Forest Health Protection
Pacific Southwest Region

Date: October 24, 2009
File Code: 3420

To: Lonnie Rodriguez, Environment Department, Morongo Band of Mission Indians

Subject: Disease Evaluation of Hardwoods on the Morongo Reservation (Report SC-09-07)

On August 28, 2009, Paul Zambino, Forest Health Protection (FHP) Pathologist conducted a field evaluation of sycamores, alders and other hardwoods on portions of the Morongo Reservation at the request of Lonnie Rodriguez of the Environment Department, Morongo Band of Mission Indians. The primary objective of the visit was to determine if there were significant diseases in natural stands of trees of riparian areas used by cattle and if mitigation measures would be useful. Such recommendations may be considered for inclusion in a Master Plan being developed for the management of tribal natural resources.

Area assessed: Portions of Millard, Potrero, and Hathaway Canyons. Most intensive assessment along Millard Creek, legal description below.
Legal: R2E T2S Sections 21 (esp. NW Quadrant), 20, 29.
GIS: Sycamore stands around: N 33.986945 W116.785583 Elev. 3545 ft.; N33.98702 W116.78483 Elev. 3610 ft. Individual at: N33.97125 W116.86082.
Alder stands at: N33.98693 W116.78602 Elev. 3562 ft.; N33.98212 W116.7888 Elev. 3407 ft.; N33.979623 W116.793500.
Walnut individuals at: N33.97176 W116.79765.
Interior live oak at: N33.98606 W116.78447 Elev. 3596 ft.

Background

Trees in the canyons occur predominantly as single-canopy riparian "gallery" forests along permanent or seasonal streams. White alder (*Alnus rhombifolia*) is limited to areas with very moist soils along streams, whereas western sycamore (*Platanus racemosa*) occurs on adjacent slightly drier soils on streambed slopes to elevated flats. In contrast, the local species of oaks occur on protected north aspects to flats, ranging from live oaks (e.g., *Quercus wislizenii, Q. agrifolia*) to shrub oaks (*Q. dumosa* and allies) depending on water availability. Lonnie Rodriguez, Environment Department, who was present during the evaluation, indicated that the sycamores were of most concern and prompted the assessment, as these are considered to be of highest value for sheltering cattle and have obvious leafy mistletoe (*Phoradendron villosus*). Sycamores in some

areas of the canyons had been treated for mistletoe removal previously. Alders also provide shelter for cattle closer to the flowing water, and may be providing habitat for sensitive animal species such as the Southwestern willow flycatcher (*Empidonax traillii extimus*) and the least Bell's vireo (*Vireo bellii pusillus*). Also, the shaded stream under the alders at the headwaters of the stream in Millard Canyon had multiple individuals of the Pacific tree frog (*Pseudacris regilla*) – a species that can be useful to indicate potential habitat for the mountain yellow-legged frog (*Rana muscosa*) that is listed as endangered in its distribution in southern California. Lonnie may incorporate information on tree diseases and their potential impacts and mitigations in these species to make specific recommendations for the Natural Resources Management Master Plan.

Observations on mistletoe on sycamore

Leafy mistletoe infections in sycamores ranged from moderate to heavy in the stands in Millard Canyon, with the most severe symptoms in the large old trees along the watercourse (below, at left), where they were interspersed with large and heavily mistletoe-infested alders. The mistletoe that infects both the sycamores and alders is the large-leafed mistletoe *Phoradendron tomentosum* ssp. *macrophyllum*, which has over 60 hardwood hosts. Note that this is a different species from the mistletoe (*Phoradendron villosus* ssp. *villosus*) that infects oaks in the area. All leafy mistletoes are easily spread by birds consuming the berries and perching in other branches or trees. There are no barriers to spread between sycamore and alder hosts.

Leafy mistletoes are considered water parasites, and use their high rate of water loss through leaves to increase their sap uptake as a means to obtain additional nutrients from their hosts. Water and nutrients are obtained through root-like structures, within the living bark and cambium of the host. These structures can be present in the bark up to a foot from the site where the external part of the mistletoe attaches, and can generate new shoots if the external plant is removed. Nonetheless, these mistletoes obtain most of the sugars needed to grow and survive from photosynthesis in their green leaves.

Effects on the sycamores and alders on Morongo lands likely include water stress, potential for breakage in wind or snow, entry points for decay fungi and pathogens, and shading effects that reduce host photosynthesis. Stress appeared greater for the small trees on the flat; these had branch malformations, breakage, and diebacks, as well as fruiting structures of the charcoal canker fungus *Biscogniauxia mediterranea* (below, at right). This pathogen uses injuries, including mistletoe-related breaks and holes from boring insects to enter its hardwood hosts. Once in its host, the pathogen can

become dormant until trees are stressed, when its renewed growth causes cankers that kill branches and whole trees. Water stress on trees heavily infested with mistletoe can be severe, as leafy mistletoes lose water through their leaves at a higher rate than their hosts, and are not deciduous. Stresses from the mistletoe on infected sycamores are difficult to quantify, but can be assumed to be significant on both the large heavily infested trees in the moistest soils at and at the less heavily infested younger stand on the drier flat at N33.98702 W116.78483**.**

Treatment for sycamore mistletoe:

Several types of treatments would be appropriate for trees in the affected stands. The stand may benefit if affected trees that are in a very advanced state of decline (those with premature leaf yellowing and wilting, with branch dieback) are felled. Such heavily affected trees may not survive, even after pruning. Resprouting might occur from stumps of felled trees within 1-2 years. If so, there should be a follow-up treatment to thin sprouts to regenerate 1-2 stems per stump.

Mistletoe in less heavily affected trees can be controlled by a combination of careful limb pruning and removal of the mistletoe shoots (cutting them away from the tree without affecting the branches or bole). Mistletoe removal will reduce both the stress on the tree and the amount of seed that can be spread to infect other trees and branches. Standard practice should be used in pruning, to speed wound healing and minimize the size of tree wounds and prevent entry of decay fungi. Three point cuts when pruning affected limbs back to their junction with a larger stem will prevent running bark-strip wounds. Final cuts should be perpendicular to the branch axis at its narrowest point beyond its junction with another branch, in other words just after the branch collar, to make round instead of oblong wounds. No more than 50% of the living crown should be removed, and branch pruning should be done in a way that preserves the ability of the tree to have and to regenerate good crown form.

To prevent spread of pathogens such as the charcoal canker fungus (*Biscogniauxia mediterranea*) into wounds, I suggest using a spray bottle filled with rubbing alcohol (50% alcohol concentration to make it non-flammable) to spray hand tools betweens cuts on different branches. Infections will also be minimized if cuts are not made in the rainy season when spores are being produced. A few sources suggest pruning when sycamores are dormant; this can aid in locating clumps of mistletoe.

If mistletoe removal cannot be accomplished exclusively by branch pruning without severely reducing crown, branch pruning can be combined with pruning the mistletoe shoots themselves, to preserve the infected branches. Cutting the mistletoe shoots provides temporary relief from water stress and keeps seeds from spreading but does not kill the mistletoe. New mistletoe shoots will appear in several years. The extra time may allow some uninfected branches to fill in parts of the canopy that have been removed, allowing more branches infested with mistletoe clumps to be pruned out at a

later date. Treating all trees in an area will minimize reinfection by birds feeding on seeds in untreated trees, and perching on treated trees. A follow-up treatment in 2-3 years will allow missed infections and resprouted infections to be pruned before significant seed dispersal, and may allow trees to be shaped using the modified branch architecture from earlier pruning.

Chemical treatment with ethephon® has been used more in the past than now. This material is applied to mistletoe foliage, causing the mistletoe branches to fall off, but this does not always kill the mistletoe. Ethephon® can only be applied to the mistletoe foliage when trees are fully dormant. Use of chemicals has fallen out of favor, because there is only a low margin between an effective dose and doses that would damage trees.

Bole and major branch infections can be treated by removing mistletoe shoots and then wrapping (not too tightly!) with black plastic, so that new mistletoe shoots will not receive enough sunlight to survive. If plastic is applied, it must be removed after several years, or constriction will damage the tree.

As a wildlife consideration, some birds utilize the mistletoe berries as food. These birds also spread seeds in their dung to perch sites in other trees, where they germinate and infect. (The Anglo-Saxon origin for the word mistletoe, “mistle-tan” i.e., “dung on a twig”, likely refers to this habit). Birds can also nest in the clumps of mistletoe. There may be a need to survey before treatment, and specify that pruning will not occur during normal nesting, or to avoid trees with active nesting, if sensitive bird species are present at the sites of mistletoe treatment.

If pruning must be accomplished by climbing, trees should be carefully surveyed for hazard and structural weaknesses. There should be no climbing in trees considered a hazard due to problems at the base, or in rotten or cracked branches. Hazard branches (dead or broken branches) may need removal before mistletoe treatment in some trees.

Categories of trees that might be used to calculate costs for the project:
trees for cutting and removal
trees with light mistletoe removal, by pruning from ground
trees with heavy removal, by pruning from ground
trees light removal, by climbing (requires a spotter / swamper)
trees heavy removal, by climbing

<u>Other damage and observations</u>

Alder decline was occurring on pole to mature white alder (*Alnus rhombifolia*) in very discrete patches in Millard Canyon. This species is considered short-lived, and is

limited to areas with very moist soils along streams, so even slight fluctuations in ground water level or water course can cause weakening of the trees, with greater susceptibility to insects and diseases. Areas of decline had a combination of borer and bark beetle damage, foamy canker, and several opportunistic canker fungi (e.g., *Valsa/Cytospora*

canker species and perhaps others). Oldest trees, along permanent springs, also had large-leafed mistletoe *Phoradendron tomentosum* ssp. *macrophyllum*, which may contribute to stress.

Alder decline should not be of great concern, as dense regeneration is occurring all along the watercourse, especially closer to flowing water in areas where watercourse has changed. There are no recommendations for control. Harvest of trees with obvious decline will neither help nor hinder the progress of alder decline, but removal of declining trees that have mistletoe will reduce the seeds that could be spread to other trees, including sycamores. Control of mistletoe in healthy or declining white alder by climbing would be difficult and likely dangerous, due to the very thin and upright architecture of this tree species.

A large recently dead interior live oak was examined and found to have no evidence of the goldspotted oak borer, *Agrilus coxalis*. This new and virulent insect pest is not believed to be in the area, but is causing massive mortality on the Cleveland National Forest and environs.

A walnut tree on a dry site that had extensive branch dieback was examined. The cause was found to be a normal decline, and there was no evidence of "Thousand Canker Disease"—a severe new disease known to be in the LA basin, and caused by a lethal insect and pathogen combination.

/s/ Paul Zambino

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