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Wild plant species as subjects in O₃ research

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Abstract

Tropospheric ozone (O₃) occurs in high concentrations nowadays and affects a many plant species in Northern hemisphere. Numerous wild plant species are known to be negatively affected by O₃, and this may impact biodiversity and ecosystems in near future. Given the importance of O₃ research with wild plants, we provide a list of 473 relevant taxa - that have been used as a subject of O₃ research - as a research material, under various controlled-environment facilities, along with information about their response to O₃. In addition, we include species which have been reported that they had developed ozone-like (but not confirmed) symptoms. This list of taxa along with the references is considered an important database, useful to researchers when planning their relevant investigations.

Key words: Air pollution, Biodiversity conservation, Genetic resources, Native plants, Natural heritage

Introduction

Ground-surface ozone (O₃) is an allotropic form of oxygen and a natural constituent of the atmosphere already known since the Hellenic antiquity (e.g. Saitanis 2008). The tropospheric O₃ column accounts for only 10 % of the vertical O₃ column above the earth surface (Krupa and Manning 1988) and results mainly from complex reactions among volatile organic compounds (VOCs), and NO_y including nitrogen oxides (NO_x), under ultraviolet (UV) radiation (Krupa and Manning 1988, Chameides *et al.* 1994, Heo *et al.* 2012, Akritidis *et al.* 2014, Santurtun *et al.* 2015). Furthermore, long-range transport of O₃ accounts for its presence even in previously unpolluted regions (Akimoto 2003, Ganey *et al.* 2008, Kleanthous *et al.* 2014, Akimoto *et al.* 2015).

Since the Industrial Revolution, O₃ levels have been quite highly increased (Chameides *et al.* 1994, Akimoto 2003, Akritidis *et al.* 2014, Santurtun *et al.* 2015) and still continue increasing – especially in many cities - (Sicard *et al.* 2013, Paoletti *et al.* 2014, Dominguez-Lopez *et al.* 2015). Asia faces again nowadays very severe ozone pollution problem (Akimoto 2003, Akimoto *et al.* 2015, Feng *et al.* 2015) and it is predicted that many Asian regions will suffer from even higher levels (Takigawa 2009, Yamaji *et al.* 2008).

Ozone is not only a significant greenhouse gas (Paoletti and Manning 2007) but also a menace to plants (e.g. Saitanis 2008). It penetrates plant tissues through stomata and its deleterious effects force plants to express complex responses (Fiscus *et al.* 2005, Vaultier and Jolivet 2014) which finally lead to reduced yields and net primary productivity (Grantz *et al.* 2006, Feng *et al.* 2008, Emberson *et al.* 2009, Ainsworth *et al.* 2012). Forest tree species and other wild plants have been suffering from elevated O₃ (e.g. Long and Davis,

1991, Bortier *et al.* 2000, Burkey *et al.* 2006, Watanabe *et al.* 2007, Paoletti *et al.* 2008, Black *et al.* 2010, Watanabe *et al.* 2010a, Watanabe *et al.* 2010b, Calatayud *et al.* 2011b, Koike *et al.* 2012, Hoshika *et al.* 2013a, Hoshika *et al.* 2013b, Koike *et al.* 2013, Wang *et al.* 2015). Such an impact to wild plants threatens biodiversity and ecosystems stability and, therefore, O₃ research with such species is needed.

Based on the available scientific literature, we reviewed and provide here a catalog of wild plant species - either documented as sensitive or insensitive to O₃ -, that have been studied for their response to O₃, as base information and an important scientific tool for future research and resources management (Agathokleous *et al.* 2015). Using 195 original peer-reviewed publications dealing with O₃ effects on wild plant species, we created a list with 473 wild plant taxa (Agathokleous *et al.* 2015) which have been tested for O₃-induced effects, under various controlled-environment facilities (or techniques) as Table 1. In addition, we have traced and include species which have been reported that had developed ozone-like symptoms, but not confirmed (Table 2). We hope this database will support researchers in their experiments as well as practical land-use planners in their effort to form and develop green areas.

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Table 1. Wild species tested for ozone-induced affected parameters, under various controlled-environment facilities (or techniques). When the damage of a species is confirmed in other articles we also include the non-confirmed articles. The note “Yes” in the “Affected” column indicates that species are affected by ozone, and this is confirmed: at least ozone-induced injury appeared on the leaves, and most of the studies include several other parameters such as physiological, biochemical, etc., with the exception of 2-3 cases where other parameters were altered, even if foliar visible injury did not appear. “No” indicates that plants did not negatively respond to ozone at any of the measured parameters

| Taxon | | Type | Sub-Type | Affected | Reference |
|---|----------|--------------|------------|----------|------------------------------|
| Genus & Species | Family | | | | |
| Abies | | | | | |
| <i>A. concolor</i> (Gord. & Glend.) Lindl. ex Hildebrand | Pinaceae | Tree | Coniferous | Yes | Treshow and Stewart, 1973 |
| <i>A. religiosa</i> (Kunth.) Schltld. & Cham. | Pinaceae | | | | Alvarez et al. 1998 |
| Acacia | | | | | |
| <i>A. aneura</i> F. Muell. ex Benth | Fabaceae | Tree / Shrub | | Yes | O'Connor et al. 1975 |
| <i>A. baileyana</i> F. Muell. | Fabaceae | Tree / Shrub | | No | O'Connor et al. 1975 |
| <i>A. brachybotrya</i> Benth. | Fabaceae | Tree / Shrub | | No | O'Connor et al. 1975 |
| <i>A. calamifolia</i> Sweet. ex Lindl. | Fabaceae | Tree / Shrub | | No | O'Connor et al. 1975 |
| <i>A. decurrens</i> Willd. | Fabaceae | Tree / Shrub | | No | O'Connor et al. 1975 |
| <i>A. elata</i> A. Cunn. ex Benth. | Fabaceae | Tree / Shrub | | Yes | O'Connor et al. 1975 |
| <i>A. floribunda</i> Sieb. | Fabaceae | Tree / Shrub | Perennial | No | O'Connor et al. 1975 |
| <i>A. glandulicarpa</i> Reader | Fabaceae | Tree / Shrub | Perennial | No | O'Connor et al. 1975 |
| <i>A. greggii</i> A. Gray. | Fabaceae | Tree / Shrub | Deciduous | No | Temple, 1989 |
| <i>A. howittii</i> F. Muell. | Fabaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>A. longifolia</i> (Andrews) Willd. | Fabaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>A. iteaphylla</i> F. Muell ex Benth. | Fabaceae | Tree / Shrub | | No | O'Connor et al. 1975 |
| <i>A. jonesii</i> F. Muell. & Maiden. | Fabaceae | Shrub | | No | O'Connor et al. 1975 |
| <i>A. melanoxylon</i> R. Br. | Fabaceae | Tree | | No | O'Connor et al. 1975 |
| <i>A. microbotrya</i> Benth | Fabaceae | Tree / Shrub | | No | O'Connor et al. 1975 |
| <i>A. notabilis</i> F. Muell. | Fabaceae | Tree / Shrub | | No | O'Connor et al. 1975 |
| <i>A. pendula</i> A. Cunn. ex G.Don. | Fabaceae | Tree | | No | O'Connor et al. 1975 |
| <i>A. podalyriaefolia</i> A. Cunn. ex G.Don. | Fabaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>A. pravissima</i> F. Muell. ex Benth. | Fabaceae | Shrub | Evergreen | No | O'Connor et al. 1975 |
| <i>A. prominens</i> A. Cunn. ex G.Don. | Fabaceae | Tree / Shrub | | No | O'Connor et al. 1975 |
| <i>A. pruinosa</i> A. Cunn. ex Benth. | Fabaceae | Tree / Shrub | | Yes | O'Connor et al. 1975 |
| <i>A. pycnantha</i> Benth. | Fabaceae | Trees | | Yes | O'Connor et al. 1975 |
| <i>A. rhetinodes</i> Schlecht. | Fabaceae | Shrub | Evergreen | No | O'Connor et al. 1975 |
| <i>A. saligna</i> (Labill.) H. Wendl. | Fabaceae | Tree / Shrub | | Yes | O'Connor et al. 1975 |
| <i>A. sophorae</i> (Labill.) R. Br. | Fabaceae | Shrub | | No | O'Connor et al. 1975 |
| <i>A. trineura</i> F. Muell. | Fabaceae | Tree / Shrub | | Yes | O'Connor et al. 1975 |
| <i>A. triptera</i> Benth. | Fabaceae | Shrub | | No | O'Connor et al. 1975 |
| <i>A. vestita</i> Ker-Gawl. | Fabaceae | Tree / Shrub | | No | O'Connor et al. 1975 |
| <i>A. wattiana</i> F. Muell. ex Benth. | Fabaceae | Tree / Shrub | | No | O'Connor et al. 1975 |
| Acer | | | | | |

| Taxon | | Type | Sub-Type | Affected | Reference |
|--|----------------|-------|------------|----------|--|
| Genus & Species | Family | | | | |
| <i>A. campestre</i> L. | Sapindaceae | Tree | Deciduous | Yes | Bussotti <i>et al.</i> 2006; Zhang <i>et al.</i> 2001 |
| <i>A. grandidentatum</i> Nutt. | Sapindaceae | Tree | Deciduous | Yes | Treshow and Stewart, 1973 |
| <i>A. negundo</i> L. | Sapindaceae | Tree | | Yes | Treshow and Stewart, 1973 |
| <i>A. pseudoplatanus</i> L. | Sapindaceae | Tree | Deciduous | Yes | Benham <i>et al.</i> 2010; Orendovici <i>et al.</i> 2003; VanderHeyden <i>et al.</i> 2001; Vollenweider <i>et al.</i> 2003b |
| <i>A. rubrum</i> L. | Aceraceae | Tree | Deciduous | Yes | Samuelson, 1994; Schaub <i>et al.</i> 2003 |
| <i>A. saccharinum</i> L. | Sapindaceae | Tree | Deciduous | Yes | Orendovici <i>et al.</i> 2003 |
| Achillea | | | | | |
| <i>A. millefolium</i> L. | Asteraceae | Herb | Perennial | Yes | Scebba <i>et al.</i> 2006a, 2006b; Treshow and Stewart, 1973 |
| <i>A. ptarmica</i> L. | Asteraceae | Herb | Perennial | Yes | Franzaring <i>et al.</i> 2000 |
| Actaea | | | | | |
| <i>A. arguta</i> Nutt. | Ranunculaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Actinostrobus | | | | | |
| <i>A. pyramidalis</i> Miq. | Cupressaceae | Tree | Coniferous | No | O'Connor <i>et al.</i> 1975 |
| Aegilops | | | | | |
| <i>A. geniculata</i> Roth. | Poaceae | | | Yes | Bermejo <i>et al.</i> 2003 |
| <i>A. triuncialis</i> L. | Poaceae | | | Yes | Bermejo <i>et al.</i> 2003 |
| Agastache | | | | | |
| <i>A. urticifolia</i> (Benth.) Kuntze. | Lamiaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Agonis | | | | | |
| <i>A. flexuosa</i> (Willd.) Sweet. | Myrtaceae | Tree | | Yes | O'Connor <i>et al.</i> 1975 |
| Agropyron | | | | | |
| <i>A. caninum</i> (L.) P. Beauv. | Poaceae | Grass | | Yes | Treshow and Stewart, 1973 |
| Agrostis | | | | | |
| <i>A. capillaris</i> L. | Poaceae | Grass | Perennial | Yes | Hayes <i>et al.</i> 2006; Scebba <i>et al.</i> 2006a |
| <i>A. vineale</i> Schreber. | Poaceae | Grass | | Yes | Hayes <i>et al.</i> 2006 |
| Ailanthus | | | | | |
| <i>A. altissima</i> (Mill.) Swingle. | Simaroubaceae | Tree | Deciduous | Yes | Bussotti and Ferretti, 2009; Gravano <i>et al.</i> 2003; Manning <i>et al.</i> 2002; |
| Alchemilla | | | | | |
| <i>A. sp.</i> | Rosaceae | Herb | Perennial | Yes | Bussotti and Ferretti, 2009 |
| Allium | | | | | |
| <i>A. acuminatum</i> Hook. | Amaryllidaceae | Forb | Perennial | Yes | Treshow and |

| Taxon | | Type | Sub-Type | Affected | Reference |
|--|----------------|---------------|------------|----------|--|
| Genus & Species | Family | | | | |
| | | | | | Stewart,1973 |
| <i>A. ursinum</i> L. | Amaryllidaceae | Forb | Perennial | Yes | Fangmeier, 1989 |
| Alnus | | | | | |
| <i>A. incana</i> (L.) Moench. | Betulaceae | Tree | | Yes | Manning and Godzik, 2004; Manning <i>et al.</i> 2002 |
| <i>A. viridis</i> (Chaix.) DC. ssp. <i>Viridis</i> | Betulaceae | Tree / Shrub | | Yes | VanderHeyden <i>et al.</i> 2001 |
| Ambrosia | | | | | |
| <i>A. psilostachya</i> DC. | Asteraceae | Forb | Perennial | Yes | Treshow and Stewart,1973 |
| Amelanchier | | | | | |
| <i>A. alnifolia</i> (Nutt.) Nutt. | Rosaceae | Tree / Shrub | Deciduous | Yes | Treshow and Stewart,1973 |
| | | | | | |
| Angelica | | | | | |
| <i>A. pinnata</i> S. Watson. | Apiaceae | Forb | Perennial | Yes | Treshow and Stewart,1973 |
| Angophora | | | | | |
| <i>A. costata</i> (Gaertn.) Britten. | Myrtaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| Anthoxanthum | | | | | |
| <i>A. odoratum</i> L. | Poaceae | Grass | Perennial | Yes | Dawnay and Mills, 2009; Hayes <i>et al.</i> 2006; Scebba <i>et al.</i> 2006a |
| Anthyllis | | | | | |
| <i>A. cornicina</i> L. | Fabaceae | | | No | Bermejo <i>et al.</i> 2003 |
| <i>A. lotoides</i> L. | Fabaceae | | | No | Bermejo <i>et al.</i> 2003 |
| <i>A. vulneraria</i> L. | Fabaceae | Medical plant | Perennial | Yes | Scebba <i>et al.</i> 2006a |
| Arabidopsis | | | | | |
| <i>A. thaliana</i> (L.) Heynh. | Brassicaceae | | | Yes | Hoepflinger <i>et al.</i> 2011 |
| Arabis | | | | | |
| <i>A. petraea</i> | Brassicaceae | Forb | | Yes | Hayes <i>et al.</i> 2006 |
| Araucaria | | | | | |
| <i>A. heterophylla</i> (Sailsb.) Franco. | Araucariaceae | Tree | Coniferous | Yes | O'Connor <i>et al.</i> 1975 |
| Arbutus | | | | | |
| <i>A. unedo</i> L. | Ericaceae | Tree / Shrub | Evergreen | No | Paoletti, 2005 |
| Armeria | | | | | |
| <i>A. maritima</i> (Mill.) Willd. | Plumbaginaceae | Forb | | Yes | Hayes <i>et al.</i> 2006 |
| Artemesia | | | | | |
| <i>A. tridentata</i> Nutt. | Asteraceae | Shrub | Evergreen | Yes | Treshow and Stewart,1973 |
| Asclepias | | | | | |
| <i>A. exaltata</i> L. | Apocynaceae | | | Yes | Burkey <i>et al.</i> 2006; Chappelka <i>et al.</i> 1997;Souza <i>et al.</i> 2006 |

| Taxon | | Type | Sub-Type | Affected | Reference |
|---|--------------|--------------|------------------------|----------|---|
| Genus & Species | Family | | | | |
| <i>A. incarnata</i> L. | Apocynaceae | Herb | Perennial | Yes | Orendovici <i>et al.</i> 2003 |
| <i>A. syriaca</i> L. | Apocynaceae | | | Yes | Bennett <i>et al.</i> 2006; Davis and Orendovici, 2006; Yuska <i>et al.</i> 2003 |
| Asimina | | | | | |
| <i>A. triloba</i> (L.) Dunal. | Annonaceae | Tree / Shrub | Deciduous | Yes | Orendovici <i>et al.</i> 2003 |
| Aster | | | | | |
| <i>A. engelmannii</i> (Eat.) A.Gray | Asteraceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Astrantia | | | | | |
| <i>A. major</i> L. | Apiaceae | Herb | Perennial | Yes | Bussotti and Ferretti, 2009; Manning and Godzik 2004; Manning <i>et al.</i> 2002 |
| Avena | | | | | |
| <i>A. barbata</i> (L.) Pott. ex Link. | Poaceae | Herb | Annual or perennial | Yes | Bermejo <i>et al.</i> 2003; Scebba <i>et al.</i> 2006a |
| <i>A. sterilis</i> L. | Poaceae | | | Yes | Bermejo <i>et al.</i> 2003 |
| Banksia | | | | | |
| <i>B. ericifolia</i> L.f. | Proteaceae | Shrub | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>B. marginata</i> Cav. | Proteaceae | Shrub | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>B. spinulosa</i> var. <i>collina</i> (R. Br.) A.S. George | Proteaceae | Shrub | | Yes | O'Connor <i>et al.</i> 1975 |
| Betula | | | | | |
| <i>B. ermanii</i> Cham. | Betulaceae | Tree | | Yes | Hoshika <i>et al.</i> 2013a |
| <i>B. papyrifera</i> Marshall. | Betulaceae | Tree | | Yes | Darbah <i>et al.</i> 2008 |
| <i>B. pendula</i> Roth. | Betulaceae | Tree | | Yes | Benham <i>et al.</i> 2010; Karlsson <i>et al.</i> 2003; Oksanen and Holopainen, 2001; Skelly <i>et al.</i> 1998; Slimestad <i>et al.</i> 1995; VanderHeyden <i>et al.</i> 2001; Wittmann <i>et al.</i> 2007; Zhang <i>et al.</i> 2001 |
| <i>B. platyphylla</i> var. <i>japonica</i> 'Whitespire' | Betulaceae | Tree | | Yes/No | Hoshika <i>et al.</i> 2013c (Yes); 2013a (No) |
| <i>B. pubescens</i> Ehrh. | Betulaceae | Tree | Deciduous | Yes | Paakkonen <i>et al.</i> 1997 |
| Biserrula | | | | | |
| <i>B. pelecinus</i> L. | Fabaceae | | | Yes | Bermejo <i>et al.</i> 2003 |
| Brachychiton | | | | | |
| <i>B. populneus</i> (Schott. & Endl.) R. Br. | Malvaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| Brassica | | | | | |
| <i>B. campestris</i> L. | Brassicaceae | | | Yes | Black <i>et al.</i> 2012 |
| Briza | | | | | |
| <i>B. maxima</i> L. | Poaceae | Grass | Annual or perennial | Yes | Bermejo <i>et al.</i> 2003; Scebba <i>et al.</i> 2006a |

| Taxon | | Type | Sub-Type | Affected | Reference |
|---|------------------|--------------|--------------------|----------|---|
| Genus & Species | Family | | | | |
| Bromus | | | | | |
| <i>B. briziformis</i> Fisch. & C.A. Mey. | Poaceae | Grass | Annual | Yes | Treshow and Stewart,1973 |
| <i>B. carinatus</i> Hook. & Am. | Poaceae | Grass | Perennial | Yes | Treshow and Stewart,1973 |
| <i>B. erectus</i> Huds. | Poaceae | Grass | Perennial | Yes | Nussbaum et al. 2001; Scebba et al. 2006a |
| <i>B. hordeaceus</i> L. | Poaceae | Grass | Annual or biennial | Yes | Bermejo et al. 2003; Scebba et al. 2006a |
| <i>B. sterilis</i> L. | Poaceae | | | Yes | Bermejo et al. 2003 |
| <i>B. tectorum</i> L. | Poaceae | Grass | Annual | Yes | Treshow and Stewart,1973 |
| Buddleia | | | | | |
| <i>B. davidii</i> Franch. | Scrophulariaceae | Shrub | | Yes | Fidley et al. 1997 |
| Caesalpinia | | | | | |
| <i>C. echinata</i> Lam. | Fabaceae | Tree | | Yes | Moraes et al. 2006 |
| Callistemon | | | | | |
| <i>C. salignus</i> Sm. Sweet. | Myrtaceae | Tree / Shrub | | No | O'Connor et al. 1975 |
| Callitris | | | | | |
| <i>C. collumellaris</i> F. Muell. | Cupressaceae | Tree | Coniferous | No | O'Connor et al. 1975 |
| <i>C. rhomboidea</i> R. Br. ex Rich. & A. Rich. | Cupressaceae | Tree | Coniferous | No | O'Connor et al. 1975 |
| Calochortus | | | | | |
| <i>C. nuttallii</i> Torr. & A. Gray. | Liliaceae | Forb | Perennial | Yes | Treshow and Stewart,1973 |
| Calothamnus | | | | | |
| <i>C. sanguineus</i> Labill. | Myrtaceae | Tree / Shrub | | No | O'Connor et al. 1975 |
| Campanula | | | | | |
| <i>C. rotundifolia</i> L. | Campanulaceae | Forb | | No | Hayes et al. 2006 |
| <i>C. spp.</i> | Campanulaceae | | | Yes | Skelly et al. 1998 |
| Campsis | | | | | |
| <i>C. radicans</i> Seem. | Bignoniaceae | Vine | Deciduous | Yes | Oredovici et al. 2003 |
| Carex | | | | | |
| <i>C. demissa</i> Hornem. | Cyperaceae | Sedge | | Yes | Hayes et al. 2006 |
| <i>C. echinata</i> Murray. | Cyperaceae | Sedge | | Yes | Hayes et al. 2006 |
| <i>C. laevigata</i> Sm. | Cyperaceae | Sedge | | No | Hayes et al. 2006 |
| <i>C. nigra</i> (L.) Reichard. | Cyperaceae | Sedge | | Yes | Franzaring et al. 2000; Scebba et al. 2006a |
| <i>C. panicea</i> L. | Cyperaceae | Sedge | | Yes | Hayes et al. 2006 |
| <i>C. siccata</i> Dewey. | Cyperaceae | Forb | Perennial | Yes | Treshow and Stewart,1973 |
| Carpinus | | | | | |
| <i>C. betulus</i> L. | Betulaceae | Tree | | Yes | Benham et al. 2010; Gunthardt-Goerg et al. 2000 |
| Casuarina | | | | | |
| <i>C. cristata</i> Miq. | Casuarinaceae | Tree | | No | O'Connor et al. 1975 |

| Taxon | | Type | Sub-Type | Affected | Reference |
|---|---------------|--------------|------------------|----------|--|
| Genus & Species | Family | | | | |
| <i>C. cunninghamiana</i> Miq. | Casuarinaceae | Tree | Evergreen | No | O'Connor <i>et al.</i> 1975 |
| <i>C. glauca</i> Sieber. | Casuarinaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| <i>C. meulleriana</i> Miq. | Casuarinaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| <i>C. stricta</i> Dryand. | Casuarinaceae | Tree | Evergreen | Yes | O'Connor <i>et al.</i> 1975 |
| <i>C. torulosa</i> Dryand. | Casuarinaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| Catalpa | | | | | |
| <i>C. speciosa</i> (Warder.) Warder. ex Engelm. | Bignoniaceae | Tree | Deciduous | Yes | Orendovici <i>et al.</i> 2003 |
| Centaurea | | | | | |
| <i>C. jacea</i> L. | Asteraceae | Herb | Perennial | Yes | Francini <i>et al.</i> 2008; Nussbaum <i>et al.</i> 2001; Ramo <i>et al.</i> 2006 |
| <i>C. nigra</i> L. | Asteraceae | Forb | Perennial | Yes | Manning and Godzik, 2004; Manning <i>et al.</i> 2002 |
| <i>C. scabiosa</i> L. | Asteraceae | Forb | Perennial | Yes | Manning and Godzik, 2004; Manning <i>et al.</i> 2002 |
| Ceratonia | | | | | |
| <i>C. siliqua</i> L. | Fabaceae | Tree / Shrub | Evergreen | Yes | Orendovici <i>et al.</i> 2003; Ribas <i>et al.</i> 2005 |
| Cercis | | | | | |
| <i>C. canadensis</i> L. | Fabaceae | Tree / Shrub | Deciduous | Yes | Orendovici <i>et al.</i> 2003 |
| Chenopodium | | | | | |
| <i>C. fremontii</i> S. Wats. | Amaranthaceae | Forb | Annual | Yes | Treshow and Stewart, 1973 |
| <i>C. spp.</i> | Amaranthaceae | Herb | Annual/perennial | Yes | Skelly <i>et al.</i> 1998 |
| Chilopsis | | | | | |
| <i>C. linearis</i> (Cav.) Sweet. | Bignoniaceae | Tree / Shrub | | No | Temple, 1989 |
| Cichorium | | | | | |
| <i>C. intybus</i> L. | Asteraceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Cinnamomum | | | | | |
| <i>C. camphora</i> (L.) J. Presl. | Lauraceae | Tree | Evergreen | Yes/No | O'Connor <i>et al.</i> 1975 (No); Zhang <i>et al.</i> 2012 (Yes) |
| Cirsium | | | | | |
| <i>C. arvense</i> (L.) Scop. | Asteraceae | Forb | Perennial | No/Yes | Hayes <i>et al.</i> 2006; Treshow and Stewart, 1973 |
| <i>C. dissectum</i> (L.) Hill | Asteraceae | Forb | | Yes | Franzaring <i>et al.</i> 2000 |
| Clematis | | | | | |
| <i>C. vitalba</i> L. | Ranunculaceae | Shrub | | Yes | Bussotti and Ferretti, 2009; Manning <i>et al.</i> 2002; Orendovici <i>et al.</i> 2003 |

| Taxon | | Type | Sub-Type | Affected | Reference |
|--|---------------|----------------------|------------|----------|--|
| Genus & Species | Family | | | | |
| <i>C. spp.</i> L. | Ranunculaceae | Vine | | No | Novak <i>et al.</i> 2003 |
| Collomia | | | | | |
| <i>C. linearis</i> Nutt. | Polemoniaceae | Forb | Annual | Yes | Treshow and Stewart, 1973 |
| Colutea | | | | | |
| <i>C. arborescens</i> L. | Fabaceae | Shrub | Deciduous | Yes | Orendovici <i>et al.</i> 2003 |
| Conium | | | | | |
| <i>C. maculatum</i> L. | Apiaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Corchorus | | | | | |
| <i>C. olitorius</i> L. | Malvaceae | Herb | Annual | Yes | Madkour and Laurence, 2002 |
| Cornus | | | | | |
| <i>C. alba</i> L. | Cornaceae | Shrub | Suckering | Yes | Novak <i>et al.</i> 2003 |
| <i>C. sanguinea</i> L. | Cornaceae | Shrub | Deciduous | Yes/No | Manning and Godzik, 2004 (Yes); Orendovici <i>et al.</i> 2003 (No); VanderHeyden <i>et al.</i> 2001 (No) |
| Corylus | | | | | |
| <i>C. avellana</i> L. | Betulaceae | Shrub | Deciduous | Yes/No | Benham <i>et al.</i> 2010 (Yes); Bussotti and Ferretti, 2009 (Yes); Manning <i>et al.</i> 2002; Zhang <i>et al.</i> 2001 (Yes); VanderHeyden <i>et al.</i> 2001 (No); Vollenweider <i>et al.</i> 2003b (Yes) |
| Crataegus | | | | | |
| <i>C. monogyna</i> Jacq. | Rosaceae | Shrubs / small trees | | Yes | Novak <i>et al.</i> 2003; Orendovici <i>et al.</i> 2003 |
| Cryptogamma | | | | | |
| <i>C. crispa</i> (L.) R.Br. ex Hook. | Pteridaceae | Forb | | No | Hayes <i>et al.</i> 2006 |
| Cryptomeria | | | | | |
| <i>C. japonica</i> (L.f) D. Don | Cupressaceae | Tree | Coniferous | Yes | Watanabe <i>et al.</i> 2010b |
| Cyclobalanopsis | | | | | |
| <i>C. glauca</i> (Thunb.) Oerst. or <i>C. repandifolia</i> (Liao.) Liao. | Fagaceae | Tree | Evergreen | Yes | Zhang <i>et al.</i> 2014; 2012 |
| Cynosurus | | | | | |
| <i>C. echinatus</i> L. | Poaceae | Grass | | Yes/No | Bermejo <i>et al.</i> 2003; Scebbba <i>et al.</i> 2006a (No) |
| Dactylis | | | | | |
| <i>D. glomerata</i> L. | Poaceae | Grass | Perennial | Yes | Wagg <i>et al.</i> 2013 |
| Danthonia | | | | | |
| <i>D. decumbens</i> (L.) DC. | Poaceae | Grass | Perennial | Yes | Franzaring <i>et al.</i> 2000 |

| Taxon | | Type | Sub-Type | Affected | Reference |
|--|--------------|-------|-------------|----------|--|
| Genus & Species | Family | | | | |
| Descurainia | | | | | |
| <i>D. californica</i> (Gray.) O.E.Schulz | Brassicaceae | Forb | Annual | Yes | Treshow and Stewart, 1973 |
| Dodonaea | | | | | |
| <i>D. attenuata</i> A. Cunn. | Sapindaceae | Shrub | Sapindaceae | No | O'Connor <i>et al.</i> 1975 |
| Dryas | | | | | |
| <i>D. octopetala</i> L. | Rosaceae | Forb | | Yes | Hayes <i>et al.</i> 2006 |
| Echinacea | | | | | |
| <i>E. purpurea</i> (L.) Moench. | Asteraceae | Herb | Perennial | Yes | Szantoi <i>et al.</i> 2007 |
| Epilobium | | | | | |
| <i>E. angustifolium</i> L. or <i>Chamerion angustifolium</i> (L.) Holub. | Onagraceae | Herb | Perennial | Yes | Skelly <i>et al.</i> 1998; Treshow and Stewart, 1973 |
| <i>E. hirsutum</i> L. | Onagraceae | Forb | Perennial | Yes | Scebba <i>et al.</i> 2006a |
| <i>E. montanum</i> L. | Onagraceae | Herb | Perennial | Yes | Orendovici <i>et al.</i> 2003 |
| <i>E. watsoni</i> Barbey. | Onagraceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Eriogonum | | | | | |
| <i>E. heracleioides</i> Nutt. | Polygonaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Eriophorum | | | | | |
| <i>E. angustifolium</i> Honck. | Cyperaceae | Forb | | Yes | Hayes <i>et al.</i> 2006 |
| <i>E. vaginatum</i> L. | Cyperaceae | Sedge | Perennial | No | Mörsky <i>et al.</i> 2011 |
| Eucalyptus | | | | | |
| <i>E. aggregata</i> H. Deane. et Maiden | Myrtaceae | Tree | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>E. alpina</i> Lindl. | Myrtaceae | Tree | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>E. astringens</i> (Maiden.) Maiden. | Myrtaceae | Tree | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>E. bosistoana</i> F. Muell. | Myrtaceae | Tree | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>E. botryoides</i> Sm. | Myrtaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| <i>E. brockwayi</i> C. A. Gardner. | Myrtaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| <i>E. caesia</i> Benth. | Myrtaceae | Tree | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>E. calophylla</i> R. Br. ex var. <i>rosea</i> Lindl. or <i>Corymbia calophylla</i> (R.Br.) K.D.Hill & L.A.S. Johnson. | Myrtaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| <i>E. camaldulensis</i> Dehnh. | Myrtaceae | Tree | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>E. campaspe</i> S. Moore. | Myrtaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| <i>E. citriodora</i> Hook. or <i>Corymbia citriodora</i> (Hook.) K.D. Hill & L.A.S. Johnson. | Myrtaceae | Tree | Evergreen | No | O'Connor <i>et al.</i> 1975 |
| <i>E. cladocalyx</i> F. Muell, var. <i>nana</i> Hort. | Myrtaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| <i>E. cornuta</i> Labill. | Myrtaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| <i>E. cosmophylla</i> F. Muell. | Myrtaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| <i>E. crenulata</i> Blakely & Beuzev. | Myrtaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| <i>E. dielsii</i> C. A. Gardner. | Myrtaceae | Shrub | Evergreen | No | O'Connor <i>et al.</i> 1975 |

| Taxon | | Type | Sub-Type | Affected | Reference |
|---|---------------|--------------|-----------|----------|------------------------|
| Genus & Species | Family | | | | |
| <i>E. elata</i> Dehnh. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. ficifolia</i> F. Muell. or <i>Corymbia ficifolia</i> (F. Muell.) K.D. Hill. & L.A.S. Johnson. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. flocktoniae</i> Maiden. | Myrtaceae | Tree | | No | O'Connor et al. 1975 |
| <i>E. forrestiana</i> Diels. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. gardneri</i> Maiden. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. globulus</i> Labill. | Myrtaceae | Tree | Evergreen | Yes | O'Connor et al. 1975 |
| <i>E. gomphocephala</i> DC. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. gracilis</i> F. Muell. | Myrtaceae | Tree | | No | O'Connor et al. 1975 |
| <i>E. hemiphloia</i> var. <i>albens</i> (Benth.) Maiden. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. kitsoniana</i> (Kuehm.) Maiden | Myrtaceae | Tree | | No | O'Connor et al. 1975 |
| <i>E. kondininensis</i> Maiden et Blakely | Myrtaceae | Tree | | No | O'Connor et al. 1975 |
| <i>E. largiflorens</i> F. Muell. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. leucoxydon</i> F. Muell. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. maculata</i> Hook. or <i>Corymbia maculata</i> (Hook.) K.D. Hill. & L.A.S. Johnson. | Myrtaceae | Tree | | No | O'Connor et al. 1975 |
| <i>E. melliodora</i> A. Cunn. ex Schau. | Myrtaceae | Tree | | No | O'Connor et al. 1975 |
| <i>E. nicholii</i> Maiden et Blakely | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. nutans</i> F. Muell. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. occidentalis</i> Endl. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. pauciflora</i> Sieber. ex Spreng. | Myrtaceae | Tree / Shrub | | Yes | O'Connor et al. 1975 |
| <i>E. pellita</i> F. Muell. | Myrtaceae | Tree | | No | O'Connor et al. 1975 |
| <i>E. platypus</i> Hook. | Myrtaceae | Tree | | No | O'Connor et al. 1975 |
| <i>E. polyanthemos</i> Schauer. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. radiata</i> Sieb. ex DC. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. riminalis</i> Labill. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. robusta</i> Sm. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. sideroxydon</i> A. Cunn. ex Wools var. <i>rosea</i> | Myrtaceae | Tree | | No | O'Connor et al. 1975 |
| <i>E. spathulata</i> Hook. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. St. johnii</i> R. T. Bak. | Myrtaceae | Tree | | No | O'Connor et al. 1975 |
| <i>E. steedmanii</i> C. A. Gardner. | Myrtaceae | Tree / Shrub | | Yes | O'Connor et al. 1975 |
| <i>E. torquata</i> Luehm. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. viridis</i> R. T. Bak. | Myrtaceae | Tree | | Yes | O'Connor et al. 1975 |
| <i>E. websteriana</i> Maiden. | Myrtaceae | Tree | | No | O'Connor et al. 1975 |
| <i>E. woodwardii</i> Maiden. | Myrtaceae | Tree | | No | O'Connor et al. 1975 |
| Eupatorium | | | | | |
| <i>E. connabinum</i> L. | Asteraceae | Herb | Perennial | Yes | Franzaring et al. 2000 |
| <i>E. perfoliatum</i> L. | Asteraceae | Herb | Perennial | Yes | Orendovici et al. 2003 |
| Euphorbia | | | | | |
| <i>E. dulcis</i> 'Chameleon' | Euphorbiaceae | Herb | Perennial | Yes | Bussotti and Ferretti, |

| Taxon | | Type | Sub-Type | Affected | Reference |
|---|---------------|-------|-----------|----------|---|
| Genus & Species | Family | | | | |
| | | | | | 2009 |
| Euphrasia | | | | | |
| <i>E. kernerii</i> Wettst. | Orobanchaceae | | | Yes | Bussotti and Ferretti, 2009 |
| Fagus | | | | | |
| <i>F. crenata</i> Blume. | Fagaceae | Tree | | Yes | Azuchi <i>et al.</i> 2014; Hoshika <i>et al.</i> 2012b; Watanabe <i>et al.</i> 2010a, 2012, 2013, 2014; Yamaguchi <i>et al.</i> 2007a, 2007b, 2010; Yonekura <i>et al.</i> 2001 |
| <i>F. sylvatica</i> L. | Fagaceae | Tree | Deciduous | Yes | Baumgarten <i>et al.</i> 2000; Benham <i>et al.</i> 2010; Bortier <i>et al.</i> 2000; Braun <i>et al.</i> 2004, 2007; 2010; Bussotti and Ferretti, 2009; Cascio <i>et al.</i> 2010; Clark <i>et al.</i> 2000; Gerosa <i>et al.</i> 2003, 2008, 2009; Gunthardt-Goerg <i>et al.</i> 2000; Kitao <i>et al.</i> 2009; Landolt <i>et al.</i> 2000; Nikolova <i>et al.</i> 2010; Novak <i>et al.</i> 2008; Nunn <i>et al.</i> 2005a and 2005b; Olbrich <i>et al.</i> 2010; Pearson and Mansfield, 1993; Pretzsch <i>et al.</i> 2010; Stribley and Ashmore, 2002; VanderHeyden <i>et al.</i> 2001; Vollenweider <i>et al.</i> 2003b; Zhang <i>et al.</i> 2001 |
| <i>F. sylvatica</i> L. | Fagaceae | Tree | Deciduous | No | Orendovici <i>et al.</i> 2003 |
| Festuca | | | | | |
| <i>F. ovina</i> L. | Poaceae | Grass | | Yes | Hayes <i>et al.</i> 2006 |
| <i>F. rubra</i> L. | Poaceae | Grass | | Yes | Hayes <i>et al.</i> 2006 |
| Fragaria | | | | | |
| <i>F. ovalis</i> (Lehm.) Rydb. or <i>F. virginiana</i> Duchesne | Rosaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| <i>F. vesca</i> L. | Rosaceae | Herb | Perennial | Yes | Bussotti and Ferretti, 2009; Manninen <i>et al.</i> 2003 |
| Frangula | | | | | |
| <i>F. alnus</i> Mill. or <i>Rhamnus frangula</i> | Rhamnaceae | Shrub | Deciduous | Yes | VanderHeyden <i>et al.</i> |

| Taxon | | Type | Sub-Type | Affected | Reference |
|--|----------------|--------------|-----------|----------|--|
| Genus & Species | Family | | | | |
| L. | | | | | 2001 |
| Fraxinus | | | | | |
| <i>F. americana</i> L. | Oleaceae | Tree | | Yes | Schaub <i>et al.</i> 2003 |
| <i>F. angustifolia</i> Vahl. | Oleaceae | Tree | Deciduous | No | Orendovici <i>et al.</i> 2003 |
| <i>F. excelsior</i> L. | Oleaceae | Tree | Deciduous | Yes | Benham <i>et al.</i> 2010; Bussotti and Ferretti, 2009; Gerosa <i>et al.</i> 2003, 2009; Gunthardt-Goerg <i>et al.</i> 2000; Landolt <i>et al.</i> 2000; Novak <i>et al.</i> 2003, 2005; Orendovici <i>et al.</i> 2003; Paoletti <i>et al.</i> 2008; Reiner <i>et al.</i> 1996; VanderHeyden <i>et al.</i> 2001; Zhang <i>et al.</i> 2001; |
| <i>F. ornus</i> L. | Oleaceae | Tree | Deciduous | Yes | Orendovici <i>et al.</i> 2003; Paoletti <i>et al.</i> 2010 |
| Galium | | | | | |
| <i>G. bifolium</i> S. Wats. | Rubiaceae | Forb | Annual | Yes | Treshow and Stewart, 1973 |
| <i>G. saxatile</i> L. | Rubiaceae | Forb | | No | Hayes <i>et al.</i> 2006 |
| Gayophytum | | | | | |
| <i>G. racemosum</i> Torrey. & A. Gray. | Onagraceae | Forb | Annual | Yes | Treshow and Stewart, 1973 |
| Gentiana | | | | | |
| <i>G. amarella</i> (L.) Borner. | Gentianaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| <i>G. asclepiadea</i> L. | Gentianaceae | Forb | Perennial | Yes | Bussotti and Ferretti, 2009; Manning and Godzik, 2004; Manning <i>et al.</i> 2002 |
| Geranium | | | | | |
| <i>G. fremontii</i> Torr. ex Gray or <i>G. caespitosum</i> E. James. | Geraniaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| <i>G. richardsonii</i> Fisch. & Trautv. | Geraniaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| <i>G. spp.</i> | Geraniaceae | | | Yes | Bussotti and Ferretti, 2009 |
| Globularia | | | | | |
| <i>G. nudicaulis</i> L. | Plantaginaceae | | | Yes | Bussotti and Ferretti, 2009 |
| Grecillea | | | | | |
| <i>G. robusta</i> A. Cunn. ex R.Br. | Proteaceae | Tree | | Yes | O'Connor <i>et al.</i> 1975 |
| Hakea | | | | | |
| <i>H. laurina</i> R. Br. | Proteaceae | Tree / Shrub | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>H. saligna</i> (Andr.) Knight. or <i>H.</i> | Proteaceae | Tree / Shrub | | No | O'Connor <i>et al.</i> 1975 |

| Taxon | | Type | Sub-Type | Affected | Reference | |
|---|--------|---------------|--------------|---------------------|-----------|---|
| Genus & Species | Family | | | | | |
| <i>salicifolia</i> (Vent.) B.L. Burtt. | | | | | | |
| <i>H. suaveolens</i> R. Br. or <i>H. drupacea</i> (C.F.Gaertn.) Roem. & Schult. | | Proteaceae | Tree / Shrub | Evergreen | No | O'Connor <i>et al.</i> 1975 |
| Hardenbergia | | | | | | |
| <i>H. violacea</i> (Schneev.) Stearn. | | Fabaceae | Climbing | Evergreen | No | O'Connor <i>et al.</i> 1975 |
| Hedera | | | | | | |
| <i>H. helix</i> L. | | Araliaceae | Vine | Evergreen | Yes | Torre <i>et al.</i> 1998 |
| Hedysarum | | | | | | |
| <i>H. boreale</i> Nutt. | | Fabaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Helianthus | | | | | | |
| <i>H. annuus</i> L. | | Asteraceae | Forb | Annual | Yes | Treshow and Stewart, 1973 |
| <i>H. hirsutus</i> Raf. | | Asteraceae | Forb | Perennial | Yes | Orendovici <i>et al.</i> 2003 |
| Helleborus | | | | | | |
| <i>H. niger</i> L. | | Ranunculaceae | Evergreen | Perennial | Yes | Bussotti and Ferretti, 2009 |
| Hibiscus | | | | | | |
| <i>H. syriacus</i> L. | | Malvaceae | Shrub | Deciduous | Yes | Paoletti <i>et al.</i> 2009 |
| Hieracium | | | | | | |
| <i>H. pilosella</i> L. | | Asteraceae | | Perennial | Yes | Scebba <i>et al.</i> 2006a |
| <i>H. sp.</i> | | Asteraceae | | | Yes | Bussotti and Ferretti, 2009 |
| Holcus | | | | | | |
| <i>H. lanatus</i> L. | | Poaceae | Grass | Perennial | Yes/No | Hayes <i>et al.</i> 2006 (No); Scebba <i>et al.</i> 2006a (Yes); Tonneijck <i>et al.</i> 2004 (Yes) |
| Horminum | | | | | | |
| <i>H. pyrenaicum</i> L. | | Lamiaceae | | Perennial | Yes | Bussotti and Ferretti, 2009 |
| Humulus | | | | | | |
| <i>H. lupulus</i> L. | | Cannabaceae | Vine | Perennial-Deciduous | Yes | Manning and Godzik, 2004; Manning <i>et al.</i> 2002 |
| Hypericum | | | | | | |
| <i>H. perforatum</i> L. | | Hypericaceae | Tree / Shrub | Perennial | Yes | Orendovici <i>et al.</i> 2003; Scebba <i>et al.</i> 2006a |
| Iberis | | | | | | |
| <i>I. carnosa</i> Willd. | | Brassicaceae | Forb | Annual or perennial | Yes | Orendovici <i>et al.</i> 2003 |
| Ilex | | | | | | |
| <i>I. aquifolium</i> L. | | Aquifoliaceae | Tree | Perennial | Yes | Ranford and Reiling, 2007a, 2007b |
| <i>I. integra</i> Thunb. | | Aquifoliaceae | Tree | Perennial | Yes | Zhang <i>et al.</i> 2012 |
| Impatiens | | | | | | |

| Taxon | | Type | Sub-Type | Affected | Reference |
|---|----------------|--------------|--------------------|----------|---|
| Genus & Species | Family | | | | |
| <i>I. parviflora</i> DC. | Balsaminaceae | Forb | Annual | Yes | Manning and Godzik, 2004; Manning <i>et al.</i> 2002 |
| Ipomoea | | | | | |
| <i>I. nil</i> 'Scarlet O'Hara' | Convolvulaceae | | | Yes | Alves <i>et al.</i> 2011; Dafre' -Martinelli <i>et al.</i> 2011 |
| Juncus | | | | | |
| <i>J. effusus</i> L. | Juncaceae | Forb | | Yes | Hayes <i>et al.</i> 2006 |
| <i>J. squarrosus</i> L. | Juncaceae | Forb | | No | Hayes <i>et al.</i> 2006 |
| <i>J. sp.</i> | Juncaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Knautia | | | | | |
| <i>K. arvensis</i> (L.) Koutl. | Dipsacaceae | Herb | Perennial | Yes | Nussbaum <i>et al.</i> 2001 |
| <i>K. spp.</i> | Dipsacaceae | | | Yes | Bussotti and Ferretti, 2009 |
| Koeleria | | | | | |
| <i>K. pyramidata</i> (Lam.) P. Beauv. | Poaceae | Grass | Perennial | Yes | Scebba <i>et al.</i> 2006a |
| Laburnum | | | | | |
| <i>L. alpinum</i> J. Presl. | Fabaceae | Tree | Deciduous | Yes | Bussotti and Ferretti, 2009 |
| Lactuca | | | | | |
| <i>L. seriola</i> L. | Asteraceae | Plant | Annual or biennial | Yes | Bussotti and Ferretti, 2009 |
| Lagunaria | | | | | |
| <i>L. patersonia</i> (Andrews.) G. Don. | Malvaceae | Tree | Evergreen | Yes | O'Connor <i>et al.</i> 1975 |
| Lamottea | | | | | |
| <i>L. diana</i> (Webb.) G. Lopez. | Asteraceae | Forb | Perennial | Yes | Calatayud <i>et al.</i> 2011a |
| Larix | | | | | |
| <i>L. decidua</i> Mill. | Pinaceae | Tree | Coniferous | Yes | Wieser <i>et al.</i> 2013; Wieser and Havranek, 1996 |
| <i>L. gmelinii</i> (Rupr.) Rupr. var. <i>japonica</i> | Pinaceae | Tree | | Yes | Koike <i>et al.</i> 2012 |
| <i>L. kaempferi</i> (Lamb.) Carr. | Pinaceae | Tree | Coniferous | Yes | Koike <i>et al.</i> 2012; Watanabe <i>et al.</i> 2010b |
| Lathyrus | | | | | |
| <i>L. lanzwertii</i> Kell. | Fabaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| <i>L. pauciflorus</i> Fern. | Fabaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Lemna | | | | | |
| <i>L. gibba</i> L. | Araceae | Aquatic | Free-floating | Yes | Forberg <i>et al.</i> 1987 |
| Leptospermum | | | | | |
| <i>L. laevigatum</i> (Gaertn.) F. Muell. | Myrtaceae | Tree / Shrub | | No | O'Connor <i>et al.</i> 1975 |
| Liquidambar | | | | | |
| <i>L. formosana</i> Hance. | Hamalidaceae | Tree | Deciduous | Yes | Zhang <i>et al.</i> 2012 |

| Taxon | | Type | Sub-Type | Affected | Reference |
|---|-----------------|--------------|---------------------|----------|---|
| Genus & Species | Family | | | | |
| Liriodendron | | | | | |
| <i>L. chinense</i> (Hemsl.) Sarg. | Magnoliaceae | Tree | Deciduous | Yes | Zhang <i>et al.</i> 2012 |
| <i>L. tulipifera</i> L. | Magnoliaceae | Tree | | Yes | Benham <i>et al.</i> 2010; Pellegrini <i>et al.</i> 2011 |
| Lolium | | | | | |
| <i>L. perenne</i> L. | Poaceae | | | Yes | Hayes <i>et al.</i> 2009 |
| <i>L. rigidum</i> (Gaudin.) Weiss. ex Nyman | Poaceae | | | Yes | Bermejo <i>et al.</i> 2003 |
| Lonicera | | | | | |
| <i>L. etrusca</i> Santi. | Caprifoliaceae | Climbing | Deciduous perennial | Yes | Orendovici <i>et al.</i> 2003 |
| Lotus | | | | | |
| <i>L. corniculatus</i> L. | Fabaceae | Herb | Perennial | Yes | Bussotti and Ferretti, 2009 |
| Lychnis | | | | | |
| <i>L. flos-cuculi</i> L. | Caryophyllaceae | Herb | Perennial | Yes | Franzaring <i>et al.</i> 2000; Tonneijck <i>et al.</i> 2004 |
| <i>L. salicaria</i> L. | Caryophyllaceae | | | Yes | Franzaring <i>et al.</i> 2000 |
| Mahonia | | | | | |
| <i>M. repens</i> (Lindl.) G. Don. | Berberidaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Malva | | | | | |
| <i>M. parviflora</i> L. | Malvaceae | Herb | Perennial | Yes | El-Khatib, 2003 |
| Medicago | | | | | |
| <i>M. lupulina</i> L. | Fabaceae | Weed | Annual or biennial | No | Pfleeger <i>et al.</i> 2010 |
| <i>M. minima</i> L. Bartal. | Fabaceae | | | Yes | Bermejo <i>et al.</i> 2003 |
| <i>M. sativa</i> L. | Fabaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Melaleuca | | | | | |
| <i>M. armillaris</i> (Sol. ex Gaertn.) Sm. | Myrtaceae | Tree / Shrub | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>M. decussata</i> R. Br. | Myrtaceae | Tree / Shrub | | No | O'Connor <i>et al.</i> 1975 |
| <i>M. ericifolia</i> Sm. | Myrtaceae | Tree / Shrub | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>M. halmaturorum</i> Miq. | Myrtaceae | Tree / Shrub | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>M. hypericifolia</i> Sm. | Myrtaceae | Shrub | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>M. incana</i> R. Br. | Myrtaceae | Shrub | | No | O'Connor <i>et al.</i> 1975 |
| <i>M. lanceolata</i> Otto. | Myrtaceae | Tree / Shrub | | Yes | O'Connor <i>et al.</i> 1975 |
| <i>M. linariifolia</i> Smith. | Myrtaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| <i>M. nesophila</i> F. Muell. | Myrtaceae | Tree / Shrub | | No | O'Connor <i>et al.</i> 1975 |
| <i>M. squarrosa</i> Donn. ex Sm. | Myrtaceae | Shrub | summer-flowering | No | O'Connor <i>et al.</i> 1975 |
| <i>M. styphelioides</i> Sm. | Myrtaceae | Tree | | No | O'Connor <i>et al.</i> 1975 |
| <i>M. wilsonii</i> F. Muell. | Myrtaceae | Shrub | | No | O'Connor <i>et al.</i> 1975 |
| Melica | | | | | |
| <i>M. uniflora</i> Retz. | Poaceae | Grass | Perennial | Yes | Fangmeier, 1989 |

| Taxon | | Type | Sub-Type | Affected | Reference |
|--------------------------------------|------------------|--------------|--------------------|----------|--|
| Genus & Species | Family | | | | |
| Melilotus | | | | | |
| <i>M. indicus</i> (L.) All. | Fabaceae | Herb | Annual or biennial | Yes | El-Khatib, 2003 |
| Melissa | | | | | |
| <i>M. officinalis</i> L. | Lamiaceae | Herb | Perennial | Yes | Döring <i>et al.</i> 2014 |
| Mentha | | | | | |
| <i>M. sp.</i> L. | Lamiaceae | Herb | Perennial | Yes | Orendovici <i>et al.</i> 2003 |
| Mertensia | | | | | |
| <i>M. arizonica</i> Greene. | Boraginaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Mimulus | | | | | |
| <i>M. guttatus</i> DC. | Scrophulariaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| <i>M. moschatus</i> Dougl. ex Lindl. | Scrophulariaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Mitella | | | | | |
| <i>M. guttatus</i> DC. | Saxifragaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Molinia | | | | | |
| <i>M. caerulea</i> (L.) Moench. | Poaceae | Herb | Perennial | Yes | Franzaring <i>et al.</i> 2000; Tonneijck <i>et al.</i> 2004 |
| Morus | | | | | |
| <i>M. nigra</i> L. | Moraceae | Tree | Deciduous | Yes | Skelly <i>et al.</i> 1998; VanderHeyden <i>et al.</i> 2001; Zhang <i>et al.</i> 2001 |
| Myoporum | | | | | |
| <i>M. insulare</i> R. Br. | Scrophulariaceae | Tree / Shrub | | No | O'Connor <i>et al.</i> 1975 |
| Myrtus | | | | | |
| <i>M. communis</i> L. | Myrtaceae | Tree / Shrub | Evergreen | No | Orendovici <i>et al.</i> 2003 |
| Nardus | | | | | |
| <i>N. stricta</i> L. | Poaceae | Grass | | Yes | Hayes <i>et al.</i> 2006 |
| Narthecium | | | | | |
| <i>N. ossifragum</i> (L.) Huds. | Nartheciaceae | Forb | | No | Hayes <i>et al.</i> 2006 |
| Neolitsea | | | | | |
| <i>N. sericea</i> (Blume.) Koidzumi. | Lauraceae | Tree | | Yes | Zhang <i>et al.</i> 2012 |
| Oenothera | | | | | |
| <i>O. japonica</i> L. | Onagraceae | Herb | Perennial | Yes | Skelly <i>et al.</i> 1998 |
| Ornithopus | | | | | |
| <i>O. compressus</i> L. | Fabaceae | | | No | Bermejo <i>et al.</i> 2003 |
| Osmorhiza | | | | | |
| <i>O. occidentalis</i> (Nutt.) Torr. | Apiaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Oxalis | | | | | |

| Taxon | | Type | Sub-Type | Affected | Reference |
|---------------------------------------|--------------|-----------|------------|----------|--|
| Genus & Species | Family | | | | |
| <i>O. acetosella</i> L. | Oxalidaceae | Forb | | Yes | Hayes <i>et al.</i> 2006 |
| Oxyria | | | | | |
| <i>O. digyna</i> (L.) Hill. | Polygonaceae | Forb | | No | Hayes <i>et al.</i> 2006 |
| Parthenocissus | | | | | |
| <i>P. quinquefolia</i> (L.) Planch. | Vitaceae | Vine | Deciduous | Yes | Manning and Godzik, 2004; Orendovici <i>et al.</i> 2003 |
| Pastinaca | | | | | |
| <i>P. sativa</i> L. | Apiaceae | Vegetable | Biennial | Yes | Bussotti and Ferretti, 2009 |
| Paxistima | | | | | |
| <i>P. myrsinites</i> (Pursh.) Raf. | Celastraceae | Shrub | Perennial | Yes | Treshow and Stewart, 1973 |
| Phacelia | | | | | |
| <i>P. heterophylla</i> Pursh. | Boraginaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Phleum | | | | | |
| <i>P. alpinum</i> L. | Poaceae | Grass | Perennial | Yes | Danielsson <i>et al.</i> 1999 |
| <i>P. pratense</i> L. | Poaceae | Grass | Perennial | Yes | Danielsson <i>et al.</i> 2013;1999 |
| Photinia | | | | | |
| <i>Photinia x fraseri</i> 'Red Robin' | Rosaceae | Shrub | Evergreen | Yes | Zhang <i>et al.</i> 2012 |
| Picea | | | | | |
| <i>P. abies</i> (L.) H. Karst. | Pinaceae | Tree | Coniferous | Yes | Braun <i>et al.</i> 2004; Hofer <i>et al.</i> 2008; Karlsson <i>et al.</i> 2004; Kivimaenpaa <i>et al.</i> 2004; Landolt <i>et al.</i> 2000; Magel <i>et al.</i> 1990 ; Muller <i>et al.</i> 1996; ; Nikolova <i>et al.</i> 2010; Nunn <i>et al.</i> 2005b; Ogner, 1993; Percy <i>et al.</i> 2009; Pretzsch <i>et al.</i> 2010; Siefertmann-Harms <i>et al.</i> 2005; Thomas <i>et al.</i> 2005; Vollenweider <i>et al.</i> 2003b; Wieser and Havranek, 1996; Wieser <i>et al.</i> 2013;Wulff <i>et al.</i> 1996 |
| <i>P. abies</i> (L.) H. Karst. | Pinaceae | Tree | Coniferous | No | Braun <i>et al.</i> 2007 |
| <i>P. rubens</i> Sarg. | Pinaceae | Tree | Coniferous | Yes | Thornton <i>et al.</i> 1990 |
| Pimpinella | | | | | |
| <i>P. major</i> (L.) Huds. | Apiaceae | Herb | Perennial | Yes | Bussotti and Ferretti, 2009 |
| Pinus | | | | | |

| Taxon | | Type | Sub-Type | Affected | Reference |
|---|----------------|--------------|------------|----------|---|
| Genus & Species | Family | | | | |
| <i>P. armandii</i> Franch. | Pinaceae | Coniferous | Evergreen | Yes | Shan <i>et al.</i> 1996;1995 |
| <i>P. canariensis</i> C.Sm | Pinaceae | Coniferous | Evergreen | Yes | Then <i>et al.</i> 2009 |
| <i>P. cembra</i> L. | Pinaceae | Tree | Coniferous | Yes | Manning <i>et al.</i> 2002; Vollenweider <i>et al.</i> 2003b; Wieser <i>et al.</i> 2013 |
| <i>P. densiflora</i> Sieb. et Zucc. | Pinaceae | Tree | Coniferous | Yes | Nakaji and Izuta, 2001; Nakaji <i>et al.</i> 2004; Shan <i>et al.</i> 1997; Watanabe <i>et al.</i> 2010b |
| <i>P. ellioti</i> var. Densa | Pinaceae | Tree | | Yes | Evans and Fitzgerald, 1993 |
| <i>P. halepensis</i> Mill. | Pinaceae | Tree | | Yes | Elvira <i>et al.</i> 2007; Soda <i>et al.</i> 2000 |
| <i>P. ponderosa</i> Douglas ex C. Laws. | Pinaceae | Tree | | Yes | Anderson <i>et al.</i> 2003; Fares <i>et al.</i> 2010; Grulke <i>et al.</i> 1998; Temple <i>et al.</i> 1992 |
| <i>P. pungens</i> Lamb. | Pinaceae | Tree | Coniferous | No | Neufeld <i>et al.</i> 2000 |
| <i>P. radiata</i> D. Don | Pinaceae | Tree | | Yes | Calzada <i>et al.</i> 2001 |
| <i>P. sylvestris</i> L. | Pinaceae | Tree | Coniferous | Yes | Augustaitis and Bytnerowicz, 2008; Jokela <i>et al.</i> 2011; Landolt <i>et al.</i> 2000; Suorsa <i>et al.</i> 2002; Wingsle <i>et al.</i> 1992; Wulff <i>et al.</i> 1996 |
| <i>P. taeda</i> L. | Pinaceae | Tree | | Yes | Barbo <i>et al.</i> 2002; Horton <i>et al.</i> 1990; Kuehler and Flagler, 1999; Manning <i>et al.</i> 2003; Richardson <i>et al.</i> 1992 |
| <i>P. uncinata</i> Raymond ex A. DC | Pinaceae | Tree | Pinaceae | Yes | de Quijano <i>et al.</i> 2012 |
| <i>P. virginiana</i> Mill. | Pinaceae | Tree | Coniferous | No | Neufeld <i>et al.</i> 2000 |
| Pistacia | | | | | |
| <i>P. lentiscus</i> L. | Anacardiaceae | Tree / Shrub | Evergreen | Yes | Reig-Arminana <i>et al.</i> 2004 |
| Pittosporum | | | | | |
| <i>P. phillyraeoides</i> D.C. | Pittosporaceae | Tree / Shrub | | No | O'Connor <i>et al.</i> 1975 |
| Plantago | | | | | |
| <i>P. lanceolata</i> L. | Plantaginaceae | Forb | Perennial | Yes | Franzaring <i>et al.</i> 2000; Kolliker <i>et al.</i> 2008; Nussbaum <i>et al.</i> 2001; Scebba <i>et al.</i> 2006a; Tonnejck <i>et al.</i> 2004 |
| <i>P. lanceolata</i> L. | Plantaginaceae | Forb | Perennial | No | Hayes <i>et al.</i> 2006 |
| <i>P. major</i> L. | Plantaginaceae | Herb | Perennial | Yes | Black <i>et al.</i> 2010; Scebba <i>et al.</i> 2006a; |

| Taxon | | Type | Sub-Type | Affected | Reference |
|---|----------------|-------|-----------|----------|--|
| Genus & Species | Family | | | | |
| | | | | | Skelly <i>et al.</i> 1998; Zheng <i>et al.</i> 2000 |
| <i>P. sp.</i> L. | Plantaginaceae | Herb | | Yes | Bussotti and Ferretti, 2009; Orendovici <i>et al.</i> 2003 |
| Poa | | | | | |
| <i>P. pratensis</i> L. Lato. | Poaceae | Grass | Perennial | Yes | Scebba <i>et al.</i> 2006a, 2006b; Treshow and Stewart, 1973 |
| Polemonium | | | | | |
| <i>P. foliosissimum</i> A.Gray. | Polemoniaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Polygala | | | | | |
| <i>P. chamaebuxus</i> L. | Polygalaceae | | | Yes | Bussotti and Ferretti, 2009 |
| Polygonatum | | | | | |
| <i>P. sp.</i> | Asparagaceae | | | Yes | Bussotti and Ferretti, 2009 |
| Polygonum | | | | | |
| <i>P. douglasii</i> Greene | Polygonaceae | Forb | Annual | Yes | Treshow and Stewart, 1973 |
| <i>P. sp.</i> | Polygonaceae | Forb | | Yes | Bussotti and Ferretti, 2009 |
| Populus | | | | | |
| <i>P. deltoides</i> Bart. (ILL-129) | Salicaceae | Tree | Deciduous | Yes | Street <i>et al.</i> 2011 |
| <i>P. deltoides</i> x <i>P. caudina</i> (clone NE359) | Salicaceae | Tree | Deciduous | Yes | Wei <i>et al.</i> 2004 |
| <i>P. deltoides</i> x <i>P. nigra</i> | Salicaceae | Tree | Deciduous | Yes | Dumont <i>et al.</i> 2013 |
| <i>P. deltoides</i> x <i>P. trichocarpa</i> | Salicaceae | Tree | Deciduous | Yes | Reich, 1983 |
| <i>P. maximoviczii</i> Henry x <i>berolinensis</i> Dippel | Salicaceae | Tree | | Yes | Hoshika <i>et al.</i> 2012a, 2013b; |
| <i>P. maximowiszii</i> Henry x <i>P.</i> <i>trichocarpa</i> Torr. & Gray (clone NE388) | Salicaceae | Tree | Deciduous | Yes | Orendovici-Best <i>et al.</i> 2008; Wei <i>et al.</i> 2004 |
| <i>P. nigra</i> L. | Salicaceae | Tree | | Yes | Benham <i>et al.</i> 2010; Bortier <i>et al.</i> 2000; Gerosa <i>et al.</i> 2009; Novak <i>et al.</i> 2003, 2005 |
| <i>P. tremuloides</i> Michx. | Salicaceae | Tree | Deciduous | Yes | Karnosky <i>et al.</i> 1998; Treshow and Stewart, 1973 |
| <i>P. trichocarpa</i> Torr. & Gray (93-968) | Salicaceae | Tree | Deciduous | Yes | Street <i>et al.</i> 2011 |
| <i>P. trichocarpa</i> Torr. & Gray x <i>P.</i> <i>deltoides</i> Bart (ILL-129) [F2 mapping population (Family 331)] | Salicaceae | Tree | Deciduous | Yes | Street <i>et al.</i> 2011 |
| Potentilla | | | | | |
| <i>P. erecta</i> Uspenski ex Ledeb. | Rosaceae | Forb | | Yes | Bussotti and Ferretti, 2009; Hayes <i>et al.</i> 2006 |

| Taxon | | Type | Sub-Type | Affected | Reference |
|---|-------------|--------------|-----------|----------|--|
| Genus & Species | Family | | | | |
| <i>P. fruticosa</i> L. or <i>Dasiphora fruticosa</i> (L.) Rydb. | Rosaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Primula | | | | | |
| <i>P. vulgaris</i> Huds. | Primulaceae | | Perennial | Yes | Bussotti and Ferretti, 2009 |
| Prunus | | | | | |
| <i>P. americana</i> Marsh. | Rosaceae | Tree / Shrub | | Yes | Orendovici <i>et al.</i> 2003 |
| <i>P. avium</i> (L.) L. | Rosaceae | Tree | Deciduous | Yes | Novak <i>et al.</i> 2003; VanderHeyden <i>et al.</i> 2001; Zhang <i>et al.</i> 2001 |
| <i>P. serotina</i> Ehrh. | Rosaceae | Tree | | Yes | Benham <i>et al.</i> 2010; Bennett <i>et al.</i> 2006; Chappelka <i>et al.</i> 1997; Davis and Orendovici, 2006; Fredericksen <i>et al.</i> 1995, 1996; Ghosh <i>et al.</i> 1998; Gunthardt-Goerg <i>et al.</i> 2000; Kouterick <i>et al.</i> 2000; Lee <i>et al.</i> 1999; Long and Davis, 1991; Orendovici-Best <i>et al.</i> 2008; Samuelson, 1994; Schaub <i>et al.</i> 2003; Skelly <i>et al.</i> 1997, 1998; VanderHeyden <i>et al.</i> 2001; Vollenweider <i>et al.</i> 2003a; Yuska <i>et al.</i> 2003; Zhang <i>et al.</i> 2001, 2010 |
| <i>P. spinosa</i> L. | Rosaceae | Tree | | | Benham <i>et al.</i> 2010; Orendovici <i>et al.</i> 2003 |
| Psidium | | | | | |
| <i>P. guajava</i> L. 'Paluma' | Myrtaceae | Tree | Fruit | Yes | Alves <i>et al.</i> 2011; Pina and Moraes, 2010; de Rezende and Furlan, 2009; Pina and Moraes, 2007; Furlan <i>et al.</i> 2007 |
| Quercus | | | | | |
| <i>Q. faginea</i> Lam. | Fagaceae | Tree | | Yes | Calatayud <i>et al.</i> 2011b |
| <i>Q. gambelii</i> Nutt. | Fagaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| <i>Q. ilex</i> L. | Fagaceae | Tree | | Yes | Baldantoni <i>et al.</i> 2011; Ribas <i>et al.</i> 2005 |
| <i>Q. ilex</i> L. <i>subsp.</i> <i>Ballota</i> | Fagaceae | Tree | | Yes | Calatayud <i>et al.</i> 2011b |
| <i>Q. kelloggii</i> Newb. | Fagaceae | Tree | | Yes | Handley and Grulke, |

| Taxon | | Type | Sub-Type | Affected | Reference |
|---|-----------------|--------------|-----------|----------|--|
| Genus & Species | Family | | | | |
| | | | | | 2008 |
| <i>Q. mongolica</i> var. <i>crispula</i> Fisch. ex Ledeb. | Fagaceae | Tree | | Yes | Watanabe <i>et al.</i> 2013 |
| <i>Q. pyrenaica</i> Willd. | Fagaceae | Tree | | Yes | Calatayud <i>et al.</i> 2011b |
| <i>Q. robur</i> L. | Fagaceae | Tree | | Yes | Gerosa <i>et al.</i> 2008 |
| <i>Q. rubra</i> L. | Fagaceae | Tree | Deciduous | Yes | Calatayud <i>et al.</i> 2011b; Edwards <i>et al.</i> 1994; Gerosa <i>et al.</i> 2009; Samuelson <i>et al.</i> 1996; Weinstein <i>et al.</i> 1998 |
| <i>Q. serrata</i> J.A. Mur. | Fagaceae | Tree | Deciduous | Yes | Watanabe <i>et al.</i> 2007 |
| Ranunculus | | | | | |
| <i>R. acris</i> L. | Ranunculaceae | Forb | Perennial | Yes/No | Hayes <i>et al.</i> 2006 (No); Wagg <i>et al.</i> 2013 (Yes) |
| <i>R. spp.</i> | Ranunculaceae | Forb | Perennial | Yes | Bussotti and Ferretti, 2009 |
| Rhamnus | | | | | |
| <i>R. cathartica</i> L. | Rhamnaceae | Tree / Shrub | Deciduous | Yes | Benham <i>et al.</i> 2010; VanderHeyden <i>et al.</i> 2001; Zhang <i>et al.</i> 2001 |
| Rhus | | | | | |
| <i>R. copallinum</i> L. | Anacardiaceae | Tree | Deciduous | Yes | Davis and Orendovici, 2006; Orendovici <i>et al.</i> 2003 |
| <i>R. trilobata</i> Nutt. | Anacardiaceae | Shrub | | Yes | Temple, 1989 |
| Ribes | | | | | |
| <i>R. alpinum</i> L. | Grossulariaceae | Shrub | Deciduous | Yes | Novak <i>et al.</i> 2003 |
| <i>R. hudsonianum</i> Richards. | Grossulariaceae | Shrub | | Yes | Treshow and Stewart, 1973 |
| Robinia | | | | | |
| <i>R. pseudoacacia</i> L. | Fabaceae | Tree | | Yes | Benham <i>et al.</i> 2010; Bussotti and Ferretti, 2009; Vollenweider <i>et al.</i> 2003b |
| Rosa | | | | | |
| <i>R. canina</i> L. | Rosaceae | Shrub | Deciduous | Yes | Bussotti and Ferretti, 2009 |
| <i>R. woodsii</i> Lindl. | Rosaceae | Shrub | Deciduous | Yes | Treshow and Stewart, 1973 |
| Rubia | | | | | |
| <i>R. peregrina</i> L. | Rubiaceae | Herb | Perennial | Yes | Bussotti and Ferretti, 2009 |
| Rubus | | | | | |
| <i>R. fruticosus</i> Aggr. | Rosaceae | | Perennial | Yes | Vollenweider <i>et al.</i> 2003b |

| Taxon | | Type | Sub-Type | Affected | Reference |
|--------------------------------|----------------|--------------|---------------------------------|----------|---|
| Genus & Species | Family | | | | |
| <i>R. sp.</i> | Rosaceae | | | Yes | Bussotti and Ferretti, 2009 |
| Rudbeckia | | | | | |
| <i>R. laciniata</i> L. | Asteraceae | Herb | Perennial | Yes | Burkey <i>et al.</i> 2006; Chappelka <i>et al.</i> 2003; Davison <i>et al.</i> 2003; Szantoi <i>et al.</i> 2009 |
| <i>R. occidentalis</i> Nutt. | Asteraceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Rumex | | | | | |
| <i>R. acetosa</i> L. | Polygonaceae | Forb | Perennial | No | Hayes <i>et al.</i> 2006 |
| <i>R. acetosa</i> L. | Polygonaceae | Forb | Perennial | Yes | Scebba <i>et al.</i> 2006a; Manning and Godzik, 2004; Skelly <i>et al.</i> 1998 |
| <i>R. crispus</i> L. | Polygonaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| <i>R. obtusifolius</i> L. | Polygonaceae | Weed | Perennial | Yes | Nussbaum <i>et al.</i> 2001; Scebba <i>et al.</i> 2006a; VanderHeyden <i>et al.</i> 2001 |
| <i>R. sanguineus</i> L. | Polygonaceae | | Perennial | Yes | Skelly <i>et al.</i> 1998 |
| <i>R. sp. L.</i> | Polygonaceae | Herb | Annual or biennial or perennial | Yes | Orendovici <i>et al.</i> 2003 |
| Salix | | | | | |
| <i>S. alba</i> L. | Salicaceae | Tree | Deciduous | Yes | Novak <i>et al.</i> 2003 |
| <i>S. gooddingii</i> C.R.Ball. | Salicaceae | Tree | | Yes | Temple, 1989 |
| <i>S. viminalis</i> L. | Salicaceae | Shrub | | Yes | VanderHeyden <i>et al.</i> 2001 |
| Salvia | | | | | |
| <i>S. pratensis</i> L. | Lamiaceae | Herb | Perennial | Yes | Bussotti and Ferretti, 2009 |
| Sambucus | | | | | |
| <i>S. ebulus</i> L. | Adoxaceae | Herb | | Yes | Orendovici <i>et al.</i> 2003 |
| <i>S. melanocarpa</i> A.Gray | Caprifoliaceae | Shrub | Deciduous | Yes | Treshow and Stewart, 1973 |
| <i>S. nigra</i> L. | Adoxaceae | Tree / Shrub | Deciduous | Yes | Benham <i>et al.</i> 2010; Orendovici <i>et al.</i> 2003 |
| <i>S. racemosa</i> L. | Adoxaceae | Shrub | | Yes | Manning and Godzik, 2004; Manning <i>et al.</i> 2002; VanderHeyden <i>et al.</i> 2001 |
| Sanguisorba | | | | | |
| <i>S. minor</i> Scop. | Rosaceae | Herb | Perennial | Yes | Bussotti and Ferretti, 2009 |
| Saxifraga | | | | | |
| <i>S. arguta</i> D. Don | Saxifragaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |

| Taxon | | Type | Sub-Type | Affected | Reference |
|--|----------------|------------------|-----------------------|----------|--|
| Genus & Species | Family | | | | |
| <i>S. stellaris</i> (L.) or <i>Micranthes stellaris</i> (L.) Galasso, Banfi et Soldano | Saxifragaceae | Forb | | Yes | Hayes <i>et al.</i> 2006 |
| Schima | | | | | |
| <i>S. superba</i> Gardner. et Champion. | Theaceae | Tree | Evergreen | Yes | Zhang <i>et al.</i> 2012 |
| Scirpus | | | | | |
| <i>S. cespitosus</i> L. | Cyperaceae | Forb | | Yes | Hayes <i>et al.</i> 2006 |
| Senecio | | | | | |
| <i>S. fluviatilis</i> Wallr. or <i>S. ovatus</i> (G. Gaertn. et Al.) Willd. | Asteraceae | Forb | | No | Hayes <i>et al.</i> 2006 |
| <i>S. subalpinus</i> Koch. | Asteraceae | Forb | Perennial | Yes | Manning and Godzik, 2004 |
| <i>S. serra</i> Hook. | Asteraceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| <i>S. vulgaris</i> L. | Asteraceae | Forb | | Yes | El-Khatib, 2003 |
| Silphium | | | | | |
| <i>S. perfoliatum</i> L. | Asteraceae | Herb | Perennial | Yes | Orendovici <i>et al.</i> 2003 |
| Sonchus | | | | | |
| <i>S. oleraceus</i> L. | Asteraceae | | | Yes | El-Khatib, 2003 |
| Sorbus | | | | | |
| <i>S. aria</i> Crantz. | Rosaceae | Tree | Deciduous | Yes | Vollenweider <i>et al.</i> 2003b |
| <i>S. aucuparia</i> L. | Rosaceae | Tree / Shrub | Deciduous | Yes/No | Gunthardt-Goerg <i>et al.</i> 2000 (Yes); Manning and Godzik, 2004 (Yes); Manning <i>et al.</i> 2002 (Yes); Orendovici <i>et al.</i> 2003 (No) |
| Spartina | | | | | |
| <i>S. alterniflora</i> Loisel. | Poaceae | Grass | Perennial (Deciduous) | Yes | Taylor <i>et al.</i> 2002 |
| Sphagnum | | | | | |
| <i>S. papillosum</i> Lindb. | Sphagnaceae | Moss | | No | Mörsky <i>et al.</i> 2011 |
| Spiraea | | | | | |
| <i>S. spp.</i> | Rosaceae | Shrub | Deciduous | Yes | Skelly <i>et al.</i> 1998 |
| Stachys | | | | | |
| <i>S. officinalis</i> (L.) Trevis. ex Briq. | Lamiaceae | Forb (grassland) | Perennial | Yes | Manning and Godzik, 2004; Manning <i>et al.</i> 2002 |
| <i>S. spp.</i> | Lamiaceae | Shrub / Herb | Annual or perennial | Yes | Bussotti and Ferretti, 2009 |
| Succisa | | | | | |
| <i>S. pratensis</i> Moench. | Dipsacaceae | | Perennial | Yes | Franzaring <i>et al.</i> 2000 |
| Symphoricarpos | | | | | |
| <i>S. vaccinioides</i> Rydb. | Caprifoliaceae | Shrub | Deciduous | Yes | Treshow and Stewart, 1973 |
| Taraxacum | | | | | |

| Taxon | | Type | Sub-Type | Affected | Reference |
|--|-----------------|-------|-----------------------|----------|--|
| Genus & Species | Family | | | | |
| <i>T. officinale</i> F.H. Wigg. | Asteraceae | Forb | Perennial | Yes | Bussotti and Ferretti, 2009 Treshow and Stewart, 1973 |
| Teucrium | | | | | |
| <i>T. scorodonia</i> L. | Lamiaceae | Herb | Perennial | Yes | Orendovici <i>et al.</i> 2003 |
| Thalictrum | | | | | |
| <i>T. endleri</i> Engelm. | Ranunculaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Thymus | | | | | |
| <i>T. polytrichus</i> A. Kern. ex Borbas | Lamiaceae | Forb | | No | Hayes <i>et al.</i> 2006 |
| Tibouchina | | | | | |
| <i>T. pulchra</i> (Cham.) Cogn. | Melastomataceae | Tree | | Yes | Furlan <i>et al.</i> 2008; Moraes <i>et al.</i> 2003 |
| Tilia | | | | | |
| <i>T. cordata</i> Miller. | Malvaceae | Tree | Deciduous | Yes | Novak <i>et al.</i> 2003 |
| <i>T. platyphyllos</i> Scop. | Malvaceae | Tree | Deciduous | Yes | Novak <i>et al.</i> 2003 |
| Toxicodendron | | | | | |
| <i>T. radicans</i> (L.) Kuntze. | Anacardiaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Tradescantia | | | | | |
| <i>T. pallida</i> (Rose.) Hunt. | Commelinaceae | | Perennial + Evergreen | Yes | de Souza Lima <i>et al.</i> 2009 |
| Trifolium | | | | | |
| <i>T. angustifolium</i> L. | Fabaceae | | | Yes | Bermejo <i>et al.</i> 2003 |
| <i>T. cherleri</i> L. | Fabaceae | | | Yes | Bermejo <i>et al.</i> 2003 |
| <i>T. ciliolatum</i> Benth. | Fabaceae | Herb | Annual | No | Pfleeger <i>et al.</i> 2010 |
| <i>T. glomeratum</i> L. | Fabaceae | | | Yes | Bermejo <i>et al.</i> 2003 |
| <i>T. hirtum</i> All. | Fabaceae | | | Yes | Bermejo <i>et al.</i> 2003 |
| <i>T. hybridum</i> L. | Fabaceae | Herb | Perennial | Yes | Pfleeger <i>et al.</i> 2010 |
| <i>T. microcephalum</i> Pursh. | Fabaceae | Herb | Annual | No | Pfleeger <i>et al.</i> 2010 |
| <i>T. pratense</i> L. | Fabaceae | Herb | Perennial | Yes | Bussotti and Ferretti, 2009; Nussbaum <i>et al.</i> 2001; Scebba <i>et al.</i> 2006a |
| <i>T. repens</i> L. | Fabaceae | | | Yes | Hayes <i>et al.</i> 2009; Scebba <i>et al.</i> 2006a; Tang <i>et al.</i> 1999 |
| <i>T. striatum</i> L. | Fabaceae | | | Yes | Bermejo <i>et al.</i> 2003 |
| <i>T. subterraneum</i> L. | Fabaceae | | Annual | Yes | Bermejo <i>et al.</i> 2003; Sanz <i>et al.</i> 2005; Vollsnes <i>et al.</i> 2010 |
| Trisetum | | | | | |
| <i>T. flavescens</i> (L.) P. Beauv. | Poaceae | Grass | Perennial | Yes | Nussbaum <i>et al.</i> 2001 |
| Tristania | | | | | |
| <i>T. conferta</i> (R. Br.) Steud. or <i>Lophostemon confertus</i> (R.Br.) P.G. Wilson et J.T. Waterh. | Myrtaceae | Tree | | Yes | O'Connor <i>et al.</i> 1975 |

| Taxon | | Type | Sub-Type | Affected | Reference |
|---|----------------|---------------------------|--------------------|----------|---|
| Genus & Species | Family | | | | |
| Tsuga | | | | | |
| <i>T. canadensis</i> (L.) Carriere. | Pinaceae | Tree | Coniferous | No | Neufeld <i>et al.</i> 2000 |
| Ulmus | | | | | |
| <i>U. minor</i> Mill. | Ulmaceae | Tree | | Yes | Orendovici <i>et al.</i> 2003 |
| Urtica | | | | | |
| <i>U. gracilis</i> Alton. or <i>U. dioica</i> ssp. <i>gracilis</i> (Alton.) Selander. | Urticaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| Vaccinium | | | | | |
| <i>V. myrtillus</i> L. | Ericaceae | Shrub | | Yes | Bussotti and Ferretti, 2009; Manning <i>et al.</i> 2002 |
| Verbesina | | | | | |
| <i>V. occidentalis</i> Walt. | Asteraceae | Herb | Perennial | Yes | Burkey <i>et al.</i> 2006; Chappelka <i>et al.</i> 2003 |
| Vernonia | | | | | |
| <i>V. noveboracensis</i> Wild. | Asteraceae | Herb | | Yes | Orendovici <i>et al.</i> 2003 |
| Veronica | | | | | |
| <i>V. anagallis-aquatica</i> L. | Plantaginaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| <i>V. chamaedrys</i> L. | Plantaginaceae | Herbs | Perennial | Yes | Scebba <i>et al.</i> 2006a; 2006b |
| <i>V. spp.</i> | Plantaginaceae | Herb / Shrub / Small tree | Annual / perennial | Yes | Bussotti and Ferretti, 2009 |
| Viburnum | | | | | |
| <i>V. lantana</i> L. | Adoxaceae | Shrub | Deciduous | Yes | Benham <i>et al.</i> 2010; Bussotti and Ferretti, 2009; Novak <i>et al.</i> 2003, 2005, 2008; Orendovici <i>et al.</i> 2003; Skelly <i>et al.</i> 1998; VanderHeyden <i>et al.</i> 2001; Vollenweider <i>et al.</i> 2003b; Zhang <i>et al.</i> 2001 |
| <i>V. lentago</i> L. | Adoxaceae | Tree / Shrub | | Yes | Orendovici <i>et al.</i> 2003 |
| <i>V. opulus</i> L. | Adoxaceae | Shrub | Deciduous | Yes | Benham <i>et al.</i> 2010; Manning <i>et al.</i> 2002; Novak <i>et al.</i> 2003 |
| <i>V. tinus</i> L. | Adoxaceae | Shrub | Evergreen | No | Orendovici <i>et al.</i> 2003 |
| Vicia | | | | | |
| <i>V. americana</i> Muhl. ex Willd. | Fabaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |
| <i>V. tetrasperma</i> (L.) Moench. | Fabaceae | Herb | Annual | No | Pfleeger <i>et al.</i> 2010 |
| Viola | | | | | |
| <i>V. adunca</i> Sm. | Violaceae | Forb | Perennial | Yes | Treshow and Stewart, 1973 |

| Taxon | | Type | Sub-Type | Affected | Reference |
|--|-----------|-------|-----------|----------|--|
| Genus & Species | Family | | | | |
| <i>V. lutea</i> Huds. | Violaceae | Forb | | No | Hayes et al. 2006 |
| <i>V. reichenbachiana</i> Jord. ex Boreau. | Violaceae | Herb | Perennial | Yes | Fangmeier, 1989 |
| Vitis | | | | | |
| <i>V. vinifera</i> L. | Vitaceae | | | Yes | Bussotti and Ferretti, 2009; Davis and Orendovici, 2006 (<i>V. spp.</i>) |
| Vulpia | | | | | |
| <i>V. ciliata</i> L. Dumont. | Poaceae | Herb | | Yes | Scebba et al. 2006a |
| <i>V. myuros</i> L. Gmelin. | Poaceae | Grass | Annual | No | Scebba et al. 2006a |
| Zelkova | | | | | |
| <i>Z. serrata</i> (Thunb.) Makino. | Ulmaceae | Tree | | Yes | Hoshika et al. 2012c |

Table 2. Species reported that have developed ozone-like (but not confirmed) symptoms. The most of them have been observed in naturally grown plants (under open-field conditions) where the influence of other factors (such as other pollutants, nutrient deficiency, etc.) cannot be excluded

| Taxon | | Type | Sub-Type | Foliar Visible Injury | Reference |
|-------------------------------------|----------------|-------|-----------|-----------------------|---------------------|
| Genus & Species | Family | | | | |
| Chaerophyllum | | | | | |
| <i>C. aromaticum</i> L. | Apiaceae | Forb | Perennial | Yes | Manning et al. 2002 |
| Cornus | | | | | |
| <i>C. sanguinea</i> L. | Cornaceae | Shrub | Deciduous | Yes | Manning et al. 2002 |
| Geranium | | | | | |
| <i>G. palustre</i> L. | Geraniaceae | Forb | Perennial | Yes | Manning et al. 2002 |
| Lapsana | | | | | |
| <i>L. communis</i> L. | Asteraceae | Forb | Annual | Yes | Manning et al. 2002 |
| Ligustrum | | | | | |
| <i>L. vulgare</i> L. | Oleaceae | | | Yes | Benham et al. 2010 |
| Lonicera | | | | | |
| <i>L. nigra</i> L. | Caprifoliaceae | Shrub | | Yes | Manning et al. 2002 |
| Pinus | | | | | |
| <i>P. koraiensis</i> Sieb. et Zucc. | Pinaceae | Tree | | Yes | Choi et al. 2006 |
| <i>P. rigida</i> Miller. | Pinaceae | Tree | | Yes | Choi et al. 2006 |
| Populus | | | | | |
| <i>P. tremula</i> L. | Salicaceae | Tree | | Yes | Benham et al. 2010 |
| Prunus | | | | | |
| <i>P. mahaleb</i> L. | Rosaceae | Tree | | Yes | Benham et al. 2010 |
| Salix | | | | | |
| <i>S. caprea</i> L. | Salicaceae | Shrub | Deciduous | Yes | Manning et al. 2002 |
| <i>S. daphnoides</i> Vill. | Salicaceae | | | Yes | Benham et al. |

| Taxon | | Type | Sub-Type | Foliar Visible Injury | Reference |
|--|-------------|------|-----------|-----------------------|----------------------------|
| Genus & Species | Family | | | | |
| | | | | | 2010 |
| Sassafras | | | | | |
| <i>S. albidum</i> (Nutt.) Nees. | Lauraceae | Tree | Deciduous | Yes | Davis and Orendovici, 2006 |
| Thymus | | | | | |
| <i>T. alpestris</i> A. Kern. | Lamiaceae | Forb | Perennial | Yes | Manning <i>et al.</i> 2002 |
| Ulmus | | | | | |
| <i>U. excelsior</i> L. | Ulmaceae | Tree | | Yes | Manning <i>et al.</i> 2002 |
| <i>U. glabra</i> Huds. | Ulmaceae | Tree | | Yes | Benham <i>et al.</i> 2010 |
| <i>U. laevis</i> Pall. | Ulmaceae | Tree | | Yes | Manning <i>et al.</i> 2002 |
| <i>U. montana</i> Stokes, Sm., Loudon, Mathieu, With or <i>U. glabra</i> Huds. | Ulmaceae | Tree | | Yes | Manning <i>et al.</i> 2002 |
| Vincetoxicum | | | | | |
| <i>V. officinale</i> Moench. or <i>Cynanchum vincetoxicum</i> (L.) Pers. | Apocynaceae | Forb | Perennial | Yes | Manning <i>et al.</i> 2002 |

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