INTRODUCTION

Forest insects and diseases follow natural cycles that range from there being little evidence of their existence to their being landscape-scale impacts. The following section is an analysis of the most common and/or most damaging insects and pathogens observed within the planning area. At endemic levels, insects and diseases increase mortality and reduce tree growth at the individual tree and stand levels. Widespread epidemics can create landscape-scale vegetative changes. There are many more insects and pathogens at work in these cover types, resulting in impacts that may not be extensive or apparent.

LEGAL AND ADMINISTRATIVE FRAMEWORK

LAWS

- ***The Organic Administration Act of 1897***: This act states that national forests are established "to improve and protect the forest within the boundaries, for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States."
- ***The Multiple-Use Sustained-Yield Act of 1960***: Under this act, "National forests are established and shall be used for outdoor recreation, range, timber, watershed, and wildlife and fish purposes." The Secretary of Agriculture is authorized and directed to develop and administer the renewable surface resources of the national forests for multiple uses and sustained yield, without impairment of the productivity of the land.
- ***The National Forest Management Act of 1976***: This act substantially amends the Forest and Rangeland Renewable Resources Planning Act of 1974. This act strengthens the references pertaining to suitability and compatibility of land areas; stresses the maintenance of productivity; and seeks to avoid the permanent impairment of the productive capability of the land. This act sets forth the requirements for Land Management Plans for the USFS.

DESIGN CRITERIA

Management guidelines and design criteria describe the environmental protection measures that would be applied to all of the alternatives at the project level in order to protect, enhance, and, where appropriate, improve resources related to insects and disease. Guidelines and design criteria are presented in Part 3 of Volume II of the DLMP/DEIS.

AFFECTED ENVIRONMENT

EXISTING CONDITIONS AND TRENDS

Rangeland Insects and Diseases

Several native insect species, mainly grasshoppers and Mormon crickets, can become pests through periodic dramatic population increases. These insects pose the greatest threats to cultivated lands. It is management policy to initiate control actions when a project is supported by an environmental analysis, is economically feasible, and the pest may be effectively controlled. When control measures are deemed necessary, public land management agencies work with the USDA Animal Plant Health Inspection Service (APHIS) through a Memoranda of Understanding (MOU) or a cooperative agreement.

Beginning in the late 1990s, SJPLC land managers began observing gradual increases in grasshopper species *(Camnula pellucida)* within the planning area. Generally, these outbreaks were confined to western Montezuma and Dolores Counties. Surveys conducted by APHIS confirmed SJPLC observations. The increase appeared to be related to an on-going, localized drought. Surveys conducted in 2004 estimated significant grasshopper populations on approximately 9,600 acres in these two counties.

During the same time, increases in the local Mormon cricket *(Anabrus simplex)* populations were observed across public lands in southwestern Colorado. In addition to increases in local cricket populations in Montezuma and Dolores Counties, significant cricket populations were observed in portions of La Plata and Archuleta Counties. Approximately 23,000 acres of Mormon cricket infestations were recorded in 2003; approximately 2,000 acres in 2004. Public land management agencies did not request control assistance from APHIS. In 2005, no insect surveys were undertaken by the SJPLC, because it appeared that insect populations were on the decline.

Long-term trends, in the context of predicting possible management actions, are difficult to identify. Rangeland management practices that maintain or improve healthy rangelands are important in reducing the impacts to native vegetation. In general, if precipitation cycles return to "normal," there may be improved plant vigor, increased forage production, improved species composition, and increased ground cover. Favorable precipitation cycles may also improve crop conditions, which may, in turn, reduce the need to undertake control actions within the planning area in order to protect croplands. Direct insect impacts, therefore, would be reduced and no management actions would be necessary.

An assessment of current conditions by major forest cover type is described below.

Ponderosa Pine

- ***Mountain Pine Beetle (dendroctonus ponderosae)***: Mountain pine beetle infestations are currently at endemic levels, with some increased activity resulting from the on-going drought.
- ***Western Pine Beetle (Dendroctonus brevacomis), Pine engraver (Ips pini), and Roundheaded pine beetle***: These insects area a pest "complex" that can result in localized ponderosa pine mortality throughout the ponderosa pine type, especially in dry years. Currently, there are high levels of activity, which is resulting in significant mortality in the Animas Valley and Hermosa Creek drainage. Scattered activity has been recorded throughout the planning area.
- ***Southwestern dwarf mistletoe (Aarcuethobium vaginatum ssp. cryptopodum)***: This parasitic plant causes deformity, growth loss, and eventual mortality in localized areas of ponderosa pines.

- ***Shoestring Root Rot (Armillaria ostoyae)***: This root rot fungus occurs in localized areas in ponderosa pine, mixed-conifer, and spruce-fir forest types throughout the planning area.

Mixed-Conifer

Within the planning area, Douglas-fir generally does not occur in pure stands. It is more likely to be found in a "mixed-conifer" stand in association with ponderosa pine and white-fir (warm-dry mixed-conifer); or aspen, spruce, and subalpine-fir (cool-moist mixed-conifer) stands.

- ***Douglas-fir beetle (Dendroctonus pseudotsugae) and the Douglas-fir pole beetle (Pseudohylesinus nebulosus)***: These insets can kill significant numbers of Douglas-fir, especially in the drier mixed-conifer vegetation types and during drought years.
- ***Western spruce budworm (Choristoneura occidentalis)***: This insect defoliates white-fir, Douglas-fir, spruce and subalpine-fir, and may can result in growth loss, top killing, and tree mortality. Defoliation levels vary from year to year; however, they tend to be more chronic in lower elevation mixed-conifer stands.
- ***Fir Engraver Beetle (Scolytus ventralis)***: The planning area is currently experiencing widespread white-fir stands as a result of the presence of the fir engraver beetle in the mixed-conifer stands. Overly dense stands, drought conditions, chronic budworm defoliation, and root disease all predispose trees to attack by this beetle -- and all of these conditions are currently present.
- ***Shoestring Root Rot (Armillaria ostoyae) and Annosus Root Rot (Heterobasidium annosum)****:* These are the primary root diseases in mixed-conifer stands. Root diseases results in significant growth loss and mortality. Stem decays (including *Echinodontium tinctorium* in white-fir, and *Phellinus pini* in all higher elevation conifers) results in mortality due to stem failure. They also result in economic losses for lumber manufacturers, and pose hazards on developed sites. Both of these diseases are prevalent on the San Juan, killing primarily true firs and Douglas-fir trees.
- ***Douglas-fir Dwarf Mistletoe (arceuthobium douglasii)***: This parasite, where it occurs, results in the most significant disease problem related to Douglas-fir stands.

Spruce-Fir

Spruce beetle *(Dendroctonus rufipennis)* has resulted in large-scale spruce mortality, and populations are continuing to increase within the planning area. Western balsam bark beetle *(Dryocoetes confuses)* is abundant within the planning area, and is killing numerous subalpine-fir trees. Western spruce budworm defoliation of higher elevation spruce and fir is common; however, it is not as damaging or as chronic as it is at lower elevations. Shoestring root rot *(Armillaria ostoyae)* is common in spruce-fir stands, and contributes to tree hazards on developed sites.

Aspen

Two aspen bark beetles, *Tryphloeus populi* and *Procryphalus mucronatus*; two aspen wood borers, *Agrilus liragus* and *Saperda calcarata*; as well as some canker diseases have contributed to the sudden increase in aspen mortality seen in recent years. Currently, the cause of the mortality is being assessed. The current hypothesis is that the mortality is indirectly due to drought and stand age.

Root rots (including *Armillaria ostoyae*) and stem rots (including *Phellinus tremulae*) are common, and are causing economic loss and mortality.

Stem cankers (including Sooty bark canker, Hypoxylon canker, Black canker, and Cytospora canker) are also common in aspen. They cause deformity and mortality in aspen; and provide "entrance wounds" for other pathogens.

Defoliators are also common within the planning area; however, there are no large-scale outbreaks at this time. This includes Western tent caterpillar (*Malacosoma californicum),* which has resulted in large-scale damage in the past, killing whole clones of aspen. Other defoliators present are large aspen tortrix, and aspen leaf miner.

Pinyon-Juniper

Pinyon ips *(Ips confuses)* has resulted in extensive pinyon mortality during dry periods. This insect is often associated with high levels of pinyon twig beetles *(Pityophthorus spp.).* Pinyon pine dwarf mistletoe *(Arceuthobium divaricatum)* causes significant deformity and pinyon mortality in localized areas. Black stain root disease *(Leptographium wageneri)* is widespread in pinyon-pine in the broader Four Corners area.

TRENDS

Within the planning area, insect and disease activity is increasing. In general, the increased activity is a result of drought and stand conditions. The region is experiencing long-term drought, which has been exacerbated by forest stands that are unnaturally dense and old (due to fire-suppression and past management practices).

ENVIRONMENTAL CONSEQUENCES

DIRECT AND INDIRECT IMPACTS

The key indicator for the management of insects and disease is Management Area (MA) allocations. The primary emphasis of all the alternatives is to inventory and monitor insect and disease risk related to vegetation conditions, as well as to integrate insect and disease risk management into all levels of planning. The SJPLC is developing vegetation management strategies designed to minimize pest encroachment into areas where the values to be protected exceed the costs of protection, and to identify areas where pests would be allowed to run their natural course. Insects and diseases are unpredictable and very difficult to manipulate. If conditions allow, they may result in change on a significant scale. The primary strategy for managing insects and disease is to manage for ecological health in order to fortifying forests so that they would be less vulnerable to extreme events by guiding conditions within the historic range of variation (HRV) (see Part 1, Volume II of the DLMP/DEIS for a description of HRV). Direct manipulation of the insect and disease organisms would be reserved for focused efforts within the planning area.

General Impacts

MA designation may influence the occurrence of insect and disease activity, as well as the actions that would be taken in order to minimize impacts.

Regardless of the alternative adopted, natural disturbance events will continue within the planning area; however, the scale at which natural processes would operate as the primary agents of change may vary by alternative. Where natural processes are the predominant process, the management of insect and disease populations may be less likely to occur. Insect risk is medium or high throughout much of the planning area; therefore, it may be possible that many of the acres at risk of insect damage could be attacked within the next 50 years. Similarly, with the current high levels of disease infection, it is likely there would be continued high levels of tree mortality over the next 50 years.

DLMP/DEIS Alternatives: The emphasis on management activities designed to prevent or reduce pest populations would vary under all of the alternatives. It would correspond to levels of timber harvesting or other activities that promote greater habitat diversity. Management alternatives that change the mix of age classes, density, and species make-up of forest stands may result in the greatest impacts to insects and diseases. Alternative C would place the most emphasis on natural processes as the major change agent; therefore, it may result in greater risks to loss from insect and disease. Alternative D may result in the least susceptibility of forest stands to large insect and disease outbreaks, followed by Alternatives A, B, and C, in order from the least impacts to forest stands to the greatest impacts to forest stands.

Impacts Related to Fire and Fuels Management

Large destructive wildfires would likely reduce insect risk in those areas where extremely hot fires burn. Fires can also reduce stand density and make stands more resistant to attack. Conversely, lower burning intensities that occur in portions of most wildfires, and most prescribed burns, can severely weaken the resistance of trees to pest attacks by damaging root systems and cambial tissues. This, in turn, can lead to increased populations and subsequent outbreaks of some pest species.

DLMP/DEIS Alternatives: The extent and frequency of large fires may increase following major bark beetle outbreaks. However, the occurrence of this type of behavior has not been recorded in the past. Alternatives that include more acres managed with the intent of allowing natural processes to run their course, such as Alternative C, may have the greatest likelihood of large-scale insect and disease attack and large-scale fires, followed by Alternatives B, A, and D.

Impacts Related to Timber Management

Timber harvesting and timber stand improvements (TSI) may provide an opportunity to prevent or reduce pest outbreaks through the removal of diseased and high-risk trees. In particular, clear-cuts and other final harvesting methods may provide opportunities for the long-term protection and prevention of insect and disease outbreaks. In stands scheduled for overstory removal, shelterwood, or uneven-aged management, individual suppressed or dying trees could be removed, which may, in turn, increase the overall growth and vigor of the remaining trees. In commercial and pre-commercial thinning operations, susceptibility to insects and disease may be decreased by increasing the growth and vigor of the remaining trees.

Timber management could also be used to create forests that have increased age and species diversity. The more diversity that is present within an area, the less likely that large-scale epidemics would occur. The degree to which harvests targeted insect-infested or diseased stands are undertaken within the planning area would largely depend upon the associated risks. This may include the potential infestation spreading into healthy stands, public safety, the presence of high-value resources, and the resource emphasis of the infected, or adjoining, area.

DLMP/DEIS Alternatives: Alternatives that increase the amount, extent, or density of mature and over-mature stands will generally increase the risk of attack by bark beetles. The greatest potential for impacts due to insects and disease would be under Alternative C, followed by Alternatives B, A, and D. Alternatives that include no new oil and gas leasing would have no measurable effect on insect and disease conditions or management.

Under all of the alternatives, there would be the potential for salvage and/or sanitation cuts designed to harvest dead or damaged timber and to slow or impede infestations from spreading.

Impacts Related to Wilderness Management

In lands managed as proposed Wilderness, the amount of suppression and control, as well as silvicultural activities designed to reduce risk, will decrease; therefore, the occurrence of insects and diseases would increase.

DLMP/DEIS Alternatives: The greatest potential insect and disease impacts related to the management of Wilderness Areas may be under Alternative C, followed by Alternatives B, D, and A, respectively.

Impacts Related to Recreation

In developed and dispersed recreation sites where trees are often affected by camping activities, and where the overall health and vigor of trees is reduced by soil compaction, insects and diseases may occur at higher levels. Pest-management activities would be intensified under all of the alternatives in order to protect developed recreation sites. Costs may be higher in these developed recreation sites than they would be for general forest areas, in order to ensure that vegetation in and around developed recreation areas is not degraded. This may result in greater safety hazards from insects or disease.

MAs that emphasize Wilderness Area, backcountry, and non-motorized recreation would have little or no management activity targeted toward the prevention or reduction of insects and diseases.

DLMP/DEIS Alternatives: Proposed recreation activity would not vary substantially from one alternative to another; therefore, impacts may not vary substantially.

CUMULATIVE IMPACTS

Within the planning area, forest-stand density, age, and size have increased and, in turn, are increasing the risk of insect and disease outbreaks over a larger land area. Over the life of the approved land management plan, this risk would increase even further as the forest ages.

Silvicultural treatments can change vegetation structural stage and can create forests that are more resistant to large-scale outbreaks. Salvage operations would occur in MAs where timber production is emphasized, or where it was needed in order to reduce hazards in high-use recreation areas.

As forest stands age, they pass through different stages of susceptibility to insects and diseases. Generally, mature forest stands are at the highest risk of insect and disease activity, when impacts exceed management objectives.

Alternatives that propose increased hazard-reducing activities may, in turn, provide opportunities for the greatest reduction in insect and disease activity. Alternative D is the least likely alternative to have large landscape-scale insect and disease events across the planning area, followed by Alternatives A, B, and C. The greater the number of acres that emphasize natural processes, the greater the probability of large-scale disturbance.