and see if the in situ observed morphological differences are environmental or genetic in their origins.

Cypselae collection data: 2015-193, Agoseris grandiflora, 06/24/2015, Jim West.

83. Do a DNA workup on the solitary Hesperocyparis abramsiana growing along the horse trail, between Emma's Shreve Oak and the lower section of Mt. Cook Gulch (between 37.060485, -122.229175 and 37.063617, -122.229959), to determine if it falls within the circumscription for var. abramsiana or var. butanoensis.

Note: One old tree, at least 20 meters in height, growing along horse trail between Emma's record holding Shreve Oak and the lower section of Mt. Cook Gulch (CalPoly/Swanton Pacific Ranch). Surrounded, up and down slope, by at least 100 (all age category) Torreya californica specimens. A genetic workup needs to be done, to determine if this lone example of a partially Santa Cruz County endemic conifer, is more closely related to the Eagle Rock var. abramsiana or the var. butanoensis, residing next door in the southern part of San Mateo County.

Herbarium data: OBI161496, Hesperocyparis abramsiana, Reed Kenny, 196B, 2019-04-05.

Seed collection data: 2016-133, Hesperocyparis abramsiana, 09/01/2016, Jim West.
Seed collection data: 2016-134, Hesperocyparis abramsiana, 09/01/2016, Jim West.
Seed collection data: 2016-281, Hesperocyparis abramsiana, 05/14/2016, Jim West.
Seed collection data: 2017-428, Hesperocyparis abramsiana, 06/01/2017, Jim West.

84. [This query differs from query 61 by profiling A. crustacea subsp. subcordata and the need to clarify the taxonomic status of this putative disjunct.] The Schoolhouse Ridge contains one of the most complex assemblages of Arctostaphylos in the county, including two forms of the endemic A. glutinosa (the forma typical and the infrequently appearing "green glut"), A. crustacea sensu lato referencing genetic influences from A. andersonii, A. canescens (derived from A. glutinosa), A. sensitive, A. uva-ursi and an isolated population of a close facsimile to A. crustacea subsp. subcordata (a northern Channel Islands taxon). This putative insular

disjunct population of A. crustacea subsp. subcordata (12+ plants), is embedded within a morphologically diverse A. crustacea subsp. crinita population but unlike the sympatric subsp. crinita, is uniform in all its external characteristics (foliar scabridity, gland tipped trichomes, etc..) and most definitely warrants a complete genetic workup, to determine if this taxon and the Channel Islands resident, are one in the same. It is also worth noting, that the traits distinguishing subsp. subcordata (glandular indument, bifacial foliage which adaxially is scabridulous in the extreme, etc.) do not appear in any of the morphologically diverse sympatric subsp. crinita populations.

Herbarium data: UCSC100000081, Arctostaphylus crustacea, Dylan Neubauer, 98b, 2014-09-01.
Herbarium data: UCSC100000082, Arctostaphylus crustacea, Dylan Nuebauer, 98c, 2014-09-01.
Herbarium data: UCSC100000083, Arctostaphylus crustacea, Dylan Neubauer, 98a, 2014-09-01.
Herbarium data: OBI142269, Arctostaphylus crustacea, Dylan M. Neubauer, 98, 2014-09-01.
Herbarium data: OBI142315, Arctostaphylus crustacea subsp. subcordata, Monika Richardson, 112, 2017-07-14.

Stones collection data: 2013-228, Arctostaphylos aff. crustacea subsp. subcordata, 10/22/2013, Jim West.
Stones collection data: 2013-229, Arctostaphylos aff. crustacea subsp. subcordata, 10/22/2013, Jim West.
Stones collection data: 2013-230, Arctostaphylos aff. crustacea subsp. subcordata, 10/22/2013, Jim West.
Stones collection data: 2014-93, Arctostaphylos aff. crustacea subsp. subcordata, 10/14/2014, Jim West.

85. Festuca roemeri (var. klamathensis) exists in two long studied sites within the area defined as the Scott Creek Watershed/Environs and has been synonymized under Festuca idahoensis in the Jepson Manual/Second Edition but is recognized in the Flora of North America North of Mexico. Both sites have been documented with mature inflorescences containing viable caryopses (residing at the UCSC Arboretum) and a revisiting of this betwixt and between taxon, with a genetic analysis and a histological examination of the foliage, should be undertaken, to determine the taxonomic status of this perennial, densely cespitose, native fescue rare within the county and that has ornamental value as a rock garden constituent.

The Google Earth co-ordinates for the two populations, are as follows:

#1) 37.082552, -122.263853, elevation 305 feet/n-end of Swanton Road, grassy slope overlooking (in part) Washout Turn and growing sympatrically with Clarkia aff. davyi

(bicolored flowers/gray encrusted seeds), 12+ long established plants scattered within this exposed maritime coastal grassland with the dense tussocks often circumscribed by meadow vole runs.

Herbarium data: JEPS82399, Festuca roemeri, Roy E. Buck and James A. West, 1983-5-13, 265.

Caryopsis collection data: 2007-1349, Festuca idahoensis, 07/07/2007. Jim West.
Caryopsis collection data: 2008-1655, Festuca idahoensis, 07/12/2008, Jim West.
Caryopsis collection data: 2008-1658, Festuca idahoensis, 06/23/2008, Jim West.
Caryopsis collection data: 2009-868, Festuca idahoensis, 07/22/2009, Jim West.
Caryopsis collection data: 2012-189, Festuca aff. idahoensis, 07/25/2012, Jim West.
Caryopsis collection data: 2012-396, Festuca idahoensis, 07/12/2012, Jim West.
Caryopsis collection data: 2012-442, Festuca aff. idahoensis, 08/17/2012, Jim West.
Caryopsis collection data: 2012-592, Festuca idahoensis, 06/20/2012, Jim West.
Caryopsis collection data: 2013-397, Festuca aff. idahoensis, 07/29/2013, Jim West.

#2) 37.066225, -122.244520, elevation 617 feet

Solar Panel Gate Refugium/small population growing sympatrically with Stebbinsoseris decipiens, Ligusticum apiifolium, Claytonia exigua subsp. exigua and Trifolium willdenovii (low growing, yellow seed type).

Caryopsis collection data: 2009-867, Festuca idahoensis, 08/05/2009, Jim West.
Caryopsis collection data: 2012-593, Festuca aff. idahoensis, 06/23/2012, Jim West.

86. An ecologically specialized environment that is rarely discussed, or systematically explored, are the cliff faces directly above the coastal strand and bearing the full impact of wind patterns, salt spray (both fog transported, and wave buffeted) which is often mixed with fresh water from seeps and periodical exfoliation of the fractured siliceous mudstone (containing and leeching iron based compounds). Using the north and south ends of Scott Creek and Greyhound Rock Beaches, and where possible, the areas in between as base lines, document and study these vertical refugia and what strategies have these resilient taxa employed to succeed under such physiologically impactive stresses. Documenting not only with herbarium pressings and living collections plus seeds, but also with digital images. From past personal experiences, one severe winter storm can eliminate an entire cliff face hosting an aggregation of rare and ecologically site-specific native species. Some of the rare and uncommon “natives” observed and documented for these often difficult to access habitats, are Erythranthe aff. arenicola, Agrostis microphylla, Sagina maxima subsp. crassicaulis and

Agrostis densiflorus ("Big Blue" form).

An interesting research project would be to document those taxa that have representatives growing on both these vertical maritime gardens under extreme ecological pressures but also have populations growing horizontally further inland, outside of the constant impact of salt spray, erosive impacts from wave action during high tides and changes in soil chemistry (accumulated salts coating substrate and corresponding ph changes in growing media). Agrostis densiflora, Pseudognaphalium stramineum and Erythranthe grandis are three examples of taxa occupying both diverse habitats and are there any measurable physiological differences and resulting morphological responses that may warrant separating these taxa along forma or varietal designation? The desnsly matted, rosette forming populations of Pseudognaphalium stramineum growing like furry Dudleyas on the vertical coastal aeries and the robust, 25-50cm+ interior populations, often growing sympatrically with Pseudognaphalium californicum, could form a study in itself…. examining possible differences in chemical signatures of foliage, longevity, presence/absence of pollinating vectors resulting in outbreeding versus obligate selfing syndromes.

87. Within the Scott Creek Watershed proper, four isolated populations of Cryptantha torreyana (sensu lato) have been documented over the past three decades, with the one growing on a ne-facing slope overlooking Swanton Road down from Mountain Lion Gulch, lost in a major landslide during a 1980's El Nino storm series. The remaining three populations, each impacted by the 2009 Lockheed Fire/2020 CZU Lightning Fires, may still exist in the former Ceanothus thyrsiflorus dominated slopes but fortunately have been documented with nutlet collections and deposited with the UCSC Arboretum. A two-pronged research project would be: (a) to raise out and from a taxonomic perspective, determine the status of this rare county wide taxon and is it…. C. torreyana var. torreyana or C. torreyana var. pumila? and (b) revisit the watershed to study the status of the three documented populations and explore for new ones. Below listed, are the general Google Earth co-ordinates for these three populations:

(1) 37.095423, -122.234105, elevation 486 feet/ridge complex, between the Upper Seymore Field and the Mill Creek sub-Watershed, growing along edge of horse trail and an area severely burned by the 2009 Lockheed Fire.

Nutlet collection data: 2007-1215, Cryptantha torreyana, 05/28/2007, Jim West.
Nutlet collection data: 2010-30, Cryptantha torreyana, 07/15/3010, Jim West.

(2) 37.079844, -122.203002, elevation 1219 feet/upper Little Creek sub-Watershed, s-facing hillside along access road/horse trail, en route to the General Smith Redwood.

Nutlet collection data: 2009-633, Cryptantha torreyana, 08/05/2009, Jim West.

(3) 37.063328, -122.234821, elevation 601 feet/e/se facing disjunct chaparral, overlooking central portion of Mt. Cook drainage.

Nutlet collection data: 2008-1541, Cryptantha torreyana, 07/11/2008, Jim West.

88. With the Scott Creek Watershed/Environs considered a botanical "hot spot" and a substantial representation of its native flora documented by 3,000+ seed collections housed with the UCSC Arboretum, raising out select populations from these collections, could engender the following research projects:

(a) Creating in depth herbarium collections for those taxa deemed endangered, rare, of uncertain taxonomic status and poorly represented in herbaria.

(b) Giving permanent documentation to taxa, whose in situ population(s) no longer exist.

(c) Showing the inherent diversity within a taxon's gene pool, that one or even several herbarium specimens cannot…. specifically, those taxa of putative hybrid origin (e.g., Lupinus propinquus E. Greene) or polyploids with complex ancestry (e.g., Dudleya caespitosa, Arctostaphylos crustacea sensu lato).

(d) Observing specific traits that may provide data clarifying a species' taxonomic status which can be lost when studied/pressed as an adult, such as cotyledon morphology and basal juvenile foliage.

(e) With two major ecological holocausts, the 2009 Lockheed Fire and 2020 CZU Lightning Fire, severely impacting the biodiversity of the Scott Creek Watershed, the curated seed collections for the Swanton region, may be the only (when raised out) living material to compare with and validate, the real-time existence of these taxa discussed in the Traversing Swanton Road essay.

89. Study the structural and physiological mechanics of long lived seasonally deciduous/evergreen native taxa that reside within stream beds, securing the various sized cobbles, stabilizing sandbars and can withstand significant periods of submersion due to seasonally elevated water levels.

Research Topics for the Scott Creek Watershed and Environs
James A. West (updated Jan 2019)
Using Carex nudata, Petasites frigidus var. palmatus and Rumex salicifolius as local examples:

(a) Does seasonal dormancy or the deciduous nature of aerial vegetative parts above root systems coupled with the type of epidermal sheathing the rhizomes have, play any role in how these taxa maintain viable root systems, when submerged over extended periods of time?

(b) Do the actual root systems persist for several seasons or are they replaced yearly and if new roots are seasonally regrown, do the previous season's roots persist as anchors, securing the rhizomes/root stocks within the surrounding bedrock/alluvium/seasonal debris?

(c) What external triggers break the dormancy and initiate new growth…. as the season progresses, does the drop in water level coupled with increasing day length and corresponding rise in ambient air temperature?

(d) Often in the case of Petasites frigidus var. palmatus, the erosive nature of the stream flow exposes sections of the extensively branched rhizomes and does this exposure to sunlight, activate growth hormones in the dormant rhizomes?

(e) Other herbaceous perennials that occupy the same riparian corridors and can have their rhizomes/root systems seasonally submerged in moving water, are: Cicuta douglasii, Oenanthe sarmentosa [Apiaceae]; Nasturtium officinale [Brassicaceae]; Datisca glomerata [Datiscaceae]; Erythranthe grandis, Erythranthe inodora, Erythranthe cardinalis [Phrymaceae]; Veronica americana [Plantaginaceae]; Persicaria amphibia, Persicaria punctata [Polygonaceae]; Carex amplifolia, Cyperus eragrostis, Scirpus microcarpus [Cyperaceae]; Juncus xiphioides [Juncaceae]

(f) Study the ecological/genetic diversity [or lack of] value of asexual population expansion via rhizomes being broken up during storm events and carried downstream, lodging on a sandbar, and taking root. Does having elongate/sectionalized rhizomes facilitate this mode of colonization as opposed to those aquatics with caespitose growth patterns?

Note: Relative to native streamside non-woody perennials, Rubus ursinus often has parts of its aerial stems touching or partially submerged and if in contact with the stream flow long enough, develop clusters of roots apically, that if broken off with some stem still intact, can move down stream and lodge on a sandbar or stream bank and expand its genotype asexually.

(g) How long can these stream-based taxa endure total submersion before irreversible damage is incurred to their photosynthesizing parts and during prolonged submersion, can any oxygen be extracted from the surrounding aqueous environment?

90. [This query compliments #70]. Elymus glaucus subsp. virescens is represented by two distinct "forms" within the Scott Creek Watershed/Environs and both need to be carefully studied, to determine if these morphologically divergent taxa, are two ecologically based extremes of one species, one species with two genetically stable varieties or two separate species. Both entities have been documented with multiple collections of mature inflorescences with viable caryopses (stored with the UCSC Arboretum) and would offer valuable material for a research project possibly leading to a published paper. The coastal bluff taxon is the most removed from what is typically referred to as E. glaucus subsp. virescens and is concentrated on the ocean side edge of the Santa Cruz Terrace, overlooking the north and south ends of Greyhound Rock Beach. The Google Earth co-ordinates for both E. glaucus aff. subsp. virescens analogs are as follows:

The reduced in stature, densely caespitose coastal bluff form:

(a) Scattered micro-populations within and adjacent to Dylan's Garden. Between 37.074319, -122.262354, elevation 111 feet and 37.074338, -122.262299, elevation 127 feet.

Inflo/caryopsis data: 2009-877, Elymus glaucus aff. subsp. virescens, 07/02/2009, Jim West.
Inflo/caryopsis data: 2013-106, Elymus glaucus aff. subsp. virescens, 11/27/2013, Jim West.
Inflo/caryopsis data: 2013-120, Elymus glaucus aff. subsp. virescens, 11/27/2013, Jim West.
Inflo/caryopsis data: 2013-205, Elymus glaucus aff. subsp. virescens, 08/13/2013, Jim West.
Inflo/caryopsis data: 2015-77, Elymus glaucus aff. subsp. virescens, 08/13/2015, Jim West.
Inflo/caryopsis data: 2015-78, Elymus glaucus aff. subsp. virescens, 08/13/2015, Jim West.
Inflo/caryopsis data: 2015-93, Elymus glaucus aff. subsp. virescens, 06/20/2015, Jim West.
Inflo/caryopsis data: 2015-94, Elymus glaucus aff. subsp. virescens, 06/20/2015, Jim West.

Inflo/caryopsis data: 2015-95, Elymus glaucus aff. subsp. virescens, 06/20/2015, Jim West.
Inflo/caryopsis data: 2016-214, Elymus glaucus aff. subsp. virescens, 06/27/2016, Jim West.

(b) W-facing edge of bluff overlooking n-end of Greyhound Rock Beach. Scattered micro-populations growing sympatrically with Agrostis blasdalei, Castilleja wightii and TYPE POPULATION OF Trifolium "mini-macraei". 37.080191, -122.267001, elevation 118 feet.

Inflo/caryopsis data: 2002-539, Elymus glaucus aff. subsp. virescens, 09/30/2002, Jim West.
Inflo/caryopsis data: 2007-1060, Elymus glaucus aff. subsp. virescens, 09/21/2007, Jim West.
Inflo/caryopsis data: 2013-104, Elymus glaucus aff. subsp. virescens, 11/27/2013, Jim West.
Inflo/caryopsis data: 2013-121, Elymus glaucus aff. subsp. virescens, 11/27/2013, Jim West.
Inflo/caryopsis data: 2015-98, Elymus glaucus aff. subsp. virescens, 06/16/2015, Jim West.
Inflo/caryopsis data: 2015-99, Elymus glaucus aff. subsp. virescens, 06/16/2015, Jim West.
Inflo/caryopsis data: 2015-100, Elymus glaucus aff. subsp. virescens, 06/16/2015, Jim West.

The interior form, with erect almost filiform culms and all plant parts the opposite of the reduced/condensed gestalt defining the coastal bluff taxon.

(a) Hairpin turn general area, n-end of Swanton Road.
37.084347, -122.263870, elevation 379 feet

Inflo/caryopsis data: 2014-48, Elymus glaucus subsp. virescens, 07/04/2014, Jim West.
Inflo/caryopsis data: 2014-49, Elymus glaucus subsp. virescens, 07/13/2014, Jim West.
Inflo/caryopsis data: 2014-51, Elymus glaucus subsp. virescens, 07/04/2014, Jim West.
Inflo/caryopsis data: 2014-326, Elymus glaucus subsp. virescens, 07/13/2014, Jim West.
Inflo/caryopsis data: 2015-101, Elymus glaucus subsp. virescens, 06/16/2015, Jim West.
Inflo/caryopsis data: 2015-102, Elymus glaucus subsp. virescens, 06/16/2015, Jim West.
Inflo/caryopsis data: 2015-103, Elymus glaucus subsp. virescens, 07/02/2015, Jim West.
Inflo/caryopsis data: 2016-79, Elymus glaucus subsp. virescens, 06/10/2016, Jim West.
Inflo/caryopsis data: 2018-682, Elymus glaucus subsp. virescens, 09/20/2018, Jim West.

(b) N-facing grassy slope, between Las Trancas Arroyo and Last Chance Road, overlooking upper Gianone Barn Gulch Spring. 37.085855, -122.261395, elevation 573 feet

Inflo/caryopsis data: 2015-97, Elymus glaucus subsp. virescens, 06/17/2015, Jim West.
Inflo/caryopsis data: 2015-104, Elymus glaucus subsp. virescens, 07/27/2015, Jim West.
Inflo/caryopsis data: 2016-77, Elymus glaucus subsp. virescens, 06/10/2016, Jim West.
Inflo/caryopsis data: 2016-210, Elymus glaucus subsp. virescens, 07/11/2016, Jim West.
Inflo/caryopsis data: 2018-681, Elymus glaucus subsp. virescens, 09/20/2018, Jim West.

Note: Both above population's habitats were severely compromised by the 2020 CZU Lightning Fires. Whether either population survived is uncertain and these collections may be their only documentation.

The reduced in stature, loosely cespitose, virtually awnless populations found within Dylan's Garden and growing on the w-facing edge of the coastal bluffs overlooking the nw-end of Greyhound Rock Beach, should be studied, and evaluated with reference to a related taxon not documented for Santa Cruz County, namely Elymus pacificus (= Leymus pacificus, Agropyron arenicola). If this distinctive and localized taxon, relative to the other two local components of the Elymus glaucus complex (subsp. glaucous and subsp. virescens) should prove to be conspecific with Elymus pacificus (or the result of past hybridization with), then this would add a new native (and California endemic) grass to the Santa Cruz County plant check list. While the cespitose mode of growth differs from the rhizomatous pattern of E. pacificus sensu strictu, if not an immutable character, then the degree of substrate compactness may have influenced the coastal bluff unique gestalt. An analogous behavior occurred with a population of Agrostis blasdalei growing on eolian sand micro-dunes atop the Agrostis Rectangle, where this normally densely cespitose native grass, displayed distinctly rhizomatous growth patterns with loosely positioned culms.

91. Initiate a study, comparing the wide range of forms Microseris bigelovii displays within the Scott Creek Watershed/Environs, ranging from the ocean edge of the Santa Cruz Terrace up to the Schoolhouse Ridge and determine if more than one species exists, within this taxon's constellation of forms. Cypselae collections for several of these populations reside under the custodial care of the UCSC Arboretum and more need to be made plus in situ herbarium documentation.

(a) 37.060821, -122.253030, elevation 97 feet:

Oceanside edge of Agrostis Rectangle. This population ranged from verdant yet to flower individuals, plants in full flower mode and the majority displaying mature capitula with ready to disperse ripe cypselae, all this taking place late in the growing season, despite the ever-present desiccating presence of the coastal winds. At the same time, those populations further inland (n-end of Swanton Road), were already withered and most of the cypselae had been disperse, the presence of coastal fog, may have aided this populations protracted growth cycle and there may also be an underlying genetic component as well!!!

(b) 37.082630, -122.244089, elevation 355 feet:
Grassy transition zone, between Upper and Lower Pozzi Meadows/growing sympatrically with Stebbinsoseris decipiens.

(c) 37.081297, -122.263458, elevation 314 feet:
n-end of Swanton Road, gravelly edge of tarmac flanked on the left by the Harry Wain Arroyo and overlooking Highway 1/Greyhound Rock Beach parking lot. Growing sympatrically with the immediate coastal low growing component of the Trifolium willdenovii complex with pale yellow seeds. When collected, this population had cypselae double the size of the following population.

(d) 37.074982, -122.253837, elevation 468 feet:
Edge of synform overlooking w-end of the Pumpkin Field Marsh. Growing sympatrically with Stebbinsoseris decipiens, Poa unilateralis, Sanicula arctopoides, Layia platyglossa, Trifolium aff. macraei, Platystemon californicus, Silene verecunda (dark flower phase), Gilia clivorum, et al. This population of Microseris bigelovii was low growing in stature and had mature cypselae ½ the size of the previous discussed population.

92. Within Santa Cruz County, separated by elevation, two subspecies of Deschampsia cespitosa are known to occur (subsp. cespitosa and subsp. holciformis) and to what extent gene flow between these two subspecies has taken place, remains a research topic to pursue. The Scott Creek Watershed populations, growing on CalPoly's Swanton Pacific Ranch (Western Terrace/coastal prairie), are quite uniform as to the characters defining subsp. holciformis and a genetic/morphometric analysis between the Scott Creek populations and those found in neighboring San Mateo County (between Ano Nuevo and Gazos Creek) should be undertaken and then compared with the higher elevation populations (subsp. cespitosa) at Marshall Field, near UCSC Santa Cruz.

Research Topics for the Scott Creek Watershed and Environs
James A. West (updated Jan 2019)

#1) 37.078806, -122.260943, elevation 374 feet/coastal terrace near head of Gulch #1 [Old H-H Ranch].

Herbarium data: JEPS83108, Deschampsia cespitosa subsp. holciformis, Roy E. Buck and James A. West, 350, 1983-6-11.

#2) 37.075345, -122.252538, elevation 477 feet/upper edge of slope, between Buckeye Grove and Cement Reservoir and bisected by Back Ranch Road.

Cypselae collection data: 2012-113, Deschampsia cespitosa subsp. holciformis, 10/10/2012, Jim West.

Cypselae collection data: 2013-129, Deschampsia cespitosa subsp. holciformis, 07/07/2013, Jim West.

Cypselae collection data: 2014-68, Deschampsia cespitosa subsp. holciformis, 06/25/2014, Jim West.

Cypselae collection data: 2016-225, Deschampsia cespitosa subsp. holciformis, 08/28/2016, Jim West.

#3) 37.070047, -122.255157, elevation 355 feet/coastal prairie, between Morehus Arroyo and lower Big Willow Gulch.

Cypselae collection data: 2007-1212, Deschampsia cespitosa subsp. holciformis, 07/30/2007, Jim West.

Cypselae collection data: 2009-665, Deschampsia cespitosa subsp. holciformis, 06/28/2009, Jim West.

#4) 37.077134, -122.260112, elevation 373 feet/Western Terrace (coastal prairie) between Allium Marsh (Gulch #2) and Gulch #3.

Cypselae collection data: 2012-345, Deschampsia cespitosa subsp. holciformis, 06/08/2012, Jim West.
Cypselae collection data: 2013-130, Deschampsia cespitosa subsp. holciformis, 09/12/2013, Jim West.

#5) 37.071881, -122.253208, elevation 385 feet/"micro-refugium", overlooking Frog

Pond/central section of Big Willow Gulch.

Cypselae collection data: 2013-128, Deschampsia cespitosa subsp. holciformis, 06/21/2013, Jim West.

#6) 37.072653, -122.257575, elevation 442 feet/oceanside edge of coastal prairie overlooking Gulch #5[#7]

Cypselae collection data: 2013-131, Deschampsia cespitosa subsp. holciformis, 08/06/2013, Jim West.

#7) 37.071870, -122.255500, elevation 363 feet/oceanside edge of Western Terrace [coastal prairie], between e & w forks of Big Willow Gulch.

Cypselae collection data: 2014-66, Deschampsia cespitosa subsp. holciformis, 08/17/2014, Jim West.

#8) 37.070683, -122.254647, elevation 359 feet/edge of Western Terrace [coastal prairie] overlooking lower Big Willow Gulch/Highway 1.

Cypselae collection data: 2014-67, Deschampsia cespitosa subsp. holciformis, 08/26/2014, Jim West.

93. Hosackia stipularis var. stipularis (Lotus stipularis var. stipularis) …. Within the Scott Creek Watershed proper, this former member of the genus Lotus is rare, and to date, restricted to a narrow strip of chaparral, sandwiched between Last Chance Ridge and the Scott Creek riparian corridor. Occasionally, isolated plants occur growing on sandbars along lower Scott Creek but the preferred habitat for this horticulturally attractive native perennial, appears to be the more xeric higher elevation realm of knobcone pines and manzanitas. The form of H. stipularis that occurs in the Swanton region, is distinctive in being resinous-glandular throughout (except for flowers) and balsam scented, which was typified as (Hosackia balsamifera Kell. Proc. Calif. Acad. 2:123 1861/Lotus balsamiferous Greene, Man. Bay Reg., 93 1894/Hosackia stipularis subsp. balsamifera (Kell.) Abrams).

Due to the rarity of the subsp. balsamifera within Santa Cruz County, at least one batch of seeds should be raised out, with herbarium pressings made and a genetic workup done, comparing the subsp. balsamifera with the non-glandular var. stipularis, to see if

presence/absence of balsam scented glands are indicative of other non-visible molecular distinctions.

#1) 37.105572, -122.258354: n/s aligned ridge, separating upper portion of Lair Gulch from the Last Chance Ridge and the Scott Creek riparian corridor.

Seed collection data: 2009-675, Hosackia stipularis var. stipularis, 06/15/2009, Jim West.
Seed collection data: 2011-415, Hosackia stipularis var. stipularis, 10/15/2011, Jim West.

#2) 37.064558, -122.229874: sandy/gravel streambank edge, between the confluences of Big and Little Creeks with Scott Creek proper. One lg plant, 12+ prostrate stems, some circa 1m in length. All vegetative parts of plant glandular/hairy including calyces except for flowers (banner, wings, keel), being non-glandular, and a white/pink combination in coloration.

Seed collection data: 2004-284, Hosackia stipularis var. stipularis, 09/15/2004, Jim West.
Seed collection data: 2004-285, Hosackia stipularis var. stipularis, 09/15/2004, Jim West.

Note: The seed for this solitary specimen most likely originated in the chaparral of the upper Scott Creek Watershed. Whether the Lair Gulch Population still exists is questionable, since the 2020 CZU Lightning Fire carbonized much of that area, which also included an isolated population of Arctostaphylos glutinosa. Ironically, that population of A. glutinosa was spared immolation from the 2009 Lockheed Fire, by being on the opposite side of the Scott Creek riparian corridor.

94. Triphysaria micrantha/only two documentations of this diminutive annual for Santa Cruz County and both from the Scott Creek Watershed. The two herbarium pressings were taken on the Magic Triangle Ridge where this locally rare taxon was growing intermixed with Triphysaria eriantha subsp. rosea (T. eriantha subsp. eriantha analogs with concolored yellow corollas forming a minority representation) and Triphysaria pusilla (both purple maroon and greenish yellow forms present). Triphysaria micrantha looked like a hybrid between these sympatric relatives and were these scattered individuals diagnosed as T. micrantha, hybrids? The herbarium sheets, deposited with the Jepson Herbarium (UC Berkeley) are as follows:

JEPS82584, Triphysaria micrantha, James A. West, 198, 1984-3-3

JEPS89206, Triphysaria micrantha, James A. West, 28, 1983-2-5

With the technically advanced tools now available, would a revisiting to those two pressings yield any hybrid origin for the specimens and if not, what is the phylogenetic relationship between T. eriantha, T. pusilla and T. micrantha?

95. Supplemental data relative to the Juncus hesperius x Juncus patens natural hybrids… see Queries #47, #48 & #68. This naturally occurring F1 hybrid, had not been documented prior to the 1982/1983 pressings made on the H-H Ranch (the sites of the two pressings, Pumpkin Field Marsh and Sandy Bottom Reservoir, now part of the Cal/Poly Swanton Pacific Ranch holdings). The UCSC Arboretum holds extensive in-situ seed/inflorescence collections, documenting this F1 natural hybrid collected elsewhere within the Scott Creek Watershed/Environs, plus seed collections gathered from ex-situ raised F2 plants, representing the next generation of the original in-situ F1 hybrids. The fertility of the ex-situ raised hybrids varies considerably from plant to plant (circa 1% to 60%) and four F3 generation ex-situ plants have been raised, producing an abundance of capsules (reflecting both parents in morphology) filled with fully formed ovules, suggesting that apomixis may be occurring. All of this, from the in-situ F1 hybrids up thru the ex-situ raised F3 generation, represent terra incognita as to whether plants growing within naturally occurring mixed species populations, are valid species or natural hybrids passing as species. The F1 hybrids, while generally having culms green as in the J. hesperius parent, often possess a slight bluish cast when viewed during the time of day/angle of the sunlight reaching the plants(s) in question but usually have mature capsules overtopped by the perianth parts and when the flowers are open, six stamens are usually present (J. hesperius has 3 stamens while J. paten has 6). Because the F1 natural hybrids generally mimic the J. hesperius parent in the mixed J. hesperius/J. patens populations and to what extent backcrossing or obligate selfing may also be occurring, this hybrid could be more common that its lack of past documentation may suggest.

Note: the two herbarium pressings housed at the Jepson Herbarium (UC Berkeley) are listed below.

JEPS81543, Juncus, Roy E. Buck and James A. West 114, 8/29/1982

JEPS83075, Juncus hesperius, Roy E. Buck and James A. West 407, 7/3/1983

When raising out the Juncus hesperius x Juncus patens F1, F2, F3 hybrids, it is important to understand that the fertile seed is pinprick in size and intermixed with abortive ovules and chaff-like capsule fragments. The seeds are best sown on a sterile medium that is lightly covered with a layer of small sized gravel/sand particles, such as one may find sand bars composed of. Scatter the seeds (fertile, sterile and chaff) over the uneven seed bed surface and thoroughly mist until the seeds are positioned in between the top dressing's granular components. Keep the growing container(s) moist and covered with a pane of glass or some similar light transmitting but moisture retaining material. As the viable seeds imbibe the surrounding moisture and begin to swell, usually after 1-2 weeks, the solitary cotyledon should appear and along with the first leaf, looks less than the terete culms of either hybrid parent or more like a species of grass. Eventually, the cylindrical/terete culms will appear and can range in color, from the glaucous blue of the J. patens parent to grass green, reflecting the J. hesperius parentage. The terete culms of the adult plants may be originally derived from an ancestral grass-like leaf that enfolded on itself and eventually fused its margins, becoming cylindrical/terete in gestalt. With the adult foliage of Juncus species ranging from grass-like (J. occidentalis) thru Iris mimics (J. xiphioides and J. phaeocephalus), the terete culmed Juncus species may be the most recent in evolutionary derivation.

96. Expanding on Query #71a: Within the Scott Creek Watershed/Environs, two visually distinct forms of Trifolium willdenovii occur. These two related taxa are consistent in their habitat preference, mode of growth and seed coloration. Form #1 is found on the immediate coast, is reduced in stature, and consistently produces seeds colored a greenish yellow. Form #2 occupies the interior of the watershed, is robust in overall mode of growth and dependably produces dark brown seeds. Whether the growth patterns and seed coloring disparities reflect differences on a molecular level and warranting varietal status, remains to be seen. Comprehensive documentation via seed collections has been done and the material resides in the custodial care of the UCSC Arboretum. Some enterprising young UCSC researcher, looking to expand the data base of Randall Morgan's Trifolium monograph, should raise out populations for both "variations on a theme" and determine if there are sufficient differences on a molecular level to explain the observable differences on a visual level and justify a new nomenclatural designation.

Form #1 (yellow seed) collection data at UCSC Arboretum:

2015-320, Trifolium aff. willdenovii, 06/03/2015, Jim West.
2015-321, Trifolium aff. willdenovii, 06/03/2015, Jim West.
2016-37, Trifolium willdenovii, 04/28/2016, Jim West.
2017-100, Trifolium aff. willdenovii, 05/26/2017, Jim West.

2018-666, Trifolium willdenovii, 07/17/2018, Jim West.
2018-667, Trifolium willdenovii, 06/11/2018, Jim West.
2018-668, Trifolium willdenovii, 06/11/2018, Jim West.
2018-669, Trifolium willdenovii, 07/02/2018, Jim West.

Form #2 (dark seed) collection data at UCSC Arboretum:

2015-319, Trifolium aff. willdenovii, 06/03/2015, Jim West.
2015-322, Trifolium aff. willdenovii, 08/11/2015, Jim West.
2015-323, Trifolium willdenovii, 06/23/2015, Jim West.
2016-153, Trifolium willdenovii, 07/01/2016, Jim West.
2017-98, Trifolium willdenovii, 06/01/2017, Jim West.
2017-99, Trifolium willdenovii, 05/30/2017, Jim West.
2018-651, Trifolium willdenovii, 06/11/2018, Jim West.
2018-652, Trifolium willdenovii, 06/11/2018, Jim West.

97. Agrostis blasdalei populations in the Scott Creek Watershed/Environs: This rare, 1B.2/Sen, California endemic grass, was not known to occur south of Marin County, until a population numbering in the 800-900 range, was discovered in the late 1970s, growing on the Santa Cruz Terrace, proximal to China Ladder Gulch. After that initial range expansion discovery, this rare California endemic has now been documented as far south (in Santa Cruz County) as Laguna Beach and in the opposite direction, coastal bluffs west of Pescadero Marsh. What distinguishes the populations found within the circumscription of the Scott Creek Watershed/Environs, is not only the extreme variability of this taxon relative to its TYPE description but the documented evidence, showing introgressive hybridization with two sympatric relatives, namely… Agrostis densiflora (itself restricted to the North Coast portion of Santa Cruz County) and Agrostis exarata (var. pacifica). The extensive documentation for the Scott Creek region, with herbarium pressings (Jepson, Norris, Hoover), mature caryopsis collections (deposited with the UCSC Arboretum) and the data included in the Traversing Swanton Road Essay, afford botanists interested in biogeography, species formation/augmentation thru isolation and introgressive gene acquisition with sympatric relatives but also a specific research topic… are the populations south of San Francisco Bay, genetically identical with those occupying the Marin, Mendocino, and Sonoma coasts, and if not, do they warrant a new nomenclatural status, such as sub-species? While more than a dozen local populations have been documented with viable caryopsis collections and extensive herbarium documentation has also taken place, no genetic workups for any of the "South of San Francisco Bay" populations have been initiated.

"Agrostis Rectangle" population, growing on the Santa Cruz Terrace (ocean side of Highway 1), between 37.061469, -122.252435, elevation 155 feet and 37.061613, -122.252201, elevation 167 feet. This site has the largest concentrated population of A. blasdalei discovered to date, south of San Francisco Bay and currently (2021), containing at least 400 individuals. Since the original discovery in the late 1970s, erosion and vehicular access has reduced the population size considerably. This population, due to its sympatry with uncommon sister species, Agrostis densiflora, displayed morphological variability to such a degree, that several dozen herbarium pressings have been made (Jepson, Norris, and Hoover Herbaria), and extensive caryopsis collections (housed at the UCSC Arboretum). Much more work needs to be done, not only with this population but relative to the interior ones residing inland of Highway 1 (both sides of the Santa Cruz Syncline), with regards to morphological plasticity, spatial isolation, introgressive hybridization with A. exarata var. pacifica, response to herbivory, and susceptibility to the ergot fungus.

Herbarium data for Agrostis Rectangle population:

JEPS81559, Agrostis blasdalei, Roy E. Buck and James A. West, 1982-7-25, 102.
JEPS82919, Agrostis blasdalei, Roy E. Buck and James A. West, 1983-6-23, 369.
JEPS82920, Agrostis blasdalei, Roy E. Buck and James A. West, 1983-6-23, 368.
JEPS83603, Agrostis blasdalei, Roy E. Buck and James A. West, 1983-6-23, 370.

Caryopsis collections at the UCSC Arboretum for Agrostis Rectangle population:

2009-38, Agrostis blasdalei, 09/24/2009, Jim West.
2011-307, Agrostis blasdalei, 07/18/2011, Jim West.
2011-308, Agrostis blasdalei, 07/18/2011, Jim West.
2011-309, Agrostis blasdalei, 07/18/2011, Jim West.
2012-115, Agrostis blasdalei, 10/04/2012, Jim West.
2012-275, Agrostis blasdalei, 09/24/2012, Jim West.
2013-169, Agrostis blasdalei, 08/29/2013, Jim West.
2013-202, Agrostis blasdalei, 08/29/2013, Jim West.
2013-239, Agrostis blasdalei, 08/29/2013, Jim West.
2013-240, Agrostis blasdalei, 08/29/2013, Jim West.
2014-108, Agrostis blasdalei, 07/29/2014, Jim West.
2014-111, Agrostis blasdalei, 07/29/2014, Jim West.
2015-194, Agrostis blasdalei, 08/18/2015, Jim West.
2015-195, Agrostis blasdalei, 07/01/2015, Jim West.
2015-196, Agrostis blasdalei, 08/18/2015, Jim West.
2015-197, Agrostis blasdalei, 09/10/2015, Jim West.

2015-198, Agrostis blasdalei, 09/10/2015, Jim West.
2017-287, Agrostis blasdalei, 07/11/2017, Jim West.

"Upper Buckeye Grove Ridge" population, one of two that are the innermost respective to the immediate coastal bluff populations… 37.075703, -122.252694, elevation 465 feet. Growing prostrate when unsupported by adjacent vegetation but vertical when growing up through Baccharis pilularis aff. subsp. pilularis, sympatric taxa of interest include a reduced form of Elymus glaucus subsp. glaucus, Deschampsia cespitosa subsp. holciformis, Lupinus variicolor and Spiranthes romanzoffiana. More than half of this localized Agrostis blasdalei population becomes infected with the Ergot fungus as the inflorescences develop, while adjacent plants are not parasitized. A subject worthy of intensive investigation.

Caryopsis collections at the UCSC Arboretum for "Upper Buckeye Grove Ridge" population:

2011-304, Agrostis blasdalei, 07/17/2011, Jim West.
2012-241, Agrostis blasdalei, 07/22/2012, Jim West.
2012-242, Agrostis blasdalei, 07/22/2012, Jim West.
2012-414, Agrostis blasdalei, 06/30/2012, Jim West.
2013-255, Agrostis blasdalei, 07/07/2013, Jim West.
2014-109, Agrostis blasdalei, 06/25/2014, Jim West.
2015-211, Agrostis blasdalei, 08/07/2015, Jim West.

"Sandy Bottom Reservoir" population, former H-H Ranch (now part of CalPoly's Swanton Pacific Ranch). 37.074046, -122.252903, elevation 462 feet. Both Agrostis blasdalei and Agrostis exarata (var. pacifica) exist within this artificially sculpted, dirt lined (mixed siliceous mudstone fragments and eolian sand deposits) abandoned water storage site and a complex series of hybrid taxa combining the morphological characters of both Agrostis species. These putative hybrids were documented with both herbarium pressings and mature inflorescences containing viable caryopses in the early 1980s and were given the working name of Agrostis "pseudo-densiflora". Other species of native taxa growing sympatrically at the time those pressings were made, are as follows… Cicendia quadrangularis, Pogogyne serpylloides, Crassula aquatica, Zeltnera davyi, Carex x nitidicarpa (fertile hybrid derived from Carex densa x Carex subbracteata), Agrostis blasdalei, Danthonia californica, Juncus bufonius, Juncus phaeocephalus, and two long established interspecific hybrids between Juncus hesperius and Juncus patens. The caryopsis collections for this previously undocumented interspecific Agrostis hybrid, need to be raised out and have a genetic profiling done. These rarely reported, broaching of reproductive isolation barriers between two related taxa, one rare and the other widespread, can shed some light on species formation and established species variability through the inadvertent acquisition of genetic material, possibly due to some

disruptive ecological event.

Herbarium pressings at the Jepson (UC Berkeley) for the "Sandy Bottom Reservoir" interspecific Agrostis hybrids:

JEPS82923, Agrostis blasdalei, Roy E. Buck and James A. West, 1983-8-7, 184.
JEPS82926, Agrostis blasdalei, Roy E. Buck and James A. West, 1983-7-29, 182.

Caryopsis collections at UCSC Arboretum for the "Sandy Bottom Reservoir" interspecific Agrostis hybrids:

2012-243, Agrostis x blasdalei x exarata, 07/22/2012, Jim West.
2012-244, Agrostis x blasdalei x exarata, 07/22/2012, Jim West.
2012-245, Agrostis x blasdalei x exarata, 07/22/2012, Jim West.
2012-246, Agrostis x blasdalei x exarata, 07/22/2012, Jim West.
2012-247, Agrostis x blasdalei x exarata, 07/22/2012, Jim West.
2012-248, Agrostis x blasdalei x exarata, 07/22/2012, Jim West.
2012-410, Agrostis x blasdalei x exarata, 06/30/2012, Jim West.
2012-411, Agrostis x blasdalei x exarata, 07/01/2012, Jim West.
2012-412, Agrostis x blasdalei x exarata, 07/01/2012, Jim West.
2012-413, Agrostis x blasdalei x exarata, 07/01/2012, Jim West.

Note: As of 2021, since the above collections were taken, the composition of plant taxa occupying "Sandy Bottom Reservoir" has been severely compromised by cattle grazing and the physical impacts on the thin vegetative skin covering the mixture of eolian derived sand and fragmented siliceous mudstone. The caryopsis collections may, when raised out, provide the only documented proof of this putative interspecific hybrid's origins subject to genetic analysis.

"Cowboy Shack Gulch" (w-fork), also called "Solar Panel Gate Gulch" … concentrated population growing within w-facing gulchlet draining into central portion of "Cowboy Shack Gulch". Associate native taxa include Clarkia aff. davyi (erect mode of growth, bicolored flowers, grey encrusted seeds), Danthonia californica and Lupinus variicolor. Google Earth co-ordinates are: 37.063967, -122.245885.

Caryopsis collections at the UCSC Arboretum for the w-fork of the Cowboy Shack Gulch population:

2009-3, Agrostis blasdalei, 09/16/2009, Jim West.

2011-474, Agrostis blasdalei, 07/18/2011, Jim West.
2012-389, Agrostis blasdalei, 07/15/2012, Jim West.
2013-232, Agrostis blasdalei, 07/17/2013, Jim West.
2014-110, Agrostis blasdalei, 01/23/2014, Jim West.
2015-200, Agrostis blasdalei, 07/05/2015, Jim West.
2015-210, Agrostis blasdalei, 08/07/2015, Jim West.
2016-219, Agrostis blasdalei, 08/06/2016, Jim West.

Upper portion of s-fork of the "Cookhouse Gulch Complex". Google Earth co-ordinates for this Agrostis blasdalei population are: 37.068932, -122.245636. This population is growing sympatrically with Agrostis exarata (var. pacifica) and several plants show evidence of past hybridization between these two taxa, one widespread and the other, listed (1B.2/Sen) and rare statewide.

Caryopsis collections at the UCSC Arboretum for the "Cookhouse Gulch Complex" population:

2009-266, Agrostis blasdalei, 08/05/2009, Jim West.
2012-240, Agrostis blasdalei, 08/01/2012, Jim West.
2014-112, Agrostis blasdalei, 08/21/2014, Jim West.

98. Stebbinsoseris decipiens/This 1B.2 listed taxon, has its TYPE location in the uppermost reaches of the Scott Creek Watershed, between Scott and Mill Creeks. When first described, it was named Microseris decipiens and is an allotetraploid derivative of Microseris bigelovii and Uropappus lindleyi. At least 20 separate populations of this rare California endemic, exist within the region defined as the Scott Creek Watershed/Environs. Each population's ecological makeup is different, with S. decipiens growing sympatrically with both or one of its diploid parents or without the presence of either. Population size can range from 15-20 individuals up to several hundred members and the overall gross morphology of the plants can vary considerably, not only from population to population, but within a given population. Due to this taxon's rarity, comprehensive cypselae collections have been made for most but not all the Swanton area populations, and these comprising more than three decades of in-depth documentation, are in the custodial care of the UCSC Arboretum. What still needs to be accomplished, are populations raised out from the existing cypselae collections housed at the UCSC Arboretum and herbarium pressings made and shared with various herbaria and research institutions. As of 2021, due to the 2009 and 2020 fires within the Scott Creek Watershed, the fate of many of the in-situ populations is unknown and the envelopes of

cypselae may be the only existing documentation for those populations, to predicate future research projects on. Dr. Susan Lambrecht, of San Jose State University, is doing the first research on this taxon in a long time, dealing with the effects of prolonged drought on the resilience of several of the local populations, using cypselae collections from the same populations covering the span of several years. Ancillary research projects may develop, giving grad students a chance to further explore this allotetraploid with forensic tools not available to Kenton Chambers, when he created the new genus Stebbinsoseris, to accommodate the former Microseris decipiens and Microseris heterocarpa.

Raising out ex situ populations of this rare allotetraploid derivative from each of the in situ documented populations, could yield valuable data as to population formation, whether through hybridization with the sympatric diploid parents, intra-specific crosses within the population, selfing, or where two separate populations are proximal to each other, inter-populational gene flow. Some results from Dr. Susan Lambrecht's recent work on S. decipiens, that absent the presence of a pollinator (her plants were raised in a controlled environment) some form of auto-fecundation (autogamy) was taking place, with the post-anthesis flowers producing cypselae. Were the flowers obligate selfers (cleistogamous) or possibly, was facultative apomixis occurring? Was this behavior a fall-back strategy when a pollinator is absent during flowering and if selfing of some form takes place within each population, does this reduce the variability within the population or stabilize the genetic uniqueness of said population… rendering each population of S. decipiens genetically distinct on some level? With allotetraploid S. decipiens formed by the union of two diploid parents, is the gene flow between the parents, uni-directional or if bi-directional, can that two-way street, possibly lead to more diversity and account for the morphological variability between the S. decipiens populations studied to date?

Note: See query 121. For an in-depth data review of this listed species within the Scott Creek Watershed/Environs.

37.074594, -122.254205, elevation 443 feet (micro-population "a") and 37.074573, -122.254422, elevation 422 feet (micro-population "b")/s, sw-facing edge of synform (above ground manifestation of the Santa Cruz Syncline) overlooking the w-end of the Pumpkin Field Marsh. The Stebbinsoseris decipiens plants behave differently within each of the two proximal but separate populations. In population designated "a", the S. decipiens plants are reduced in stature and are surrounded by an extensive Microseris bigelovii contingent, the majority of which are no more than 2.5-3cm in height. The S. decipiens gathering defined as population "b", growing at the base of the synform, on a mini-slope comprised of large chunks of exfoliated/fractured siliceous mudstone, is unique in that its quasi-succulent foliage allowed it to sustain its annual growth cycle longer into the Summer season than the other documented

S. decipiens populations found within the Scott Creek Watershed region. The “b” S. decipiens population also displayed a trait, inherited from its Uropappus lindleyi parent, in that the base of the mature plant was elevated above ground level, giving the impression that it was about “to take off running”. Population “b”, unlike population “a” situated not more than 15 feet above it, did not share its growing space with either diploid parent or in terms of gross morphology, behaved as if it was a totally separate species. All the related taxa in this partially shared microcosm, were documented with cypselae collections and are deposited with the UCSC Arboretum.

99. Carex gracilior is represented by three small populations in the Scott Creek Watershed/Environs and has been documented with both herbarium pressings (reposing in the Norris Natural History Museum and Hoover Herbarium, CalPoly), and mature inflorescences with viable perigynia (housed at the UCSC Arboretum). Since this is a rare taxon in Santa Cruz County, these three isolated micro-populations need to be raised out and carefully studied in both a morphological and genetic context, to determine their taxonomic relationship with the TYPE specimen, collected in Sonoma, California.

Population #1) 37.084883, -122.248907, elevation 129 feet/Scott Creek riparian corridor, along edge of horse trail that connects Purdy Road with Gianone Barn Gulch drainage.

Herbarium data/UCSC008861, Carex gracilior, Dylan M. Nuebauer, 2014-5-10, 66a-1, Santa Cruz
Herbarium data/UCSC008862, Carex gracilior, Dylan M. Neubauer, 2014-5-10, 66b, Santa Cruz
Herbarium data/UCSC008863, Carex gracilior, Dylan M. Neubauer, 2014-5-10, 66c, Santa Cruz
Herbarium data/UCSC008930, Carex gracilior, Dylan M. Neubauer, 2014-5-10, 66a-2, Santa Cruz
Herbarium data/OBI167652, Carex gracilior, Reed Kenny 933A, 26 June 2019

Perigynia collection data: 2015-123, Carex aff. gracilior, 06/23/2015, Jim West.
Perigynia collection data: 2016-185, Carex gracilior, 07/17/2016, Jim West.

Population #2) 37.062472, -122.253118, elevation 139 feet/Santa Cruz Terrace, between Agrostis Rectangle and China Ladder Gulch. Small population growing in an area of botanical complexity, with Carex x imperfecta, C. “gianonei” (C. harfordii analog), Carex densa, Isolepis cernua (densely tufted perennial form), Dudleya caespitosa, Rumex occidentalis, et al. Documented with herbarium pressings and collections of inflorescences with mature

perigynia, which are deposited with the UCSC Arboretum.

Herbarium data/OBI144630, Carex gracilior, Monika Richardson, 232, 2017-8-3

Perigynia collection data: 2016-70, Carex aff. gracilior, 06/17/2016, Jim West
Perigynia collection data: 2016-71, Carex aff. gracilior, 06/17/2016, Jim West
Perigynia collection data: 2016-186, Carex aff. gracilior, 09/15/2016, Jim West
Perigynia collection data: 2017-324, Carex aff. gracilior, 07/11/2017, Jim West

Population #3) 37.095614, -122.248228, elevation 196 feet/edge of dirt road accessing the Seymore Hill, between Purdy Road and lower Calf Gulch. Mature inflos and perigynia collected and deposited with the UCSC Arboretum.

100. In the early 1980s, I discovered a Sanicula on the Scott Creek side of the upper Seymore Hill area, that in hasty botanizing, could superficially be assigned as being part of the variable S. crassicaulis var. crassicaulis alliance. Upon studying the plants more closely, several defining traits stood out not personally seen on any previous S. crassicaulis var. crassicaulis plants. Having studied the species in situ over the course of several years, these defining morphologies focused on leaf structure and its margining denticulations, biochemical signature of the crushed leaves (distinct from the celery-like odor of S. crassicaulis sensu strictu), and unblemished intensely colored yellow flowers with conspicuously exerted equally bright yellow anthers. The comparison between sympatrically growing S. crassicaulis var. crassicaulis and the new taxon in question, left no doubt that these were two different Saniculas. Even if this localized sanicle was just an undescribed variant of S. crassicaulis, I later found a separate population growing up along the crest of the Seymore Hill, in a grove of Quercus agrifolia, behaving in the self-same fashion and to further raise questions as to its taxonomic status, the late Randall Morgan and Roy Buck, found the same botanical entity, growing in the Crystal Spring Watershed and a perfectly matching specimen was brought back for me to verify. What makes the initial Seymore Hill discovery interesting, were the other Sanicula species growing sympatrically in this isolated ecological niche… Sanicula arctopoides, Sanicula bipinnatifida, Sanicula crassicaulis var. crassicaulis, Sanicula crassicaulis var. nudicaulis and Sanicula hoffmannii. Sanicula crassicaulis, has been considered in some botanical circles, to be a hybrid derived from S. hoffmannii x S. laciniata and could the S. “pseudo-laciniata” be the result of such a union? Both a schizocarp collection and herbarium pressing was made for this imperfectly understood taxon and plants should be raised out, to see if the above enumerated traits are uniformly exhibited in the ex-situ raised population and a genomic profiling done, to see if it combines S. hoffmannii and S. laciniata genetic material.

Herbarium data: JEPS82953, Sanicula crassicaulis, James A. West, 1985-1-22, 298, Santa Cruz.

Schizocarp collection data: 2009-608, Sanicula aff. crassicaulis, 06/02/2009, Jim West, California, Santa Cruz.

101. Carex x gianonei, pro. sp. nov. / This widespread coastal prairie taxon, masquerading as and confused with Carex harfordii, is readily separated from that taxon, by having inflorescences with the lower 1-5(+) spikelets, usually compound-congested (reduced panicle branches derived from C. densa), which can be gynaecandrous, androgynous and/or mixed. Occasionally, spikelets on elongate, filiform stalks arising from near the sheathed base of the flowering culms occur, representing a possible derivation from a third section of the Carex genus, this being the Montanae, with the probable genetic conveyer being C. brevicaulis, often found growing sympatrically on the coastal prairie. All the previously defined traits characterizing Carex x gianonei, pro. sp. nov., appear seasonally on plants which have been observed in-situ for more than two decades and ex-situ offspring, raised from the achenes collected from the in-situ parents, behave in the self-same way. All of the below listed perigynia collections, are from the designated TYPE population. For a more comprehensive overview of this taxonomically unresolved Carex, both from a morphological and genetic basis, review The Traversing Swanton Road Essay (2016) and for additional perigynia collections, consult the UCSC Arboretum seed data base, documenting the Scott Creek Watershed/Environs collections in their possession.

TYPE POPULATION SITE, as designated for Carex gianonei, pro. sp. nov. /between 37.082270, -122.263096, elevation 349 feet and 37.081557, -122.262737, elevation 336 feet… growing in a seasonally wet to moist drainage ditch, paralleling the n-end of Swanton Road and emptying into the Harry Wain Arroyo.

Perigynia collection data: 2012-404, Carex x gianonei, pro. sp. nov., 07/15/2012, Jim West
Perigynia collection data: 2012-554, Carex x gianonei, pro. sp. nov., 11/18/2012, Jim West
Perigynia collection data: 2013-390, Carex x gianonei, pro. sp. nov., 03/04/2013, Jim West
Perigynia collection data: 2013-391, Carex x gianonei, pro. sp. nov., 03/04/2013, Jim West
Perigynia collection data: 2013-392, Carex x gianonei, pro. sp. nov., 03/04/2013, Jim West
Perigynia collection data: 2013-393, Carex x gianonei, pro. sp. nov., 03/04/2013, Jim West
Perigynia collection data: 2013-394, Carex x gianonei, pro. sp. nov., 03/04/2013, Jim West
Perigynia collection data: 2014-313, Carex x gianonei, pro. sp. nov., 06/01/2014, Jim West
Perigynia collection data: 2014-314, Carex x gianonei, pro. sp. nov., 06/01/2014, Jim West
Perigynia collection data: 2016-184, Carex x gianonei, pro. sp. nov., 07/04/2016, Jim West

Research Topics for the Scott Creek Watershed and Environs
James A. West (updated Jan 2019)
Note: Due to the 2020 CZU Lightning Complex fires that engulfed much of the Scott Creek Watershed/Environs, the TYPE population has been reduced to scattered remnants further compromised by road maintenance activity.

102. Carex "nitidicarpa"/along with Carex "imperfecta", this putative, fertile inter-sectional hybrid (Multiflorae x Ovales), constitutes the other component of the Carex "gianonei" complex. Where C. "imperfecta" functions as a
potential uni-directional contributor of inter-sectional hybrid genetic material, with stamens producing pollen but pistils non-functional, the C. "nitidicarpa" offspring appear to be fully fertile, even though morphologically, this taxon combines in situ observable characteristics, that could only be derived from C. densa and C. subbracteata, both of which are growing sympatrically. This poses a question… does the direction of pollen transference between these two species, deliverer versus receiver, determine the fertility of this inter-sectional cross? Comprehensive collections have been made of mature inflorescences and their perigynia and these should be studied carefully and compared with both C. densa (androgynous) and C. subbracteata (gynaecandrous), as to the arrangement of the staminate and pistillate organs. Also, populations need to be raised out, to see the spectrum of parental influences and then having genetic workups done.

Note: The UCSC Arboretum curates at least 25 separate collections of mature inflorescences/cypselae, documenting all of the below listed populations.

#1) 37.089718, -122.262039, elevation 607 feet/seasonally wet slope, which drains into the e-fork of Las Trancas Arroyo (across Last Chance Road from the Laguna de las Trancas), and contains Carex "nitidicarpa" and both of its putative parents, C. densa and C. subbracteata.

#2) between 37.084877, -122.264011, elevation 386 feet and 37.084160, -122.263177, elevation 397 feet/s-facing slope, paralleling n-end of Swanton Road and becoming saturated during the Winter/Spring rains, behaving like a seasonal marsh. This area is dominated by two Carex species, C. densa and C. subbracteata, with scattered examples of their fertile inter-specific hybrid, C." nitidicarpa".

#3) 37.075223, -122.247229, elevation 377 feet/"Bulb Field", an area which has been subject to several types of agricultural usages and within its +/- rectilinear center, following heavy rainfall, becomes a seasonal bog. Despite the multiple ecological disruptions, the populations of carices have persisted, and include… C. densa, C. subbracteata and the three putative derivatives from those two parents, C. "gianonei" (C. harfordii matrix), C. "imperfecta" and C. "nitidicarpa".

#4) 37.069804, -122.250952, elevation 458 feet/s-facing slope, below the Grey Hayes "test plot", overlooking and transitioning into the coastal prairie (Western Terrace), between Morehus Arroyo and China Ladder Marsh. This area hosts a complex array of Carex, with C. densa, C. subbracteata and C. obnupta representing the species and C. "gianonei" (C. harfordii matrix), C. "imperfecta" and C. "nitidicarpa", the taxonomic mélange in need of serious study.

#5) 37.070209, -122.253299, elevation 299 feet/marshy micro-habitat, occupying the central portion of Western Terrace, between Big Willow Gulch and Morehus Arroyo. Carex "imperfecta" is an associate component in this localized habitat.

#6) 37.087108, -122.259387, elevation 583 feet/outflow from Laguna de las Trancas, which drains into the upper portion of Gianone Barn Gulch. This seasonally wet habitat contains extensive populations of C. densa and C. subbracteata, along with Trifolium grayi (showy, lg capitula with concolored flowers) and several examples of the Juncus hesperius x Juncus patens hybrid.

103. Pseudognaphalium "gianonei", pro.sp.nov./This is a morphologically stable taxon, putatively derived from hybridization, between Pseudognaphalium californicum and Pseudognaphalium stramineum. The chemical signature of P. "gianonei" combines the distinctive scents of both parents and warrants a separate study of the biochemical makeup of each parent and then seeing if some combination of the two parental scents occurs in the hybrid. Pseudognaphalium "gianonei" frequently occurs along the immediate coast, in the company of one or both parents but can also be found without them. A population of more than 100 individuals was discovered in 2012, growing along the Lockheed Fire Road, that was morphologically uniform and had apparently survived the 2009 Lockheed Fire. Several populations have been documented via cypselae collections and if raised out, could give an in-depth overview as to how each separate population reconfigures its hybrid inheritance and if growing sympatrically with one or both parents, to what extent has backcrossing affected the parent population. If the hybrid is self-fertile, the selfing might also provide some insight as to parental influences and where hybrid and parent(s) co-exist, are there intermediate forms that could be mistaken as aberrant phases of either parent?

Note: A recurring problem, when attempting to collect viable cypselae, is the fact that often many of the developing ovules have been eaten by the larval stage of possibly a diurnal lepidopteran and the waste byproducts can to the naked eye, be misconstrued for cypselae.

Research Topics for the Scott Creek Watershed and Environs
James A. West (updated Jan 2019)
#1) 37.069506, -122.256482, elevation 270 feet/Transverse gulchlet paralleling Highway 1 and +/- connecting the lower portions of Big Willow Gulch and Morehus Arroyo.

Herbarium data: JEPS82801, Pseudognaphalium, Roy E. Buck and James A. West, 293, 1983-5-26.
Herbarium data: JEPS82802, Pseudognaphalium, Roy E. Buck and James A. West, 293, 1983-5-26.

#2) 37.074135, -122.262228, elevation 162 feet/"Dylan's Garden", isolated edge of the Santa Cruz Terrace, overlooking Pelican Rock and the lower half of Greyhound Rock Beach. This isolated botanical "hotspot", has gathered within its topographical "smallness" an abundance of botanical "richness". Some of the associate taxa, include: Erysimum franciscanum (var. crassifolium), Poa unilateralis, Calystegia subacaulis subsp. subacaulis, Agoseris apargioides var. apargioides, Horkelia cuneata var. cuneata, Piperia michaelii, Agrostis densiflora, Fritillaria affinis aff. var. tristulis (or perhaps an undescribed taxon related to F. affinis), etc.

Cypselae collection data: 2015-231, Pseudognaphalium gianonei, pro.sp.nov., 07/11/2015, Jim West.
Cypselae collection data: 2015-233, Pseudognaphalium gianonei, pro.sp.nov., 08/12/2015, Jim West.
Cypselae collection data: 2016-127, Pseudognaphalium gianonei, pro.sp.nov., 07/01/2016, Jim West.
Cypselae collection data: 2018-660, Pseudognaphalium gianonei, pro.sp.nov., 07/09/2018, Jim West.

#3) 37.085360, -122.224290, elevation 1034 feet/Lockheed Fire Road, traversing Mill Creek side of ridge separating the Mill and Big Creek sub-Watersheds.

Cypselae collection data: 2012-165, Pseudognaphalium gianonei, pro.sp.nov., 01/18/2012, Jim West.

#4) Between 37.082758, -122.263771, elevation 306 feet and 37.081454, -122.263014, elevation 336 feet/extended grass covered slope, circumscribed above and below by hairpin turn (Swanton Road), and bordered on the east by the Harry Wain Arroyo and on the west, by Washout Turn.

Cypselae collection data: 2012-449, Pseudognaphalium "gianonei", pro.sp.nov., 01/14/2012,

Jim West.

Cypselae collection data: 2912-530, Pseudognaphalium “gianonei”, pro.sp.nov., 05/30/2012, Jim West.

Cypselae collection data: 2012-531, Pseudognaphalium “gianonei”, pro.sp.nov., 06/08/2012, Jim West.

Cypselae collection data: 2012-551, Pseudognaphalium “gianonei”, pro.sp.nov., 11/18/2012, Jim West.

Cypselae collection data: 2012-552, Pseudognaphalium “gianonei”, pro.sp.nov., 11/15/2012, Jim West.

Cypselae collection data: 2013-377, Pseudognaphalium “gianonei”, pro.sp.nov., 07/28/2013, Jim West.

#5) 37.035637, -122.225467, elevation 115 feet/stabilized eolian dune system, between Swanton Berry Farm and the lower Molino Creek drainage.

Cypselae collection data: 2009-798, Gnaphalium gianonei, pro.sp.nov., 07/28/2009. Jim West.

#6) 37.078454, -122.245425, elevation 99 feet/sw-facing roadbank (Swanton Road), between entrance to Purdy Road and the Mill Creek Bridge.

Cypselae collection data: 2009-800, Gnaphalium gianonei, pro.sp.nov., 07/13/2009, Jim West.

Cypselae collection data: 2011-367, Pseudognaphalium “gianonei”, pro.sp.nov., 09/02/2011. Jim West.

104. Trifolium “mini-macraei”, pro.sp.nov./TYPE population, edge of Santa Cruz Terrace overlooking w-end of Greyhound Rock Beach… 37.080169, -122.267152, elevation 106 feet.

Note: In his monograph of the California Trifoliums, Randall Morgan added several new taxa (based on their genetic signature) from the Scott Creek Watershed region. One such taxon, was originally discovered on the edge of the Santa Cruz Terrace, overlooking the w-end of Greyhound Rock Beach. Since then, additional populations have been found, simulating the TYPE population in reduction of overall gross morphology, growing mainly on exposed siliceous mudstone bedding planes and warrant being raised out and genetically profiled. If each of these analogous populations prove to be genetically identical with the TYPE population and not reduced-in-stature ecotypes of T. macraei sensu strictu, then Santa Cruz

County may have a new endemic clover.

Herbarium data: UCSC100002435, Trifolium macraei, James West, 6/2/2016.
Herbarium data: UCSC100002436, Trifolium macraei, James West, 6/2/2016.

Seed collection data: 2017-73, Trifolium “mini-macraei”, pro.sp.nov., 06/07/2017, Jim West.

Note: Below listed, are some of the documented analogs to the TYPE population of Trifolium “mini-macraei”. pro.sp.nov.

#1) 37.069719, -122.256477, elevation 268 feet/narrow sliver of remnant terrace, separating lower Morehus Arroyo from lower Big Willow Gulch. Scattered but concentrated micro-populations of T. “mini-macraei”, growing in shallow moss-lined depressions, along this weathered/exposed habitat. All taxa within this series of clustered micro-populations, are morphological facsimiles to the constituents of the TYPE population.

Seed/plant material collection data: 2016-167, Trifolium aff. “mini-macraei”, 08/25/2016, Jim West.
Seed/plant material collection data: 2018-658, Trifolium aff. “mini-macraei”, 07/01/2018, Jim West.
Seed/plant material collection data: 2018-659, Trifolium aff. “mini-macraei”, 07/05/2018, Jim West.

#2) 37.066712, -122.254286, elevation 247 feet/w-facing exposed section of remnant terrace, between China Ladder Gulch and Morehus Arroyo.

Seed/plant material collection data: 2017-107, Trifolium aff. “mini-macraei”, 06/05/2017, Jim West.
Seed/plant material collection data: 2017-108, Trifolium aff. “mini-macraei”, 06/05/2017, Jim West.

#3) 37.070306, -122.256446, elevation 267 feet/w-facing eroded terrace, which overlooks/parallels lower Big Willow Gulch.

Seed/plant material collection data: 2016-150, Trifolium aff. “mini-macraei”, 06/30/2016, Jim West.
Seed/plant material collection data: 2017-262, Trifolium aff. “mini-macraei”, 07/25/2017, Jim West.

#4) 37.072183, -122.258251, elevation 261 feet/s-facing exposed terrace face, overlooking Highway 1, between lower Gulch #5 and w-fork of Big Willow Gulch.

Seed/plant material collection data: 2016-148, Trifolium aff. “mini-macraei”, 06/26/2016, Jim West.

#5) 37.083553, -122.264657, elevation 311 feet/sw-facing exposed edge of terrace overlooking original Old Coast Road and +/- 200 feet in elevation above the TYPE location for Trifolium “mini-macraei”.

Seed/plant material collection data: 2016-147, Trifolium aff. “mini-macraei”, 06/24/2016, Jim West.
Seed/plant material collection data: 2017-101, Trifolium aff. “mini-macraei”, 05/28/2017, Jim West.
Seed/plant material collection data: 2017-102, Trifolium aff. “mini-macraei”, 05/28/2017, Jim West.

#6) 37.075566, -122.252585, elevation 472 feet/edge of synform overlooking w-end of Pumpkin Field Marsh.

Seed/plant material collection data: 2016-149, Trifolium “mini-macraei”, 07/25/2016, Jim West.
Seed/plant material collection data: 2017-103, Trifolium “mini-macraei”, 05/24/2017, Jim West.

#7) between 37.072890, -122.252770, elevation 458 feet and 37.072311, -122.252532, 436 feet/top of synform overlooking central portion of Big Willow Gulch/Frog Pond.

Seed/plant material collection data: 2013-64, Trifolium macraei, 05/21/2013, Jim West.

105. Within the Scott Creek Watershed/Environs, at least 15 Stephanomeria populations have been documented via cypselae collections and deposited with the UCSC Arboretum. These in situ populations may represent two, possibly three separate species or hybrid combinations (S. elata, S. exigua and S. virgata), and range in elevation from the “Chalks” (900+ feet) down to the Santa Cruz Terrace (150 + feet). The CZU Lightning Fires, severely damaged the habitats supporting the majority of the Stephanomeria populations and the cypselae collections may be the only source of documentation for the Scott Creek Watershed. The collections were done between 2007 and 2013, with the 2009 Lockheed Fire having a major ecological impact as well.

Research Topics for the Scott Creek Watershed and Environs
James A. West (updated Jan 2019)
A worthwhile research project, would be to raise out plants from each of the documented in situ populations, study the cypselae morphology from the in-situ collections and compare with those produced ex-situ, to determine which species and possible hybrids occur in the Scott Creek region. The Arboretum accession numbers for the 20 cypselae collections are as follows:

2007-1296,
2007-1297,
2009-26,
2009-824,
2009-825,
2010-27,
2010-38,
2010-41,
2010-42,
2010-43,
2010-45,
2010-46,
2011-344,
2011-383,
2011-423,
2012-135,
2013-361,
2013-362,
2013-363,
2013-364.

106. Plagiobothrys bracteatus/This variable taxon, is uncommon within Santa Cruz County. In the Scott Creek Watershed proper, at least one population has been diagnosed as Plagiobothrys hispidulus, which is out of TMJ2 range for this species (OBI45560, Plagiobothrys hispidulus, David J. Keil, V.L. Holland and Larry Kelly, 20636, 1988-5-7). All of the documented populations, as listed below, should have their nutlets carefully evaluated under a microscope, and then an ex situ generation raised out, to determine if more than one taxon is masquerading as the bonafide P. bracteatus. While each of these physically distanced populations superficially resemble each other in gross morphology, on a molecular level (as with Lasthenia californica and Lasthenia gracilis), could one or more of these populations be undiagnosed cryptic species?

Population #1: 37.091403, -122.248606, elevation 154 feet/sw-facing drainage (alluvial fan) of unnamed gulch, crossing Purdy Road, between Calf Gulch and Purdy Road cattleguard.

Nutlet collection data: 2009-753, Plagiobothrys aff. bracteatus, 06/03/2009, Jim West.

Population #2: 37.082495, -122.246746, elevation 123 feet/lower Schoolhouse Gulch Road, where it interdicts Purdy Road.

Nutlet collection data: 2009-635, Plagiobothrys aff. bracteatus, 05/28/2009, Jim West.
Nutlet collection data: 2009-754, Plagiobothrys aff. bracteatus, 06/03/2009, Jim West.
Nutlet collection data: 2011-202, Plagiobothrys aff. bracteatus, 06/03/2011, Jim West.
Nutlet collection data: 2012-54, Plagiobothrys aff. bracteatus, 05/27/2012, Jim West.
Nutlet collection data: 2012-210, Plagiobothrys aff. bracteatus, 07/29/2012, Jim West.
Nutlet collection data: 2012-546, Plagiobothrys aff. bracteatus, 06/09/2012, Jim West.
Nutlet collection data: 2016-272, Plagiobothrys aff. bracteatus, 05/16/2016, Jim West.

Population #3: 37.059694, -122.225832, elevation 111 feet/seasonally moist depressions on old dirt road, paralleling Swanton Road, between the entrance to Old Schoolhouse Gulch Road and the Big Creek Fire Station.

Nutlet collection data: 2007-1175, Plagiobothrys aff. bracteatus, 05/22/2007, Jim West.
Nutlet collection data: 2008-1542, Plagiobothrys aff. bracteatus, 05/16/2008, Jim West.
Nutlet collection data: 2009-755, Plagiobothrys aff. bracteatus, 06/03/2009, Jim West.
Nutlet collection data: 2009-757, Plagiobothrys aff. bracteatus, 05/16/2009, Jim West.

Population #4: 37.084075, -122.246812, elevation 113 feet/edge of Squirrel Flat, paralleling Purdy Road, which is saturated during the Winter/Spring months.

Nutlet collection data: 2009-756, Plagiobothrys aff. bracteatus, 06/14/2009, Jim West.
Nutlet collection data: 2013-268, Plagiobothrys aff. bracteatus, 06/04/2013, Jim West.
Nutlet collection data: 2015-272, Plagiobothrys aff. bracteatus, 06/22/2015, Jim West.
Nutlet collection data: 2015-273, Plagiobothrys aff. bracteatus, 05/30/2015, Jim West.

Population #5: 37.069091, -122.231561, elevation 74 feet/Swanton Pacific Ranch, along horse trail proximal to the confluence of Big and Scott Creeks.

Nutlet collection data: 2011-203, Plagiobothrys aff. bracteatus, 06/30/2011, Jim West.
Nutlet collection data: 2012-545, Plagiobothrys aff. bracteatus, 06/09/2012, Jim West.
Nutlet collection data: 2016-274, Plagiobothrys aff. bracteatus, 05/11/2016, Jim West.

Population #6: 37.074836, -122.239199, elevation 110 feet/drainage ditch along Swanton Road, between entrance to Old Miller Ranch Road and Canfield driveway.

Nutlet collection data: 2012-92, Plagiobothrys aff. bracteatus, 05/27/2012, Jim West.
Nutlet collection data: 2012-280, Plagiobothrys aff. bracteatus, 05/16/2012, Jim West.
Nutlet collection data: 2014-341, Plagiobothrys aff. bracteatus, 05/24/2014, Jim West.
Nutlet collection data: 2017-261, Plagiobothrys aff. bracteatus, 07/02/2017, Jim West.

Population #7: 37.096259, -122.249550, elevation 481 feet/edge of dirt road, which connects Purdy Road with the Scott Creek side of the Seymore Field, paralleling the lower part of the Calf Gulch drainage. Growing sympatrically with both Plagiobothrys diffusus and Trifolium buckwestiorum.

Nutlet collection data: 2011-205, Plagiobothrys aff. bracteatus, 06/30/2011, Jim West.
Nutlet collection data: 2011-259, Plagiobothrys aff. bracteatus, 05/02/2011, Jim West.

Population #8: 37.075471, -122.247228, elevation 375 feet/scattered mat-like colonies, growing in former Bulb Field (aka Hay Field), sympatric with Plagiobothrys chorisianus var. chorisianus.

Nutlet collection data: 2013-67, Plagiobothrys aff. bracteatus, 05/03/2013, Jim West.
Nutlet collection data: 2013-68, Plagiobothrys aff. bracteatus, 05/03/2013, Jim West.
Nutlet collection data: 2013-69, Plagiobothrys aff. bracteatus, 05/03/2013, Jim West.

107. Study the differences in understory species composition, between undisturbed coast redwood and oak/conifer woodlands, compared with post-harvesting or non-anthropogenic disruptions in the same habitats… factoring in changes due to increased light, wind patterns, soil compaction due to vehicular activity, inadvertent introductions of non-native taxa whose ruderal propensities out compete the displaced native species recovery, changes in species/pollinator relationships, seed dispersal mechanisms and altering the relationship between the fungal mycelia within the substrate and the root systems of above surface biota that depend on their often symbiotic relationships.

108. Do a genetic profiling of Nemophila aff. pulchella var. fremontii/This rare local, appears to be closest in overall morphology, to Nemophila pulchella var. fremontii, which would make it a new addition to Santa Cruz County's native species checklist. A molecular workup needs

to be done and when observed growing sympatrically with both Nemophila parviflora and Nemophila pedunculata, no hybrids have been observed. Several localized populations have been documented within the Scott Creek Watershed proper and both herbarium pressings and seed collections (curated by the UCSC Arboretum) have been made for most of them. Several of the pressings deposited with the Jepson Herbarium (UC Berkeley), have been misdiagnosed as Nemophila heterophylla, from which Nemophila aff. pulchella var. fremontii differs in corolla and style configuration (e.g., corolla lobes lanceolate with entire apices and overall length of style, circa 1mm, with branches shallowly bifurcate), and the first developed basal leaves, are arranged in a rosette pattern.

Population #1: 37.084422, -122.255711, elevation 436 feet/s-facing slope, overlooking central section of Gianone Barn Gulch. The habitat is principally a mixed oak/conifer woodland (Quercus agrifolia var. agrifolia, Quercus parvula var. shrevei, Pinus x attenuradiata and Aesculus californica), with Nemophila parviflora growing sympatrically.

Herbarium data: OBI80933, Nemophila, Jim West, 2015-3-28.
Herbarium data: OBI80934, Nemophila, Jim West, 2015-3-28
Herbarium data: UCSC011032, Nemophila, Jim West, 2015-3-28, s.n.
Herbarium data: UCSC011033, Nemophila, Jim West, 2014-3-28, s.n.

Seed collection data: 2011-180, Nemophila aff. pulchella var. fremontii, 05/29/2011, Jim West.
Seed collection data: 2012-65, Nemophila aff. puchella var. fremontii, 05/19/2012, Jim West.
Seed collection data: 2013-257, Nemophila aff. pulchella var. fremontii, 05/09/2013, Jim West.
Seed collection data: 2014-113, Nemophila aff. pulchella var. fremontii, 05/26/2014, Jim West.
Seed collection data: 2015-217, Nemophila pulchella var. fremontii, 04/30/2015, Jim West.
Seed collection data: 2016-277, Nemophila aff. pulchella var. fremontii, 05/12/2016, Jim West.
Seed collection data: 2018-670, Nemophila aff. pulchella var. fremontii, 06/11/2018, Jim West.

Population #2: 37.079475, -122.248524, elevation 155 feet/Bottom of Buckeye Grove Gulch.

Herbarium data: JEPS83082, Nemophila, James A. West, 335.1, 1985-2-20.

Population #3: 37.088414, -122.251375, elevation 159 feet/Mouth of Graveyard Gulch.

Herbarium data: JEPS82946, Nemophila, James A. West, 30.2, 1983-3-28.

Population #4: 37.087043, -122.251292, elevation 149 feet/Mouth of Gianone Barn Gulch, growing sympatrically with Nemophila parviflora and Nemophila pedunculata.

Herbarium data: JEPS82949, Nemophila, James A. West, 33.2, 1983-3-30.

Seed collection data: 2012-56, Nemophila aff. pulchella var. fremontii, 05/27/2012, Jim West.
Seed collection data: 2018-638, Nemophila aff. pulchella var. fremontii, 06/21/2018, Jim West.

Population #5: 37.083655, -122.245510, elevation 150 feet/Lower Schoolhouse Gulch, growing sympatrically with Nemophila parviflora and Nemophila pedunculata.

Herbarium data: OBI166691, Nemophila pulchella var. fremontii, Reed Kenny, 468, 2019-04-27.
Herbarium data: OBI174301, Nemophila pulchella var. fremontii, Reed Kenny, 467B, 2019-04-27.
Herbarium data: UCSC100005820, Nemophila pulchella var. fremontii, Reed Kenny, 665, 2019-05-21.
Herbarium data: UCSC161444, Nemophila pulchella var. fremontii, Reed Kenny, 665, 2019-05-21.

Seed collection data: 2016-276, Nemophila aff. pulchella var. fremontii, 05/18/2016, Jim West.

Population #6: 37.084758, -122.246540, elevation 130 feet/w-facing slope, overlooking Purdy Road and across from Squirrel Flat. This small population appeared post-2009 Lockheed Fire and possibly had been established on this hillside but hidden from view by the Frangula/Toxicodendron tangle.

Seed collection data: 2011-179, Nemophila aff. pulchella var. fremontii, 05/29/2011, Jim West.

Population #7: 37.077348, -122.252640, elevation 328 feet/Upper Haybarn Gulch, contains several small populations, scattered within the upper portion of the Gulch.

Seed collection data: 2012-53, Nemophila aff. pulchella var. fremontii, 05/26/2012, Jim

West.

Note: The below listed herbarium pressings, have been accessioned as Nemophila heterophylla but are Nemophila aff. pulchella var. fremontii.

Herbarium data: JEPS100958, Nemophila heterophylla, Dean W. Taylor, 9652, 1988-5-22.
Herbarium data: JEPS100959, Nemophila heterophylla, Dean W. Taylor, 9653, 1988-5-22.
Herbarium data: JEPS82017, Nemophila heterophylla, Roy E. Buck, James A. West, and R. Dou 1983-4-10.
Herbarium data: JEPS82572, Nemophila heterophylla, James A. West, 30.2, 1983-3-28.
Herbarium data: JEPS82573, Nemophila heterophylla, Roy E. Buck and James A. West, 208, 1983-4-16.

Note: All the above populations for Nemophila (aff.) pulchella var. fremontii, were impacted by the 2020 CZU Lightning Fire and their current in-situ status is unknown.

109. Stachys chamissonis/China Ladder Marsh, 37.066502, -122.251370, elevation 320 feet. This uncommonly beautiful native member of the Lamiaceae, occurs in only one locale within the Scott Creek Watershed/Environs, namely China Ladder Marsh. Within the marsh, S. chamissonis, supported by colonies of Rubus ursinus and low hanging Salix lasiolepis branches, can attain 2.5m in height. With analogous benched marshes, positioned along the oceanside edge of the Western Terrace, between the Scott Creek Marsh (37.042568, -122.228743) and the former Lasher Marsh (37.080718, -122.260641), what ecological factors account for this native taxon's continued presence in only one site?

Herbarium data: JEPS81507, Stachys chamissonis, Roy E. Buck and James A. West, 16, 1982-6-11.
Herbarium data: JEPS81508, Stachys chamissonis, Roy E. Buck and James A. West, 16, 1982-6-11.
Herbarium data: OBI111171, Stachys chamissonis, Monika Richardson, 108, 2017-7-13.
Herbarium data: OBI174310, Stachys chamissonis, Reed Kenny, 950, 2019-07-12.

Nutlet collection data: 2009-671, Stachys chamissonis, 09/01/2009, Jim West.
Nutlet collection data: 2011-408, Stachys chamissonis, 10/17/2011, Jim West.
Nutlet collection data: 2013-123, Stachys chamissonis, 10/22/2013, Jim West.

110. Agrostis aff. exarata/a distinctive member of the A. exarata alliance, which occurs in

ancient marshes within the Scott Creek Watershed bioregion and occasionally elsewhere in Santa Cruz County. While this taxon's awnless lemmas would place it within what was formerly called var. exarata (which occurs along the n-end of Swanton Road in seasonally wet drainage ditches), the habitat, robust growth gestalt and dense/interrupted inflorescences, immediately remove it from its roadside relative. This local native grass, due to its overall distinctiveness, warrants being raised out under controlled conditions and analyzed on both a morphological and molecular level, to see if the observable differences reflect an underlying genetic basis.

#1) 37.094515, -122.257274, elevation 618 feet/Beaver Flat Marsh, upper half.

Caryopsis collection data: 2007-577, Agrostis exarata, 08/06/2007, Jim West.
Caryopsis collection data: 2013-247, Agrostis exarata, 07/07/2013, Jim West.
Caryopsis collection data: 2013-248, Agrostis exarata, 07/07/2013, Jim West.

#2) 37.087858, -122.254144, elevation 376 feet/Marti's Park Marsh.

Caryopsis collection data: 2013-249, Agrostis exarata, 07/07/2013, Jim West.
Caryopsis collection data: 2013-250, Agrostis exarata, 07/07/2013, Jim West.
Caryopsis collection data: 2013-251, Agrostis exarata, 07/07/2013, Jim West.

111. Silene verecunda/The local constituents (subsp. verecunda?) of this taxonomically unresolved species complex (but historically considered a narrowly restricted endemic), are sporadically distributed along the immediate coastal section of the Scott Creek Watershed/Environs and are predictably found growing out of the fractured siliceous mudstone road banks and exposed bedding planes. The majority of the below listed sites with their approximate Google Earth coordinates, have been documented via seed collections, which are curated by the UCSC Arboretum. Some of the pre-1990 herbarium and seed collection data, which follows site #5, due to the broadly drawn site descriptions or lack of site-specific Google Earth coordinates at the time in which the in-situ collections were made, reflect/represent the same general locations but underscore the need to revisit, press, geolocate and capture the individual populations digitally.

Note: All populations need to be genotyped, to see if spatial isolation between each population has resulted in crypticism and a series of genetically distinct micro-species.

#1) 37.082317, -122.263811, elevation 296 feet/n-end of Swanton Road, growing out of fractured siliceous mudstone road bank margining tarmac and facing across road on its outer edge, a

scattered population of Stebbinsoseris decipiens. The case of the dueling listed taxa, both having CRPR (California Rare Plant Rank) 1B.2 status.

Seed collection data: 2012-662, Silene verecunda subsp. verecunda, 04/29/2012, Jim West.
Seed collection data: 2013-284, Silene verecunda subsp. verecunda, 08/26/2013, Jim West.

#2) 37.083525, -122.264701, elevation 299 feet/localized population growing at base of exposed siliceous mudstone bedding planes, which overlook original Old Coast Road (pre-1900).

Seed collection data: 2007-1266, Silene verecunda subsp. verecunda, 06/20/2007, Jim West.
Seed collection data: 2008-1598, Silene verecunda subsp. verecunda, 05/17/2008, Jim West.
Seed collection data: 2016-104, Silene verecunda subsp. verecunda, 05/25/2016, Jim West.
Seed collection data: 2018-493, Silene verecunda, 06/09/2018, Jim West.

#3) 37.074788, -122.253985, elevation 469 feet/scattered plants growing on sw-facing edge of synform (above ground manifestation of Santa Cruz Syncline) overlooking Pumpkin Field Marsh. This small population possesses the darkest flowers seed to date in the Scott Creek Watershed/Environs region. Sympatric native taxa include: Poa unilateralis, Stebbinsoseris decipiens, Microseris bigelovii, Trifolium macraei, Gilia clivorum, Dudleya caespitosa, Layia platyglossa, Lupinus arboreus x variicolor hybrid, Platystemon californicus, etc.

Seed collection data: 2011-482, Silene verecunda subsp. verecunda, 07/17/2011, Jim West.
Seed collection data: 2016-53, Silene verecunda subsp. verecunda, 06/01/2016, Jim West.
Seed collection data: 2017-200, Silene verecunda, 07/17/2017, Jim West.

#4) 37.070325, -122.256542, elevation 256 feet/small population overlooking transverse gulchlet, connecting lower Morehus Arroyo with lower Big Willow Gulch. As with the previous three Silene verecunda populations, this one is also growing on/out of weathered fractured siliceous mudstone.

#5) Between 37.071796, -122.259182 and 37.066414, -122.255072/exposed n-facing siliceous mudstone road banks, between China Ladder Gulch and Dylan's Garden. This population is invisible to the naked eye unless one is positioned directly in front of it and is growing in a near vertical alignment overlooking Highway 1.

Note: The below listed herbarium collections, represent a documented cross section of this rare taxon found within the Scott Creek region and due to road maintenance work and the 2020 CZU Lightning Fire complex, the future viability for some of these populations may exist only in herbarium documentation and seed collections.

Herbarium data: JEPS82771, Silene verecunda subsp. verecunda, James A. West, 43, 1983-4-11.
Herbarium data: JEPS82967, Silene verecunda subsp. verecunda, James A. West, 80, 1983-5-11.
Herbarium data: JEPS82615, Silene verecunda subsp. verecunda, Roy E. Buck and James A. West, 251, 1983-5-4.
Herbarium data: JEPS82662, Silene verecunda subsp. verecunda, Roy E. Buck and James A. West, 262, 1983-5-13.
Herbarium data: JEPS82663, Silene verecunda subsp. verecunda, Roy E. Buck and James A. West, 262, 1983-5-13.
Herbarium data: JEPS81534, Silene verecunda subsp. verecunda, R. Doug Stone, Roy E. Buck, James A. West, 462, 1982-5-13.
Herbarium data: JEPS97527, Silene verecunda subsp. verecunda, R.D. Stone, 678, 1985-6-6.
Herbarium data: JEPS90792, Silene verecunda subsp. verecunda, Dean W. Taylor, 9617, 1988-4-29.
Herbarium data: CAS-BOT-BC175282, Silene verecunda, Dean Wm. Taylor, 9617, 1988-4-29.
Herbarium data: RSA0086974, Silene verecunda, D.W. Taylor, 9617, 1988-4-29.
Herbarium data: OBI140747, Silene verecunda, Monika Richardson, 97, 2017-7-13.
Herbarium data: OBI161838, Silene verecunda subsp. verecunda, Reed Kenny, 965, 2019-07-14.
Herbarium data: OBI166722, Silene verecunda subsp. verecunda, Reed Kenny, 876, 2019-06-27.
Herbarium data: OBI161347, Silene verecunda subsp. verecunda, Reed Kenny, 700, 2019-05-23.
Herbarium data: OBI161336, Silene verecunda subsp. verecunda, Reed Kenny, 679, 2019-05-21.
Herbarium data: OBI161499, Silene verecunda subsp. verecunda, Reed Kenny, 181, 2019-04-03.

112. The Schoolhouse Gulch Complex/framed to the west by Scott Creek (37.092137, -122.245154), to the east by Mill Creek (37.087877, -122.238734), at its top by the Seymore Hill (37.095270, -122.239600) and its base by Swanton Road (37.078772, -122.245140). This ridge/gulch ecosystem contains one of the most biodiverse Arctostaphylos (Manzanita) assemblages (easily 1,000+ individuals) in Santa Cruz County, with burl former A. crustacea subsp. crinita the predominant representative, a small, isolated population that closely

resembles the insular endemic, A. crustacea subsp. subcordata and two forms of the Scott Creek endemic, A. glutinosa. The dominant A. crustacea subsp. crinita is so polymorphic, that one could press fifty examples from any given area within the Schoolhouse Gulch ecosystem and think that you are looking at several dozen separate taxa, all linked by a basal burl. This tetraploid "genetic sponge" reflects such diverse species in its ancestry as A. sensitiva, A. andersonii, A. canescens and possible influences derived from A. uva-ursi and A. pumila. A. crustacea subsp. crinita's stature within the Schoolhouse Gulch environment, ranges from low growing shrubs under two feet in height to one specimen circa 5+ meters in height and from a distance, looking more like a madrone (Arbutus menziesii). Besides the Arctostaphylos diversity populating the Schoolhouse Ridge/Gulch complex, the "vertical grasslands" which occur on both the Scott and Mill Creek sides, host many rare and listed native taxa… see Query 8, sites 2 & 3, of this paper. Since CalPoly/Swanton Pacific Ranch owns a substantial portion of the Schoolhouse Ridge, several seminal student theses could be written on how this island of biodiversity has fared following two major holocausts, eleven years apart… the 2009 Lockheed Fire and the 2020 CZU Lightning Fire Complex.

113. Agrostis densiflora/This endemic grass, principally distributed along the immediate coastline of central and northern California, presents some fascinating research possibilities within the Scott Creek Watershed/Environs. The local populations sort themselves out into three catagories: (a) the reduced in stature, prostrate to ascending form, that resides on the Santa Cruz Terrace/coastal bluffs, usually in soil high in eolian sand deposits overlying the siliceous mudstone bedding planes, (b) putative hybrids between the (a) populations with sympatric and listed endemic (1B.2/Sen) Agrostis blasdalei and (c), the morphologically robust (in all aspects) form growing on permanently moist vertical sea cliff faces, at the upper and lower ends of Scott Creek Beach, designated as "Big Blue". While the UCSC Arboretum caretakes a large collection of A. densiflora mature inflorescences/caryopses, which have been accessioned and are displayed on a comprehensive spreadsheet, the below listings focus on two differing forms of the locally rare species: (1) the complex population, numbering in the hundreds, growing sympatrically with A. blasdalei, on the Santa Cruz Terrace, in an area called the Agrostis Rectangle and (2) the gigas form, growing on moist, vertical cliff faces, with direct exposure to the vagaries of the ocean. Are there differences on a molecular level between these two populations and if so, do they translate out on either a forma or varietal level? What role does the continual presence of moisture play in the "Big Blue" outsized growth gestalt as opposed to the seasonally wet/dry, horizontal alignment of the Agrostis Rectangle populations? The vertical habitat of the s-end of Scott Creek Beach "Big Blue" population is in continual flux, due to the constant exfoliation of the fractured siliceous mudstone, coupled with proximity to the seasonal action of the ocean waves and prevailing

winds…. making the long-time survival for this unique population uncertain.

#1) Between 37.035877, -122,227911, elevation 20 feet and 37.033804, -122.227131, elevation 47 feet/ s-end of Scott Creek Beach, vertical cliff faces supporting "hanging gardens", which have continual moisture and besides providing habitat for the A. densiflora "Big Blue" also host populations of Plantago maritima, Erythranthe grandis, Erigeron glaucus, Fragaria chiloensis, Isolepis cernua (perennial form), etc. This habitat, being unstable, needs to have ex situ populations raised and some plants providing material for herbarium sheets, select specimens established in botanical gardens and caryopses stored away for future in situ restoration.

Caryopsis collection data: 2002-886, Agrostis densiflora, 11/06/2002, Jim West ["Big Blue" form].
Caryopsis collection data: 2014-99, Agrostis densiflora, 09/17/2014, Jim West ["Big Blue" form].
Caryopsis collection data: 2015-212, Agrostis densiflora, 08/13/2015, Jim West ["Big Blue" form].
Caryopsis collection data: 2015-213, Agrostis densiflora, 08/13/2015, Jim West ["Big Blue" form].

Note: There is an excellent photo, taken in situ by Dylan Neubauer, of the "Big Blue" form of Agrostis densiflora at the s-end of Scott Creek Beach. The photo is on the CalPhoto website and the specific data for the image is as follows:
https://calphotos.berkeley.edu/ Agrostis densiflora, California Bent Grass, ID: 0000 0000 0211 2747. @ 2011 Dylan Neubauer

#2) 37.061532, -122.252426, elevation 160 feet/Agrostis Rectangle, an erosion prone, eolian sand/fragmented siliceous mudstone capped portion of the Santa Cruz Terrace, due east of China Ladder Gulch. This unique area contained several hundred Agrostis blasdalei plants when explored in the late 1970s (this was the first documentation for this rare taxon, south of Marin County) and several dozen herbarium pressings were made and deposited with the Jepson Herbarium at UC Berkeley. Sharing this exposed and wind abraded habitat was another rare and related grass, Agrostis densiflora. The A. densiflora population growing at this site, differs in several magnitudes of reduction when compared to the "Big Blue" populations growing at the s-end of Scott Creek Beach. The extreme variability of the A. blasdalei population was, in part, due to the introgression of genetic material from the sympatric and often intermixed A. densiflora population (an occurrence not previously reported for the populations of A. blasdalei north of San Francisco Bay).
Herbarium data: JEPS82899, Agrostis densiflora, Roy E. Buck and James A. West, 371, 1983-6-23.

Caryopsis collection data: 2011-241, Agrostis densiflora, 07/30/2011, Jim West.
Caryopsis collection data: 2011-468, Agrostis densiflora, 07/18/2011, Jim West.
Caryopsis collection data: 2011-469, Agrostis densiflora, 07/18/2011, Jim West.
Caryopsis collection data; 2012-117, Agrostis densiflora, 11/09/2012, Jim West.
Caryopsis collection data: 2012-118, Agrostis densiflora, 11/09/2012, Jim West.
Caryopsis collection data: 2013-180, Agrostis densiflora, 08/29/2013, Jim West.
Caryopsis collection data: 2013-181, Agrostis densiflora, 08/28/2013, Jim West.
Caryopsis collection data: 2013-244, Agrostis densiflora, 08/28/2013, Jim West.
Caryopsis collection data: 2013-478, Agrostis densiflora, 07/29/2013, Jim West.
Caryopsis collection data: 2014-56, Agrostis aff. densiflora, 07/30/2014, Jim West.
Caryopsis collection data: 2014-100, Agrostis aff. densiflora, 07/30/2014, Jim West.
Caryopsis collection data: 2015-204, Agrostis densiflora, 08/21/2015, Jim West.
Caryopsis collection data: 2015-206, Agrostis densiflora, 07/01/2015, Jim West.
Caryopsis collection data: 2016-221, Agrostis densiflora, 06/22/2016, Jim West.
Caryopsis collection data: 2016-222, Agrostis densiflora, 06/30/2016, Jim West.
Caryopsis collection data: 2017-325, Agrostis densiflora, 07/11/2017, Jim West.
Caryopsis collection data: 2017-327, Agrostis densiflora, 07/11/2017, Jim West.

114. Agrostis microphylla/The populations for this rare, in Santa Cruz County, native Agrostis species, occupy three distinctly different habitats: (1) seasonally wet, vertical cliff faces overlooking the s-half of Greyhound Rock Beach, (2) arid, exposed fragmented terrace, midway down Gulch #4 and overlooking Highway 1, and (3) an isolated colony on ridge between the Upper Seymore Field and the Mill Creek riparian corridor. All three Agrostis microphylla populations differ from the forma typica, in possessing a palea and not growing in a vernal pool habitat. The small population growing midway down Gulch #4, in several ways matched Agrostis aristiglumis Swallen from Marin County, which is now subsumed under the A. microphylla name. All these local populations need to be studied on both a morphological and genetic level, and after those diagnostic workups, compared with populations growing away from the central coast.

#1) Between 37.077393, -122.263174 and 37.074715, -122.262362, elevation 74 feet/seasonally wet, vertical siliceous mudstone cliff/waterfall faces, s-end of Greyhound Rock Beach. The seasonal waterfalls, drain the gulches, beginning with Lasher Marsh and moving eastward, that have their origins on the Western Terrace (aka coastal prairie) and in some cases, share rare species… e.g., Erythranthe aff. arenicola (= annual form of Erythranthe grandis?).

Herbarium data: JEPS100279, Agrostis microphylla, Dean W. Taylor, 9307, 1987-8-20.
Herbarium data: UCSC011420, Agrostis microphylla, Dylan M. Neubauer, 908, 2017-4-1.

Caryopsis collection data: 2008-399, Agrostis microphylla, 09/24/2008, Jim West.
Caryopsis collection data: 2015-209, Agrostis microphylla, 07/27/2015, Jim West.
Caryopsis collection data: 2016-89, Agrostis microphylla, 06/02/2016, Jim West.
Caryopsis collection data: 2016-90, Agrostis microphylla, 06/02/2016, Jim West.

#2) 37.075468, -122.260731, elevation 274 feet/se-facing fragmented siliceous mudstone terrace remnant, overlooking lower portion of Gulch #4. This isolated population, was growing in an exposed, arid environment (coastal fog the principal moisture conveyer) and in overall morphology, matched a taxon from Marin County, Agrostis aristiglumis, which has been reduced to synonymy under A. microphylla. Since access to recollect is no longer possible, the status of this taxon is unknown.

Herbarium data: JEPS82598, Agrostis microphylla, James A. West, 218, 1984-5-8.
Herbarium data: JEPS82606, Agrostis microphylla, James A. West, 210, 1984-4-16.

#3) 37.095424, -122.233583, elevation 504 feet/gulchlet draining siliceous mudstone ridge, "Chalks", that separates the Upper Seymore Field from the Mill Creek riparian corridor. This is an area of rich biodiversity, that despite losing much of its aerial biomass in the 2009 Lockheed Fire, has rebounded. The negative byproduct of the fire was the population explosion of fire follower, Ceanothus thyrsiflorus var. thyrsiflorus, which makes access to much of this area problematic. Some of the native taxa sharing this ecologically severe aerie with the Agrostis microphylla, include: Arctostaphylos glutinosa (extensive population of surviving old shrubs and newly emerging recruitments), Arctostaphylos crustacea subsp. crinita (a polymorphic "genetic sponge"), an isolated population of Dudleya caespitosa, that may turn out to be an older and less genetically complex representative of this polyploid/polyphylectic taxon, than the morphologically diverse populations growing on the coastal headlands (e.g. the area between the Agrostis Rectangle and lower China Ladder Gulch), a reduced in stature Eriophyllum confertiflorum var. confertiflorum with intensely colored inflorescences [cypselae collection data: 2012-555, Eriophyllum confertiflorum var. confertiflorum, 02/26/2012, Jim West], a population of Stephanomeria, which appeared the following year containing plants 1.5m in height and are part of a complex in need of a molecular workup [cypselae collection data: 2010-45, Stephanomeria aff. elata, 07/15/2010, Jim West], Festuca octoflora, and numerous other "natives" of interest.

Caryopsis collection data: 2010-28, Agrostis microphylla, 07/15/2010, Jim West.

Note: This population should be raised out and a comparison study done with the populations growing on the seasonally wet cliff faces overlooking the s-end of Greyhound Rock Beach.

Note: The 2020 CZU Lightning Fire Complex, inflicted far more damage to this area than the preceeding 2009 Lockheed Fire, and a final assessment as to what species will be returning, as of 03/2021, is unknown.

115. Plagiobothrys diffusus/this ground hugging, easily overlooked member of the Boraginaceae, was thought to be extinct until it was rediscovered in Swanton, in the 1960s. Several of the Scott Creek Watershed/Environs populations have been documented via herbarium pressings and/or nutlet collections, which are housed with the UCSC Arboretum. Since some of the early documented populations no longer exist or are due to property ownership, not accessible, some of the nutlet collections, held by the UCSC Arboretum, should be raised out…. to both augment the existing nutlet collection and to make a series of additional herbarium pressings, that can be shared with other educational institutions.

#1) 37.099975, -122.244124, elevation 608 feet/Scott Creek side of Seymore Hill, growing on seasonally wet dirt road, connecting Purdy Road to top of Seymore Hill, where road forks and the left branch enters Bettencourt Gulch.

Nutlet collection data: 2009-638, Plagiobothrys aff. diffusus, 05/16/2009, Jim West.
Nutlet collection data: 2011-206, Plagiobothrys aff. diffusus, 06/30/2011, Jim West.

#2) 37.096233, -122.249108, elevation 278 feet/Along margin of dirt road paralleling lower Calf Gulch, which connects Purdy Road with the crest of the Seymore Hill. Two native taxa of interest, due to their rarity or uncommon occurrence locally and growing sympatrically with P. diffusus, are Plagiobothrys aff. bracteatus and Trifolium buckwestiorum.

Nutlet collection data: 2011-260, Plagiobothrys diffusus, 06/06/2011, Jim West.

#3) 37.078629, -122.255716, elevation 491 feet/e-facing slope between the forks of Bifurcate Gulch.

Herbarium data: JEPS83121, Plagiobothrys diffusus, Roy E. Buck and James A. West, 317, 1983-6-4.

116a. Do a study, using long lived native perennial grasses as erosion mitigators for hillside or wetland environments, with emphasis on Calamagrostis nutkaensis (Pacific Reed Grass), Calamagrostis rubescens (Pine Grass), Festuca californica (California fescue), Danthonia

californica (California Wild Oat Grass), Phalaris californica (California Canary Grass) and Stipa pulchra (Purple Needle Grass). Used individually or in combination, test for drought tolerance, soil saturation durability, weed control value, ease of propagation (either from seed or asexual division), post fire responsivity, vigor (re)colonizing recently disturbed habitats, disease resistance, response to grazing and mechanical disturbance, soil binding capacity and deep shade versus full sun exposure tolerance.

116b. Do a parallel study on stream bank, sandbar, and slope margined spring habitats, with the following sedges/Carex amplifolia (Ample-leaved Sedge), Carex bolanderi (Bolander's Sedge), Carex obnupta (Slough Sedge), Carex nudata (Torrent Sedge), Carex barbarae (Santa Barbara Sedge) and Carex tumulicola (Foothill Sedge). Used in conjunction with the below listed Juncus species, the lower repositioned section of Queseria Creek was stabilized along its sinuous margins and nearly two decades later, has maintained its bank stability. Other native members of the Cyperaceae that were incorporated in the restoration mix, were Cyperus eragrostis (Tall Cyperus) and Scirpus microcarpus (Panicled Bulrush).

116c. Expanding on the previous two native plant families (Poaceae and Cyperaceae) containing erosion controlling species, an equally valuable and within the Scott Creek Watershed, available genus, is the vegetatively diverse assemblage of Juncus species. Long lived and tolerating a wide spectrum of conditions, ranging from seasonally saturated/inundated soils through the opposite scenario, prolonged aridity, the following taxa are important restoration components straight from Nature's toolbox: Juncus patens (Spreading Rush), Juncus phaeocephalus (Brown-headed Rush), Juncus hesperius (Bog Rush), Juncus leseurii (Salt Rush) and Juncus effusus var. pacificus (Common Rush). Two additional Juncus species, J. occidentalis (Western Rush) could be used with Danthonia californica in seasonally wet meadows and J. xiphioides (Iris-leaved Rush), a visually arresting compliment to the traditional looking terete stemmed Juncus.

Note: With the repositioning/restoration of lower Queseria Creek nearly two decades old, do a detailed analysis of how effective the utilization of many of the above listed taxa have been in maintaining the contouring of the creek and in conjunction with the native willow species (Salix lasiolepis, Salix lasiandra and Salix sitchensis), have provided a useful blueprint for similar restoration projects elsewhere.
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117. Plagiobothrys chorisianus var. chorisianus/This listed (1B.2) component of the Boraginaceae, is primarily found within several old, landslide derived marshes and tends to grow between (an often climbing into) tussocks of Calamagrostis nutkaensis, Juncus effusus subsp. pacificus and Juncus hesperius. When in full flower, even when hidden from view, an

intense vanilla like scent alerts the olfactory perceptive botanist as to its presence. Below, are listed six such marshes and except for the Lasher Marsh, Plagiobothrys chorisianus var. chorisianus still can be found. Since the 55,000+ years old Laguna de las Trancas, a landslide derived palustrine wetland, is proximal to the Beaver Flat, West Spring and the Marti's Park Marshes, all the results of ancient landslides and are self-contained/isolated habitats, are all of the Plagiobothrys chorisianus var. chorisianus population derived from the same original population or are there genetic differences between each population?

#1) 37.094371, -122.255814, elevation 583 feet/Beaver Flat Marsh.

Nutlet collection data: 2008-1544, Plagiobothrys chorisianus var. chorisianus, 06/17/2008, Jim West.
Nutlet collection data: 2008-1545, Plagiobothrys chorisianus var. chorisianus, 06/17/2008, Jim West.
Nutlet collection data: 2011-201, Plagiobothrys chorisianus var. chorisianus, 06/30/2011, Jim West.
Nutlet collection data: 2014-340, Plagiobothrys chorisianus var. chorisianus, 06/11/2014, Jim West.
Nutlet collection data: 2015-276, Plagiobothrys chorisianus var. chorisianus, 06/01/2015, Jim West.

#2) 37.091252, -122.257901, elevation 592 feet/Rosetta Stone Pine Marsh.

Nutlet collection data: 2008-991, Plagiobothrys chorisianus var. chorisianus, 06/30/2008, Jim West.
Nutlet collection data: 2009-636, Plagiobothrys chorisianus var. chorisianus, 06/02/2009, Jim West.
Nutlet collection data: 2009-760, Plagiobothrys chorisianus, 06/20/2009, Jim West.
Nutlet collection data: 2009-761, Plagiobothrys chorisianus var. chorisianus, 05/27/2009, Jim West.
Nutlet collection data: 2011-258, Plagiobothrys chorisianus var. chorisianus, 06/07/2011, Jim West.
Nutlet collection data: 2012-394, Plagiobothrys chorisianus var. chorisianus, 07/12/2012, Jim West.
Nutlet collection data: 2013-438, Plagiobothrys chorisianus var. chorisianus, 06/30/2013, Jim West.
Nutlet collection data: 2015-277, Plagiobothrys chorisianus var. chorisianus, 05/30/2015, Jim West.

#3) 37.090280, -122.256243, elevation 494 feet/West's Spring Marsh.

Nutlet collection data: 2007-1216, Plagiobothrys chorisianus var. chorisianus, 08/10/2007, Jim West.
Nutlet collection data: 2007-1217, Plagiobothrys chorisianus var. chorisianus, 08/10/2007, Jim West.
Nutlet collection data: 2007-1218, Plagiobothrys chorisianus var. chorisianus, 07/20/2007, Jim West.
Nutlet collection data: 2008-1546, Plagiobothrys chorisianus var. chorisianus, 06/09/2008, Jim West.
Nutlet collection data: 2009-759, Plagiobothrys chorisianus, 06/30/2009, Jim West.
Nutlet collection data: 2011-200, Plagiobothrys chorisianus var. chorisianus, 06/30/2011, Jim West.
Nutlet collection data: 2012-393, Plagiobothrys chorisianus var. chorisianus, 07/12/2012, Jim West.
Nutlet collection data: 2015-274, Plagiobothrys chorisianus var. chorisianus, 06/06/2015, Jim West.

#4) 37.087793, -122.253783, elevation 363 feet/Marti's Park Marsh.

Nutlet collection data: 2008-1543, Plagiobothrys chorisianus var. chorisianus, 08/03/2008, Jim West.
Nutlet collection data: 2009-758, Plagiobothrys chorisianus, 06/21/2009, Jim West.
Nutlet collection data: 2011-204, Plagiobothrys chorisianus var. chorisianus, 06/30/2011, Jim West
Nutlet collection data: 2013-525, Plagiobothrys chorisianus var. chorisianus, 07/07/2013, Jim West.
Nutlet collection data: 2014-130, Plagiobothrys chorisianus var. chorisianus, 09/13/2014, Jim West.
Nutlet collection data: 2015-275, Plagiobothrys chorisianus var. chorisianus, 06/05/2015, Jim West.

#5) 37.085977, -122.250351, elevation 123 feet/Lower Gianone Barn Gulch Marsh.
Note: Small population observed over the course of several years, growing deep within marsh and the whole area currently overridden with Conium maculatum. No pressings or nutlet collections made for this population.

#6) 37.08039ee7, -122.260675, elevation 383 feet/Lasher Marsh.

Herbarium data: JEPS82766, Plagiobothrys chorisianus var. chorisianus, James A. West, 69, 1983-5-3.

#7) 37.080889, -122.250129, elevation 248 feet/Central section of Old Road, where horse trail intersects at water tank.

Herbarium data: JEPS82567, Plagiobothrys chorisianus var. chorisianus, James A. West, 162, 1983-7-8.

#8) 37.075369, -122.247311, elevation 375 feet/Bulb Field aka Hayfield.
Nutlet collection data: 2013-58, Plagiobothrys chorisianus var. chorisianus, 05/03/2013, Jim West.

118. The Flora of the Swanton Pacific Ranch, affords the botanically and ecologically inclined students at CalPoly, a wide range of issues that could result in seminal theses. These range from pure research along taxonomic lines thru interdisciplinary topics, such as using cattle grazing (herbivory) as a replacement for the pre-European presence of tule elk and their co-evolutionary role in maintaining vigorous and species diverse coastal grasslands. An educational scenario falling somewhat in between these two research polarities and not yet developed, is what native plant species on the Swanton Pacific Ranch have immediate horticultural potential, or could be developed through breeding programs? Below listed are a few possibilities:

(a) The Scott Creek Watershed/Environs, contains five native species of Delphinium (Larkspur): D. californicum, D. decorum subsp. decorum, D. hesperium, D. nudicaule and D. patens. Three of these species exist on the Swanton Pacific Ranch and with an innovative breeding program, could possibly create a series of native derived horticultural introductions for the Central Coastal California native gardens. With most garden larkspurs of European derivation, the possibility of combining D. californicum's stature and flower count with D. decorum's intense flower color, could result in a garden subject adaptable to the vagaries of our coastal climate including periods of prolonged fog.

Delphinium decorum subsp. decorum/The Scott Creek Watershed hosts five species of Delphinium, namely: D. californicum subsp. californicum, D. decorum subsp. decorum, D. hesperium subsp. hesperium, D. nudicaule, and D. patens. Of the five listed, D. decorum subsp. decorum is possibly the rarest, with many herbarium collections, both within and outside of Santa Cruz County, made several decades ago. D. hesperium subsp. hesperium, while widespread elsewhere, occurs only in one small area…. the e-facing crest of the Seymore

Hill, overlooking the Upper Seymore Field/Mill Creek sub-watershed. The localized habitat for D. hesperium subsp. hesperium was incinerated during the 2009 Lockheed Fire but a small patch survived, discovered when the area was revisited the following spring. When D. hesperium subsp. hesperium was first observed in the early 1980s, it was growing sympatrically with the relatively common D. patens, but this small colony was distinctive, in having its stems and inflorescence hairy not glabrous/covered with a glaucous bloom. There appears to be hybridization, to some extent within the Scott Creek Watershed, between D. decorum subsp. decorum and D. patens, the hirsute nature of the Seymore Hill D. patens possibly derived from D. decorum subsp. decorum. Some of the coastal plants of D. decorum subsp. decorum appear to evidence the reciprocal effect. D. nudicaule has only been found locally, growing on both consolidated and decomposed granite (quartz diorite) in the Big Creek sub-watershed, although widespread elsewhere. This leaves the locally uncommon "giant" of the five Delphinium species, D. californicum subsp. californicum, some plants reaching 2m+ in height and often growing out of reach, in Toxicodendron diversilobum colonies.

#1) 37.078096, -122.262206, elevation 240 feet/nw-facing slope, near s-fork waterfall of Gulch #1 (old H-H Ranch).

Herbarium data/JEPS81984, Roy E. Buck and James A. West, 185, 1983-4-3.
Herbarium data/JEPS81983, Roy E. Buck and James A. West, 186, 1983-4-3.

#2) 37.078200, -122.248675, elevation 263 feet/nw-facing slope, overlooking central Buckeye Grove Gulch. This population reflected past hybridization with Delphinium patens.

Herbarium data/JEPS81921, Roy E. Buck, James A. West, and R. Doug Stone, 193, 1983-4-10.

#3) 37.058005, -122.236763, elevation 514 feet/w-facing, near vertical slope, overlooking the Prairie Overlook Gulch. Sympatric native species include: Amsinckia lunaris, Thysanocarpus laciniatus, Galium californicum subsp. californicum, Clarkia rubicunda, ect.

Herbarium data/UCSC010498, Delphinium decorum subsp. decorum, Dylan M. Neubauer, Tim Forsell, James A. West and Christian Schwarz, 616, 2016-4-5.
Herbarium data/UCSC010499, Delphinium decorum subsp. decorum, Dylan M. Neubauer, Tim Forsell, James A. West and Christian Schwarz, 616, 2016-4-5.
Herbarium data/UCSC010500, Delphinium decorum subsp. decorum, Dylan M. Neubauer, Tim Forsell, James A. West and Christian Schwarz, 616, 2016-4-5.

#4) 37.083127, -122.263705, elevation 274 feet/w-facing slope overlooking the n-end of Swanton Road, just above Washout Turn.

Seed collection data: 2014-70, Delphinium decorum subsp. decorum, 05/21/2014, Jim West.

Delphinium californicum subsp. californicum/Of the five native Delphinium species found within the confines of the Scott Creek Watershed/Environs, this one owns the epithet gigas, for its stature potential….some plants have been observed, over the past four decades, that attained 2+ meters in height!!!

#1) 37.080525, -122.257592, elevation 525 feet/Magic Triangle…. this botanical "hotspot" also hosts Delphinum decorum subsp. decorum.

Herbarium data: JEPS81497, Delphinium californicum subsp. californicum, Roy E. Buck and James A. West, 28, 1982-6-20.
Herbarium data: JEPS81498, Delphinium californicum subsp. californicum, Roy E. Buck and James A. West, 28, 1982-6-20.

#2) Between 37.055398, -122.225286, elevation 54 feet and 37.056767, -122.225061, elevation 55 feet/w-facing Toxicodendron diversilobum cloaked slope, overlooking Swanton Road, between Winter Creek and Archibald Creek.

Seed collection data: 2007-1222, Delphinium californicum subsp. californicum, 08/02/2007, Jim West.
Seed collection data: 2009-656, Delphinium californicum subsp. californicum, 08/25/2009, Jim West.
Seed collection data: 2009-763, Delphinium californicum subsp. californicum, 07/20/2009, Jim West.
Seed collection data: 2015-115, Delphinium californicum subsp. californicum, 08/13/2015, Jim West.
Seed collection data: 2015-254, Delphinium californicum subsp. californicum, 10/22/2015, Jim West.
Seed collection data: 2016-187, Delphinium californicum subsp. californicum, 08/03/2016, Jim West.

#3) 37.041225, -122.223408, elevation 89 feet/s-end of Swanton Road, brush covered inner bank overlooking Scott Creek Marsh and proximal to a long established Chenopodium

californicum plant.

Seed collection data: 2015-107, Delphinium californicum subsp. californicum, 07/07/2015, Jim West.

#4) 37.035808, -122.225459, elevation 112 feet/relictual eolian dune system, fully covered with native coastal sage scrub vegetation, between Swanton Berry Farm and lower Molino Creek drainage.

Seed collection data: 2009-762, Delphinium californicum subsp. californicum, 07/28/2009, Jim West.

#5) 37.043180, -122.219690, elevation 84 feet/w-facing slope overlooking lower Queseria Creek drainage. This gulch, along with its two companion gulches, "No Name Gulch" and "George Valentine Gulch", contain the only documented populations for Prunus emarginata in the Scott Creek Watershed.

Seed collection data: 2011-422, Delphinium californicum subsp. californicum, 10/11/2011, Jim West.

(b) Of all the native taxa that populate the Swanton Pacific Ranch's 3,200 acres, except for the myriad forms of Arctostaphylos crustacea subsp. crinita, none top the Dudleya caespitosa populations locally for rock garden adaptability, drought tolerance, compactness in growth, and extreme variability in foliar coloration and presentation… with structural complexity and basic alignment of the inflorescences, coming in a close second. Horticultural students could easily raise out flats with hundreds of these succulent jewels for sale in local nurseries specializing in xeriscaping, while at the same time, studying the variations of any given ex-situ raised population, comparing them with the in-situ seed source population and see what genetic contributions D. farinosa, D. lanceolata and D. cymosa may have made.

Note: See Query 54. for detailed data relative to this proposal.

(c) Of the three native rose species growing in the Swanton area, Rosa californica has the greatest potential as a wild garden introduction… its tolerance for a moist substrate, the size of its flowers and the all-pervasive power of its scent, rivalling that of Rhododendron occidentale.

A few years back, I discovered a particularly floriferous population growing in the central portion of Big Willow Gulch, which I collected two envelopes of achenes, curated by the UCSC Arboretum. This is the data I wrote on both envelopes… "CalPoly/Swanton Pacific Ranch,

central portion of Big Willow Gulch. Growing adjacent to Frog Pond, a localized population with exceptionally floriferous "inflos". The cymes can have up to 40 flowers and such an aggregation has ornamental value for any garden. This is one species of rose that does not mind growing in a marsh like environment".

If some enterprising CalPoly student with an ornamental horticulture major and was looking for a native rose with superior qualities to raise out a population, then this might be the candidate. Just seeing if the "floriferous" behavior of the in-situ population showed up in the ex-situ raised offspring would be a worthwhile study, from both an ecological and genetic perspective.

The Google Earth co-ordinates for the population are: 37.071456, -122.253077, elevation 357 ft.
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The achene collection data is: 2013-272, Rosa californica, 11/07/2013, Jim West.
2013-273, Rosa californica, 11/07/2013, Jim West.

119. Carex x imperfecta/intersectional hybrid between C. densa (sect. Multiflorae) and C. subbracteata (sect. Ovales), that is pistillately sterile and possesses functioning stamens. This hybrid taxon, not previously documented until discovered within the Scott Creek Watershed (in the 1960s), is integral to the understanding of two taxa whose taxonomic status has yet to be resolved…. namely, Carex "gianonei" and Carex "nitidicarpa". There are more than 200 examples of Carex x imperfecta occurring within the Scott Creek Watershed/Environs and all of them share the same modus vivendi, with inflorescences displaying functioning stamens (when mature, shedding pollen) but the pistillate components sterile and/or abortive). The gross morphology of this putative intersectional hybrid, ranges from aspects of its C. subbracteata parent to that blatantly reflecting its sect. Multiflorae parent (C. densa), with scabrid margined triquetrous culms terminating in inflorescences that markedly display reduced panicle branches (compound-congested). Since these hybrids are notoriously long lived, many of them have been observed behaving seasonally, over periods of several decades, in the same way as to inflorescence morphology. In the "Research material relative to Carex x imperfecta study" pdf, the theorized origin, basic structural mechanics, relationships to both C. "gianonei" and C. "nitidicarpa" and proposed research solutions to resolving this taxonomic quagmire, are put forth. The below listed inflorescence collections, representing the vast majority of C. x imperfecta plants studied (200+), are meant to be a taxonomic/morphological overview of this yet to be formally described taxon and should ultimately be affixed to herbarium sheets, for DNA extraction and a baseline frame of reference, for further study. Each of the many inflorescence collections, offer a diagnostic window into how new species can possibly form, when reproductive isolating barriers are

broached, and fertility may be restored through outcrossing back on to one or both putative parents and a complex poly-genomic syngameon is created.

Note: It is of paramount importance, that all the below listed Carex x imperfecta collections, be properly mounted and herbarium stored, for they provide the critical material, to not only study the broaching of reproductive isolating barriers through ecological disruption events but how fertility can be restored, through unidirectional backcrossing/outcrossing with sympatric relatives.

Note: The majority of the below listed Carex x imperfecta inflorescence collections, have been transferred from the UCSC Arboretum down to the Hoover Herbarium/CalPoly, San Luis Obispo.

#1) 37.073300, -122.254128, elevation 410 feet/Pumpkin Field Marsh, Western Terrace, area contains 100+ examples of Carex x imperfecta growing sympatrically with both parents, C. densa and C. subbracteata, as well as, both C. “gianonei” (C. harfordii matrix) and C. “nitidicarpa”.

Note: The below listed collections should engage, even the most diehard naysayers, as to the validity of Carex x imperfecta, not as a sterile endgame but a significant key to species formation and exisiting species enrichment, with the underlying evolutionary mechanism, being various types of ecological disturbances, natural and anthropogenic, creating opportunities for the exchange of genetic material.

Inflorescence collection data: 2011-243, Carex x imperfecta, 08/17/2011, Jim West.
Inflorescence collection data: 2011-244, Carex x imperfecta, 08/17/2011, Jim West.
Inflorescence collection data: 2011-268, Carex x imperfecta, 08/06/2011, Jim West.
Inflorescence collection data: 2011-269, Carex x imperfecta, 08/06/2011, Jim West.
Inflorescence collection data: 2011-337, Carex x imperfecta, 09/24/2011, Jim West.
Inflorescence collection data: 2011-440, Carex x imperfecta, 06/30/2011, Jim West.
Inflorescence collection data: 2012-32, Carex x imperfecta, 04/07/2012, Jim West.
Inflorescence collection data: 2012-33, Carex x imperfecta, 04/07/2012, Jim West.
Inflorescence collection data: 2012-34, Carex x imperfecta, 04/07/2012, Jim West.
Inflorescence collection data: 2012-94, Carex x imperfecta, 05/26/2012, Jim West.
Inflorescence collection data: 2012-154, Carex x imperfecta, 02/21/2012, Jim West.
Inflorescence collection data: 2012-541, Carex x imperfecta, 06/08/2012, Jim West.
Inflorescence collection data: 2012-542, Carex x imperfecta, 06/08/2012, Jim West.
Inflorescence collection data: 2012-543, Carex x imperfecta, 06/08/2012, Jim West.
Inflorescence collection data: 2012-544, Carex x imperfecta, 06/08/2012, Jim West.

Inflorescence collection data: 2012-559, Carex x imperfecta, 02/24/2012, Jim West.
Inflorescence collection data: 2012-601, Carex x imperfecta, 06/16/2012, Jim West.
Inflorescence collection data: 2012-602, Carex x imperfecta, 06/16/2012, Jim West.
Inflorescence collection data: 2012-603, Carex x imperfecta, 06/16/2012, Jim West.
Inflorescence collection data: 2012-604, Carex x imperfecta, 06/16/2012, Jim West.
Inflorescence collection data: 2012-605, Carex x imperfecta, 06/16/2012, Jim West.
Inflorescence collection data: 2012-606, Carex x imperfecta, 06/14/2012, Jim West.
Inflorescence collection data: 2012-607, Carex x imperfecta, 06/14/2012, Jim West.
Inflorescence collection data: 2012-608, Carex x imperfecta, 06/14/2012, Jim West.
Inflorescence collection data: 2013-410, Carex x imperfecta, 03/19/2013, Jim West.
Inflorescence collection data: 2013-411, Carex x imperfecta, 03/19/2013, Jim West.
Inflorescence collection data: 2013-412, Carex x imperfecta, 03/19/2013, Jim West.
Inflorescence collection data: 2014-286, Carex x imperfecta, 06/29/2014, Jim West.
Inflorescence collection data: 2014-287, Carex x imperfecta, 06/29/2014, Jim West.
Inflorescence collection data: 2014-328, Carex x imperfecta, 06/22/2014, Jim West.
Inflorescence collection data: 2014-329, Carex x imperfecta, 06/22/2014, Jim West.
Inflorescence collection data: 2014-330, Carex x imperfecta, 06/22/2014, Jim West.
Inflorescence collection data: 2014-331, Carex x imperfecta, 06/22/2014, Jim West.
Inflorescence collection data: 2015-124, Carex x imperfecta, 05/02/2015, Jim West.
Inflorescence collection data: 2015-125, Carex x imperfecta, 05/02/2015, Jim West.
Inflorescence collection data: 2015-126, Carex x imperfecta, 05/02/2015, Jim West.
Inflorescence collection data: 2015-128, Carex x imperfecta, 05/02/2015, Jim West.
Inflorescence collection data: 2015-129, Carex x imperfecta, 05/02/2015, Jim West.
Inflorescence collection data: 2016-135, Carex x imperfecta, 07/02/2016, Jim West.

#2) 37.087823, -122.253680, elevation 359 feet/Marti's Park Marsh. One of a series of landslide derived benched marshes, sympatric to the 55,000+ years old Laguna de las Trancas. Besides containing at least 20 large Carex x imperfecta tussocks, Carex densa, Carex subbracteata, Carex "gianonei" and Carex obnupta also occur.

Inflorescence collection data: 2011-437, Carex x imperfecta, 06/30/2011, Jim West.
Inflorescence collection data: 2011-444, Carex x imperfecta, 06/30/2011, Jim West.
Inflorescence collection data: 2012-27, Carex x imperfecta, 04/01/2012, Jim West.
Inflorescence collection data: 2012-28, Carex x imperfecta, 04/01/2012, Jim West.
Inflorescence collection data: 2012-29, Carex x imperfecta, 04/01/2012, Jim West.
Inflorescence collection data: 2012-300, Carex x imperfecta, 05/16/2012, Jim West.

Inflorescence collection data: 2012-301, Carex x imperfecta, 05/16/2012, Jim West.
Inflorescence collection data: 2012-405, Carex x imperfecta, 06/28/2012, Jim West.

Inflorescence collection data: 2012-407, Carex x imperfecta, 06/28/2012, Jim West.
Inflorescence collection data: 2012-408, Carex x imperfecta, 06/28/2012, Jim West.
Inflorescence collection data: 2012-409, Carex x imperfecta, 06/28/2012, Jim West.
Inflorescence collection data: 2013-154, Carex x imperfecta, 06/16/2013, Jim West.
Inflorescence collection data: 2013-203, Carex x imperfecta, 06/16/2013, Jim West.
Inflorescence collection data: 2013-204, Carex x imperfecta, 06/16/2013, Jim West.
Inflorescence collection data: 2013-206, Carex x imperfecta, 06/16/2013, Jim West.
Inflorescence collection data: 2013-401, Carex x imperfecta, 03/26/2013, Jim West.
Inflorescence collection data: 2013-402, Carex x imperfecta, 03/26/2013, Jim West.
Inflorescence collection data: 2013-403, Carex x imperfecta, 03/26/2013, Jim West.
Inflorescence collection data: 2013-404, Carex x imperfecta, 03/26/2013, Jim West.
Inflorescence collection data: 2014-332, Carex x imperfecta, 06/22/2014, Jim West.
Inflorescence collection data: 2014-333, Carex x imperfecta, 06/22/2014, Jim West.
Inflorescence collection data: 2014-334, Carex x imperfecta, 07/04/2014, Jim West.
Inflorescence collection data: 2015-133, Carex x imperfecta, 06/05/2015, Jim West.
Inflorescence collection data: 2015-134, Carex x imperfecta, 06/05/2015, Jim West.
Inflorescence collection data: 2015-135, Carex x imperfecta, 06/05/2015, Jim West.
Inflorescence collection data: 2015-136, Carex x imperfecta, 06/05/2015, Jim West.
Inflorescence collection data: 2015-137, Carex x imperfecta, 06/05/2015, Jim West.
Inflorescence collection data: 2015-138, Carex x imperfecta, 06/05/2015, Jim West.
Inflorescence collection data: 2015-139, Carex x imperfecta, 06/05/2015, Jim West.

#3) 37.091234, -122.257760, elevation 589 feet/Rosetta Stone Pine Marsh, midway between the Laguna de las Trancas and Beaver Flat Marsh and draining down slope(in part) into West Spring Marsh. This seasonally wet marsh also hosts an extensive population of Plagiobothrys chorisianus subsp. chorisianus.

Inflorescence collection data: 2013-207, Carex x imperfecta, 06/16/2013, Jim West.
Inflorescence collection data: 2013-400, Carex x imperfecta, 03/27/2013, Jim West.
Inflorescence collection data: 2014-74, Carex x imperfecta, 07/05/2014, Jim West.

#4) 37.094403, -122.256651, elevation 596 feet/Beaver Flat Marsh. One of a series of descending (with Beaver Flat Marsh at the top and Marti's Park Marsh at the bottom) landslide derived marshes, proximal to the 55,000+ years old Laguna de las Trancas. Numerous rare and uncommon "natives" exist within and peripheral to this ancient refugium, including: Plagiobothrys chorisianus var. chorisianus, Epilobium hallianum, Sanicula hoffmannii, Triteleia hyacinthina, Galium trifidum subsp. columbianum, Solidago elongate, Rumex occidentalis, etc.

Inflorescence collection data: 2012-25, Carex x imperfecta, 04/04/2012, Jim West.
Inflorescence collection data: 2013-399, Carex x imperfecta, 03/27/2013, Jim West.
Inflorescence collection data: 2014-318, Carex x imperfecta, 06/22/2014, Jim West.

#5) 37.073970, -122.252281, elevation 476 feet/"micro-marsh" upslope from Sandy-bottom Reservoir, which contains 10+ old C. x imperfecta plants (these having been observed, seasonally, over the course of 30+ years), clusters of both Carex densa and Carex subbracteata and scattered examples of Carex "gianonei" (C. harfordii matrix). The uniformity/consistency of the C. x imperfectas seasonal flowering over the time span of several decades, removes from consideration, the idea that the underlying cause for these "inflos" with non-functioning pistils, is imperfect pollination.

Inflorescence collection data: 2011-271, Carex x imperfecta, 08/06/2011, Jim West.
Inflorescence collection data: 2011-441, Carex x imperfecta, 06/30/2011, Jim West.
Inflorescence collection data: 2011-442, Carex x imperfecta, 06/30/2011, Jim West.
Inflorescence collection data: 2012-94, Carex x imperfecta, 05/26/2012, Jim West.
Inflorescence collection data: 2012-299, Carex x imperfecta, 05/11/2012, Jim West.
Inflorescence collection data: 2012-302, Carex x imperfecta, 05/11/2012, Jim West.
Inflorescence collection data: 2014-320, Carex x imperfecta, 06/22/2014, Jim West.
Inflorescence collection data: 2014-321, Carex x imperfecta, 06/22/2014, Jim West.
Inflorescence collection data: 2014-322, Carex x imperfecta, 06/22/2014, Jim West.
Inflorescence collection data: 2016-136, Carex x imperfecta, 07/02/2016, Jim West.

#6) between 37.069661, -122.251022, elevation 452 feet and 37.070132, -122.253244, elevation 377 feet/slope draining into and coastal prairie, between Morehus Arroyo and China Ladder Marsh. This area contains 100+ examples of Carex x imperfecta growing sympatrically with Carex densa, Carex subbracteata, Carex "nitidicarpa", Carex "gianonei" (C. harfordii matrix), Carex obnupta and Carex tumulicola.

Inflorescence collection data: 2011-267, Carex x imperfecta, 08/08/2011, Jim West.
Inflorescence collection data: 2011-302, Carex x imperfecta, 07/20/2011, Jim West.
Inflorescence collection data: 2012-26, Carex x imperfecta, 04/04/2012, Jim West.
Inflorescence collection data: 2012-30, Carex x imperfecta, 04/07/2012, Jim West.
Inflorescence collection data: 2012-31, Carex x imperfecta, 04/07/2012, Jim West.
Inflorescence collection data: 2012-155, Carex x imperfecta, 02/20/2012, Jim West.
Inflorescence collection data: 2013-405, Carex x imperfecta, 03/21/2013, Jim West.
Inflorescence collection data: 2013-406, Carex x imperfecta, 03/21/2013, Jim West.
Inflorescence collection data: 2013-407, Carex x imperfecta, 03/21/2013, Jim West.
Inflorescence collection data: 2013-408, Carex x imperfecta, 03/21/2013, Jim West.

Inflorescence collection data: 2013-409, Carex x imperfecta, 03/21/2013, Jim West.
Inflorescence collection data: 2014-75, Carex x imperfecta, 07/02/2014, Jim West.
Inflorescence collection data: 2014-76, Carex x imperfecta, 07/02/2014, Jim West.
Inflorescence collection data: 2014-77, Carex x imperfecta, 07/02/2014, Jim West.
Inflorescence collection data: 2014-78, Carex x impertecta, 07/02/2014, Jim West.
Inflorescence collection data: 2014-79, Carex x imperfecta, 07/02/2014, Jim West.
Inflorescence collection data: 2015-132, Carex x imperfecta, 05/20/2015, Jim West.

#7) 37.089377, -122.255552, elevation 471 feet/West Spring Marsh, the second in a series of three ancient landslide derived marshes, that constitute a descending alignment, with the Beaver Flat Marsh at the highest point of elevation and the Marti's Park Marsh, at the bottom. Carex x imperfecta and both of its putative parents (C. densa and C. subbracteata), are found, either within or margining these contained wetlands, that have some water present year-round (if only subsurface). Rare and/or uncommon native species shared by this trio of botanical refugia, include: Epilobium hallianum, Calamagrostis nutkaensis, Rumex occidentalis, Plagiobothrys chorisianus var. chorisianus and another Santa Cruz County rarity, Galium trifidum subsp. columbianum (to date, found in two of the three marshes, Beaver Flat and Marti's Park but found upslope, in the Laguna de las Trancas).

Inflorescence collection data: 2011-303, Carex x imperfecta, 07/30/2011, Jim West.
Inflorescence collection data: 2013-398, Carex x imperfecta, 03/27/2013, Jim West.
Inflorescence collection data: 2014-73, Carex x imperfecta, 07/06/2014, Jim West.

120. Trifolium buckwestiorum/discovered in the Scott Creek Watershed in 1957 and given the working name of Trifolium gianonei, pro.sp.nov., then misindentified by a Canadian botanist and was subsumed under a Chilean species, T. triaristatum Bert. ex Colla, then finally Duane Isely determined that it was indeed a valid new species and published it as T. buckwestiorum in Madrono 39(2):90-92, f.2. 1992. There may be other populations, still undiscovered within the Scott Creek Watershed, and a detailed genetic profiling for all the documented populations, has never been undertaken. Seed collections have been made for most of the already pressed populations and these reside at the UCSC Arboretum.

#1) 37.083250, -122.243531, elevation 378 feet/TYPE population, Schoolhouse Ridge, Upper Pozzi Meadow. This population has not been seen since the 2009 Lockheed Fire scorched the TYPE area and much of the grassland surrounding it. Growing sympatrically with Stebbinsoseris decipiens, Lomatium caruifolium var. caruifolium, Plectritis congesta subsp. brachystemon, Stipa pulchra and Danthonia caifornica, all of which rebounded after the 2009 Lockheed Fire.

Herbarium data/JEPS81528, Roy E. Buck, James A. West, Tom Hawke, and Connie Vigno, 1, 1982-5-20.

#2) 37.101606, -122.245535, elevation 558 feet/Scott Creek side of Seymore Hill, growing on dirt road descending into Bettencourt Gulch.

Herbarium data/JEPS83454, R.A. Morgan and J.A. West, 3, 1986-5-3.
Herbarium data/JEPS118496, James A. West, 107, 1983-6-1 (holotype).
Herbarium data/JEPS82767, James A. West, 73, 1983-6-6.

#3) 37.100845, -122.241180, elevation 679 feet/Scott Creek side of Seymore Hill, upper end of "Bowl Area".

Herbarium data/JEPS82502, James A. West, 110, 1983-6-7.

#4) 37.081622, -122.249782, elevation 296 feet/original population discovered in 1957 and still growing proximal to the original Old Coast Road, on a moss/humus substrate overlaying the siliceous mudstone bedrock.

Herbarium data/UCSC008870, Dylan M. Neubauer, 72b, 2014-5-21.
Herbarium data/UCSC008871, Dylan M. Neubauer, 72c, 2014-5-21.
Herbarium data/UCSC008872, Dylan M. Neubauer, 72d, 2014-5-21.

Seed collection data: 2015-313, Trifolium buckwestiorum, 07/31/2015, Jim West.
Seed collection data: 2015-314, Trifolium buckwestiorum, 06/05/2015, Jim West.
Seed collection data: 2015-315, Trifolium buckwestiorum, 08/01/2015, Jim West.
Seed collection data: 2018-663, Trifolium buckwestiorum, 06/24/2018, Jim West.

#5) 37.078241, -122.250742, elevation 328 feet/in the mid-1980s, a small population of T. buckwestiorum was discovered, growing in the grassland margining the Dump Gulch/Buckeye Grove Ridge. This area is no longer accessible, and the status of the Santa Cruz clover is unknown.

#6) 37.063043, -122.214104, elevation 820 feet/ridge between Little and Winter Creek drainages. A few years after the 2009 Lockheed Fire, a grass cover slope surrounded by a mixed conifer/oak woodland, yielded a rich and varied selection of native taxa, amongst this bounty, was a small colony of T. buckwestiorum. This area needs to be revisited and thoroughly botanized.

#7) 37.096167, -122.249035, elevation 278 feet/concentrated population growing along edge of dirt road, which connects Purdy Road with the Scott Creek side of the Seymore Hill. The area in question, drains down into the lower portion of Calf Gulch and while periodically grazed by cattle, this rare clover seems to be able to co-exist with periodic herbivory. Across the dirt road, two other native species of interest have taken up residence, namely Plagiobothrys aff. bracteatus and Plagiobothrys diffusus. Both taxa have been documented via inflorescences containing mature nutlets and are in the custodial care of the UCSC Arboretum.

Seed collection data: 2009-643, Trifolium buckwestiorum, 05/14/2009, Jim West.
Seed collection data: 2012-62, Trifolium buckwestiorum, 05/23/2012, Jim West.

121. Stebbinsoseris decipiens/This 1B.2 listed taxon, has its TYPE location in the uppermost reaches of the Scott Creek Watershed, between Scott and Mill Creeks. When first described, it was named Microseris decipiens and is an allotetraploid , derived from Microseris bigelovii and Uropappus lindleyi. At least 20 separate populations for this rare native exist within the region defined as the Scott Creek Watershed/Environs. Due to this taxon's overall rarity, comprehensive cypsela collections have been made for most but not all of the Scott Creek Watershed/Environs populations, and these, comprising more than three decades of in-depth documentation, are in the custodial care of the UCSC Arboretum. What still needs to be accomplished, are comprehensive herbarium pressings made for these already referenced sites. Dr. Susan Lambrecht, of San Jose State University, is doing the first research on this taxon in a long time, concerning the effects of prolonged drought on the resilience of this taxon and several ancillary research projects may develop, giving grad students a chance to further explore this allotetraploid, with forensic tools not available to Kenton Chambers, when he created the new genus of Stebbinsoseris, to accommodate the former Microseris decipiens and Microseris heterocarpa.

#1) 37.070478, -122.255940, elevation 295 feet/w-facing slope overlooking lower Big Willow Gulch. Scattered population growing sympatrically with Microseris bigelovii, Lasthenia gracilis, Micropus amphibolus, Trifolium aff. mini-macraei, Festuca california, etc.

Cypselae documentation data: 2007-1166, Stebbinsoseris decipiens, 05/27/2007, Jim West.
Cypselae documentation data: 2008-970, Stebbinsoseris decipiens, 05/12/2008, Jim West.
Cypselae documentation data: 2008-1630, Stebbinsoseris decipiens, 05/14/2008, Jim West.
Cypselae documentation data: 2009-829, Stebbinsoseris decipiens, 06/06/2009, Jim West.
Cypselae documentation data: 2016-81, Stebbinsoseris decipiens, 06/13/2016, Jim West.
Cypselae documentation data: 2017-115, Stebbinsoseris decipiens, 05/24/2017, Jim West.

#2) 37.058008, -122.235816, elevation 630 feet/w-facing near vertical slope overlooking Prairie Overlook Gulch. Some associate species, include Amsinckia lunaris, Delphinium decorum subsp. decorum, Thysanocarpus laciniatus, Trifolium macraei, Galium californicum subsp. californicum, Solidago velutina subsp. californica, etc.

Cypselae documentation data: 2016-82, Stebbinsoseris decipiens, 06/03/2016, Jim West.

#3) 37.086725, -122.265709, elevation 318 feet/w-facing grass covered slope paralleling Las Trancas Arroyo and flanked on the east by a mixed conifer/oak woodland. Growing with S. decipiens, are Monardella villosa subsp. franciscana, Leptosiphon androsaceus, Microseris paludosa, etc.

Cypselae documentation data: 2009-835, Stebbinsoseris decipiens, 05/10/2009, Jim West.
Cypselae documentation data: 2009-837, Stebbinsoseris decipiens, 05/21/2009, Jim West.
Cypselae documentation data: 2017-113, Stebbinsoseris decipiens, 06/12/2017, Jim West.

#4) 37.085693, -122.265226, elevation 334 feet/w-facing grassy slope overlooking n-interface of Swanton Road with Highway 1. Growing with Clarkia aff. davyi, Grindelia hirsutula, Micropus californicus aff. var. subvestitus and proximal to an overarching example of the Pinus attenuata x Pinus radiata syngameon.

Cypselae documentation data: 2009-834, Stebbinsoseris decipiens, 05/09/2009, Jim West.
Cypselae documentation data: 2014-344, Stebbinsoseris decipiens, 05/28/2014, Jim West.
Cypselae documentation data: 2015-298, Stebbinsoseris decipiens, 05/03/2015, Jim West.

#5) 37.085688, -122.246827, elevation 251 feet/w-facing steep hillside (Scott Creek side of Schoolhouse Ridge), overlooking Purdy Road/Squirrel Flat. This near vertical grassland hosts a complex assemblage of native taxa, several rare or uncommon and one of the largest populations in the watershed of Stebbinsoseris decipiens, numbering in the 500-600 range. Some of the associate natives include, Malacothrix floccifera, Trifolium ciliolatum, Toxicoscordion fremontii, Dudleya caespitosa, Antirrhinum kelloggii, Piperia elongata, Piperia transversa, Phacelia distans, Scutellaria tuberosa, Eriogonum nudum, sensu lato (a population with inflated stems), Arctostaphylos crustacea subsp. crinita, etc.

Cypselae documentation data: 2007-1299, Stebbinsoseris decipiens, 05/18/2007, Jim West.
Cypselae documentation data: 2009-828, Stebbinsoseris decipiens, 06/10/2009, Jim West.
Cypselae documentation data: 2009-830, Stebbinsoseris decipiens, 06/10/2009, Jim West.
Cypselae documentation data: 2014-147, Stebbinsoseris decipiens, 05/05/2014, Jim West.

Cypselae documentation data: 2015-293, Stebbinsoseris decipiens, 06/02/2015, Jim West

#6) 37.082603, -122.244098, elevation 355 feet/grass covered corridor between Upper and Lower Pozzi Meadows. A concentrated population of Stebbinsoseris decipiens growing intermingled with co-parent, Microseris bigelovii. Associate native taxa include Castilleja densiflora subsp. densiflora, Lomatium caruifolium var. caruifolium, Melica californica, Danthonia californica, Plectritis congesta subsp. brachystemon and nearby, the seasonally wet depression where the TYPE specimen for the listed (1B.1/Sen) Trifolium buckwestiorum aka Santa Cruz clover, was collected. The 2009 Lockheed Fire turned this grassland habitat into a blackened carpet but ironically, all of the aforementioned natives save the Trifolium buckwestiorum, survived.

Cypselae documentation data: 2007-1302, Stebbinsoseris decipiens, 05/17/2007, Jim West.
Cypselae documentation data: 2008-1008, Stebbinsoseris decipiens, 05/08/2008, Jim West.
Cypselae documentation data: 2012-519, Stebbinsoseris decipiens, 06/05/2012, Jim West.
Cypselae documentation data: 2013-57, Stebbinsoseris decipiens, 05/01/2013, Jim West.
Cypselae documentation data: 2015-299, Stebbinsoseris decipiens, 05/08/2015, Jim West.
Cypselae documentation data: 2016-38, Stebbinsoseris decipiens, 04/28/2016, Jim West.
Cypselae documentation data: 2017-117, Stebbinsoseris decipiens, 05/23/2017, Jim West.

#7) 37.083070, -122.243040, elevation 374 feet/upper section of gulchlet, which drains Upper Pozzi Meadow down into Mill Creek. The steep grass cloaked slopes, which mirror the upper part of this relatively short but topographically complex drainage system, host 400+ Sebbinsoseris decipiens specimens. One of the two largest concentrated populations for this taxon in the Scott Creek Watershed proper. Some of the associate native taxa, including several relatives within the Cichorieae, are as follows: Agoseris grandiflora, Agoseris heterophylla sensu lato, Melica californica, Poa secunda subsp. secunda, Stipa pulchra, Sanicula arctopoides, Sanicula bipinnatifida, and Primula clevelandii var. gracilis.

Cypselae documentation data: 2007-1303, Stebbinsoseris decipiens, 05/17/2007, Jim West.
Cypselae documentation data: 2008-1009, Stebbinsoseris decipiens, 05/08/2008, Jim West.
Cypselae documentation data: 2009-827, Stebbinsoseris decipiens, 06/24/2009, Jim West.
Cypselae documentation data: 2009-832, Stebbinsoseris decipiens, 04/28/2009, Jim West.
Cypselae documentation data: 2009-836, Stebbinsoseris decipiens, 05/11/2009, Jim West.
Cypselae documentation data: 2012-520, Stebbinsoseris decipiens, 06/05/2012, Jim West.
Cypselae documentation data: 2013-54, Stebbinsoseris decipiens, 05/12/2013, Jim West.
Cypselae documentation data: 2013-76, Stebbinsoseris decipiens, 05/12/2013, Jim West.
Cypselae documentation data: 2014-345, Stebbinsoseris decipiens, 05/25/2014, Jim West.
Cypselae documentation data: 2015-294, Stebbinsoseris decipiens, 04/10/2015, Jim West.

Cypselae documentation data: 2015-295, Stebbinsoseris decipiens, 06/24/2015, Jim West.
Cypselae documentation data: 2015-296, Stebbinsoseris decipiens, 04/10/2015, Jim West.
Cypselae documentation data: 2016-35, Stebbinsoseris decipiens, 04/28/2016, Jim West.
Cypselae documentation data: 2016-46, Stebbinsoseris decipiens, 05/02/2016, Jim West.
Cypselae documentation data: 2017-116, Stebbinsoseris decipiens, 05/23/2017, Jim West.
Cypselae documentation data: 2018-650, Stebbinsoseris decipiens, 06/03/2018, Jim West.

#8) 37.081347, -122.242210, elevation 217 feet/isolated, steep grass covered slope that overlooks the drainage into Mill Creek section of the gulchlet originating at the Upper Pozzi Meadow. This small and scattered population is threatened by the post-2009 Lockheed Fire's Ceanothus thyrsiflorus var. thyrsiflorus population expansion.

Cypselae documentation data: 2009-826, Stebbinsoseris decipiens, 07/01/2009, Jim West.
Cypselae documentation data: 2015-301, Stebbinsoseris decipiens, 05/08/2015, Jim West.
Cypselae documentation data: 2016-278, Stebbinsoseris decipiens, 05/12/2016, Jim West.

#9) 37.080511, -122.257781, elevation 540 feet/nw-facing visible break in the synform (above ground manifestation of Santa Cruz Syncline) known ecologically as the "Magic Triangle". From a botanical perspective, this deltoid shaped zone of biodiversity hosts Stebbinsoseris decipiens flanked by both of its diploid parents, Microseris bigelovii and Uropappus lindleyi. Some 120 species of native taxa have been documented for this "pinprick" on the Scott Creek Watershed/Environs 30 sq miles map!!!

Cypselae documentation data: 2013-56, Stebbinsoseris decipiens, 05/01/2013, Jim West.

#10) 37.074594, -122.254205, elevation 443 feet (micro-population "a") and 37.074573, -122.254422, elevation 422 feet (micro-population "b")/s, sw-facing edge of synform (above ground manifestation of Santa Cruz Syncline) overlooking Pumpkin Field Marsh .The Stebbinsoseris decipiens plants behave differently within each of these two proximal but separate populations…. in population, designated as "a", the S. decipiens plants are reduced in stature and are surrounded by an extensive M. bigelovii contingent, the majority of which are no more than 2.5-3cm in height. The S. decipiens gathering defined as population "b", growing at the base of the synform, on a mini-slope comprised of large chunks of exfoliated/fractured siliceous mudstone, is unique in that its quasi- succulent foliage allowed it to sustain its annual growth cycle far longer into the Spring/Summer than the other documented S. decipiens populations found within the Scott Creek Watershed/Environs. The "b" S. decipiens population also displayed an inherited trait from its Uropappus lindleyi parent, in that the base of the mature plant was elevated above the ground level, giving the impression that it was about to" take off running". Population "b" unlike population "a"

situated no more than 15 feet above it, did not share its growing space with either diploid parent but in terms of gross morphology, behaved as if it was a totally separate species. All of the related taxa in this partially shared microcosm, were documented with cypsela collections and deposited with the UCSC Arboretum.

Cypselae collection data: 2007-1301, Stebbinsoseris decipiens, 05/20/2007, Jim West.
Cypselae collection data: 2008-1728, Stebbinsoseris decipiens, 05/10/2008, Jim West.
Cypselae collection data: 2011-481, Stebbinsoseris decipiens, 07/17/2011, Jim West.
Cypselae collection data: 2015-297, Stebbinsoseris decipiens, 04/13/2015, Jim West.
Cypselae collection data: 2016-43, Stebbinsoseris decipiens, 05/11/2016, Jim West.

#11) 37.082643, -122.263918, elevation 286 feet/n-end of Swanton Road, outer edge of road above Washout Turn.

Herbarium data for population #11/JEPS82652, Roy. E. Buck, James A. West and Tom Hawke, 235, 1983-5-2.
Herbarium data for population #11/JEPS85645, Roy E. Buck, James A. West and Tom Hawke, 235, 1983-5-2.

Cypselae collection data: 2009-833, Stebbinsoseris decipiens, 04/28/2009, Jim West.
Cypselae collection data: 2012-673, Stebbinsoseris decipiens, 04/29/2012, Jim West.
Cypselae collection data: 2013-49, Stebbinsoseris decipiens, 05/04/2013, Jim West.

#12) 37.082011, -122.245617, elevation 228 feet/"Beehive Hill", a w-facing near vertical grassland, overlooking Purdy Road, between Swanton Road entrance and Schoolhouse Gulch bridge. This small but species rich slope, hosts such diverse native taxa, as Gilia clivorum, Clarkia purpurea subsp. quadrivulnera, Dudleya caespitosa, and despite being torched by the 2009 Lockheed Fire, has managed to maintain its species diversity. Post-fire encroachment by Ceanothus thyrsiflorus var. thyrsiflorus has shrunk this "vertical grassland" a tad and how much of the species rich grassland will remain over the next decade, is a worthwhile study in grassland ecology that could form thesis material for a CalPoly grad student.

Cypselae documentation data: 2008-1010, Stebbinsoseris decipiens, 05/08/2008, Jim West.
Cypselae documentation data: 2015-300, Stebbinsoseris decipiens, 05/08/2015, Jim West.
Cypselae documentation data: 2016-279, Stebbinsoseris decipiens, 05/12/2016, Jim West.

#13) 37.096680, -122.236341, elevation 679 feet/e-facing hillside, overlooking Upper Seymore Field, above access trail beginning on Upper Schoolhouse Ridge/Seymore Hill and terminating at the w-edge of the Upper Seymore Field. Scattered population of S. decipiens, growing in

association with: Cirsium occidentale var. venustum, Lupinus latifolius var. latifolius, Eriophyllum confertiflorum var. confertiflorum, Pinus attenuate, Quercus agrifolia var. agrifolia, Clarkia rubicunda, Baccharis pilularis subsp. consanguinea, Monardella villosa aff. subsp. franciscana (lvs thick and pubescent, with truncate bases), Frangula californica subsp. californica, Eriogonum nudum, Ceanothus thyrsiflorus var. thyrsiflorus, ect. Neither diploid parent (Microseris bigelovii and Uropappus lindleyi) present.

Cypselae collection data: 2017-114, Stebbinsoseris decipiens, 05/26/2017, Jim West.

#14) 37.088984, -122.247476, elevation 343 feet/isolated "vertical grassland", circa 60 meters above Purdy Road cattle guard/slide area. Two rare/uncommon "natives" for the Scott Creek Watershed, share this sequestered refugium…. Athysanus pusillus* and Layia gaillardioides* (flowers an intense yellow without white tips, with a 1-2% of the population, presenting inflorescences colored a paler yellow).

Cypselae collection data: 2008-1631, Stebbinsoseris decipiens, 06/04/2008, Jim West.
*Cypselae collection data: 2009-609, Layia gaillardioides, 06/10/2009, Jim West.
*Cypselae collection data: 2011-459, Layia gaillardioides, 07/17/2011, Jim West.

*Herbarium data/JEPS82763, Athysanus pusillus, James A. West, 54.2, 1983-4-19.
*Herbarium data/JEPS82961, Athysanus pusillus, James A. West, 54.1, 1983-4-19.

*Silicle collection data: 2007-1164, Athysanus pusillus, 05/28/2007, Jim West.

#15) 37.066307, -122.244544, elevation 600 feet/Solar Panel Gate Refugium…. this break in the synform (above ground manifestation of the Santa Cruz Syncline), parallels its further west analog, the "Magic Triangle", by hosting circa 120 documented native species, several found only in the Swanton area or are rare, county wide. A cursory selection for the Solar Panel Gate Refugium, is as follows: Erigeron foliosus var. franciscensis, Ligusticum apiifolium, Claytonia exigua subsp. exigua, Microseris bigelovii, Festuca roemeri var. klamathensis (= F. idahoensis? and Primula hendersonii.

Cypselae collection data: 2007-1168, Stebbinsoseris decipiens, 05/26/2007, Jim West.
Cypselae collection data: 2012-572, Stebbinsoseris decipiens, 06/19/2012, Jim West.
Cypselae collection data: 2016-83, Stebbinsoseris decipiens, 06/03/2016, Jim West.

#16) 37.079517, -122.248622, elevation 149 feet/narrow ridge, paralleling gulch between the Bulb Field and Buckeye Grove Ridge, containing a micro-meadow, circa midway along its downward decent towards the Scott Creek Bridge. A very localized/isolated population of

Stebbinsoseris decipiens has existed there for several decades and a DNA workup/comparison with other S. decipiens populations in the Scott Creek Watershed, might have research value.

Cypselae collection data: 2007-1300, Stebbinsoseris decipiens, 05/20/2007, Jim West.
Cypselae collection data: 2008-969, Stebbinsoseris decipiens, 05/12/2008, Jim West.
Cypselae collection data: 2009-614, Stebbinsoseris decipiens, 05/29/2009, Jim West.
Cypselae collection data: 2009-839, Stebbinsoseris decipiens, 05/23/2009, Jim West.
Cypselae collection data: 2011-406, Stebbinsoseris decipiens, 06/14/2011, Jim West.

Supplemental Herbarium data for pressings done within the Scott Creek Watershed/Environs but data on sheets not specific enough, as to which of the above 11 (or new) populations the specimens were obtained.

Herbarium data accessioned as Microseris decipiens/CAS-BOT_BC7483, John Hunter Thomas, 4094A, 1954-5-7.
Herbarium data accessioned as Microseris decipiens/RSA502386, D.W. Taylor, 9656, 1988-5-22.
Herbarium data accessioned as Stebbinsoseris decipiens/CAS-BOT-BC339984, K.L. Chambers, 670, 1955-5-11.
Herbarium data accessioned as Stebbinsoseris decipiens/CAS-BOT-BC339985, K.L. Chambers, 670, 1955-5-11.
Herbarium data accessioned as Stebbinsoseris decipiens/JEPS13995, K.L. Chambers, 670, 1955-5-11.
Herbarium data accessioned as Stebbinsoseris decipiens/JEPS81532, R. Doug Stone, Roy E. Buck and James A. West, 460, 1982-5-13.
Herbarium data accessioned as Stebbinsoseris decipiens/JEPS82648, Roy E. Buck, James A. West, 211, 1983-4-22.

122. Piperia unalascensis [= Plantanthera unalascensis subsp. unalascensis]/the locally documented populations for this widespread terrestrial orchid are distinctive, in that they match only the type collection from Unalaska Island in the Aleutian Islands. After being documented via herbarium pressings and in situ photography, the coastal headland populations disappeared…. whether due to environmental stress and/or an air/soil born pathogen, was never determined. All of this was taking place during Randall Morgan's monographing of the genus Piperia and due to the current inaccessible status for the documented sites, there is no data reflecting, if the populations overlooking Highway 1 are

marginally present or permanently extinct. Two subsequent populations, both very localized and small in stature, were found on what is now property owned by CalPoly aka the Swanton Pacific Ranch, and need to be revisited, to determine if these populations are still extant.

#1) Between 37.079560, -122.261688, elevation 319 feet and 37.079782, -122.261283, elevation 352 feet/w-facing, near vertical slope overlooking lower Lasher Marsh Gulch.

Herbarium data: JEPS81531, Piperia unalascensis, R. Doug Stone, 459, 1982-5-13.
Herbarium data: UCSC008331, Piperia unalascensis, James A. West, 300-P-309-P.
Herbarium data: UCSC008332, Piperia unalascensis, Randall Morgan, 1805, 1990-5-11.
Herbarium data: UCSC011112, Plantanthera unalascensis subsp. unalascensis, James A. West, 60-P through 73-P, 1980-7-30.
Herbarium data: UCSC011113, Plantanthera unalascensis subsp. unalascensis, James A. West, 300-P through 309-P, 1981-5-14.

#2) 37.068061, -122.254722, elevation 197 feet/w-facing slope overlooking lower Morehus Arroyo.

Note: this site was visited on 4/17/2019, and no Piperia/Planthanthera specimens were observed.

#3) 37.064551, -122.240010, elevation 638 feet/w-facing slope, overlooking upper Cowboy Shack Gulch.

Note: one flowering example of this locally rare terrestrial orchid was observed a decade ago and the w-facing forested (mixed oak/conifer) slopes need to be revisited and meticulously explored. Due to the ecological impact of the 2020 CZU Lightning Fire Complex, the near-vertical slopes that define the ocean side draining gulches of the Swanton Pacific Ranch's property, need to be meticulously explored to see if this rare native terrestrial orchid still exists.

123. Nemophila pedunculata/This species, while considered rare within Santa Cruz County, exists in several small populations, often growing sympatrically with Nemophila parviflora and occasionally with the rare Nemophila aff. pulchella var. fremontii. Floral pigmentation and corolla markings vary from population to population, raising the question: are all these spatially separated populations with differences in corolla pigmentation/patterning, minor variations of one species or is there more than one species masquerading as N. pedunculata and does this variability involve some form of crypticism?

#1) 37.076724, -122.260733, elevation 302 feet/upper nw-facing slope of Gulch #3.

Herbarium data: JEPS82014, Nemophila pedunculata, Roy E. Buck, James A. West, and Randy Morgan, 188, 1983-4-3.

#2) 37.077607, -122.255881, elevation 525 feet/Magic Triangle Ridge, ne facing slope overlooking Upper Dump Gulch.

Herbarium data: JEPS82775, Nemophila pedunculata, James A. West, 57, 1983-4-23.

#3) 37.086954, -122.251271, elevation 144 feet/mouth of Gianone Spring [Barn] Gulch. This population was growing in association with both N. parviflora and N. aff. puchella var. fremontii.

Herbarium data: JEPS82776, Nemophila pedunculata, James A. West, 31, 1983-3-28.
Herbarium data: JEPS82947, Nemophila pedunculata, James A. West, 31, 1983-3-28.

#4) 37.084258, -122.245307, elevation 162 feet/Lower Schoolhouse Gulch, proximal to Boy Scout Camp. This population of N. pedunculata is growing sympatrically with both N.parviflora and N. aff. pulchella var. fremontii.

Seed collection data: 2015-218, Nemophila pulchella, 04/28/2015, Jim West.
Seed collection data: 2016-273, Nemophila pulchella, 05/12/2016, Jim West.

#5) between 37.076010, -122.241053, elevation 95 feet and 37.075507, -122.240337, elevation 96 feet/along both sides of Swanton Road, across from entrance to the Old Miller Ranch Road.

Seed collection data: 2008-1004, Nemophila pedunculata, 05/08/2008, Jim West.
Seed collection data: 2012-666, Nemophila pedunculata, 04/29/2012, Jim West.
Seed collection data: 2013-51, Nemophila pedunculata, 05/09/2013, Jim West.
Seed collection data: 2014-305, Nemophila pedunculata, 05/26/2014, Jim West.
Seed collection data: 2015-216, Nemophila pedunculata, 04/28/2015, Jim West.
Seed collection data: 2015-219, Nemophila pedunculata, 04/13/2015, Jim West.
Seed collection data: 2016-41, Nemophila pedunculata, 05/03/2016, Jim West.

124. Rumex occidentalis/This striking and uncommon native dock should be incorporated into landscaping with other coastal native species. In old coastal marshes, plants can exceed two

meters in height and a mature inflorescence can be colored a sunset riot of orange, red and pink. Basal leaves can reach one meter in length. Since the populations for this locally uncommon native Rumex are primarily confined to ancient landslide derived marshes, isolated from each other, are all the Scott Creek Watershed/Environs populations genetically uniform or due to this taxon's high ploidy level (2n=140, 200), are there measurable differences between populations on a genetic level?

#1) 37.066506, -122.251314, elevation 322 feet/China Ladder Marsh.

Herbarium data: JEPS81557, Rumex occidentalis, Roy E. Buck and James A. West, 105, 1982-7-25.
Herbarium data: JEPS81558, Rumex occidentalis, Roy E. Buck and James A. West, 105, 1982-7-25.

Achene collection data: 2002-176, Rumex occidentalis, 10/12/2002, Jim West.

#2) 37.089631, -122.256055, elevation 489 feet/West's Spring Marsh

Achene collection data: 2007-168, Rumex occidentalis, 07/19/2007, Jim West.
Achene collection data: 2007-1150, Rumex occidentalis, 08/13/2007, Jim West.
Achene collection data: 2009-654, Rumex occidentalis, 08/04/2009, Jim West.
Achene collection data: 2011-376, Rumex occidentalis, 09/03/2011, Jim West.
Achene collection data: 2013-476, Rumex occidentalis, 11/07/2013, Jim West.
Achene collection data: 2016-122, Rumex occidentalis, 09/15/2016, Jim West.

#3) 37.087925, -122.254242, elevation 380 feet/Marti's Park Marsh.

Achene collection data: 2007-169, Rumex occidentalis, 07/19/2007, Jim West.

#4) 37.063231, -122.253348, elevation 158 feet/area between Agrostis Rectangle and China Ladder Gulch.

Achene collection data: 2007-170, Rumex occidentalis, 07/30/2007, Jim West.
Achene collection data: 2008-415, Rumex occidentalis, 07/11/2008, Jim West.
Achene collection data: 2015-279, Rumex occidentalis, 07/09/2015, Jim West.

#5) 37.080684, -122.260743, elevation 388 feet/Lasher Marsh

Achene collection data: 2007-176, Rumex occidentalis, 08/12/2007, Jim West.

Achene collection data: 2008-417, Rumex occidentalis, 10/01/2008, Jim West.

#6) 37.088779, -122.258873, elevation 585 feet/Laguna de las Trancas.

Achene collection data: 2009-270, Rumex occidentalis, 07/21/2009, Jim West.
Achene collection data: 2013-477, Rumex occidentalis, 06/30/2013, Jim West.

#7) 37.061501, -122.253030, elevation 91 feet/Agrostis Rectangle.

Achene collection data: 2009-271, Rumex occidentalis, 07/02/2009, Jim West.

#8) 37.094519, -122.257305, elevation 621 feet/Beaver Flat Marsh (upper portion).

Achene collection data: 2013-271, Rumex occidentalis, 07/05/2013, Jim West.
Achene collection data: 2015-280, Rumex occidentalis, 07/07/2015, Jim West.

125. Epilobium hallianum/this rare for Santa Cruz County, Epilobium species, has been found growing in a series of ancient marshes, all within the north coast area defined as the Scott Creek Watershed/Environs. Documentation has been done with a comprehensive series of herbarium pressings (showing the diagnostic turions, rootstocks bearing winter-buds with fleshy overlapping scales that persist at base of the next season's stem) and seed collections. In several of these ancient landslide derived marshes, Epilobium hallianum is growing sympatrically with Epilobium ciliatum subsp. ciliatum and since both taxa's phenologies are concurrent, are there hybrids in these populations passing as species?

#1) 37.094403, -122.256651, elevation 597 feet/scattered population growing in the lower half of Beaver Flat Marsh, sympatrically with Epilobium ciliatum subsp. ciliatum and several years back, Epilobium densiflorum [Boisduvalia densiflora]*.

Herbarium data/JEPS81527, Roy E. Buck, James A. West, Tom Hawke, and Connie Vigno, 2, 1982-5-20.
Herbarium data/OBI80929, Jim West, s.n., 2015-3-21.
Herbarium data/OBI80938, Jim West, s.n., 2015-3-21.
Herbarium data/UCSC011009, Jim West, s.n., 2015-3-21.
Herbarium data/JEPS82591, James A. West, 100, 1983-5-26.
Herbarium data/JEPS82592, James A. West, 100.1, 1983-5-26.

*Seed collection data: 1979-255, Epilobium densiflorum, 01/01/1979, Jim West.

Seed collection data: 2009-650, Epilobium hallianum, 06/14/2009, Jim West.
Seed collection data: 2009-782, Epilobium hallianum, 06/03/2009, Jim West.
Seed collection data: 2014-336, Epilobium hallianum, 06/11/2014, Jim West.
Seed collection data: 2015-76, Epilobium hallianum, 06/02/2015, Jim West.
Seed collection data: 2015-184, Epilobium hallianum, 04/27/2015, Jim West.
Seed collection data: 2016-73, Epilobium hallianum, 05/25/2016, Jim West.
Seed collection data: 2017-92, Epilobium hallianum, 05/29/2017, Jim West.
Seed collection data: 2018-637, Epilobium hallianum, 04/14/2018, Jim West.

#2) 37.077657, -122.260142, elevation 368 feet/Gulch #2, which drains Allium Marsh.

Herbarium data/JEPS83116, Roy E. Buck and James A. West, 341, 1983-6-9

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#3) 37.090144, -122.255779, elevation 489 feet/Quercus agrifolia woodland adjacent to the West Spring Marsh and site of the first (mid-1970s) Epilobium hallianum documentation, for the Scott Creek Watershed.

Seed collection data: 2011-324, Epilobium hallianum, 06/30/2011, Jim West.

#4) 37.087810, -122.253729, elevation 361 feet/lower portion of Marti's Park Marsh.

Seed collection data: 2011-323, Epilobium hallianum, 06/30/2011, Jim West.

#5) 37.091234, -122.257760, elevation 589 feet/Rosetta Stone Pine Marsh.

Seed collection data: 2015-185, Epilobium hallianum, 04/27/2015, Jim West.

126. Arctostaphylos glutinosa/One of two endemic manzanitas occurring within the Scott Creek Watershed/Environs, the other being A. ohloneana, restricted to the siliceous mudstone ("chalks"), between the upper Big Creek sub-Watershed and the head of Bannister Gulch (Scott Creek Watershed). While A. ohloneana does not descend physically down to the Swanton Pacific Ranch's property, A. glutinosa does…. and in both of its distinctive manifestations, these being the forma typical with leaves clothed in a cinerous indument (reflecting the A. canescence parentage) and the glaucous-green, sub-glabrous and thin in texture foliage (reflecting A. andersonii genetic input). A satellite population of A. glutinosa was discovered circa three decades ago, growing across Scott Creek, on the upper portion of Lair Gulch (Last Chance Ridge), which was fortunate to have escaped the horrendous impact the 2009 Lockheed Fire wrought on the Schoolhouse Ridge/Lockheed "chalks" populations.

While the Last Chance Ridge population has yet to be documented, either by nutlet collections or herbarium pressings, the Swanton Pacific Ranch has a file (stored in the "cloud"), with circa 50 digital in situ images for this rare by any standards, native.

#1) 37.086717, -122.240191, elevation 577 feet/lower Schoolhouse Ridge, containing both of A. glutinosa's morphs (canescent and the "green glut" forms), with this satellite population (the lowest down in elevation from the principal one occupying the Lockheed "chalks") losing all its adult plants (not surprising, since A. glutinosa is an obligate seeder, lacking a basal burl). One can only hope, that amongst the resprouting A. crustacea subsp. crinita population surrounding the incinerated A. glutinosas, that a seedling recruitment population may soon emerge, if not overwhelmed by the ever encroaching, Ceanothus thyrsiflorus var. thyrsiflorus population.

Herbarium data/CAS-BOT-BC24564, Arctostaphylos glutinosa, James West, s.n.,1976-1-16.
Herbarium data/JEPS81979, Arctostaphylos glutinosa, Roy E. Buck and James A. West, 153, 1983-3-13, (lvs. green).
Herbarium data/JEPS81980, Arctostaphylos glutinosa, Roy E. Buck and James A. West, 152, 1983-3-13, (lvs. gray-canescent).

Nutlet collection data: 2007-578, Arctostaphylos glutinosa (green lvd form), 09/02/2007, Jim West.
Nutlet collection data: 2007-583, Arctostaphylos glutinosa (gray lvd form), 09/02/2007, Jim West.

#2) 37.101236, -122.231946, elevation 1087 feet/north-south aligned ridge (lower "chalks"), between the upper Seymore Field and the Mill Creek sub-Watershed. This xeric, exposed to the elements ecosystem, was severely ravaged by the 2009 Lockheed Fire but some adult plants survived and seedling recruitment, has taken place.

Nutlet collection data: 2007-581, Arctostaphylos glutinosa, 10/17/2007, Jim West.
Nutlet collection data: 2007-585, Arctostaphylos glutinosa, 10/17/2007, Jim West.

#3) 37.113180, -122.259834, elevation 1133 feet/ isolated colony, on e-side of the Last Chance Ridge overlooking the Scott Creek Watershed, proximal to the upper reach of the Lair Gulch system. Presently documented, only by an extensive series of digital images, housed in a special file residing in the Swanton Pacific Ranch's cloud storage.

Note: Since the 2009 Lockheed Fire ravaged much of the Arctostaphylos glutinosa habitat, a second and far more ecologically devastating fire, the 2020 CZU Lightning Complex Fire, has

impacted this endemic manzanita's ecology to a far greater extent, including the previously unscathed Last Chance Ridge population. Ironically, a swath of ridge between the Upper Seymore Field and the Mill Creek riparian corridor, was spared, creating a thin ribbon of verdancy that has allowed seedling regeneration for this non-burl forming endemic. An important collaborative research project, between UCSC and CalPoly students, would be to monitor the known range of A. glutinosa, from the "chalks" down to the Swanton Pacific Ranch's portion of the Schoolhouse Ridge, to test the survivability of this obligate seeder, in the aftermath of two holocausts, eleven years apart.