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Pitzer College Outback Preserve Restoration Project

Paul Faulstich, Professor of Environmental Analysis

A question we keep asking ourselves in environmental analysis at Pitzer College is whether it's possible to create modern socio-natural systems that are truly sustaining; that is, that avoid the features of contemporary systems in which the human factor dominates to the detriment of the environment. Any genuinely sustainable society must honor diversity— cultural and biological—and, at Pitzer, we're committed to forging innovative directions for a healthy future. Toward this end, students, along with faculty and staff, have initiated a program of ecological restoration in the Pitzer College Outback Preserve.

Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed. This document provides an introduction to the ecological restoration project being undertaken in the Outback. It also provides a rationale for the direction of the restoration efforts and an outline for ongoing care and maintenance.

Ecological restoration of the Pitzer Outback Preserve is academic and co-curricular activity that initiates the recovery of this fragment of the alluvial scrub ecosystem with respect to its health, integrity and sustainability. This ecosystem has been degraded, damaged and impacted as the direct and indirect result of human activities.

For the purpose of restoration, an ecosystem can be recognized in a spatial unit of any size, from a microsite containing only a few individuals to an area showing some degree of structural and taxonomic homogeneity, such as the “alluvial scrub



California Buckwheat (*Eriogonum fasciculatum*) flower clusters in their brown glory of summer and fall. The buds cluster in tight pinkish balls on long stalks that turn white when they open and as they dry they turn rust brown in the fall. Vast areas of California used to have Buckwheat covering the ground.

ecosystem.” The Pitzer Outback Preserve exists on this continuum and is biologically marginal due to its limited expanse, its urbanized context and its historical usage. It functions as an eco-cultural landscape wherein a respectful relationship with the natural ecosystem of this alluvial sage scrub habitat is fostered.

This guiding document serves as a framework for the Outback Preserve Restoration Project and includes the following components:

Project Background:

- Rationale as to why restoration is needed in the Outback Preserve
- Ecological description of the site
- Designation and description of the baseline, or reference site
- Explanation of how the restoration will integrate with the campus landscape and its flows of organisms and materials

Goals and Objectives:

- Statement of the goals and objectives of the restoration project

Scope of Work (7 Stages):

- Stage 1: Background Research and Precedents
- Stage 2: Inventory
- Stage 3: Program
- Stage 4: Analysis
- Stage 5: Synthesis and Design
- Stage 6: Production
- Stage 7: Implementation and Monitoring

List of Tasks:

- Specific tasks to be performed within each stage listed above
- Restoration techniques to be utilized

Deliverables:

- Project deliverables for physical publication
- Performance standards, with monitoring protocols by which the project can be evaluated
- Strategies to implement for long-term protection and maintenance of the Outback

Schedule:

- Project timeline

Budget:

- Project costs and budget
- Human capital needs

PROJECT BACKGROUND**Rationale**

Pitzer's mission statement opens with this sentence: "Pitzer College produces engaged, socially responsible citizens of the world through an academically rigorous, interdisciplinary liberal arts education emphasizing social justice, intercultural understanding and environmental sensitivity." The statement highlights the intersection of social

and environmental justice, acknowledging that one cannot sufficiently occur without the other. Additionally, our core values of social responsibility, intercultural understanding, interdisciplinary learning, student engagement and environmental sustainability guide our teaching and research. When passed through college council, it was our hope that as agents of change, our students will utilize these core values to create solutions to our world's challenges.

Pitzer's Environmental Studies program began in 1970 in response to concerns about our environmental predicament. The program's founding faculty wanted to help students understand what had gone wrong with the human/nature relationship and how it could be corrected. Forty years later, the need for such a program is greater than ever, and the Outback restoration is one project within Environmental Analysis that works toward this correction.

The Outback restoration project seeks to preserve the type of plant and animal community that once covered most of the region directly below the foothill entrance to nearby San Antonio Canyon. Here, in the Pitzer Outback, the native mix of coastal sage scrub and chaparral still survives but has been heavily impacted by vegetative clearing, dumping, and the introduction of non-native plant species. Restoring Nature: The Pitzer Outback and its sister course, Practicum in Exhibiting Nature, are designed with the goal of educating the community about this area of the Arboretum and the importance of ecological restoration, making it more integrated with and accessible to the College community, and restoring and managing this rare and valuable campus resource.

A goal of the course Restoring Nature (EA 31) is to design and begin to implement a restoration strategy for the Pitzer Outback Preserve. This goal is to be met by learning about restoration theory, methods and case studies, as well as engaging in hands-on restoration work. The planning and implementation of restoration efforts will be determined on-site and through student input.

How the Outback is Integrated with the Campus Landscape

Pitzer College, since its founding in 1963, has a record of supporting environmental causes in the community and examining ecological issues through its academic programs. Along with the

College's mission to "produce engaged, socially responsible citizens of the world through an academically rigorous, interdisciplinary liberal arts education emphasizing social justice, intercultural understanding and environmental sensitivity," Pitzer has a Statement of Environmental Policy and Principles, which affirms that it "strives to incorporate socially and environmentally sound practices into the operations of the College and the education of our students....A Pitzer education should involve not just a mastery of ideas, but a life lived accordingly. We are thus committed to principles of sustainability, and dedicated to promoting awareness and knowledge of the impacts of our actions on humanity and the rest of nature." Additionally, Pitzer's core values include the tenant of environmental sustainability.

In fall 2007, the College completed the first phase of construction of new Gold LEED-certified residence halls. Stage two of the College's master plan, two new residence halls completed in fall 2010, achieved a Platinum LEED certification. This development severely impacted the Outback by reducing its size to approximately 3.4 acres. Also, it has brought the residence halls into closer proximity to the Outback. Construction of a proposed "outdoor classroom" in the Outback has been shelved because of the harshly reduced size of the preserve. As a condition of the LEED Platinum certification of the Phase II, Pitzer has committed to preserving the remaining Outback for at least the life of the buildings. In keeping with the Pitzer Master Plan, the Outback Preserve will be better integrated with the rest of the campus.

In keeping with the Pitzer Master Plan, the Outback restoration project aims to better integrate the preserve with the rest of the campus, while increasing its ecological integrity. The Outback is part of the John Rodman Arboretum. Since 1988, the Arboretum has been an official part of the College. The Arboretum has retained much of its original participatory character and continues to rely heavily on student and faculty volunteers. Since 2001, the Arboretum has been managed by Joe Clements.

The College's *Guidelines for the Pitzer College Landscape* address the desirability of ecologically appropriate landscaping. It includes a set of seven guidelines:

1. Campus landscaping should reflect our climate and geological setting.
2. The campus should be designed to

3. conserve water.
3. The campus landscape should be educational.
4. Campus plantings should be interesting and attractive, with attention to shape, texture and color.
5. The landscape should help unify the campus, which will increasingly contain buildings of different styles and periods.
6. Grounds management should emphasize ecological understanding of soil development and maintenance, biotechnical cycling, species and age diversity, and structural and physiological adaptation of the vegetation.
7. Landscaping should reflect the spirit of the College.

The Outback restoration project employs an ecosystematic design approach, wherein multiple scales and systems are considered and integrated in the planning and restoration process. Connections are made at local, watershed, and regional levels to establish existing patterns and processes, strengthen project relevance, and provide appropriate site design context. The level and depth of restoration is informed by the results of combining historic background research with current analysis and context of the site. This approach, which is continually evaluated, ensures an appropriate and adaptive level of restoration for the Outback Preserve so that it functions harmoniously with the existing Pitzer campus and community, fostering a cohesive socio-natural landscape.

Ecological Description

The Pitzer College Outback is a 3.4-acre parcel. It is our intent to preserve and restore the remaining native alluvial scrub once prevalent on the footprint of our campus. Though heavily impacted and disturbed, in this area it represents a unique combination of recovering coastal sage scrub and chaparral plant communities.

Restoration Needs

This section addresses the question of what is meant by "recovery" in the ecological restoration of the Pitzer Outback Preserve. An ecosystem has recovered—and is restored—when it contains sufficient biotic and abiotic resources to continue its development without further assistance or human intervention. It will sustain itself structurally



Students in “Restoring Nature: The Pitzer College Outback Preserve” have seeded and planted hundreds of native plants in our effort to restore ecological health to this small fragment of alluvial sage scrub.

and functionally and will demonstrate resilience to normal ranges of environmental stress and disturbance. It will interact as much as possible with regional ecosystems in terms of biotic and abiotic flows and cultural interactions. The small size and urban setting of the Pitzer Outback makes full ecological restoration impossible, so a standard must be set for achieving particular goals.

Alluvial scrub is the reference ecosystem for the Pitzer Outback; it serves as the model for planning our ecological restoration project and will later serve in the evaluation of the project. The proximity and health of the sage scrub habitat at the Bernard Biological Field Station makes the BFS the most appropriate ecological reference site of the Outback restoration effort.

Designation and Description of the Ecological Reference

Certain floodplain systems in Southern California sustain unique scrub vegetation rather than riparian woodlands due to a lack of perennial water. Alluvial scrub occurs on outwash fans and riverine deposits along the coastal side of major mountains in Southern California. This vegetation type is adapted to severe floods and erosion, nutrient poor substrates and the presence of subsurface moisture. There has been huge historical loss of this unique floodplain vegetation type, due to mining, ranching, agriculture and development, sprawl and flood

control. Current threats to alluvial scrub vegetation include changes to the flooding regime caused by flood control, irrigation and upstream residential and commercial development projects, urban edge effects, pollution from residential and industrial runoff and off-highway vehicle use.

Alluvial scrub (also called interior sage scrub, Riversidian sage scrub, and California sage scrub) is a Mediterranean scrubland type that occurs in washes and on gently sloping alluvial fans. Alluvial scrub is made up predominantly of drought-deciduous soft-leaved shrubs, but with significant cover of larger perennial species typically found in chaparral. This vegetation type is distinctive because of the co-occurrence of evergreen shrubs, drought-deciduous shrubs, riparian species and upland annual species in close proximity to one another. Because alluvial scrub is intermediate between chaparral and coastal sage scrub, it shares many of the same species.

Alluvial scrub is found on recent or actively alluviating surfaces that experience infrequent but severe flood events. Alluvial scrub typically is found on coarse-particle river wash soils near the flood channels or in areas that are frequently inundated. Soils supporting alluvial scrub drain rapidly, have slow runoff and contain low amounts of organic matter. These drainages typically do not support extensive hydrophytic (i.e., wetland) vegetation because of the scarcity of surface water for much of the year.

The spatial distribution and species composition of alluvial scrub is largely determined by the dynamic geomorphic processes within floodplains and alluvial fans. Several different stages of alluvial scrub have been identified based on flooding frequency and distance from the floodplain channel.

The role of fire in the development and maintenance of alluvial scrub vegetation is significant. Because the species composition of alluvial scrub vegetation largely is made up of fire-adapted plants, fire may play a role in reducing older aged stands and promoting the growth of younger individuals and annual species similar to upland coastal sage scrub and chaparral systems. Fire is probably less important and less likely in younger-aged stands that are frequently flooded because of the lack of fuel load and open nature of the vegetation. It is important to recognize that while alluvial sage scrub is a fire-adapted ecosystem, it is not necessarily a fire-dependent ecosystem. (See the section below on fire for more information.)

Since the Pitzer Outback is situated in an area that historically received some surface water flow in winter, some elements of riparian ecosystems may have been present. These floral species may have included sycamore and poplar trees. Moreover, coast live oaks may have been found in this area in greater number but are now few because they were historically diminished for use as fuel wood and lumber.

Situated on the alluvial flow of the San Gabriel Mountains, the area that is now incorporated as Claremont would have naturally been subjected to periodic and seasonal flooding. This natural hydrological component is now absent from the ecology of the alluvial fan due to the massive effect of San Antonio Dam, the 210 Freeway, channeling of water runoff and suburban landscaping. It is largely unknown how the lack of flooding and mineral outwash affects the health and distribution of sage scrub species. In light of this drastic ecosystem alteration, we must identify the best strategies for either replicating the effect of water flows and flooding or determine how to best adjust the plant palette accordingly.

Species Plans

For the purposes of this restoration project, floral species are categorized as native or non-native, with the intention of restoring ecological balance and diversity within the native plant community and reducing the impact of non-native species. Toward this end, the Outback is being mapped for floral distribution, key ecological relationships and areas of special concern. These species maps are being overlaid on topographic maps and input using GPS.

Native Plant List

Native perennial flora of the Pitzer Outback includes but is not limited to: white sage (*Salvia apiana*), redberry (*Rhamnus crocea*), flat-top buckwheat (*Eriogonum fasciculatum*), yucca (*Hespero yucca whipplei*), California croton (*Croton californicus*), tarragon (*Artemisia dracuncululus*), yerba santa (*Eriodictyon spp.*), mule fat (*Baccharis salicifolia*), wild cucumber (*Marah spp.*), laurel sumac (*Malosoma*), black sage (*Salvia melifera*), California sagebrush (*Artemisia californica*), lemonadeberry (*Rhus integrifolia*), golden yarrow (*Eriophyllum confertifolium*), prickly-pear (*Opuntia littoralis*) and cholla (*Opuntia serpentiana*), scrub oak (*Quercus berberidifolia*), coast live oak (*Quercus agrifolia*), poison oak (*Toxicodendron diversilobum*), holly-

leafed cherry (*Prunus ilicifolia*) and mountain-mahogany (*Cercocarpus betuloides*), scale broom (*Lepidospartum squamatum*), whiteflower currant (*Ribes indecorum*), mesa horkelia or wedgeleaf horkelia (*Horkelia cuneata ssp. Puberula*).

Annual species composition has not been studied but is probably similar to that found in understories of neighboring scrubland vegetation.

Exotics Plant List

Exotic species occurring within the Outback will generally be eliminated and discouraged from reoccurring. Exception may be made if a compelling cultural and ecological rationale is made.

Non-native flora of the Pitzer Outback includes but is not limited to: mustard (*Brassica spp.*), Spanish broom (*Spartium junceum*), agave (*Agave americana*), star-thistle (*Centaurea spp.*) and San Pedro Cactus (*Trichocereus pachanoi*).

Fauna

Restoring animal species to the Pitzer Outback is beyond the scope of this project. Hence, it is not the intention of this restoration plan to eradicate or introduce any faunal species, or to directly influence the balance of faunal species (but that is not to say that they are not critical to the alluvial sage scrub habitat). However, efforts can be made in order to attract native fauna species to the Outback. These efforts could include creating a denser barrier of native flora between the edge of the Outback and the streets creating a more livable space for animals, or including birdhouses in the Outback to attract nesting bird species. The more native animals that inhabit the Outback the closer we come to creating a more complete ecosystem.

While restoring animal species to the Outback is not an immediate concern of this project, here is a short list of faunal residents one might encounter:

Some Outback faunal residents include Cooper's hawk (*Accipiter cooperii*), California quail (*Callipepla californica*), Western scrub jay (*Aphelocoma californica*), cottontail rabbit (*Sylvilagus audubonii*), wood rat (*Neotoma macrotis*), California legless lizard (*Anniella pulchra*), western fence lizard (*Sceloporus occidentalis*) and black widow spider (*Latrodectus Hesperus*). Non-resident species include coyote (*Canis latrans*) and bobcat (*Lynx rufus*). A number of important faunal species are locally extinct within

the Outback, including mule deer, grizzly bear, rattlesnake, tarantula and mountain lion.

Since fire has not provided this site with its positive benefits, at least in the historical record, the Outback restoration plan strives to mimic some of the clearing effects of conflagrations. To achieve this, much of the debris wood and dead vegetation is being removed. In some cases, healthy native plants are being pruned in partial replication of the effects of fire. In other cases, the brush is simply stomped down (unless determined as a potential habitat or resource and/or aesthetically pleasing) or mulched and distributed onsite.

Native species occurring within the Outback are generally encouraged to thrive. The exception is when an assessment has been made that the floral species occurs in a disproportional abundance to what would exist naturally in the ecological reference.

Restoration Goals

Generally, restoration attempts to return an ecosystem to its historic, ecological trajectory. Historic conditions are therefore the natural starting point for restoration design. However, given substantial changes to natural ecosystems and global conditions, it may be best to consider restoring to an ecological trajectory based on contemporary or future conditions.

Since ecological restoration of natural ecosystems attempts to recover as much ecological authenticity as can be reasonably accommodated, the reduction or elimination of exotic species at restoration project sites is highly desirable. An exotic species of plant or animal is one that was introduced into an area where it did not occur prior to recent human activities. Nonetheless, financial and logistical constraints exist within the Outback Preserve Restoration Project, and it is important to be realistic and pragmatic in approaching exotic species control, particularly on a college campus.

In cultural and historical restoration projects, exotic species are frequently an integral part of the landscape. Such exotic species are acceptable for cultural restoration.

In natural ecosystems, invasive exotic species commonly compete with and replace native species. However, not all exotic species are harmful. Indeed, some even fulfill ecological roles formerly played

by the native species that have become rare or extirpated. In such instances, the rationale for their removal may be tenuous. For example, some exotic species were introduced centuries ago by human or non-human agents and have become naturalized, so that their status as an exotic is debatable. Other species were managed by Indigenous Americans such that their distribution and representation have been altered from a natural state. Still others may have migrated in and out of the region in response to climatic fluctuations during the Holocene and can scarcely be regarded as exotics. Even if all exotic species are removed from the Outback restoration site, the opportunity for re-invasion remains extremely high. Therefore, it is essential for a policy to be developed for each exotic species present, based upon biological, economic and logistical realities. Highest priority is best reserved for the control or extirpation of those species that pose the greatest threats. These include invasive plant species that are particularly mobile and pose an ecological threat at landscape and regional levels and animals that consume or displace native species, in our case Mustard (*Brassica* spp.), Spanish broom (*Spartium junceum*), and agave (*Agave americana*). Care should be taken to cause the least possible disturbance to indigenous species and soils as exotics are removed.

Ecological Considerations in the Context of Regional Development

The primary development negatively affecting alluvial sage scrub ecosystems in general and the Outback Preserve specifically include:

- Encroachment
- Edge effect
- Soil alterations
- Invasive species
- Existing and expanding infrastructure
- Altered fire regimes, including both fire suppression and frequency (see below)

Fire

Fire in interior sage scrub has led to the selection of fire survival strategies. Since fire has been a recurring, although infrequent event, for millions of years, only those species that have adaptations allowing them to recover persist. Consequently, many sage scrub plant species depend on some fire cue or post-fire environmental condition for maximal reproductive success. But over the past

century, fires have increased dramatically (due to human activity) in excess of what the ecosystem can tolerate. Old-growth sage scrub (50+ years old) remains a vigorous plant community, continues to add biomass over time and supports a dynamic population of animals.

There are three basic strategies plants use to respond to fire in the chaparral:

Obligate resprouters like toyon (*Heteromeles arbutifolia*) depend on resprouting from underground root systems or burls to survive after a fire. Geophytes (perennials with fleshy, underground structures like bulbs or tubers) are obligate resprouters, but the enhanced light from the lack of cover stimulates many geophytes to produce large numbers of flowers.

Obligate seeders, like many *Ceanothus* species, are destroyed in the flames and depend on seedlings to replace their populations. Their seeds require some fire cue (heat, charred wood, smoke) to germinate.

Facultative seeders like chamise (*Adenostoma fasciculatum*) resprout and germinate after a fire.

Since fire has not provided this site with its positive benefits, at least in the historical record, the Outback Preserve Restoration Project strives to mimic the clearing effects of conflagrations. To achieve this, some of the debris wood and dead vegetation will be removed. In some cases, healthy native plants will be vigorously pruned in partial replication of the effects of fire. In other cases, the brush will be stomped down (unless determined as a potential habitat or resource and/or aesthetically pleasing) or mulched and distributed onsite.

Strategies

Ecological restoration is the practice of restoring ecosystems, as performed by practitioners at specific project sites, whereas *restoration ecology* is the science upon which the practice is based. Restoration ecology ideally provides clear concepts, models, methodologies and tools for practitioners in support of their practice. Restoration strategies incorporate perspectives from scientific ecology as well as social science perspectives.

Our strategies for the Outback restoration project incorporates the perspectives of interested parties, as well as an understanding of staffing needs, required materials and statements of use of pesticides.

Reference Points

The Pitzer College Master Plan and the Housing Master Plan are points of reference for current and future campus plans. The natural history guide *Introduction to California Chaparral* provides some guidance on the ecological characteristics of alluvial scrub communities.

Performance Standards

Design criteria

The principle design criteria for the project is to achieve Outback floral restoration to a state replicating the historical benchmark or trajectory, while balancing this with the desirability of increasing access for the Pitzer College community and beyond.

Cultural resources, like the currently existing walking paths, have been assessed individually for their fit within the project goals. Some paths have been eliminated, new paths have been created, and some existing paths have been improved. The preserve will continue to be monitored for improvements in order to help natural ecosystems through the restoration process.

It must be understood that *restoration* of the Outback may be an idealized goal, but the reality is that achieving some degree of *rehabilitation* will be a benchmark of success. As one student in Restoring Nature indicated, "The Outback is not undergoing a restoration so much as it is being rehabilitated from a severely degraded state."

Success criteria

Ongoing and post-project interviews and surveys with the interested parties will assess the social and ecological successes of the project.

The ecological stability of the Outback Preserve project area is being monitored with longitudinal assessments, making use of photographic documentation, GPS data and narrative summaries.

Throughout the duration of the restoration project, the Outback will continue to be utilized in appropriate ways by the campus and regional community. As explicated in the Pitzer Master Plan, the Outback can be employed as a mechanism of bringing the community together to appreciate, respect and gain knowledge about the native ecosystems of our region.

Learning Criteria

Throughout the discrete stages of the project and its corresponding academic course, students are developing the knowledge and skills to be able to:

- Define options and plans for ecosystem restorations
- Recognize the social aspects of ecological restoration
- Understand local site ecology: topography, flora, fauna, soil and climate
- Engage in the effective science and practice of ecological restoration through a hands-on approach
- Measure impacts and assess solutions for conservation of species and ecosystems through formal, iterative processes for decision making
- Implement diverse strategies for effective management and planning in conservation

Interested Parties/Stakeholders

The following interest groups have a stake in the restoration project, and are consulted as necessary. Additional local, regional, national and global stakeholders may be identified as the project progresses and added to the following list:

- Students enrolled in Restoring the Outback (EA 131)
- The John Rodman Arboretum
- Robert Redford Conservancy for Southern California Sustainability
- The Pitzer College community (students, faculty and staff)
- Claremont and regional communities
- Joint Science Ecologists
- The Rancho Santa Ana Botanic Garden
- California Native Plant Society
- Theodore Payne Foundation
- Audubon Society
- American Society of Landscape Architects
- National Resource Defense Council
- Environmental Protection Agency
- Rivers and Mountains Conservancy
- Council for Watershed Health

Goals and Objectives

A properly planned restoration project attempts to fulfill clearly stated goals that reflect important attributes of the reference ecosystem. Pursuing

specific objectives is how the goals are achieved. The goals are ideals, and the objectives are strategies taken to attain these goals. Two fundamental questions are being asked with respect to the evaluation of the Outback as a restored ecosystem: Were the objectives accomplished? Were the goals fulfilled? Answers to these questions gain validity only if the goals and objectives have been clarified prior to implementation of restoration work.

Objectives for the Outback restoration project are based on performance standards, also known as design criteria or success criteria. In our case, these standards or criteria are conceived in large part from an understanding of the alluvial scrub reference ecosystem. For this reason, the Arboretum director, Joe Clements, along with Professor Paul Faulstich are providing the baseline and performance standards for the Outback restoration project. Objectives, performance standards and protocols for monitoring and for data assessment are outlined in this document, and are being incorporated into restoration plans throughout the duration of the project.

Periodic evaluations of the project will be employed to survey how well goals are being met. Evaluations include the assessment of stated goals and objectives that pertain to ecological, educational and institutional concerns. Hence, our evaluations have generally included the methods and techniques of the social sciences.

Project Goal

The goal of the Pitzer College Outback Preserve Restoration Project is:

to rehabilitate, preserve and maintain the Pitzer Outback as a resilient landscape for the Pitzer campus community and beyond to experience, steward and enjoy.

This goal is to be achieved through implementing the following strategies, identified a project objectives:

Project Objectives

Thirteen objectives provide a basis for determining when the restoration goals set for the Outback have been accomplished. The full expression of all of these attributes is not essential to demonstrate restoration. Instead, it is only necessary for these attributes to demonstrate an appropriate historical trajectory of ecosystem development towards the

intended goals or reference. Some attributes are readily measured, while others must be assessed indirectly (including most ecosystem functions, which cannot be ascertained without research efforts that exceed the capabilities and budgets of our restoration project).

1. The restored Outback ecosystem will contain a characteristic assemblage of the species that occur in the alluvial scrub reference ecosystem and that provide appropriate community structure.
2. The restored Outback ecosystem consists of indigenous species to the greatest practicable extent.
3. All functional groups necessary for the continued development and/or stability of the restored Outback ecosystem are represented or, if they are not, the missing groups have the potential to colonize by natural means, or the omission is purposeful (for example, the intentional omission of rattlesnakes, or the suppression of fire).
4. The physical environment of the restored Outback ecosystem is capable of sustaining reproducing populations of the species necessary for its continued stability or development along the desired trajectory.
5. The restored Outback ecosystem apparently functions normally for its ecological stage of development, and signs of dysfunction are minimized to the extent possible.
6. While there are severe limitations to connecting the Outback to the larger ecosystem, the restored Outback ecosystem is integrated to the largest possible extent into a larger ecological matrix with which it interacts through abiotic and biotic flows and exchanges.
7. Potential threats to the health and integrity of the restored Outback ecosystem from the surrounding landscape have been reduced as much as possible. This includes the elimination or reduction in smoking that occurs in the preserve.
8. The restored Outback ecosystem is sufficiently resilient to endure the normal periodic stress events in the local environment (e.g., drought, heat) that serve to maintain the integrity of the ecosystem.
9. The restored Outback ecosystem is self-sustaining to the maximum degree given its small size and its physical surroundings.
10. The restored landscape will integrate the Outback into the campus and local

community and will promote a sense of respect for and accessibility to our natural, local ecosystem.

11. The Outback Preserve Restoration Plan establishes site programs to promote education, foster environmental stewardship and support a sense of place within the local and regional community.
12. The restored Outback draws local and regional level connections to generate a far-reaching effect beyond the immediate campus community.
13. The Outback Restoration Plan serves as a model for ecological systems planning and holistic design on a campus level.

Other objectives may be added to this list if they are identified to be compatible with the goals of the restoration project.



The foreground in this photo shows the entrance to the Outback Preserve stripped of vegetation by campus building projects. This area has since been re-vegetated, and enhanced with this steel sign designed by Kathryn Miller, Emeritus Professor of Art.

Scope of Work

Stage 1: Background Research and Precedents

This initial stage involved the gathering of preliminary information pertinent to the project. This includes relevant materials related to the site such as photos, maps and data. Background, precedents, innovations, and research have been informed by literature review of relevant topics and consultation

with stakeholders, community members and professional and industry experts.

Tasks Completed:

- Gathered preliminary data pertaining to site context
- Reviewed relevant policy and planning information
- Identified and met with relevant stakeholders to assess issues and concerns
- Identified restoration methods and technologies
- Gathered and reviewed relevant case studies and referenced successful restoration projects

Stage 2: Inventory

In this stage, an inventory of relevant information was developed. This was conducted through the charting of environmental, spatial, atmospheric, demographic, economic and physical site contexts, as well as through site visits and community stakeholder meetings. Information gathered during these first two stages provides a basis of knowledge pertinent to the study and inform the project team as it moves toward analysis and design.

Tasks Completed:

- Gathered pertinent data related to geology, geomorphology and soils
- Collected pertinent data related to climate and microclimates
- Assembled pertinent data related to vegetation presence and patterns
- Established current and historic wildlife presence and patterns
- Determined current and historic land uses
- Ascertained pertinent data related to social and cultural patterns
- Established geographic setting and topography
- Gathered pertinent data related to current and historic hydrology and drainages
- Collected data related to soil variation, components and beneficial microorganisms specific to alluvial scrub ecosystem

Stage 3: Program

During this stage, the project team collected information regarding the needs, preferences and perceptions of project stakeholders, community members and other experts involved in decision-making about the Outback Preserve Restoration Project.

Tasks Completed:

- Met with stakeholders to assess issues and concerns
- Refined goals, objectives, and scope of work based upon initial findings and stakeholder feedback

Stage 4: Analysis

The goal of this stage was to fully understand the interrelated issues associated with the project and develop opportunities and constraints. The project team assessed data collected as well as information provided by stakeholders—locally and beyond—and established priorities and effective strategies towards design. Evaluations included site mapping and GIS analysis. Analysis provided synthesized opportunities and constraints that have and will continue to inform design changes. GPS is also a useful tool in studying the spatial aspects of the site. It could be that at some point GIS can be utilized to reveal preferential inclinations of the neighboring demographic to extend their resources, express interests and help or invest their time and energy into this project.

Tasks Completed or Ongoing:

- Assembled inventory information for analysis
- Build GIS or mapping system for project site with available data (ongoing)
- Reviewed inventory and assess for gaps in information
- Analyzed assembled information for project opportunities and constraints
- Assessed and categorized opportunities and constraints into common themes
- Presented initial analysis for review and feedback
- Compiled relevant findings and assessments of project issues, constraints and opportunities
- Established design criterion
- Identified indicator species that will help identify the ecological health of the site

Stage 5: Synthesis and Design

During the synthesis and design stage, the project team coalesced research, analysis and opportunities to formulate site designs that most effectively address stakeholder needs and issues established through stages of research and analysis.

Tasks Completed:

- Developed a restoration plan for the Pitzer

Outback that highlights preservation, education and community

- Presented initial design and restoration plan to project stakeholders and community
- Refined initial design based on stakeholder feedback

Stage 6: Production

Through this phase, the project team produced materials that reflect physical restoration designs, guidelines, educational programming, and all aspects of the project leading up to them. This included presentations, physical documents outlining the restoration design and two books that graphically document the project in its entirety.

Tasks Completed and Ongoing:

- Finalized designs and restoration plan
- Compiled and refined all necessary supporting information, technical specifications, and graphics
- Wrote and edited all necessary document text
- Assembled all relevant materials into a cohesive, comprehensive and attractive format for visual presentation and physical publication. These publications, which are available in both hardcopy and online formats, are:
Restoring Nature: The Pitzer Outback (2012) and
Restoring Nature: Part Two, The Pitzer Outback Preserve (2013)
- Formally presented restoration plan to project stakeholders and community
- Assessed social and ecological successes of the project with post-project interviews and surveys with the interested parties
- Monitor ecological stability of the project area with longitudinal assessments, making use of photographic documentation (ongoing)

Stage 7: Implementation and Monitoring

During this final phase, the Pitzer Outback Preserve Restoration Project has begun to be implemented and monitored to ensure success and effectiveness. The Outback will continue to need rehabilitation on an ongoing basis, and it could potentially become a more student-oriented and student-run process. Ideally, the future of the Outback should involve more integration of the Pitzer community and the Outback.

Ongoing Tasks:

Staffing: The initial stages of the Outback restoration project are being implemented by students enrolled in Restoring Nature. Students are assisted in their labor by Arboretum staff and Professor Paul Faulstich.

Tools Needed:

- Ecological descriptions, species lists and maps of the project site
- Historical and recent aerial and ground-level photographs
- Access to the different levels of book making or brochure making (printers, ink, bindings, etc.)
- Gardening tools and equipment
- Earth-moving equipment, on an as-needed basis
- Organic/locally created mulch
- Herbicides (if deemed appropriate, and only in very small and controlled situations)
- Monitoring equipment
- Microbial analyses regarding soil conditions, methods, laboratory equipment and resources necessary to conduct such studies

Protocols for Monitoring

Monitoring the Outback Preserve is the responsibility of the Arboretum staff, under the direction of the Arboretum director. The staff will continually assess the Outback and conduct ongoing management that is aligned with this restoration plan. Arboretum staff will include students as appropriate in the ongoing monitoring.

Strategies for Long-term Protection and Maintenance

Success of the project over time is dependent on the ability to maintain low levels of invasive plants and the elimination of unwanted anthropogenic use of the area (including campfires, excessive noise and other damaging activities). Maintenance of the area is under the purview of the Arboretum, which is charged with oversight of all grounds on the Pitzer campus.

A critical measure of project success is assessing the goal of increasing community appreciation of the Outback, which will then further encourage its long-term preservation.



Through hands-on engagement with restoring the Outback Preserve, students act on our responsibility to steward nature while learning about the endangered sage scrub ecosystem native to our area of southern California.

Introduction of new courses, including Exhibiting the Outback and Design Workshop: Fostering a Sense of Place, is intended to increase the visual aesthetics of the area, to design appropriate access and educational displays, and to increase understanding and appreciation of the campus resource. This is considered to be an important aspect for long-term protection and maintenance.

Deliverables

All deliverables designed for physical publication will also be made available in digital format. Deliverables may include:

- Student learning: Though the course Restoring Nature, students engage with the Outback Preserve in a hands-on curriculum
- Comprehensive publication documenting all aspects of the restoration project from site analysis to final restoration plan. The final publication may include, but is not limited to: site and regional analysis, comprehensive restoration plan and site programming, plant selection, material selection, maintenance specifications, and organic nutrient and pest management guidelines. Additionally, the document may include general cost estimates and tiered plan alternatives designated to accommodate varying scales

of economic investment

- Educational systems, programs and materials enabling the Pitzer community to present and share information to the greater public that relates to the restoration and preservation of the Outback
- Website, booklet, condensed project report or other materials to present to potential granting agencies when pursuing future funding for the Outback Preserve Restoration Project
- Well-developed and explicitly stated performance standards, with monitoring protocols by which the project can be evaluated
- Implementation of strategies for long-term protection and maintenance of the restored ecosystem

Schedule

The current phase of the ongoing Outback Restoration Project is slated to run through the spring 2015 semester. Thereafter, a reassessment of this plan will precede further restoration work. The Arboretum staff that oversees the Pitzer campus grounds will monitor the site.

Budget

Funding for this project has been minimal. To date, funds have been acquired through a generous grant from the Dean Witter Foundation, the Community Engagement Center at Pitzer College, Pitzer's Faculty Research and Awards, the John Rodman Arboretum, and a pitzfunder project. As the project continues, we will need to seek additional funding.

Funds will continue to be needed for the following:

- Site Preparation
 - Fencing and other infrastructure materials and installations
- Purchase and installation of plants and irrigation
 - Purchase of plants
 - Soil, mulch, amendments
 - Post-installation activities
 - Ongoing monitoring and maintenance
- Signage; designs, materials and construction
- Landscaping tools and equipment
- Printing

- Benches and other landscaping materials
- Landscape crew
- Supplies for student projects

Reflections

Humans are transforming Earth’s landscape from a natural matrix with pockets of civilization to just the opposite. Most of us realize that this pattern is not sustainable. I live and work in Pitzer’s home community of Claremont, California, a charming college town in the midst of suburban sprawl. The town has a central “village” of tasteful, exorbitantly priced bungalows nestled in the shade of tall, largely exotic trees. Indeed, most of the landscape of this “city of trees and PhDs” has been imported, only a few remnants of coastal sage scrub remains. The coastal sage scrub ecosystem, once the prevalent indigenous plant community in the Claremont region, is now endangered as result of sprawl and inappropriate development. It was partly our experience of this disjunction between environmental past and present that led me to develop the Outback restoration plan.

At Pitzer College, social responsibility is defined as awareness, knowledge and behavior based on a commitment to the values of equity, access and justice, civic involvement and environmental sustainability, and rooted in a respect for diversity, pluralism and freedom of expression. To improve implementation of this educational objective, Pitzer introduced a specific guideline during the 1995-96 academic year that requires students to participate in a semester-long community-based service project. Students may pursue one of several options to meet this guideline, but the preferred method is an experiential-learning placement in the context of a course (e.g., Restoring Nature). Following the introduction of this new guideline, Pitzer began to encourage its faculty to experiment with service-learning courses and to develop experiential learning projects.

While the vast majority of “Social Responsibility” courses are driven and sustained by the research interests of individual faculty members, the Outback Preserve restoration project emerged more out of passion than expertise. I am trained as a cultural anthropologist, and I direct the Outback restoration largely as an add-on to my other responsibilities. As an academic generalist with diverse interests, I am engaged in preparing students not only to learn, but also to act effectively on their values and to participate in their communities. I strive to

encourage proactive and intelligent responses to our social and ecological dilemmas. My academic strengths lay in a broad “human ecology,” which teaches that diversity, interdependence and whole systems are fundamental to us and to the health of the planet. This is the passion that was the impetus for ecological restoration of the Outback.

Community takes many forms. From an ecological perspective, a community can be as vast as an entire forest ecosystem or as tiny as a group of microbes inhabiting a rotting log. Similarly, from a social perspective, communities vary in size and composition, along with a variety of other cultural and economic factors. Revitalizing communities is key to ecological health and social harmony. Our current environmental crisis is symptomatic of our fractured relationship with the natural world and with each other. We are unlikely to succeed in appreciating and restoring the natural environment if we lack the knowledge and passion to restore human communities. It is my intent to address both of these critical concerns through the Outback restoration program.

In many ways, the Outback Preserve restoration effort is about extending: extending our learning outside of the classroom, extending our relationship with the world, extending our understanding of others, extending our sense of community. In keeping with Pitzer’s educational objectives, students learn to evaluate the effects of actions and social policies and to take responsibility for making the world in which we live a better place.

Through the Pitzer Outback Preserve Restoration Project, the benefits and limitations of the evolving science of restoration ecology are studied and implemented. Indeed, this engagement with the Outback Preserve is at the heart of this project. Students and others learn the process of restoration theory and implementation through an interdisciplinary and comprehensive approach that stresses participatory and student-led projects and research. Ecological restoration is work to restore the health of the land. By engaging in restoration, we accept a forsaken responsibility, and we participate in a partnership ethic with the land. It is pertinent to note—and not just as parenthetically—that current human systems also need restoration. We must honor diversity, and ecological diversity may well be correlated with human diversity.

There is remarkable beauty and diversity within the Pitzer College Outback Preserve. But from an

ecological perspective, it is a damaged environment and could use our concerted stewardship. We have the opportunity to help nature heal by restoring this small, damaged ecosystem.

Along with protecting native plants and animals within the Outback boundaries, the College needs to carefully regulate adjacent activities. For example, because of the adverse impacts of second-generation anticoagulant rodenticides on wildlife, these unnecessary toxins should be restricted. Poison baits injure and kill huge numbers of wild animals and pets. Because of the risk of harm to children, pets and wildlife, the US Environmental Protection Agency has starting the process of banning the most deadly rodenticides from the consumer market. Rodents consume these poisons and then slowly die of internal hemorrhaging, taking up to ten days to die after eating the rodenticide. During this time, the rodents can continue to consume bait, raising their toxin levels to doses that are lethal even for larger animals such as owls, foxes and bobcats, which eat rodents or carrion.

In Southern California, 92% of bobcats have anticoagulant poison in their systems, and bobcats that die of mange all have trace amounts of anticoagulant rat poison in their livers. Exposure to anticoagulant rat poison is linked to increased susceptibility to notoedric mange, caused by a microscopic mite, which leads to the death of the bobcats.

Rat poisons, especially those containing the active ingredient brodifacoum, are implicated in the poisonings and deaths of an increasing number of California wildlife species. The link between rat poison and terminal mange is deeply troubling, especially since bobcats unexposed to the poison do not die of mange. It is illogical to strive to protect the Outback Preserve if we are poisoning the animals that belong in this ecosystem. The bottom line is that using these poisons in our community is inhumane and irresponsible, and I'm proud to say that Pitzer College is phasing out all rodenticide use on campus and is switching to use of snap traps exclusively to control rats.

Understanding the history of our bioregion gives us valuable perspective. Let's dream big. With the Outback Preserve comes the responsibility of stewardship. From my perspective, this stewardship should be eco-centric in that the needs of the environment—its plants, animals and ecological relationships—are prioritized. But doing so will necessitate compromises by us, as benefactors and

beneficiaries. Prioritizing the health of the Outback will focus our campus management decisions accordingly. In the process, the Pitzer campus will become biologically richer and healthier, and safer for visitors. It will become an exemplary for how to best manage the urban-wildlands interface.

We have an opportunity to manage the Outback as a small refuge offering diverse and lightly impacted habitat for our fellow creatures. Let's recognize the richness and vulnerability of this environment, and steward it with humility.