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OVERVIEW OF FOREST PESTS

MEXICO

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DISCLAIMER

The aim of this document is to give an overview of the forest pest[1] situation in Mexico. It is not intended to be a comprehensive review.

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

[1] Pest: Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products (FAO, 2004).

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Background

This paper is one of a series of FAO documents on forest-related health and biosecurity issues. The purpose of these papers is to provide early information on on-going activities and programmes, and to stimulate discussion.

In an attempt to quantify the impacts of the many factors that affect the health and vitality of a forest, the Global Forest Resources Assessment 2005 (FRA 2005) asked countries to report on the area of forest affected by disturbances, including forest fires, insects, diseases and other disturbances such as weather-related damage. However, most countries were not able to provide reliable information because they do not systematically monitor these variables.

In order to obtain a more complete picture of forest health, FAO continues to work on several follow-up studies. A review of forest pests in both naturally regenerating forests and planted forests was carried out in 25 countries representing all regions of the world. This *Overview of forest pests* represents one paper resulting from this review. Countries in this present series include Argentina, Belize, Brazil, Chile, China, Cyprus, Colombia, Ghana, Honduras, India, Indonesia, Kenya, Kyrgyz Republic, Malawi, Mauritius, Mexico, Moldova, Mongolia, Morocco, South Africa, Sudan, Thailand, Romania, Russian Federation, Uruguay; this list will be continuously updated.

Comments and feedback are welcome. For further information or if you are interested in participating in this process and providing information on insect pests, diseases and mammals affecting forests and the forest sector in your country, please contact:

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MEXICO

Introduction

Mexico's forest cover in 2005 was estimated at 64 million hectares or 34 percent of the land area (FAO, 2006). Planted forests cover over 1 million ha representing 1.6 percent of the country's total forest area (FAO, 2006).The topography of much of Mexico is characterized by a series of parallel mountain ranges that run in a northwest-southeast direction. These ranges are covered with forests dominated by *Pinus*, *Quercus* and other temperate species. Mexico has the largest number of indigenous pine species in the world, with 42 known species, varieties and forms (Perry, 1991). Other conifers include relict stands of *Picea* spp. and *Pseudotsuga menziesii* in northern Mexico and two species of *Cupressus* in the central part of the country. Several species of *Abies* are also indigenous to Mexico. The most important is *Abies religiousa* which forms extensive pure forests at high elevations in the central part of the country. The coastal regions and the Yucatan Peninsula are dominated by mixed broadleaf tropical forests.

In 2000, it was estimated that 7 880 ha of forests and other wooded lands in Mexico was damaged by forest insects and 2 000 ha was damaged by forest diseases (FAO, 2005).

Forest pests

Naturally regenerating forests

Insects

Indigenous insects

Bark beetles of the genus *Dendroctonus* are the most common and damaging pests of native conifer forests in Mexico. Ten species of *Dendroctonus* are known from Mexico (Cibrián Tovar *et al.*, 1995) with *D. mexicanus*, *D. frontalis* and *D. adjunctus* being the most damaging.

***Dendroctonus adjunctus* Blandford**

Other scientific names: *Dendroctonus convexifrons*
Coleoptera: Scolytidae
Common names: round headed pine beetle; bark beetle
Host type: conifer
Hosts: *Pinus* spp.; *P. ponderosa*; *P. montezumae*; *P. rudis*

During 2002 and 2003, activity by *Dendroctonus adjunctus* was at abnormally high levels in Oaxaca State in the south and Chihuahua State in the north. This bark beetle feeds on several pine species including *Pinus ponderosa*, *P. montezumae* and *P. rudis*. It usually attacks the boles of stressed or weakened trees. This insect degrades the value of the timber produced by trees affected. The patterns of the galleries, which the different species of *Dendroctonus* form, are characteristic of each *Dendroctonus* species.

Pathways of movement of the round headed pine beetle include movement in infested logs and the beetles are strong fliers and capable of moving considerable distances by

themselves. *D. adjunctus* has approximately 2 generations per year and overwinter as semi-mature larvae or adults.
http://www.eppo.org/QUARANTINE/insects/Dendroctonus_adjunctus/DENCAD_ds.pdf
http://www.fao.org/documents/show_cdr.asp?url_file=/docrep/007/y5507e/y5507e05.htm
http://www.barkbeetles.org/browse/subject.cfm?SUB=22
http://www.fs.fed.us/r6/nr/fid/fidls/fidl155.pdf
http://www.fs.fed.us/r1-r4/spf/fhp/field_guide/PDFs/RoundheadedPineBeetle57.pdf
http://www.fs.fed.us/r1-r4/spf/fhp/field_guide/57rndhdpb.htm

***Dendroctonus frontalis* Zimmerman, 1868**

Other scientific names: *Dendroctonus arizonicus*
Coleoptera: Scolytidae
Common names: southern pine beetle; bark beetle; tree killer
Host type: conifer
Hosts: *Pinus* spp.

Dendroctonus frontalis is considered to be one of the most damaging species of bark beetles in Central America and the southern areas of North America. It has a wide distribution occurring from Pennsylvania in the United States south to Mexico, Belize, Guatemala, Honduras and Nicaragua. It feeds primarily on the inner bark of pine trees often leading to the death of trees and is known to attack healthy trees when population numbers are sufficiently high. They kill trees by a combination of two factors: girdling during construction of egg galleries; and the introduction of blue stain fungi of the genus *Ophiostoma*.

It attacks a wide range of *Pinus* spp. and has 3-7 generations per year, depending on temperature. The areas where this beetle lives have periodic outbreaks of this species which occur more or less at 8-12 year intervals. The attacks on trees are initiated by female beetles, which release aggregation pheromones. The beetles bore into the bark and then make galleries in the phloem and cambium where the females lay their eggs.
http://www.eppo.org/QUARANTINE/insects/Dendroctonus_frontalis/DENCFR_ds.pdf
http://www.fire.uni-freiburg.de/GlobalNetworks/MesoAmerica/Fire-Beetle-USFS-Report-2002.PDF
http://www.fao.org/docrep/007/y5507e/y5507e05.htm
http://www.barkbeetles.org/browse/subject.cfm?SUB=24
http://www.forestpests.org/southern/southernpinebeetle.html
http://www.forestpests.org/northeast/southernpinebeetle.html
http://www.barkbeetles.org/spb/SPBFIDL49.htm
http://www.bugwood.org/factsheets/99-008.html
http://www.barkbeetles.org/spb/spbbook/Index.html
http://www.barkbeetles.org/spbhandbook.cfm
http://www.padil.gov.au/viewPest.aspx?id=300
http://www.srs.fs.usda.gov/pubs/7310

***Dendroctonus mexicanus* (Hopkins)**

Other scientific names:

Coleoptera: Scolytidae
Common names: Mexican pine beetle; pine bark beetle; bark beetle
Host type: conifer
Hosts: *Pinus* spp.

Dendroctonus mexicanus has a similar appearance and biology to *D. frontalis* and have been considered the same species by some authors. Although these two species are difficult to distinguish based on physical characteristics, there are some important differences in behavior, life history, and biology between the two species as they occur in Mexico. *D. mexicanus* generally has fewer generations per year, occurs at higher elevations, has a broader host range, and produces smaller patches of tree mortality than *D. frontalis* (Tkacz *et al*., 1998).

Dendroctonus mexicanus is known to occur in the Mexican states of Aguascalientes, Chiapas, Colima, Durango, Guerrero, Hidalgo, Jalisco, Mexico, Michoacan, Morelos, Nuevo Leon, Oaxaca, Puebla, Queretaro, San Luis Potosi, Sinaloa, Sonora, Tamaulipas, Tlaxcala, Veracruz, and Zacatecas. This species attacks at least 21 species of pine trees. There are a number of species of sap stain fungi known to be associated with this species.
http://www.fao.org/docrep/x5361e/x5361e04.htm

***Dendroctonus pseudotsugae* Hopkins, 1905**

Other scientific names:
Coleoptera: Scolytidae
Common names: Douglas fir beetle; bark beetle
Host type: conifer
Hosts: *Pseudotsuga menziesii*; *Larix* spp.

The Douglas fir beetle occurs throughout the western United States and Mexico. It infests and kills standing Douglas fir (*Pseudotsuga menziesii*) trees and occasionally attacks but rarely establishes in live larch trees. However, it can often successfully establish in freshly felled larch trees. Outbreaks in live Douglas fir are frequently associated with drought and can persist for 2-4 years. Losses during outbreaks can be high. The Douglas fir beetle also infests isolated trees, particularly if they have been damaged by fire or disease, or defoliated by other insects. The highest level of damage occurs in dense, mature stands of Douglas fir.

Dendroctonus pseudotsugae has only one generation per year. It breeds primarily in stressed, weakened or dying trees. However if the population of beetles is very high then it is thought that it is able to attack healthy trees. The eggs are laid in a fairly characteristic pattern and larvae develop in the phloem of trees. Damage is often not noticeable until the second year after infestation.
http://www.eppo.org/QUARANTINE/insects/Dendroctonus_pseudotsugae/DENCPS_ds.pdf
http://www.barkbeetles.org/browse/subject.cfm?SUB=28
http://www.barkbeetles.org/douglasfir/dfb.html
http://www.forestpests.org/acrobat/fidl5.pdf
http://www.barkbeetles.org/Biocontol/douglasfirbeetle.html
http://www.fs.fed.us/r1-r4/spf/fhp/field_guide/62dgfrbtl.htm

http://www.idahoforests.org/health4a.htm

***Ips confusus* (LeConte, 1876)**

Other scientific names: *Tomicus confusus* (LeConte)
Coleoptera: Scolytidae
Common names: piñon ips; piñon engraver beetle
Host type: conifer
Hosts: *Pinus* spp.; *P. edulis*; *P. monophylla*

Ips confusus is a bark beetle that usually attacks *Pinus edulis* and *P. monophylla* (piñon pines). It causes damage to forests of these pines at low elevations in Mexico (Castillo, 2003). The piñon engraver beetle occurs throughout North America. It mainly attacks stressed or dying trees and outbreaks of this species usually occur following periods of severe drought or other major disturbances. Males initiate attacks on trees and create a nuptial chamber; they then emit sex pheromones to attract females. This activity attracts further individuals and aggregations form. Females lay eggs in the galleries that are created off the nuptial chamber. There are 2-4 generations per year. At high population levels deaths of trees occur.

Pathways for spread of *I. confusus* include the movement of unseasoned sawn timber, dunnage and packing material with bark. This species is a strong flier and can thus spread some distance by itself.
http://www.eppo.org/QUARANTINE/insects/Ips_confusus/IPSXCO_ds.pdf
http://www.barkbeetles.org/browse/subject.cfm?SUB=40
http://www.fs.fed.us/r1-r4/spf/fhp/field_guide/61pnngrvrb.htm
http://www.ext.colostate.edu/PUBS/insect/05558.html

***Ips pini* (Say, 1826)**

Other scientific names: *Bostrichus pini*; *Ips laticollis*; *Ips oregonis*
Coleoptera: Scolytidae
Common names: pine engraver beetle
Host type: conifer
Hosts: *Pinus* spp.; *P. jeffreyii*; *P. contorta*

Ips pini occurs widely across North and Central America. Its hosts are primarily *Pinus* spp. with particular preference for lodgepole (*Pinus contorta*) and Jeffrey pine (*Pinus jeffreyii*). This beetle usually attacks weakened and dying trees, however at times it can kill live saplings and young trees. Males initiate attacks on trees and emit sex pheromones to attract females; this activity attracts further individuals and aggregations form. Females lay eggs in their galleries. There may be up to 5 generations per year although 2-3 generations are more common. Two species of *Ips* were especially damaging in high elevation forests of Baja California following a historic severe drought. *Ips pini* caused severe damage to forests of *Pinus jeffreyii* (Castillo, 2003).
http://www.eppo.org/QUARANTINE/insects/Ips_pini/IPSXPI_ds.pdf
http://www.fs.fed.us/r6/nr/fid/fidls/f122.htm
http://www.barkbeetles.org/Biocontol/pineengraver.html
http://www.fs.fed.us/r1-r4/spf/fhp/field_guide/PDFs/PineEngraverBeetles60-61.pdf

http://www.barkbeetles.org/browse/subject.cfm?SUB=50
http://web.unbc.ca/ctl/webcourses/fsty307/bark/bark.html

***Pseudohylesinus variegatus* (Blandford)**

Other scientific names:
Coleoptera: Scolytidae
Common names: bark beetle
Host type: conifer
Hosts: *Abies religiosa*; *A. vejarii*

Pseudohylesinus variegatus is a bark beetle species that infests fir trees that are under some form of stress such as root disease, air pollution, and drought. In the state of Michoacan, *P. variegatus* shows a strong association with annosus root disease (Tkacz *et al*., 1998). It rarely attacks healthy trees though it can kill healthy trees if population numbers are sufficiently high (Tkacz *et al*., 1998). Trees of all sizes are attacked and typically, the beetle will attack large branches and tree tops though they may attack the lower bole of large trees. They can kill overmature trees. *P. variegatus* has several overlapping generations per year.

Believed to be more widespread than previously thought, *P. variegatus* occurs in the Distrito Federal and the states of Hidalgo, Jalisco, Mexico, Michoacan, Morelos, Nuevo Leon, Oaxaca, Puebla and Tlaxcala (Tkacz *et al*., 1998).
http://www.barkbeetles.org/browse/subject.cfm?SUB=9208

Introduced insects

To date, introduced forest insects in Mexico have only been recorded infesting exotic trees in either planted forests or urban settings.

Diseases

Indigenous diseases

No data was available on indigenous diseases affecting naturally regenerating forests in Mexico.

Introduced diseases

No data was available on introduced diseases affecting naturally regenerating forests in Mexico.

Other pests

Indigenous other pests

***Arceuthobium* spp.**

Other scientific names:
Santalales: Visaceae
Common names: dwarf mistletoe; witches' broom

Host type: conifer
Hosts: Pinaceae; Cupressaceae; *Abies* spp.; *Pinus* spp.; *Pseudotsuga* spp.

Arceuthobium spp. or dwarf mistletoes are parasitic plants that can affect the health and vitality of host trees. The effects include growth loss, reduction in seed production and, in extreme cases, tree mortality. The weakening of trees also potentially enables infestation by secondary invasive species. Dwarf mistletoes are mainly found on members of Pinaceae and Cupressaceae such as *Abies* spp., *Pinus* spp. and *Pseudotsuga* spp. The flowers of dwarf mistletoe are mostly wind and insect pollinated. The seeds are dispersed by explosive dehiscence mechanisms that project the seeds up to 16 metres from the host tree. These parasitic plants primarily infect relatively young host branches and feed parasitically on the host plant tissue.
http://www.fao.org/documents/show_cdr.asp?url_file=/docrep/X0453E/X0453E00.htm
http://www.science.siu.edu/parasitic-plants/Viscaceae/cycle.html

***Phoradendron* spp.**

Other scientific names:
Santalales: Visaceae
Common names: American mistletoe
Host type: broadleaf
Hosts: *Quercus* spp.; *Carya* spp.

American mistletoes are perennials that are wholly or partially parasitic of host plants. They can affect the health and vitality of host trees through growth loss, reduction in seed production, and in extreme cases, tree mortality. These parasitic plants primarily infect relatively young host branches and feed parasitically on the host plant tissue. These plants gain some of their nutrients by photosynthesis as well as water and other nutrients from the host plant. The weakening of trees also potentially enables infestation by secondary invasive species. American mistletoes are mainly found on broadleaf plants but also on some conifers. The seeds are dispersed by birds that excrete on new host plants.
http://www.cdfa.ca.gov/phpps/ipc/weedinfo/viscum.htm
http://www.forestpests.org/southern/mistletoe.html

***Psittacanthus* spp.**

Other scientific names:
Santalales: Loranthaceae
Common names: parrot-flower mistletoe
Host type: broadleaf and conifer
Hosts: *Abies* spp.; *Cupressus* spp.; *Pinus* spp.; *Quercus* spp.; *Acacia* spp.; *Juglans* spp.; *Ficus* spp.; *Populus* spp.; *Salix* spp.; *Prunus* spp.; *Prosopis* spp.; *Annona* spp.; *Bursera* spp.; *Citrus* spp.; *Nerium* spp.; *Olea* spp.; *Crataegus* spp.; *Bacharis* spp.; *Fraxinus* spp.; *Eucalyptus* spp.; *Persea* spp.; *Cassuarina* spp.; *Pseudosmondingium* spp.; *Arbutus* spp.; *Ulmus* spp.; *Liquidambar* spp.; *Psidium* spp.; *Spondia* spp.; *Phitecellobium* spp.; *Amphipterigium* spp.; *Pyrus* spp.; *Mimosa* spp.; *Cydonia* spp.

Parrot-flower mistletoes are perennial plants that are wholly or partially parasitic of host plants. They can affect the health and vitality of host trees through growth loss, reduction

in seed production and in extreme cases, tree mortality. These plants gain some of their nutrients by photosynthesis as well as water and other nutrients from the host plant. The weakening of trees also potentially enables infestation by secondary invasive species. These parasitic plants can have a significant impact on conifers in Mexico. Parrot-flowered mistletoes are found on both broadleaf plants and conifers. These plants are both insect (e.g. butterflies) and animal (e.g. hummingbirds) pollinated. The seeds are dispersed by birds which feed on the fruit and transport the seeds in their gut. http://www.fs.fed.us/rm/pubs/rmrs_gtr098.pdf

Introduced other pests

No data was available on introduced other pests (i.e. nematodes, mites, mammals, etc.) affecting naturally regenerating forests in Mexico.

Diebacks and other conditions

During the mid 1980s, extensive decline and mortality of *Abies religiosa* occurred in the Parque Nacional Desierto de los Leones near Mexico City. This condition was attributed to high levels of ozone caused by motor vehicle emissions reacting with sunlight in the Mexico City basin. The decline was accompanied by secondary attacks of several species of bark beetles (Ciesla and Macias Samano, 1987).

Planted forests

Insects

Indigenous insects

Chrysobothris yucatanensis van Dyke

Other scientific names:
Coleoptera: Buprestidae
Common names: jewel beetle
Host type: broadleaf
Hosts: Meliaceae; *Swietenia* spp.; *Cedrela* spp.

The stem borer, *Chrysobothris yucatanensis*, is a major pest of mahogany. Surveys of 153 planted forests conducted in 2002 in the Yucatan Peninsula indicated that the shoot borer, *Hypsipyla grandella* and the stem borer *Chrysobothris yucatanensis* were the major pests of mahogany. Damage was detected in every plantation surveyed with average levels of damage ranging from 7.6 to 42.89 percent for *Hypsipyla grandella* and 6.7 to 28.38 percent for *Chrysobothris yucatanensis*.

Hypsipyla grandella (Zeller, 1848)

Other scientific names:
Lepidoptera: Pyralidae
Common names: mahogany shoot borer
Host type: broadleaf
Hosts: Meliaceae; *Swietenia* spp.; *Cedrela* spp.

The mahogany shoot borer is the main pest species of *Swietenia* and *Cedrela* in the New World. The larvae bore into new shoots and twigs of Meliaceae (mahogany family), in particular *Swietenia* spp., killing the first few centimetres as well as attacking seed and fruit capsules. They pupate either in the twigs, shoots or the soil. Damage is caused by the killing of the terminal shoot of the plant which then induces branching and the main stem becomes distorted. This species of moth is one of the main factors preventing the ready establishment of mahogany plantations in the region.

Surveys of 153 planted forests conducted in 2002 in the Yucatan Peninsula indicated that the shoot borer, *Hypsipyla grandella* and the stem borer *Chrysobothris yucatanensis* were the major pests of mahogany. Damage was detected in every plantation surveyed with average levels of damage ranging from 7.6 to 42.89 percent for *Hypsipyla grandella* and 6.7 to 28.38 percent for *Chrysobothris yucatanensis*.
http://www.aciar.gov.au/web.nsf/att/JFRN-6BN983/$file/pr97chapter2.pdf
http://www.fcla.edu/FlaEnt/fe80p34.htm
http://www.mahoganyforthefuture.org/projectmeliaceae/borer/borer.html
http://www.creatures.ifas.ufl.edu/trees/moths/mahogany_borer-english.htm

Sarsina violascens Herrich-Schaeffer, 1856

Other scientific names:
Lepidoptera: Lymantriidae
Common names: purple moth
Host type: broadleaf
Hosts: *Eucalyptus* spp.; *Psidium* spp.; *Mikania* spp.; *Osmanthus* spp.

Sarsina violascens is a polyphagous caterpillar that has demonstrated a capacity to thrive on new hosts, such as introduced *Eucalyptus* species. It has been reported causing damage to eucalypt plantations in the states of Tabasco and Veracruz, Mexico. *S. violascens* has caused localized defoliation (de Oliveira *et al*., 2003). The impact of defoliation on eucalyptus plantations is poorly understood. Defoliation can reduce growth rates and can be unsightly. However, the ability of insect defoliation to kill eucalypts is considered unlikely (de Oliveira *et al*., 2003).

This insect is mobile in both adult and juvenile stages and hence it has the capacity to spread into new areas. Other methods of introduction to new areas include the accidental transport of egg masses or adults being attracted to lights and then carried on vehicles.

This species was considered indigenous to Mexico and neighbouring countries (Zanuncio, 1976; Berti Filho, 1983; Zanuncio *et al.*, 1992) though recently it is questioned as to whether it is indigenous or an exotic invasive species in Mexico (Izquierdo, Gilli and Soberano, 2000; Izquierdo and Gilli, 2002).
http://spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=10&langdisplay=english

Introduced insects

Mexico began a programme to detect insects and diseases of quarantine importance in 1999. Up to May 2003, three fungi and 37 genera of exotic insects have been detected. Most of the forest and tree insects introduced to date are important pests of urban trees and conifer plantations.

***Adelges cooleyi* (Gillette, 1907)**

Other scientific names:
Hemiptera: Adelgidae
Common names: Cooley gall aphid; Cooley spruce gall adelgid; spruce gall adelgid
Host type: conifer
Hosts: *Picea* spp.; *Pseudotsuga menziesii*

Adelges cooleyi has primary and secondary hosts, spruce and Douglas fir respectively. Males and females occur on the primary hosts, whereas only asexually reproducing females occur on the secondary hosts. The damage on hosts is not normally serious and takes the form of galls of around six centimetres on the tips of new growth and terminals of the primary host and yellowing and distortion on the secondary host affecting the growth rate and appearance of trees. Galls are formed only on the primary hosts. It takes two years for these aphids to complete their full cycle on both primary and secondary hosts. Females overwinter under the bark scales of spruce or Douglas fir.
http://www.invasive.org/browse/subimages.cfm?SUB=480
http://www.forestry.ubc.ca/fetch21/FRST308/lab3/adelges_cooleyi/cooley.html
http://www.forestpests.org/vermont/galladelgids.html
http://www.ento.csiro.au/aicn/name_s/b_88.htm
http://cnfi.cfs.nrcan.gc.ca/diseases/nursery/pests/aphids_e.html
http://www.cce.cornell.edu/suffolk/grownet/tree-insect/spradelg.html

***Chionaspis pinifoliae* (Fitch, 1856)**

Other scientific names: *Phenacaspis pinifoliae*
Hemiptera: Diaspidae
Common names: pine needle scale
Host type: conifer
Hosts: Taxaceae; Pinaceae; *Abies* spp.; *Cedrus* spp.; *Taxus* spp.; *Tsuga* spp.; *Pinus* spp.; *P. mugo*, *P. sylvestris*

Pine needle scale has a broad host range that includes most conifers however they show a particular preference for mugho pine (*Pinus mugo*) and Scots pine (*P. sylvestris*). It can cause yellowing, dieback and even tree death at high infestation levels. At low levels they cause little damage and more usually there are sublethal affects such as slowing tree growth which can have a significant impact particularly on amenity trees. The reduced vigour of the trees makes them susceptible to attack by secondary invasive pests. There are 1-2 generations per year. They overwinter as eggs in the dead bodies of adult females. Dispersal is normally by movement of the first instar crawler stage.
http://www.forestry.ubc.ca/fetch21/FRST308/lab5/chionaspis_pinifoliae/scale.html
http://www.fs.fed.us/r1-r4/spf/fhp/field_guide/141pnscl.htm
http://www.forestpests.org/vermont/pineneedlescale.html
http://www.forestryimages.org/browse/subimages.cfm?SUB=297
http://www.colostate.edu/Depts/CoopExt/LARIMER/plantinsectid/Pine%20needle%20scale.pdf
http://www.ento.psu.edu/extension/factsheets/pineneedscale.htm
http://ip30.eti.uva.nl/bis/diaspididae.php?selected=beschrijving&menuentry=soorten&id=99

***Coptotermes gestroi* (Wasmann, 1896)**

Other scientific names: *Coptotermes havilandi* Holmgren
Isoptera: Rhinotermitidae
Common names: Asian subterranean termite
Host type: broadleaf
Hosts:

Coptotermes gestroi is a subterranean termite that is a destructive pest of standing trees, agricultural crops and timber in service. This species of termite lives in tropical areas. As with all termites, it is social, living in large colonies where there are distinct castes (body types) that align with the functions that an individual carries out. There are few individuals that reproduce within the colonies; the other individuals are sterile and have functions such as food gathering or protection of the colony. The reproductive individuals are often long-lived (sometimes years), whereas the other individuals are usually not as long-lived. They can build nests in tree trunks or voids in buildings; however a source of moisture is required for survival. Two main means of dispersal are by winged reproductive adults that shed their wings after the dispersal flight and transportation in freshly felled logs or infested timber.
http://www.fcla.edu/FlaEnt/fe80p408.pdf
http://www.padil.gov.au/viewPest.aspx?id=296
http://creatures.ifas.ufl.edu/urban/termites/havilandi.htm

***Dynaspidiotus californicus* (Coleman, 1903)**

Other scientific names: *Aspidiotus abietis*; *Aspidiotus californicus*; *Nuculaspis californica*
Hemiptera: Diaspidae
Common names: black pineleaf scale
Host type: conifer
Hosts: *Pinus* spp.; *Pseudotsuga* spp.; *Tsuga* spp.

Black pineleaf scale is an armoured scale that can severely weaken or kill hosts, particularly young trees. At low levels it does not cause significant damage, however at epidemic levels it can. It causes premature needle drop with subsequent production of fewer and shorter needles. The weakening or stress on the trees makes them susceptible to attack by secondary invasives, in particular bark beetles.

Adult scales are only about 1.5 mm long and can be transported on host plants or crawlers can disperse on air currents. Females do not fly; they remain as adults on the host plants covered by a thick scale, whereas males develop wings and can move between plants. There are often 2-3 generations per year. *Dynaspidiotus californicus* occurs throughout the United States and in the mountainous areas of Mexico. Hosts include piñon pine, ponderosa pine, Jeffrey pine, Monterey pine and sugar pine.
http://www.fs.fed.us/r6/nr/fid/fidls/fidl91.htm
http://www.forestryimages.org/browse/subimages.cfm?sub=323
http://ip30.eti.uva.nl/bis/diaspididae.php?selected=beschrijving&menuentry=soorten&id=115

Glycaspis brimblecombei Moore, 1964

Other scientific names*:*
Hemiptera: Psyllidae
Common names: red gum lerp
Host type: broadleaf
Hosts: *Eucalyptus* spp.; *E. camaldulensis*; *E. grandis; E. urophylla; E. blakelyi*; *E. brassiana*; *E. bridgesiana*; *E. dealbata*; *E. mannifera*; *E. tereticornis*

Glycaspis brimblecombei, an insect native to Australia, was first discovered in Mexico in 2000 in the northern border city of Tijuana. Within less than a year, this insect had invaded most urban and plantation trees of *Eucalyptus camaldulensis* in central and northern Mexico. Populations of this insect are declining however, most likely a result of a successful classic biological control programme using a parasitic wasp, *Psyllaephagus bliteus* (Castillo, 2003).

Infestations cause leaf drop, growth loss, dieback and stress to trees. The red gum lerp as a juvenile feeds on sap from leaves and excretes large volumes of a sugary solution from which they create finely woven shelters to protect them from the environment and predators. This sugary solution also provides a substrate that enables large amounts of sooty mould to grow and blacken trees. It stresses trees which then makes them vulnerable to attack by other organisms.

Host species include various eucalypt species including *Eucalyptus camaldulensis; E. grandis* and *E. urophylla* (Wilcken *et al.*, 2003). Other hosts include *Eucalyptus tereticornis*, *E. mannifera*, *E. dealbata* and *E. blakelyi*.
http://www.eppo.org/QUARANTINE/Alert_List/insects/glybrim.htm
http://commserv.ucdavis.edu/CESanDiego/redgumlp.pdf
http://www.cnr.berkeley.edu/biocon/dahlsten/rglp/index.htm
http://www.deh.gov.au/cgi-bin/abrs/fauna/details.pl?pstrVol=PSYLLOIDEA;pstrTaxa=369;pstrChecklistMode=1

Minthea rugicollis (Walker, 1858)

Other scientific names:
Coleoptera: Bostrichidae
Common names: powder post beetle; hairy powder post beetle; Malayan powder post beetle
Host type: broadleaf
Hosts: *Afzelia* spp.; *Artocarpus* spp.; *Bombax* spp.; *Parashorea* spp.; *Shorea* spp.

Minthea rugicollis tends to attack wide-pored hardwood, broadleaf or coniferous trees and timber with starch levels of greater than three percent. The females create grooves in the wood and then test for the level of available starch. If the level of starch present in the wood is correct, then eggs are laid in the pores of the wood. It attacks a wide range of species including *Afzelia*, *Artocarpus*, *Bombax*, *Parashorea* and *Shorea*, and is capable of causing significant structural damage to timber in service. This species is often transported in timber and wooden products; items as small as wooden pegs or rulers provide sufficient host material for transportation of this species. The other main means of dispersal is by adults flying to new host material.

http://www.ento.csiro.au/aicn/name_s/b_2591.htm
http://www.padil.gov.au/viewPest.aspx?id=110
http://caripestnet.org/dynamicdata/data/docs/minthea%20rugicolis.pdf
http://www2.dpi.qld.gov.au/forestry/5035.html

***Paranthrene dollii* (Neumoegen, 1894)**

Other scientific names: *Paranthrene castaneum*; *Paranthrene fasciventris*
Lepidoptera: Sessidae
Common names: poplar clear wing moth; poplar borer; cottonwood clearwing borer
Host type: broadleaf
Hosts: *Populus* spp.; *Salix* spp.

Parantrene dollii are relatively large clear-wing moths that fly during the day. The females lay eggs in the bark of the tree and the larvae bore into the sapwood of trees. They pupate in the bark and emerge as non-feeding adults. Low levels of damage can be tolerated by the trees, however higher levels of damage can cause limb dieback and tree death. Effects on the trees include the degradation of the value of the trees.
http://www.forestpests.org/subject.html?SUB=2169
http://www.entomology.umn.edu/cues/Web/088ClearwingBorers.pdf

***Scolytus multistriatus* (Marsham, 1802)**

Other scientific names: *Eccogaster abhorrens*; *Eccogaster multistriatus*; *Ips multistriatus*; *Scolytus affinis*; *Scolytus flavicornis*; *Scolytus javanus*; *Scolytus nodifer*; *Scolytus orientalis*; *Scolytus papuanus*; *Scolytus therondi*; *Scolytus ulmi*
Coleoptera: Scolytidae
Common names: Dutch elm beetle; European elm bark beetle; smaller European elm bark beetle
Host type: broadleaf
Hosts: *Ulmus* spp.

Scolytus multistriatus is a pest of all species of elms (*Ulmus* spp.) and is also a major vector of the fungus that causes Dutch elm disease. Dutch elm disease is transmitted by adults feeding on the twigs of host trees. The females create longitudinal tunnels in the main trunks of the host trees in which they lay eggs. The larvae then bore out laterally from the main gallery. Although these beetles are capable of primary damage, the greatest impacts are usually felt when Dutch elm disease is present. The beetles normally colonize older, dying, unhealthy trees or trees that have been stressed by other factors. There are usually two generations annually. The adults are reasonably strong fliers and disperse from the trees in which they develop.
http://www.forestry.ubc.ca/fetch21/FRST308/lab6/scolytus_multistriatus/elm.html
http://www.barkbeetles.org/browse/subject.cfm?SUB=66
http://www.forestpests.org/southern/smallereuroelm.html
http://www.barkbeetles.org/hardwood/SEEBB2.html
http://www.barkbeetles.org/Biocontol/europeanelmbarkbeetle.html
http://www.wcrl.ars.usda.gov/cec/insects/ded1.htm
http://www.padil.gov.au/viewPest.aspx?id=459

***Xylosandrus morigerus* (Blandford, 1894)**

Other scientific names: *Xyleborus coffeae* Wurth; *Xyleborus difficilis*; *Xyleborus luzonicus* Eggers; *Xyleborus morigerus* Blandford; *Xylosandrus coffeae* (Wurth)
Coleoptera: Scolytidae
Common names: Ambrosia beetle; twig borer; brown twig beetle; brown coffee borer; brown coffee twig borer; coffee beetle
Host type: broadleaf
Hosts: *Juglans nigra*; *Salix* spp.; *Persea* spp.; *Coffea* spp.; *Albizia falcataria*

The hosts of *Xylosandrus morigerus* include black walnut, willow, avocado and *Albizia falcataria*. In some areas they are also considered significant pests of coffee. They cause premature leaf drop and damage to the smaller branches of trees, at times killing them. Adults construct galleries in the timber and feed on the fungus that develops on the walls of the galleries. When the fungus has commenced growing the females lay batches of eggs in the galleries. The eggs hatch and the larvae feed on the fungi. Adults generally disperse from trees where they develop and colonize new host trees.
http://xyleborini.tamu.edu/query.php?tax_id=1738
http://www.cabicompendium.org/NamesLists/FC/Full/XYLSMO.htm

Diseases

Indigenous diseases

No data was available on indigenous diseases of planted forests in Mexico.

Introduced diseases

Fusarium subglutinans* f.sp. *pini* J.C. Correll *et al.

Other scientific names:
Ascomycota: Nectriaceae
Common names: pine pitch canker
Host type: conifer
Hosts: *Pinus* spp.

Pine pitch canker, caused by *Fusarium subglutinans* f.sp. *pini*, is a serious fungal disease of several pine species. This fungus causes cankers on the stems and branches of host trees and copious pitch flow. It can cause dieback of branches and the crown. It can survive for more than twelve months in the absence of host material. In 1992, the disease was observed in a *Pinus radiata* plantation near Amecameca in the State of Mexico. It has also been recorded from Haiti, Japan, Spain and the United States but is considered a disease of unknown origin.
http://www.oregon.gov/ODA/PLANT/docs/pdf/PPC_Alert.pdf
http://www.fs.fed.us/r8/foresthealth/pubs/pitchcnk/pitchcnk.htm

Other pests

Indigenous other pests

No data was available on indigenous other pests (i.e. nematodes, mites, mammals, etc.) affecting planted forests in Mexico.

Introduced other pests

No data was available on introduced other pests (i.e. nematodes, mites, mammals, etc.) affecting planted forests in Mexico.

Diebacks and other conditions

No records were available for diebacks and other conditions affecting Mexico's planted forests.

Capacity for forest health protection

Government level

Mexico's national forest service is the Comision Nacional Forestal (CONAFOR). Part of this organization's mission is to monitor the health of Mexico's forests and to undertake control operations when needed. Since 1985, through a cooperative agreement with the USDA Forest Service, an aerial survey programme using low-flying, high wing aircraft and helicopters to detect and assess damage caused by forest insects and diseases has been implemented.

Monitoring and detection

Monitoring and detection of forest insects and disease is accomplished via a combination of aerial and ground surveys. Since 1985, via a USDA Forest Service/CONAFOR cooperative technical exchange, Mexican forest pest management specialists have received training both in the US and Mexico on aerial sketch map techniques for mapping bark beetle and defoliator damage. This technical exchange programme is ongoing.

Data management

Much of the data on forest pests of Mexico is qualitative in nature. Mexico's forest insects are well documented in a book published under the auspices of the FAO North American Forest Commission (Cibrián Tovar *et al.*, 1995). Parasitic plants affecting Mexico's forests are described by Geils, Cibrián Tovar and Moody (2002). In 2000, it was estimated that 7 880 ha of forests and other wooded lands in Mexico was damaged by forest insects and 2 000 ha was damaged by forest diseases (FAO, 2005).

Pest management

Bark beetle outbreaks are managed by a combination of salvage sales, cutting and burning of infested trees, and silvicultural measures. Outbreaks of defoliating insects are treated with both aerial and ground applications of biological and chemical insecticides.

Private landowners

More than half of Mexico's forest area is in public ownership. Forest land in private ownership is minimal. The remainder, classified as "other property" is largely communal forests or "ejidos" - areas of land granted by the federal government for community management. While some forest protection activities are done at the ejido level, most are done under the leadership of CONAFOR.

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OSN = Other Scientific Name (other names, synonyms, other combinations, etc. that have been used for this species)