

玉山國家公園

關山區維管束植物調查

研究報告

委託單位：內政部營建署玉山國家公園管理處

研究單位：國立成功大學生物系

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### 圖與表目錄及附錄

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## 摘要

關山區維管束植物調查研究第二年研究重點及初步成果如下：1.繼續就南部橫貫公路沿線進行調查工作。本次植物調查研究總名錄增加 70 種；包括蕨類 3 種、裸子植物 1 種、雙子葉植物 49 種、單子葉植物 17 種。2.選擇關山嶺步道作為高山植物解說線；提供該線有關植物名錄、分佈、海拔高度、重要特徵與圖譜等解說資料。3.於天池二葉松造林地火災區進行調查；探討火災適存植群及演替機制。

## 壹、緒言

按玉管處擬訂之中長程之規劃指導原則，長期持續之植物調查工作為各項後續相關研究之基礎；故第二年仍繼續就南橫沿線按月採集、記錄調查；方法與結果詳見報告貳之第一章。

關山嶺步道位國家公園關山區內南橫終點附近、海拔高 3174 公尺，登頂不難、費時不多是遊客駐足頻繁之處。且步道沿線可供解說之資料豐富，是一理想之高山植物解說線。結果詳見報告貳之第二章。

天池為南橫全線東西交通之匯，也是公路客運接駁處。適合設遊憩區，植物調查宜早進行。且該區內二葉松造林地於七六年三月曾遭大火；葉處長及解說課均提示應把握機會進行火災生態之研究。本系有意培養生態研究人才，仍積極配合，由大四同學選為論文，著手調查工作。結果詳見報告參。

國家公園之各項研究為長遠持續之百年大業。調查研究資料與日俱增且得來不易；當有效管理與應用、也即資訊電腦。本研究室選用一資料管理應用軟體於 MacIntosh SE 機器下使用，操作簡單，容易推廣。也於本次報告中介紹。

## 貳、植物調查與解說

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## 第一章 關山區維管束植物調查

第二期計劃自七七年二月起至十月止共採集八次。採集標本共 666 號（表一）所有標本經乾燥、除蟲及滅菌後經鑑定再以台紙付標籤封入塑膠內，存於成大生物系標本館供查證及相關研究之用。

### 新增植物名錄

本期報告關山區維管束植物總名錄新增種類共 70 種（表二）。大都為本次研究期間所採、少數為上期採集品；均於名錄中登錄採集號以供核對。另一部分系陳玉峰課長來函告知則加註“Chen Y. F.”以茲識別。

### 幻燈片解說資料庫

本期調查過程中仍循往例，每次均拍攝彩色幻燈片；保存各季所見景觀和植物特徵。以 Macintosh SE 資料管理應用軟體 File Maker plus 製一 Color Slide 檔；每筆記錄由日期（Date）、地點（Locality）、號碼（Number）、名字（Name）及加註（Note）等欄（fields）構成一資料庫。

各欄中：日期、地點為每一幻燈片之基本資料，按實際拍攝時地登錄。號碼由英文字母及阿拉伯數字組成；分別為幻燈片保存盒代號及其內各張編號。名字係植物學名，而加註則記載解說資料；也即每一幻燈片之主題或內容。當然各欄之設定可隨需要增刪如加借用者（user）或出版情形（Publish）等欄以利管理。

今以實例說明如次；表三為幻燈片資料庫(color slide)之一部份。其中 d13 至 d28 總共 16 筆記錄；以第一筆為例；d13 指 d 盒內第 13 張幻燈片、拍攝時地為 76 年 6 月 29 日、植物是 *Dianthus pygmaeus*、主在說明玉山石材之花苞及開花狀態。餘各筆類推。查詢簡便；只需於要查欄內輸入關鍵字即可由 FIND 功能查得。如於 note 欄內輸入“shiny”找有關陽性植物資料，可查得 d14，d15，d16 及 d17 等四張。操作純熟後極易組合關鍵字查詢各類資訊供應用。

## 第二章 關山嶺步道解說線植物調查

南橫為台灣南部橫貫東西之要道。近年觀光人口急遽增加；西自梅山口東山埡隧道全位玉山國家公園關山區內，遊憩壓力日增，解說點與線之規劃宜盡快進行。前期初勘已擬訂梅山、唯金溪、禮觀橋、天池、進涇橋、檜谷及關山嶺等處。

上述解說點與線以關山嶺海拔最高。一般欣賞、認識台灣高山植物景觀、植被和各類植物、通常均需具有登山負重能力及較長時間；而本區關山嶺因緊鄰橫貫公路邊線（圖一），其步道攀登容易、交通方便、遊客易到（圖二），是極佳之解說線。本期重點為調查該區植物並提供解說資料。

### 關山嶺步道解說線植物名錄

目前登錄本區維管束植物共計 150 種。表四按科名字母順序、依次將學名、中名及採集號登錄。

關山嶺步道解說線主要景觀為芒草及玉山箭竹草原、雲衫及鐵杉林。蕨類有 30 種；鱗毛蕨科就佔 16 種，是一特色。灌木以小蘗、莢迷、柳等屬及杜鵑花科植物為主。其它大多為高山草本植物、出現於岩隙、小徑傍或斜坡壁上。其中雙子葉植物有 96 種、以菊科植物為最多；達 15 種。單子葉植物有 23 種。以禾本科植物為主；多達 11 種。

### 關山嶺步道解說線資料

利用 MacIntosh SE 型電腦，以 File Maker plus 應用軟體，將關山嶺步道解說線有關植物之分布、海拔高度、重要特徵與圖譜等解說資料編輯成資料庫。（表五）可供隨時查詢、整合各類資料。此一應用軟體特色，在於資料的輸入和輸出非常靈活、且富變化；可由使用者自行設計、不論增添刪除或修改各項資料均易操作。此外又可經由掃描器（scanner）將影像存入資料庫內。這是 PC 電腦中常用軟體 dBASE 無法望其項背的。

表一 採集記錄

日期	號	碼	地	點
02/27/1988	013857-	013859	mei-shan	梅山
02/27/1988	013860-	013878	112k-	113k
02/27/1988	013879-	013880	119k-	120k
02/27/1988	013881-	013900	122k-	123k
02/28/1988	013901-	013904	132k	
01/31/1988	013905-	014066	tien-chi	天池
04/04/1988	014177-	014230	tien-chi	天池
04/05/1988	014231-	014242	guan-shan-lin	關山嶺
04/05/1988	014243-	014259	134k	
04/05/1988	014260-	014269	131k	
04/05/1988	014270-	014284	129k	
04/05/1988	014284-	014301	wei-gin-chi	唯金溪
04/05/1988	014302		li-guan	禮觀
04/05/1988	014303-	014315	119k	
07/23/1988	014669-	014671	mei-shan	梅山
07/23/1988	014672-	014682	112-	1/2k
07/23/1988	014683-	014696	117k	

07/23/1988	014697-014708	114k
07/23/1988	014709-014743	133k
07/24/1988	014744-014763	shian-yang-shan 向陽山
09/14/1988	014985-015048	tien-chi to gin-zin-chiao 天池 逕進橋
09/15/1988	015049-015056	tien-chi-136k 天池
09/15/1988	015057-015072	136k-137k
09/15/1988	015073-015081	137k-138k
09/15/1988	015082-015086	138k-139k
09/15/1988	015087-015088	kuai-gu 檜谷
09/15/1988	015089-015090	
09/15/1988	015091-015132	guan-shan-lin 關山嶺
09/14/1988	015132-015204	gin-zin-chiao 天池 逕進橋

表二、關山區新增維管束植物名錄

Aceraceae

<i>Acer albopurpurascens</i> Hay.	樟葉槭 Chen Y. F.
<i>Acer morrisonense</i> Hay.	台灣紅榨槭 14198,
<i>Acer serrulatum</i> Hay.	青楓 14267,

Amaranthaceae

<i>Achyranthes japonica</i> Nakai.	日本牛膝 Chen Y. F.
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Anacardiaceae

*Rhus succedanea* L. 木蠟樹 14258,

Aquifoliaceae

*Hex ficoidea* Hemsl. 台灣糊零 Chen Y. F.

Araceae

*Arjsaema grapsospadix* Hay. 毛筆天南星 Chen Y. F.

Asclepiadaceae

*Asclepias curassavica* L. 尖尾鳳 Chen Y. F.

Athyriaceae

*Athyrium oppositilpinnum* Hay. 對生蹄蓋蕨 12838,

Blechnaceae

*Woodwardia orientalis* Sw. 東方狗脊蕨 12956,

Caprifoliaceae

*Viburnum foetidum* Wall. 狹葉莢迷 13304, Chen Y. F.

*Viburnum sphaerocarpum* Y.C. Liu et C.H.

Compositae

*Cirsium kawakamii* Hay. 玉山薊 15096,

*Eupatorium chinense* L. 塔山澤蘭 15045,

*Microglossa pyrifolia* O. Kuntze. 小舌菊 Chen Y. F.



*Petasites formosanus* Kitamura. 山菊 13728,14223,

*Saussurea kanzanensis* Kitamura. 關山青木香 15095,

*Sonchus oleraceus* L. 苦蕒菜 13727,14188,

*Veronia cinerea* Less. 一枝香 13869,

Cyperaceae

*Carex phacota* Sprengel. 七星斑囊果薹 14287,

Elaeocarpaceae

*Elaeocarpus japonicus* Sieb. 薯豆 14301,

*Sloanea formosana* Li. 猴歡喜 Chen Y. F.

Ericaceae

*Rhododendron oldhamii* Maxim. 金毛杜鵑 14186,

*Rhododendron ovatum* Planch. 馬銀花 13929,

Euphorbiaceae

*Glochidion aequorcum* Hance 白樹仔 14311,

Fagaceae

*Pasania brevicaudata* Schott. 短尾柯 Chen Y. F.

*Passania kawakamii* Schott. 大葉柯 Chen Y. F.

*Pasania ternaticupula* Schott. 三斗柯 Chen Y. F.

Labiatae

<i>Glechoma hederaceae</i> L.	大馬蹄金 14675,
<i>Pogostemon formosanus</i> Oliv.	節節紅 Chen Y. F.
Lauraceae	
<i>Cinnamomum camphora</i> Nees.	樟樹 14284,
Leguminosae	
<i>Crotalaria lanceolata</i> E. Meyer.	長葉豬屎豆 13857,
Liliaceae	
<i>Aletris formosana</i> Sasaki.	台灣粉條兒菜 14203,
<i>Aletris spicata</i> Franchet.	束心草 13736,
<i>Ophiopogon formosanus</i> Ohwi.	台灣沿階草 13723,
Lomariopsidaceae	
<i>Elaphoglossum yoshinagae</i> Makino.	舌蕨 14193,
Magnoliaceae	
<i>Michelia compressa</i> Sargent.	烏心石 Chen Y. F.
Menispermaceae	
<i>Cocculus sarmentosus</i> Diels	鐵牛人石 14307,
<i>Paracyclea ochiaiana</i> Kudo	台灣土防己 14270,
Myrsinaceae	
<i>Ardisia quinqueгона</i> Blume	小葉樹杞 13917,

Myrtaceae

*Syzygium formosanum* Meri 台灣赤楠 Chen Y. F.

Oleaceae

*Osmanthus enervius* Masam. & Mori 無脈木犀 Chen Y. F.

*Osmanthus lanceolatus* Hay. 銳葉木犀 Chen Y. F.

*Osmanthus matsumuranus* Hay. 大葉木犀 Chen Y. F.

Orchidaceae

*Bulbophyllum umbellatum* Lindl. 繖形捲瓣蘭 14672,

*Bulbophyllum umbellatum* Lindl. 傘花捲瓣蘭 Chen Y. F.

*Calanthe reflexa* Maxim. 反捲根節蘭 14750,

*Luisia teres* Bl. 金釵蘭 14281,

*Odontochilus bisaccatus* Hay. 二囊齒唇蘭 14673,

Palmae

*Arenga engleri* Becc. 山棕 14286,

Pinaceae

*Pinus morrisonicola* Hay. 台灣五葉松 Chen Y. F.

Poaceae

*Agropyron formosanum* Honda 台灣鵝觀草 15105,

*Bromus formosanum* Honda 台灣雀麥 15104, 15106,

<i>Leptochloa chinensis</i> L.	千金子 14674,
<i>Vulpia myuros</i> Gmel.	鼠茅 15142,
Polygalaceae	
<i>Polygala tatarinowii</i> Regel.	小扁豆 15022,
Polygonaceae	
<i>Polygonum viscosum</i> Buch.	香蓼 15133,
Rosaceae	
<i>Photinia serrulata</i> Lindl.	小櫻桃 Chen Y. F.
<i>Prunus phaeosticta</i> Maxim.	黑心櫻 Chen Y. F.
Rubiaceae	
<i>Nertera nigricarpa</i> Hay.	黑果深柱夢草 14715,
<i>Rubia linii</i> Chao	林氏茜草 15111,
Rutaceae	
<i>Toddalia asiatica</i> (L.) Lam.	飛龍掌血 14292,
Salicaceae	
<i>Salix morii</i> Hay.	台東柳 14209,14213,
<i>Salix takasagoalpina</i> Koidz.	台灣山柳 14232,
Scrophulariaceae	
<i>Mazus alpinus</i> Masamune.	高山通泉草 13891,

Smilacaceae

*Smilax hayatae* T.Koyama. 旱田氏菝葜 14201,

Solanaceae

*Solanum nigrum* L. 龍葵 13964,

Theaceae

*Eurya chinensis* Brown. 米碎柃木 13699,

Ulmaceae

*Ulmus uyematsui* Hay. 阿里山榆 14223,

Urticaceae

*Lecanthus sasakii* Hay. 長梗盤花麻 15016,

Zingiberaceae

*Alpinia speciosa* K. Schum. 玉桃 13918,

表三、幻燈片解說資料庫之一

d13 nanhen 06/29/76 *Dianthus pygmaeus*

note : flower buds and open one

d14 nanhen 06/29/76 *Lilium formosanum*

note : flower blooming, shiny grass slope

d15 nanhen 06/29/76 *Lilium formosanum*

note : flower blooming, shiny grass slope

d16 nanhen 06/29/76 *Bletia formosanum* Schltr.

note : roadside slope shiny

d17 nanhen 06/29/76 *Miscanthus floridulus*

note : full blooming reddish inflorescence

d18 nanhen 06/29/76 *Arundo formosana* Hack

note : plant pendent, rocky walls along roadside

d19 nanhen 06/29/76 *Torenia concolor* Lindley var. *formosana* Yamazaki

note : full blooming reddish inflorescence

d20 nanhen 06/29/76 *Bredia gibba* Ohwi

note : fruit reddish

d21 nanhen 06/29/76 *Bredia gibba* Ohwi

note : fruit reddish

d22 nanhen 06/29/76 *Pilea* sp.

note : roadside shady wet rocky place, flower small

d23 nanhen 06/29/76 *Duchesnea indica*

note : fruit reddish, aggregate

d24 nanhen 06/29/76 *Derris trifoliata*

note : small shrub

d25 nanhen 06/29/76 *Pityrogramma calomelanos*

note : rocky clef, leaf farinose on back, pterophilous

d26 nanhen 06/29/76 *Adiantum malesianum* Ghatak.

note : a recently noted new record very close to *A. caudatum*

d27 nanhen 06/29/76 *Bletia formosanum* Schltr.

note : roadside slope shiny

d28 nanhen 06/29/76 *Torenia concolor* Lindley var. *formosana* Yamazaki

note : pink purplish flower blooming

#### 表四、關山嶺維管束植物名錄

##### Acanthaceae

*Parachampionella flexicaulis*. 曲莖蘭坎馬藍 12934, 12950, 12955,

##### Araliaceae

*Fatsia polycarpa* Hay. 台灣八角金盤 12953,

*Hedera rhombea* Bean var. *formosana*. 台灣常春藤 11985,

##### Athyriaceae

*Athyrium oppositipinum* Hay. 對生蹄蓋蕨 12490, 12503,

*Cystopteris moupinensis* Franch. 寬葉冷蕨 12450, 12480,

##### Balsaminaceae

*Impatiens uniflora* Hay. 紫花鳳仙花 11960, 12448,

##### Berberidaceae

*Berberis alpicola* Schneid. 高山小檗 13422,

*Berberis hayatana* Mizush. 南湖小檗 12464,

*Berberis kawakamii* Hay. 台灣小檗 14236,

*Mahonia oiwakensis* Hay.

#### Blechnaceae

*Woodwardia unigemmata* Nakai. 頂芽狗脊蕨 12956,

#### Campanulaceae

*Adenophora uehatae* Yamamoto. 高山沙參 12460,

*Codonopsis kawakamii* Hay. 玉山山奶草 11948,

#### Caprifoliaceae

*Lonicera acuminata* Wall. 阿里山忍冬 12435,

*Viburnum luzonicum* var. 莢迷 15113,

*Viburnum luzonicum* var. *oblongum* Li. 長橢圓葉莢迷 12949,

#### Caryophyllaceae

*Cerastium triggnum* Vill var. 玉山卷耳 11964,12444,12481,15118

*Silene morrisonmontana* Ohwi. 玉山繩子草 12443,

*Stellaria alsine* Grimm. var. 天蓬草 11966,

#### Compositae

*Ainsliaea reflexa* Merr. 台灣鬼督郵 11955,13418,



<i>Anaphalis margaritacea</i> Benth.	玉山抱莖籟簫 11933,11989,12465,
<i>Artemisia campestris</i> L.	細葉山艾 11979,15110,
<i>Artemisia kawakamii</i> Hay.	山艾 12499,14238,
<i>Aster lasioclada</i> Hay.	絨山白蘭 12447,15103,
<i>Aster taiwanensis</i> Kitamura.	台灣馬蘭 12935, 12944,
<i>Carpesium cernuum</i> L.	杓岩菜 12445,15116,
<i>Cirsium kawakamii</i> Hay.	玉山艾 15096,
<i>Erigeron morrisonensis</i> Hay.	玉山飛蓬 11965,
<i>Ixeris transnokoensis</i> Kitamura.	12466,15099
<i>Myriactis humilis</i> Merr.	矮菊 12477,12940,
<i>Petasites formosanus</i> Kitamura.	山菊 14233,
<i>Saussurea kanzanensis</i> Kitamura.	15095
<i>Senecio scandens</i> Ham. ex D. Don.	蔓黃苑 12441,12405,
<i>Vernonia patula</i> Merr.	嶺南野菊 12009
Crassulaceae	
<i>Sedum morrisonensis</i> Hay.	玉山 12459,15093,
Cruciferae	
<i>Arabis formosana</i> Liu & Ying.	台灣筷子芥 11994,13426,
<i>Arabis morrisonensis</i> Hay.	玉山筷子芥 11971,

Cyperaceae

- Carex cruciata* Wahl. 煙火薑 12960,  
*Carex gentilis* Franch. subsp. 中原氏二柱薑 12919,12957,

Diapensiaceae

- Shortia exappensiculata* Hay. 裂綠花 12469,

Dryopteridaceae

- Arachniodes rhomboides* Ching. 斜方複葉耳蕨 12931,12947,12961,  
*Dryopteris alpestris* Tagawa. 腺鱗毛蕨  
*Dryopteris barbiger*a Ktze. 密毛鱗毛蕨 12506,  
*Dryopteris fibrillosa* Hand-Maz. 密鱗毛蕨 12409,  
*Dryopteris lepidopoda* Hayata 厚葉鱗毛蕨  
*Dryopteris sparsa*(Don.)Ktze. 長葉鱗毛蕨  
*Peranema cyatheoides* Don. 柄囊蕨 12457,  
*Polystichum falcatipinnum* Hay. 鎌葉耳蕨 12505,  
*Polystichum hancockii* Diels. 韓氏耳蕨 12927,12929,  
*Polystichum ilicifolium* Moore. 針葉耳蕨 12507,  
*Polystichum kodamae* Tagawa. 兒玉氏耳蕨  
*Polystichum nepalense* C. Chr. 軟骨耳蕨 12504,  
*Polystichum parvipinnum* Tagawa. 尖葉耳蕨 12928,12952,

*Polystichum piceopaleaceum* Tagawa. 壬鱗耳蕨  
*Polystichum stenophyllum* Christ 芽胞耳蕨  
*Polystichum thomsoni* Beddome 尾葉耳蕨 11978, 12747, 12509,

Elaeagnaceae

*Elaeagnus obovata* L. 小葉胡頹子 12500.

Ericaceae

*Gaultheria itoana* Hay. 高山白珠樹 12000, 12478, 13420,

*Rhododendron morii* Hay. 森氏杜鵑 15120,

*Rhododendron taiwanalpinum* Ohwi 台灣杜鵑 12001,

Euphorbiaceae

*Mercurialis leiocarp* Sieb. 山定 12942,

Gentianaceae

*Gentiana flavo-maculata* Hay. 黃花龍膽 11961,

*Tripterospermum cordifolium* Satake. 高山肺形草 15097,

Geraniaceae

*Geranium hayatanum* Ohwi. 單花牻牛兒苗 11960, 15131,

*Geranium nepalense* Sweet. var. 牻牛兒苗 12476,

*Geranium suzukii* Masamune. 山牻牛兒苗 12430, 15091,

Grammitidaceae

<i>Xiphopteris okuboi</i> Copel.	梳葉蕨 12455,
Guttiferae	
<i>Hypericum nagasewai</i> Hay.	玉山金絲桃 11981,
Hymenophyllaceae	
<i>Mecodium polyanthos</i> Copel.	細葉鐮蕨 12462,
<i>Mecodium wrightii</i> Copel.	萊氏鐮蕨 12456,
Juncaceae	
<i>Luzula taiwaniana</i> Satake.	台灣地楊梅 11962
Labiatae	
<i>Clinopodium gracile</i> Ktze.	塔花 12937,
<i>Clinopodium laxiflorum</i> Matsum.	疏花塔花 11986,
<i>Mentha canadensis</i> L.	薄荷 12492,
<i>Origanum vulgare</i> L. var. <i>formosanum</i> .	台灣晴薄荷 12494,
<i>Paraphlomis gracilis</i> Kudo.	短柄舞子草 12926, 12940,
<i>Salvia arisanensis</i> Hay.	阿里山紫參 12936,
Liliaceae	
<i>Disporum kawakamii</i> Hay.	台灣寶鐸花 12498,
<i>Liriope minor</i> Makino.	小麥門冬 12924,
<i>Smilacina formosana</i> Hay.	台灣鹿藥 11972,

*Trillium tschonoskii* Maxim. 延齡草 11947,12464,

Lycopodiaceae

*Lycopodium clavatum* L. 石松 12496,

*Lycopodium quasipolytrichoides* Hay. 反捲葉石松 13431,15128

*Lycopodium somai* Hey. 相馬氏石松 12510,

Onagraceae

*Epilobium amurense* Hausskn. 黑龍江柳葉菜 11970,

*Epilobium brevifolium* Don. subsp. 短葉柳葉菜 12454,12468,

*Epilobium platystigmatosum* Robins. 闊柱柳葉菜 15702,

Orchidaceae

*Appendicula reflexa* Blume. 竹節蘭 12467,

*Goodyera velutina* Maxim ex Rey. 烏嘴蓮 12453,12461,

*Platanthera stenosepala* Schltr. 狹瓣粉蝶蘭 12439,

*Ponerorchis kiraishiensis*. 奇萊紅蘭 11954,

Oxaliaceae

*Oxalis acetosella* L. subsp. *japonica*. 酢醬草 14234,

Pinaceae

*Piceae morrisonicola* Hay. 台灣雲杉 12920,

*Tsuga chinensis* Diels var. *formosana*. 台灣鐵杉 11952,

Poaceae

<i>Agropyron mayebaratum</i> Honda	前原鵝觀草 11996,12007,
<i>Brachypodium kawakamii</i> Hay.	川上短柄草 11995,
<i>Brachypodium sylvaticum</i> (Huds.)	短柄草 13415,
<i>Bromus morrisonensis</i> Honda.	玉山雀麥 12471,
<i>Deschampsia flexuosa</i> Trin.	曲芒髮草 11975,12003,
<i>Deyeuxia arundinacea</i> Beauv.	類蘆野青茅 12459,
<i>Deyeuxia formosana</i> C. Hsu.	台灣野青茅 12470,
<i>Festuca ovina</i> L. var. <i>ovina</i> L.	羊茅 11990,
<i>Miscanthus floridulus</i> Schum. & Laut.	五節芒 13416,
<i>Yushania niitakayamensis</i> Keng f.	玉山箭竹

Polygonaceae

<i>Polygonum cuspidatum</i> Sieb & Zucc.	虎杖 12473,
<i>Polygonum rucinatum</i> Buch-Ham.	散血草 12422,
<i>Polygonum thunbergii</i> Sieb. & Zucc.	戟狀蓼 11987,

Polypodiaceae

<i>Crypsinus quasidivaricatus</i> Copel.	玉山蕨 12491,
<i>Lepisorus pseudo-ussuriensis</i> .	烏蘇里瓦葦 12959,

Primulaceae

<i>Primula miyabeana</i> to & Kawakami.	報春花 11949,
Pteridaceae	
<i>Cheilanthes argentea</i> Kunze.	長柄粉背蕨 12010,
<i>Cryptogramma brunoniana</i> Wall.	高山珠蕨 13432,
<i>Pteris dactylina</i> Hook.	掌鳳尾蕨 13419,
Pyroiaceae	
<i>Pyrola morrisonensis</i> Hay.	玉山鹿蹄草 13425,
Ranunculaceae	
<i>Aconitum bartletii</i> Vamamoto.	台灣烏頭 12440,
<i>Eriocapitella vitifolia</i> Nakai.	小白頭翁 11999,12959,
<i>Ranunculus matsudi</i> Hay.	疏花毛茛 11956,
<i>Thalictrum fauriei</i> Hay.f	台灣唐松草 15100,
<i>Thalictrum myriophyllum</i> Ohwi.	密葉唐松草 11951,15123,
<i>Thalictrum sessile</i> Hay.	玉山唐松草 12486,
Rosaceae	
<i>Cotoneaster morrisonensis</i> Hay.	玉山舖地蜈蚣 12008,
<i>Prinsepia scandens</i> Hay.	假皂莢 15112,
<i>Rosa transmorrisonensis</i> Hay.	高山薔薇 12938,
<i>Rubus calycinoides</i> Hay.	玉山懸鉤子 12487,

*Spiraea formosana* Hay. 台灣繡線菊 12502,

Rubiaceae

*Galium formosense* Ohwi. 圓葉豬殃殃 11959,12943,13434,  
15092,

*Galium fukuyamii* Masamune. 福山氏豬殃殃 11977,

*Ophiorrhiza japonica* Blume. 蛇根草 12922,12954,

*Rubia linii* Chao. 林氏茜草 15111

Rutaceae

*Boenninghausenia albiflora*. 臭節草 12495,

Salicaceae

*Salix taiwanalpina* Kimura. 高山柳 12497,14231,15124,

*Salix takasagoalpina* Koidz. 台灣山柳 14232,

*Salix warburgii* O. Seem. 水柳 12002,

Saxifragaceae

*Deutzia taiwanensis* Schneider. 台灣溲疏 11990,

*Mitella formosana* Masamune. 台灣噴吶草 12472,

*Parnassia palustris* L. 梅花草 12446,

Scrophulariaceae

*Euphrasia bilineata* Ohwi. 雙脈萃雪草 12436,



*Euphrasia transmorrisonensis* Hay. 玉山小米草 13430,

*Pedicularis ikomai* Sasaki. 馬先蒿草 11992,

Scrophulariaceae

*Ellisiophyllum pinnatum* Makino. 海螺菊 12011,

Smilacaceae

*Smilax vaginata* Decne. 玉山拔契 12493,

Stachyuraceae

*Stachyurus himalaicus* Hook. 通條木 12933,

Theaceae

*Eurya crenatifolia* Kobuski. 假柃木 15122,

*Eurya glaberrima* Hay. 厚葉柃木 12501,

Umbelliferae

*Angelica morii* Hay. 森氏當歸 12004, 12449,

*Centella asiatica* Urban. 雷公根 12925,

*Oreomyrrhis involucrata* Hay. 山熏香 11967,

*Pimpinella niitakayamensis* Hay. 玉山回芹 11963,

Urticaceae

*Elatostema sessile* Forst var. 樓梯草 12923,

Valerianaceae

*Triplostegia glandulifera* Wall.

三萼花草 12463, 15094,

表五、關山嶺植物解說資料庫

altitude

4000

x

3500

x

stem erect, carpel hirsute and the habit in var.

3000

x

formosanum is scandent but in var. fukutomei is

2500

glabrous.

2000

1500

1000

500

0

*Aconitum bartlettii* Yamamoto

Ranunculaceae

flora 2 : 0477

altitude

4000

3500

stem hispid with retrorse unicellular hairs,

3000

x

leaf alternate ; flower actinomorphic, terminal

2500

solitary or few disc tubular or cup-shaped

2000

1500

1000

500

0

*Adenophora uehatae* Yamamoto

Campanulaceae

flora 4 : 0741

altitude

4000

3500

lemma with distinct transparent margin, palea

3000

x winged, ovary with hairy appendage apex, hilum

2500

x linear; spikelet sessile; grain tightly enclosed

2000

between the lemma and palea

1500

1000

500

0

*Agropyron mayebaratum* Honda

Poaceae

flora 5 : 0456

altitude

4000

3500

leaf radical rosulate, base rounded; petiole

3000

x more or less winged.

2500

2000

1500

1000

x

500

0

*Ainsliaea reflexa* Merr.

Compositae

flora 4 : 0779

altitude

4000

3500

cauline leaf not or rarely indistinctly

3000

x decurrent, 3-9cm long; head many in corymbose

2500

x cluster; involucre bracts 7-8-seriate, imbricate

2000

white or yellowish; achene 0.5mm long.

1500

1000

500

0

*Anaphalis margaritacea* Benth. subsp.

*morrisonicola* Kitamura

Compositae

flora 4 : 0781

altitude

4000

3500

x plant less than 1m high, ultimate segment of

3000

x leaf 2cm long 1cm broad; peta glabrous; carpel

2500

6 vittae.

2000

1500

1000

500

0

*Angelica morii* Hay.

Umbelliferae

flora 3 : 0942

altitude

4000

3500  
3000  
2500  
2000  
1500  
1000  
500  
0

plant epiphyte; leaf elliptic or oblong, about  
x 3cm long; flower greenish fleshy.

x  
x  
x

*Appendicula reflexa* Blume

Orchidaceae

flora 5 : 0880

altitude

4000  
3500  
3000  
2500  
2000  
1500  
1000  
500

x  
x leaves entire, radical leave 2-3cm long  
x 0.5-0.6cm wide.

0

*Arabis formosana* Liu & Ying

Cruciferae

flora 2 : 0676

altitude

4000

x

3500

x

leaves lyrately lobed.

3000

x

2500

2000

1500

1000

500

0

*Arabis morrisonensis* Hay.

Cruciferae

flora 2 : 0678

altitude

4000

3500

lamina subcoriaceous, bipinnate, pinnule or

3000



x segment sharply dentate; indusium reniform  
2500  
x fringed.  
2000  
x  
1500  
x  
1000  
500  
0

*Arachniodes rhomboides* Ching.

Dryopteridaceae

flora 1 : 0365

altitude

4000  
3500  
perennial plant, inflorescence 4.5-12cm long,  
3000  
x leaf 2.5cm long; segment 1mm long.  
2500  
x  
2000  
1500  
1000  
500  
0

*Artemisia kawakamii* Hay.

Compositae

flora 4 : 0789

altitude

4000

3500

stem and leaf densely pubescent; head 1.3cm

3000

x broad, corymbosely arranged, involucre

2500

campanulate, bracts 3-seriate, ray flower white;

2000

achene densely hirsute; pappus reddish.

1500

1000

500

0

*Aster lasioclada* Hay.

Compositae

flora 4 : 0797

altitude

4000

3500

stem striated, terete, subglabrous or

3000

x hispidulous; head paniculately arranged,

2500

x involucre tubular, campanulate 4-5 seriate, ray

2000

x flower white, disc flower yellow; pappus 4.5mm  
1500  
x long white or reddish.  
1000  
500  
0

*Aster taiwanensis* Kitamura

Compositae

flora 4 : 0801

altitude

4000  
3500  
x pinnae patent underside of rachis and costae  
3000  
x without glandular hairs; pinnules of middle  
2500  
pinnae broadly adnate at base, spine-like  
2000  
processes borne along costa but not along  
1500  
costule, pinnae sessile, widely patent lower  
1000  
pinnae opposite upper pair usually alternate  
500  
0

*Athyrium oppositipinnum* Hay.

Athyriaceae

flora 1 : 0452

altitude

4000

3500

leave 1.5-2.5cm long, marginal teeth spreading,

3000

x less than 8 in number.

2500

x

2000

1500

1000

500

0

*Berberis alpicola* Schneid

Berberidaceae

flora 2 : 0515

altitude

4000

3500

x leave 2-5.5cm long, marginal teeth ascending

3000

x less than 8 in number.

2500

x

2000

1500

1000

500

0

*Berberis kawakamii* Hay.

Berberidaceae

flora 2 : 0516

altitude

4000

3500

herbaceous plant with abundant pellucid glands

3000

x filled with essential oil; stem teret branched;

2500

x leaf ternately 2-3-pinnate, leaflets entire;

2000

panicle compound flower white.

1500

1000

500

0

*Boenninghausenia albiflora*

Rutaceae

flora 3 : 0507

altitude

4000

3500

3000 x ovary with hairy appendage apex, hilum linear,  
2500 x spikelet shortly; pedicelled on a raceme, lemma  
2000 villous-tomentose raceme only with 1- to  
1500 3-spikelet.  
1000  
500  
0

*Brachypodium kawakamii* Hay.

Poaceae

flora 5 : 0426

altitude

4000  
3500  
3000 x ovary with hairy appendage apex, hilum linear,  
2500 x spikelet shortly; pedicelled on a raceme, lemma  
2000 x glabrous or shortly hirsute; raceme more than 3  
1500 spikelet.  
1000  
500  
0

*Brachypodium sylvaticum* (Huds.) Beauv. var

*luzoniense* Hara

Poaceae

flora 5 : 0428

altitude

4000

3500

sheath with fused margin, ovary with hairy

3000

x appendage apex, hilum linear; spikelet

2500

x pedicelled in a panicle; lemma pubescent at base

2000

of vein.

1500

1000

500

0

*Bromus morrisonensis* Honda.

Poaceae

flora 5 : 0429

altitude

4000

3500

culm 30-200cm high; spike 1-2cm long in

3000

2500 x paniculiform arising from empty prophyll, all  
2000 x androgynous; utricle almost as long as the  
1500 glume; stigma 3 achene 3-sided.  
1000  
500  
0

*Carex cruciata* Wahl.

Cyperaceae

flora 5 : 0310

altitude

4000  
3500 x inflorescence of several fascicle of spike all  
3000 x androgynous; utricle sparsely hispidulous along  
2500 margin only; pistilate glum much shorter than  
2000 utricle; stigma 2; achene lenticular.  
1500  
1000  
500  
0

*Carex gentilis* Franch. subsp. *nakaharai* T. Koyama



Cyperaceae

flora 5 : 0322

altitude

4000

3500

stem densely white villous, much branched; leaf

3000

x spathulate, oblong, base contracted into winged

2500

x petiole; margin irregularly mucronulate,

2000

x duplicate-serrate, white villous on both

1500

x surface; head 15-18mm across, pedunculate;

1000

x achene linear 5mm long.

500

x

0

*Carpesium cernuum* L.

Compositae

flora 4 : 0819

altitude

4000

3500

prostrate perennial herb; leaf

3000

x orbicular-reniform, entire crenate or lobulate;

2500

petiole 4-10cm long; umbels 3-6-flowered.

2000

1500

x

1000

x

500

x

0

*Centella asiatica* Urban

Umbelliferae

flora 3 : 0944

altitude

4000

x

3500

x

capsule dehiscent by terminal teeth, leaf less

3000

x

than 1cm long; petal double the length of sepal.

2500

2000

1500

1000

500

0

*Cerastium trigynum* Vill var. *morrisonense* Hay.

Caryophyllaceae

flora 2 : 0326

altitude

4000

3500

frond deltoid, nether surface white or yellow

3000

x ceraceous, pseudoindusium continuous and with.

2500

smooth margin.

2000

x

1500

x

1000

500

0

*Cheilanthes argentea* Kunze

Pteridaceae

flora 1 : 0282

altitude

4000

3500

both surface of leaf-blade glabrous or lower

3000

x surface minutely hair on the veinlets, bracteole

2500

x shorter than or as lon as pedicel, calyx teeth

2000

x triangular; leaf membranous.

1500

x

1000

500 x  
0 x

*Clinopodium gracile* Ktze.

Labiatae

flora 4 : 0453

altitude

4000

3500

both surface of leaf-blade glabrous or lower

3000

x surface minutely hair on the veinlets, bracteole

2500

x longer than pedicel; calyx teeth narrowly

2000

x triangular; leaf coriaceous.

1500

1000

500

0

*Clinopodium laxiflorum* Matsum

Labiatae

flora 4 : 0456

altitude

4000

3500

vine-like herb with bed-smeling; leaf alternate  
3000 x or opposite, both surface densely covered with  
2500 white hair; flower actinomorphic; capsule 1cm  
2000 long and across, apically deshiscent.  
1500  
1000  
500  
0

*Codonopsis kawakamii* Hay.

Campanulaceae

flora 4 : 0748

altitude

4000 x  
3500 x low prostrate shrub, densely branched; leaf  
3000 x coriaceous, ovate, obovate up to 1-2cm long  
2500 5-10mm wide, entire; flower solitary; fruit  
2000 ellipsoid red.  
1500  
1000  
500  
0

*Cotoneaster morrisonis* Hay.

Rosaceae

flora 3 : 0061

altitude

4000

x

3500

x

rhizome ascending, stipe fascicular; fertile

3000

x

frond with lamina deltoid-ovate, tripinnate,

2500

ultimate pinnule linear-oblong, sterile frond

2000

smaller, ultimate pinnule elliptic dentate.

1500

1000

500

0

*Cryptogramma brunoniana*

Pteridaceae

flora 1 : 0284

altitude

4000

x

3500

x

frond distant, multicellular hair lacking;

3000

x

rachis groove open to admit grooves of rachillae

2500

2000

1500

1000

500

0

*Cystopteris moupinensis* Franch

Athyriaceae

flora 1 : 0457

altitude

4000

3500

x plant body less than 30cm high, leaf blade

3000

x filiform, panicle purplish, lemma with bent-awn

2500

2000

1500

1000

500

0

*Deschampsia flexuosa* Trin.

Poaceae

flora 5 : 0411

altitude

4000

3500

leaf membranaceous, chartaceous, oblong-

3000

x lanceolate, margin serrulate; inflorescence to

2500

x 6cm long.

2000

x

1500

x

1000

500

0

*Deutzia taiwanensis* Schneider

Saxifragaceae

flora 3 : 0034

altitude

4000

3500

x spikelet 1-flowered, bisexual; lemma rounded

3000

x apex, with dorsal awn, rachilla 1.2mm long with

2500

long silky hair; anther more than 2mm long;

2000

lodicule bifid at apex.

1500



1000

500

0

*Deyeuxia arundinacea* Beauv.

Poaceae

flora 5 : 0413

altitude

4000

3500

x spikelet 1-flowered, bisexual, lemma apex

3000

x minutely 2-toothed or lobed with dorsal awn,

2500

basal with short hair, rachilla minute; anther

2000

less than 1.25mm long; lodicule acuminate.

1500

1000

500

0

*Deyeuxia formosana* C. Hsu

Poaceae

flora 5 : 0415

altitude

4000

3500  
3000  
2500  
2000  
1500  
1000  
500  
0

x leaf lanceolate 3-4cm wide, petiolate; flower  
yellowish-white.

x  
x

*Disporum kawakamii* Hay.

Liliaceae

flora 5 : 0052

altitude

4000  
3500  
3000  
2500  
2000  
1500  
1000  
500

x  
x frond bipinnate, pinnule on basispic side,  
x about equal in length or only slightly longer  
than on acroscopic side, upper surface of lamina  
covered with long hair; stipe and rachis densely  
covered with reddish-brown scale of dfferent  
size but not reflexed.

0

*Dryopteris barbigera* Ktze.

Dryopteridaceae

flora 1 : 0375

altitude

4000

3500

x frond bipinnate, pinnule on basispic side

3000

x about equal in length or only slightly longer

2500

x than on acroscopic side, upper surface glabrous;

2000

x rachis scale black, scale not reflexed.

1500

1000

500

0

*Dryopteris lepidopoda* Hayata

Dryopteridaceae

flora 1 : 0378

altitude

4000

3500

first basispic pinnule of lowest pinna much

3000

2500 x longer than the next basisopic pinnule; scale  
 2000 x on upper stipe rachis and rachillae few or none.  
 1500 x  
 1000 x  
 500 x  
 0

*Dryopteris sparsa* (Don.) Ktze.

Dryopteridaceae

flora 1 : 0380

altitude

4000  
 3500 spiny shrub branchlet greyish, silvery-  
 3000  
 2500 x lepidote, 3-4cm long 1.4-1.8cm wide, apex acute;  
 2000 fruit 2-4 fasciculate, 7-8mm long, silvery  
 1500 lepidote.  
 1000  
 500 x  
 0

*Elaeagnus obovata* Li.

Elaeagnaceae

flora 3 : 0757

altitude

4000

x

3500

plant less than 25cm high; annual herbs; leave

3000

x

lanceolate.

2500

2000

1500

1000

x

500

0

*Elatostema sessile* Forst var. *cuspidatum* Wedd.

Urticaceae

flora 2 : 0183

altitude

4000

3500

delicate pubescent perennial herbs; stem long-

3000

x

creeping; leaf alternate, long-petiolate,

2500

x

pinnately cleft; flower solitary in axils white.

2000

1500 x  
1000 x  
500  
0

*Ellisiophyllum pinnatum* Makino

Scrophulariaceae

flora 4 : 0556

altitude

4000  
3500  
3000  
2500  
2000  
1500  
1000  
500  
0

tufted herb; stem pubescent along strongly  
elevated lines decurrent from the margins of  
the petioles..

x

*Epilobium amurense* Hauskn.

Onagraceae

flora 3 : 0885

altitude

4000

3500

x tufted herb; stem pubescent all around; leaf

3000

x lanceolate or narrowly ovate, 0.4-1.5cm wide

2500

x with 4-22 teeth on each side.

2000

1500

1000

500

0

*Epilobium brevifolium* Don. subsp. *trichoneurum*

Raven

Onagraceae

flora 3 : 0887

altitude

4000

x

3500

x radical leaf linear spatulate, margin sparsely

3000

x mucronulae to entire, cauline leaf 1-3cm long

2500

1.5-5mm broad; 1-6 head 1.3-1.9cm across,

2000

involucre 5mm or more long.

1500

1000

500

0

*Erigeron morrisonensis* Hay.

Compositae

flora 4 : 0860

altitude

4000

3500

x fronds deeply pinnatifid, 2-5pairs of lateral

3000

x lobes, lowest lobes deflexed, margin serrulate

2500

x and with a notch between main veins.

2000

1500

1000

500

0

*Crypsinus quasidivaticatus* Copel.

Polypodiaceae

flora 1 : 0175

altitude

4000



3500

x rhizomatous perennial herb; sericeous-tomentose

3000

x hairs, radical leave clustered, long-petiolate

2500

x (6-10cm), trifoliolate, dilate-clasping at base.

2000

1500

1000

500

0

*Eriocapitella vitifolia* Nakai

Ranunculaceae

flora 2 : 0495

altitude

4000

3500

stem pubescent along two line, leaf broadly

3000

x ovate with 2-3 teeth on either margin; the teeth

2500

acutish.

2000

1500

1000

500

0

*Euphrasia bilineata* Ohwi

Scrophulariaceae

flora 4 : 0560

altitude

4000

3500

x leaf glabrous or sparsely pubescent; calyx

3000

x glandular hairs; leaf glabrous.

2500

2000

1500

1000

500

0

*Euphrasia transmorrisonensis* Hay.

Scrophulariaceae

flora 4 : 0565

altitude

4000

3500

x leave up to 2.5cm broad, sharply toothed, evenly

3000

2500 x elliptic, longer than 4cm glabrous ovary and  
fruit glabrous.

2000

1500

1000

500

0

*Eurya glaberrima* Hay.

Theaceae

flora 2 : 0608

altitude

4000

3500

x small tree or shrub, all leaf distinctly

3000

x 5-7-palmately lobed, 1/2 the length orbicular in

2500

outline, 20-35cm across; umbels arranged in

2000

terminal panicle.

1500

1000

500

0

*Fatsia polycarpa* Hay.

Araliaceae

flora 3 : 0925

altitude

4000

3500

x culm base erect; blade 0.3-0.6mm broad; ovary

3000

x glabrous; spikelet one to several flower; sheath

2500

margin adnate at least at the basal part; glume

2000

about 1/3 as long as lowest lemma.

1500

1000

500

0

*Festuca ovina* L. var. *ovina* L.

Poaceae

flora 5 : 0441

altitude

4000

3500

x leaves 3, main veins pubescent; different from

3000

x *G. morii* (glabrous).

2500

2000

1500

1000

500

0

*Galium formosense* Ohwi

Rubiaceae

flora 4 : 0261

altitude

4000

3500

small herb 10-20cm high, branch glabrous,

3000

x internode longer than 1cm long; leaf 4

2500

verticillate; fruit with short depressed hooked

2000

hair.

1500

1000

500

0

*Galium fukuyamii* Masamune

Rubiaceae

flora 4 : 0261

altitude

4000

3500

x leaf 1-1.5cm long; flower pseudo-terminal

3000

x racemes; calyx enclosing the capsule and

2500

x becoming enlarged and berry-like.

2000

1500

1000

500

0

*Gaultheria itoana* Hay.

Ericaceae

flora 4 : 0016

altitude

4000

3500

leaf with cartilaginous white margins; stem

3000

x erect; leaf not plicate; calyx-lobe linear

2500

x shorter than calyx-tube.

2000

x

1500

1000

500

0

*Gentiana flavo-maculata* Hay.

Gentianaceae

flora 4 : 0170

altitude

4000

3500

x leaf simple 3-5-divided; stem ascending; corolla

3000

x purple; flower soliatry.

2500

2000

1500

1000

500

0

*Geranium hayatanum* Ohwi

Gentianaceae

flora 3 : 0428

altitude

4000

3500

leaves simple, 3-5-divided; flower yellow; stem  
3000 x stoloniferous.  
2500  
2000  
1500  
1000  
500  
0

*Geranium suzukii* Masamune

Geraniaceae

flora 3 : 0430

altitude

4000  
3500  
3000 leaf dark green with a distinct white midrib;  
2500 x flower more than 5 usually erect.  
2000  
1500 x  
1000 x  
500 x  
0



Goodyera velutina Maxim ex Rey

Orchidaceae

flora 5 : 1014

altitude

4000

3500

scandent shrub, woody vine climbing by aerial

3000

x rootlets; leaf without glands, leaf 3-5-lobed of

2500

x 5-angular, green shiny above and pale beneath;

2000

x corymbose umbel stellately pubescent.

1500

x

1000

500

0

Hedera rhombea Bean var. formosana Li.

Araliaceae

flora 3 : 0925

altitude

4000

3500

flower 1-2; wing-petals trilobed; anther caudate

3000

x flower white reddish-purple or pale purple.

2500

2000 x  
1500 x  
1000  
500  
0

*Impatiens uniflora* Hay.

Balsaminaceae

flora 3 : 0601

altitude

4000

3500

x leaf narrow-linear 2-3mm wide 3-7 nerved, scape

3000

x 8-12cm long with 5-10 flower fascicled at apex.

2500

x

2000

1500

1000

500

0

*Liriope minor* Makino

Liliaceae

flora 5 : 0063

altitude

4000

3500

x rhizome scale concolorous, lumina all clear;

3000

x frond narrowly-linear 3-7mm wide; rhizome

2500

x 1-2.5mm wide; sori oval, reaching from costa to

2000

margin; venation of lamina hidden.

1500

1000

500

0

*Lepisorus pseudo-ussuriensis* Tagawa

Polypodiaceae

flora 1 : 0187

altitude

4000

3500

climbing shrubs; leaf simple, glabrous beneath;

3000

x flower in peduncled pairs; fruit 2-3-celled

2500

x berry.

2000

1500

1000

500

0

*Lonicera acuminata* Wall.

Caprifoliaceae

flora 4 : 0707

altitude

4000

3500

x leaf more or less pilose on the margin; capsule

3000

x 1-locule; inflorescence a spike-like head not

2500

x open cyme.

2000

1500

1000

500

0

*Luzula taiwaniana* Satake

Juncaceae

flora 5 : 0156

altitude

4000

x

3500

x branch terete; sporophyll very different from

3000

x vegetative leaf, the latter flat spiral

2500

x monomorphic, ending in a long hair-like tip;

2000

x strobili stalked 2-several.

1500

x

1000

500

0

*Lycopodium clavatum* L.

Lycopodiaceae

flora 1 : 0035

altitude

4000

3500

x perennial herbs; creeping rhizome; leaf mostly

3000

x basal cordate, incised to lobulate long-

2500

petiolate; spicate raceme; sepal 5, equal in

2000

size; fruit capsule.

1500

1000

500

0

*Mitella formosana* Masamune

Saxifragaceae

flora 3 : 0042

altitude

4000

3500

x no distinct strobilus; terrestrial plants;

3000

	x	vegetative leaf entire with reflexed leaf 5-10mm
2500		
	x	long.
2000		
	x	
1500		
	x	
1000		
500		
0		

*Lycopodium quasipolytrichoides* Hay.

Lycopodiaceae

flora 1 : 0029

altitude

4000		
3500		
	x	plant glabrous; frond including stipe 10-25cm
3000		
	x	tall; stipe wingless.
2500		
	x	
2000		
	x	
1500		
	x	
1000		
500		
0		

*Mecodium polyanthos* Copel.

Hymenophyllaceae

flora 1 : 0127

altitude

4000

3500

x plant glabrous; frond including stipe 1.5-3.5cm

3000

x tall stipe wingless.

2500

x

2000

1500

1000

500

0

*Mecodium wrightii* Copel.

Hymenophyllaceae

flora 1 : 0127

altitude

4000

3500

x perennial herb covered with septate hairs; leaf

3000

puberulent covered with glandular dots;

2500

clustered flower in leaf axil; calyx campanulate

2000



5-toothed.

1500

1000

x

500

x

0

*Mentha canadensis* L.

Labiatae

flora 4 : 0484

altitude

4000

3500

perennial herb, rhizome long creeping; stem

3000

x simple glabrous; leaf opposite 5-8cm long

2500

x 1.5-2cm wide, margins serrulate; spike axillary,

2000

solitary 6-10cm long; staminate in lower,

1500

pistillate in upper.

1000

500

0

*Mercurialis leiocarp* Sieb.

Euphorbiaceae

flora 3 : 0487

altitude

4000  
3500  
3000  
2500  
2000  
1500  
1000  
500  
0

- x main axis of inflorescence longer than the
- x raceme and raceme more or less branched;
- x spikelets 2-4mm long inflorescence more than
- x 30cm long.
- x
- x
- x

*Miscanthus floridulus* Schum. & Laut.

Poaceae

flora 5 : 0678

altitude

4000  
3500  
3000  
2500  
2000  
1500  
1000

- x inflorescence in contract panicle, spikelet with
- x only one fertile floret; glume thinner and
- x shorter than lemma, tip of lemma with awn 8mm
- x long, vein distinct; pericarp not free.

500

0

*Muhlenbergia longistolon* Ohwi

Poaceae

flora 5 : 0498

altitude

4000

x

3500

x

stem erect villous puberulous; radical leaf

3000

x

oblong lyrate-pinnatifid with long winged

2500

x

petiole; segment of 2-3 pairs; head solitary

2000

7-9mm across; involucre bract 2-seriate; achene

1500

2mm long.

1000

500

0

*Myriactis humilis* Merr.

Compositae

flora 4 : 0912

altitude

4000

3500

3000 x perennial herb, leaf all radical, 1-2 pinnate;  
2500 x umbel simple.  
2000  
1500  
1000  
500  
0

*Oreomyrrhis involucrata* Hay.

Umbelliferae

flora 3 : 0960

altitude

4000  
3500 blade elliptic to ovate; flower in corymbosal  
3000  
2500 x thyrses; calyx 5-toothed, the lobe equal;  
2000 x corolla 5-lobed, bilabiate; fruit glabrous.  
1500 x  
1000 x  
500  
0

*Origanum vulgare* L. var. *formosanum* Hay.

Labiatae

flora 4 : 0494

altitude

4000

3500

x herb rhizome erect; leaf radical, leaflets

3000

x 1-1.5cm long 1-3cm wide; flower solitary, yellow

2500

or pale yellow.

2000

1500

1000

500

0

*Oxalis acetosella* L. subsp. *japonica* Hara

Oxalidaceae

flora 3 : 0427

altitude

4000

3500

suffrutescent herb, glabrous; branch often

3000

x zigzag; flower in spike, corolla contorted in

2500

x bud, calyx 3-partite, perfect stamen 4; seed 4.  
2000  
1500  
1000  
500  
0

*Parachampionella flexicaulis*

Acanthaceae

flora 4 : 0652

altitude

4000  
3500  
3000 blade elliptic to ovate 2-5cm wide; flower in  
2500 x verticillate cymes; calyx teeth 5, narrowly  
triangular, the lobe equal; corolla 5-lobed,  
2000 x bilabiate; fruit glabrous.  
1500  
1000 x  
500 x  
0

*Paraphlomis gracilis* Kudo

Labiatae

flora 4 : 0496

altitude

4000

3500

x perennial glabrous herbs; rhizomes short; leaf

3000

x radical, orbicular-cordate entire; flower

2500

solitary, white or pale yellow.

2000

1500

1000

500

0

*Parnassia palustris* L.

Saxifragaceae

flora 3 : 0044

altitude

4000

3500

x leaf glabrous beneath; beak of corolla-galea

3000

x more or less entire at apex; opposite corolla

2500

purple, the upper galea terminating in a short

2000

beak.

1500

1000

500

0

*Pedicularis ikomai* Sasaki

Scrophulariaceae

flora 4 : 0585

altitude

4000

3500

rhizome short erect or suberect; stipe tufted

3000

x densely scaly; frond tripinnate to 4-pinnatifid,

2500

x vein free forking; indusia globose stalked.

2000

x

1500

x

1000

500

0

*Peranema cyatheoides* Don.

Dryopteridaceae

flora 1 : 0383

altitude

4000



3500

x leaf pinnate, leaflet margin dentate; calyx-

3000

x teeth minute or obsolete; ribs filiform,

2500

carpophore present; umbels compound.

2000

1500

1000

500

0

*Pimpinella niitakayamensis* Hay.

Umbelliferae

flora 3 : 0967

altitude

4000

x

3500

x stem erect, ascending above; outer perianth-

3000

x segment winged on back in fruit; leaf-sheaths

2500

4-6mm.

2000

1500

1000

500

0

*Polygonum cuspidatum* Sieb. & Zucc.

Polygonaceae

flora 2 : 0268

altitude

4000

3500

x leaf runcinate auricled at base, glandular-

3000

x punctate beneath; petioles winged.

2500

2000

1500

1000

500

0

*Polygonum runcinatum* Buch-Ham

Polygonaceae

flora 2 : 0280

altitude

4000

3500

stem armed with recurved prickles; leaf hastate;

3000

2500 x sheath cylindrical, expanding margin entire or

2000 x few shallow incision.

1500

1000

500

0

*Polygonum thunbergii* Sieb. & Zucc.

forma *biconvexum* Liu

Polygonaceae

flora 2 : 0284

altitude

4000

3500

3000

2500 x pinnae pinnatifid to bipinnate with white-  
callose margin; scale at base of stipe blackish

2000

x shining, rigid in texture, those on rachis

1500

lanceolate to linear.

1000

500

0

0

*Polystichum falcatipinum* Hay.

Dryopteridaceae

flora 1 : 0390

altitude

4000

3500

x pinnae or pinnule without a white-callose

3000

x margin, apical margin of large scale without

2500

x dark brown serration, large stipe scales without

2000

brown cilia at apex, basal pinnae usually

1500

elongate and again pinnate, sometimes about the

1000

size of the others but more deeply cut.

500

0

*Polystichum hancockii* Diels

Dryopteridaceae

flora 1 : 0390

altitude

4000

3500

x pinnae narrow lanceolate, margin not revolute,

3000

x lamina rigidly coriaceous; large scale on stipe

2500

2000  
1500  
1000  
500  
0

incised at top, small scale on undersurface of  
pinna linear with an obtuse or gland-like tip;  
indusium distorted orbicular with undulate  
margin large.

*Polystichum ilicifolium* Moore

Dryopteridaceae

flora 1 : 0392

altitude

4000  
3500  
3000  
2500  
2000  
1500  
1000  
500  
0

x pinnae or pinnule without a white-callose margin  
frond bipinnate, rachis not viviparous, large  
basal scale membranaceous with a black central  
line, apical margin of large scale with dark  
brown serration; sori usually terminal on  
veinlet; scale on rachis linear intermixed with  
large ovate or lanceolate one.

*Polystichum kodamae* Tagawa

Dryopteridaceae

flora 1 : 0392

altitude

4000

3500

x pinnae with white-calloose margin but not

3000

x pinnatifid; scale at base of stipe brown, thin

2500

x in texture, those on rachis lanceolate

2000

intermixed with broadly ovate-acuminate one.

1500

1000

500

0

*Polystichum nepalense* C. Chr.

Dryopteridaceae

flora 1 : 0394

altitude

4000

3500

pinnae margin not revolute, stipe without

3000

x blackish scale; indusium nearly entire; lamina

2500

x not rigid, large scale on stipe not incised at

2000

top, small scale on undersurface of pinna

1500

1000 acicular with acrosus top; indusia round thick  
500 membranaceous with sinuate cell.  
0

*Polystichum parvipinum* Tagawa

Dryopteridaceae

flora 1 : 0395

altitude

4000  
3500 x pinnae margin not revolute stipe with lustrous  
3000 x blackish scale; indusium fimbriate on margin;  
2500 lamina not rigid; large scale on stipe not  
2000 incised at top; small scale on undersurface of  
1500 pinna acicular with acrosus top; indusia round  
1000 thick membranaceous with sinuate cell.  
500  
0

*Polystichum parvipinum* Tagawa

Dryopteridaceae

flora 1 : 0396

altitude

4000

3500

x basal pinnae reduced and retrose; small scale

3000

x on under surface of pinna deltoid; lamina

2500

coriaceous, simple pinnae; rachis viviparous

2000

below the foliose apex.

1500

1000

500

0

*Polystichum stenophyllum* Christ

Dryopteridaceae

flora 1 : 0397

altitude

4000

3500

x pinnae or pinnule without a white callose margin

3000

x , not revolute; apical margin of large scale

2500

without dark brown serration, large stipe scales

2000

without brown cilia at apex; lamina bipinnatifid

1500

; sori terminal on veinlet; indusia thin

1000

membranaceous orbicular-reniform with undulate

500



linear cell.

0

*Polystichum thomsoni* Beddome

Dryopteridaceae

flora 1 : 0399

altitude

4000

3500

x terrestrial leafy herb; leaf sheathing not

3000

x plicate; flower usually 1-3, whitish purple with

2500

red spot on the lip.

2000

1500

1000

500

0

*Ponerorchis kiraishiensis*

Orchidaceae

flora 5 : 1073

altitude

4000

3500

x perennial tufted herb; stolon stout; leaf all

3000

2500 x radical, spatulate, 12-24cm long 3-5cm wide,  
margin with short deltoid teeth; scapose terete;  
2000  
flowers whorled at interval on indeterminate  
1500  
umbel; corolla purple.  
1000  
500  
0

*Primula miyabeana* Ito & Kawakami

Primulaceae

flora 4 : 0086

altitude

4000  
3500 x stipe stramineous glabrous; frond palmate,  
3000 x lamina digitate consisting of 3-7 pinnae,  
2500 without false-vein in mesophyll; sterile pinna  
2000 less than 0.7cm wide, apex tapering.  
1500  
1000  
500  
0

*Pteris dactylina* Hook.

Pteridaceae

flora 1 : 0294

altitude

4000

3500

x perennial herb 20cm high; leaf ovate-rhomboid

3000

x 2-3cm long 2-2.5cm broad, upper surface with

2500

x impressed veins; racemes 10-25cm long.

2000

1500

1000

500

0

*Pyrola morrisonensis* Hay.

Pteridaceae

flora 4 : 0011

altitude

4000

3500

x perennial herbs, densely hirsute; stem solid,

3000

x sheath thickened; middle segment of leaf

2500

regularly 3-lobed, spear-like.

2000

1500

1000

500

0

*Ranunculus matsudi* Hay.

Ranunculaceae

flora 2 : 0502

altitude

4000

3500

x leaf pubescent beneath, glabrous above; stipule

3000

x adnate to petiole, more than half their length;

2500

x flower solitary, style united into column,

2000

glabrous.

1500

1000

500

0

*Rosa transmorrisonensis* Hay.

Rosaceae

flora 3 : 0103

altitude

4000

3500

prostrate subshrub; stems rooting at nodes; leaf

3000

x coriaceous, rounded in outline 2-3.5cm across,

2500

x base deeply cordate, shallowly 3-4-lobed, margin

2000

coarsely dentate, upper surface rugose, lower

1500

surface fulvous tomentose; stipule ovate-oblong

1000

7-10mm long 5mm wide.

500

0

*Rubus calycinoides* Hay.

Rosaceae

flora 3 : 0109

altitude

4000

x

3500

leaves 2-3cm, ovary and capsule pubescent; stalk

3000

x 2-3mm long.

2500

2000

1500

1000

500

0

*Salix taiwanalpina* Kimura

Salicaceae

flora 2 : 0038

altitude

4000

3500

plant creeping; leave 1cm; ovary and capsule

3000

x glabrous; stalk 0.7mm long.

2500

2000

1500

1000

500

0

*Salix takasagoalpina* Koidz.

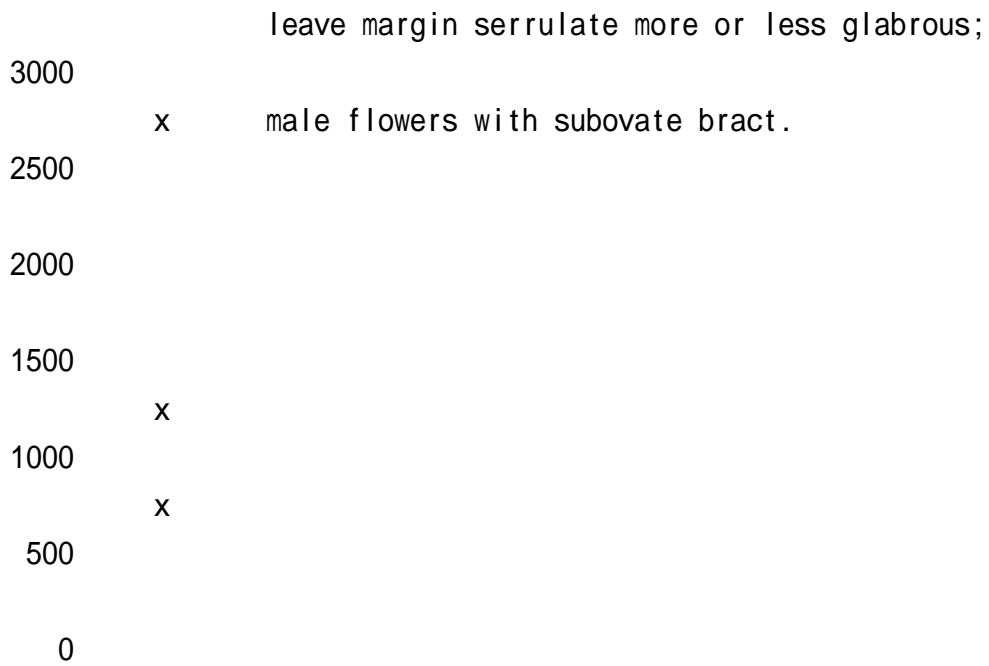
Salicaceae

flora 2 : 0039

altitude

4000

3500

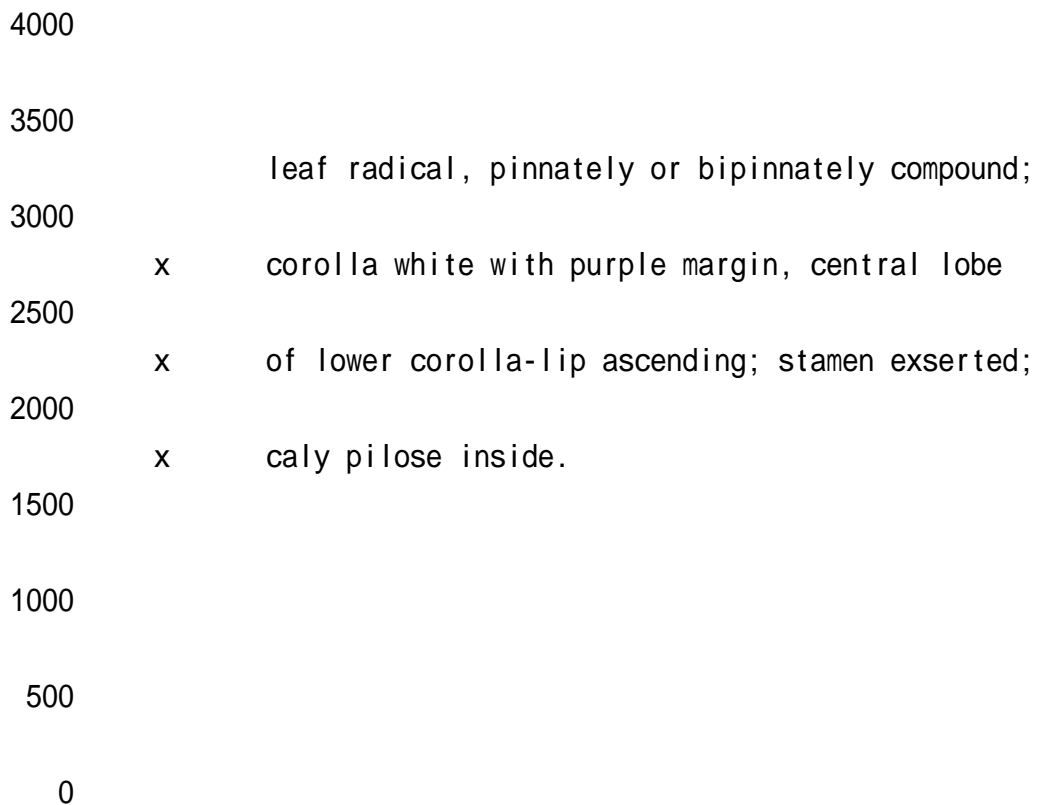


Salix warburgii O. Seem.

Salicaceae

flora 2 : 0039

altitude



*Salvia arisanensis* Hay.

Labiatae

flora 4 : 0510

altitude

4000

x

3500

x

plant glabrous; flowers yellow; sepal free,

3000

x

unequal in length; stigma pointed; leaf margin

2500

entire; oblong-lanceolate densely arranged;

2000

cymose more than 6 flowers; stem erect densely

1500

branched above.

1000

500

0

*Sedum morrisonensis* Hay.

Crassulaceae

flora 3 : 0019

altitude

4000

x

stem elongate scandent branched; leaf elongate-

3000

x

deltoid, apex acuminate, base truncate to

2500



2000 hastate, margin incised dentate or subentire,  
1500 pubescent on both side; paniculate corymbose  
1000 terminal.  
500  
0

*Senecio scandens* Ham. ex D. Don

Compositae

flora 4 : 0933

altitude

4000  
3500  
3000 x perennial glabrous herb; leaf radical, rounded  
2500 x to obovate 2-5cm long and broad, margin serrate-  
2000 crenate; scape 1-3 erect; flower solitary;  
1500 capsule 5mm long.  
1000  
500  
0

*Shortia exappensiculata* Hay.

Diapensiaceae

flora 4 : 0001

altitude

4000

x

3500

x

3000

x

2500

2000

1500

1000

500

0

*Silene morrisonmontana* Ohwi.

Caryophyllaceae

flora 2 : 0342

altitude

4000

x

3500

x

3000

x

2500

x

2000

1500

sepal united; petal imbricate; fruit capsule (in the genus *Cucubalus* the fruit is a berry) flower solitary.

perennial herb; rhizome creeping; leaf ovate-oblong, rounded at base, 7-12cm long 2.5-3.5cm wide; panicle solitary terminal; flower white; berry globose 6-8mm across red.

1000

500

0

*Smilacina formosana* Hay.

Liliaceae

flora 5 : 0077

altitude

4000

3500

stem woody, petiole jointed at very apex of

3000

x petiolar sheath, leaf blade ovate to ovate-

2500

x oblong, thin and no tendril; inflorescence

2000

single umbel at lower part of branch.

1500

1000

500

0

*Smilax vaginata* Decne

Liliaceae

flora 5 : 0126

altitude

4000

3500  
 x shrub branchelets, densely pubescent; leaf 4-8cm  
 3000  
 x long 2-3cm wide; margin double-serrate, mature  
 2500  
 x follicle spreading.  
 2000  
 1500  
 1000  
 500  
 0

*Spiraea formosana* Hay.

Rosaceae

flora 3 : 0137

altitude

4000  
 3500  
 x small tree with spreadig branches; leaf greenish  
 3000  
 x above pale beneath, 8-13cm long 3.5-5.5cm broad,  
 2500  
 x finely serrulate, pendulous; raceme 5-10cm long,  
 2000  
 x sessile flower yellow; fruit subglobose 7-8mm  
 1500  
 x across.  
 1000  
 x  
 500

x  
0

*Stachyurus himalaicus* Hook.

Stachyuraceae

flora 3 : 0786

altitude

4000

3500

achene distinctly stipitate; stem less than 50cm

3000

x high.

2500

x

2000

x

1500

1000

500

0

*Thalictrum fauriei* Hay.

Ranunculaceae

flora 2 : 0510

altitude

4000

3500

x achene sessile not stipitate; carpels 5-10;

3000

2500 x leaflet ovate-deltoid 3-5 partite, lateral  
2000 segments falcate obtuse or 2-3-fild, middle  
1500 segment broader; stipule fimbriate biauriculifor  
1000  
500  
0

*Thalictrum myriophyllum* Ohwi

Ranunculaceae

flora 2 : 0510

altitude

4000  
3500 leaf 3, sessile, verticillate at the apex of  
3000 x stem, rhombic-orbicular to depressed-orbicular  
2500 x 8-11cm long 9-10cm wide; flower white or light-  
2000 purplish; fruit a berry.  
1500  
1000  
500  
0

*Trillium tschonoskii* Maxim.

Liliaceae

flora 5 : 0083

altitude

4000

3500

x calyx without hairs, not coiled as Valeriana and

3000

x with curved 4 epicalyx which Partrinia lacking.

2500

x

2000

1500

1000

500

0

*Triplostegia glandulifera* Wall.

Valerianaceae

flora 4 : 0727

altitude

4000

3500

x branch with long shoot only, single leaf

3000

x branchlet roughened by persistent leaf-base;

2500

x mature cone pendulous scale persistent; leaf

2000

1500 flattened with stomatic band beneath or on both  
1000 surface; short petiole with 1 resin duct in each  
500 leaf; cone ovoid 1.5-2.5cm long, lustrous  
0 yellowish brown.

*Tsuga chinensis* Diels var. *formosana* Li & Keng.

Pinaceae

flora 1 : 0528

altitude

4000  
3500  
3000 x annual; stem stout ashy-puberulent; head 20 to  
2500 30 flowered; papus-bristle 1-seriate; achene  
2000 glabrous.  
1500 x  
1000 x  
500 x  
0 x

*Vernonia patula* Merr.

Compositae

flora 4 : 0958

altitude



4000  
3500  
3000  
2500  
2000  
1500  
1000  
500  
0

x lamina linear deeply pinnatifid, covered on both  
x surface with spreading reddish-brown hair, each  
x lobe or pinna with only a single vein; fertile  
x pinnae flat; sori dorsal.  
x

*Xiphopteris okuboi* Copel.

Grammitidaceae

flora 1 : 0227

altitude

4000  
3500  
3000  
2500  
2000  
1500  
1000

leaves entire radical leave 2-3cm long 0.5-0.6cm  
wide

500

0

*Yushania niitakayamensis* (Hay.) Keng f.

flora

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天池位於高雄縣桃源鄉南橫公路上，海拔約 2280 公尺（圖一、二），該地為台灣二葉松人造林地，該土山坡多岩塊土質貧脊，谷地有數處窪地、積雨成池，其中一池最大，終年有水，而池水附近之土層較厚且濕潤，植被變化較。該地曾於十年前（1977）火燒過，去年（1987）3 月下旬又再度火燒，焚燒面積達 10.57 公頃，但時逢春天、植被復育迅速，在高山雨季（7 8 月）蘇（32,33,34）來臨前，草木植被已將火燒的裸地完全覆蓋。調查時間從 19687 年 9 月至 1988 年 4 月。

一個生態系的發育受許多環境因子所控制，「火」是其中的因子之一（26,29），然而受人口過度膨脹的影響，與人類生活密切的「火」有意無意間成為影響生態系的主要因子。據統計，台灣在 1974 1983 這十年間，共發生森林火災達 309 次，焚燒面積 113 78 公頃，主要係由人為所引起（53）。同時呂金誠（23）等研究發現台灣的森林火災以台灣二葉松（*Pinus taiwanensis*）林發生的頻率最高，並就火對土壤結構、有機層的變化做進一步之研究（21），認為火災對土壤有機層破壞很大，同時也會因林地覆蓋層消失，增加土壤的沖蝕，Ahlgren(1)及 Isaac（13）亦證實如此的結果。

但是「火」對生態系的影響並非都是負面的，前面已提過，「火」亦為環境因子，有些生態系甚至需要「火」才得以維持(5)，在此所適存的植群稱為火災適存群落(fire adaptative plants)(4,36)。蘇及劉（55）認為台灣小雪山之高山草原係受週期性火災之影響，同時此因造成海拔 2800m 間呈高山萱草、蕨過渡群叢及其後之二葉松、華山松過渡臨叢。

除了「火」本身對生態系的影響，不同之地理位置、植被、甚至燃燒的時間等，都可能造成許多不同的結果。如 Wright（39）認為火燒對該地土壤營養的流失影響不大，推測是因春天火燒之故。此外火燒造成植被生理的變化，如生產量的提高（38），促進開花（38），刺激種子萌發（1,6,16,35）等等都是有趣而值得加以探討的現象。

由於火燒之頻繁，國外相關之研究文獻很多，同時多已做深入之探討，反視國內火燒對生態的研究僅在近年來為少數學者（3,23）加以重視及進行研究調查，本研究的即在於提供火燒後生態之變化及其影響，以為一種紀錄及資料，供日後國家公園有關生態之保育及應用之參考。

## 研究地區與方法

### 3-1 取樣 (Sampling)

76 年 9 月 21 日火燒之人造林區設 22 個 4 公尺平方之方形樣區。以天池兩大池水為軸心

，向四方做軸射的人為取樣（如圖三），同時在未火燒之人造林區設兩個對照樣區調查所出現之植物種類、頻度、覆蓋度植物適存特性之採證。

### 3-2 植被分析

調查各樣區植物之種類及覆蓋度（附錄一）。覆蓋度乃以目測其垂直投影的面積，繪於比例圖上（20 × 20cm）（附錄二）。分析各種植物之頻度及覆蓋度，並轉換為相對值，合計作為重要值（I.V.），再進一步對照樣區做相似度分析以便做進一步之植被分析。各種數值之公式如下（53）：

某種出現樣區數

頻度  $F$  . =

樣區總數

某種頻度（ $F$ ）

相對頻度  $R . F \% =$  × 100

各種頻度總和（ $\sum F$ ）

某種佔的面積

覆蓋度  $C$  . =

樣區總數

某種覆蓋度（ $D_0$ ）

相對覆蓋度  $R . C \% =$  × 100

各種覆蓋度總和  $\sum D_0$

2 MW

相似度  $I . S . =$

$$MA + MB$$

MA、MB 表 A、B 兩區內所有植物之重要值

MW 表此兩區共同種最小重要值之和

重要值  $I V = R . F . + R . C .$  (引用 reference 3)

為瞭解火燒後初期植群歧異度之改變，並且採用夏農氏公式計算其歧異度指數

(Shannon diversity index), 公式如下：

$$D = - \sum_{i=1}^S \left( \frac{n_i}{N} \right) \log_e \left( \frac{n_i}{N} \right) = - \sum_{i=1}^S P_i \log_e P_i$$

S : 為總數

$n_i$  : 為第 i 種植物之重要性

N : 為所有植物重要值之和

### 3-3 物理因子分析

為瞭解火燒後環境因子變化的情形，取地層表面 5cm 土壤來分析其 pH 值，含水量、有機質、溫度，方式如下 (52):

測 pH 值

採 20 g 均質土壤加 60c.c. 之蒸餾水，均勻攪拌後靜置 24hr 後用 pHmeter 測。

測含水量

取均質土壤用鋁箔紙密封稱重，於 105 之 oven 烘乾 24hr 後取出置冷稱重。

濕重 - 乾重

含水量 =

乾重 - 鋁鉑紙重

有機質含量

以 105 烘乾的土壤置於 550 之 oven 經 20min 後取出置冷稱重。

乾重 - 烘乾 ( 550 ) 種

含水量 =

乾重 - 鋁鉑紙重

溫度

於中午 12 : 00 至 PM 1 : 30 內用溫度計插入土中約 15cm 處測每個樣區之土溫。  
這四種物理因子將配合植被分佈特性、分析其彼此間的相關性。

分析方法以生物統計小樣本的抽樣理論：學生 t 分配檢測火燒影響之顯著性。  
。

圖表分析以電腦 lotus 套裝軟體分析、統計及繪圖。

資料儲存以電腦 dBase 套裝軟體處理。

## 結果與討論

### (a) 土壤分析

森林火災影響土壤之物、化性，已多為前人所深入研究 ( 1,21 )，惟影響土壤的因素除火燒外，尚因土壤中微生物、坡度、原植被狀態及土壤結構之特性，而有複雜的個別差異 ( 54 )。根據調查結果，依未火燒區與火燒區及火燒區之向背陽坡面分析土溫、土壤濕度 ( % )、有機質含量 ( % ) 及 pH 值依月變化 ( 如圖四七 )。並以 t ( student ) test 檢定火燒及坡面影響土壤性質之顯著性 ( 如表一、二 )。



由圖四可見土溫從十月開始往下降，在一月達最低溫，然後漸漸提昇，恰與該地季節氣候變化一致，表示氣候影響土溫。比較火燒區與未火燒區，土溫並未達 0.01 及 0.05 以上之顯著水準（見表一），表示火燒並未使土壤溫度造成明顯差異，此結果與 Fujita(7)和 Ahlgren(1) 認為火燒會因土表的裸出而提高土溫相反，推測是因本調查始於火燒後六個月才開始，此時火燒地已覆滿草本及灌木等植被，故土溫的差異已不明顯。此外由圖四向背陽面土溫之變化，經 test 分析得知二者並無明顯差異，原因同上述之推測。

由圖五土壤濕度變化表及表一及表二 t test 分析結果發現火燒後濕度顯著 (P 0.01) 提昇，而坡面則以背陽面為顯著潮濕 (P 0.01)，在前人研究(1) 火燒後土表裸出、有機層之破壞，造成土壤含水量下降，然而由上述土溫得知火燒六個月後的溫度差異已不大，同時由圖六土壤有機質變化表及 t test 分析顯示有機質在火燒後亦無明顯的破壞，以致火燒區的土壤濕度並未降低，但何以反比未火燒區顯著潮濕，主因火燒區的微環境特異（圖一）所致，因調查的火燒區多屬谷地，同時谷底有多處窪地，其中一地常年有水，另一處則會積雨成池，谷中每日下午約 3 至 4 時起霧、空氣中濕度高，而對照組（未火燒區）又恰巧位在稜線上，先天環境卻有差異，加上採土的方法以表土數公分為主，火燒區因火燒去落葉層，採到的土壤已為半腐質土，而未火燒區則多為未為微生物作用的枯枝層，依林昭遠等（21）研究土壤覆蓋層之物理特性，得證落葉層的含水量少於半腐化層。

至於向背陽坡面、濕度及有機質含量背陽坡面皆高於向陽坡面，因土溫在二者並無明顯差異，故推測是因背陽坡面土壤中微生物作用較佳、植被的復育及覆蓋度均較向陽面快且完全，如此不僅提升土壤有機含量，更因封閉的覆蓋保持土壤之濕度。

由圖七及 t test 分析得知平均 pH 值火燒後較高，但並不顯著；在火燒區之向背陽面也是一樣，據 Isaac (13) Lin (22) 研究報告指出火燒後因土層裸出受雨水的淋洗發生氫離子與鹼性元素交換，使 pH 值上昇。但據 Chen (2) Kutiel (19) 指出火燒初期因灰份含量高而提高土壤 pH 值，然後因植物之再生吸收了酸性元素和微生物之固氮作用及氧之 mineralization (礦質化)，使土壤 pH 漸漸下降，圖七得知背陽面因微生物較旺盛的作用，pH 值確實比向陽面低（但未達 0.05 以上顯著性），就整體而言，pH 值變化的範圍不超過一，並且各區值差異不大，表示該火燒並未對土壤 pH 造成明顯改變。

#### (b) 火燒對植被之影響

火燒後天池台灣二葉松人造林區植物種類共計 93 種（附錄三），火燒區占 85 種，未火燒區占 37 種，二區皆出現者占 28（表三）。表四顯示二區之植物社會結構，

發現火燒區及未火燒區皆以草本植物為主要角色，但以火燒區占百分之 84 為凸顯，表示火燒後次級消長的社會主要以草本為先驅，而未火燒區雖具草生社會的特色，但灌木及木本（包括喬木的幼苗）比例則提高，故推測如無火之干擾，天池人造林區將出現混生有矮灌、闊葉喬木及台灣二葉松之次生林相。底層則由耐陰性強的草本占據。

表五為天池人造林區出現頻度較高之 12 種植物，在火燒及未火燒區的重要值之月變化並以直方圖表示之（如圖八 十一），由於調查始於夏末終於初春，植被之重要值變化受季節影響很大，如在夏季占優勢的球柱草、煙火薑、戀大蕨，卻因無法過冬使其重要值遽降，然後因氣溫回升而紛紛萌芽生長。但高山芒及玉山箭竹則無顯著之季節性變化，並且一直維持很高的優勢，由圖十可見二者在火燒區及未火燒區的表現相異其趣，高山芒在火燒區有較高的優勢度，而玉山箭竹反而在未火燒區有較高的優勢，其因將於後詳加討論。

在這 12 種頻度較高的植物中，發現白花香清、一枝黃花、台灣油點草及絨山白蘭皆在火燒區表現較大的優勢，其他則在火燒區及未火燒區優勢度相當，表示這些高出現頻度的植物，不是原本即很適應於當地的環境，即是因火燒提供廣闊的生存空間以致使種族散佈開來。

為了了解火燒後植被之生態特性及生存策略，經由定性調查得知火燒區植被多具有分生能力強旺的根莖，如高山芒及玉山箭竹（圖十二），肥大的根莖如：輪葉沙參（圖十三）、戀大蕨（圖十四）、萌蘖能力強的白珠樹及台灣馬醉木（圖十五、圖十六），能自然下種、於隔年春天萌發幼株的台灣二葉松（如圖十七、圖十八）。同時經由收集數種植物之種子及稱其重量並記錄開花期如表六，發現出現頻度高的植物（具 \* 號者）往往能產生很多種子，或種子很輕易傳播、或開花期很長。表七及針對 12 種出現頻度高的植物，就種子數目、種子重量、及根部做一生存策略之分配比較，由表七可看出火燒後植被的復育主要仍側重根部的繁殖能力，至於種子數目及重量，可能需經一代以上的時才能辨識該種策略的競爭力，但可依種子數目之多需及種子之輕重，推判日後的競爭潛力，一般而言種子多而輕易於占領火燒後破壞的裸地，因此競爭潛力較大，故此表概係以此為準則，對火燒後主要植被生存特性之說明。

至於火燒前後植物社會之變化，乃由計算每月之歧異度（diversity）及相似度（similarity）表示之。由表八結果發現火燒後植物的歧異度雖增加，但不顯著，表示火燒並未影響該植物社會；同時由 Bary 及 Curtis 二紙的相似度指數（index of similarity）公式計算火燒前後之變化（如表九），發現平均相似度達 67%，其間的差異則應屬取樣時微環境之差異，以及對照組未火燒區本身雖為人造林，但位於闊葉林邊界，社會組成自然會受闊葉林的影響而有差異。同時發現在 1 月時有

最高的相似度達 86%，此與上述火燒後植被復育的特性綜合觀之可了解火燒後的植被多屬原有之植被組成。據了解十年前天池人造林區曾被火燒過，生存下的植物必有一套適應的策略，據 (3,23) 研究指出火燒頻繁的地區往往會形成火災適存植群，今由結果發現火燒後的植被的確有適應火災的方法，同時因草生植被之生產率快，並迅速繁殖，大量之枝葉因不耐冬寒而枯萎，圖十九為 1 月 30 日所攝之天池寫景，圖二十為變山蕨之新葉及去年的枯枝，這些枯枝的累積又將成為下次火燒的誘因。

至於天池台灣二葉松林受火燒的干擾下植被是否真的符合適存植群則尚待長期分析，但對於高山芒及玉山箭竹這二種最優勢的植物，分析結果發現高山芒在火燒後佔有顯著的優勢 ( $t=6.5^{**}$ )，反之玉山箭竹則相反，在未火燒區較有顯著的優勢 ( $t=4.5^{**}$ )，圖二十一可看出高山芒和玉山箭竹彼此間有明顯的消長。火燒後高山芒占很高的優勢，但若無火燒之干擾玉山箭竹將逐漸的侵入而與高山芒並列優勢，其主因乃高山芒為 C4 植物，能適應乾熱的環境，在火燒後的裸地上以其根莖旺盛之無性繁殖，因此能在短時間內迅速復育並拓展領域，尤其由圖二十二比較，高山芒在向陽面的優勢度來看更顯示出 C4 植物的特性。反之玉山箭竹屬 C3 植物較不耐熱，對火燒後裸地競爭力較差，尤其是向陽坡面更加凸顯，但因能耐陰，可充份利用覆蓋度高的林床，故能在植被復育之後達到優勢的地位，亦即如果火燒因子消失則玉山箭竹將會轉而超越高山芒的地位。

Table 1. The T test analysis of soil factors between  
burned and unburned area

	soil temperature		soil-water		organism		pH value	
	burned	unburned	burned	unburned	burned	unburned	burned	unburned
X	11.91	10.78	92.04	52.66	20.28	22.29	5.24	5.18
S	2.16	1.87	18.66	11.61	5.78	13.30	0.16	0.29
S	4.66	3.50	348.29	134.84	33.28	172.30	0.027	0.03
T	0.79		3.58**	0.281		0.504		

\*\* P 0.01

\* P 0.05

Table 2. The T test analysis of four soil factor between  
sunny and shady slope in burned area

temperature	moisture	organism	pH value
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	sunny		shady		sunny		shady	
X	13.72	11.07	65.35	110.18	15.92	22.97	5.24	5.03
S	2.64	1.78	18.89	23.82	3.45	3.71	0.179	0.212
N	5	5	5	5	5	5	5	5
t	1.67		2.95**		2.787**		1.24	

\*\* P 0.01

\* P 0.05

Table 3. The vegetation in Tein-chih pinus forest

蕨類植物	8 科	12 種
裸子植物	3 科	3 種
被子植物		
雙子葉植物	24 科	58 種
單子葉植物	8 科	20 種
總 計	43 科	93 種

Table 4. The burned and unburned vegetation composition in Tein-chih

herb plants	71 種	84 %	26 種	70%
(含 fern)				
shrub plants	11 種	13 %	7 種	19%
tree	3 種	3 %	4 種	11%
total	85 種	100 %	37 種	100%

Table 5. The dorminant plants at Tien-chih

SPECIES	AREA	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.
7	B	2.28	1.66	2.95	1.92	3.14	2.83
	U	3.31	0.00	0.00	0.00	0.00	0.00
12	B	2.75	2.79	5.89	5.66	6.80	4.49
	U	0.00	0.00	3.85	5.04	8.15	3.29
14	B	7.47	1.48	0.00	0.69	1.23	4.02
	U	0.00	4.00	7.56	4.79	4.07	3.29
15	B	9.62	7.34	10.35	8.28	3.93	4.75

U	0.00	0.00	3.77	5.26	-----	3.92	
17	B	14.87	4.49	5.86	0.00	0.00	0.80
U	11.67	4.82	0.00	0.00	0.00	0.00	
20	B	4.22	2.35	4.92	4.45	4.37	4.77
U	8.49	16.22	10.51	10.95	11.75	9.80	
27	B	47.28	73.36	64.62	70.95	69.37	70.98
U	47.30	43.89	46.08	57.08	49.20	42.59	
28	B	17.57	21.61	29.33	33.44	37.65	34.49
U	25.66	49.46	48.88	40.30	45.83	48.64	
33	B	3.75	1.30	2.75	1.93	0.68	0.64
U	0.00	0.00	0.00	0.00	0.00	0.00	
35	B	3.68	4.81	4.29	5.08	4.26	4.14
U	-----	4.82	3.85	4.95	-----	-----	
55	B	5.02	10.08	6.98	4.52	4.86	4.45
U	-----	4.31	3.77	0.00	0.00	3.35	
61	B	1.51	5.40	6.12	7.20	3.64	7.84
U	3.38	-----	-----	5.01	4.22	3.48	

\*B=burned area

\*U=unburned area

-----=missing value

Table 6. The seed No., Seed weight. and reproductive periods  
of some plants on the burned area in Tien-chih

	seed No.	seed Wt.	reproductive periods	frequency	higher	
玉山箭竹	200	0.0012 g	6	3 (月)		
白花香清	700	0.00002	6	12		*
刀傷草	800		7	9		
一枝黃花	300	0.0001	6	3		*
山苦蕒	2500	0.001	7	10		
球柱草	1700		6	10		*
煙火苔	350	0.00063	6	10		*
白珠樹	10000	0.000067	6	9		
刺芒野古草	1000	0.00024	6	11		
高山芒	10000	0.00093	8	12		*
鐵掃帚	150	0.0014	6	10		



台灣百合	1800	0.0023	6	9	
玉山小米草	1200	0.00016	6	9	
絨山白蘭	3600	0.00024	6	11	*
台灣澤蘭	1500	0.0003	6	3	
台灣油點草	750	0.0002	6	10	*

Table 7. The analysis of twelve higher frequency plants survival competitive potential

	seed No.	seed Wt.	root/rizhome
百花香清	* *	*	* * *
一枝黃花	*	* *	* * *
球柱草	* *	*	* * *
煙火苔	*	*	* * *
大 蕨			* * *
高山白珠樹	* *	*	* * *
高山芒	* * *	* *	* * *
玉山箭竹			* * *

台灣油點草	* *	*	* * *
地刷子			* * *
絨山白蘭	* *	*	* * *
苔屬			* * *

\* 表示生存策略著重部位之程度

Table 8. The diversity of the post-fire vegetation at Tien-Chih

Month	Burned	Unburned	Burned/Unburned
OCT	1.28	1.20	1.08
NOV	1.19	1.14	
DEC	1.32	1.05	
JAN	1.25	1.09	
FEB	1.09	1.05	
MAR	1.20	1.32	
Total	7.35	8.85	
Average	1.23	1.14	

Table 9. The similarity comparison between burned and unburned\*\*\*\*\*

	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	AVER.
VALUE	56%	52%	64%	66%	74%	66%	67%

附錄一 樣區植物覆蓋面積記錄表

地點：

日期：

No	覆蓋面積	樣區
species		
1	Araceae Arisaema formosana	台灣天南星
2	Berberidac Mahonia Oiwaknesis	阿里山十大功勞
3	Campanulac Adenophora triphylla	輪單沙參
4	Caryophyll Dianthus pugmaeus	玉山厄竹
5	Caryophyll Stellaria vestia	疏花繁縷
6	Commelinac Cyanotis vaga	鴨舌疔

- 7 Compositae Anaphalis  
Margaritaceae 白花香清
- 8 Compositae Cirsium  
蘇屬
- 9 Compositae Eupatorium  
formosanum 台灣澤蘭
- 10 Compositae Ixeris laevigata  
Var oldhami 刀傷草
- 11 Compositae Picris hier  
acioides 玉山毛蓮菜
- 12 Compositae Solidago  
一枝黃花屬
- 13 Compositae Sonchus  
oleraceus 苦蕒菜
- 14 Cyperaceae Bulbostylis  
densa 球柱草
- 15 Cyperaceae Carex Crucjata  
subsp. cruceata 煙火苔
- 16 Cyperaceae Carex  
macrandrolepis 和平菱果苔
- 17 Dennstaedt Pteridium 戀大蕨  
aquilinum subsp. 碗、蕨科
- 18 Elaeagnaceae Elaeagnus  
obocata 小單胡頹子
- 19 Ericaceae Gaultheria

- leucocarpa 白珠樹
- 20 Ericaceae Gaultheria ifoama  
高山白珠樹
- 21 Ericaceae Lyonia ovalifolia  
ovalifolia. 南燭
- 22 Ericaceae Pieris taiwanesis  
台灣馬醉木
- 23 Ericaceae Rhododendron  
elliptica L. 西施花
- 24 Gentianace Gentiana 台灣  
atkinsoni Buric var. 龍膽
- 25 Gramineae Agrostis davata  
Trin. subsp. mar 翦股穎
- 26 Gramineae Arundinella  
setosa 刺芒野古草

## 附錄二 覆蓋度估算表

樣區代號                      植相

植物名稱：

總數：

平均高度(約)：

## 結論與建議

1. 由土壤分析結果得知天池之火燒並未嚴重影響土壤成份及破壞其結構。此與火燒的季節性有關 (39)，春天發生的火燒往往能在植被旺盛的萌蘗力或萌芽率迅速復育，減少火對該地生態的影響。此外向陽坡面與背陽坡面之土壤溫度及濕度有明顯差異，故火燒後植被復育及種間競爭亦有明顯差異，此亦造成趨異度之增高。
2. 台灣高山之森林火災頻傳，光是天池一地十年間已火燒二次，分析該地主要為台灣二葉松次生林，林床以草本為多，灌叢錯落其間，因草本植物每年冬天累積大量的枯枝落葉，外加松林本身富含松脂、材質易燃，極易引發火災。依結果得知，天池人造林區火燒後的植被並無太大的改變，月平均相似度達 67%，1 月甚至高達 86%，可知火燒區植被多為原來植被之再生，分析這些植物生存的策略，發現草本則藉盤生之根莖（如高山芒），多汁、肥大的根莖（如戀大蕨）鱗莖；灌木則藉強旺之萌蘗能力，且能迅速的開花、結果（如台灣馬醉木）。至於喬木以台灣二葉松為代表，其藉毬果保護種子，並能在火燒後自然下種。此外前人研究指出火燒會提高種子的萌芽率，將生育時間縮短、及增加開花 (12)，以成為火燒後的適存種，亦有人提出火災適存植群一名詞 (4)，尤其強調在火燒頻繁之地所常見之植群，(3,23) 研究指出台灣二葉松應屬火災適存植群，芒草類 (*Miscanthus* spp) 及戀大蕨為火燒適存種，綜此研判天池火燒後之植被已有火災適存植群之特色。
3. 天池人造林地以高山芒及玉山箭竹為主要優勢種，但火燒地則以高山芒占顯著優勢，此現象除受生理之差異，火災所提供開放的裸地，亦是帶動彼此消長之因。因 C4 植物耐乾耐熱，故高山芒能在火燒地，特別是向陽面表現出優勢；C3 植物耐陰故能在遮陰地如背陽面或植被覆蓋層多的未火燒區占到優勢，預期若無火之控制，灌叢及喬木的生長將增加底層的遮閉性，屆時玉山箭竹將會凌駕於高山芒之優勢地位。
4. 高山地區之森林，由於林床結構本易引起火災，但由本研究中知道，南橫已有多種火災適存植群，所以火災對林相之破壞不大。因此在火災後若此植物能自然復育，可將火災區保留，供學術單位進行生態研究，其結果極富教育意義，可供遊客了解火災後自然界復育之生態意義。

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附錄三 天池樣區、植物名錄

NO	FAMI	SPEC	PHYSIO	STRATEGY	BURNED	UNBURNED
1	Araceae	Arisaema formosana Hayata	p.h	rhizome	*	*
2	Berberidaceae	Mahonia japonica (Thunb.) Dence.	p.t	resprout	*	
3	Campamulaceae	Adenophora triphylla (Thunb.)	p.h	resprout	*	
4	Caryophyllaceae	Dianthus pugmaeus Hayata	p.h	rhizome	*	*
5	Caryophyllaceae	Stellaria vestita Hayata	p.h	undetermined	*	
6	Commelinaceae	Cyanotis vaga Hayata	a.h	rhizome	*	
7	Compositae	Anaphalis	p.h	stolon	*	

margaritaceae (L.)

Benth

8	Compositae	Cirsium arisanense Kitamura	p.h	rhizome	*	*
9	Compositae	Eupatorium formosanum Hayata	p.h	rhizome	*	
10	Compositae	Ixeris laevigata (Maxim.) Kitamura	p.h	rhizome	*	*
11	Compositae	Picris bieraciodes L. (Hayata) Kitamura	u.h	undetermined	*	
12	Compositae	Solidago virga- aurea L. (Benth.) A. Gray	a.h	rhizome	*	*
13	Compositae	Lactuca sororia Miq.	p.h	rhizome	*	
14	Cyperaceae	Bulbostylis dense (Wall) Hand.	p.h	stolon	*	*
15	Cyperaceae	Carex cruciata Wall	p.h	stolon	*	*
16	Cyperaceae	Carex nubigena (Hayata) T.Koyama	p.h	stolon	*	
17	Dennstaedtiaceae	Pteridium (Wall.) Shieh	p.f	rhizome	*	
18	Elaeagnaceae	Elaeagnus obovata Li	p.s	resprout	*	

19	Ericaceae	Gaultheria leucocapa cumingiana(Vidal) Sleumer	p.s	resprout	*	*
20	Ericaceae	Gaultheria itoama Hayata	p.w	resprout	*	*
21	Ericaceae	Lyonia ovalifolia (Wall.) Drude	p.s	unburned		*
22	Ericaceae	Pieris taiwanensis Hayata	p.s	resprout	*	*
23	Ericaceae	Rhododendron elliptica L.	p.s	unburned	*	
24	Gentianaceae	Gentiana atkinsonii Buric (Hayata) Yamamoto	p.h	stolon	*	
25	Gramineae	Agrostis clavata Trin.	a.h	undetermined	*	*
26	Gramineae	Arundinella setosa Trin	a.h	undetermined	*	
27	Gramineae	Miscanthus transmorrisonensis Hayata	p.h	stolon	*	*
28	Gramineae	Yushania niitakaymensis (Hayata) Keng f.	p.w	stolon	*	*
29	Juncaceae	Juncus effusus L. Buchen	p.h	stolon	*	

30	Labiatae	Origanum vulagre L. Hayata	u.h	undetermined	*	
31	Leguminosae	Lespedeza cumeata G. Don.	p.h	rhizome	*	
32	Liliaceae	Lilium formosanum Wallace	p.h	bulb	*	
33	Liliaceae	Tricyrtis formosana Bak.	p.h	rhizome	*	
34	Lycopodiaceae	Lycopodium clavatum L.	p.f	rhizome	*	
35	Lycopodiaceae	Lycopodium complanatum L.	p.f	rhizome	*	*
36	Compositae	Ixeris chinensis (Thunb.) Nakai	a.h	rhizome	*	*
37	Orchidaceae	Herminium lanceam var. longicrure Hara	p.h.	rhizome	*	*
38	Polygonaceae	Polygonum runcinatum Buch. Ham	a.h	undetermined	*	
39	Rosaceae	Rosa transmorrisonesis Hayata	p.s	resprout	*	*
40	Salicaceae	Salix fulvopubescens Hayata	p.s	resprout	*	
41	Scrophulariaceae	Euphrasia	a.h	undetermined	*	

transmorrisonensis

Hayata

42	Smilacaceae	Smilax Hayatae T. Koyama	p.v	undetermined	*	*
43	Theaceae	Eurya crenatifolia (Yamamoto) Kobuski	p.s	resprout	*	*
44	Urticaceae	Gonostegia hirta Mig	p.h	undetermined	*	
45	Violaceae	Viola caespitosa D. Don	p.h	rhizome	*	*
46	Guttiferae	Hypericum nagasawoi Hayata	p.h	undetermined	*	
47	Osmundaceae	Osmunda japonica Thumb.	p.f	rhizome	*	
48	Campanulaceae	Wahlenbergia marginata(Thunb.) A. DC.	p.h	rhizome	*	
49	Dryopteridaceae	Acrophorus stipellatus(Wall.)	p.f	rhizome	*	
50	Athyriaceae	Athyrium reflexipinum Hayata	p.f	rhizome	*	
51	Scrophulariaceae	Hemiphragma heterophyllum	p.h	rhizome	*	
52	Compositae	Gnaphalium hypoleucum DC.	p.h	stolon	*	

53	Scrophulariaceae	Mazus pumilus (Brum.f.) Steemis	a.h	undetermined	*		
54	Urticaceae	Chamabainia cuspidata Might	a.h	undetermined	*		
55	Cyperaceae	Carexfilicina Nees	p.h	stolon		*	
56	Compositae	Aster lasioclada Hayata	p.h	rhizome	*		*
57	Cupressaceae	Chamaecyparis formsensis Matsum.	p.t	resprout	*		
58	Polypodiaceae	Crypsinus taiwanesis (Tagawa) Tagawa	p.f	rhizome	*		*
59	Rosaceae	Rubus calycinoides Hayata	p.s	resprout	*		*
60	Oxalidaceae	Oxalis corniculata L.	p.h	stolon			*
61	Cyperaceae	Carex spp.	p.h	stolon	*		
62	Athyriaceae	Athyrium cryptogrammoides Hayata	p.f	rhizome	*		
63	Polypodiaceae	Leposorus pseudo- ussuriensis Tag	p.f	stolon		*	*
64	Liliaceae	Liriope angustissima Ohwi	p.h	stolon	*		*
65	Berberiaceae	Berberis spp.	p.s	resprout		*	



66	Salicaceae Koidz	Salix okamotoana	p.s	resprout	*	
67	Gramineae (L.) Rendle	Cymbopogon nardus	p.h	rhizome	*	
68	Polygalaceae Houtti	Polygala Japonica	p.h	stolon	*	
69	Ophiglossaceae Sw	Botrychium termatum (Thunb.)	p.f	rhizome	*	
70	Saxifragaceae (Hayata) Hayata	Astilbe longicarpa	p.h	rhizome	*	
71	Salicaceae Kimura	Salix taiwanalpina	p.s	resprout	*	
72	Smilacaceae	Smilax spp.	p.v	rhizome	*	
73	Aceraceae Hayata	Acer morrisonense	p.t	unburned		*
74	Pinaceae Hayata	Pinus taiwanensis	p.t	unburned	*	*
75	Rosaceae (Andr.) Focke	Duchesnea indica	p.v	stolon	*	*
76	Polypodiaceae (Lueress) Copel	Crypsinus engleri	p.f	rhizome	*	*
77	Caprifoliaceae Wall. W	Lonicera acuminata	c.p	resprout	*	
78	Rosaceae (Hayata) Li	Spiraea prunifolia	p.s	resprout	*	

79	Pinaceae	Tsuga chinensis Li	p.t	unburned	*	
80	Polygonaceae	Pinus taiwanensis Hayata	p.t	unburned	*	*
81	Gentianaceae	Gentiana flavomaculata Hayata	p.h	stolon	*	*
82	Gleicheniaceae	Diplopterqium glaucum(Houtt) Nakai	p.f	unburned	*	
83	Polygonaceae	Polygonum chinexe L.	p.h	rhizome	*	
84	Rosaceae	Cotoneaster morrisonensis Hayata	p.h	resprout	*	
85	Compositae	Chrysanthemum arisanense Hayata	p.h	rhizome	*	
86	Compositae	Gynura Bicolor (Willd) D.C.	u.h	undetermined	*	
87	Labiatae	Salvia plebeia R. Br.	u.h	undetermined	*	
88	Liliaceae	Aletris formosana (Hayata) Sasak	p.h	undetermined	*	
89	Trochodendraceae	Trochodendron aralioides Sieb	p.t	unburned	*	*
90	Campamilaceae	Adenophora urhata Yamamoto	p.h	rhizome	*	

91	Guttiferae	Triadenum breriliflorum Y. Kimura	p.h	rhizome	*
92	Rubiaceae	Galium spp.	u.h	undetermined	*
93	Polygalaceae	Polygala paniculata L.	p.h	rhizome	*

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