STRATEGIC VISION FOR CAMPUS VERNAL POOL RESERVE

A. VISION FOR SNRI FIELD STATIONS

UC Merced is located in an eco-region of California that was described as a landscape that "reveals ecosystems that are every bit as integrated with their surroundings as the montane forests, boreal meadows, and alpine tundra a few score miles to the east." The location of the campus is so important because of its adjacency to 6,428 acres of these very vernal pool grasslands that are controlled by the University of California (Figure 1). These lands are part of an intact landscape that encompasses the largest, least-fragmented example of a vernal-pool grassland environment anywhere in the world. This Campus Vernal Pool (CVP) Strategic Plan demonstrates the CVP’s importance as a University of California Natural Reserve System site and how it further implements the Sierra Nevada Research Institutes mission.

It is important to place the mission of the CVP in the context of the broader mission of the Sierra Nevada Research Institute (SNRI) and the aims of its field facilities. SNRI’s mission is to discover and disseminate new knowledge that contributes to sustaining the ecosystems of California, and related regions worldwide, through integrated research and education in natural science, social science and engineering. SNRI’s regional focus on the Sierra Nevada eco-region, including the Central Valley and adjacent areas, requires interdisciplinary research at broad spatial scales that crosses traditional political and ecosystem-specific boundaries. As an Organized Research Unit within UC Merced, SNRI’s faculty, researchers and students have primary affiliations with all three of UC Merced’s undergraduate schools and most of the university’s graduate groups. SNRI’s conceptual foci include: 1) climate and hydrology, 2) ecology and ecosystem science, 3) air pollution and public health, 4) environmental economics, policy, and management, and 5) environmental education and creative communication of science to the public. Specific research foci will be established by investigator-defined priorities of critical environmental and socio-economic issues facing the broader Sierra Nevada eco-region. This combined regional and conceptual mission is designed to make SNRI’s regionally specific research globally applicable, and to make UCM faculty research in other locations regionally applicable to the Sierra Nevada.

The primary goal of SNRI field stations and natural reserves is to provide infrastructure and logistical support for programs and projects that help achieve the broader mission of SNRI, while also helping protect and preserve the ecosystems where they are located. Toward this end, the broad strategic vision for SNRI field stations and reserves is to:

a. Foster interdisciplinary research focused on the Sierra Nevada eco-region, including the Central Valley and other adjacent areas.

b. Facilitate synergistic links between science, education, and natural resource management.

c. Facilitate creative scientific communication through collaborations between science and art.

To help support coordinated research at broad scales, SNRI is developing an integrated network of facilities and long-term research sites along both north-south and east-west transects in the Sierra Nevada and Central Valley (Figure 2). SNRI’s current target area for new facilities is the west slope of the central and southern Sierra Nevada, and the adjacent valley, to fill a gap in UC and federal field stations in California. Facilities along this north-south gradient will span

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1 Comments by California vernal pool expert Robert F. Holland.
important gradients in regional climate, precipitation geology, soils, and air-pollution patterns. Field facilities will be clustered to provide a base for research along elevation gradients that include Central Valley wetlands, grassland, oak woodland, chaparral, montane, sub-alpine and alpine communities.

Since SNRI field stations are start-up operations within a start-up university, our strategic vision is to remain as flexible as possible to capitalize on unanticipated opportunities and to convert unanticipated constraints into new opportunities, while at the same time keeping true to the broader mission and objectives outlined above. One field station may capitalize on unique opportunities for education and outreach, and thus place greater emphasis on developing those programs, while another site may capitalize on existing instrumentation or long-term datasets to become primarily a research site. One station may be better suited for observational research, while another may be ideal for large-scale experimental manipulations. Within this flexible strategy, the biggest challenge will be to strike a balance between two potentially competing objectives: One is to ensure that there are adequate resources to develop one or more of the field stations into vibrant academic hubs that act as focal points for collaborations and synergistic interdisciplinary interactions. The other is to ensure that there are adequate facilities to enable research across the region.

SNRI field stations fill a critical gap in the UC Natural Reserve System’s (NRS) geographic and ecological representation in California (Figure 3). Current SNRI field facilities are being organized into two clusters that have a common science focus and administrative structure: 1) The Sierra Nevada Research Station (SNRS) and 2) The Vernal Pools and Valley Reserve (VPVR). The CVP will fall within the VPVR. Each field station cluster will have one ‘hub’ that serves as the administrative core, and that seeks to create a vibrant ‘research and learning community’ of students, research scientists, and professors. Other satellite ‘nodes’ will primarily serve as dispersed bases for field research and education along the planned north-south and east-west regional transects. As funding develops, they will grow into more vibrant research and education hubs. The goal of this strategic model is to ensure that there is at least one academic hub for each reserve cluster, but also allow the smaller satellite nodes to grow into academic hubs as opportunities arise.

Below we outline the strategic vision of the SNRI Campus Vernal Pool field station within the context of the larger Vernal Pool and Valley Reserve. The CVP facilities development plan is outlined in section B. The staffing plan to meet this strategic vision outlined in section C. The financial plan to achieve these goals is outlined in section D. The overall plan for SNRI’s field facilities is described in a separate document.²

B. STRATEGIC VISION

Most of the existing and planned SNRI field facilities in the Sierra Nevada are field stations on existing protected public land that is managed by a federal or state agency. The general goal of these facilities is to support access to these public lands for research and education. In contrast, the VPVR includes Central Valley lands owned by UC Merced and managed by the University or in partnership with other organizations, e.g. the Nature Conservancy. Thus, in addition to supporting research and education, the VPVR is designed to actively protect,

conserve, and manage wild lands within a matrix of suburban, rural, and agricultural lands. The VPVR will include two sites near the UC Merced campus: 1) the Campus Vernal Pool Reserve (CVP) (Figure 3) and 2) the Snelling Merced River (SMR) property (Figure 1). The Snelling property is 12 ac of land on the west bank of the Merced River, near the town of Snelling. It is about 11 miles from campus. Though there was placer mining all along the Merced River, this land is relatively undisturbed, and is not grazed. It is proposed to develop and manage this land for research and educational activities as part of the VPVR. In this plan we focus on the CVP reserve, the academic hub of the VPVR.

The University of California has protected from development over 6,400 acres of land through the placement of conservation easements. These lands consist of the former Virginia Smith Trust (VST) (5,030-acres), Campus Natural Reserve (CNR) (1,309-acres) and Myers Easterly (91-acres) properties. The 3,070-acre Cyril Smith Trust (CST) ranch is adjacent to these University controlled lands to the north and is also conserved in perpetuity. The CST was purchased with funds allocated by the California Legislature in AB No. 1740 for the “University Of California Merced Grasslands Project”. Upon purchase of the land by the Wildlife Conservation Board, the land was transferred to The Nature Conservancy (TNC) through a grant agreement. At this time the CST is owned by TNC and not proposed as part of the CVP. Independent of any research and education provisions, the CST land is ideally situated to be a protective buffer for managing and enforcing access restrictions to the CVP (Figure 3). UC Merced and SNRI will work closely with The Nature Conservancy to engage in discussions about potential partnerships that would allow research and teaching activities on CST lands in order to increase the effective size of the reserve to ~10,000 Acres. This partnership is essential not only for increasing the value of the CVP, but also for providing strong scientific information for protecting and managing the CST lands.

A Management Plan (Appendix 1) has been prepared for these lands, and monitoring, reporting and adaptive management are required in connection with the development of the campus. The University is currently implementing the Management Plan and, although SNRI currently has no role in managing these lands, this Strategic Plan dictates that SNRI assume management responsibility with emphasis on research, education and conservation.

The entire CVP lands lie within the watersheds of the Fahrens, Black Rascal and Cottonwood Creeks, which flow generally southwest from the property to Bear Creek and the San Joaquin River. Elevations are about 200-570 ft; topography is flat to moderately rolling. Currently the only structure on the property is a historic barn, located near the boundary of campus with the Campus Natural Reserve. SNRI also has a meteorological station on the [which parcel? land.

The site is defined by watersheds that support a dense vernal-pool complex, including the habitat of the extremely rare Conservancy fairy shrimp (Branchinecta conservatio); a cross-section of both upland and wetland areas are part of the site. Vernal pools are considered one of the most threatened ecosystems in California, with a significant proportion (~90%) of their distribution lost to cultivation or urbanization. The CVP is underlain by hummocky Pleistocene alluvial terraces with extensive hardpan that supports a Northern hardpan vernal pool community type. The area is considered the largest region of dense vernal pool habitat in California. Northern Claypan vernal pool complexes occur on low alluvial terraces across the Central Valley, west of Merced. The NRS’ Jepson Prairie Reserve contains claypan vernal pools, but the type of pool complex in the CVP is currently unrepresented in the NRS. Merced River alluvial
fan that underlies the CVP area was deposited during the first Pleistocene glacial episode and may be among the oldest surviving alluvial surfaces on earth.

The ecological importance of CVP land is evident in the number of federally or state-listed species that occur there. Amphibians on the site include the California tiger salamander (*Ambystoma californiense*), a state and federal listing as an endangered species. (Not much more for me to add here, Eric) The federally listed vernal pool fairy shrimp (*Branchinecta lynchi*) is widely distributed on the site, as well as one extremely rare federally listed species, the Conservancy fairy shrimp (*Branchinecta conservatio*) which is found only in seven other locations in California. Other fairy shrimp species on the site include the midvalley fairy shrimp (*Branchinecta mesovallensis*), California clam shrimp (*Cyzicus californicus*), and California fairy shrimp (*Linderiella occidentalis*). The federally listed vernal pool tadpole shrimp (*Lepidurus packardi*) has also been observed on the CVP lands. A total of 209 plant taxa representing 45 families were identified in the site, including three state and federally listed species – succulent owl’s clover (*Castilleja campestris ssp. succulenta*), Colusa grass (*Neostapfia colusana*) and San Joaquin orcutt grass (*Orcuttia inaequalis*) – and three special status species – Henderson’s bentgrass (*Agrostis hendersonii*), dwarf downingia (*Downingia pusilla*), and shining navarretia (*Navarretia nigelliformis ssp. radians*). In addition, 19 of the 46 soil units mapped are known to support special-status plant species. A complete list of flora and fauna recorded in surveys of the CVP lands is available in the Management Plan (Appendix 1).

Vernal pool landscapes created and sustained by the unique interactions between soils and hydrology. While vernal pool landscapes are best known for the biological functions that they perform, they also contain ‘rare-unique’ soils that are endangered by human disturbance. These soils regulate the hydrologic flowpaths and hydroperiod (length of time water is ponded in pools) that in turn regulate flora and fauna dynamics. Due to the integrated hydrologic nature of vernal pools on the landscapes, disturbance of up-gradient vernal pools may have appreciable impacts on hydrological and biogeochemical processes in all down-gradient vernal pools and streams. Thus, protecting large integrated tracts of vernal pool landscapes is necessary for preserving the ecological function of these landscapes. The size of the CVP reserve is unique in that it does preserve the landscape level hydrological characteristics of habitat type.

As described above in Section A, the specific strategic vision of the CVP reserve is guided by the unique opportunities and constraints of the site. These factors are listed below.

**Opportunities**

1. **Unique ecological status of the land** – As described above, the CVP site is not simply an old ranch that happened to fall in the hands of UC Merced. Rather it is a unique habitat that is home to a wide variety of special-status flora and fauna and ‘rare/unique’ soils. This attribute of the CVP clearly defines high priority strategic goals for this site to support biodiversity conservation and science-based management of a threatened habitat. The unique ecological status of the land provides a unique opportunity to demonstrate a cooperative engagement with conservation groups and state and federal agencies that facilitates research and education while also protecting special status species.

2. **Proximity to campus** – The proximity of this reserve to campus provides unique opportunities to more fully integrate educational programs and curricula with campus activities than almost any other existing UC Natural Reserve site. The close proximity of the UC Reserve lands to campus provides UC Merced (and other UC) faculty the unique opportunity to use this
precious resource in many educational settings. The site location also provides opportunities to develop reserve facilities that minimize impacts to the reserve land.

3. **Control of campus land** – The CVP lands are controlled by UC Merced, and the conservation easements include provisions for appropriate research and education. This situation provides unique opportunities for the CVP reserve to serve as a model for creative, adaptive, science-based approaches to managing and protecting sensitive ecosystems for lands that are subject to use restrictions such as conservation easements.

4. **Proximity to local communities** – The CVP location provides a focal point for UCM outreach activities with the local community, to educate the public about the ecological importance of vernal pool habitats, and to broaden public support for conservation of ecosystems native to the Central Valley.

5. **Proximity to other UC campuses** – The CVP is ~ 2 hrs from UC Davis, UC Berkeley, and UC Santa Cruz. This proximity makes it possible for classes and researchers at these institutions to visit the CNR for a day trip.

6. **Management Plan regulatory requirements** – The number of special-status species on the CNR lands means that UCM must comply with a number of federally and state mandated requirements for monitoring and management of the land. Rather than being a constraint, these requirements have helped UCM acquire and commit funding for long term monitoring of the site. These regulatory requirements provide an opportunity to generate, maintain, and disseminate long term biodiversity and site monitoring data. The Management Plan (Appendix 1) for the site also specifies a mandate for Adaptive Management of the land for: a) controlling/preventing the spread of invasive species, b) ensuring viable physical and biotic habitat for special status species, and c) regulating the impacts of various types of access to the land. While the monitoring program will be developed and approved by the federal and state agencies, The Management Plan allows for SNRI to have significant input into the approaches for achieving these objectives to ensure that they benefit education and research as well as providing high quality information for the agencies. The Management Plan also includes a research protocol that was required under the VST conservation easement (Appendix 2) Together, these mandates give SNRI the opportunity to lead the field in vernal pool conservation ecology, adaptive management, and integrated pest management.

7. **Ease of enforcement of boundaries and access** – The combined geography of the CNR, VST, and CST lands facilitates control and enforcement of the reserve boundaries. La Paloma road, which defines the northern boundary of the CST and VST, is gated at both ends of the reserve land. The eastern boundary is all grazing land with little if any easy public access. The western boundary is either UCM campus, CST grazing land and fences, or Lake Yosemite. The Southern boundary is either campus land or protected grazing land. Together this layout provides only two small access points, Lake Yosemite and the UCM campus, both of which are controllable. This enforceability provides opportunities for a strategic vision, which emphasizes: 1) large scale adaptive management projects that are protected from vandalism, 2) conservation zones where human access is extremely difficult, and 3) highly controlled access for appropriate educational and passive recreational activities (under limited controlled access) that are essential for expanding public appreciation for and understanding of the value of vernal pool ecosystems. There is currently no public access to the lands, but we recognize the necessity of establishing limited controlled public access for
hiking and nature observation (particularly for UCM students, faculty, and staff) that is separate from formal education and outreach activities. Consistent with NRS Use Guidelines, recreational use is expressly prohibited if it would interfere with protecting sensitive habitats, on-going research, and instructional programs.

8. *Existing road network* – The existing roads on these lands facilitate regulated access for the purposes of research and education in regular 4WD vehicles.

**Constraints**

1. *Conservation Easement on VST* – The conservation easement necessarily restricts activities on this land; however, the language of the easement is directly in line with the broader conservation goals of the reserve and also includes provisions for science-based adaptive management of the land. The VST easement allows, but does not require, ranching/grazing, and there has been grazing on the VST since the UC acquired the property. Clarification is needed on some details relative to proposed research and interpretation activities.

2. *CST land is not owned by UCM* – This 3074 acres parcel is owned by Nature Conservancy, which limits the ability of UCM to control activities here. However, as noted above, there are a number of advantages to this situation. First, the CST lands provide a ‘defensible barrier’ to public access to the VST and CNR lands. Second, these lands increase the protected area from 6376 acres to almost 10,000 acres – a size which helps ensure the viability of special status species in this habitat. Third, this additional land provides options for zoning entire area into different tiers of access for education and research purposes.

3. *Financial constraints* – The Hewlett Foundation donated a $2 million endowment for the management of the CVP lands in 2001. These funds were placed in the UC General Endowment Pool and have not been spent. The annual proceeds from the endowment have been reinvested in the Endowment Pool but will eventually fund the regulatory mandates associated with the monitoring and management programs that are in addition to the typical staffing required for most reserves. The $2 million Hewlett Foundation endowment is a much needed start, but we need revenue from the equivalent of a $10 million endowment to have a world-class reserve and at least $5 million to initiate a viable program.

**In summary,** this combination of opportunities and constraints help define the unique strategic vision for this reserve. We envision the CVP reserve to play a visionary, leadership role in:

- a. interdisciplinary research that furthers our understanding of entire vernal pool ecosystems
- b. creative, site-specific adaptive management approaches to conserving special-status species and the functioning of entire vernal pool ecosystems
- c. long term monitoring protocol development, data acquisition, data integration, information dissemination, and data visualization in partnership with state-wide wetlands programs (e.g., the California Wetlands Monitoring Workgroup).
- d. public engagement in vernal pool ecosystem protection and management
- e. environmental education curriculum development at multiple levels (K-8, high school, undergraduate, graduate).
- f. controlled recreational activities that promote public appreciation of this unique ecosystem while also preserving it for future generations.

The CVP and it’s facility on campus will be an icon of UC Merced’s unique status in the UC system with a potential of over 10,000 acres of protected vernal pool lands visible from campus.
As such, it has the potential to serve as a flagship center for UCM to host potential donors and other public events.

C. RESEARCH AND EDUCATION PLAN

There are outstanding opportunities for both basic and applied research on the proposed CVP. Much of this research can inform adaptive management of vernal pool ecosystems across the region. Much remains to be learned of the geological history of the CVP, including more accurate ages of the landforms. The identification of the processes that form and maintain the pools have yet to be definitively determined, and much of the resulting soil hydrological and chemical responses to landform age have yet to be studied. This geological and hydrological framework creates the unique habitat in which this unique ecosystem has adapted. Many important aspects of species biology and management have not yet been studied, creating gaps in our ability to develop a scientific basis to their protection. Thus, in an adaptive management sense, results of research will be used to refine habitat protection, habitat management, and species and ecosystem monitoring to more effectively meet recovery criteria. Primary information needs related to management include: surveys to determine species distributions; population censusing and monitoring; reproductive and demographic studies; the linkage between seasonal soil physical and chemical conditions and biological changes; habitat management technique research; restoration technique research; biosystematic and population genetics studies; studies of pesticide and herbicide effects; and habitat and species restoration trials. The types of projects needed to support recovery efforts in the region include: studies related to habitat protection (e.g., appropriate preserve size and location), habitat management and restoration techniques (e.g., appropriate levels of burning, grazing, mowing, or rest), and species ecology and biology (e.g., genetic relatedness, tolerances to environmental contaminants, and species interactions). The breeding systems and patterns of gene flow are not known for most species; however, interim adaptive management plans should be developed and implemented for protection of the species and their habitat until appropriate research is conducted.

One UC Merced faculty member (A. Aguilar) has initiated research on the CVP lands, focusing on a landscape genetic analysis of population structure for four species of large vernal pool crustaceans (*Branchinecta lynchi*, *B. mesovallensis*, *Lepidurus packardi*, and *Linderiella occidentalis*). Initial work involved collection of samples (with permits obtained through USFWS and CDFG) and generation of DNA sequence data. The main goal of this work is to better understand the spatial extent of gene flow for vernal pool crustaceans, the role of local adaptation in regulating population structure, and the effects of habitat fragmentation/alteration on vernal pool crustaceans. A portion of the CVP has been used for graduate research by S. Reed, a PhD student at Berkeley, and her advisor, R. Amundson. Reed’s work has focused on the distribution, and rates, of soil movement by gophers, and the role they play in the maintenance of pool habitats.

The CVP is already being used by UC Merced classes, and its potential for university and K-12 education is excellent. In UC Merced’s Biology 149F (Conservation Biology Field) class, taught by A. Aguilar, junior and senior undergraduate students learn about vernal pool

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ecology/natural history/conservation and are involved in sampling vernal pool invertebrates. This course was offered during Spring. Students had the opportunity to directly observe and sample vernal pools on proposed CVP lands. Class activities included characterizing plant communities, identification of vernal pool invertebrates, and the analysis of sampled vernal pool crustacean communities over space and time.

In addition to university education, there are several opportunities to partner with public agencies responsible for habitat restoration to increase the public’s general awareness of vernal pool ecosystems. Development of a nature walk describing the unique geologic, soils, hydrologic, and biological interactions occurring on vernal landscapes would provide high visibility and awareness. The ability for K-12 programs to take field trips to this ecological resource and the ability of CVP staff to provide guided nature walks with studies guides would make this facility an important resource to the community.

Having a research site conveniently located next to campus provides excellent opportunities for independent research and exploration by undergraduate students through internships. It is envisioned that the CVP staff could facilitate coordinated internship opportunities that could contribute to and enhance the existing ecological monitoring at the site. At the same time, students could use the monitoring data and data collected over the years to conduct their own independent research. Issues surrounding vernal pools provides undergraduate research concepts for a wide range of disciplines: ecological, environmental policy, management, and economics, soils, and hydrology.

Given the unique soils that support the CVP reserve (China Hat-Laguna Formation deposited ~3 million years ago), there would be a great opportunity to provide access to a soil observation site on the reserve. Providing a permanent backhoe trench that dissected a pool-mound sequence would allow observers to evaluate differences in soil properties between wetlands (the pool) and upland (mound) habitats. In particular, the UC summer field course run through the Davis campus would incorporate these soils into the course. Faculty at UCD have expressed interest in providing soil characterization data for such soils that could be further be utilized to enhance outreach programs. It is also envisioned that several environmental courses from UCD and UCB would take advantage of such a resource.

Finally, there is a great opportunity to create a hydrologic observatory within the CVP. It has been recently recognized that vernal pool landscapes are hydrologically connected either through surface runoff in swales between pools or by subsurface lateral flow above the claypan or duripan (silica cemented soil horizon). As such, water flow from up-gradient sources contributes water and nutrients for down-gradient pools resulting in differences in biological response along the hydrologic flowpath. Previous studies have only examined hydrologic flowpaths between pools at a very small scale (<50 m). The size and variety of vernal pools and hillslope characteristics at the CVP provides a truly unique opportunity to examine hydrologic connectivity at the landscape scale, which is the scale most relevant to management and restoration activities. Following from this research is the opportunity to explore creation or enhancement (making pools larger and/or deeper) of vernal pools to provide guidance for establishment of mitigation vernal pools (vernal pools established to compensate from those destroyed by development). The ability to provide a long-term study of the efficacy of creating or enhancing vernal pools to provide habitat for rare and endangered species is extremely important within California, especially given the future projections for population growth in the Central Valley during the remainder of this century. Such studies would allow partnering with
agencies, such as US Fish and Wildlife and California Fish and Game, and could provide demonstration sites to display vernal pool creation, restoration, and enhancement techniques.

D. FACILITIES DEVELOPMENT PLAN

Meeting the strategic needs of the CVP will require adequate facilities to accommodate: 1) CVP administrative staff, 2) space for education and outreach, 3) housing for visiting students and researchers, 4) lab and office space for both resident and visiting researchers, 5) space to hold meetings, workshops, conferences, and also facilitate informal interaction among students and researchers at the CVP, and 6) museum space for both educational and research purposes. To minimize impacts to vernal pool habitat and hydrology, SNRI will site almost all of these facilities on campus (Figure 1), and, if feasible, will renovate or replace the existing barn to create one on-site multi-purpose facility to be used primarily for education and public outreach purposes. Rather than create a typical field station facility of rambling low buildings, our vision is to follow the campus model of minimizing building footprints on the land. Ideally, we would construct one 35,000-40,000 ft² research, education, and public outreach building on campus that would open onto the conservation lands. We would also have access to dedicated CVP housing to accommodate at least 40 visiting scientists and students. Both the research/education and housing facilities would be designed to facilitate social interaction and group gatherings. In particular, given the unique nature of this reserve and its proximity to campus, the lab, office and museum space noted above could include the equivalent of a multi-use “Faculty Club” with a café/dining/bar area overlooking the vernal pool lands – a space that could be used to entertain potential donors, encourage social interaction among faculty, research associates, and graduate students, and host regional and international meetings. This facility, and its relationship to the vernal pool land, has the potential to serve as an icon for UCM’s unique status in the UC system.

In the intermediate term, a 10,000 ft² building to provide work space for users of the CVP would enable launching many of the proposed programs. This building would provide basic staging and meeting areas, with reliance on existing campus buildings for high-quality laboratory space.

E. ORGANIZATIONAL AND STAFFING PLAN

Meeting the strategic objectives and facilities needs outlined in sections B and C requires appropriate staff and an effective communication and reporting structure. Table 1 outlines fundamental operational needs that must be met by appropriate staffing. We focus on “needs” independent of “people” because this allows maximum flexibility to parse the former among different combinations of the latter depending on the developmental stage of the CVP and the specific skill sets of different people. For example, early in the process, multiple needs may be met by one person, and later they could be separated into two or more separate positions. Similarly, the person hired to be a ‘research coordinator’ may also have a strong background and interest in environmental compliance and land management, which would indicate that they could satisfy both of those needs. Alternatively, the ‘research coordinator’ may have a stronger background and passion for education than for environmental compliance issues, thus the academic and science coordinating could be met by one person, but the environmental-compliance and land-management functions would require different staff.

A typical NRS reserve includes at a minimum a reserve manager/director, a steward and a part-time faculty director to support reserve staff and to promote reserve activities on campus.
The manager and steward collaborate on maintenance of facilities, and carry out environmental monitoring. The manager oversees and coordinates research and teaching use of the reserve, and archives use and scientific data, for incorporation into systemwide NRS data bases. The following factors make the CVP reserve unique that will likely require more staffing:

1. The number of special status species on the reserve, and the requirements for monitoring and reporting are still being defined. While 0.25 FTE may be adequate for this, a higher fraction of time could be required to ensure compliance with environmental regulations and reporting.

2. The uncertainty and range of factors involved in actively managing the land to protect these special-status species from invasive flora and fauna may also require more effort than usual to develop large scale adaptive management studies that are coordinated with other research on the site.

3. Since this reserve is immediately accessible to campus (and the nearby community), it is likely that more effort than usual will be required to develop an array of education and outreach programs for UCM students as well as Merced high schools and the general public.

4. As outlined in Sections A and B, the SNRI field facilities are designed to add up to more than the sum of their parts. Rather than being opportunistically acquired parcels of land with no obvious cohesion, our goal is to have the field stations facilitate large scale research that can address questions at the scale of the Sierra Nevada eco-region. Thus, we anticipate the need for personnel to help coordinate research and education programs, as well as data integration, among multiple sites.

The proposed organization of CVP staff anticipates the CVP becoming part of the UC Natural reserve System (Figure 4). When NRS status was approved, the faculty member in charge would have a direct reporting line to the Vice Chancellor for Research. However, the SNRI director would have administrative and budget responsibility for the CVP. The direct reporting to the Vice Chancellor would not be needed until NRS status was approved.

The CVP Station Manager will be responsible for organizing and supervising the establishment and day-to-day activities at this station and in helping plan for growth. The manager will: 1) develop budget and standard operating procedures, 2) work with UC faculty and researchers to facilitate and carry out research, 3) coordinate outreach programs in cooperation with outreach professionals at UC Merced and partners, and 4) be responsible for relations with SNRI clients, from initial inquiries to evaluation, including collecting results for station data bases and reports. Along with the Faculty Director and the SNRI Director, the Station Manager will represent SNRI on UC campuses, with state and federal agencies, and with other stakeholders.

Some fraction of a person will be needed for the compliance monitoring. This could initially be part of the duties of the Station Manager, but with growth should be split off. Two facilities support roles are needed: 1) basic maintenance of the lands as a ranch, and 2) support of research infrastructure and facilities, i.e. building, research enclosures. The Station Manager may initially be responsible for coordination of both research and educational activities, but with growth one or more of these functions should be split off to others.

**F. FINANCIAL PLAN**

SNRI will assume responsibility for managing these CVP lands (and developing special partnerships for access to CST lands) and proposes that they become part of the UC Natural Reserve only if that responsibility is supported by sufficient funding to both carry out
conservation/land management responsibilities and maintain the lands for research and education. At present the UC Endowment Pool contains a $2 million gift fund that is dedicated to the management and monitoring of the CVP. It is our estimate that this endowment is enough to get started with a development of the proposed reserve, but that it would need to grow to approximately $10 million to fully support the salaries and operations of the CVP (Table 2). This estimate does not include funds for the buildings. These funds will need to come through development. SNRI was recently assigned a 0.75-FTE development officer, who is exploring opportunities for this facility and other needs identified in this plan. A potential revenue source is grazing revenue from the lands within the CVP, which is approximately $200,000. This revenue is contractually required to be distributed to the Virginia Smith Trust through 2017. The contract requirement is part of the land transaction that occurred in 2001 between the Virginia Smith Trust and the Regents. Another potential revenue source is a California Department of Fish and Game grant application for $1.2 million. UC Merced submitted the grant application in the summer of 2009 and the results are pending.

Finally, SNRI will work with Facilities Management and Campus Physical Planning to explore whether the CVP educational building on campus may be eligible for state funding for both construction and long term maintenance expenses.
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<td>Accounting</td>
<td>Accounts, reconciliation, compliance</td>
</tr>
<tr>
<td>Scheduling</td>
<td>Scheduling use, responding to inquiries, prioritizing user needs</td>
</tr>
<tr>
<td>Billing</td>
<td>Invoicing users, following-up with users, developing recharge plan</td>
</tr>
<tr>
<td>Budgeting</td>
<td>Managing budgets, planning &amp; justifying budget requests</td>
</tr>
<tr>
<td>Annual reports</td>
<td>Tracking user days, accomplishments, progress, gaps, future needs</td>
</tr>
<tr>
<td>Staffing</td>
<td>Recruiting, hiring new staff</td>
</tr>
<tr>
<td>Regulate use</td>
<td>Approve &amp; regulate use of reserve, research applications</td>
</tr>
<tr>
<td><strong>Programs</strong></td>
<td></td>
</tr>
<tr>
<td>Integrative program development</td>
<td>Planning &amp; facilitating educational, research, art &amp; outreach programs; creating synergy among people &amp; programs, organizing retreats, workshops</td>
</tr>
<tr>
<td>Environmental compliance</td>
<td>Vernal pool monitoring, compliance reporting, stakeholder engagement</td>
</tr>
<tr>
<td>Land management</td>
<td>Invasive plant monitoring, detection &amp; control, adaptive management, recreational access, fire management, law enforcement</td>
</tr>
<tr>
<td>Education coordinating</td>
<td>Coordinate &amp; implement K-12, undergraduate, outreach, volunteer programs</td>
</tr>
<tr>
<td>Research coordinating</td>
<td>Science champion for CVP, integrate research with adaptive management, promote synergy among researchers, do research</td>
</tr>
<tr>
<td>Data management</td>
<td>Work with state partners to manage, visualize &amp; disseminate data</td>
</tr>
<tr>
<td>Collections curating</td>
<td>Store &amp; curate specimen collections for research, education, outreach</td>
</tr>
<tr>
<td>Strategic planning</td>
<td>Planning programmatic growth, staffing, finances</td>
</tr>
<tr>
<td>Facilities planning</td>
<td>Upgrades, sustainability improvements, anticipate user needs</td>
</tr>
<tr>
<td><strong>External relations</strong></td>
<td></td>
</tr>
<tr>
<td>Communications</td>
<td>Website, press releases, photo documentation, engage press</td>
</tr>
<tr>
<td>Ambassador duties</td>
<td>Represent SNRI/CVP, engaging stakeholders, give talks</td>
</tr>
<tr>
<td>Funding</td>
<td>Fund raising for both facilities &amp; programs: federal, state, private</td>
</tr>
</tbody>
</table>
FIGURE 3
UNIVERSITY OF CALIFORNIA NATURAL RESERVE SYSTEM SITES
Campus Vernal Pool Reserve Strategic Plan


Sierra Nevada Research Institute at UC Merced

Angelo Coast Range Reserve
Allo Nuevo Island Reserve
Blue Oak Ranch Reserve
Bodega Marine Reserve
Box Springs Reserve
Boyd Deep Canyon Desert Research Center
Burns Pillow Ridge Reserve
Carpinteria Salt Marsh Reserve
Chickering American River Reserve
Coal Oil Point Natural Reserve
Dawson Los Monos Canyon Reserve
Eagle Lake Field Station
Eliott Chaparral Reserve
Emerson Oaks Reserve
Fort Ord Natural Reserve
Hastings Natural History Reservation
James San Jacinto Mountains Reserve
Jenny Pygmy Forest Reserve
Jeppson Prairie Reserve
Kendall-Frost Mission Bay Marsh Reserve
Landels-Hill Big Creek Reserve
McLaughlin Natural Reserve
Molots Rimrock Reserve
Kenneth S. Norris Rancho Marin Reserve
Quail Ridge Reserve
Sagehen Creek Field Station
San Joaquin Freshwater Marsh Reserve
Santa Cruz Island Reserve
Scripps Coastal Reserve
Sedgwick Reserve
Sierra Nevada Aquatic Research Laboratory (SNARL) / Valentine Eastern Sierra Reserve
Stebbins Cold Canyon Reserve
Stunt Ranch Santa Monica Mountains Reserve
Sweeney Granite Mountains Desert Research Center
Valentine Camp / Valentine Eastern Sierra Reserve
Younger Lagoon Reserve

UC NRS Sites
County Boundaries


Sierra Nevada Research Institute at UC Merced
Figure 4: Proposed Campus Vernal Pool Organization Chart