

COLLEGE OF SAN MATEO BUILDING 20 DEMOLITION FINAL SUBSEQUENT ENVIRONMENTAL IMPACT REPORT

PREPARED FOR:

San Mateo County Community College District
3401 CSM Drive
San Mateo, CA 94402
Contact: Mitchell Bailey
650.574.6560

PREPARED BY:

ICF
201 Mission Street, Suite 1500
San Francisco, CA 94105
Contact: Heidi Mekkelson
415.677.7116

October 2018



ICF. 2018. *College of San Mateo Building 20 Demolition Final Subsequent Environmental Impact Report*. October. (ICF 00602.17.) San Francisco, CA.
Prepared for the San Mateo County Community College District, San Mateo County, CA.

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Chapter 1

Introduction

This document contains comments submitted by agencies, organizations, and individuals concerning the July 2018 Draft Subsequent Environmental Impact Report (Draft SEIR) to the *San Mateo Community College District 2015 Facilities Master Plan Amendment Final Environmental Impact Report* (2015 Certified EIR), State Clearinghouse #2015052007, certified in December 2015. The Draft SEIR analyzed a change in the 2015 Facilities Master Plan Amendment (Project) to include the proposed demolition of existing structures at the Building 20 Complex at the College of San Mateo and construction of a single surface parking lot in their place (Project Change). This document also contains responses to each comment received and appropriate revisions to the Draft SEIR. The San Mateo Community College District (District) is the lead agency for the project.

The Draft SEIR was made available to the public and regulatory agencies for review and comment during a 47-day comment period between July 25, 2018 and September 10, 2018.

The Guidelines implementing the California Environmental Quality Act (CEQA) require that written responses be prepared for all written comments received on a Draft EIR during the public review period. CEQA Guidelines Section 15132 specifically states:

The Final EIR shall consist of:

1. The Draft EIR or a revision of that draft.
2. Comments and recommendations received on the Draft EIR either verbatim or in a summary.
3. A list of persons, organizations, and public agencies commenting on the Draft EIR.
4. The response of the Lead Agency to significant environmental points raised in the review and consultation process.
5. Any other information added by the Lead Agency.

This Final SEIR has been prepared in compliance with these Guidelines and includes the following:

- Chapter 1, *Introduction*
- Chapter 2, *Comments Received on the Draft Subsequent EIR*
- Chapter 3, *Responses to Comments*
- Chapter 4, *Revisions to the Draft Subsequent EIR*

Information provided in the responses to comments and in the revisions to the Draft SEIR clarifies and amplifies the analysis presented in the Draft SEIR. No significant new information, as defined by CEQA Guidelines Section 15088.5, was added that would trigger recirculation of the Draft SEIR. Specifically, there are no new significant environmental impacts, or a substantial increase in the severity of any significant impact, identified in the comments or responses that were not already identified in the Draft SEIR.

Chapter 2

Comments Received on the Draft Subsequent EIR

This chapter includes a list of the agencies, organizations, and individuals who commented on the Draft Subsequent EIR (Draft SEIR), the letter of receipt from the State Clearinghouse, and the actual comment letters submitted on the Draft SEIR. The comment letters have been numbered as shown in Table 2-1 and include both letters and emails. The individual comments within each letter have been numbered in the right margins. A response to each comment is provided in Chapter 3, *Responses to Comments*. Each individual response in Chapter 3 is numbered to correspond with the comment to which it responds.

Table 2-1. List of Commenters

Letter #	Commenter
Local Agencies	
1	Department of Transportation (Caltrans)
2	Town of Hillsborough (Elizabeth Cullinan)
Organizations	
3	American Institute of Architects Students College of San Mateo (AIAS CSM)
4	Friends of the CSM Gardens Group (Violeta Grigorescu)
Individuals	
5	Liane Benedict
6	Linton Bowie
7	Charlotte Kelley
8	John Lewis



EDMUND G. BROWN JR.
GOVERNOR

STATE OF CALIFORNIA
GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH



KEN ALEX
DIRECTOR

September 6, 2018

Mitchell Bailey
City of San Bruno
3401 CSM Drive
San Mateo, CA 94402

Subject: College of San Mateo Building 20 Demolition
SCH#: 2015052007

Dear Mitchell Bailey:

The State Clearinghouse submitted the above named Supplemental EIR to selected state agencies for review. On the enclosed Document Details Report please note that the Clearinghouse has listed the state agencies that reviewed your document. The review period closed on September 5, 2018, and the comments from the responding agency (ies) is (are) enclosed. If this comment package is not in order, please notify the State Clearinghouse immediately. Please refer to the project's ten-digit State Clearinghouse number in future correspondence so that we may respond promptly.

Please note that Section 21104(c) of the California Public Resources Code states that:

"A responsible or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency. Those comments shall be supported by specific documentation."

These comments are forwarded for use in preparing your final environmental document. Should you need more information or clarification of the enclosed comments, we recommend that you contact the commenting agency directly.

This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Enclosures

cc: Resources Agency

**Document Details Report
State Clearinghouse Data Base**

SCH# 2015052007
Project Title College of San Mateo Building 20 Demolition
Lead Agency San Mateo County Community College District

Type SIR Supplemental EIR
Description The project involves the demolition of all existing on-site structures (building 20, the greenhouse, and the lath house) and the construction of a surface parking lot with 211 stalls which would provide centrally located, convenient parking for college staff and students. The project would include associated landscape, storm drain, lighting, signage, and security improvements as well as the extension of underground chilled water utilities and the replacement of stairs adjacent to building 19 and building 12.

Lead Agency Contact

Name	Mitchell Bailey		
Agency	City of San Bruno		
Phone	650-574-6560	Fax	
email			
Address	3401 CSM Drive		
City	San Mateo	State CA	Zip 94402

Project Location

County	San Mateo				
City	Redwood City, Woodside, San Mateo, San Bruno				
Region					
Lat / Long	37° 32' 15.6" N / 122° 20' 11.6" W				
Cross Streets	Perimeter Rd, Athletic Loop Rd				
Parcel No.	038281030				
Township	4S	Range	4W	Section	Pulgas
				Base	MD

Proximity to:

Highways	SR 92
Airports	
Railways	Caltrain
Waterways	Lower Crystal Springs Reservoir
Schools	Baywood ES,
Land Use	Major institution/special facility

Project Issues Aesthetic/Visual; Air Quality; Archaeologic-Historic; Biological Resources; Cumulative Effects; Drainage/Absorption; Flood Plain/Flooding; Geologic/Seismic; Noise; Public Services; Recreation/Parks; Schools/Universities; Soil Erosion/Compaction/Grading; Solid Waste; Toxic/Hazardous; Traffic/Circulation; Vegetation; Water Quality; Water Supply

Reviewing Agencies Resources Agency; Department of Fish and Wildlife, Region 3; Office of Historic Preservation; Department of Parks and Recreation; Department of Water Resources; California Highway Patrol; California Department of Education; Caltrans, District 4; Resources, Recycling and Recovery; Regional Water Quality Control Board, Region 2; Department of Toxic Substances Control; Native American Heritage Commission

Date Received	07/20/2018	Start of Review	07/23/2018	End of Review	09/05/2018
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Letter 1

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY

EDMUND G. BROWN Jr., Governor

DEPARTMENT OF TRANSPORTATION

DISTRICT 4

OFFICE OF TRANSIT AND COMMUNITY PLANNING

P.O. BOX 23660, MS-10D

OAKLAND, CA 94623-0660

PHONE (510) 286-5528

FAX (510) 286-5559

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www.dot.ca.gov

Governor's Office of Planning & Research



Making Conservation
a California Way of Life.

AUG 06 2018

August 6, 2018

STATE CLEARINGHOUSE SCH # 2015052007
GTS # 04-SM-2018-00152
GTS ID: 9336
PM: SM - 92 - 9.387

Mitchell Bailey
San Mateo County Community College District
3401 SMC Drive
San Mateo, CA 94402

College of San Mateo Building 20 Demolition - Draft Subsequent Environmental Impact Report (EIR)

Dear Mr. Bailey:

Thank you for your inclusion of the California Department of Transportation (Caltrans) in the environmental review process for the College of San Mateo Building 20 Demolition. The comments in this review reflect Caltrans' modernized approach to evaluating and mitigating impacts to the State Transportation Network (STN). Our Strategic Management Plan 2015-2020 aims to reduce Vehicle Miles Traveled (VMT) by tripling bicycle and doubling both pedestrian and transit travel by 2020. Our comments are based on the July 23, 2018 Draft Subsequent EIR.

Project Understanding

Project involves the demolition of existing on-site structures (Building 20, the greenhouse, and the lath house) and the construction of a surface parking lot with 211 stalls that would provide centrally located, convenient parking for college staff and students. The project would include associated landscape, storm drain, lighting, signage, and security improvements as well as the extension of underground chilled water utilities and the replacement of stairs adjacent to Building 19 and Building 12. Regional access to the campus is provided by the State Route 92 interchange at Hillsdale Boulevard, approximately 0.5 miles southeast of the project site.

Lead Agency

As the Lead Agency, the San Mateo County Community College District is responsible for all project mitigation, including any needed improvements to the STN. The project's fair share contribution, financing, scheduling, implementation responsibilities and lead agency monitoring should be fully discussed for all proposed mitigation measures.

1-1

1-2

(Letter 1 cont.)

Mr. Bailey, San Mateo County Community College District
August 6, 2018
Page 2

Transportation Permit

Project work that requires movement of oversized or excessive load vehicles on state roadways, such as Interstate (I-) 280, US Route (US) 101, SR 85, or SR 92 requires a transportation permit that is issued by the Department. To apply, a completed transportation permit application with the determined specific route(s) for the shipper to follow from origin to destination must be submitted to: Office of Transportation Permits, California DOT Headquarters, P.O. Box 942874, Sacramento, CA 94274-0001. See the following website link for more information:
<http://www.dot.ca.gov/hq/traffops/permits/>.

1-2

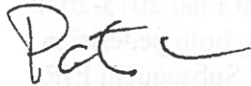
Encroachment Permit

Please be advised that any work or traffic control that encroaches onto the state ROW requires an encroachment permit that is issued by the Department. To apply, a completed encroachment permit application, environmental documentation, and five (5) sets of plans clearly indicating state ROW must be submitted to: Office of Permits, California DOT, District 4, P.O. Box 23660, Oakland, CA 94623-0660. Traffic-related mitigation measures should be incorporated into the construction plans during the encroachment permit process. See the website link below for more information: <http://www.dot.ca.gov/hq/traffops/developserv/permits/>.

1-3

Thank you again for including Caltrans in the environmental review process. Should you have any questions regarding this letter, please contact Jake Freedman at 510-286-5518 or jake.freedman@dot.ca.gov.

Sincerely,



PATRICIA MAURICE
District Branch Chief
Local Development - Intergovernmental Review

c: State Clearinghouse

Letter 2

Greetings Mitchell and thank you for your time today in walking the project area and surrounds. We appreciate working together with you to best understand and address project impacts proactively.

Following are our recommendations and comments related to the project:

- | | |
|---|-----|
| ❖ All exterior lighting shall not be directed toward the street, the sky or neighboring parcels. Lighting shall be shielded and down-lit to prevent light spill onto neighboring residential properties. | 2-1 |
| ❖ Landscape screening shall be provided to screen project areas visible from neighboring properties. | 2-2 |
| ❖ Construction and dirt haul routes shall be shared with the Town of Hillsborough's Public Works and Police Departments and respective concerns shall be incorporated into final routes. | 2-3 |
| ❖ The Town of Hillsborough shall have the opportunity to review and comment on the associated tree/vegetation removal and landscape replacement plan, prior to its final approval. | 2-4 |
| ❖ We support the proposed mitigation measures prohibiting construction during daylight hours. | 2-5 |
| ❖ Public notification shall be provided to neighboring property owners, property owners with potential visual impacts, and to interested parties (including of homes that may have transferred title but had prior concerns). | 2-6 |
| ❖ Prior to construction, CSM shall provide the Town of Hillsborough and impacted property owners with notice of commencement. | 2-7 |

We would be pleased to work with you on the best approach to incorporate our comments into your environmental and entitlement documents.

Thank you.

Elizabeth S.R. Cullinan AICP
Director of Building and Planning
Town of Hillsborough
Phone: (650) 375-7416
Fax: (650) 375-7415

(Letter 2 cont.)

From: Elizabeth Cullinan <ECullinan@HILLSBOROUGH.NET>
Sent: Tuesday, September 11, 2018 3:57 PM
To: Bailey, Mitchell <baileym@smccd.edu>
Cc: 'Roberts, Diana' <Diana.Roberts@icf.com>; Timothy Anderson <TAnderson@HILLSBOROUGH.NET>
Subject: RE: Notice of Availability, San Mateo County Community College District College of San Mateo Building 20 Demolition (SCH #2015052007)

Greetings Mitchell: - I think you probably realize this, but our comments were that we support the prohibition of construction during NON-daylight hours rather than daylight hours.

2-8

Thank you.

Elizabeth S.R. Cullinan AICP

Director of Building and Planning

Town of Hillsborough

Phone: (650) 375-7416

Fax: (650) 375-7415

ecullinan@hillsborough.net

www.hillsborough.net

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Letter 3

From: T Barksdale <tbarks123@icloud.com>
Sent: Monday, September 10, 2018 4:38 PM
To: Bailey, Mitchell <baileym@smccd.edu>
Subject: Copy of Copy of AIAS Garden Renovation Proposal.docx

Hello Mr. Bailey,

The American Institute of Architects Students College of San Mateo is submitting the attached document in response to the SEIR analysis of the Building 20 demolition project.

As the California Environmental Quality Act establishes clear ecological guidelines and since the District is adhering to all building codes as such we have drafted a project proposal as our response to the SEIR. Please click the link to read our response and view the enclosed links to our supplemental online visual aids.

We are enthusiastic to engage with the District on a collaborative dialogue about the development of the site and we look forward to hearing from you.

Please direct responses to toniabarksdale@my.smccd.edu

Respectfully,
Tonia Barksdale, AIAS CSM
On behalf of AIAS CSM

3-1

(Letter 3 cont.)



AIAS

Created September 5, 2018

San Mateo Community College District

**Project Change Demolition Only Alternative
Garden Renovation**

**REQUEST FOR PROPOSAL
for
AIAS COLLEGE OF SAN MATEO**

3-2

**RFP RELEASE DATE: SEPTEMBER 5, 2018
RFP CLOSE DATE: SEPTEMBER 10, 2018**

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1.0 Introduction

As the mission statement of the district of the San Mateo Community College District elaborates, the primary objective of the district is to “provide the occasions and settings which enable students to develop their minds and their skills, engage their spirits, broaden their understanding of social responsibilities, increase their cultural awareness and realize their individual potential.”

AIAS CSM, Umoja, Puente, and a large percentage of the student body propose the design and construction of an innovative outdoor education area in place of the former building 20 and solar powered makerspace pavillion in the area created by the demolition of the greenhouses and lath house.

A collaborative design process with AIAS CSM and the district for the beneficial renovations of the botanical garden and outdoor education area is an environmentally superior and ideal solution for campus development.

A supplementary slideshow of proposed concepts can be viewed at www.tinyurl.com/CSMoutsooreducationspace

3-2

1.1 Project Overview

This project proposal is being presented by the American Institute of Architects Students (referred to in this document as AIAS CSM, also known as the College of San Mateo Architecture Club) with the support of the student groups of the Umoja Village (Puente and Umoja), as well as representatives from Associates Students of College of San Mateo (ASCSM) and many members of the student body. Upon thorough review of the Subsequent Environmental Impact Review, AIAS CSM has conceptualized an ecologically superior solution that meets the districts objectives for Project Change and enriches the intellectual and emotional resources of the space that were not accounted for in the SEIR. AIAS CSM proposes the districts approval and collaboration on an innovative renovation of the Building 20 complex and surrounding gardens. The

3-3

renovation hereby referred to as the “CSM Outdoor Education Space”, would be completed in four phases. The initial phase consisting of a collaborative design process between the district and AIAS CSM. Phase II establishes an innovative outdoor workspace through the implementation of initial educational elements: renovation of the rare specimen botanical gardens, installation of biological educational signage, and the construction of ‘solar trees’ and outdoor technology workstations. The third phase incorporates the demolition of Building 20 and soil remediation of the former building site. Phase IV culminates in the construction of an ecologically sustainable and technologically innovative solar powered, CIS integrated, makerspace pavillion/classroom.

3-3

1.2 Project Team

The project team consist of instructors and students participating in upper level students of the CSM architecture department (with the potential for a design-build coursework through the popular architecture department course Arch 680MB and qualifying hours towards licensure), AIAS CSM members. ARCH 680MB, offered in Spring 2017, incorporated opportunities to use design, digital modeling skills, building code research and compliance skills in an industry setting.

3-4

In a collaboration between the lead agents for the district, AIAS CSM, and the regulatory officials will result in a notable and innovative space that will serve both students and the community.

2.0 Instructions to Proponents

2.1 Introduction

The objectives of the Outdoor Education Space synthesize the district’s goals for Project Change while preserving the highly valuable and irreplaceable botanical specimens, the emotional and intellectual resources held by the commemorative vista garden, labyrinth structure, and extremely rare mature Dawn Redwood tree that honors the values, commitments and

3-5

traditions of higher education exemplified by Adrian Orozco. AIAS CSM proposes a collaborative design process to develop an innovative space that adheres to State CEQA Guidelines for the environmentally superior alternatives to the current Project Change plan. The proposed concepts integrate mindful design solutions that satisfy the desire for innovation, sustainability, and feasibility. The districts engagement with AIAS CSM through this project upholds the districts mission to facilitate opportunities to enrich the skills, experience, and portfolios of CSM architecture students.

3-5

2.2 Adherence to CEQA Building Code

“Section 21002 of the *State CEQA Guidelines* requires lead agencies to adopt environmentally superior [construction] alternatives in order to avoid adverse environmental effects.”

3-6

In addition to a thorough review of the SEIR, the preparation of this proposal was informed by analysis of the CEQA codes, as published by the State of California in the 2016 Statutes and Guideline.

2.3 Evaluation Criteria

The reading and analysis of the SEIR compiled the ICF, review of the referenced CEQA codes, interviews with long-standing College of San Mateo staff, the CSM Sustainability committee, and various student groups were analyzed and synthesized into this proposal document.

The annulment of the construction plans for a new building 19, releases funds and expands the potential for design prospects for a redesign of the Project Change Site. AIAS CSM has evaluated the SEIR, the site potentials, and the needs of current and future students to develop the components of the multi-phase Outdoor Education Space construction project. The district's primary objective for Project Change was the allocation of a staging space for the construction of a new building 19. The cancellation of the demolition of the current building 19 also eliminates the need to remove the rare botanical specimens, extremely rare species of redwood that is also a highly valued commemorative tree, brick path labyrinth and commemorative vista garden.

3-7

3.0 Scope of Services

3.1 Proposed Basic Services

The proposed basic services include initial design interview between AIAS CSM and the district to assess the updated goals of the district, budgetary considerations, timeline targets, and programming objectives for the various departments that will use the outdoor education space.

Basic services from AIAS CSM will include building code research, design drafting and digital visual modeling.

AIAS CSM will also consult with biology staff on the design of informational, engaging, aesthetic, educational signage that integrates the themes of California native flora and fauna, sustainability concepts, and major themes in environmental science.

In addition to basic design and project planning services, AIAS CSM will also provide a change strategy assessment of potential benefits for the various stakeholders (the district, community business leaders, regulatory professionals, alumni and potential students). AIAS CSM will also negotiate industry partners for additional professional services.

3-8

Letter 4

Sept 10, 2018

San Mateo County Community College District Attention: Mitchell
Bailey
3401 CSM Drive
San Mateo, CA 94402

Dear Mr. Bailey:

My name is Violeta Grigorescu and I am a member of the Friends of the CSM Gardens Group. I am writing to express disappointment that the administration of the San Mateo Community College District has not abandoned the idea of transforming an area for which so many have fought so hard to persevere, into a parking lot.

4-1

While reading the Draft Environmental Impact Report to the San Mateo Community College District 2015 Facilities Master Plan Amendment EIR, I noticed that the word "gardens" does not even appear at all in the description of the project. Instead, the Draft EIR is referring to this area, rich in history and heritage, as well as in rare botanical species, by the nondescript name of "open space", or "landscaping".

4-2

Over the many years the many members of the SMCCD community at large have spoken loud and clear about the many ways in which these gardens are valuable. The letters written on this topic in the past, filed as part of the Friends vs. SMCCD lawsuit, should serve as a reminder of the importance of the gardens both as psychological relief from urban development, as well as a living laboratory for many of the classes taught at CSM.

4-3

While it is true that the gardens are in great disrepair, it is also true that it was the duty of the district to repair and maintain these gardens over the years. Rather than destroying the gardens, the district could consider gently removing the structures that are unused, and enhancing the gardens to be a recreational spot for students, teachers, staff, and administrators alike. The studies attached, and many others like it, stand as proof of the psychological benefits of green spaces rich in biodiversity.

4-4

San Mateo Community College District has plenty of parking already. The administration can hardly claim to be holding an environmental stand, implementing plans like this.

4-5

The community of San Mateo has already spoken and even sued the district for damages caused by the light pollution originated by the overdevelopment of the College of San Mateo. It would be unwise for the college to continue aggravating the very community that is supposed to serve.

4-6

Please consider the information from the other four attachments within this email, and recommend that the gardens would be enhanced, and used as an oasis of peace and health, rather than bulldozed and covered with cement.

4-7

In closing I urge the San Mateo Community College District to abandon the plan of razing fifty five years-old gardens to build a parking lot.

4-8

The members of the Friends of CSM Gardens group are more than willing to meet with the district staff to discuss the scope and the content of the proposed SEIR' Environmental information, and hopefully arrive to a mutually satisfying solution that does not involve the destruction of this treasured resource.

Thank you for your consideration!



Violeta Grigorescu
Member of the Friends of the CSM Gardens Group 3620 19th
Street, Apt 37
San Francisco, CA 94110

Letter 5

September 6, 2018 Via e-mail
September 7, 2018 Via US Postal Service

San Mateo County Community College District
Attn: Mitchell Bailey
3401 CSM Drive
San Mateo, CA 94402
baileym@smccd.edu

My name is Liane Benedict. I've been a resident of San Mateo County since 1978. I would like to comment on the Draft Subsequent Environmental Impact Report and to plead for the teaching gardens and facilities at the College of San Mateo (CSM).

5-1

I understand that the plan is to demolish the horticulture complex at CSM including the greenhouses and the green space around those areas and replace it with a parking lot and a few young trees and bushes. The green spaces around the horticulture complex provide natural beauty, recreation, a restful oasis for study and habitat for animals. They contain diverse plant life providing many unique opportunities for learning. Unusual plant species include dawn redwood (while not native, it is classified as endangered on the IUCN Red list), cashmere cypress, incense cedar, coast silk tassel, cycad, and many others. There are also California natives such as coastal redwood, buckeye, live oak, coastal oak, bay laurel and douglas fir. Many are well-established plants (perhaps older than me). It isn't the same to replace a well-established, mature plant with a spindly, young specimen. The horticulture greenspace is the only place at CSM with mature specimens of flowering and fruiting species available to students and the public. Also, young replacement plants, even if native to California, require more water and care than well-established plants.

5-2

5-3

5-4

These gardens provide habitat for many birds, insects, small mammals and other wildlife including some species listed as Species of Special Concern by the State of California and/or the California Fully Protected Species. Landscaped vegetation provides nesting and roosting habitat for native wildlife as well as wildlife food sources such as insects, nuts, or berries. The large trees provide suitable habitat for migratory birds, raptors, and bat species. While these animals may return to the area in time, it will take at least several generations for the young replacement plants to mature enough to provide habitat for those animals and the amount of vegetation proposed will be significantly reduced from current levels.

5-5

With the current environmental and global warming issues, there is a need for biology, horticultural and floristry programs. How can science properly know the effects of our

5-6

(Letter 5 cont.)

actions on the environment without people trained in the horticulture? Medicine also depends on chemicals derived from plants. There is scientific evidence that flowers speed the healing process. We need to respect and learn from our environment which begins with education and the CSM gardens provide a perfect classroom.

5-6

The gardens and plants around Building 20 are part of what attracts students and faculty to CSM's biology, botany, and general science programs as well as the athletics, child care and art programs. English students practice their speeches and write poetry in the gardens. The gardens also provide space for large architecture projects. In other words, they are used by students from many departments as well as the community at large. In addition, these gardens and buildings are part of the historical legacy of the campus. Some part of the original campus environment should be preserved. As far as ADA requirements go, it should be relatively easy to retrofit Building 20, a single-story structure, to fit those requirements.

5-7

5-8

From an environmental perspective, replacing the gardens with a parking lot could also affect water quality and erosion. Sun and wind patterns will also be affected by removal of buildings, plants and open space.

5-9

I do not believe that the mitigation described in the Draft EIR will be adequate to substantially eliminate the effects of the proposed changes.

5-10

Is there truly a need for more parking at CSM when there are many large parking lots on campus and the number of online classes is growing? What about alternatives? Is CSM "going green" when we replace teaching gardens and opportunities to learn green practices with parking lots? I visited the campus on many occasions at different times of the day. I did not personally experience difficulty finding parking near the horticulture complex and the students I spoke with did not mention any parking difficulties.

5-11

I appreciate your consideration of these concerns. I would hate to see the District eliminate this important teaching greenspace with all of its history and botanical richness, for a parking lot!

Liane Benedict
1550 Winding Way
Belmont, CA 94002
650-591-6739
liane.benedict@sbdglobal.net

Letter 6

Mitchell Bailey
Chief of Staff
San Mateo County Community College District
3401 CSM Drive
San Mateo, CA, 94402

September 9, 2018

Dear Mr. Bailey,

I am writing in response for your invitation for public comment on the College of San Mateo Building 20 Demolition Subsequent Environmental Impact Report. The proposed project: The Project Change would entail demolishing all existing structures and vegetation within the Project Change Site and replacing them with a single surface parking lot containing up to 208 uncovered parking stalls, along with attendant landscaping, lighting, signage, storm drainage, and security improvements.

6-1

My comments specifically address aesthetic, and cultural resources.

3.1 Aesthetics

Greenspaces with natural values are important. Most campuses have an area like this and CSM should not be an exception. This area has mature shade trees, and is cooler than the main campus. This evaluation should be based on equivalency of what would be lost. The mitigation measure CSM-AES-2 is not specific about what plants, where, context, and how they will create an equivalent aesthetic landscape. Who will review and monitor the MMR and how will the public and campus be informed on the plan?

6-2

6-3

6-4

The SEIR describes the current state of the facilities as deteriorating, and all of the pictures show current conditions. The area has been abandoned, and apparently from the pictures used to deposit waste material. But, this garden was once maintained for its aesthetic quality. Historical pictures of the garden are quite different. The current conditions photos used in the SEIR are misleading as to the original aesthetic value of the gardens. In addition, the pictures show the "Adrian's Tree" in a deciduous phase, but not in leafed out condition, this is misleading. CSM-AES-3 requires the "Adrian's Tree" plaque from the dawn redwood will be relocated by CSM and placed on a marker or monument. To grow a dawn redwood requires specific conditions and the location and care should be considered in a specific plan.

6-5

6-6

The James K. Roberts Plaque is not mentioned in CSM-AES-3 and should also be relocated and planted from that garden and suitable replacements, in honor of his contributions to floristry.

6-7

3.4 Cultural Resources

The statement: "Research did not reveal any instructors or alumni associated with the horticulture career program at CSM—which utilized Building 20, adjacent buildings, and gardens—as being significant for contributions to local, state, or national history." The CSM historical archives should have produced information about the significance of the horticultural program, at least locally. I would direct your attention to the College of San Mateo book "Class Act" and CSM's historical photo archives. The Horticulture Program was not unknown locally. Here is some information that was available in these sources:

6-8

(Letter 6 cont.)

- 1943 Patriotic Agriculture was encouraged and a "Victory Garden" was established at the CSM Delaware Campus.
- Official dedication of the campus was on Dec. 8, 1963 including "a horticultural center."
- In 1966 college landscaping won national acclaim receiving the American Nurseryman's Award by Lady Bird Johnson on November 15, 1966.
- I would also point out that James K. Roberts, Jack Daniels and Alexander Graham had local significance. The Floristry program was also sponsored and nationally recognized and was a national presence via the American Institute of Floral Design. Lois Wallace was a nationally recognized floral designer and gave invited presentations at this institution.

6-8

Sustainability is a big part of what we do on campus. This project does not strike me as a sustainable alternative, given the goals of the Sustainability Program. Building over a greenspace is generally not a sustainable practice. I also believe that temporary staging for construction of a future building is not a suitable reason to build a parking lot over a greenspace. What about a sustainable enhancement to our campus? There would be enough interest I think among the student body and faculty for a volunteer-community partnership to enhance and manage this area. It could serve as a showpiece for 21st Century sustainable living.

6-9

I offer these comments with the most heartfelt and sincere desire to see the college thrive and set an example to the community on sustainable practices.

Sincerely,



Linton Y. Bowie

Letter 7

From: Charlotte Kelley <lovecak727@gmail.com>
Sent: Monday, September 10, 2018 4:59 PM
To: Bailey, Mitchell <baileym@smccd.edu>
Subject: Building 20 Demolition

Mitchell Bailey, Chief of Staff
San Mateo County Community College District

Dear Mitchell Bailey,

What would Edison think? Why would an institution of higher learning, CSM, curtail an outstanding Horticulture program that provided an education and a viable income for its students?

7-1

Why dismantle the Greenhouse? It was used, not only used by the Horticulture program, also, the Greenhouse was a welcomed resource for the Biology Department.

7-2

The plants and trees surrounding Building 20 provided serenity in the park area for the students to have a place to study and have lunch.

7-3

Building 20 Demolition is a Bad Idea..Please Revisit your decision..
Many Students were able to utilize the classroom and the Greenhouse..
Edison would say, "Turn on the Light Bulb and reinstate the program and keep Building 20!"

7-4

I was able to receive my Horticulture Certificate, Please let others do the same!

Thank you,

Charlotte Kelley

Letter 8

From: john lewis <john.lewis10@comcast.net>
Sent: Monday, September 10, 2018 2:47 PM
To: Bailey, Mitchell <baileym@smccd.edu>
Cc: john.lewis10@comcast.net
Subject: SMCCCD Building 20 Demolition (SCH #2015052007)

To whom it may concern.

I will like to strenuously object to the proposed scope of work for the above noted project. Removing the trees, garden, landscaping and greenhouses and increasing the amount of hard scape paving runs directly counter to the State of California and the Governor's stated climate impact goals of reducing greenhouse gases and global warming.

8-1

In addition I have observed the parking lots during peak hours at the many existing lots and they are never near capacity. Therefore, creating more parking is simply a complete waste of capital monies.

8-2

I strongly urge the Board to reject this wasted capital project and instead install more landscape islands with trees in existing parking lots in order to reduce the impact of global warming.

8-3

John Lewis
John.lewis10@comcast.net

Chapter 3

Responses to Comments

This chapter includes responses for each of the numbered comments identified in the comment letters in Chapter 2, *Comments Received on the Draft Subsequent EIR*. Each response begins with a summary of the comment, responds to the comment, and then identifies if revisions to the Draft SEIR are required. Revisions to the Draft SEIR are included in Chapter 4, *Revisions to the Draft Subsequent EIR*.

In responding to comments, CEQA does not require a Lead Agency to conduct every test or perform all research, study, or experimentation recommended or demanded by commenters. Rather, a Lead Agency need only respond to significant environmental issues and does not need to provide all information requested by reviewers, as long as a good faith effort at full disclosure is made in the EIR (CEQA Guidelines secs. 15088, 15204).

Response to Comment Letter 1 (Department of Transportation [Caltrans District 4])

Comment 1-1

The comment describes Caltrans' Strategic Management Plan 2015-2020 and correctly summarizes key aspects of the Project Change.

Comment noted. The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 1-2

The comment states that as Lead Agency, the San Mateo County Community College District is responsible for all project mitigation and states that the project's fair share contribution, financing, scheduling, implementation responsibilities, and lead agency monitoring should be fully discussed for all proposed mitigation measures. The comment also notes that project work that requires movement of oversized or excessive load vehicles on state roadways requires a transportation permit issued by the Department of Transportation.

The Project, including the Project Change, would obtain all necessary permits for the movement of oversized or excessive load vehicles on state roadways in accordance with Caltrans requirements.

The Draft SEIR provides an analysis of potential impacts to transportation and circulation that would result from the Project Change (see page 1-6). As discussed therein, the Project Change would not increase enrollment or employment, or contribute to campus growth, and would not generate new vehicle trips. As such the Project Change would not result in a change to the 2015 Certified EIR's conclusion that the Project would have no impact to transportation and circulation. Because no impact would occur during Project operation, no mitigation is required.

The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 1-3

The comment states that any work or traffic control that encroaches onto the state right-of-way will require an encroachment permit from Caltrans.

The Project, including the Project Change, would obtain all necessary encroachment permits in accordance with Caltrans requirements.

The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Response to Comment Letter 2 (Town of Hillsborough)

Comment 2-1

The comment recommends that all exterior lighting be directed toward the interior of the Project Change Site and be shielded and down-lit to prevent light spill into neighboring residential properties.

Potential impacts resulting from light were addressed in Chapter 3.1, *Aesthetics*, of the Draft SEIR. As discussed on page 3.1-12, the Project Change would be subject to previously adopted Mitigation Measure CSM-AES-4 from the 2015 Certified EIR, which would ensure that light fixtures installed as part of the Project Change would be directed downward and shielded, with the minimal intensity necessary to achieve the safety and security standards desired by the District for a particular area, in compliance with industry-standard “dark sky” guidelines. With implementation of Mitigation Measure CSM-AES-4, impacts from light would be less than significant. The comment does not contain questions or concerns regarding the adequacy of this analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 2-2

The comment requests that landscape screening be provided to screen the project areas visible from neighboring properties.

The Draft SEIR evaluated potential impacts to views from off-campus vantages. As discussed in Chapter 3.1, *Aesthetics*, of the Draft SEIR (see page 3.1-7), views of the Project Change Site are generally buffered from off-campus vantages due to surrounding trees and landscaping. These features limit off-campus views of the Project Change Site to the few residences along the southern segment of Tobin Clark Drive (within the Town of Hillsborough). As identified in the 2015 Certified EIR, a grove of eucalyptus trees could be removed on the slopes below Perimeter Road, near the Project Change Site, as part of the previously reviewed and approved 2015 Facilities Master Plan Amendment Project. Removal of these trees could make views of the Project Change Site slightly more apparent from locations along Tobin Clark Drive, but existing native oaks would remain and the area would be mulched and infilled with native trees and shrubs. As a result, off-campus views of the campus from public areas adjacent to the campus might be changed somewhat in that the number of the structures in the view would be reduced, mature vegetation at the Project Change Site would no longer be visible, and the buildings surrounding the Project Change Site might become somewhat more visible. However, the buildings surrounding the Project Change Site are already visible from this portion of Tobin Clark Drive and the proposed landscaping would replace views of vegetation at the Project Change Site. The visual character and quality of views would be largely

maintained from off-campus vantages and merely being able to see an additional portion of the existing campus from any specific vantage point off the District's property is not considered a substantial degradation to the existing visual character of the campus or its surrounding visual environment. Once the Project Change is completed, the existing visual character and quality of the CSM site overall as a community college would remain similar to existing conditions. Therefore, the Draft SEIR analysis concluded that impacts to visual character and quality, including views from scenic vistas, would be less than significant from surrounding properties, and mitigation is not required. The comment does not contain questions or concerns regarding the adequacy of this analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 2-3

The comment requests that construction and dirt haul routes be shared with the Town of Hillsborough's Public Works and Police Departments and that their concerns be incorporated into the plan for final routes.

As discussed in Chapter 1, *Introduction*, of the Draft SEIR, previously adopted Mitigation Measure CSM-TRA-1 requires implementation of a Traffic Control Plan during construction and includes performance standards for the Traffic Control Plan (see page 1-6). Implementation of Mitigation Measure CSM-TRA-1 would reduce construction traffic impacts to a less-than-significant level.

Although not required to reduce a significant impact of the Project Change identified in the Draft SEIR analysis, in response to this comment, Mitigation Measure CSM-TRA-1 has been revised in the Mitigation Monitoring and Reporting Program (MMRP) for the 2015 Facilities Master Plan Amendment Project (SCH# 2015052007) to indicate that the Town of Hillsborough's Public Works and Police Departments shall be provided with an opportunity to review and comment on the Traffic Control Plan for CSM. A revised MMRP reflecting this and other mitigation measure changes identified the Draft SEIR analysis has been prepared and can be reviewed by contacting the SMCCCD District Office, 3401 CSM Drive, San Mateo, (650) 574-6550. If it approves the Project Change, the SMCCCD Board of Trustees will be required to certify this Subsequent EIR and adopt the revised MMRP.

Comment 2-4

The comment requests that the Town of Hillsborough have the opportunity to review and comment on the associated tree/vegetation removal and landscape replacement plan, prior to its final approval.

It is assumed that the comment is referring to the tree and landscape removal and replacement program that is referenced in proposed Mitigation Measure CSM-AES-2, which, if approved by the SMCCCD Board of Trustees, will be added to the MMRP for the 2015 Facilities Master Plan Amendment Project, as discussed in the Draft SEIR analysis (refer to Chapter 3.1, *Aesthetics*, page 3.1-10). Although not required to reduce a significant impact identified in the Draft SEIR analysis, proposed Mitigation Measure CSM-AES-2 has been revised in response to the comment to indicate that the Town of Hillsborough's Building and Planning Department will be provided with an opportunity to review and comment on the tree and landscape removal and replacement program.

See also Response to Comment 2-3 regarding the revised MMRP.

Comment 2-5

The comment expresses support for the proposed mitigation measures prohibiting construction during non-daylight hours (as corrected via Comment 2-8, below). It is assumed that the comment is referring to previously adopted Mitigation Measure CSM-AES-1 in Chapter 3.1, *Aesthetics*, of the Draft SEIR (see page 3.1-6).

Comment noted. The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 2-6

The comment requests that public notification be provided to neighboring property owners, property owners with potential visual impacts, and to interested parties, including homes that may have transferred title but had expressed prior concerns.

Public notification of the Project Change has been provided on multiple occasions in accordance with CEQA requirements. A Notice of Preparation (NOP) for the SEIR was circulated by the District on January 19, 2018, and provided the opportunity for responsible agencies, interested organization, and the public to provide comments concerning the scope of the environmental analysis of the Project Change. The NOP was filed with the San Mateo County Clerk and the State Clearinghouse and made available for public review. The 30-day NOP review period began on January 19, 2018 and ended on February 18, 2018. In addition, a Notice of Availability (NOA) was circulated on July 24, 2018, informing responsible agencies, interested organization, and the public of the availability of the Draft SEIR. The 47-day review period for the Draft SEIR began on Wednesday, July 25, 2018 and ended on Monday, September 10, 2018. The NOA was filed with the San Mateo County Clerk and the State Clearinghouse and made available for public review. Interested parties will also have the opportunity to provide comments at the approval hearing for the Project Change which is expected to be held in November 2018.

No revisions to the Draft SEIR are necessary.

Comment 2-7

The comment requests that prior to construction, the College of San Mateo provide the Town of Hillsborough and impacted property owners with a notice of commencement.

Comment noted. The District provides public notification of upcoming construction projects on its website at <https://www.smccd.edu/construction/index.php>. The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 2-8

The comment clarifies a typographical error in the earlier Comment 2-5. Refer to Response to Comment 2-5.

Response to Comment Letter 3 (American Institute of Architects Students College of San Mateo)

Comment 3-1

The comment includes introductory remarks identifying the commenter's organizational affiliation as the American Institute of Architects Students College of San Mateo (AIAS CSM) and expressing a desire to engage with the District in a dialogue about the Project Change.

Comment noted. The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 3-2

The comment includes introductory remarks regarding the mission statement of the District. Additionally, the comment introduces what is understood by the Lead Agency to be a proposed alternative to the Project Change. The Lead Agency reviewed the slideshow included in the URL provided in the comment,¹ which is entitled "Outdoor Education Area, Botanical Garden Restoration (Reduced Parking Alternative)." While somewhat unclear, the slideshow appears to promote a design for a potential alternative to the Project Change that would preserve and renovate the existing garden on the Project Change Site as an outdoor educational area that incorporates parking and a solar-powered makerspace pavilion. The slideshow presents high-level design concepts such as preserving certain botanical specimens, integrating sustainable design features, and engaging CSM students in a collaborative design process with the District. However, the slideshow does not include a conceptual design or specific design details such as the size and location of the proposed parking lot, the size and location of open space areas to be preserved and renovated, or the size and location of the solar-powered pavilion. Therefore, it is not possible to evaluate the extent to which the proposed alternative could reduce or eliminate the environmental impacts of the Project Change, or the extent to which the proposed alternative would meet the basic project objectives.

It is noted that the Alternatives analysis in Chapter 5, *Alternatives*, of the Draft SEIR evaluated a Reduced Parking Alternative similar to the alternative that is described in the comment. The Reduced Parking Alternative assumes that Building 20, the greenhouse, the lath house, and a portion of the South Garden would be demolished for construction of a smaller parking lot than that proposed under the Project Change. The analysis concludes that the Reduced Parking Alternative would meet four of the five fundamental project objectives and would reduce, but would not eliminate, the Project Change's significant impact on air quality. Therefore, the Reduced Parking Alternative was determined to be the environmentally superior alternative. The Draft SEIR notes that, while the Reduced Parking Alternative is considered potentially feasible to implement, it would represent a trade-off in environmental impacts compared to the Project Change because it would be too small to provide adequate construction staging area adjacent to the new Building 19; as such, it would shift noise, construction traffic, and potential pedestrian safety impacts resulting from Building 19 construction to a more heavily used area of campus,

¹ The exact URL provided in the comment (www.tinyurl.com/CSMoutsooreducatationspace) is not a functioning URL. It is assumed that the intended URL is www.tinyurl.com/CSMoutdooreducatationspace, which includes a slideshow consistent with what is described in the comment letter. The EIR preparer reviewed the materials provided at this URL.

creating greater disruption of student learning and other campus activities during construction. The comment does not contain questions or concerns regarding the adequacy of this analysis. No revisions to the Draft SEIR are necessary.

The determination as to whether or not the Reduced Parking Alternative is actually feasible, and whether to approve the Reduced Parking Alternative evaluated in the Draft SEIR, or a Reduced Parking Alternative similar to the alternative described in the comment, is at the discretion of the decision-makers (i.e., the SMCCCD Board of Trustees). Should the decision-makers choose to approve a Reduced Parking Alternative, the District could consider feedback from the AIAS CSM in developing a design for such an alternative.

Comment 3-3

See **Response to Comment 3-2**.

Comment 3-4

See **Response to Comment 3-1**.

Comment 3-5

See **Response to Comment 3-2**.

Comment 3-6

The comment summarizes provisions of the CEQA Statute (California Public Resources Code, Division 13) related to environmentally superior alternatives.

Comment noted. The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary. See also Response to Comment 3-2.

Comment 3-7

The comment states that the District no longer plans to demolish the existing Building 19 and construct the new Building 19, Emerging Technologies, thus providing an opportunity to reevaluate the development proposal for the Project Change Site. This is factually inaccurate and inconsistent with the information presented in the Draft SEIR. As discussed in Chapter 2, *Project Description*, of the Draft SEIR (see page 2-2), the new Building 19 project was evaluated in the 2015 Certified EIR as part of the 2015 Facilities Master Plan Amendment Project. The Project Change evaluated in the Draft SEIR does not propose any changes to the new Building 19 project; rather, the Draft SEIR evaluates changes to the adjacent Project Change Site that were not previously evaluated in the 2015 Certified EIR (i.e., the construction of a parking lot that would serve as a construction staging area and permanent parking location for the new Building 19). The District still intends to move forward with implementation of the Building 19 Project. As such, the purpose and need for the Project Change, as summarized in Chapter 2, *Project Description*, of the Draft SEIR (see page 2-4), have not changed.

Comment 3-8

The comment summarizes services that AIAS CSM would like to provide to the District related to the design of an alternative to the Project Change.

Comment noted. The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary. See also Response to Comment 3-2.

Response to Comment Letter 4 (Friends of the CSM Gardens Group)**Comment 4-1**

The comment includes an introductory statement and expresses an opinion about the Project Change.

Comment noted. The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the SEIR are necessary.

Comment 4-2

The comment notes that the Draft EIR for the San Mateo Community College District 2015 Facilities Master Plan Amendment uses the terms “open space” and “landscaping” instead of “garden,” and expresses an unfavorable opinion about the use of these terms.

The Project Description in the Draft SEIR for the Project Change uses the terms “North Garden” and “South Garden” to describe the gardens on the Project Change Site. These terms are first defined on page 2-6 in Chapter 2, *Project Description*, and are used as standard conventions throughout the Draft SEIR analysis.

If the comment instead concerns the 2015 Certified EIR, the Project Change discussed in the 2018 Draft SEIR is the subject of the current evaluation, not the 2015 Facilities Master Plan Amendment considered in the prior 2015 EIR. The 2015 Certified EIR did not discuss the proposed removal of the North or South Gardens in the Building 20 complex area because that area was not included in the Project area for the Facilities Master Plan Amendment at that time. The 2015 EIR was certified and the CEQA process for the Facilities Master Plan Amendment Project is completed. The current (2018) SEIR is reviewing the potential environmental effects of the proposed demolition of the Building 20 complex, including removal of the gardens, which, if approved would be an amendment to the Facilities Master Plan Amendment Project. As noted above, the current Draft SEIR is explicit in referring to the gardens as the North and South Gardens throughout the document.

No revisions to the Draft SEIR are necessary.

Comment 4-3

The comment expresses appreciation for the existing gardens on the Project Change Site “both as psychological relief from urban development, and as a living laboratory for many of the classes taught at CSM.” The comment references similar opinions that were previously expressed as part of the *Friends of College of San Mateo Gardens v. San Mateo Community College District* appellate decision.

The legal context of the Project Change, including the *Friends of College of San Mateo Gardens v. San Mateo Community College District* decision, is described in detail in Chapter 1, *Introduction*, of the Draft SEIR (see page 1-1).

With regard to the use of the Project Change Site as a psychological relief from urban development and an outdoor classroom, Section 15064(e) of the State CEQA Guidelines states that “[e]conomic and social changes resulting from a project shall not be treated as significant effects on the environment.” To the extent that the comment relates to the perceived aesthetic value of the Project Change Site, this impact is addressed in Chapter 3.1, *Aesthetics*, of the Draft SEIR, which concludes that impacts to visual quality and character would be less than significant with mitigation. To the extent that the comment relates to the recreational value of the Project Change Site, this impact is addressed in Chapter 3.8, *Recreation*, of the Draft SEIR, which concludes that impacts to recreation would be less than significant. The comment does not contain questions or concerns regarding the adequacy of either of these analyses, or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 4-4

The comment affirms that the gardens are in disrepair, and states that it is the responsibility of the District to repair and maintain the gardens. The comment also suggests that the District consider removing the unused structures and enhancing the gardens to serve as a recreational location for students, teachers, staff, and administrators. The comment includes four attachments² which indicate the psychological benefits of green spaces rich in biodiversity and the diversity of the species in the gardens.

With regard to the portion of the comment that addresses the psychological benefits of green spaces, see **Response to Comment 4-3**.

With regard to the maintenance of the gardens, as stated on page 2-5 in Chapter 2, *Project Description*, of the Draft SEIR, the programs and courses that were previously located in Building 20, which include floristry and horticulture instruction as well as student services, were discontinued or relocated to other campus buildings in 2011 or earlier. No programs or courses are currently housed in Building 20, and the building has been vacant for several years. It is within the District’s purview and discretion to focus resources, maintenance and improvement activities on areas of campus that are actively used for educational purposes. In accordance with CEQA, the Draft SEIR analysis analyzes Project Change impacts against current baseline conditions as defined at the time of the NOP. To the extent that the commenter is suggesting that the Project Change should be analyzed against a historic baseline in which the gardens were in a different condition, there is no such requirement under CEQA. (State CEQA Guidelines sec. 15125(a) [“normal” baseline is existing setting at time of NOP].)

² The attachments consist of an inventory of plant species entitled “College of San Mateo Botanical Collection” as well as the following journal articles: Fuller, R. A., Irvine, K. N., Devine-Wright, P., Warren, P. H., and K. J. Gaston. 2007. Psychological benefits of greenspace increase with biodiversity. *Biological Letters*. (15 May 2007).; Berman, M., Kross, E., Krpan, K. M., Askren, M. K., Burson, A., Deldin, P. J., Kaplan, S., Sherdell, L., Gotlib, I., and J. Jonides. 2012. Interacting with Nature Improves Cognition and Affect for Individuals with Depression. *J Affect Disord*. (2012 November).; Maller, C., Townsend, M., Pryor, A., Brown, P., and L. St Leger. 2005. Healthy nature healthy people: ‘contact with nature’ as an upstream health promotion intervention for populations. *Health Promotion International*. (Vol. 21. No. 1). The attachments to Comment Letter 4 are included in Appendix A to this Final SEIR.

The analysis of alternatives in the Draft SEIR included an alternative that is comparable to the alternative described in the comment: the Building Demolition Only Alternative. As discussed in Chapter 5, *Alternatives*, of the Draft SEIR (page 5-5), this alternative would demolish Building 20, the greenhouse, and the lath house but would not construct the parking lot or the associated improvements and would leave the North and South Gardens in their current states. The Draft SEIR analysis determined that the Building Demolition Only Alternative would not eliminate the Project Change's significant impact on air quality. The Draft SEIR analysis also determined that the Building Demolition Only Alternative would meet only one of the Project Change objectives (ensure safety of students and faculty by removing unsafe structures). The alternative would not meet the other four Project Change objectives (i.e., provide parking, direct access, and loading space for the new Building 19, Emerging Technologies; provide a staging area for the construction of the new Building 19, Emerging Technologies, that is adequately sized and located so as to minimize environmental impacts and disruptions to ongoing campus activities during Building 19 construction; expand parking option on the east side of the campus to better serve current students, staff, and the community/visitors; and, improve access for disabled students). The District has the discretion to make the final determination of whether the Building Demolition Only Alternative is actually feasible, and to approve or reject the Building Demolition Only Alternative or any other alternative analyzed in the Draft SEIR alternatives analysis. The comment does not contain questions or concerns regarding the adequacy of this analysis or the CEQA process. No revisions to the SEIR are necessary.

Comment 4-5

The comment states that CSM has adequate parking, and also states an opinion that the Project Change would not be beneficial for the environment.

The commenter is correct in that there is currently no campus-wide parking shortage at CSM; however, the District's facilities plans are designed for current and future needs. This is consistent with statements made throughout the Draft SEIR. As discussed in Chapter 1, *Introduction*, (page 1-6), "[o]bservations made at the campus in October 2017 established that there is currently no parking shortage at CSM because there are still available parking spaces in several parking lots when the parking demand is highest." The Project Change objectives are stated in Chapter 2, *Project Description* (page 2-4). As discussed therein, increasing the overall supply of parking on the campus is not an objective of the Project Change. Rather, the objectives of the Project Change are closely tied to its location adjacent to the new Building 19, and include (among other objectives): providing loading space for the new Building 19; providing a staging area for the construction of the new Building 19; and expanding parking options on the east side of the campus to better serve students, staff, and community/visitors accessing the new Building 19 and the much-utilized nearby Building 10. As stated on page 2-3 of the Draft SEIR, Building 10 includes staff offices, classrooms, event space, the campus bookstore, and essential student services including enrollment, admissions/records, financial aid, counseling, and career services. The District estimates that on average, approximately 2,700 people access Building 10 each day. Large internal and external events are held up to three times a week. Building 10 is currently served by two small lots: Bulldog Lot 9 (Staff and Student Parking) and Forum Lot 8 (Disabled and Visitor Parking). These two lots currently provide 287 spaces and are regularly full. A parking survey conducted by Hexagon Transportation Consultants on October 24, 2017 showed both lots parked at 100 percent capacity. The Project Change would provide up to 208 additional parking spaces in the vicinity of Building 10 and would be approximately the same distance from Building 10 as Bulldog Lot 9.

The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 4-6

The comment describes previous community objections and legal actions taken against the District in relation to light pollution produced by the overdevelopment of CSM. The comment also expresses an opinion about the District's potential approval of the Project Change.

With regarding to lighting impacts, see **Response to Comment 2-1**. No revisions to the Draft SEIR are necessary.

Comment 4-7

The comment requests that four attached documents be considered and recommends that the gardens be preserved and enhanced.

Comprising a total of 43 pages, the four attachments that are referenced in the comment include scholarly articles about the psychological benefits of exposure to nature and a letter that inventories the types of botanical species present on the Project Change Site. The attachments do not provide direct comments or questions regarding the adequacy of the Draft SEIR analysis. CEQA case law establishes that a Lead Agency is not required to respond to general reference materials submitted in support of comments. Therefore, individual responses to the attachments are not provided. However, the attachments will be provided to the decision-makers for their review and consideration of the Project Change.

With regard to the request that the gardens be preserved and enhanced, see **Response to Comment 4-4**. No revisions to the Draft SEIR are necessary.

Comment 4-8

The comment includes closing remarks and restates the commenter's objection to the Project Change.

Comment noted. The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Response to Comment Letter 5 (Liane Benedict)

Comment 5-1

The comment includes an introductory statement and brief understanding of the Project Change.

Comment noted. Subsequent comments are addressed below. No revisions to the Draft SEIR are necessary.

Comment 5-2

The comment notes that the Project Change Site provides natural beauty, recreation, a restful oasis for study, and a habitat for animals. The comment lists various botanical species believed to be present on the Project Change Site.

With regard to the portion of the comment addressing "natural beauty, recreation, a restful oasis for study," see **Response to Comment 4-3**.

With regard to the portion of the comment addressing botanical species and animal habitat on the Project Change Site, potential impacts to biological resources are addressed in Chapter 3.3, *Biological Resources*, of the Draft SEIR. Under CEQA, a significant impact to biological resources would occur if the Project Change were to:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marshes, vernal pools, coastal wetlands, etc.) through direct removal, filling, hydrological interruption, or other means.
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.
- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan.

The analysis in Chapter 3.3, *Biological Resources* is based on a reconnaissance-level survey of the Project Change Site conducted by ICF biologists on December 19, 2017. During the site visit, many of the plant species described by the commenter were identified, as described on pages 3.3-2 through 3.3-5 of the Draft SEIR. While the gardens contain a variety of plant species, no species considered candidate, sensitive, or special-status species were detected. Furthermore, the Project Change would be subject to previously adopted Mitigation Measures CSM-BIO-1, CSM-BIO-2, and CSM-BIO-3 which require the District to implement plant surveys, nesting bird avoidance measures, and bat avoidance measures prior to construction to ensure that impacts to special-status species and habitat are mitigated to a less-than-significant level. The comment does not contain questions or concerns regarding the adequacy of this analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 5-3

The comment asserts that the horticulture greenspace is the only place at CSM with mature specimens of flowering and fruiting species available to students and the public.

While the Project Change Site contains a planted diversity of species, other areas on campus could also provide recreation greenspace. As discussed in Chapter 3.8, *Recreation* (page 3.8-3), a large walkable area with grass, benches, sidewalks, and water features exists less than 175 yards to the west of the Project Change Site. With regard to the aesthetic value of the on-site gardens, consistent with the comment, the analysis in Chapter 3.1, *Aesthetics*, notes that “some of the botanical collections and specimens are unique and not readily observable in other locations on campus. The small commemorative plaques are also unique features. In addition, the gardens, vegetation, and

walkways have been used for passive recreation and outdoor education. The parking lot will not provide for preservation of the unique botanical specimens or commemorative plaques and will not accommodate current site uses.” (See page 3.1-8 of the Draft SEIR.) The analysis prescribes a new mitigation measure, Mitigation Measure CSM-AES-2, to address unique botanical specimen removal. The mitigation measure requires relocation of unique botanical specimens which will provide for continued educational (and aesthetic) viewing of such specimens on campus in addition to numerous off-campus opportunities described in the Draft SEIR. With implementation of the proposed mitigation measure, the Draft SEIR determined that aesthetic impacts of the Project Change would be reduced to a less than significant level. The comment does not contain questions or concerns regarding the adequacy of this analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 5-4

The comments asserts that young replacement plants require more water and care than well-established plants.

The removal of all 151 trees and other associated moderate to dense landscaping within the Project Change Site is necessary to facilitate the Project Change. Replacement landscaping will consist of 24 trees and associated shrubs and groundcovers concentrated around the proposed parking lot frontages abutting the new Building 19. While it is true that replacement plantings (regardless of age) may require more water and regular maintenance to establish as compared to mature specimen counterparts, trees in the San Francisco Bay Area typically only require regular irrigation during the plant establishment period (PEP), which is approximately 3 months. The PEP is the period in which the tree establishes roots in the landscape soil. Following the PEP, trees will require minimal water consistent with the maintenance required for trees throughout the rest of the campus, which will occur on an as-needed basis based on observations of tree health. In addition, the number of trees on-site in the Project Change Site will be reduced by more than 75 percent, so even if the replacement trees require some additional care to establish following planting, it is unlikely that there would be any net increase in water consumption for landscaping.

No revisions to the Draft SEIR are necessary.

Comment 5-5

The comment makes a number of assertions regarding biological resources at the Project Change site, including; (1) that the gardens provide habitat for many birds, insects, small mammals and other wildlife including some species listed as Species of Special Concern by the State of California and/or the California Fully Protected Species; (2) the landscaped vegetation provides nesting and roosting habitat for native wildlife as well as wildlife food sources such as insects, nuts, or berries; (3) the large trees provide suitable habitat for migratory birds, raptors, and bat species; (4) while these animals may return to the area in time, it will take at least several generations for the young replacement plants to mature enough to provide habitat for those animals; and (5) the amount of vegetation proposed will be significantly reduced from current levels.

See **Response to Comment 5-2**. In addition, potential impacts to special-status species and nesting birds are addressed in Chapter 3.3, *Biological Resources*, and protections for special-status species and nesting birds are addressed in Mitigation Measures CSM-BIO-2 and CSM-BIO-3. Mitigation Measure CSM-BIO-3 includes the replacement of bat habitat if determined necessary through

consultation with CDFW. The Project Change would result in the disturbance of 1.29 acre of landscaped and open space area, which constitutes only 1.5 percent of the 86 acres of total landscaped and open space within the CSM Campus. Although the Project Change Site may provide habitat, the routine human presence and disturbance reduces the likelihood of foraging, nesting, and roosting within or near the area. As the Project Change Site occupies a small portion of the CSM campus, and the ongoing presence of humans reduces the likelihood of species foraging, nesting, and roosting there, it was determined that, with the implementation of previously adopted mitigation measures, impacts to special-status species resulting from the Project Change would be less than significant. The comment is correct that the amount of replacement vegetation proposed for the Project Change Site will be significantly reduced from current levels. The comment does not contain questions or concerns regarding the adequacy of this analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 5-6

The comment states an opinion regarding the importance of biology, horticultural and floristry programs, and that the on-site gardens serve these purposes.

As stated in Chapter 2, *Project Description*, (Page 2-5), the floristry and horticulture instruction as well as student services were discontinued or relocated to other campus buildings in 2011 or earlier; therefore, the decision to discontinue these programs is not related to the Project Change.

The comment does not concern the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 5-7

The commenter describes the different uses of the Project Change Site and provides an option regarding its importance as an outdoor educational space, passive recreational spaces, and contributor to the historical legacy of the campus.

With regard to the Project Change Site's use as an educational and passive recreational space, refer to **Response to Comment 4-3**. The potential historical character of the Project Change Site is discussed in Chapter 3.4, *Cultural Resources*. Revisions have been made to this chapter and are discussed in **Response to Comment 6-8**.

The comment does not concern the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the SEIR are necessary.

Comment 5-8

The comment asserts that ADA requirements could be met by retrofitting Building 20.

Improving access for disabled persons is one of five Project Change objectives stated in Chapter 2, *Project Description*, of the Draft SEIR. An alternative that rehabilitated Building 20 would not serve the remaining four Project Change objectives.

Furthermore, as discussed in Chapter 5, *Alternatives*, on page 5-2, the District maintains a Facilities Condition Index (FCI) which provides a ratio of the cost to correct a facility's deficiencies to the current replacement value of the facility. The FCI for Building 20 is 68.36 percent, which indicates the building is in very poor condition and the cost to repair the facilities far exceeds the cost to

replace the building. In addition, the building is known to contain hazardous materials which would add additional cost to a rehabilitation effort. Considering the overall condition of the Building 20, an alternative that rehabilitated Building 20 would not be financially feasible.

No revisions to the Draft SEIR are necessary.

Comment 5-9

The comment asserts that replacing the gardens with a parking lot could affect water quality and erosion as well as sunlight and wind patterns.

The Draft SEIR discusses water quality impacts in Chapter 3.6, *Hydrology and Water Quality*, and concludes that with the implementation of previously adopted Mitigation Measures CSM-HYD-1, CSM-HYD-2, CSM, HYD-3, CSM-HYD-4, CSM-HAZ-1, CSM-HAZ-2 impacts on hydrology and water quality resulting from the Project Change would be less than significant. As discussed in Chapter 1, *Introduction*, (Page 1-6), potential erosion could occur during surface trenching, but with the implementation of Mitigation Measure CSM-HY-1, which would implement erosion-control measures, the impact would be less than significant. See **Response to Comment 2-1** regarding impacts from light. Wind impacts are not included in Appendix G of the State CEQA Guidelines nor does the District have a threshold for wind impacts; but notably, the commenter does not provide any substantial evidence for, nor provide any kind of explanation of the basis for a belief that there would be impacts relating to changed wind patterns as a result of the Project Change. Therefore, impacts from wind were not discussed in the Draft SEIR and no discussion of wind impacts has been added in the Final SEIR.

No revisions to the Draft SEIR are necessary.

Comment 5-10

The comment asserts that the mitigation as described in the Draft SEIR will not be adequate to substantially eliminate the effects of the proposed changes.

The comment does not provide specific examples of how the proposed mitigation measures would be inadequate, nor does it provide facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts in support of its assertion. Therefore, a specific response to the comment cannot be provided.

No revisions to the Draft SEIR are necessary.

Comment 5-11

The comment questions the need for the Project Change, citing the general availability of parking campus-wide. The comment also asks about alternatives and suggests that the Project Change is not environmentally beneficial.

Regarding parking, see **Response to Comment 4-5**. Regarding alternatives, the Draft SEIR evaluated three alternatives in Chapter 5, *Alternatives*. See also **Response to Comment 3-2**.

The opinions expressed in the comment are noted. The comment does not concern the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Response to Comment Letter 6 (Linton Bowie)

Comment 6-1

The comment summarizes key aspects of the Project Change and states that the comments will specifically address aesthetic and cultural resources.

Comment noted. Specific responses to the letter's comments are included below. The comment does not concern the adequacy of the Draft SEIR or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 6-2

The comment expresses appreciation for the Project Change Site as an aesthetic and recreational resource.

See **Response to Comment 4-3**. Additionally, while the Project Change Site includes a unique greenspace on the CSM campus, there are other places which supply greenspace for student and faculty use. As discussed in Chapter 3.8, *Recreation* (page 3.8-3), a large walkable area with grass, benches, sidewalks, and water features exists less than 175 yards to the west of the Project Change Site.

The comment does not concern the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the SEIR are necessary.

Comment 6-3

The commenter requests additional details regarding Mitigation Measure CSM-AES-2 including which plants will be relocated and where, and asks how an equivalent aesthetic landscape will be created.

See **Response to Comment 5-3** for a discussion of Mitigation Measure CSM-AES-2. Mitigation Measure CSM-AES-2 (page 3.1-10 of the Draft SEIR) includes specific performance standards addressing the various questions raised in the comment. As stated therein, botanical specimens addressed by the mitigation measure are defined as "trees, shrubs, and herbaceous plants that have been intentionally planted in the past to be a part of the specimen garden at the Project Change Site and which are uncommon on the rest of the campus." While specific new locations are not defined in the mitigation measure, performance standards are established indicating that new locations shall be selected for their suitability in ensuring the health and vigor of relocated plants. Because the analysis of aesthetics is inherently subjective, it is not possible to ensure that the mitigation measure will create an aesthetic landscape that is perceived as equivalent to the current landscape by all viewers. However, Mitigation Measure CSM-AES-2 represents a good faith effort to mitigate the aesthetic impacts of the Project Change as required by CEQA and the SEIR provides substantial evidence and adequate explanation to support the District's conclusion that the resulting impact will be less than significant.

See **Response to Comment 6-4** for discussion of mitigation implementation and monitoring.

No revisions to the Draft SEIR are necessary.

Comment 6-4

The comment asks who will review and monitor the MMRP and how will the public and campus be informed on the plan.

CEQA Guidelines Section 15097 describes the duties of a lead agency in Mitigation Monitoring or Reporting. The District is responsible for implementing and monitoring the MMRP. See **Response to Comment 2-3** regarding revisions made to the MMRP as part of the Draft SEIR analysis, and contact information for reviewing the revised MMRP.

The comment does not concern the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 6-5

The comment states that the Draft SEIR describes the facilities as deteriorating but asserts that the Draft SEIR uses misleading photos of the garden which do not show as historical pictures do.

See **Response to Comment 4-4** and **Response to Comment 5-8** regarding the condition of the on-site uses. The photographs of the garden used in the Draft SEIR were taken to provide the reader with a representative visual understanding of the nature of the garden at one point in time; they were not intended to give a complete representation of all the seasonal variations the garden may experience throughout the course of several years. The proper baseline condition of the gardens against which to assess the potential impacts is its condition at the time the Notice of Preparation (NOP) was published on January 19, 2018, in accordance with CEQA. The photos of the gardens were taken on December 19, 2017.

No revisions to the Draft SEIR are necessary.

Comment 6-6

The comment asserts the Mitigation Measure CSM-AES-3 requires the “Adrian’s Tree” plaque to be relocated on a marker or a monument, adding that to grow a dawn redwood requires specific conditions and the location and care should be considered in a specific plan.

The comment refers to Mitigation Measure CSM-AES-3: Relocate existing commemorative plaques. As described in Chapter 3.1, *Aesthetics*, (page 3.1-10), the “Adrian’s Tree” plaque from the dawn redwood will be relocated on a marker or monument for the replacement dawn redwood tree required by Mitigation Measure CSM-AES-2. The planting plan required by Mitigation Measure CSM-AES-2 will utilize the expertise of “a qualified horticultural specialist, such as an experienced botanist and/or landscape architect,” so care will be taken in determining the right location and conditions for the replacement tree.

No revisions to the Draft SEIR are necessary.

Comment 6-7

The comment states that the James K. Roberts Plaque is not mentioned in Mitigation Measures CSM-AES-3 and requests that the plaque should also be relocated and planted with suitable replacements in honor of his contributions to floristry.

As discussed in **Response to Comment 6-8**, James K. Roberts was an ornamental horticulture instructor at CSM. In response to this comment, Mitigation Measure CSM-AES-3 on page 3.1-10 in Chapter 3.1, *Aesthetics*, has been revised to include the James K. Roberts plaque. See Chapter 4, *Revisions to the Draft Subsequent EIR*, of this Final SEIR.

Comment 6-8

The comment asserts the SEIR is incorrect in stating “Research did not reveal any instructors or alumni associated with the horticulture career program at CSM—which utilized Building 20, adjacent buildings, and gardens—as being significant for contributions to local, state, or national history.” The comment references information available in two sources—the historical book “Class Act” and the CSM historical photograph archives—in support of the assertion that the CSM horticulture program was “not unknown locally,” and identifies four horticulture and floristry instructors who the commenter states are locally significant individuals.

The Draft SEIR concluded that the Building 20 complex is not eligible for listing in the California Register of Historical Resources (California Register) for associations with significant events or significant persons. As stated in the “Cultural Resource Evaluation Memorandum for the Building 20 Complex at College of San Mateo,” attached to the Draft SEIR as Appendix C, the historical sources that informed the Draft SEIR’s findings include digitized historical photographs from the CSM archives, among other sources. These sources did not reveal information that indicated the CSM horticulture program or instructors associated with the Building 20 complex were significant to local, state, or national history.

The book “Class Act” presents a history of CSM but does not include any substantive information related to the horticulture or floristry programs during their occupancy of Building 20. The comment points to the book’s occasional references to gardens, landscaping, and horticulture throughout CSM’s history. These points are discussed below:

- The comment explains that CSM contained a successful victory garden during World War II. The victory garden, however, was located on the college’s Delaware campus, which it occupied prior to the construction of the current College Heights campus. The CSM victory garden has no direct association with the college’s horticulture program within the Building 20 complex, which was constructed approximately 20 years later on an altogether separate campus from where the victory garden was located. Furthermore, victory gardens represent a popular trend implemented across the United States during World War II and are not specific to CSM.
- The comment specifies that a “horticultural center” (presumably Building 20) was a component of the CSM campus at the dedication of the College Heights campus in 1963. The Draft SEIR states that Building 20 was original to the College Heights campus, and thus this information was considered in the Draft SEIR.
- The comment describes that in 1964, Lady Bird Johnson, First Lady of the United States, awarded CSM the American Nurseryman’s Association Award for the landscaping of the College Heights campus. The formal landscaping of the campus, which was recognized by the 1964 award, was not the result of CSM’s horticulture program or activities that took place within Building 20, but rather was planned by design professionals as part of the overall campus design. The campus landscaping has no direct association with the Building 20 complex; as outlined in the Draft SEIR and Cultural Resources Evaluation Memo, the gardens that are currently adjacent to Building 20 are not original to the College Heights campus design and did not contribute to the campus landscape that was recognized by the 1964 award.

The Cultural Resource Evaluation Memorandum has been revised to specifically discuss the instructors identified in the comment: James K. Roberts, Jack Daniels, and Alexander Graham. This discussion indicates these individuals were accomplished within their fields of instruction but did not have a wider influence that would qualify as a significant contribution to local, state, or national history. Additional research did not uncover any information on the fourth individual identified in the comment, Lois Wallace, which reflects that this individual made professional contributions to the extent that she could be considered historically significant. Therefore, the additional research and discussion of these individuals in the Cultural Resources Evaluation Memo does not necessitate a change in the statement in the Draft SEIR that “Research did not reveal any instructors or alumni associated with the horticulture career program at CSM—which utilized Building 20, adjacent buildings, and gardens—as being significant for contributions to local, state, or national history.”

The comment therefore does not present additional research sources or information that would change the findings of the Draft SEIR regarding the CSM horticulture program and associated instructors’ lack of significance within local, state, and national history.

It should be noted that the mitigation measure regarding the James K. Roberts plaque, as described in **Response to Comment 6-7**, would address the impact to aesthetics identified in the Draft SEIR. Relocation of the plaque would not address cultural resource impacts, as no such impacts are identified in the Draft SEIR.

No revisions to the Draft SEIR are necessary.

Comment 6-9

The comment states that sustainability is important for CSM and asserts that the Project Change is inconsistent with the goals of the campus Sustainability Program. The commenter further asserts that a temporary staging ground for the construction of a future building is not a suitable reason to build a parking lot over a greenspace. The commenter suggests that there would be enough interest among students and faculty for a volunteer-community partnership to enhance and manage the area.

As discussed in Chapter 2, *Project Description* (page 2-4) of the Draft SEIR, the Project Change has a number of objective besides providing a staging area for the construction of the new Building 19. The Project Change would provide parking, direct access, and loading space for the new building; it would improve access for disabled persons; and it would remove unsafe structures from the CSM campus. See also **Response to Comment 4-5**.

An alternative that maintains the Project Change Site in its current condition but enhances the on-site gardens would not meet any of the Project Change objectives. Specifically, such an alternative would not ensure the safety of students and faculty by removing unsafe structures; providing parking, direct access, and loading space for the new Building 19, Emerging Technologies; provide a staging area for the construction of the new Building 19, Emerging Technologies, that is adequately sized and located so as to minimize environmental impacts and disruptions to ongoing campus activities during Building 19 construction; expand parking options on the east side of the campus to better serve current students, staff, and the community/visitors; or improve access for disabled students.

It is noted that a similar Alternative – the No Project Alternative – was analyzed in Chapter 5, *Alternatives*, of the Draft EIR. The No Project Alternative would maintain existing conditions on the Project Change Site, with no changes to the condition of the on-site structures or gardens. The analysis

concludes that the No Project Alternative would avoid the Project Change's significant impact on air quality. While the No Project Alternative would be potentially feasible in the sense that there is no current parking shortage overall on the CSM campus that is driving the need for the 208 spaces proposed under the Project Change, it would not achieve any of the Project Change objectives.

See also **Response to Comment 3-2** regarding the Reduced Parking Alternative evaluated in the Draft SEIR.

No revisions to the Draft SEIR are necessary.

Response to Comment Letter 7 (Charlotte Kelley)

Comment 7-1

The comment asks why CSM would curtail an outstanding horticulture program that provided an education and a viable income for its students.

As stated in Chapter 2, *Project Description*, (Page 2-5), the floristry and horticulture instruction as well as student services were discontinued or relocated to other campus buildings in 2011 or earlier; therefore, the decision to discontinue these programs is not related to the Project Change.

The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 7-2

The comment asserts that the Greenhouse was used by both the Horticulture program and the Biology Department and asks why it is to be dismantled.

As discussed in the **Response to Comment 5-8**, the building is in disrepair and contains hazardous materials. In addition, as discussed in the **Response to Comment 7-1**, no programs have operated in the building since 2011. These facts are also stated in the Project Description in Chapter 2 of the Draft SEIR.

The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 7-3

The comment provides an observation on the use of the Project Change Area. This is consistent with the description in Chapter 3.8, *Recreation*, (Page 3.8-1), which states "the garden on the Project Change Site consists of a North Garden and a South Garden and are used for passive recreation." The area is described similarly throughout the Draft SEIR. See also **Response to Comment 4-3**.

No revisions to the Draft SEIR are necessary.

Comment 7-4

The comment expresses opposition to the Project Change.

Comment noted. The comment does not contain questions or concerns regarding the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Response to Comment Letter 8 (John Lewis)

Comment 8-1

The comment expresses an opinion on the Project Change and states that it conflicts with state GHG reduction measures. Chapter 3.5, *Greenhouse Gas and Energy*, of the Draft SEIR (Page 3.5-14) evaluates the Project Change's consistency with GHG reduction targets, including SB 32 and Executive Order EO S-3-05. The comment does not contain specific questions or concerns regarding the adequacy of this analysis or the CEQA process nor does it provide specific examples of where the Project Change runs conflicts with state GHG emissions goals; therefore, no specific response can be provided to this comment.

No revisions to the Draft SEIR are necessary.

Comment 8-2

The comment states that there is no parking shortage at CSM, questioning the purpose and rationale for the Project Change.

The commenter is correct that there is currently no overall parking shortage at CSM. See **Response to Comment 4-5**.

The comment does not concern the adequacy of the Draft SEIR or the CEQA process. No revisions to the Draft SEIR are necessary.

Comment 8-3

The commenter expresses an opinion on the Project Change and requests improvements in other parts of the CSM Campus.

Comment noted. The comment does not concern the adequacy of the Draft SEIR analysis or the CEQA process. No revisions to the Draft SEIR are necessary.

Chapter 4

Revisions to the Draft Subsequent EIR

This chapter includes revisions to the Subsequent Draft EIR by errata as allowed by CEQA. The revisions are presented in the order they appear in the Subsequent Draft EIR, with the relevant page number indicated with italicized print. New or revised text is shown with underline for additions and ~~strike-out~~ for deletions.

All text revisions are to provide clarification or additional detail. The changes do not result in a need to recirculate the Subsequent Draft EIR. Under the CEQA Guidelines, recirculation is required when new significant information identifies:

- A significant new environmental impact resulting from the project or from a new mitigation measure proposed to be implemented;
- A substantial increase in the severity of an environmental impact unless mitigation measures are adopted that reduce the impact to a level of insignificance;
- Feasible project alternative or mitigation measure, considerably different from others previously analyzed, that clearly would lessen the environmental impacts of the project but the project's proponents decline to adopt it; or
- The Draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded (Guidelines sec. 15088.5[a]).

Recirculation of a Draft EIR is not required where the new information merely clarifies, amplifies or makes minor modifications to an adequate EIR (Guidelines sec. 15088[b]). The information provided below meets those criteria.

In addition to the revisions noted below, the Mitigation Monitoring and Reporting Program (MMRP) for the 2015 Facilities Master Plan Amendment Project (SCH# 2015052007) has been revised accordingly where this SEIR adds new mitigation measures or revises existing mitigation measures for CSM. The revised MMRP can be reviewed by contacting the SMCCCD District Office, 3401 CSM Drive, San Mateo, (650) 574-6550. In approving the Project Change, the SMCCCD Board of Trustees will be required to certify this SEIR adopt the revised MMRP.

Chapter 3 – Setting, Impacts, and Mitigation Measures

Chapter 3.1 Aesthetics

Page 3.1-10, Mitigation Measure CSM-AES-2: Relocate unique botanical specimens on the Building 20 Complex at CSM, is revised as follows:

Mitigation Measure CSM-AES-2: Relocate unique botanical specimens on the Building 20 Complex at CSM

Botanical specimens described in this measure are defined as trees, shrubs, and herbaceous plants that have been intentionally planted in the past to be a part of the specimen garden at the Project Change Site and which are uncommon on the rest of the campus. CSM will relocate unique botanical specimens if the size and species type is conducive to relocation and survivability, which shall be determined by consulting with a qualified horticultural specialist, such as an experienced botanist and/or landscape architect.

The Project Change landscape plan will be revised to accommodate the relocation of unique botanical specimens to the degree possible. However, the proposed landscape plan should remain visually cohesive. Transplantable botanical specimens that would not blend well with the landscape plan will be relocated elsewhere to other locations on the campus. The new locations shall be selected for their suitability in ensuring the health and vigor of relocated plants. Relocation efforts will preserve existing botanical specimens at the campus to the highest degree possible.

However, some trees and shrubs will not be conducive to relocation due to their size or species type. Unique tree and shrub botanical specimens that cannot be relocated, such as the dawn redwood, will be replaced by CSM at a 1:1 ratio, at a minimum.

Container sizes for replacement specimens will be determined in coordination with the qualified horticultural specialist. Existing irrigation systems may need to be modified or new irrigation may need to be installed to ensure the survival of the relocated and replacement trees and shrubs. Relocated and replacement plants that do not survive within the first five (5) years after relocation will be replaced at a 1:1 ratio by CSM, permitted that the species in question is reasonably available. In the event that a species is not reasonably available, another comparable botanical specimen will be replanted in its place.

The Town of Hillsborough's Building and Planning Department will be provided with an opportunity to review and comment on the tree and landscape removal and replacement program.

Page 3.1-10, Mitigation Measure CSM-AES-3: Relocate existing commemorative plaques, is revised as follows:

Mitigation Measure CSM-AES-3: Relocate existing commemorative plaques

The "Adrian's Tree" plaque from the dawn redwood will be relocated by CSM and placed on a marker or monument for the replacement dawn redwood tree required by Mitigation Measure CSM-AES-2. A new bench will be located near this replacement tree and the plaque on the existing bench will be relocated to the new bench. Similarly, the Eleanore D. Nettle Garden stone and plaque and the James K. Roberts plaque will be relocated to an area that will be replanted with specimens from that garden or comparable replacements.

Chapter 3.4 Cultural Resources

Appendix C, Cultural Resources Evaluation Memorandum, Page 3, Historical Research, is revised as follows:

Additional resources consulted in the process of compiling this memorandum include the following:

- The 1996 book *Class Act: College of San Mateo, a History*;
- College of San Mateo Archives historic photographs, accessed via the CSM Library website;
- Historical issues of the *San Mateo Times*, accessed via Newspapers.com;
- Historical issues of the *San Francisco Chronicle*, accessed via the San Francisco Public Library website;
- Online CSM catalog archive available on the CSM website;
- California Digital Newspaper Collection;
- Online Archive of California;
- Historicaerials.com.

Appendices

Appendix C, Cultural Resources Evaluation Memorandum, pages 14-15, California Register Evaluation, is revised as follows:

Criterion 2: The Building 20 complex is not significant under CRHR Criterion 2. Research did not reveal that instructors associated with the horticulture career program at CSM—which utilized Building 20, adjacent buildings, and gardens—were noted as being significant for their roles as educators. No instructors affiliated with the academic programs housed in the Building 20 complex are described in the book *Class Act*, the primary historical account of the college’s development (Svavenik and Burgett 1996). Newspaper articles published following the completion of the Building 20 complex reveal that some instructors in the CSM horticulture and floristry programs were recognized as local authorities in their respective fields, as evidenced through speaking engagements with local gardening organizations and professional engagement in the communities surrounding CSM. Longtime floristry instructor Jack F. Daniels was also described in newspapers as having a “nationwide reputation as an authority and lecturer” on flower arrangement (*The Times* 1973:44). However, research did not uncover evidence that any instructor had a discernible influence on the development of their fields. While they were responsible for training numerous students and were professionally accomplished in their areas of instruction, individuals who taught using the Building 20 complex do not appear to have made prominent or lasting contributions to the history of the College of San Mateo, California, or the United States.

The following text is added to Page 15 of Appendix C, Cultural Resources Evaluation Memorandum, as a footnote:

Instructors include the following: Alexander Graham, head of the CSM horticulture program, who trained at the Royal Botanical Garden in Scotland and was retained in the 1970s as a consultant at the Filoli estate in nearby Woodside (*The Times* 1974:15); and James Roberts, ornamental horticulture instructor (*The Times* 1977:12).

Appendix C, Cultural Resources Evaluation Memorandum, Page 17, References, is revised as follows:

Svanevik, Michael and Shirley Burgett. 1996. Class Act: College of San Mateo, a History. San Francisco: Custom & Limited Editions.

The Times. 1973. "An Expert on Yule Décor." November 23, 1973.

---. 1974. "Club Will Hear Horticulturalist." April 5, 1974.

---. 1977. "Civic Garden Club." April 13, 1977.

Appendix A
Attachments to Comment Letter 4

College of San Mateo Botanical Collection

The botanical collection at the College of San Mateo provides instructors from across disciplines a place to engage their students in learning activities not available anywhere else on campus. The unique diversity of species, horizontal lawn surfaces and relative quietness of this location allows instructors to engage their students in a quiet outdoor-classroom setting. The collection is an indispensable source of reference material for instructors. The flat lawn area is essential for a number of lab activities. Without it, a number of lab activities in biology and horticulture will be severely impacted.

Faculty in a multitude of ways and in many different classes to augment the student learning experience uses specimens from the collection. These include but are not limited to: general biology, botany, paleontology, wildlife (birds, reptiles, insects), ethnic studies, ethnobotany, art, floristry horticulture (tree, shrub, groundcover and vine identification, entomology, integrated pest management, weeds, plant diseases, landscape maintenance and landscape design), data collected by horticulture students for use in class projects has even been used by students in a statistics class.

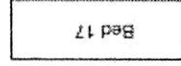
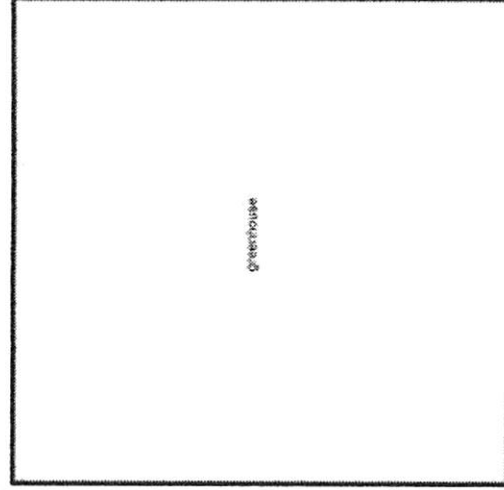
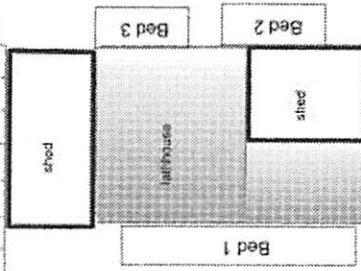
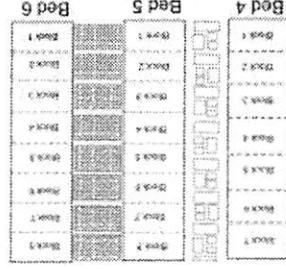
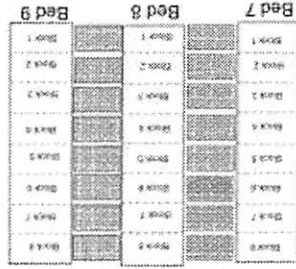
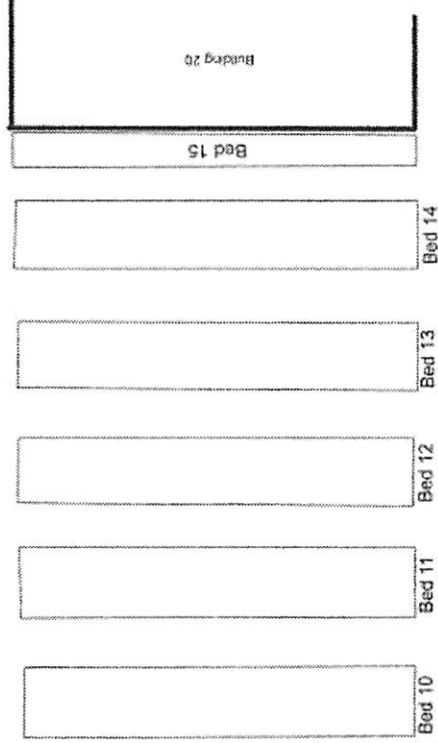
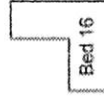
The collection includes plants from around the world, with representatives from Asia, Africa, the South Pacific, Central America, South America, North America and Europe. Of particular interest are plants from Mediterranean climates, winter-blooming plants from South Africa, native California plants (including endemics), and native California bee plants.

Our botanical collection at the College of San Mateo dates back to 1963 when the campus was opened. It is divided into four different areas surrounding and within Building 20: the Urban Display Garden, the Eleanore Nettle Garden, the California Native Plant Garden, the Building 20 Courtyard Garden, the "Hill 10" area adjacent to Building 10, the "Hill 19" area adjacent to and east of Building 19, and the "Hill 12" area adjacent to and north Building 12. The eastern end of "Hill 12" contains a section featuring California ceanothus and manzanita specimens. The total acreage for the entire collection is about .75 acres, which comprises about 0.5% of the 153-acre College of San Mateo campus. The Trustee's Grant that was used to create the California Native Plant Garden included the purchase of a plastic sign maker. As time permits, plant identification signs have been made by students and faculty and installed in the garden. Every effort has been made to include the name, planting date, planting location, nursery of origin and size of plant at planting when a plant is accessioned into the collection. Keeping the plant database updated is an ongoing endeavor.

Selected examples of instructional uses of plants found in the botanical collection		
Dawn Redwood	<i>Metasequoia glyptostroboides</i>	Biology/botany – deciduous tree, seasonal observations. Paleontology- living fossil.
Coast Redwood	<i>Sequoia sempervirens</i>	Tallest tree in the world, California native.
Giant Sequoia	<i>Sequoiadendron giganteum</i>	Largest tree in the world. California native
Ginkgo	<i>Ginkgo biloba</i>	Darwin's "Living fossil". Unique gymnosperm. Chinese

		culture and history.
Bunya-bunya	<i>Araucaria bidwillii</i>	Ancient gymnosperm. In conjunction with <i>Araucaria heterophylla</i> example of plant distribution related to continental drift.
Norfolk Island Pine	<i>Araucaria heterophylla</i>	See <i>Araucaria bidwillii</i> .
Monterey cypress	<i>Cupressus macrophylla</i>	Gymnosperm with scale-like leaf. One of the rarest plants in its native habitat. California native.
Douglas fir	<i>Pseudotsuga heterophylla</i>	Gymnosperm sample. Unique cone with Native American legend. Early American botany exploration/ Hawaiian history.
California buckeye	<i>Aesculus californicus</i>	California native. Palmate compound leaf. Drought deciduous. Fruit used by Native Americans for fishing.
Cherry	<i>Prunus sp.</i>	Flowering plant. Distinct lenticels.
Apple	<i>Malus sp.</i>	Flower/fruit "spurs".
She-oak	<i>Casuarina equisetifolia</i>	Unique vestigial leaves. Specific name instructive for nomenclature. South Pacific
Italian stone pine	<i>Pinus pinea</i>	2-needle pine example. Roman history lesson related to the explosion of Mt. Vesuvius in 59CE.
Windmill palm	<i>Trachycarpus fortunei</i>	Monocot sample. Palmate leaf.
Western redbud	<i>Cercis occidentalis</i>	California native. Example of pea family. Persistent pods used for biology labs.
Pineapple guava	<i>Feijoa selowiana</i>	Opposite leaf. Tomentose leaf
White sage	<i>Salvia apiana</i>	California native. Native American Ethnobotany.
Coast silktassle	<i>Garrya elliptica</i>	California native. Unique monospecific genus. Winter flowering.
Tree aloe	<i>Aloe arborescence</i>	Winter-blooming south African plants used for phenology observations. Succulent leaf.
Jerusalem sage	<i>Phlomis fruticosa</i>	Example of Mediterranean region plant with gray, tomentose leaf.
Cycad	<i>Cycas revoluta</i>	Botany, Paleontology.

College of San Mateo Botanical Collection
Urban Display Garden



80	1	2		15	16		29	30		43	44		57	58		71	B u i l d i n g 20
	3	4		17	18		31	32		45	46		59	60		72	
	5	6		19	20		33	34		47	48		61	62		73	
	7	8		21	22		35	36		49	50		63	64		74	
	9	10		23	24		37	38		51	52		65	66		75	
	11	12		25	26	Red Conc.	39	40		53	54		67	68		76	
	13	14		27	28	Green Conc.	41	42		55	56		69	70		77	
	Bed 10			Bed 11			Bed 12			Bed 13			Bed 14			Bed 15	

Bed 1 (east side of lath house): Spanish lavender (*Lavandula stoechas*), Parney cotoneaster (*Cotoneaster lacteus*); Powis Castle Artemisia (*Artemisia* 'Powis Castle'); Mexican sage (*Salvia leucantha*); *Cistus x skanbergii*; holly-leaf Osmanthus (*Osmanthus heterophyllus*)

Bed 2

Variegated myrtle (*Myrtus communis* 'Variegata'); flowering maple (*Abutilon* hybrid); Santa Barbara daisy, Mexican daisy (*Erigeron karvinskianus*); Mexican orange (*Choisya ternata*); Starry daisy bush (*Olearia stellulata* 'Blue Gem'); trailing gazania (*Gazania rigens leucolaena*); sticky monkey flower (*Mimulus aurantiacus*), Chilean guava (*Ugni molinae*); star jasmine (*Trachelospermum jasminoides*); variegated box-leaf euonymus (*Euonymus japonicus* 'Microphyllus Variegatus')

Bed 3

Periwinkle (*Vinca major*); white-flowered brunia (*Brunia albiflora*); king protea (*Protea cynaroides*); Mexican orange (*Choisya ternata*); Chilean guava (*Ugni molinae*); trailing rosemary (*Rosmarinus officinalis* 'Prostratus'); princess flower (*Tibouchina urvilleana*); African scurfpea, Kool-Aid bush (*Psoralea pinnata*)

Bed 4

Block 1: lily-of-the Nile (*Agapanthus praecox orientalis*); yarrow (*Achillea millefolium*); canna (*Canna* hybrid)

Block 2: canna (*Canna* hybrid)

Block 3: lion's tail (*Leonotis leonurus*, planted 2/3/1995).

Block 4: Golden Goddess bamboo (*Bamboos multiplex* 'Golden Goddess', planted 2/25/2003).

Block 5: Lynwood Gold forsythia (*Forsythia x intermedia* 'Lynwood Gold', planted 3/26/2004)
Star jasmine (*Trachelospermum jasminoides*).

- Block 6: *Euryops virgineus*
Block 7: African scurfpea, Kool-Aid bush (*Psoralea pinnata*)
Tawhihi (*Pittosporum tenuifolium*, planted 2/3/1995)

Bed 5

- Block 1: Sunset Gold breath of heaven (*Coleonema pulchrum* 'Sunset Gold')
Block 2:
Block 3: *Salvia karwinskii* planted 10/15/2007

- Block 4:
Block 5: white-flowered brunia (*Brunia albiflora*)
Block 6: Chinese tallow tree (*Sapium sebiferum*)
Bearded iris (*Iris* hybrid)
Block 7: blue glory bower (*Clerodendrum myricoides* 'Ugandense')
Block 8: Chinese pieris (*Pieris formosa forrestii*, planted 4/21/1999)
Tree dahlia (*Dahlia imperialis*)
Leatherleaf fern (*Rumohra adiantiformis*)

Bed 6

- Block 1: Norfolk Island pine (*Araucaria heterophyllus*)
Bearded iris
Block 2: bearded iris (*Iris* hybrid)
Block 3: bearded iris (*Iris* hybrid)
Block 4: tufted honeyflower (*Melianthus comosus*)
Salvia madrensis planted 10/15/2007
Block 5:
Block 6:
Block 7: Eastern snowball (*Viburnum opulus* 'Sterile', planted 1/2003)
Block 8: lily-of-the-valley shrub (*Pieris japonica*, planted 4/21/1999)

Bed 7

- Block 1: *Salvia blepharophylla* planted 10/15/2007
Block 2:
Block 3: *Sisyrinchium striatum*
Block 4: zebra grass (*Miscanthus sinensis* 'Zebrinus')
Block 5:
Block 6:
Block 7: *Cupressus cashmeriana* planted 10/15/2007 height at planting 6'
Block 8: channeled heath (*Erica canaliculata*, channeled heath, planted 4/21/1999, 1 gallon)
Red valerian (*Centranthus ruber*)

Bed 8

- Block 1: Santa Barbara daisy, Mexican daisy (*Erigeron karvinskianus*)
Block 2: argyle apple, mealy stringybark (*Eucalyptus cinerea*, planted 4/12/1997, grown from seed from Silverhill Seeds, South Africa)
Block 3:

Block 4:

Block 5: *Salvia mexicana* planted 10/15/2007 rooted cutting from Strybing Arboretum, Golden Gate Park, San Francisco

Block 6:

Block 7: *Cupressus cashmeriana* planted 10/15/2007 height at planting 6'

Block 8: doublefile viburnum (*Viburnum plicatum tomentosum*)

Bed 9

Block 1: montbretia (*Crocasmia x crocosmiiflora*)

Widdringtonia cedarbergensis Clan William cedar, grown from seed from Silverhills Nsy, South Africa. Planted 10/15/2007. Height at planting 4'.

Block 2: toyon (*Heteromeles arbutifolia*); montbretia (*Crocasmia x crocosmiiflora*)

Block 3: montbretia (*Crocasmia x crocosmiiflora*)

Block 4: common calla (*Zantedeschia aethiopica*)

Block 5: silk floss (*Chorisia speciosa*); common calla (*Zantedeschia aethiopica*)

Block 6: common calla (*Zantedeschia aethiopica*)

Block 7: common calla (*Zantedeschia aethiopica*)

Block 8: common calla (*Zantedeschia aethiopica*)

Sasa pygmaea planted 11/27/2007, height at planting 8", spread 6" x 6"

Bed 10

1. Dusty miller (*Senecio cineraria*)

5. Jack Sprat New Zealand flax (*Phormium tenax* 'Jack Sprat')

9. *Coreopsis grandiflora*

10. *Rhamnus frangula* 'Asplenifolia' 10/15/2007, 5 gallon, height when planted 4 feet.

11. Sunset Gold breath of heaven (*Coleonema pulchrum* 'Sunset Gold') planted April 1992

2. Cape mallow (*Anisodonta x hypomandarum*)

4. English lavender (*Lavandula angustifolia*)

6. Dwarf Japanese garden juniper (*Juniperus procumbens* 'Nana')

8. Common thrift (*Armeria maritima*)

14. Germander (*Teucrium x lucidrys*, syn. *T. chamaedrys*)

Bed 11

15. *Aloe x principis*, syn. *Aloe caesia*

19. Flowering quince (*Chaenomeles*)

23. Coast silk tassel (*Garrya elliptica* 'James Roof') planted November 2003, 1-gallon container

25. Copper Canyon Daisy (*Tagetes lemmonii*) and goldenaster (*Heterotheca sessiflora* 'San Bruno Mt.')

16. Red-hot poker (*Kniphofia uvaria*)

22. Alpine fescue (*Festuca brachyphylla*) planted November 2003

24. Shore juniper (*Juniperus conferta*)

26 – 28. Soap aloe (*Aloe saponaria*)

Bed 12

- 29. *Juniperus procumbens* 'Bar Harbor'
- 31. *Rhamnus frangula* 'Asplenifolia' 10/15/2007, 5 gallon, height when planted 4 feet.
- 33. Lavender cotton (*Santolina chamaecyparissus*)
- 35. Rosemary (*Rosmarinus officinalis*)
- 37. California fuchsia (*Epilobium canum*)
- 39. Lemon thyme (*Thymus x citriodorus* 'Aureus')
- 41. Jerusalem sage (*Phlomis fruticosa*)

- 30. Butterfly iris (*Dietes bicolor*)
- 40. White sage (*Salvia apiana*)

Bed 13

- 43. Daylily (*Hemerocallis*); *Alnus rhombifolia* 10/15/2007, 1 gallon plant, Yerba Buena Nsy, height at planting 4 feet.
- 45. Fortnight lily (*Dietes vegeta*)
- 47 dwarf coyote brush (*Baccharis pilularis* 'Twin Peaks')
- 49. Pineapple guava (*Feijoa sellowiana* 'Coolidgei') planted October 2003
- 55. Tamarix juniper (*Juniperus sabina* 'Tamariscifolia')

- 46. Tansy (*Tanacetum vulgare*)

Bed 14

- 59. Mexican sage (*Salvia leucantha*)
- 63. Lamb's ears (*Stachys byzantina*)
- 65. Tree aloe (*Aloe arborescens*)
- 67. *Euphorbia myrsinites* (small specimen)
- 69. Trailing gazania (*Gazania rigens leucolaena*)

- 58. Windmill palm (*Trachycarpus fortunei*)
- 60. Century plant (*Agave americana*)
- 62 – 64. Lowfast cotoneaster (*Cotoneaster dammeri* 'Lowfast')
- 70. New Zealand Christmas tree (*Metrosideros excelsus*)

Bed 15

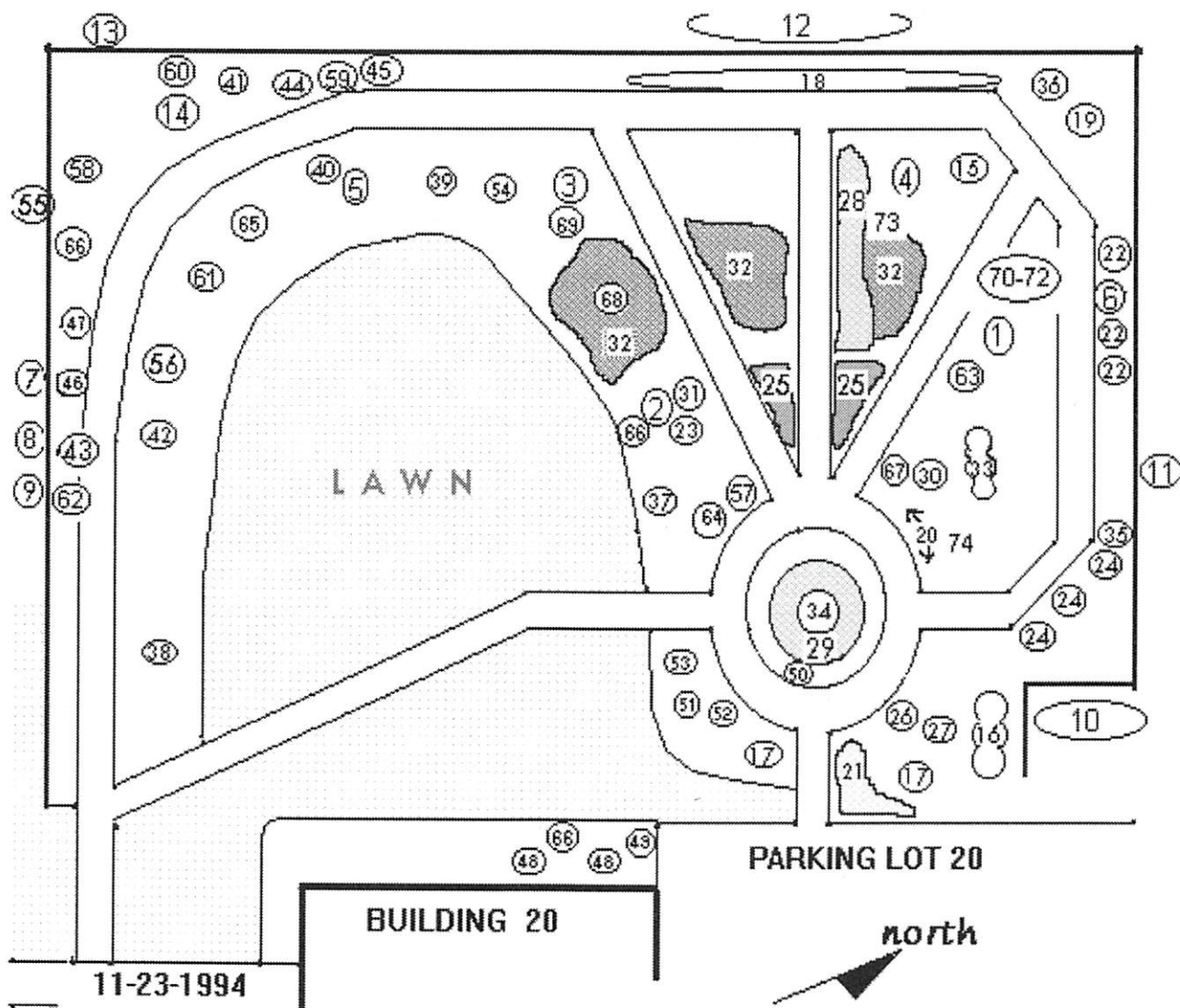
- 73. Artichoke (*Cynara scolymus*)
- 74. *Lampranthus aurantiacus* and Kaffir lily (*Clivia miniata*)
- 76. Western redbud (*Cercis occidentalis*)
- 77. Lemon bottlebrush (*Callistemon citrinus*)

Bed 16

Katsura tree (*Cercidiphyllum japonicum*)
Oak leaf hydrangea (*Hydrangea quercifolia*)
Fuchsia hybrid (note eriophyid mite galls)

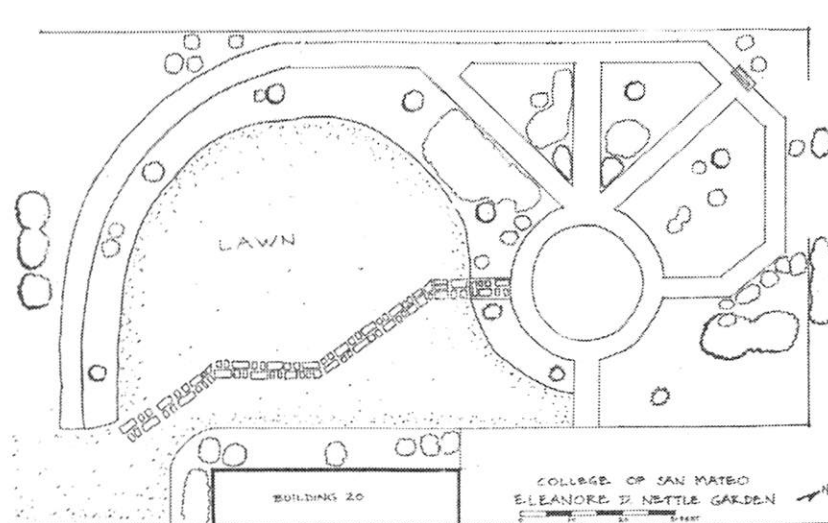
College of San Mateo Botanical Collection
Eleanore D. Nettle Garden

This garden area was dedicated to Eleanore D. Nettle, in appreciation of thirty-three years of dedicated service to the San Mateo County Community College District in 1991. It also features a Hopi Meditation Maze installed by Phi Theta Kappa students in 2009, CSM student Mike Shanahan designed, obtained materials for, and oversaw installation.



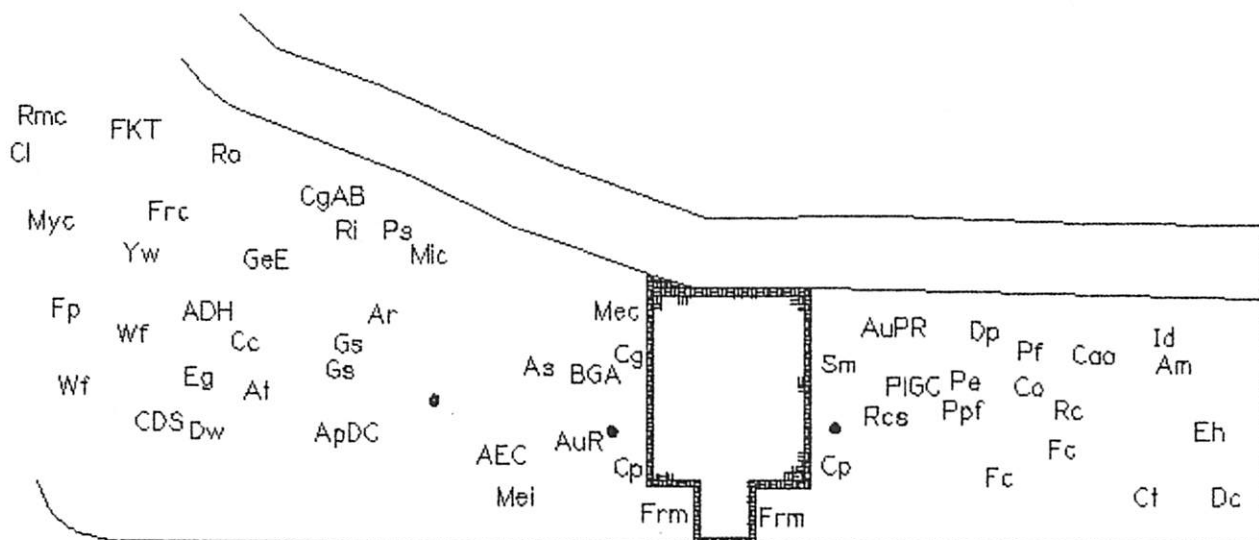
CODE	BOTANICAL NAME	COMMON NAME	DATE PLANTED	SIZE AT PLANTING
1	Chitalpa tashkentensis	Chitalpa	Jan 10, 1991	dbh 9/16"; ht 7'; 2.5' crown diameter
2	Zizyphus jujuba 'Lang'	Jujube	Jan 13, 1992	dbh 1/2"; ht 6'; 2' crown diameter
3	Geijera parviflora	Australian Willow	pre 1989	not recorded
4	Geijera parvifolia	Australian Willow	May 1991	not recorded
5	Aesculus californica	California Buckeye	May 1991	not recorded
6	Cercis occidentalis	Western Redbud	May 1991	not recorded
7 & 8	Crataegus lavalleyi	Lavalle Thorn	pre 1989	not recorded
9	Crataegus 'Autumn Glory'	Autumn Glory Hawthorn	pre 1989	not recorded
10	Eucalyptus polyanthemos	Silver Dollar Gum	pre 1989	not recorded
11	Eucalyptus pulverulenta	Silver Mountain Gum	pre 1989	not recorded
12	Acacia melanoxylon	Blackwood Acacia	pre 1989	not recorded
13	Acacia retinoides	Water Wattle	pre 1989	not recorded
14	Magnolia soulangiana 'Rustica Rubra'	Saucer Magnolia 'Rustica Rubra'	April 12, 1994	dbh 1/4"; ht 6'; 3' crown diameter
15	Ceanothus 'Joyce Coulter'	California Lilac 'Joyce Coulter'	May 1991	1' ht; 1' sp. Damaged by deer.
16	Cistus purpurea	Orchid-Spot Rockrose	May 1991	18" ht; 18" sp.
17	Dietes vegeta	Fortnight Lily	May 1991	1.5' ht; 1.5' sp.
18	Echium fastuosum	Pride of Madeira	May 1991	1.5' ht; 1.5' sp.
19	Fremontodendron 'California Glory'	'California Glory' Flannel Bush	May 1991	2' ht; 1.5' sp.
20	Helianthemum nummularium 'St Mary'	St Mary' Sunrose	May 1991	4" ht; 8" sp. Damaged by deer.
21	Lantana montevidensis	Trailing Lantana	May 1991	4" ht; 8" sp.
22	Salvia leucophylla (x3)	Purple Sage (x3)	May 1991	1' ht; 1' sp.
23	Salvia 'Allan Chickering'	'Allan Chickering' Sage	May 1991	1' ht; 1' sp.
24	Ribes sanguineum glutinosum 'White Icicle'	'White Icicle' Winter Currant (x3)	May 1991	1' ht; 1' sp.
25	Tulbaghia violacea	Society Garlic	May 1991	8" ht; 6" sp.
26	Calocephalus brownii	Cushion Bush	1993	3" ht; 3" sp. rooted cutting
27	Teucrium fruticans	Bush Germander	1993	3" ht; 3" sp. rooted cutting
28	Verbena peruviana	Verbena	May 1991	rooted cuttings
29	Berberis thunbergii	Japanese Barberry	pre 1989	not recorded
30	Lycianthes rantonnei	Blue Potato Bush	May 1991	2' ht; 2' sp. Damaged by deer
31	Abelia grandiflora	Glossy Abelia	not recorded	not recorded. Damaged by deer.
32	Cotoneaster microphyllus	Rockspray Cotoneaster	May 1991	6" ht; 1' sp.
33	Isomeris arborea	Bladderpod	1993	6" rooted cuttings
34	Rosa polyantha 'The Fairy'	Rose 'The Fairy'	May 1991	not recorded
35	Salvia involucrata		1992	6" rooted cutting from Gambel Garden
36	Salvia gaurantica		1992	6" rooted cutting from Gambel Garden
37	Aloysia triphylla	Lemon Verbena	1994	1' ht. x 1' sp.
38	Isopogon formosus		March 14, 1994	18" ht x 18" sp.
39	Grevillea 'Poorinda Firebird'	'Poorinda Firebird' Grevillea	March 14, 1994	18" ht x 18" sp.
40	Mahonia aquifolium 'Compacta'	Dwarf Oregon Grape	March 14, 1994	1' ht. x 6" sp.
41	Dodonaea affinis tenuifolia		March 14, 1994	18" ht. x 1' sp.
42	Euryops virgineus		March 14, 1994	1' ht. x 1' sp.
43	Lophomyrtus 'Kathryn'		March 14, 1994	18" ht x 8" sp.
44	Leptospermum scoparium 'Helen Strybing'	New Zealand Tea Tree 'Helen Strybing'	March 14, 1994	2' ht. x 18" sp.
45	Nerium oleander 'Petite Pink'	Oleander 'Petite Pink'	March 14, 1994	1' x 1'
46	Choisya ternata	Mexican Orange	March 14, 1994	18" x 18"
47	Plumbago auriculata	Cape Plumbago	March 14, 1994	4' ht. x 18" sp.
48	Impatiens oliveri	Poor Man's Rhododendron	March 14, 1994	1' ht. x 1' sp.
49	Malvaviscus arborea	Wax Mallow	March 14, 1994	1' ht. x 1' sp.

50	<i>Santolina chamaecyparissus</i>	Lavender Cotton	pre 1989	not recorded
51	<i>Lavendula pinnata</i> 'Madiera'		Aug 24, 1994	8" ht. x 6" sp.
52	<i>Salvia thymoides</i>		Aug 24, 1994	6" ht. x 6" sp.
53	<i>Watsonia pyramidata</i>	Watsonia	March, 1994	2' ht. x 2' sp.
54	<i>Salvia involucrata</i>		March 14, 1994	1' ht. x 1' sp.
55	<i>Sapium sebiferum</i>	Chinese tallow	Nov. 14, 1994	dbh 5/8"; ht. 7'; 2' crown diameter
56	<i>Juniperus excelsa</i> 'Stricta'	spiny Greek juniper	Nov. 14, 1994	3' ht. x 1' sp.
57	<i>Correa backhousiana</i>		Nov. 23, 1994	1' x 1'
58	<i>Juniperus chinensis</i> 'Blue Point'	'Blue Point' juniper	Nov. 23, 1994	2.5' ht. x 8" sp.
59	variegated Italian buckthorn	<i>Rhamnus alaternus</i>	Nov. 23, 1994	4"x4" cutting
60	<i>Coprosma repens</i>	mirror plant	Nov. 23, 1994	6"x6"
61	<i>Oxypetalum caeruleum</i>	Argentina skyflower	Nov. 23, 1994	2' x 2'
62	<i>Myrtus communis</i> 'Compacta Variegata'		Feb. 3, 1995	10" x 5"
63	<i>Lavatera</i> 'Barnsley Pink'		Feb. 3, 1995	10" x 5"
64	<i>Westringia rosmariniformis</i> (Syn. fruticosa?)		Feb 15, 1995	ht. 6" x sp. 16"
65	<i>Westringia</i> "Wynyabbie Gem"		Feb. 15, 1995	ht. 16" x sp. 15"
66	<i>Salvia cacialaefolia</i> (Strybing)		April 13, 1995	8 planted, all ht. 10" x sp. 8"
67	<i>Grevillea alpina</i> 'East Grampians'	died summer 1998	April 13, 1995	ht. 12" x sp. 10"
68	<i>Polygala dalmatiana</i>	Sweet-pea Shrub	April 13, 1995	ht. 12" x sp. 10"
69	<i>Anisodontia</i> 'Tara's Wonder'		April 13, 1995	ht. 2' x sp. 1'
70	<i>Thryptomene saxicola</i> "Mingenew"		Oct 8, 2004 UCSC Arboretum	ht 8", sp 12" x 12"
71	<i>Darwinia diosmoides</i>		Oct 8, 2004 UCSC Arboretum	ht 18", sp 18" x 22"
72	<i>Hermania vertillata</i>		Oct 8, 2004 UCSC Arboretum	ht 8", sp 16" x 16"
73	<i>Cassia tomentosa</i>	seeds coll Strybing Arb.	planted Oct 8, 2004 from seeds coll Strybing Arb.	ht 3"
74	<i>Anisodontea capensis</i>	Cape Mallow	Oct 8, 2004	ht 12", sp 10" x 10"
75				



College of San Mateo Botanical Collection
California Native Plant Garden

This garden was installed beginning in 2003 with a San Mateo County Community College District Program Improvement Grant. The goal of the project was to install a permanent garden for students to utilize as a living laboratory as well as enhance their appreciation of native California plants.

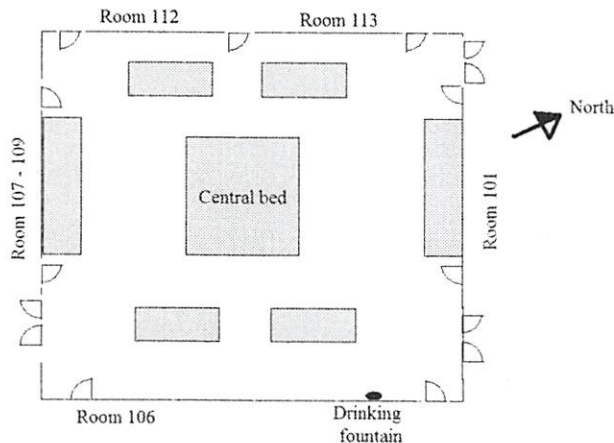


Code	Botanical name	Common name
Ac	<i>Aristolochia californica</i> (by redbud)	California Dutchman's pipe
ADH	<i>Arctostaphylos</i> 'Dr. Hurd'	Dr Hurd manzanita
AEC	<i>Arctostaphylos</i> 'Emerald Carpet'	Emerald Carpet manzanita
Am	<i>Acer macrophyllum</i>	big leaf maple
ApDC	<i>Artemisia pycnocephala</i> 'David's Choice'	Sand Hill Sage
Ar	<i>Arctostaphylos refugioensis</i>	Refugio Manzanita
As	<i>Asclepias speciosa</i>	showy milkweed
At	<i>Artemisia tridentata</i>	big sagebrush
AuPR	<i>Arctostaphylos uva-ursi</i> 'Pt. Reyes'	Pt. Reyes bearberry
AuR	<i>Arctostaphylos uva-ursi</i> 'Radiant'	Radiant bearberry
BGA	<i>Berberis</i> 'Golden Abundance'	Golden Abundance Oregon grape
Cao	<i>Calycanthus occidentalis</i>	spice bush
Cc	<i>Carpenteria californica</i>	tree anemone
CDS	<i>Ceanothus</i> 'Dark Star'	California lilac
Cg	<i>Cynoglossum grande</i>	hounds tongue
CgAB	<i>Ceanothus gloriosus</i> 'Anchor Bay'	California lilac
Cl	<i>Clematis lasiantha</i>	pipestems
Co	<i>Cercis occidentalis</i>	western redbud
Cp	<i>Chlorogalum pomeridianum</i>	soap plant
Ct	<i>Carex tumulicola</i>	Berkeley sedge
Dc	<i>Deschampsia caespitosa</i>	tufted hairgrass
Dp	<i>Darmera peltata</i>	Indian rhubarb
Dw	<i>Datura wrightii</i>	jimson weed
Fc	<i>Festuca californica</i>	California fescue
Eg	<i>Eriogonum giganteum</i>	St. Catherine's lace
Eh	<i>Equisetum hyemale</i>	horsetail
FKT	<i>Fremontodendron</i> 'Ken Taylor'	flannelbush

Fp	<i>Forestiera pubescens</i>	desert olive
Frc	<i>Fremontodendron californicum</i>	flannelbush
Frm	<i>Festuca rubra molate</i>	red fescue
GeE	<i>Garrya elliptica</i> 'Evie'	coast silktassel
Gs	<i>Galvezia speciosa</i>	showy island snapdragon
Id	<i>Iris douglasiana</i>	Douglas' iris
Mec	<i>Melica californica</i>	California melic
Mei	<i>Melica imperfecta</i>	Coast range melic
Mic	<i>Mimulus cardinalis</i>	scarlet monkeyflower
Myc	<i>Myrica californica</i>	Pacific wax myrtle
Pe	<i>Penstemon eatonii</i>	
Pf	<i>Populus fremontii</i>	Fremont cottonwood
PIGC	<i>Philadelphus lewisii</i> 'Goose Creek'	wild mock orange
Ppf	<i>Penstemon procerus formosus</i>	
Ps	<i>Penstemon spectabilis</i>	
Rc	<i>Rhamnus californicus</i>	California coffeeberry
Ri	<i>Rhus integrifolia</i>	lemonade berry
Rmc	<i>Romneya coulteri</i>	matilija poppy
Ro	<i>Rhus ovata</i>	sugar bush
Rs	<i>Ribes speciosum</i>	fuchsia-flowered gooseberry
RsC	<i>Ribes sanguineum glutinosum</i> 'Claremont'	pink flowering currant
Rsc	<i>Rosa californica</i>	California rose
ScWG	<i>Salvia clevelandii</i> 'Winifred Gilman'	Winifred Gilman Cleveland sage
Sm	<i>Sidalcea malvaeflora</i>	checker mallow
Ss	<i>Salvia spathacea</i>	hummingbird sage
Wf	<i>Washingtonia filifera</i>	California fan palm
Yw	<i>Yucca whipplei</i>	Our Lord's candle

College of San Mateo Botanical Collection
Building 20 Courtyard

Plants in this garden area are protected from deer damage that would occur in the outside gardens. It also features plants needing some protection from the frost in winter.



Room 101 bed: English ivy (*Hedra helix*); Gladwin iris (*Iris foetidissima*), Mickey Mouse plant (*Ochna serrulata*), *Aeonium arboreum* 'Atropurpureum'; pompon tree (*Dais cotinifolia*); bird of paradise (*Strelitzia reginae*); jade plant (*Crassula argentea*), spider plant (*Chlorophytum comosum* – an indoor plant); crown of thorns (*Euphorbia milii* – an indoor plant); four o'clock (*Mirabilis jalapa*); poinsettia (*Euphorbia pulcherrima* – an indoor plant)

Room 113 bed: winter-blooming bergenia (*Bergenia crassifolia*); Mediterranean fan palm (*Chamaerops humilis*); Ming fern (*Asparagus retrofractus*)

Room 112 bed: winter-blooming bergenia (*Bergenia crassifolia*); angel's trumpet (*Brugmansia x candida* – hang straight down); Myers asparagus (*Asparagus densiflorus* 'Meyers'); Indian hawthorn (*Rhaphiolepis indica*)

Room 107 – 109 bed: pygmy date palm (*Phoenix roebelenii*); shiny xylosma (*Xylosma conjestum*); gold dust plant (*Aucuba japonica* 'Variegata'); split-leaf philodendron (*Monstera deliciosa* – an indoor plant); Chinadoll (*Radermachera sinica* – an indoor plant); *Begonia foliosa*; queen's tears (*Billbergia nutans*)

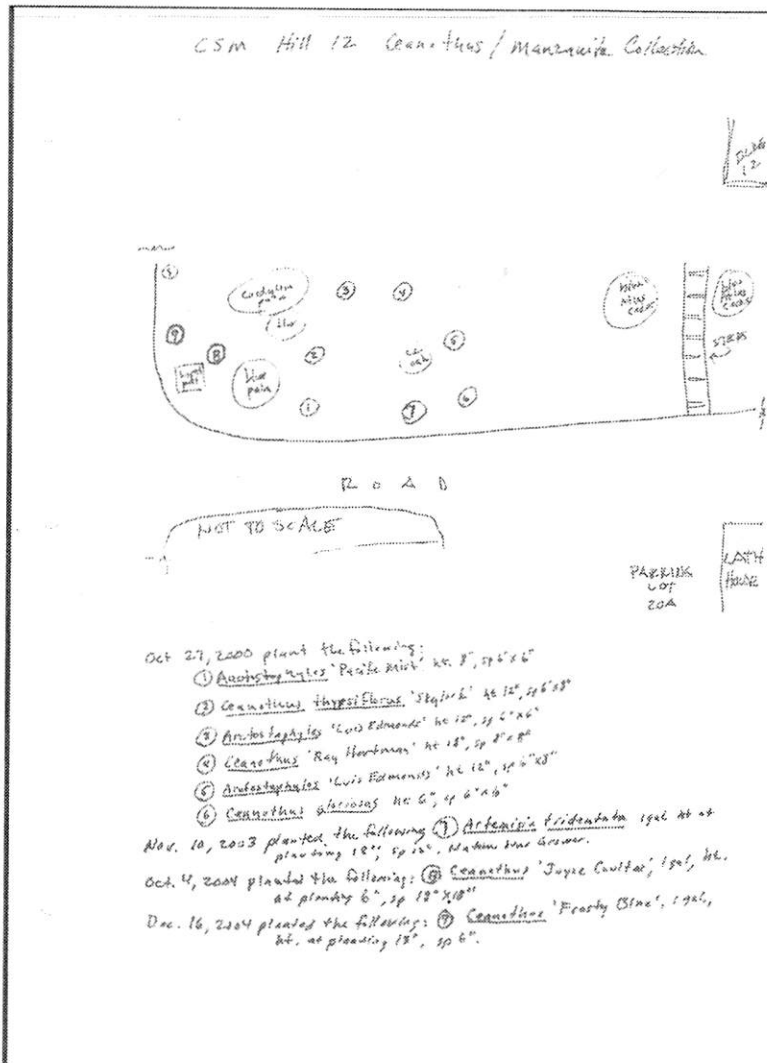
Room 106 bed: Japanese felt fern (*Pyrrosia lingua*); sago palm (*Cycas revoluta*), cast-iron plant (*Aspidistra elatior*)

Drinking fountain bed: Japanese aralia (*Fatsia japonica*); giant bird of paradise (*Strelitzia nicolai*); Ming fern (*Asparagus retrofractus*), Myers asparagus (*Asparagus densiflorus* 'Meyers')

Central bed: Mexican evening primrose (*Oenothera speciosa*), crape myrtle (*Lagerstroemia* hybrid 'Zuni'), *Galvezia speciosa*, *Rosa californica* planted 9/23/2009, *Carex pansa* planted 9/23/2009

Hill 12 Ceanothus and Manzanita Collection

In 2000, faculty decided to create an area specifically to feature the many species and cultivated varieties of our native California ceanothus and manzanita species.



Additional Plants of Note

Taxus baccata 'Stricta' on corner of Building 20 is needed for horticulture classes. Wood of yew was used for English Longbow so it also has relevance to European history. It needs to be saved or moved.

Stewartia koreana is a unique tree; specimen on the NW side of Building 20 needs to be saved.

We need to plant a new *Juglans hindsii* to replace the specimen removed during Building 10 renovation.

We need to plant a new *Cinnamomum camphora* to replace the specimen removed during Building 10 renovation.

We need to plant a new *Aesculus hippocastanum* to replace the specimen removed during Building 10 renovation.

Healthy nature healthy people: 'contact with nature' as an upstream health promotion intervention for populations

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SUMMARY

Whilst urban-dwelling individuals who seek out parks and gardens appear to intuitively understand the personal health and well-being benefits arising from 'contact with nature', public health strategies are yet to maximize the untapped resource nature provides, including the benefits of nature contact as an upstream health promotion intervention for populations. This paper presents a summary of empirical, theoretical and anecdotal evidence drawn from a literature review of the human health benefits of contact with nature. Initial findings indicate that nature plays a vital role in human health and well-being, and that parks and nature reserves play a significant role by providing access to nature for individuals. Implications suggest contact with nature may provide an effective

population-wide strategy in prevention of mental ill health, with potential application for sub-populations, communities and individuals at higher risk of ill health. Recommendations include further investigation of 'contact with nature' in population health, and examination of the benefits of nature-based interventions. To maximize use of 'contact with nature' in the health promotion of populations, collaborative strategies between researchers and primary health, social services, urban planning and environmental management sectors are required. This approach offers not only an augmentation of existing health promotion and prevention activities, but provides the basis for a socio-ecological approach to public health that incorporates environmental sustainability.

Key words: nature; health promotion; mental health; ecological health

REMEMBER NATURE?

Humans have spent many thousands of years adapting to natural environments, yet have only inhabited urban ones for relatively few generations (Glendinning 1995; Roszak *et al.*, 1995; Suzuki 1997; Gullone 2000). Whilst modern 'westernization' has doubled our life expectancy, it has also created disparities between ancient and present ways of living that may have paved the way for the emergence of new serious diseases. 'As more people survive to older age, and as patterns of living, consuming and environmental exposures change, so non-communicable diseases such as coronary heart disease, diabetes and

cancer have come to dominate' [McMichael, 2001 (p. 2)]. Further, mental, behavioural and social health problems are seen to be an increasing health burden in all parts of the world (Desjarlais *et al.*, 1995).

According to the World Bank and the World Health Organization, mental health disorders currently constitute 10% of the global burden of disease (Victorian Health Promotion Foundation, 2005). In Australia, depression costs the economy AUD\$3.3 billion in lost productivity each year (Beyondblue, 2005). Estimates suggest by the year 2020 mental health disorders will rise

to 15% of the global burden of disease and depression alone will constitute one of the largest health problems worldwide (Murray and Lopez, 1996). More than ever, nations require effective and integrated strategies for promoting health in whole populations. In light of such trends, public health strategies need to closely investigate the social and physical habitats of urban populations, and examine 'ecological' solutions alongside specific behavioural, clinical and technological interventions (McMichael, 2001). This paper examines the potential use of human contact with nature as an effective and affordable health promotion intervention for populations. The evidence invites us to 'look outside' for solutions to this global contemporary health epidemic.

NATURAL CONNECTIONS WITH PUBLIC HEALTH

In the last few hundred years, there has been an extraordinary disengagement of humans from the natural environment (Axelrod and Suedfeld, 1995; Beck and Katcher, 1996; Katcher and Beck, 1987). This is mostly due to the enormous shift of people away from rural areas into cities (Katcher and Beck, 1987). In evolutionary terms, 'the urban environment is a spontaneous, changeable and historically unfamiliar habitat' [McMichael, 2001 (p. 252)]. Never in history have humans spent so little time in physical contact with animals and plants, and the consequences are unknown (Katcher and Beck, 1987). Already, some research has shown that too much artificial stimulation and an existence spent in purely human environments may cause exhaustion and produce a loss of vitality and health (Katcher and Beck, 1987; Stilgoe, 2001). Modern society, by its very essence, insulates people from outdoor environmental stimuli (Stilgoe, 2001) and regular contact with nature (Katcher and Beck, 1987). Some believe humans may not be fully adapted to an urban existence (Kellert and Wilson, 1993; Glendinning, 1995; Kellert, 1997; Burns, 1998; McMichael, 2001). With parks and public nature reserves often their only means of accessing nature, the majority of urban-dwelling individuals may have all but forgotten their connections with the natural world.

Whilst medical technology continues to improve the capacity of nations to combat the global infectious disease burden, public health

strategies struggle to cope with the rapid changes industrialization and urbanization have meant. Human, community and cultural well-being has suffered as a result. Traditional models of public health appear ill prepared for the new reality of health risks posed to populations. This has led to a reconsideration of the interdependence between people, their health, and their physical and social environments (Kickbusch, 1989a).

For the purposes of this paper, nature is defined as an organic environment where the majority of ecosystem processes are present (e.g. birth, death, reproduction, relationships between species). This includes the spectrum of habitats from wilderness areas to farms and gardens. Nature also refers to any single element of the natural environment (such as plants, animals, soil, water or air), and includes domestic and companion animals as well as cultivated pot plants. Nature can also refer collectively to the geological, evolutionary, biophysical and biochemical processes that have occurred throughout time to create the Earth as it is today. Parks are public natural environments, spaces reserved for their natural or cultural qualities, usually owned, managed and administered by public institutions. Parks are utilized for a range of purposes, including for conservation, recreation and education. In urban settings, parks are seen to provide the most ready access to nature for many individuals. This paper focuses on the benefits of contact with nature in park environments for urban-dwelling individuals, and explores the potential of contact with nature for the promotion of health for whole populations.

The Ottawa Charter for Health Promotion identified the importance of environments supportive of health, stating that the inextricable links between people and their environment are the basis for a socio-ecological approach to health (World Health Organization, 1986). The Charter advocates for protection of natural and built environments, and conservation of natural resources as essential in any health promotion strategy. The central theme was promotion of health by maximizing the health values of everyday settings. Everyday settings include, for example, where people learn, live, work, play, etc. (World Health Organization, 1986). An emerging question might be therefore whether the majority of urban-dwelling individuals currently utilize parks and nature reserves as 'everyday settings'.

Studies in disciplines of ecology, biology, psychology and psychiatry have attempted to

empirically examine the human relationship with the natural world, some concluding that as well as being totally dependent on nature for material needs (food, water, shelter, etc.) humans also need nature for psychological, emotional and spiritual needs (Wilson, 1984; Katcher and Beck, 1987; Friedmann and Thomas, 1995; Roszak *et al.*, 1995; Frumkin, 2001; Wilson, 2001). Yet how dependent humans are on nature for psychological and well-being needs, and what benefits can be gained from interacting with nature are just beginning to be investigated.

The Australian Institute of Health and Welfare identifies seven dimensions within holistic health and well-being, including: biological and mental well-being, social well-being, economic well-being, environmental well-being, life satisfaction, spiritual or existential well-being, and 'other characteristics valued by humans' (Australian Institute of Health and Welfare, 1998). Whilst a growing body of evidence has demonstrated the importance of social relationships (and social capital) for health, the relationship between environmental health and human health remains little understood. As Brown states, sustainable ecosystems in these dimensions of human health need greater attention and exploration, as well as inclusion and emphasis in the knowledge base of public health (Brown, 1996).

CONTACT WITH NATURE PROMOTES HEALTH AND WELL-BEING—THE EVIDENCE

'People with access to nearby natural settings have been found to be healthier overall than other individuals. The longer-term, indirect impacts (of 'nearby nature') also include increased levels of satisfaction with one's home, one's job and with life in general' [Kaplan and Kaplan, 1989 (p. 173)].

When parks were first designed in the nineteenth century, city officials had a strong belief in the possible health advantages that would result from open space (Hamilton-Smith and Mercer, 1991; Rohde and Kendle, 1997). It was hoped that parks would reduce disease, crime, and social unrest as well as providing 'green lungs' for the city, and areas for recreation (Rohde and Kendle, 1997). These assumptions were used as justification for providing parks and other natural areas in cities, and preserving wilderness areas outside of cities for public use (Parsons, 1991; Ulrich, 1993).

Contact with nature in an urban park environment may be experienced via various means, including viewing natural scenes, being in natural settings, encountering plants and animals, participating in recreational activities, undertaking environmental conservation work, and participating in nature-based therapy programmes, amongst others. Although the study upon which this paper is based included an examination of the human health benefits of observing plants and animals, this review focuses on 'everyday' interactions with nature in a park setting by urban populations including: (1) viewing natural scenes; and (2) being in natural environments. Also provided is a summary of current knowledge based on current anecdotal, theoretical and empirical evidence. Only those human relationships with animals and plants where no economic benefit is to be gained from the relationship are included.

Viewing natural scenes

The healing effects of a natural view are increasingly being understood in stressful environments such as hospitals, nursing homes, remote military sites, space ships and space stations (Lewis, 1996). In these environments particularly, as well as for people who work in windowless offices, studies show that seeing nature is important to people and is an effective means of relieving stress and improving well-being (Kaplan, 1992a; Lewis, 1996; Leather *et al.*, 1998).

A study examining recovery rates of patients who underwent gall bladder surgery found that those with a natural view recovered faster, spent less time in hospital, had better evaluation from nurses, required fewer painkillers and had less postoperative complications compared with those that viewed an urban scene (Ulrich, 1984). Similarly, Ulrich and colleagues studied the effects of different natural and urban scenes on subjects who had just watched a stressful film (horror genre) (Ulrich *et al.*, 1991b). Measuring a whole array of physiological measures [including heart rate, skin conductance, muscle tension and pulse transit time (a non-invasive measure that correlates with systolic blood pressure)] they found that recovery was faster and more complete when subjects were exposed to natural rather than urban scenes (Ulrich *et al.*, 1991b). The physiological data measured by this study suggests that natural settings elicit a response that includes a component of the parasympathetic

nervous system associated with the restoration of physical energy (Ulrich *et al.*, 1991a).

Research conducted in prison environments suggests that cell window views of nature are associated with a lower frequency of stress symptoms in inmates, including digestive illnesses and headaches, and with fewer sick calls overall by prisoners (Moore, 1981). Tennessen and Cimprich gave university students a test and compared scores of students who had natural views to those that had did not (Tennessen and Cimprich, 1995). They found that those with a view of nature scored better on the test than those with non-natural views.

Research suggests access to nature in the workplace is related to lower levels of perceived job stress and higher levels of job satisfaction (Kaplan and Kaplan, 1989). Workers with a view of trees and flowers felt that their jobs were less stressful and they were more satisfied with their jobs than others who could only see built environments from their window. In addition, employees with views of nature reported fewer illnesses and headaches (Kaplan and Kaplan, 1989). A similar study found that a view of natural elements (trees and other vegetation) buffered the negative impact of job stress on intention to quit (Leather *et al.*, 1998).

Parsons *et al.*, reviewed the literature on commuter stress in car drivers and the mitigating effects of roadside environments (Parsons *et al.*, 1998). Driving is known to be a stressful activity, and causes several physiological changes in the body, including: activation of the sympathetic nervous system, increased blood pressure, increased heart rate and an increase in heart rate variability (Parsons *et al.*, 1998). Stress recovery and immunization were measured in subjects exposed to one of four simulated drives (drives with forest/rural scenery, drives along the outside of golf courses, drives through urban scenes and drives through mixed roadside scenery), immediately following and preceding mildly stressful events. Findings demonstrated that participants who viewed nature-dominated drives experienced quicker recovery from stress and greater immunization to subsequent stress than participants who viewed artifact-dominated drives (Parsons *et al.*, 1998).

Ulrich examined the effects of viewing nature on psychological state, particularly on mood affect, and found that participants who viewed slides of unspectacular scenes of nature had an increase in positive mood affect, while those

who viewed scenes of urban areas experienced a decline in positive mood affect (Ulrich, 1979; Ulrich, 1982; cited in Rohde and Kendle, 1994). In this and a later study, Ulrich concluded that scenes of nature, particularly those depicting water, had a beneficial influence on the psychological state of participants (Ulrich, 1982; cited in Rohde and Kendle, 1994).

In a review of the literature, Rohde and Kendle found that the psychological response to nature involves feelings of pleasure, sustained attention or interest, 'relaxed wakefulness', and diminution of negative emotions, such as anger and anxiety (Rohde and Kendle, 1994). Evidence presented here has demonstrated that just by viewing nature many aspects of human health and development can be markedly improved. Evidence also exists for the therapeutic benefits to be gained from *being in nature*.

Being in natural environments

Early research found that in the act of contemplating nature, the brain is relieved of 'excess' circulation (or activity) and nervous system activity is reduced (Yogendra, 1958). Furnass found an experience of nature can help strengthen the activities of the right hemisphere of the brain, and restore harmony to the functions of the brain as a whole (Furnass, 1979). This is a technical explanation of the process that occurs when people 'clear their head' by going for a walk in a natural setting.

Kaplan and Kaplan described 'restorative environments' as those settings that foster recovery from mental fatigue (Kaplan and Kaplan, 1981). According to theirs and other studies, restorative environments require four elements: fascination (an involuntary form of attention requiring effortless interest, or curiosity); a sense of being away (temporary escape from one's usual setting or situation); extent or scope (a sense of being part of a larger whole); and compatibility with an individual's inclinations (opportunities provided by the setting and whether they satisfy the individual's purposes) (Kaplan and Kaplan, 1989; Hartig *et al.*, 1991). Parks are ideal for restorative experiences due to their ability to satisfy the four elements described above (Kaplan and Kaplan, 1989; Kaplan and Kaplan, 1990; Kaplan, 1992a; Kaplan 1992b; Kaplan 1995). For example, when comparing a walk in a natural setting, a walk in an urban setting, and relaxing in a

comfortable chair, Hartig *et al.* found that mental fatigue was most successfully relieved by a walk in a park (Hartig *et al.*, 1991). Nature may well constitute a 'restorative environment'

Whilst outside the emphasis of this paper, the community benefits of social contact within nature in parks and gardens is worthy of examination. Community gardens for example provide opportunities for socializing with and learning from fellow gardeners and residents that may normally be unavailable. This aids community cohesion by dissolving prejudices about race, and economic or educational status (Lewis, 1990; Lewis, 1996). At an annual gardening competition in a public housing area of New York, research found an increase in community cohesion, a reduction in graffiti and violence, and an increase in positive attitudes about themselves and their neighbourhood for residents, resulting in personal and neighbourhood transformation (Lewis, 1990; Lewis, 1992; Lewis 1996). Civic volunteering in natural environments, such as through 'Friends of Parks' groups, may be another example of enhanced health and well-being made possible not only through contact with nature, but through the social connection that arises from working on a common community task in a local natural area.

Wong examined the benefits of contact with nature for migrants (Wong, 1997; cited in Rohde and Kendle, 1997). Benefits included: increased sense of identity and ownership of the country they live in; sense of integration rather than isolation; a reunion with nature (i.e. particularly important for first generation immigrants who have rural backgrounds); the reawakening of a sense of possibility; restoration and a relief from daily struggles; empowerment, skill development and the enabling of opportunity to participate in caring for the environment. Further, Rohde and Kendle found being in natural environments invokes a sense of 'oneness' with nature and the universe, and that being in nature can lead to transcendental experiences (Rohde and Kendle, 1994).

It has been stated that the major determinants of health may have little to do with the health care system (Hancock, 1999) and that public health needs to focus on the environmental and social aspects of health (Chu and Simpson, 1994). Public owned natural spaces are an ideal resource to support these and other aspects of human health and well-being.

Empirical, theoretical and anecdotal evidence demonstrates contact with nature positively impacts blood pressure, cholesterol, outlook on life and stress-reduction (Moore, 1981; Kaplan and Kaplan, 1989; Hartig *et al.*, 1991; Ulrich *et al.*, 1991a; Ulrich *et al.*, 1991b; Kaplan, 1992a; Rohde and Kendle, 1994; Lewis, 1996; Leather *et al.*, 1998; Parsons, *et al.*, 1998). These outcomes have particular relevance in areas of mental health and cardiovascular disease, categories that are set to be the two biggest contributors to disease worldwide by the year 2020 (Murray and Lopez, 1996). Whilst the extent to which contact with nature can contribute to human health and well-being is in need of further investigation, the strength of this evidence alone is sufficient to warrant inclusion of 'contact with nature' within population health strategies, and for parks to be considered a fundamental health resource in disease prevention for urban populations worldwide. Table 1 presents a summary of knowledge based on current anecdotal, theoretical and empirical evidence.

HUMAN HEALTH NATURALLY

As our understanding of the natural environment has developed, and the massive destruction human activities can have on natural systems has been observed, a more enlightened view has emerged. This view recognizes that plants and animals (including humans) do not exist as independent entities as was once thought, but instead are part of complex and interconnected ecosystems on which they are entirely dependent, and fundamentally a part of (Driver *et al.*, 1996). As Suzuki states, the ecosystem is the fundamental capital on which all life is dependent (Suzuki, 1990). It is clear that nature and natural environments relate to human health and well-being. To seek human health and sustainability without considering the importance of environmental sustainability is to invite potentially devastating consequences for the health and well-being of whole populations.

What is needed is a focus on social equity, social investment and social innovation in health and environment policy (Kickbusch, 1989b). Natural environments are an ideal setting for the integration of environment, society and health by promoting a socio-ecological approach

Table 1: A summary of evidence supporting the assertion that contact with nature promotes health and well-being

What the Research Demonstrates With Certainty				
Assertion	Evidence			Key reference/s
	A	T	E	
There are some known beneficial physiological effects that occur when humans encounter, observe or otherwise positively interact with animals, plants, landscapes or wilderness	✓	✓	✓	(Friedmann <i>et al.</i> , 1983a; Friedmann <i>et al.</i> , 1983b; Parsons, 1991; Ulrich, <i>et al.</i> , 1991b; Rohde and Kendle, 1994; Beck and Katcher, 1996; Frumkin, 2001)
Natural environments foster recovery from mental fatigue and are restorative	✓	✓	✓	(Furnass, 1979; Kaplan and Kaplan, 1989; Kaplan and Kaplan, 1990; Hartig <i>et al.</i> , 1991; Kaplan, 1995)
There are established methods of nature-based therapy (including wilderness, horticultural and animal-assisted therapy among others) that have success healing patients who previously had not responded to treatment	✓	✓	✓	(Levinson, 1969; Katcher and Beck, 1983; Beck <i>et al.</i> , 1986; Lewis, 1996; Crisp and O'Donnell, 1998; Russell <i>et al.</i> , 1999; Fawcett and Gullone, 2001; Pryor, 2003)
When given a choice people prefer natural environments (particularly those with water features, large old trees, intact vegetation or minimal human influence) to urban ones, regardless of nationality or culture		✓	✓	(Parsons, 1991; Newell, 1997; Herzog <i>et al.</i> , 2000)
The majority of places that people consider favourite or restorative are natural places, and being in these places is recuperative	✓	✓	✓	(Kaplan and Kaplan, 1989; Rohde and Kendle, 1994; Korpela and Hartig, 1996; Herzog <i>et al.</i> , 1997; Newell, 1997; Herzog <i>et al.</i> , 2000)
People have a more positive outlook on life and higher life satisfaction when in proximity to nature (particularly in urban areas)	✓	✓	✓	(Kaplan and Kaplan, 1989; Kaplan, 1992a; Lewis, 1996; Leather <i>et al.</i> , 1998; Kuo, 2001; Kuo and Sullivan, 2001)
Exposure to natural environments enhances the ability to cope with and recover from stress, cope with subsequent stress and recover from illness and injury	✓	✓	✓	(Ulrich, 1984; Parsons, 1991; Ulrich <i>et al.</i> , 1991b)
Observing nature can restore concentration and improve productivity	✓	✓	✓	(Tennessen and Cimprich, 1995; Leather <i>et al.</i> , 1998; Taylor <i>et al.</i> , 2001)
Having nature in close proximity, or just knowing it exists, is important to people regardless of whether they are regular 'users' of it	✓	✓	✓	(Kaplan and Kaplan 1989; Cordell <i>et al.</i> , 1998)

A, anecdotal; T, theoretical; E, empirical.

to human health and well-being based on human contact with nature.

Public health has a key role to play in environmental conservation, and environment administration has a key role to play in human health and well-being. On this basis, potential exists for parks and natural reserves to gain an expanded role, scope and influence in urban-based societies. A collaborative socio-ecological approach between health and environmental management sectors is required to ensure that contact with nature is integral to sustainable development strategies for local and global urban communities.

As Keating and Hertzman state, high exposure to economic and social inequality is a powerful

determinant of health and well-being in populations (Keating and Hertzman, 1999; cited in Commonwealth Department of Health and Aged Care and AIHW, 1999). With further investigation, perhaps ecological inequality, or a lack of opportunity to experience contact with nature may come to be recognized as a third powerful determinant of health and well-being in populations. In such a case, along with access to primary health care, accessibility to nature would be seen as a social justice issue. According to these criteria, the health benefits of contact with nature, in particular publicly-owned nature, which would be regarded as a national health resource, should be thoroughly investigated.

Although most people are aware of the health benefits of sport and recreation, the health and well-being benefits arising from contact with nature are little understood. Further empirical research is required to remedy gaps in current knowledge, to further knowledge in this area, to facilitate decision-making and policy formulation, and to foster interdisciplinary approaches. Findings summarized in this paper warrant a repositioning of natural spaces in the minds of both the community and government.

HEALTHY NATURE HEALTHY PEOPLE—A SEARCH FOR SUSTAINABILITY

Socio-ecological theory is essentially triple bottom line reporting in practice. This approach promotes enhancement of individual and community health, well-being, and welfare by following a path of economic development that does not impair the welfare of future generations; provides for equity between and within generations; and protects biodiversity maintaining essential ecological processes and life support systems (Brown, 1996).

Not only do natural spaces and public parks protect the essential systems of life and biodiversity, but they also provide a fundamental setting for health promotion and the creation of well-being for urban populations that to date has lacked due recognition. Whilst experience and intuition, along with opportunity and access, may guide some urban-dwelling individuals to seek out gardens, parks and public natural areas for improved health and sense of well-being, significant evidence exists for contact with nature to be considered in the promotion of health and well-being for individuals and communities, and potentially be incorporated within public health strategies for whole populations.

A socio-ecological approach to public health recognises that not only is health itself holistic and multidisciplinary, but that a holistic or multidisciplinary approach is needed to promote and manage health successfully. This requires inventive new efforts in the collaboration between environmental scientists and biomedical researchers on one hand, and between health and environmental policy makers on the other (Wilson, 2001).

As Birch stated, our objective for the future should be healthy people in a healthy

Table 2: Recommendations for a development of contact with nature in upstream health promotion for populations

Strategies	Recommendations
Further research	<p>Determine the potential health and well-being benefits arising from contact with nature for a range of population groups.</p> <p>Explore how contact with nature via parks could contribute to population health priority areas (especially in cardiovascular disease and mental health).</p> <p>Determine the importance of natural spaces for community health, and the actual health benefits people derive from parks.</p> <p>Examine the health benefits of volunteering in park settings, including volunteering for park conservation.</p> <p>Evaluate the health and well-being benefits of contact with nature as a potential preventive 'upstream' health intervention.</p> <p>Examine whether the destruction of the natural environment directly affects human health and well-being and/or is linked to the prevalence of mental ill-health in modern society.</p> <p>Examine whether human health in a range of population groups is affected by lack of opportunities to experience nature.</p>
Health promotion	<p>Partnerships: form partnerships between health and environment sectors, at national and local levels, towards a sustainable socio-ecological approach to health promotion.</p> <p>Education: promote understanding of the health and well-being benefits of viewing and being in nature through media and community projects that raise public awareness; promote contact with nature in schools, for example through curriculum development; encourage workplaces, schools and housing developments to provide access to nature.</p> <p>Training: train teachers, health workers and administrators of public natural spaces (including parks staff) to facilitate nature encounters.</p>

environment, with healthy relations to that environment (Birch, 1993). Natural spaces and public-owned parks not only preserve and protect the environment; they also encourage and enable people to relate to the natural world, hence they have a key role to play in a socio-ecological approach to health.

Health promotion agencies have already recognized the need for innovative, 'upstream' approaches to health and well-being, and are seeking potential alliances/opportunities to this end. Collaboration with the environmental management sector, and the use of public natural spaces in population health promotion is a clear potential strategy. As demonstrated through this review, the individual and community benefits arising from contact with nature include biological, mental, social, environmental and economic outcomes. Nature can be seen therefore as an under-utilized public resource in terms of human health and well-being, with the use of parks and natural areas offering a potential gold mine for population health promotion.

In this light, natural areas can be seen as one of our most vital health resources. In the context of the growing worldwide mental illness burden of disease, contact with nature may offer an affordable, accessible and equitable choice in tackling the imminent epidemic, within both preventative and restorative public health strategies.

Table 2 lists recommendations for research and strategies to incorporate nature contact in the promotion of health for whole populations.

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This review is based on the results of a joint initiative between Parks Victoria, the International Park Strategic Partners Group, and Deakin University. All recognize the significance of the potential health and well-being benefits arising from contact with nature in local park settings, the implications for public health, and the lack of collated information on this topic.

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Interacting with Nature Improves Cognition and Affect for Individuals with Depression

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Abstract

Background—This study aimed to explore whether walking in nature may be beneficial for individuals with major depressive disorder (MDD). Healthy adults demonstrate significant cognitive gains after nature walks, but it was unclear whether those same benefits would be achieved in a depressed sample as walking alone in nature might induce rumination, thereby worsening memory and mood.

Methods—Twenty individuals diagnosed with MDD participated in this study. At baseline, mood and short term memory span were assessed using the PANAS and the backwards digit span (BDS) task, respectively. Participants were then asked to think about an unresolved negative autobiographical event to prime rumination, prior to taking a 50 minute walk in either a natural or urban setting. After the walk, mood and short-term memory span were reassessed. The following week, participants returned to the lab and repeated the entire procedure, but walked in the location not visited in the first session (i.e., a counterbalanced within-subjects design).

Results—Participants exhibited significant increases in memory span after the nature walk relative to the urban walk, $p < .001$, $\eta_p^2 = .53$ (a large effect-size). Participants also showed increases in mood, but the mood effects did not correlate with the memory effects, suggesting separable mechanisms and replicating previous work.

Limitations—Sample size and participants' motivation.

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Contributions Marc G. Berman headed study design, analysis, and manuscript composition

Ethan Kross helped to design the study and write the manuscript

Katherine M. Krpan helped to write the manuscript

Mary K. Askren helped to analyze the data and write the manuscript

Aleah Burson helped to design the study and write the manuscript

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Conclusions—These findings extend earlier work demonstrating the cognitive and affective benefits of interacting with nature to individuals with MDD. Therefore, interacting with nature may be useful clinically as a supplement to existing treatments for MDD.

Keywords

Major Depressive Disorder; memory; nature; intervention; mood; attention restoration

Major Depressive Disorder (MDD) is characterized by cognitive impairments such as compromised working memory (Lyubomirsky et al., 2003), and by affective impairments such as persistent negative mood (Nolen-Hoeksema et al., 2008). Prior research indicates that interacting with nature enhances cognitive functioning (Berman et al., 2008; Cimprich & Ronis, 2003; Kaplan & Berman, 2010; Taylor & Kuo, 2009) and specifically increases working-memory span and improves mood (Berman, et al., 2008).

Kaplan and colleagues (Kaplan, 1995; Kaplan & Berman, 2010) have proposed Attention Restoration Theory (ART) to explain how interacting with nature improves cognitive abilities. ART draws on research demonstrating that attention can be separated into two components: involuntary attention, in which attention is captured by salient stimuli, and voluntary or directed attention, in which attention is directed by cognitive-control processes. This distinction, first proposed by William James (James, 1892), has been validated by behavioral and neuroscience research (Buschman & Miller, 2007; Corbetta & Shulman, 2002; Fan et al., 2002). ART identifies directed attention as the cognitive mechanism that is restored by interacting with nature, and others have implicated a critical role for directed attention in many contexts (Diamond et al., 2007; Posner & Rothbart, 2007), including short-term memory performance (Jonides et al., 2008).

According to ART, interacting with environments that contain inherently fascinating stimuli (e.g., sunsets) modestly invoke involuntary attention, allowing directed-attention mechanisms a chance to replenish (Berman, et al., 2008; Kaplan, 1995; Kaplan & Berman, 2010). That is, the requirement for directed attention in such environments is minimized, and attention is captured in a bottom-up fashion by features of the environment itself. Thus, following an interaction with natural environments, individuals perform better on tasks that depend on directed-attention abilities. Unlike natural environments, urban environments contain bottom-up stimulation (e.g., car horns) that capture attention dramatically, requiring directed attention to overcome that stimulation (e.g., avoiding traffic, ignoring advertising, etc.), making urban environments less restorative.

Although interacting with natural environments has been found to be beneficial for healthy individuals, it's not clear whether these benefits would generalize to individuals with MDD. On one hand, to the extent that interacting with natural environments (e.g., parks) replenish cognitive resources (Berman, et al., 2008; Kaplan & Berman, 2010), individuals with MDD may show the same or even greater cognitive gains than those demonstrated by healthy individuals. It has been hypothesized that individuals who are more attentionally fatigued may obtain greater benefits from interacting with nature (Kaplan & Berman, 2010), and fatigued participants have been found to gain greater benefits from other types of interventions (Masicampo & Baumeister, 2008). Given that individuals with depression are likely more mentally/attentionally fatigued than are nondepressed individuals due to their depressive symptoms (e.g. ruminations, psychomotor problems, etc.), it is possible that individuals with depression may show increased cognitive and affective gains from a nature interaction.

On the other hand, individuals with depression are characterized by high levels of rumination (Nolen-Hoeksema, et al., 2008). Rumination maintains and exacerbates negative mood, has been linked to impairments in short-term/working memory (Berman et al., 2011; Joormann & Gotlib, 2008; Landro et al., 2001), and may be particularly pronounced during time spent alone. Thus, asking a person with MDD to go for a solitary walk in a park may actually worsen, rather than improve, memory and mood by potentially taxing top-down/directed attention resources.

There are a variety of effective interventions for MDD, including psychotherapy (Robinson et al., 1990), medication (DeRubeis et al., 2005), and alternative treatments such as mindfulness meditation (Grossman et al., 2004). However, in a recent review, Kazdin and Blase (2011) called for more research to explore simple, portable and cost-effective interventions for mood and anxiety disorders. This study is a first attempt to discover if interacting with nature may be one such intervention possibility.

The current research

This study was designed to examine whether interacting with nature has beneficial effects on memory performance and affect in individuals diagnosed with MDD. Specifically, we examined whether interacting with nature could improve the typically impaired short-term memory/working memory performance in MDD (Berman, et al., 2011; Joormann et al., 2010; Landro, et al., 2001). We also examined whether mood would change differentially after a walk in nature vs. a walk in an urban environment, as well as the relation between mood and memory effects. Improvements in mood would be of particular interest given that MDD is characterized by low levels of positive affect (Watson & Naragon-Gainey, 2010).

A conservative task was employed to examine whether interacting with nature was beneficial for individuals with MDD by asking participants to reflect on an intense negative experience prior to going on their walks. In this way, we set the stage for an exposure to nature to maximize its impact on individuals with depression who were primed with negative thoughts and feelings.

Methods

Participants

Twenty individuals diagnosed with MDD (12 female, 8 male, mean age = 26) participated in this study. A diagnosis of MDD was made by clinicians who administered the Structured Clinical Interview (SCID) for DSM-IV (First & Gibbon, 1996). Participants were recruited from the University of Michigan and the greater Ann Arbor area through ads on Craigslist and Facebook, as well as fliers that were distributed around the University of Michigan campus and stores/shops in the greater Ann Arbor area. These ads asked participants if they were feeling sad, down or depressed and if they were interested in participating in research to e-mail our lab.

Participants were included if they met criteria for current MDD as determined by the SCID. All participants were run in the experimental sessions within two weeks of their SCID. The Beck Depression Inventory (BDI-II) (Beck et al., 1996) was also administered ($M = 30.1$, $SD = 10.8$). BDI scores of 20-28 indicate moderate depression, while scores of 29-65 indicate severe depression; thus our sample is in the moderate to severe range. Twelve participants had comorbid diagnoses (e.g., bulimia) and six were known to be on medication for depression. Participants gave informed consent as administered by the Institutional Review Board of the University of Michigan and were compensated \$20/hour. Each session

lasted 3 hours. One participant was removed for completing only the first session, leaving 19 participants with complete data.

Procedure

We first assessed participants' mood with the Positive and Negative Affect Schedule (Watson et al., 1988), which yields separate scores for positive and negative affect. Then participants performed the backward digit span (BDS) task, in which digits were presented auditorily at a pace of 1 digit per second and were repeated aloud by the participant. Next, we primed participants to ruminate by instructing them to analyze their feelings surrounding an intense, unresolved negative autobiographical experience; a procedure used by others (Kross & Ayduk, 2008; Rusting & Nolen-Hoeksema, 1998). This was done to initiate rumination in participants to explore if nature walks remediate cognitive and affective difficulties in individuals with depression who were distressed. Finally, we reassessed participants' mood.

Participants were then randomly assigned to take a 50- to 55-min walk in the Ann Arbor Arboretum (a park near campus) or in downtown Ann Arbor. The walks were predefined for participants and equated in total length (2.8 miles). Each participant was given a map displaying the path of each walk and wore a GPS watch to ensure compliance. The arboretum walk was tree-lined and secluded from traffic and people. The downtown walk was largely on traffic-heavy streets lined with university and office buildings. The walks were identical to those used in prior research, which has documented an effect of interacting with nature versus urban environments on cognitive functioning (Berman et al., 2008).

Upon their return, participants again completed the PANAS and BDS task. Participants' walk GPS data were then analyzed and superimposed on a satellite image to ensure that they walked in the specified locations. Figure 1 shows a satellite image of the two walks from participant GPS data.

At the conclusion of the session participants were asked to respond on a scale of 0-2 (0 = no; 1 = sort-of; 2 = yes) if they thought about the memory that they generated. This scale indexed the extent to which participants perseverated during their walk about the negative autobiographical memory. While not a direct measure of rumination, responses to this question provided some indication of what participants were thinking about on their walks. One week later, participants returned to the lab and repeated the entire procedure, walking in the location that was not visited in the first session. The order of walking in nature versus an urban setting was counterbalanced across participants.

Analysis Parameters

A 2 (Time: pre-walk vs. post-walk) X 2 (Location: nature vs. urban) analysis of variance (ANOVA) was conducted separately on scores from the BDS task and the PANAS. Post-hoc t-tests were conducted to follow up significant interactions.

Results

Working Memory Capacity

The two-way ANOVA on BDS scores yielded no main effects of location or time ($F_s < 3.39$, $p_s > .08$), but did yield a significant time X location interaction, $F(1, 18) = 20.5$, $p < .001$, $\eta_p^2 = .53$, indicating that participants' memory capacity increased more after the nature walk than after the urban walk. Indeed, the size of this effect was nearly 5 times larger than that found in our previous work ($\eta_p^2 = .14$) with a non-clinical sample (Berman, et al., 2008). This interaction was driven by reliable increases in BDS task performance after the nature

walk, $t(18) = 3.67$, $p < .005$, and a trend toward decreases in BDS task performance after the urban walk, $t(18) = -1.91$, $p = .07$ (See Table 1). Moreover, although there were no differences in pre-nature and pre-urban BDS task performance, $t(18) = 1.804$, n.s. (i.e., no baseline differences in BDS performance), one participant did have a pre-nature BDS score that was nearly two standard deviations below the sample mean. Even after removing that participant, the same effects of greater increases in BDS task performance after the nature walk than after the urban walk were found, $F(1, 17) = 17.88$, $p < .001$, $\eta_p^2 = .51$ (see Table 1).

Mood

As a manipulation check the mood induction was successful: positive affect (PA) was significantly reduced, and negative affect (NA) significantly increased after the participants reflected on their negative memories prior to their walks ($ps < .05$; see Table 1).

Positive affect—A 2×2 ANOVA yielded a significant effect of location (nature vs. urban), $F(1, 16^1) = 16.85$, $p < .001$, but no significant effect of time (pre-walk vs. post-walk), $F(1, 16) = 2.04$, n.s. Of most interest was the interaction – PA improved to a greater extent after the nature walk than the urban walk, as indicated by a significant interaction between location and time, $F(1, 16) = 6.62$, $p < .05$, $\eta_p^2 = .29$. Follow-up tests showed that the main effect of location was driven by greater PA after the nature walk, $t(16) = 2.30$, $p < .05$, as no baseline differences in PA were found pre-nature vs. pre-urban, $t(18) = .393$, n.s. PA, however, did improve significantly after each walk: nature, $t(16) = 4.31$, $p < .001$; urban, $t(18) = 3.67$, $p < .005$ (see Table 1). Changes in PA did not correlate with changes in BDS performance after either walk ($ps > .19$), suggesting that the observed improvements in memory were not driven by mood, and that separate mechanisms may underlie the cognitive and affective effects of interacting with nature.

Negative affect—Results from the 2×2 ANOVA yielded no significant effect of location, $F(1, 16) = 2.75$, n.s., but did yield a significant main effect of time, $F(1, 16) = 16.43$, $p < .001$. Contrary to the results for PA, NA did not decrease more for the nature walk than for the urban walk, $F(1, 15) = .13$, n.s., but decreases in NA were observed after both the nature walk $t(16) = 4.34$, $p < .001$ and the urban walk, $t(18) = 3.72$, $p < .005$. Changes in NA also did not correlate with changes in BDS performance after either walk ($ps > .53$).

Covariates

Walk order (nature first or urban first) was not a significant predictor for any mood or memory analysis when it was included as a between-subjects factor in the ANOVAs. Comorbid diagnosis was not a significant predictor for any memory analysis or any analysis of negative affect.

Thoughts during the walks

There was no difference in participants' reports of thinking about their generated negative memory on the nature ($M = 1.16$; $SD = .60$) or the urban ($M = 1.21$; $SD = .42$) walk, $t(18) = .37$, $p > .72$, indicating that most participants thought about their negative autobiographical memory to some (and the same) degree on both walks. Finally, there were no significant correlations between thinking about the negative memory and changes in BDS task performance or mood scores for either walk ($ps > .13$).

¹2 participants had missing mood data post-nature walk.

Summary

Working-memory capacity and positive affect improved to a greater extent after the nature walk relative to the urban walk. Interestingly, these effects were not correlated, suggesting separable mechanisms. Lastly, participants' thought about their negative autobiographical memories to an equal extent on both walks, therefore avoiding thinking about their negative memory was not a driving mechanism for the nature effects.

Discussion

This study examined whether interacting with nature has beneficial effects on cognitive and affective functioning in MDD. We found that individuals diagnosed with MDD exhibited cognitive and affective improvements after walking in a nature setting. These effects were observed even though participants were instructed prior to their walks to think about a painful negative experience, which has been shown to prime rumination (Kross & Ayduk, 2008), which in turn has been shown to disrupt working memory (Berman, et al., 2011).

These findings suggest that interacting with nature, even in the context of thinking about a painful memory, is beneficial for people suffering from MDD. Moreover, the effect sizes we observed for individuals with MDD in this study were nearly five times as large as the effect sizes observed in another study with healthy individuals (Berman, et al., 2008), suggesting that individuals with depression benefit even more from such interactions. Prior to this study it was not clear whether interacting with nature would harm or help those with MDD, especially given the negative mood induction prior to the walk. The fact that the nature walk was beneficial even while participants were thinking of a negative autobiographical memory suggests that the walk could be beneficial even in the midst of heightened ruminative processes. Importantly, the memory improvements we observed were not driven by changes in affect, replicating previous work (Berman, et al., 2008). Both positive and negative affect benefited after both walks, but only positive affect changed differentially for the nature walk compared to the urban walk. Increasing positive affect is important given that MDD is characterized by low levels of positive affect (Watson & Naragon-Gainey, 2010).

Some theories claim that increases in positive affect should lead to improvements in working-memory performance either by increasing dopamine levels (Ashby et al., 1999) or by broadening thought-action repertoires (Fredrickson, 2001). However, other researchers have found poorer cognitive-control in positive mood states (Oaksford et al., 1996), while still other investigators have found selective effects depending on task demands and stimuli (Gray, 2001; Phillips et al., 2002). For example, Phillips et al. (2002) suggest that induced positive moods improve performance on tasks that demand creativity and may impair performance on tasks that require more focused attention. It is possible that, had we administered a task that engaged more creative processes such as a verbal fluency task, we would have found a relation with our mood effects. While our data cannot rule out the possibility that affective and cognitive improvements are not related in all cases, the fact that memory and mood were unrelated in our study suggests that the cognitive benefits gained from interacting with nature are due to processes beyond simply increasing positive affect.

Having demonstrated the salutary effects of nature, it is important to consider the potential mechanisms at play, which could help to refine the intervention more effectively. Although the present study does not allow us to examine this directly, according to ART, interacting with nature activates involuntary attention modestly, allowing replenishment of directed-attentional mechanisms (Berman, et al., 2008; Kaplan, 1995; Kaplan & Berman, 2010). Berman et al. (2008) showed this effect most directly in demonstrating that only cognitive tasks that had an executive component improved after a nature interaction. There are, of course, other potential mechanisms that could underlie the beneficial effects of nature. For

example, the effects could be driven by stress reduction (Ulrich et al., 1991) or by other physiological changes. Future research is needed to examine the role that these processes play in mediating the observed effects.

Interestingly, there were no differences in what participants reported thinking about on the two walks. Therefore, it was not the case that participants thought about their negative experiences more on the urban walk than on the nature walk. There are at least two interpretations of this finding. First, the effects of nature on memory and positive affect may be independent of what participants think about during the walk. Alternatively, recent studies have demonstrated that people can reflect upon negative experiences either adaptively or maladaptively (Aldao & Nolen-Hoeksema, 2010; Kross & Ayduk, 2011). Thus, although participants reported thinking about their negative experience to the same degree on both walks, it is possible that they thought about it more adaptively when walking in nature versus an urban environment, which may in turn have given rise to the mood and memory effects we observed.

Limitations

In closing we should note that a limitation of our study is our relatively small sample size (19 participants). However, there are a few aspects of our design that mitigate concerns regarding sample size. First, our effect sizes were large. Second, our design was a within-subjects design, which helps to alleviate concerns regarding power and is a replication of previous work that used healthy participants (Berman, et al., 2008). Third, the sample size of this study matches that of other similar types of studies (Amir et al., 2009; Bismuth-Evenzal et al., 2012; Maalouf et al., 2011). Lastly, given our current effect size, we would need a sample of only 10 participants (half our current sample size) to have sufficient power to detect a significant interaction (i.e., power above .8), and our observed power to detect differences given our current sample size is .98, well above the .8 standard.

Despite the strengths of our design and the large effect sizes, it is difficult to rule out some alternative explanations. For example, we found no correlation between the mood effects and the cognitive effects. Although it is possible that this lack of a significant correlation is due to the small sample size in the present study, it is important to note that Berman et al. (2008) also reported no correlation between mood and cognitive effects with a sample size twice that of the current study. To rule out affective mechanisms, experiments that manipulate both mood and environmental setting are required. Future experiments should also include not only subjective measures of mood, but also physiological measures that may show relations to the cognitive effects even in the absence of relations to subjective mood measures. Finally, we did not have direct measures of adaptive versus maladaptive self-reflection during the walks. Thus, as noted earlier, we do not know whether nature influences the type of self-reflective process in which people engage.

Lastly, while all of our participants met criteria for depression as determined by the SCID, our participants were motivated enough to participate in a research study that involved mild physical activity, and not all participants with depression may have that same motivation. Therefore, an important challenge concerns how to motivate participants with depression to take nature walks given the motivational deficits that they suffer from. Although it is possible that the positive emotional and cognitive rewards may propel them to continue walking in nature in the future, additional work is needed both to motivate a broader range of participants to walk in nature and to develop methods to encourage participants to continue to walk in nature. We did not experience difficulties convincing participants in our study to walk in either location. These limitations notwithstanding, this study is an important first step in exploring the potential therapeutic benefit of interacting with nature for individuals with MDD.

Conclusion

Researchers have recently called for the development and exploration of brief, simple and portable interventions to treat mood disorders that can be widely disseminated at low-costs (Kazdin & Blase, 2011). The current research fits these aims well. Interacting with nature is, for the most part, widely accessible, simple and affordable. Yet we know virtually nothing about how this process affects mood and cognition in MDD. Although the current findings begin to address this issue, they also highlight important questions for future research. For example, how long-lasting are the effects of interacting with nature? Do individual differences (e.g., urban vs. rural dwellers) moderate their effects? How can we motivate participants with MDD to take these walks more often? Can interacting with nature provide an important supplement to existing empirically validated forms of treatment for MDD? Addressing these questions is important for refining knowledge concerning how interacting with nature influences depression.

These results are timely, as studies have indicated that urban living may adversely affect psychological functioning (Lederbogen et al., 2011) and increase psychopathology (Krabbendam & van Os, 2005; Pedersen & Mortensen, 2001; Peen et al., 2010; van Os et al., 2010). These results suggest that incorporating nearby nature into urban environments may counteract some of these adverse effects. Future research may examine whether nature interactions can supplement and enhance existing treatments for MDD and other psychopathologies to improve well-being.

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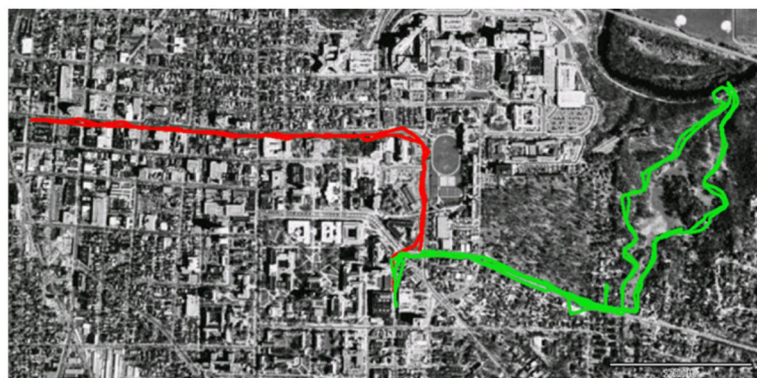


Figure 1. Satellite images of the nature and urban walks obtained from participants' GPS data. The nature walk is in green, and the urban walk in red. The nature walk shows data from two participants.

Table 1

Means and standard deviations in parentheses for BDS and mood measures. The second set of BDS measures are when one participant was removed for having a low BDS score before the nature walk that was nearly two standard deviations below the sample mean.

Measure	Walk Location	Pre-Mood Induction	Post-Mood Induction	Post-Walk
BDS	Nature	7.42 (3.00)	n/a	8.63 (2.87)
	Urban	8.26 (2.51)	n/a	7.84 (2.24)
BDS (1 participant removed)	Nature	7.72 (2.78)	n/a	8.83 (2.81)
	Urban	8.33 (2.57)	n/a	7.94 (2.26)
Positive Affect	Nature	2.11 (0.82)	1.48 (0.55)	2.62 (1.03)
	Urban	1.92 (0.62)	1.52 (0.44)	2.26 (0.89)
Negative Affect	Nature	2.04 (0.84)	2.41 (0.96)	1.53 (0.86)
	Urban	2.03 (0.88)	2.58 (1.06)	1.64 (0.92)

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Psychological benefits of greenspace increase with biodiversity

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The world's human population is becoming concentrated into cities, giving rise to concerns that it is becoming increasingly isolated from nature. Urban public greenspaces form the arena of many people's daily contact with nature and such contact has measurable physical and psychological benefits. Here we show that these psychological benefits increase with the species richness of urban greenspaces. Moreover, we demonstrate that greenspace users can more or less accurately perceive species richness depending on the taxonomic group in question. These results indicate that successful management of urban greenspaces should emphasize biological complexity to enhance human well-being in addition to biodiversity conservation.

Keywords: urban greenspace; biodiversity; psychological well-being; Attention Restoration Theory

1. INTRODUCTION

Approximately half of the world's people live in urban areas (United Nations 2004). Rapid urbanization has increasingly isolated people from experiences of nature (Wilson 1984; Miller 2005). Indeed, for much of the population, remnant or managed public urban greenspaces provide one of the few avenues for direct contact with the natural environment. This is of profound concern, because such interaction leads to a variety of measurable benefits, at both individual and societal levels. In a now classic paper, Ulrich (1984) reported that post-surgical patients whose hospital windows overlooked trees, rather than a brick wall, recovered more rapidly and required less pain relief. Subsequent research revealed that a range of human well-being measures responds positively to greenspace availability, including general health (de Vries *et al.* 2003), degree of social interaction (Sullivan *et al.* 2004) and mental fatigue (Kuo 2001), and opportunities for reflection (Herzog *et al.* 1997).

While the effects of 'green' environments are increasingly well understood, little is known about the importance of variation in the quality of greenspace

for benefits to human well-being. Here, we show that the psychological benefits gained by greenspace users increase with levels of species richness, and moreover those visitors to urban greenspaces can perceive differences in the species richness of some well-known higher taxa.

2. MATERIAL AND METHODS

(a) Study areas

Research was conducted in Sheffield, a city of 513 000 people (Office for National Statistics 2001). All greenspaces more than one hectare with public access were selected along a wedge-shaped transect from the city centre to the western suburbs. The area (13 km²) incorporated a range of residential urban forms from high-density city centre developments to low-density suburbs, and yielded 15 greenspaces.

(b) Species richness

During summer 2005, plant communities were sampled with quadrats in each greenspace. Using Ordnance Survey (2006) MASTERMAP data and field surveys, land parcels were classified into seven habitat types (amenity planting, mown grassland, unmown grassland, scrub, woodland, water and impervious surface) and 20 quadrats of 1 m² were randomly located within the area occupied by each type. All species of herbaceous plants were identified within each quadrat. Woody species (mainly large shrubs and trees) were sampled with 10 × 10 m quadrats placed using a similar protocol. Where the shape of a habitat parcel did not allow placement of a quadrat, the quadrat's shape was modified to fit, keeping area constant. Quadrats were placed until 20 were located or all habitat was sampled. Species richness estimates (species density of Gotelli & Colwell 2001) were calculated using the second-order jackknife estimator computed over 1000 runs in the ESTIMATES software (Colwell 2005). Total plant richness is the log₁₀-transformed sum of estimates for woody and herbaceous plants.

Butterflies were surveyed using standard UK Butterfly Monitoring Scheme methodology (Pollard *et al.* 1986). A transect was established across each greenspace, covering each habitat type (excluding water) approximately in proportion to its extent. Transects varied from 925 to 2015 m in length depending on greenspace size. All butterflies less than 2.5 m on either side of the route and less than 5 m in front of the observer were recorded. Transects were walked five times in suitable weather, every two weeks between June and August 2005. Species richness was the total number of species recorded across all surveys.

While conducting butterfly surveys, bird species heard or seen within the greenspace boundary were noted (excluding overflying birds not actively feeding or hunting). All habitats were surveyed over approximately 2 h in each greenspace. The intention was to list the species most likely to be encountered during a typical summer visit. Resultant species accumulation curves for the bird and butterfly data showed clear signs of attaining an asymptote, indicating detection of a large proportion of species.

(c) Psychological well-being and perceived species richness

Semi-structured interviews were conducted *in situ* with 312 greenspace users (July–October 2005). Closed-ended questions explored psychological well-being and respondents' perceptions of greenspace species richness. Well-being measures focused on greenspace as a source of cognitive restoration, positive emotional bonds and sense of identity. Responses were made on a five-point Likert scale from strongly disagree to strongly agree based on the stem question 'Please indicate how much you agree with each statement about this park' (electronic supplementary material). Five statements measured likelihood of recovery from mental fatigue and the opportunity for reflection, derived from attention restoration theory (Kaplan & Kaplan 1989). Eighteen statements explored emotional attachment to, and personal identity gained from, the greenspace drawn from theory and research on place (e.g. Manzo 2003; Patterson & Williams 2005; electronic supplementary material).

Factor analysis (electronic supplementary material) identified groups of statements measuring a single component of psychological well-being. Components were interpretable as *reflection* (ability to think and gain perspective); *distinct identity* (degree of feeling unique or different through association with a particular place); *continuity with past* (extent to which sense of identity is linked to greenspace through continuity across time); and *attachment* (degree of emotional ties with the greenspace). All four components had clear roots in the theoretical frameworks mentioned above. Continuous measures were derived by calculating each participant's average rating of the set of statements forming each component.

Electronic supplementary material is available at <http://dx.doi.org/10.1098/rsbl.2007.0149> or via <http://www.journals.royalsoc.ac.uk>.

Table 1. Greenspace characteristics, psychological well-being and perceptions of species richness in urban greenspaces. See text for details of measures. Perceived species richness is the mean of the scale values of the richness categories (1–4; see footnotes). For further details and location of sites A–O, see electronic supplementary material.

site	area (Ha)	woody plant richness (s.d.)	herbaceous plant richness (s.d.)	butterfly species richness	bird species richness	reflection (s.d.) ^a	distinct identity (s.d.) ^a	continuity with past (s.d.) ^a	attachment (s.d.) ^a	perceived plant richness ^b	perceived butterfly richness ^c	perceived bird richness ^d
A	23.76	64.7 (6.4)	96.6 (8.8)	6	12	4 (0.61)	3.67 (0.77)	3.41 (1.05)	4.40 (0.44)	2.61	1.89	2.82
B	16.02	111.4 (11.8)	143.4 (9.69)	14	18	3.97 (0.79)	3.94 (0.66)	3.66 (0.73)	4.50 (0.61)	2.17	1.61	1.85
C	6.94	328.9 (20.6)	274.2 (19.5)	8	8	4.14 (0.66)	4.30 (0.42)	3.38 (0.83)	4.71 (0.36)	3.55	1.95	2.12
D	2.27	41.6 (6.1)	67.3 (6.8)	10	17	3.29 (1.35)	3.13 (1.13)	3.23 (0.74)	4.46 (0.78)	2	1.8	2.33
E	5.66	102.6 (9.2)	93.7 (8.4)	6	7	3.93 (0.57)	3.27 (1.01)	3.27 (0.88)	4.26 (0.66)	2.37	1.65	1.95
F	1.22	29 (10)	75.1 (8.8)	5	4	3.08 (0.59)	2.85 (0.81)	2.50 (0.96)	3.85 (0.67)	1.36	1.09	1.2
G	1.4	47.8 (5.9)	39.8 (5.1)	5	8	3.72 (0.73)	3.44 (0.70)	2.94 (0.94)	4.45 (0.62)	2	1.60	2.05
H	15.05	75.7 (8.9)	159 (17.4)	7	22	3.83 (0.73)	4.03 (0.57)	3.40 (0.68)	4.61 (0.47)	2.69	1.82	2.2
I	3.12	78.6 (10.7)	95.6 (7.6)	9	7	3.7 (1.11)	2.99 (0.85)	3.01 (1.29)	4.10 (0.87)	2	1.53	1.84
J	3.81	19 (4.2)	82.6 (9)	5	4	3.46 (0.67)	3.33 (0.7)	3.24 (0.72)	4.24 (0.54)	1.8	1.18	1.67
K	7.55	37.9 (7.2)	51 (6.8)	10	11	4.06 (0.59)	4.09 (0.57)	3.53 (0.96)	4.62 (0.41)	1.89	1.4	1.9
L	12.9	70.8 (7.6)	80.9 (9.5)	9	11	3.79 (1.01)	3.37 (0.7)	3.02 (0.87)	4.25 (0.97)	1.67	1.63	1.83
M	4.01	68.5 (6.7)	74.7 (8)	12	13	3.67 (0.86)	3.10 (0.71)	3.03 (1.02)	4.29 (0.56)	1.85	1.5	1.67
N	5.57	74.9 (8.7)	196.4 (13.9)	11	16	4 (0.85)	3.69 (0.52)	3.18 (0.84)	4.43 (0.60)	2.9	1.95	2.42
O	4.90	127.1 (10.6)	98.5 (9.2)	7	7	3.69 (0.69)	3.36 (0.53)	2.59 (0.77)	4.22 (0.67)	2.37	1.62	2

^a 1–5 scale: 1 = strongly disagree to 5 = strongly agree.

^b 1–4 scale: 1 = less than 10 types, 2 = 10–100 types, 3 = 100–300 types, 4 = more than 300 types.

^c 1–4 scale: 1 = less than 4 types, 2 = 4–10 types, 3 = 10–20 types, 4 = more than 20 different types.

^d 1–4 scale: 1 = less than 5 types, 2 = 5–14 types, 3 = 15–30 types, 4 = more than 30 different types.

Table 2. Linear regressions exploring relationships between biodiversity value (habitat heterogeneity, tree cover and species richness), area and psychological well-being. Each pairwise combination of variables was tested separately and the resulting model, where significant, is shown. Then, area was entered into each significant model as a second term and backward stepwise selection was used to eliminate any term satisfying the removal criterion ($p > 0.05$) with the smaller partial R^2 at each stage. In two cases, shown in bold, the biodiversity measure was eliminated from the multivariate model, indicating that the effect of area was stronger than that of the biodiversity measure. In all other cases, the area term was excluded. b = model coefficient. In all cases, model significance $0.01 < p < 0.05$.

	<i>reflection</i>	<i>distinct identity</i>	<i>continuity with past</i>	<i>attachment</i>
no. of habitats	$b=0.131$ $F=16.03$ $R^2=0.552$	$b=0.139$ $F=5.267$ $R^2=0.288$	$b=0.099$ $F=4.697$ $R^2=0.265$	
tree cover				
plant richness	$b=0.747$ $F=6.336$ $R^2=0.328$	$b=1.012$ $F=5.034$ $R^2=0.279$		
butterfly richness				
bird richness			$b=0.033$ $F=5.538$ $R^2=0.299$	$b=0.024$ $F=6.278$ $R^2=0.341$
greenspace area	$b=0.024$ $F=5.163$ $R^2=0.284$	$b=0.035$ $F=4.842$ $R^2=0.271$	$b=0.028$ $F=6.096$ $R^2=0.319$	

To assess perceptions of species richness, we asked ‘About how many different types of plants/butterflies/birds would you say are in this park?’ Continuous measures were calculated based on a four-point scale appropriate to each taxon (electronic supplementary material).

3. RESULTS

Total plant richness varied by an order of magnitude among the 15 greenspaces, while butterfly and bird richness varied three- and fivefold, respectively (table 1). Given the theoretical basis for positive species–area relationships, the effect of area as a predictor of the well-being measures was considered in all analyses. While we recognize that care is needed when interpreting results of multiple comparisons, we did not apply a correction, as our contrasts were planned and we are studying a complex response (Moran 2003). Park area was positively correlated with the number of habitat types ($r=0.65$, $n=15$, $p=0.009$), but unrelated to plant richness ($r=0.29$, $n=15$, $p=0.296$). The number of habitat types was positively correlated with plant richness ($r=0.7$, $n=15$, $p=0.003$).

Psychological well-being measures also varied across greenspaces (table 1). *reflection*, *distinct identity* and *continuity with past* increased with greenspace area (table 2). Plant richness was positively associated with *reflection* and *distinct identity* (figure 1*a,b*), both effects stronger than those of area (table 2). Butterfly richness was not associated with any well-being measure (table 2). Bird richness was positively related to *continuity with past* and *attachment*, although the former effect was weaker than that of area (table 2). The number of habitat types was positively associated with *reflection*, *distinct identity* and *continuity with past* (figure 1*c*; table 2), although tree cover was unrelated to any well-being measure (table 2).

Perceived plant richness increased strongly with sampled plant richness ($r=0.84$, $n=15$, $p<0.001$; figure 2*a*). No apparent relationship existed between perceived and measured butterfly richness ($r=0.25$,

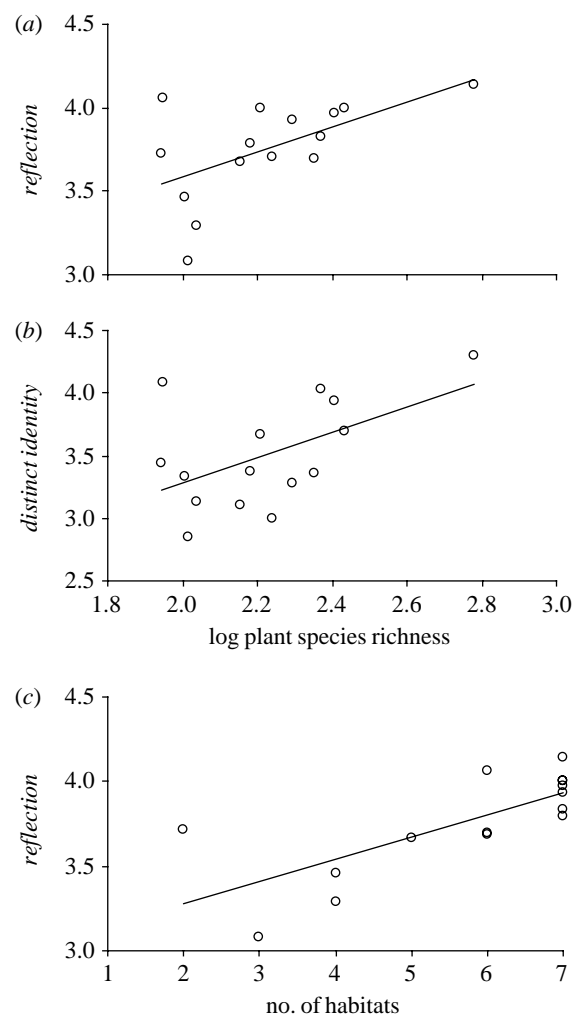


Figure 1. Relationship between log plant species richness and (a) *reflection*, (b) *distinct identity* and (c) the relationship between number of habitat types present in a greenspace and *reflection*. See text and table 1 for explanation of units.

$p=0.366$; figure 2*b*), although for birds there was a marginally non-significant positive relationship

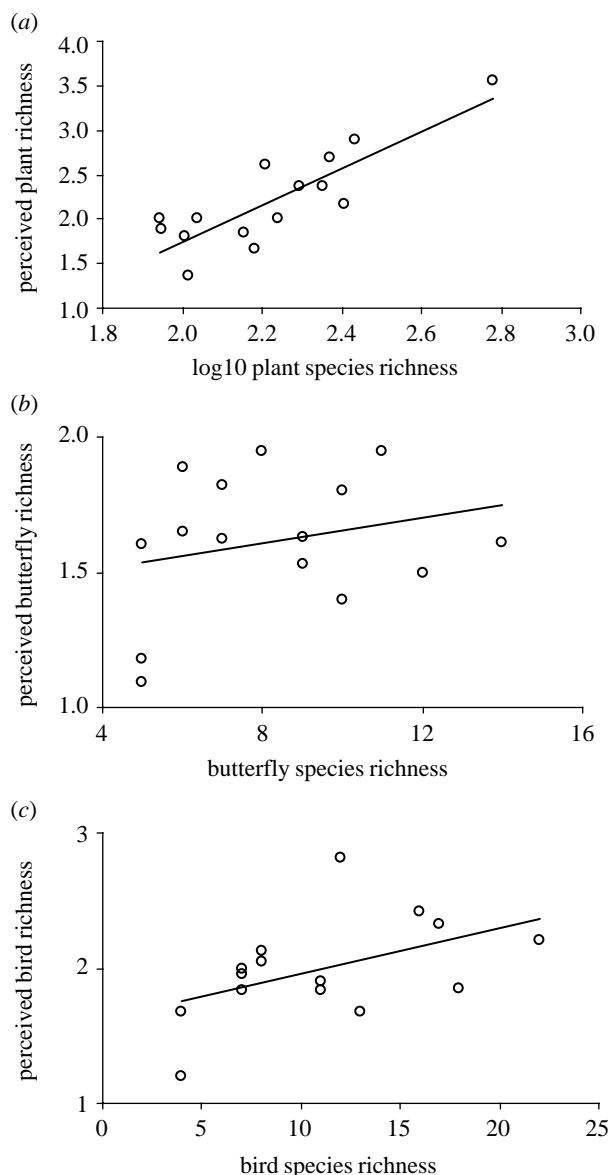


Figure 2. Relationship between perceived and sampled species richness of (a) plants, (b) butterflies and (c) birds. The relationship in the plant data remains highly significant on removal of right-hand data point. See text and table 1 for explanation of units.

($r=0.49$, $p=0.066$; figure 2c). Perceived plant richness was positively correlated with the number of habitats ($r=0.58$, $n=15$, $p=0.023$).

4. DISCUSSION

Our data demonstrate measurable positive associations between the species richness of urban greenspaces in Sheffield and the well-being of greenspace visitors. The degree of psychological benefit was positively related to species richness of plants and to a lesser extent of birds, both taxa where perceived richness corresponded with sampled richness. While benefits did increase with greenspace area, the relationships with plant and bird richness were generally stronger. Our species richness measures encompass effects of taxon density and heterogeneity, and we do not distinguish the two effects here. The number of different habitats was correlated with reflection and personal identity, plant variety with

the ability to reflect and bird variety with participants' emotional attachment.

Our results indicate that the respondents, surrounded by urban built form, are not completely disconnected from an experience of biodiversity, but that their ability to perceive ambient species richness varies across taxonomic groups. People assessed most accurately the visible static components of biodiversity namely, plant species richness. Perceptions of bird and butterfly richness, arguably more cryptic components of urban ecosystems in terms of behaviour and ease of species differentiation, respectively, were less accurate.

Although these associations emerge quite clearly, untangling causality is not easy. First, it is unlikely that people were randomly distributed among parks, perhaps preferring those that enhance their psychological well-being. Selection by individuals of environments that enhance personal well-being makes interpretation of the causal structure of these relationships difficult, but is an important effect in its own right. Increased well-being may result from a variety of different kinds of greenspace, allowing individuals to access greenspaces from which they benefit most. Second, the increase in psychological well-being with species richness and the accurate assessment of richness levels presumably operate through some proxy mechanism. Positive relationships between the number of habitats in the greenspace and (i) psychological benefits gained by users and (ii) perceived levels of plant diversity hint that gross structural habitat heterogeneity might cue the perceptions and benefits of biodiversity. If this is the case, management emphasizing a mosaic of habitat patches (Thwaites *et al.* 2005) may enhance biodiversity levels, ecosystem service provision and the well-being of the human urban population.

Our results indicate that simply providing greenspace overlooks the fact that greenspaces can vary dramatically in their contribution to human health and biodiversity provision. Consideration of the quality of that space can ensure that it serves the multiple purposes of enhancing biodiversity, providing ecosystem services (Arnold & Gibbons 1996), creating opportunities for contact with nature (Miller 2005) and enhancing psychological well-being. Given the cultural differences in perceptions of wildlife (Jim & Chen 2006), an interesting extension of our study could test the generality of our results in other cultural settings.

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