

出國報告（出國類別：其他）

派員參加第五屆國際植物園會議

服務機關：行政院農業委員會林業試驗所

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摘要

聯合國世界自然保育聯盟 (IUCN) 轄下的國際植物園保育聯盟 (BGCI) 2013 年在紐西蘭舉辦第五屆會員國大會，主題是「豐收慶典-植物園的影響與挹注」，BGCI 在超過 100 個會員國，600 個地區組織會員的參與下，訂下本屆會議主題，除了彰顯植物園在保育、研究、教育、展示的重大成長外，全世界目前有 25% 的植物被植物園所保護，也成為聯盟的重大斬獲。BGCI 在制定下一個五年計畫 (2013-2018)，擬定植物保育策略外，於紐西蘭但尼丁市舉行五天的國際研討會，除了凝聚共識強化交流並協助會員國解決植物保育的問題。台灣的植物園以台灣名義入會，隸屬於 BGCI 轄下的植物園組織，為確保會籍並保持與國際社會之合作互動交流，因此派員代表台灣與會，張貼海報說明台灣植物園的域外植物保育現況，並宣傳台灣植物園的系統與功能。

關鍵字：植物園、BGCI(國際植物園聯盟)

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本文

一、出國目的

聯合國世界自然保育聯盟（IUCN）轄下的國際植物園保育聯盟（Botanical Gardens Conservation International, BGCI），目前共有超過 100 個會員國，600 個地區組織會員，2013 年在紐西蘭舉辦第五屆會員國大會，主題是” 豐收慶典-植物園的影響與挹注”，訂下本屆會議主題，除了彰顯植物園在保育、研究、教育、展示的重大成長外，全世界目前有 25%的植物被植物園所保護，也成為聯盟的重大斬獲。

BGCI 除了制定下一個五年計畫（2013-2018），擬定植物保育策略外，於紐西蘭但尼丁市舉行五天的國際研討會，除了凝聚共識強化交流，並協助會員國解決植物保育的問題。該市但尼丁植物園適逢 150 年園慶，因此於市政廳舉行 BGCI 會員國大會暨研討會。

台灣的植物園以台灣名義入會，隸屬於 BGCI 轄下的植物園組織，為確保會籍並保持與國際社會之合作互動交流，因此派員代表台灣與會，張貼海報說明台灣植物園的域外植物保育現況，並宣傳台灣植物園的系統與功能。

二、過程

102 年 10 月 19 日

由於紐西蘭相當注意植物園的設計與管理維護，會前即先請假前往參訪基督城植物園，並搭巴士前往會議場地。

102 年 10 月 20 日

下午於但尼丁市政大廳報到，並前往 30 分鐘步程的但尼丁植物園，於植物園進行歡迎晚宴。

但尼丁植物園（Dunedin botanic garden）位於但尼丁市區東北方，佔地 28 公頃，夏季均溫 18.6 度，冬季均溫 10.4 度，年雨量 926 公厘，海拔高 25-85 公尺。四時花卉的展示，主要是夏天的玫瑰、草坪、岩生植物、香草花園；秋天的落葉樹種、杜鵑、樹木園、北美植物；冬天的澳洲植物、茶花、水生植物、溫

室、原生植物；春天的櫻花、球莖花卉、北亞植物、杜鵑花。紐西蘭植物園不同於臺灣的定時開園閉園，他們公告的開放時間是「每天天亮到太陽下山」，主要的管理展示區域則多為早上 9 點到下午 4 點開放。

10 月份時值春天，當我們報到後步行半小時抵達但尼丁植物園，植物園內花朵盛開，萬紫千紅非常熱鬧，參與研討會的許多成員已經在花園內拍照與交流，岩生植物區的花朵怒放，很多國家代表於此駐足流連。

紐西蘭沒有原生的杜鵑花，但是蒐集大量來自歐洲與南亞各地的杜鵑品種，不同的花形和花色，把整個植物園點綴的美不勝收。

102 年 10 月 21 日

大會開幕式，聯合國生物多樣性公約（CBD）代表與但尼丁市長，BGCI 理事群致歡迎辭。

「植物多樣性保護」是聯合國生物多樣性保育公約的重要目標之一，聯合國生物多樣性公約組織與植物園保育聯盟於 2002 年研訂全球植物保育策略 (Global Strategy for Plant Conservation, GSPC)，設定「植物多樣性分布重要區域保護」、「受威脅植物的就地保育」及「受威脅植物的遷地保育與種質保存」3 項作法，做為達成前述目標的重要手段，並設定 10 年為期（2001-2010），定期檢視世界各國的執行成果。2010 年生物多樣性公約第 10 屆締約國大會則檢討修訂了第二期計畫 (GSPC 2011-2020)，依保育對象及策略方法制訂 16 項指標 (targets)，涵蓋地區植物誌與保育等級評估、植物多樣性的域內與域外保護、植物多樣性的永續利用、教育獎勵與國際合作等面向。本次為期 5 天的會議，以植物多樣性域外保育、植物園永續經營、植物資源利用與生物安全、教育與合作為討論重點。

第一天於會議廳進行植物保育政策、區域性保育相關的研討會報告。報告指出，目前許多研究發現氣候暖化趨勢下，許多原生植物棲地受到壓縮與威脅，尤其是評列應予保護的稀有物種，特別容易因棲地與物種間交互作用的改變而滅絕。加以全球對於植物資源的過度利用，例如大面積的伐林毀林行為 (deforestation)，更急遽加速生物多樣性的消失。BGCI 秘書長 Sara Oldfield 指出，該聯盟在 2013-2018 年間，將以下列 3 項目標為方向，謀求上述現狀的改善：(1) 原生物種（特別是瀕危物種）的種原保存與棲地保護，同時推動復育計畫的進行；(2) 強化植物知識的教育，加強人類與自然的感情連結；(3) 研究、尋求符合天然原則的植物永續利用方法。BGCI 認為持續檢討評估植物的保育等級

及受威脅現狀是非常重要的工作，該聯盟已針對具有重要價值的分類群（杜鵑、楓、殼斗、榆）完成全球性的保育評估，未來將持續擴大評估範圍，並請各國參考該模式推動區域內重要物種的資訊收集與現狀檢視，並依檢視結果強化保育作為。

有關植物園永續經營部分，多國與會代表均提出植物園經營均面臨經費不足以及亟需開拓財源的問題，即使部分植物園經費來自於政府支持，但也面臨來源及額度不穩定的問題。傳統植物園開拓經費來源的方法不外乎募款、販賣紀念品、經營餐廳等方法，本次與會者提出新穎的經營與財源開拓概念，相當值得我國參考：(1) 由於植物園具備較充裕的植物學家及園藝工作人員，可協助國家執行與植物或園藝相關的證照考試，使報名費及委辦費用成為植物園財源之一；(2) 舉辦適合民間社團的植物與園藝教育（收費）課程，課程設計應包含初階、進階至專業，擴大參與者的面向並提供良好的知識學習管道；(3) 植物園可作為商業與食品工業的策略伙伴，例如設計部分園區作為食物作物的活體展示，或配合商業及工業行為進行食物安全介紹與展示等。除此之外，多位植物園經營者亦指出，植物園應清楚掌握園內水、電資源的耗用情形，提高可再利用資源（renewable resource）的比例。以用水為例，遊客皆希望看到繁花盛開的植物園，但管理者必須瞭解植物生長所需的水資源耗用量及回收量，在植物生長與資源投入間取得平衡，並考量種植能適應當地環境的植物，才能以經濟有效的方式維持園區的永續經營。

我國與會人員本日以「臺灣植物園的保育工作（The plant conservation by botanical gardens in Taiwan）」為題懸掛保育海報，展示解說臺灣植物園推動特稀有植物蒐集與保育的成果，並利用解說交流機會，分送台北植物園花曆海報與英文版摺頁予各國與會代表。

102 年 10 月 22 日

分五個會議廳進行各項不同主題的研討會議報告，主要討論人類與保育、種子交換與保育、植株管理、生物安全、地區監測等議題。

生物安全與監測的議題，包括 BGCI 的 Ellie Barham 介紹 IPSN（International Plant Sentinel Network）的組織與運作；紐西蘭植物園則運用植物名錄，預測危害性線蟲的可能分布，事先預防；基督城植物園園長採用分子生物學方式，建立植物園松科植物與危害的蚜蟲間的關係；另一位紐西蘭研究

人員則預警銹病與紐西蘭原生桃金娘科植物的關係；美國公園協會的 Daniel Stern 則藉由早期苗木監測避免植物害蟲與疾病的蔓延。

邱植物園的 Marcella Cocoran 以英屬凱可群島 (Caicos islands) 為例，說明原生樹種的域外保存工作。凱可群島上的特有種松樹 (*Pinus caribaea* var. *bahamensis*) 受到介殼蟲 (pine tortoise scale) 危害，造成 90% 以上個體死亡，為當地帶來嚴重的原生植被破壞問題。植物園先透過松樹適生棲地調查，選定適合的苗圃進行種原的蒐集與苗木培育，培育過程中研究人員特別著重於不同族群與不同遺傳來源的個體蒐集，搭配採樣與遺傳距離的分析，確保種原保存的異質性；在原生地部分，則配合當地政府及民間團體執行昆蟲族群抑制的工作。雖然目前原生地的蟲害問題尚未完全解決，但研究者可確認域外保存的松樹族群量足以應付未來的原生族群復育計畫使用，且保存了較高的遺傳多樣性，確保未來的復育族群仍具備良好的遺傳歧異度與環境適應能力。

102 年 10 月 23 日

會議旅行參訪日。至紐西蘭黃眼企鵝保育信託參訪，這個民間信託組織主要是保護但尼丁海岸線的黃眼企鵝棲地，他們的經費來自全民的捐贈囑託、企業捐助、國際保育組織、以及部分政府部門的預算，這個信託主要的工作是在進行企鵝棲地的復舊，首先由志工前往海岸線採集原生植物種子以及部分植物的插穗，帶回苗圃繁殖後再由志工種回被破壞的棲地。苗圃繁殖過程中，我們觀察到苗圃被切分為許多區塊，來自不同海岸棲地的植物被區分在不同的苗圃區塊內栽培，工作人員向我們解釋，這樣他們即可明確掌握各區塊的植物來源與原生棲地的位置，繁殖後的植株將被引回其原先生長的棲地，避免不同來源物種與族群的混雜污染。棲地復育的方法是先種植草毯，由草毯作為海岸線固砂的基礎，之後蘊藏於土壤種子庫內的原生植物種子將逐漸發芽生長，進而使原生地由裸地回復成原有的植群綠帶，以保護黃眼企鵝的繁殖棲地。

此外，亦參訪了奧塔哥 (Otago) 半島的皇家信天翁 (Royal Albatross) 棲地保護區，皇家信天翁是全世界體型最大的海鳥。保護區位於半島的最遠端，信天翁及海鷗以海岸邊的陡峭岩壁做為孵化與育雛場所，步道沿著保護區一部份的邊緣設置，遊客在步道上即可近距離觀察動物的行為。這個保護區設計了 3 種不同深度的參訪遊程，配合不同的收費標準，分別為展示中心參訪、解說人員帶領介紹保護區現狀與觀看自然史影片 (60 分鐘)、解說人員帶領進行展示區的全程遊

覽與人文歷史介紹（90 分鐘）。參訪收費不貲，每位成人參與全程解說需收費 50 元紐幣（折合台幣約 1250 元），但該費用極大部分被回饋於保育區的經營管理與研究，當地居民及遊客亦認同這樣的經營理念，因此形成良好而成功的正向循環。

另外一個參訪地是山區 Orokonui 自然保留區，自然保留區是紐西蘭法規最嚴格的棲地單元，本區主要設立目的是為了保護當地原生棲地的動植物，因此在這個區內嚴格的移除外來種，並進行森林復舊。所有參訪者必須通過隔離區，以避免外來哺乳類進入破壞生態區。在這個區域裡，經由基金會籌組的志工團進行運作與管理，在志工導引下，我們了解當地的動植物監測工作，並認識了許多原生植物與鳥類。

102 年 10 月 24 日

分五個會議廳進行分項研討會報告，包括網絡、資料庫、監測、夥伴組織、教育、社區保育等主題。由於同時展開不同議程，僅就參與部分概述如後：

民族植物部分：

美國國家熱帶植物園的負責人 Chipper Wichman 介紹了麵包樹的重要，麵包樹（夏威夷名 ulu）經由玻里尼西亞人引入夏威夷北邊的可艾島後，早期人類逐漸育種，由於將近 3000 年的歷史，因此麵包樹已有上百種品系。麵包樹在 1964 年美國國家熱帶植物園成立後被選為圖騰。由於麵包樹富含優質的澱粉，目前為了第三世界國家的濟助，美國農部展開多項產品開發研究計畫，希望能有效協助脫貧。過去四十年來夏威夷展開了世界最大的麵包樹 *ex situ* 保育計畫，成果相當豐碩。

紐西蘭的但尼丁市 Otago 大學永續學門的 Marion Johnson 介紹了紐西蘭植物園保存毛利植物的歷史，並解釋紐西蘭所有有用植物名都僅採用毛利語標示而不另給英名。

澳洲雪梨皇家植物園信託的原住民計畫的共同負責人 Clarence Slockee，介紹澳洲原住民是世界上歷史最久遠的族群，具有 40,000 年的歷史，然而在歐洲殖民的 225 年間原住民文化被劇烈破壞，因此試圖在澳洲植物園重建與展示澳洲原住民的植物文明。

社區保育與植物監測部分：

在植物保育項目部分，由 BGCI 秘書長 Sara Oldfield 主持，強調木本植物

蒐集與域外保存的重要。由於木本植物為森林內最顯而易見的樹種，佔有植物社會內最高的生物量與優勢度，森林若能獲得優先而適當的保護，對於其他物種的棲地維持將有最直接效益。Sara Oldfield 指出，BGCI 對於木本植物的評估與保護程序，由物種生態特性與棲地分布資訊蒐集開始，而後必須瞭解該物種的被利用現狀；此外，受到暖化變遷影響，部分對於氣候敏感的物種已出現向高海拔及高緯度遷移的現象，導致原有植物社會內的棲地環境與物種交互關係的改變，因此，以狹隘山區為主要分布範圍的物種，將可能面臨最強烈的滅絕壓力，成為必須被優先關注與保護的物種。基於上述原因，BGCI 已利用全球性的聯合資料庫對全世界 615 種裸子植物進行調查評估，將其中 211 個物種列為受威脅等級，積極推動這些物種的種原蒐集工作。BGCI 認為劃設保護區雖為同時保護物種與其棲地的好手段，然而保護區無法完整涵蓋所有應保護的物種，必須透過域外保育工作配合，才能提高生物多樣性保育的整體成效。整體而言，BGCI 已循上述模式完成裸子植物、杜鵑、楓樹、殼斗科等 8 個重要植物類群的研究與評估。希能透過國際間的合作，促使各國植物園依區域特性朝共同目標努力。

102 年 10 月 25 日

最後一天議程，包括植物園復育、植物園教育、未來的挑戰。西雙版納植物園主任陳進發表演說，介紹中國植物多樣性的分布現狀與特色，強調中國西南亞熱帶及熱帶生態系孕育的豐富生物資源，以及目前受威脅的稀有植物分布情形。陳進指出，受長期人為活動影響，中國的植物多樣性熱點多位於偏遠地區，部分鄰近都市或市郊的原生物種則面臨強烈的生存威脅，植物園的任務為加強對特稀有及受威脅植物的蒐集，同時應以區域特有物種為優先，並需注意遺傳歧異度的保存。此外，近年研究發現氣候變遷速率遠高於植物的遷徙與適應能力，某些脆弱的物種或生態系可能逐漸滅絕消失，因此，植物園研究人員除了必須清楚掌握國內植物物種的分布現狀，亦需設法瞭解區域內物種在氣候變遷情境下的易危或敏感程度，以求植物保育策略的適時適地修正與履行。

本次會議結論中，BGCI 提出各國對於 GSPC 第 8 指標（至 2020 年至少 75% 的受威脅物種被域外保育，其中至少 20% 的物種已具備執行引種與復育計畫的程度）的履行程度約在 25% 至 50% 不等；BGCI 亦提出，國際合作與研究網絡的資訊整合、以及加強植物園與當地民間團體的合作，都是促進植物保育工作履行成效的有效策略，期許各國植物園應持續朝該目標前進。

最後，主辦單位宣布下一屆國際植物園會議將於 2017 年於瑞士日內瓦舉行，經過簡單隆重的交接儀式，將主辦權交給下一屆主辦城市，宣告本次會議的圓滿達成，並期許各國植物園在下次會議前能獲致更豐碩的植物保育成果。

三、心得及建議

1. 參與本次會議最重要的目的為國際交流，藉由對於台灣現存植物園系統的推廣與介紹，讓台灣植物園系統為其他國家所知，並學習其他國家在植物園規劃與管理上的技術與經驗。
2. 我們體認到，國家的資源保育體系必須清楚瞭解區域內的生物資源分布情形，同時需掌握各種生物資源被利用的歷史與現狀，再據以評估各類生物資源的保育現狀及擬定保育策略；保育策略擬定後，分別由保護留區經營管理機關及植物園進行域內及域外保育工作，方能獲致整體性的推動效益。
3. 當保育體系建構完善，國家才有充足的能力深入探討各種生物資源的經濟利用方法與永續經營。
4. 上述的工作，除了政府責無旁貸外，亦需尋求國際組織與當地民間團體的協助：國際組織可提供更高尺度的全球保育視野，透過研討交流，可獲得更多保育與復育的實質技術；當地民間團體則可協助在地事務推動、保護留區管理與種原蒐集等工作，獲得民間團體認同後，才能有效提升植物知識的教育普及、加強地區居民與自然環境的感情連結，使生物資源的保護工作獲得落實。

四、附件一（議程）

Sunday 20 October

Dunedin Centre

10:00 -
16:00 Registration

Dunedin Botanic Garden

All day Rhododendron Day - Garden fete and festival

12:00 -
16:30 Tours of Botanic Garden

17:00 -
18:30 Welcome reception at Dunedin Botanic Garden

Monday 21 October 2013

Congress Day 1: Setting the scene

Dunedin Centre

9.00 Māori blessing

9.20 Opening

Video address
Dr Braulio Ferreira de Souza Dias, Executive
10.20 Secretary, Convention on Biological Diversity

10.30 Coffee

11.00 Plenary - Dr Sara Oldfield, Secretary General,

	BGCI UK A new agenda for botanic gardens
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11.30	Plenary - Felicity Lawrence, Deputy Director-General Science and Capability, Department of Conservation, New Zealand Conservation for prosperity, Tiakina te taiao, kia puawai
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12.00	Plenary - Dr Beth Mantle, GBIF Regional Representative, CSIRO Organising biodiversity data to support plant conservation
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12.30	Lunch
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13.45	Plenary - Prof Stephen Blackmore, Regius Keeper, Royal Botanic Garden Edinburgh, UK Partnerships for conservation
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14.15	Plenary- Prof Kaiyun Guan, Director and Professor, Turpan Eremophyte Botanic Garden, Chinese Academy of Sciences Global Significance of Biodiversity and its Conservation in Central Asia
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14.45	Coffee
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Parallel sessions

Parallel 1 - Success globally Botanic Gardens - Celebrating Success

Beatriz Maruri Aguilar, Cadereyta Regional
Botanical Garden, Mexico.

15.15 The Cadereyta Regional Botanical Garden: An
up-to-date review of its contributions toward
conservation of Central México

Iurii Naumtcev, Botanic Garden of Tver State University, Russia.

GSPC - think globally, act locally.

Chris Russell, Royal Botanic Gardens

Cranbourne, Australia.

Celebrating successes: Australian garden vision realised at Royal Botanic Gardens Cranbourne

Maité Delmas, Museum National d'Histoire Naturelle, Paris, France.

Madagascar and the Natural History Museum, Paris a living naturalist tradition committed to conservation and development

Parallel 2 - Beyond the garden walls Botanic gardens and capacity building

Hans Persoon, Utrecht University Botanic Gardens, Netherlands.

A new, botanical-garden-led undergraduate course combining botany and high level conservation management thinking.

Leigh Morris, Royal Botanic Garden Edinburgh, UK.

The role of blended & virtual Learning in capacity building

Barbara Wheeler, Dunedin Botanic Garden, New Zealand.

Training for the Future - gaining strength through partnerships

Gregory M. Mueller, Chicago Botanic Garden, USA.

Mitigating the loss of botanical capacity – Examples from Chicago Botanic Garden

Rapid Fire Presentations

Liz Caddick, Gold Coast Regional Botanic Garden, Australia.

Growing and Learning: the vital role of trainees

in a regional botanic garden

Melanie Sifton, Brooklyn Botanic Garden,
USA.

BBG's Brooklyn Urban Gardener (BUG)

Program launches green community leaders

Joachim Gratzfeld, BGCI, UK.

A new, electronic manual for botanic gardens
development and management

Parallel 3 - Horticultural changes Sustainability in botanic gardens

Casey Sclar, American Public Gardens
Association, USA.

Public Gardens Sustainability Index: A tool for
gardens to pursue and benchmark their best
practices

Marcus Ragus, Royal Tasmanian Botanical
Gardens, Australia.

The changing face of botanical gardens:
Adaptation or contraction?

Chris Bisson, Eden Project, UK.

Plant records and the triple bottom line

Mark Richardson, Planning for Plants,
Australia.

What will make botanic gardens
environmentally sustainable?

Annette Patzelt, Oman Botanic Garden, Oman.

The Oman Botanic Garden: A bold and
visionary project

Symposium 1 Discussion Round Table: Generating collaborations to utilise ex situ living collections to achieve Target 8 of the GSPC. Organiser: Andrew Wyatt,

**Missouri Botanical Garden,
USA.**

Speakers: Wei Bang Sun, Kunming Botanic Garden, China; David Rae, Royal Botanic Garden Edinburgh, UK; Tim Entwisle, Royal Botanic Gardens, Sydney, Australia; Christopher Willis, SANBI, South Africa.

**Symposium 2
Debating priorities:
Directors' perspectives on
the social and environmental
roles of botanic gardens
Organiser: Asimina Vergou,
BGCI, UK.**

Speakers: Paul Smith, Royal Botanic Gardens Kew, UK; James Hearsum, Royal Botanic Garden, Jordan; Sophia Siskel, Chicago Botanic Garden, USA. Michael Kiehn, University of Vienna, Austria.

17.30 Evening Reception

Tuesday 22 October 2013

Congress Day 2: The regional perspective

Dunedin Centre

9.00 Plenary - Chipper Wichman, Chief Executive Officer and Director, National Tropical Botanical Garden, United States
Ho'oulu ka Ulu - Addressing global food security through science, innovation and the Polynesian cultural knowledge of breadfruit

9.30 Plenary - Dr Marion Johnson, Centre for Sustainability, University of Otago, Dunedin

Traditional use of plants by Maori in Aotearoa, New Zealand

10.00

Plenary - Clarence Slockee, Coordinator, Aboriginal Programs – Royal Botanic Gardens Sydney and Domain Trust Indigenous cultural values in nature conservation

10.30

Coffee

Parallel sessions

Parallel 4 – Success globally It starts with a seed

Paul Smith, Royal Botanic Gardens, Kew, UK.

The Millennium Seed Bank Partnership: conserving and enabling the use of plant diversity for innovation and adaptation

Lucy Sutherland, Australian Seed Bank Partnership, Australia. Partnerships for plant conservation: seed banks in Australia

Philippe Bardin, National Natural History Museum, Paris, France.

Using native seeds in landscaping and land restoration: When public policies help the emergence of local plant nurseries.

David Taylor, Australian National Botanic Gardens, Australia.

Seed Production Areas at the Australian National Botanic Gardens

Megan Haidet, Bureau of Land Management, U.S. Department of Interior, USA.

Seed banking and native plant materials for a changing climate

Rapid fire presentation

Costantino Bonomi, Museo delle Scienze, Trento, Italy.

NASSTEC: a new EU project for native seed production and use in grassland restoration

Parallel 5 - Horticultural changes Managing living collections

Andrew Wyatt, Missouri Botanical Garden, USA.

How to affect change in living collections

Christopher Bailes, Chelsea Physic Garden UK.

Chelsea Physic Garden: seeking contemporary relevance in a historic setting

Tim Upson, Cambridge University Botanic Garden, UK.

Putting science into plant displays – the challenge for University Botanic Gardens

Judy West, Australian National Botanic Gardens, Australia.

11.00

Bridging the gap between horticulture and science for plant conservation

Lex Nieboer, Wilson Botanic Park, Berwick. City of Casey, Australia.

A rock to a hard place, gardening a difficult environment.

Parallel 6 - Science and innovation Conservation in action

Ulyana Spirina, Botanical Garden of Tver State University, Russia.

Living Bryophyte Collection in Botanical Garden of Tver State University as a Case Study in Bryophyte Conservation in Russia

Marcella Cocoran, Royal Botanic Garden, Kew, UK.

Saving the National tree of the Turks and Caicos Islands

Mercy Morris, Plant Heritage, UK.

Red-listing UK cultivars - Progress in the Threatened Plants Project

Ian Bailey Oliver, Oman Botanic Garden, Oman.

Plants on death row given a second chance - the challenges of saving mature native plants from the wild for a new botanic garden in the Sultanate of Oman

Marko Hyvärinen, Finnish Museum of Natural History, Finland.

From strategy to action – the first steps in the ESCAPE project

Symposium 3

Sentinel plants for biosecurity risk assessment

Organiser: Nigel Bell, AgResearch Ltd, New Zealand

Ellie Barham, BGCI UK.

Introducing an International Plant Sentinel Network

Lee Alders, AgResearch Ltd, New Zealand.

Using expatriate New Zealand flora in Botanic Gardens as predictors of nematode threats to New Zealand's natural ecosystems

John Clemens, Christchurch Botanic Gardens, New Zealand.

Spoilt for choice: Identifying new associations between aphids and Pinaceae using botanic gardens

Peter Scott, Scion, New Zealand.

Monitoring of expatriate, 'sentinel', plantings of New Zealand Myrtaceae in Australia to determine the threat of *Puccinia psidii* (myrtle rust) to New Zealand

Daniel Stern, American Public Gardens Association, USA.

New opportunities for botanical gardens to contribute to the early detection of high-consequence plant pests and diseases through collaborative offshore monitoring.

Symposium 4

Tourism is not a dirty word Organiser: Alison

Partridge, Going Gardens/Canada's Garden Council

Symposium 5

Naturally New Zealand

Organiser: Alan Matchett, Dunedin Botanic Garden, New Zealand.

Speakers: Daphne Lee, Geoff Rogers, Peter Johnson, Sue Scheele

Lunch

Workshop: Ethnobotany in the garden: engaging communities with nature.

Organiser: Ashley Glenn, Sacred Seeds Program Manager, Missouri Botanical Garden, US

13.00

Plenary - Brett Summerell, Deputy Executive Director, Royal Botanic Garden Sydney Science and Conservation

Challenges and opportunities for botanic gardens in the Australasian and Asia-Pacific region

14.00

Plenary - Alan Matchett, Director, Dunedin Botanic Garden, New Zealand

150 years of botanic gardens in New Zealand

14.30

Coffee and Posters

Themes: Success globally; Beyond the Garden Walls

15.00

Parallel sessions

Parallel 7 - Success globally The importance of partnerships

Mark Weathington, JC Raulston Arboretum at North Carolina State University, USA.
The North American Plant Collections Consortium as a model for conservation, research, and education in botanic gardens

Rosniati Apriani Risna, Bogor Botanic Garden, Indonesian Institute of Sciences, Indonesia.

Setting priorities for the conservation of threatened plants in Indonesia: Five-year progress

Christopher Willis, South African National Biodiversity Institute, South Africa.

Kirstenbosch (1913 to 2013) : celebrating 100 years of conserving South Africa's indigenous plants

Tom Myers, Dunedin Botanic Garden, New Zealand.

Ex situ conservation In New Zealand botanic gardens

16.00

Xiangying Wen, BGCI, China.

Efforts in saving China's botanical heritage

Parallel 8 - Beyond the garden walls Community engagement

Mustafa Falah al shudiefat, Royal Botanic Garden, Jordan.

Community-based Rangeland Rehabilitation Project (CBRR) Royal Botanic Garden,
Tell Ar-Rumman, Jordan Case Study

Kimberlie Mccue, Desert Botanical Garden, USA.

The Conservation Alliance—a bold initiative to foster community engagement to
study, restore and promote the desert mountain preserves of metro Phoenix, USA

Cecilia Elizondo, Botanic Garden "Dr Alfredo Barrera Marín", Quintana Roo,
Mexico.

In situ conservation actions with local communities

Jennifer Cruse-Sanders, Atlanta Botanical Garden, USA.

Botanic gardens as centers for conservation and scientific engagement

Shelley Wood, Williamstown Botanic Gardens, Australia.

Growing hearts and minds.

Parallel 9 - Rapid fire presentations Studies in botanic gardens

Elena Muratova, V. N. Sukachev Institute of Forest, Russian Academy of Sciences,
Russia.

Studies on cytogenetic features and reproductive biology of conifers in V.N. Sukachev
Institute Arboretum

Yulia Vinogradova, Main Botanical Garden, Russian Academy of Sciences, Russia.

Naturalization of alien plant species in botanical gardens of Moscow

Matthew Taylor, Longwood Gardens, USA.

A de novo conservation program - Longwood Gardens

Dongah Shin, Longwood Graduate Program at University of Delaware and Longwood
Gardens, USA.

The potential impact of a botanical garden in the Korean Demilitarized Zone

Martin Smit, Stellenbosch University Botanical Garden, South Africa. Assessing
support for integrated conservation efforts of specific North American Magnolia taxa

Erwin Kluver, The Botanic Garden TU Delft, Netherlands.

Gardens of the future

Symposium 6

Beyond the garden walls; linking gardens, growth and guests Organiser: Richard Benfield, Central

Connecticut State University, USA

Janelle Hatherly, Australia

Sowing seeds of wisdom for a greener future.

Symposium 7

BGCI's plant and garden databases: existing and future applications

Organiser: Abby Hird, BGCI, USA

Abby Hird, BGCI, USA.

Data applications of BGCI's database: 2013 BGANZ collections assessment

Adam Smith, Missouri Botanical Garden, USA.

Networking botanical gardens to assist species' migratory responses to climate change.

Suzanne Sharrock, BGCI, UK.

Networking botanic gardens for conservation – the role of BGCI's databases

Symposium 5 (contd.)

Naturally New Zealand

Rapid Fire presentations

Organiser: Alan Matchett, Dunedin Botanic Garden, New Zealand.

Speakers: Kath Dickinson, John Barkla, Rewi Elliot, Steve Newall, Shirley Stuart, Mike Thorsen

Free Evening

Wednesday 23 October

Congress Day 3

All day field trips

Thursday 24 October 2013

Congress Day 4 - Getting the word out

Dunedin Centre

9.00	Plenary - Scot Medbury, President and Chief Executive Officer, Brooklyn Botanic Garden, USA
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9.30	Plenary - Sophia Shaw Siskel, President and Chief Executive Officer, Chicago Botanic Garden Why Gardens Are Important, Especially Now
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10.00	Coffee and posters Themes: Horticultural changes; Science and innovation
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Parallel sessions

Parallel 10 - Success globally Supporting ecological restoration

Joachim Gratzfeld, BGCI, UK.

Restoring arid woodlands in Pakistan's Punjab province

Joyce Maschinski, Fairchild Tropical Botanic Garden, USA.

Factors influencing sustainable rare plant reintroductions: The importance of botanical garden collections, records, and research

Liu Zhanfeng, South China Botanical Garden, China.

Incorporating community participation and native plant resource conservation

Yang Shuo, Yunnan Institute of Environmental Science, China.

Sustainable management of the community forest in Dahetou Village, Tengchong County

Gunther Fischer, Kadoorie Farm & Botanic Garden Corporation, Hong Kong SAR.

11.00

Forest restoration in degraded tropical

landscapes: a case study from Hong Kong

Parallel 11 - Beyond the garden walls Community engagement (2)

Ian McAlister, Dubbo Regional Botanic Garden, Australia.

Dubbo Regional Botanic Garden - How improved planning for green infrastructure and access to green spaces can help improve human health and well being in an urban environment - The role of botanic gardens
Anne Duncan, BGANZ, Australia.

Creating regional sustainability from botanic gardens out.

David Reid, Royal Tasmanian Botanic Garden, Australia.

The Tasmanian Community Food Garden - Seeds of success

Sara Levin Stevenson, Longwood Graduate Program. USA.

Rooted in the Community: Tools for engagement at public gardens

Noel McGough, Royal Botanic Gardens Kew, UK.

Bulbs, BioPolitics and Botanic Gardens - opportunities for new partnerships to secure and support sustainable trade in wild plants.

Parallel 12 - Horticulture Horticulture and conservation

Kayri Havens, Chicago Botanic Garden, USA.

Consequences of fecundity reduction in cultivars of invasive perennial plants

Patrick Griffith, Montgomery Botanical Center, USA.

Underground plants help conservation on the surface

Jenny Guerin, Botanic Gardens of Adelaide,
Australia.

Germination of *Veronica parnkalliana* seeds in
response to season and fire cues.

Colin Clubbe, Royal Botanic Gardens Kew,
UK.

Rescue and conservation of a rediscovered
endemic fern: *Anogramma ascensionis* on
Ascension Island

Megan Hirst, Royal Botanic Gardens
Melbourne, Australia.

A not so common garden experiment:
Comparing plant responses to different
environmental conditions in the Royal Botanic
Gardens Cranbourne research garden.

Parallel 13 Science and innovation

Data management

Rebecca Sucher, Missouri Botanical Garden,
USA.

Advances in plant records

Bert van den Wollenberg, Botanic Garden,
Delft University of Technology, Netherlands.

One small step for man

Kerry S. Walter, BG-BASE UK Ltd., UK.

'New' information from 'Old' data

Jinshuang Ma, Shanghai Chenshan Botanical
Garden, China.

Current status and challenges of Chinese plant
taxonomy

Marion MacKay, Massey University, New
Zealand.

Data management for conservation planning:
the example of *Rhododendron*.

Rapid fire presentation

Dai Ke Tian, Shanghai Chenshan Botanical
Garden, China.

Introduction to the project on international
germplasm conservation, database construction
and cultivar registration of *Nelumbo*

Symposium 8
**Beyond Seed Banking:
Challenges and
Opportunities to Conserve
Exceptional Species**

Organiser: Abby Hird, BGCI, USA.

Valerie C. Pence, Cincinnati Zoo and
Botanical Garden, USA.

From collecting to restoration: The role of in
vitro methods in the

conservation of exceptional species

Jennifer Cruse-Sanders, Atlanta Botanical
Garden, USA.

Conserving three exceptional temperate plant
species – Lessons learned at the Atlanta
Botanical Garden

Cathy Offord, Royal Botanic Gardens and
Domain Trust, Australia.

The Australian rainforest seed conservation
project

Hugh Pritchard, Royal Botanic Garden, Kew,
UK.

Towards the integrated conservation of
exceptional species with extremely small
populations

Symposium 9
**The Global Strategy for
Plant Conservation - a
framework for action at the
national level**

Organiser: Suzanne Sharrock, BGCI, UK

Network meeting
The International

Association of Botanic Gardens

Organiser: Hongwen Huang

Open meeting and business meeting

13.00 Lunch

14.00 Plenary - Dr David Rae, Director of Horticulture, Royal Botanic Garden Edinburgh, UK.
Botanic garden horticulturalists - a threatened species?

14.30 Plenary - Mr Jack Hobbs, Curator Manager, Auckland Botanic Gardens, New Zealand.
The role of plants in environmental solutions

15.00 Coffee

Parallel sessions

Parallel 14 - Success globally Botanic gardens - pushing boundaries

15.30 Pavel Krestov, Botanical Garden-Institute FEB, Russian Academy of Sciences, Russia.
Botanical gardens of northern Asia, near the edge of permafrost and beyond
Didik Widyatmoko, Cibodas Botanic Gardens, Indonesian Institute of Sciences, Indonesia.
Treasure of the Four Kings: Plant expeditions to the Raja Ampat Islands, West Papua
Lydia Guja, Australian National Botanic Gardens and Centre for Australian National Biodiversity Research, Australia.

Ecological drivers of seed germination in
endangered Australian bog and fen
communities

Bob Ursem, Botanic Garden Delft University
of Technology, Netherlands.

Smart plant use in water management and
shown in a new display water garden in Delft
Botanic Gardens, The Netherlands.

Jean Pierre Laurent, Fork Research Centre,
Saint Lucia National Trust, St Lucia.

The Role of Botanical Gardens (Private and
Public) through the merger of Kwéyòl
Gardens for Sustainability development and
the Conservation of the Caribbean Bio-cultural
Heritage.

Parallel 15 - Beyond the garden walls Community engagement (3)

Abby Hird, BGCI, USA.

Care for the Rare: Interpretation resources for
any garden

Michael Connor, Wollongong Botanic Garden,
Australia.

The Ghost of Courtney Puckey-interpreting the
past, conserving the future

Cris Brack, Australian National University,
Australia.

New science at the National Arboretum of
Canberra

David Kendall, Royal Botanic Gardens
Melbourne, Australia.

How do we influence our visitors? Gardening
beyond our boundary

Rapid fire presentation

Joseph Cahill, Ventura Botanical Gardens,
USA.

Engaging communities with new integrative

GIS technologies-Ventura Botanical Gardens

Symposium 10
Strengthening the
conservation value of tree
collections for ex situ
conservation
Organiser: Gerard T.
Donnelly, The Morton
Arboretum

William McNamara, Quarryhill Botanical
Garden. USA.

Making our collections more valuable: A case
study from Quarryhill Botanical Garden's ex
situ conservation program

Sara Oldfield, BGCI, UK.

Developing integrated tree conservation
approaches

Dr David Rae, Royal Botanic Garden
Edinburgh, UK.

The International Conifer Conservation
Programme – an effective network towards
safe guarding threatened conifers

Nicole Cavendar, The Morton Arboretum,
USA.

A path to the future; challenges and practical
approaches for strengthening ex-situ
conservation efforts for trees

Symposium 11
The Nagoya Protocol on Access and
Benefit Sharing – How does it affect
botanic gardens?
Organiser: Natasha Ali, Royal Botanic
Gardens, Kew, UK.

Michael Kiehn, University of Vienna, Austria.
IPEN (International Plant Exchange
Network) and its current activities related to
the Nagoya Protocol of the Convention on

Biodiversity

Pamela Allenstein, American Public Gardens Association, USA.

Engaging U.S. Gardens in Access and Benefit-Sharing: a National Issues Forum
Kate Davis, BGCI, Canada.

An ABS survey for botanic gardens: how prepared are we for new rules?

Symposium 12

Feeding the Community: Approaches to Urban Gardening in North American Public Gardens and Across the Globe.

**Organiser: Donald Rakow,
Cornell Plantations. USA.**

Gregory Mueller, Chicago Botanic Garden,
USA.

Urban agriculture programs at the Chicago
Botanic Garden

Mary Pat Matheson, Atlanta Botanical Garden,
USA.

Atlanta Botanical Garden - A challenging
collaboration in urban agriculture

Scot Medbury, Brooklyn Botanic Garden,
USA.

Youth gardening at the Brooklyn Botanic
Garden

Planning living collections- a 'hands-on' workshop

Organiser: John Arnott, Royal Botanic
Gardens Cranbourne, Australia / BGANZ

19.00

Congress Dinner

Friday 25 October 2013

Congress Day 5 - Looking to the future

Dunedin Centre

9.00 Plenary - Dr Jin Chen, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Science
How to be a conservation garden

9.30 Plenary Dr Kathy MacKinnon, Vice Chair, World Commission on Protected Areas, UK
Ecological restoration and the role of botanic gardens in restoring damaged habitat

10.00 Plenary - Prof Peter Wyse-Jackson, President, Missouri Botanical Garden, USA
Celebrating botanic gardens - future challenges

10.30 Coffee

11.30 Conclusions

12.30 Closing

Workshop

14.00 Education in botanic gardens: moving from "Sage on the Stage" to "Engage on Discover"
Organisers: Julia Wilison and Asimina Vergou, BGCI, UK

The plant conservation by botanical gardens in Taiwan

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Ranunculus junipericola



Clematis akoensis



Medinilla hayataina



Phalaenopsis equestris



Epilobium nankotaiense



Peione bulbocodioides



Millettia pulehra var. *microphylla*



Rhododendron kanehirai

Plant conservation

Base on the preliminary Red List of Taiwanese Vascular Plants (2012), 908 vascular plants (20.6%) were assessed as threatened species. In order to delineate their distribution and map out adaptive conservation strategies, we overlapped the GIS data of threatened species gathered from 2 herbaria and national vegetation information systems with all types of protect areas to reveal the situation of in-situ conservation.

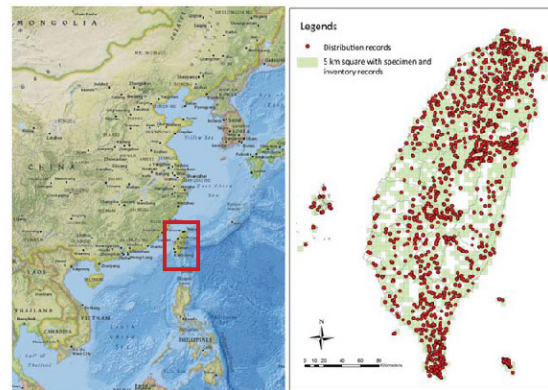


Figure 1
Specimens and inventory data covered 79.5% land area of Taiwan (green grids). The records of threatened species were marked as red dots.

Method

We used ArcGIS 10 for spatial analysis. According to 23,918 georeferenced data of 907 Taiwan plant species, we applied intersect function to integrate protect area layers to examine species and habitat were sheltered under protect areas or not.

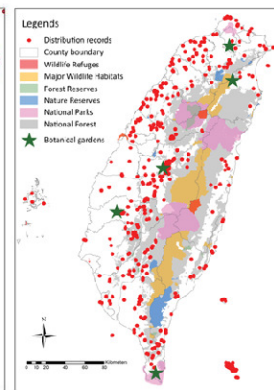


Figure 2
There are 159 species not sheltered under protect areas, mainly distributed in the west plain, coast, hill and island.

Result

In Taiwan, there are 748 threatened species (ca. 82.47%) and habitats are contained by protect areas, but still 159 species (ca. 17.53%) were not sheltered, especially Orchid Island. We regard these species should be protected ex-situ urgently.

	Area (ha)	proportion of Taiwan land area	threatened species sheltered (X of 907 sp.)	percentage
Wildlife Refuges	211.01	0.1	222	22.18
Major Wildlife Habitats	3245.23	8.91	119	10.11
Forest Reserves	211.11	0.48	139	19.24
Nature Reserves	913.11	1.99	268	32.82
National Parks	3125.2	8.91	188	20.82
National Forest	1,089.09	4.19	812	88.12
Protect Areas	4146.88	23.68	118	23.11
Orchid Island	18.89	0.03	191	21.29

Table 1
All types of protect areas accounts for 23.88% land area in Taiwan. 748 threatened species (82.47%) were fully or partially sheltered.

Conservation Status	Vine	Herb	Shrub	Arbor	Sum
CR	1	11	6	15	33
EN	4	16	4	32	56
VU	10	39	24	53	117
Sum	15	57	34	100	206
threatened species (%)	28.3	9.15	33.33	76.92	22.69

Table 2
The threatened species were collected and cultured by botanical gardens until 2012.

Conservation strategies of botanical gardens

There are several botanical gardens with various sizes and at different locations in Taiwan. They are separately at Taipei (TPBG), Heng-chun (HCTBG), Fushan (FSBG), Chiayi (CYBG), Lienhuachi (LHC) and National Museum of Natural Science in Taichung. Most of them were built by Taiwan Forestry Research Institute (TFRI). In order to implement the relocation conservation of threatened species, botanical gardens of TFRI have checked the conservation status of collected materials in the field gene bank and seed bank in 2012 and found that there were 206 species have cultured in gardens. We also found that most collections are arbors, all gardens have collected 100 arbor species and composed of

76.92 % of threatened species. Comparatively, we have few shrub, vine and herbaceous collections.

In addition to TPBG, a metropolitan botanical garden, others are located at low elevation mountain area and near threatened species hotspot. Because of the accessibility, these gardens have devoted in ex-situ conservation by keeping on collecting threatened species in the nearby area. Aim of our project is to increase collections up to 90% of threatened arbor species and 50% of threatened shrub, vine and herbaceous species.



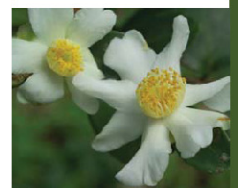
Pyrus taiwanensis



Burmanna championii



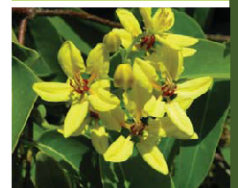
Eustigma oblongifolium



Camellia tenuiflora



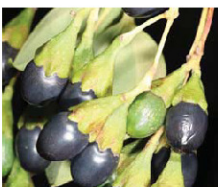
Cephalanthus naucleoides



Tristellateia australasica



Hypericum subulatum



Cinnamomum kotoense



Myristica ceylanica var. *cagayanensis*



Dehaasia incrassata



Keteleraia davidiana var. *formosana*



Cypripedium formosanum

六、活動照片

會場及演講廳

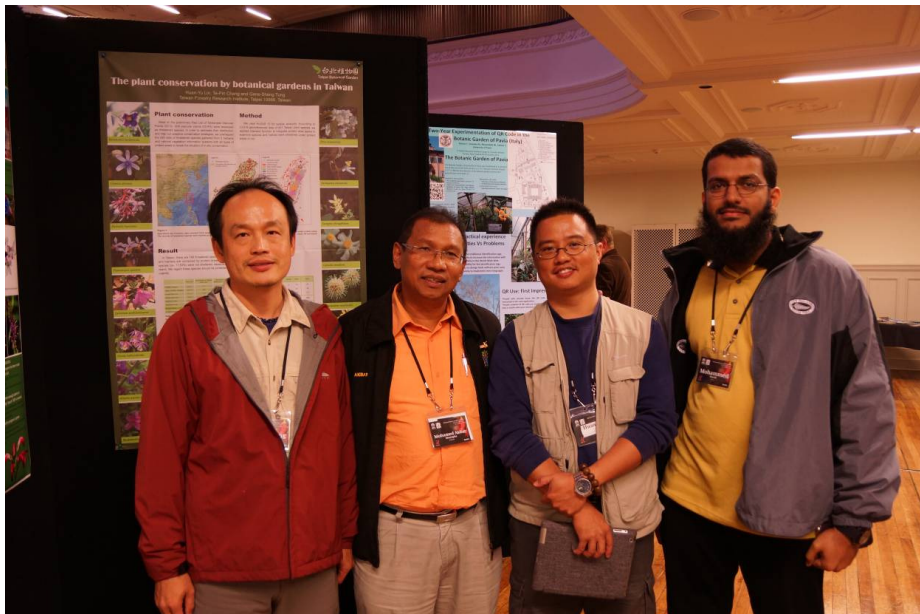


照片一：會議開幕儀式。



照片二：本次會議除於會場舉辦大型演講外，另依工作項目議題舉辦分場研討。本場次為澳洲學者針對植物園永續經營部分進行簡報。

海報區合影



照片三：我國以「臺灣植物園的保育工作 (The plant conservation by botanical gardens in Taiwan)」為題懸掛保育海報，向與會各國人士介紹台灣植物園與保育工作的現況。



照片四：會議期間於但尼丁博物館內舉行的酒會，與會人員交換心得。



照片五：最後一天的 Gala dinner，在會議的市政中心餐敘，配合一系列的原住民舞蹈，為整個會議劃下完美的句點。

大會參訪



照片六：黃眼企鵝棲地植生復育苗圃。照片內的植栽均由黃眼企鵝的原生棲地採集而來，每區塊代表不同的原生地區。植物長成後，將逐一被移植至原生地點進行植被復育。



照片七：黃眼企鵝的原生棲地，位於 Otago 半島沿岸。

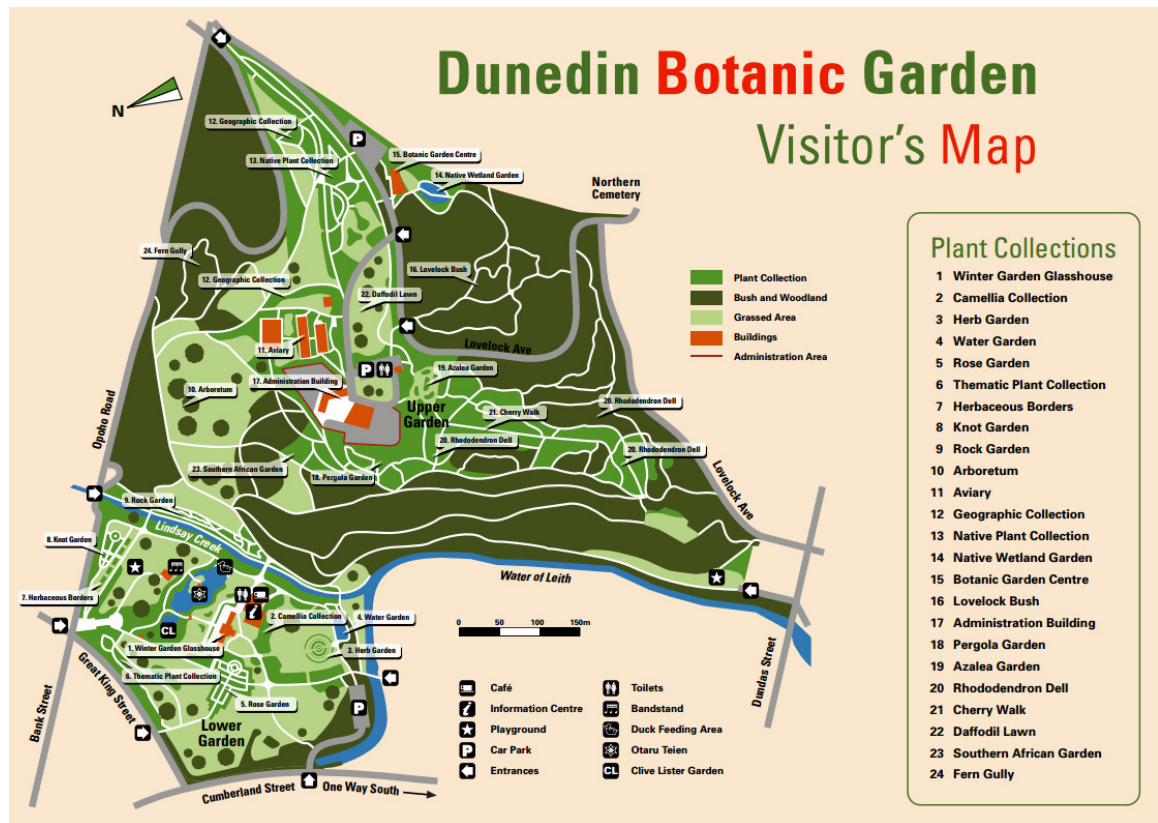


照片八：皇家信天翁棲地，位於 Otago 半島最遠端的沿海峭壁上。遊客可利用步道觀察信天翁與海鷗的活動情形。



照片九：參觀 Orokonui 自然保留區，整座保留區為了避免小型哺乳動物入侵，破壞生態系，因此以鐵門隔離整個區域。

植物園地圖



照片十：但尼丁植物園地圖

Welcome to the Christchurch Botanic Gardens

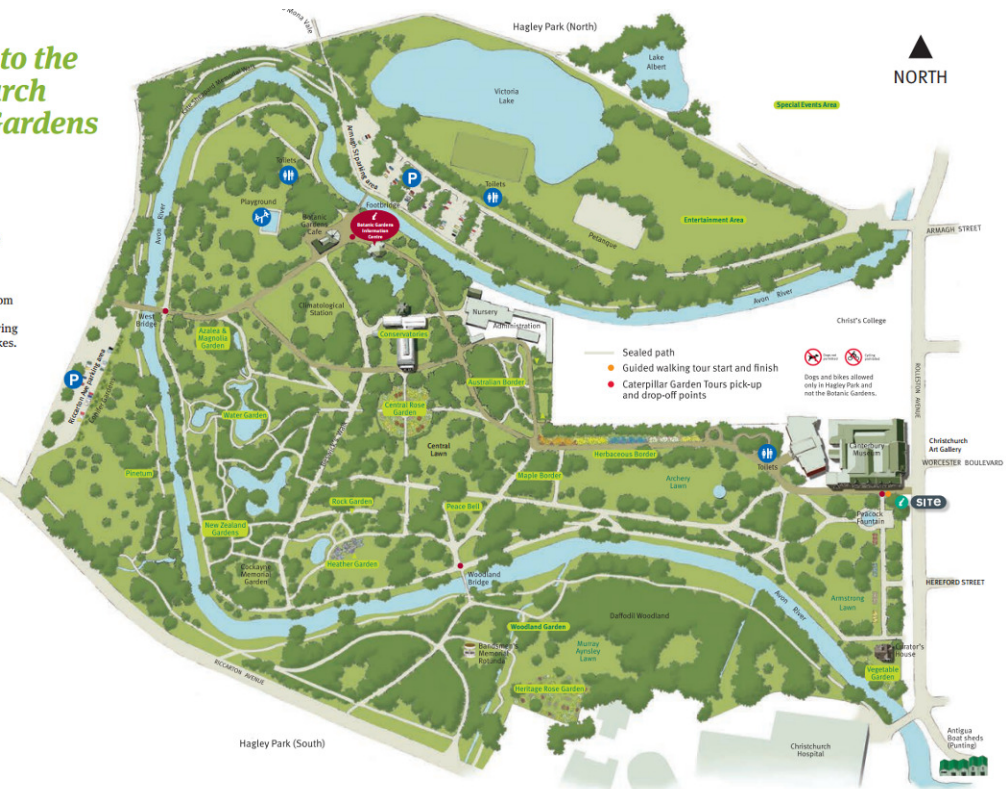
Opening Hours

The grounds
Daily from 7 am until one hour before sunset

The conservatories
Daily from 10.15am-4.00pm
Some conservatories are temporarily closed following the Canterbury earthquakes.

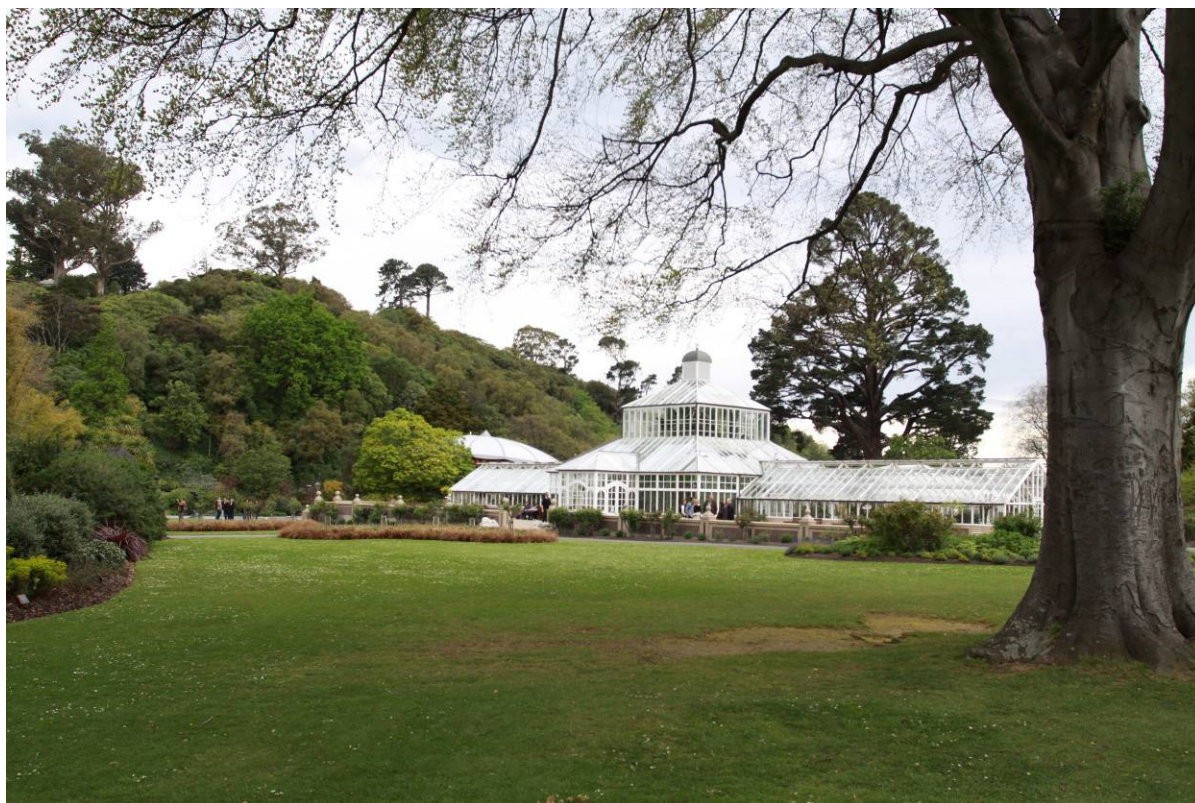
Please check with the information centre

The Botanic Gardens information centre
Monday to Friday from 9.00am-4.00pm
Saturday and Sunday from 10.15am-4.00pm



照片十一：基督城植物園地圖

植物園景觀



照片十二：但尼丁植物園內的溫室，培育了多樣的蘭花、蕨類與食蟲植物。



照片十三：但尼丁植物園內的岩生植物區。沿地形堆置石塊，形成有層次而排水良好的栽植環境，各種喜好岩生環境的植物配置栽植其中。時值春末，許多植物正在開花。



照片十四：基督城植物園內的食用與香料植物區。園方鼓勵遊客觸摸、感受本區栽植的不同植物，都是具有特殊風味的食用或香料植物。



照片十五：基督城植物園的旱生植物展示區。利用不同的介質，在展示區內營造不同的土壤與水分環境，將不同水分偏好的植物分別栽種在區塊裡，向遊客說明各物種的特性。