

itself, they may range into it from Strawberry Canyon. The same holds true for red-tailed hawks, deer, and other larger animals. To ensure such enriching of the Lawrence Hall area, it would be well to maintain a connecting pathway of native growth with Strawberry Canyon.

IV. RECOMMENDATIONS FOR THE FUTURE DEVELOPMENT AND USES OF THE  
CAMPUS ECOLOGICAL STUDY AREAS

It is clear that deterioration of the Campus Ecological Study Areas will continue unless they are clearly defined and accorded the same stature as other teaching and research facilities of the University. In the past the University seems to have compared the value of each portion of an ecological study area challenged with the estimated value of a new use. We feel that in the future the comparison should be between the value of the new use and the entire Ecological Study Area since the value of an ecological area depends in large part on its total integrity. If this position is not adhered to the present piecemeal destruction will continue, and the values we have set out to preserve will surely be lost.

Two important steps must be taken to implement the Ecological Study Areas program. Boundaries of the areas must be clearly defined and a program of management must be developed. An Ecological Study Areas Advisory Committee, with representatives from the academic departments concerned, should undertake this work. However, we wish to make certain recommendations on boundaries and management that have grown out of our study.

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MGMNT. - S/R

27.

The Lawrence Hall of Science Outdoor Ecological Laboratory. A large area of grassland has been included to the north. This area is needed in addition to the woods and brushlands to maintain food chain relationships and variety in the ecosystem. The area is less steep than the wooded section and will provide a favorable location for on-the-ground studies. In addition, as with Strawberry Canyon, the undisturbed ground cover of grass, shrubs, and leaf litter, will help reduce the threat of flooding of lower Campus areas. This area, upon completion of the Lawrence Hall of Science building complex, will be effectively delimited on three sides. It is already bounded on the west and south by a chain-link fence that separates it from the Lawrence Radiation Laboratory. The east boundary will be protected by the Lawrence Hall itself. To prevent penetration of this relatively small natural area by dogs and cats and unauthorized persons who might damage weather station instruments and study projects, a fence should be placed along the north boundary.

Lower Campus Areas. These contain a great variety of non-native plants, thus their boundaries have been determined in part by our efforts to include as much native vegetation as possible, while at the same time merging the areas gracefully with the formal landscaping.

One of the chief difficulties in attempting to maintain these areas in the past has been uncertainty as to their boundaries. We suggest that signs be erected to guide the gardeners in recognizing the borders of these areas. A single intrusion can cause much damage. Thinned vegetation may rehabilitate slowly and for a long time is poorly

suiting to provide cover and nesting sites for birds. Signs will also help explain the unkempt appearance of portions of these areas.

(2) Management of the Ecological Study Areas.

One of the chief problems in maintaining ecological study areas is to find ways to preserve not only the wild species themselves but whatever may remain of the complex interrelationships that evolved among them in a given geographic area. Preservation is by far a more fruitful approach than attempts at reestablishment. Interactions in a wild community are reflected in the structure, function, and behavior of many of the organisms found there and may represent a level of integration approaching that found in the cells, tissues, and organs of a living organism. One can no more "recreate" the former than the latter. The problem is further compounded by the fact that each wild community, whether it occupy a square foot or square mile, is unique. Thus of first importance in a given area is to identify and protect what may remain of the evolutionary productions and their historical relationships. Then, after thorough study, it may be possible to move by gradual stages toward restoration of damaged or extirpated parts. If we are to emphasize the preservation approach, the following considerations seem important to stress:

Establishment of Paths.

A serious threat, particularly to lower Campus Ecological Study Areas which will be subjected to heavy human traffic, is trampling. Paths will help minimize damage while at the same time will provide

access. Their number, location, and physical characteristics should be decided upon in consultation with the Advisory Committee.

Maintaining the Ground Cover.

Ground cover of dead leaves, branches, and forbs is of great importance in maintaining natural conditions. Such cover helps to insure effective penetration of water, protects the surface against compaction, provides shelter and a supply of food for a variety of animals.

Maintaining Brush and Dead Trees.

Dense growth is required for hiding places and nesting sites for animals and as a wind break to prevent loss of duff and to provide shelter. Dead trees provide nesting sites and cover for salamanders and certain invertebrates that live under bark. A variety of small animals feed on the decayed wood. The process of decay itself is of importance in ecologic investigations. Fallen branches, dead trees, and brush should not be removed except where an impediment to foot travel or incompatible with adjacent formal landscaping. When removal is contemplated, the advice of the Advisory Committee should be sought.

Prevention of Spraying.

With the possible exception of some parts of the lower Campus areas, spraying should not be permitted in the Ecological Study Areas. In addition to killing animals outright and impairing the health and reproductive powers of survivors, the high pressure spray jet itself may destroy bird nests and young.

Excluding Feral Plants and Animals.

Non-native plants and animals should not be introduced into the native portions of the Ecological Study Areas. Introduction of exotic plants should be kept within those parts of the areas that already contain artificial plantings. There should be no control of predatory animals for the alleged benefit of prey species, except as deemed necessary by the Advisory Committee.

Flexibility of Management.

In ecological study areas so circumscribed by human developments as are the Campus areas, disturbances in the ecosystems can be expected which may require some management in order to maintain desired conditions. Management should be based on careful study of each problem as it arises, and the workings of the entire system must be taken into consideration. We cannot predict what problems may arise. It is probable, for example, that in the hill area in the absence of grazing coyote brush and other shrubs will continue to encroach on the grasslands. With the reduction of the small rodent populations such as meadow mice that would then follow, red-tailed hawks, gopher snakes, and other rodent-feeding animals might become scarce or disappear. We might wish to curtail the spread of such growth. In the lower Campus areas we may need to plant some native vegetation to ensure replacement of aging individuals or those plants damaged by trampling or other disturbances. In mowed areas seedlings will need to be protected or young plants set out. In some areas we may wish to introduce appropriate species to enhance the ecological setting. Sword fern and oxalis might be established in the

redwood groves, for example. We must retain flexibility in handling the ecological areas while at the same time attempting to allow the ecosystems to respond to a large extent in their own way. Coping with problems of this kind in themselves will be of great educational value to our faculty and students, for it is just such problems that face mankind nearly everywhere as human developments press heavily on remaining wild lands.

(3) Recommendations:

1. Reaffirm the concept of Ecological (Natural) Study Areas on the Berkeley Campus.
2. Adopt the term "ecological study area" in place of "natural area" for the Campus lands used in ecological studies.
3. Enlarge the Strawberry Canyon Ecological Study Area to include the region shown on Map 3.
4. Establish the Lawrence Hall of Science Outdoor Ecological Laboratory.
5. Establish the Observatory Hill Ecological Study Area.
6. Apply the following official names to the Ecological Study Areas: Grinnell Ecological Study Area, Observatory Hill Ecological Study Area, Wickson Ecological Study Area, LeConte Ecological Study Area, Strawberry Canyon Ecological Study Area, Lawrence Hall of Science Outdoor Ecological Laboratory.
7. Designate boundaries of the Ecological Study Areas as shown in foldout Map 3.
8. \* Authorize the placement of signs at strategic locations to identify the Ecological Study Areas.
9. Establish an Ecological Study Areas Advisory Committee.

10. Require that proposals for any changes within the Ecological Study Areas be reviewed by the Advisory Committee before action is taken.

11. Include the Campus Ecological Study Areas as part of the long range Campus plan and seek regental approval of the Ecological Study Areas program.

#### CONCLUSION

Wild environments within and near metropolitan areas are particularly endangered, yet they are the ones most strategically located for intellectual and recreational use. The forces pitted against them are exceedingly great. Many university campuses have destroyed such areas on their own grounds as they have given way to pavement and buildings. A truly great university can avoid this. We have an opportunity for leadership and can symbolize for other universities in our country and the world what can be done and can encourage the emerging forces of conservation. We have already made great strides in this direction. We have acknowledged Strawberry Canyon as a teaching and research facility, established lower Campus Ecological Study Areas in a unique blending of formal and native landscaping and expect to develop an outdoor laboratory for the Lawrence Hall of Science. At the statewide level we have the Natural Land and Water Reserves System. We must not allow our constructive efforts to be degraded. We urge that the University continue, and make secure, its fine effort to blend the works of man and nature on this Campus.



## APPENDIX

PLANTS SUITABLE FOR REPLACEMENT AND ENRICHMENT PLANTING IN  
LOWER CAMPUS ECOLOGICAL STUDY AREAS

University of California, Berkeley

(Plantings proposed for the Ecological Study Areas should be reviewed by the Ecological Study Areas Advisory Committee)

At least three types of ecological situations exist within the Lower Campus Ecological Study Areas. For the sake of simplicity we designate them as (1) streamside woodland, (2) redwood forest, and (3) chaparral-grassland. The streamside woodland habitat is characterized by oak, bay, toyon, and associated plants -- remnants of the original native vegetation along the creeks. The redwood forest habitat is also found chiefly along the creeks. The chaparral-grassland habitat, partly native, is represented on the west and south slopes of Observatory Hill and in the LeConte Ecological Study Area. Plantings should take habitat differences into account and we recommend below suitable species for each area.

As brought out in the main body of the report we feel that, in general, only those species that would grow naturally in the Ecological Study Areas should be planted in them. The redwoods, however, are an exception. Although introduced, they should be preserved. At present the redwood habitat lacks its characteristic understory of shrubs and herbs. We have included, therefore, recommended plantings. These

redwood forest species, however, should be kept within the present limits of the redwood stands.

There is need for a further type of planting outside the Ecological Study Areas. The Departments of Botany, Forestry, and Landscape Architecture require representative examples of species other than those that occur as true natives in the Lower Campus Ecological Study Areas. Although we already have many such plants, additional species should be procured. We list here some that have been requested by academic departments. Others will be suggested in the future.

Vernacular and scientific names are based largely on W. L. Jepson's "A Manual of the Flowering Plants of California" (1925). This book may be consulted for information on distribution.

### TREES

#### Streamside Woodland Habitat

- ✓ Coast live oak, Quercus agrifolia
- ✓ California laurel, Umbellularia californica
- ✓ Big-leaf maple, Acer macrophyllum
- add ✓ Box elder, Acer negundo
- ✓ Buckeye, Aesculus californica
- ✓ Blue elderberry, Sambucus glauca
- ✓ Arroyo willow, Salix lasiolepis
- add ✓ White alder, Alnus rhombifolia
- ✓ Creek dogwood, Cornus californica

Redwood Forest Habitat

Coast redwood, Sequoia sempervirens

Tan oak, Lithocarpus densiflora

Vine maple, Acer circinatum

SHRUBSStreamside Woodland Habitat

Flowering currant, Ribes sanguineum var. glutinosum

California blackberry, Rubus vitifolius

Thimble-berry, Rubus parviflorus

California hazel, Corylus rostrata

Toyon, Photinia arbutifolia

Coyote brush, Baccharis pilularis

Jim brush, Ceanothus soledadensis

Nine-bark, Physocarpus capitatus

Coffee berry, Rhamnus californica

Snow berry, Symphoricarpos albus

Redwood Forest Habitat

California huckleberry, Vaccinium ovatum

Western azalea, Rhododendron occidentale

Salal, Gaultheria shallon

Modesty, Whipplea modesta

Wax myrtle, Myrica californica

Blue blossom, Ceanothus thyrsiflorus

Yerba buena, Micromeria chamissonis (Satureia douglassii)

FORBSChaparral-Grassland Habitat

Golden eggs, Oenothera ovata

Blue-eyed grass, Sisyrinchium bellum

Redwood Forest Habitat

Lady fern, Athyrium filix-foemina

Deer fern, Lomaria (Blechnum) spicant

Licorice fern, Polypodium vulgare (californicum)

Sword fern, Polystichum munitum

California wood fern, Aspidium rigidum (Dryopteris arguta)

Chain fern, Woodwardia radicans (fimbriata)

Common trillium, Trillium sessile

Redwood sorrel, Oxalis oregana

Inside-out flower, Vancouveria parviflora

Elk clover, Aralia californica

Indian rhubarb, Peltiphyllum peltatum

RECOMMENDED PLANTINGS FOR OUTSIDELOWER CAMPUS. ECOLOGICAL STUDY AREAS

Douglas fir, Pseudotsuga menziesii

Madrone, Arbutus menziesii

Bush monkey-flower, Diplacus aurantiacus

Heartleaf manzanita, Arctostaphylos andersoni var. pallida

Grass nut, Brodiaea laxa

Mountain dogwood, Cornus nuttalli

Bolton  
1981

## LIST OF DESIRED PLANT SPECIES

Streamside Woodland Habitat - Native Plants

- Trees:
- ✓ *Acer macrophyllum* - bigleaf maple
  - ✓ *Acer negundo* - box elder
  - ✓ *Aesculus californica* - buckeye
  - ✓ *Alnus rhombifolia* - white alder
  - ✓ *Cornus californica* - creek dogwood
  - ✓ *Quercus agrifolia* - coast live oak
  - ✓ *Salix lasiolepis* - arroyo willow
  - ✓ *Sambucus caerulea* - blue elderberry
  - ✓ *Umbellularia californica* - California laurel
- Shrubs:
- ✓ *Baccharis pilularis* - coyote bush
  - ✓ *Ceanothus sorediatus* - Jim brush ?
  - ✓ *Corylus cornuta* var. *californica* - California hazel
  - ✓ *Heteromeles arbutifolia* - toyon ?
  - ✓ *Physocarpus capitatus* - nine-bark
  - ✓ *Rhamnus californica* - coffee berry
  - ✓ *Ribes sanguineum* var. *glutinosum* - red flowering currant
  - ✓ *Rubus parviflorus* - thimbleberry
  - ✓ *Rubus vitifolius* - cal. blackberry
  - ✓ *Symphoricarpos albus* - snowberry
- blackberry ?

Redwood Forest Habitat - Native Plants

- Trees: Acer circinatum - vine maple  
 Lithocarpus densiflora - tanbark oak  
 Sequoia sempervirens - coast redwood
- Shrubs: ✓ Ceanothus thrysiflorus - blueblossom  
 ✓ Gaultheria shallon - salal  
 ✓ Mictomeria chamissonis - Yerba Buena ?  
 ✓ Myrica californica - wax maple  
 ✓ Rhododendron occidentale - western azalea  
 ✓ Vaccinium ovatum - California huckleberry  
 ✓ Whipplea modesta - modesty  
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- Forbs: ✓ Aralia californica - elk clover  
 ✓ Aspidium rigidum - California wood fern  
 ✓ Athyrium filix foemina - lady fern  
 ✓ Blechnum spicant - deer fern  
 ✓ Oxalis oregana - redwood sorrel  
 ✓ Peltophyllum peltatum - Indian rhubarb  
 ✓ Polypodium californica - licorice fern  
 ✓ Polystichum munitum - western sword fern  
 ✓ Trillium sessile - common trillium  
 ✓ Vancouveria parviflora - inside-out flower  
 ✓ Woodwardia fimbriata - giant chain fern