2012 New Mexico Forest Health Conditions Report

Energy Minerals and Natural Resources Department:

Forestry Division

Summary:

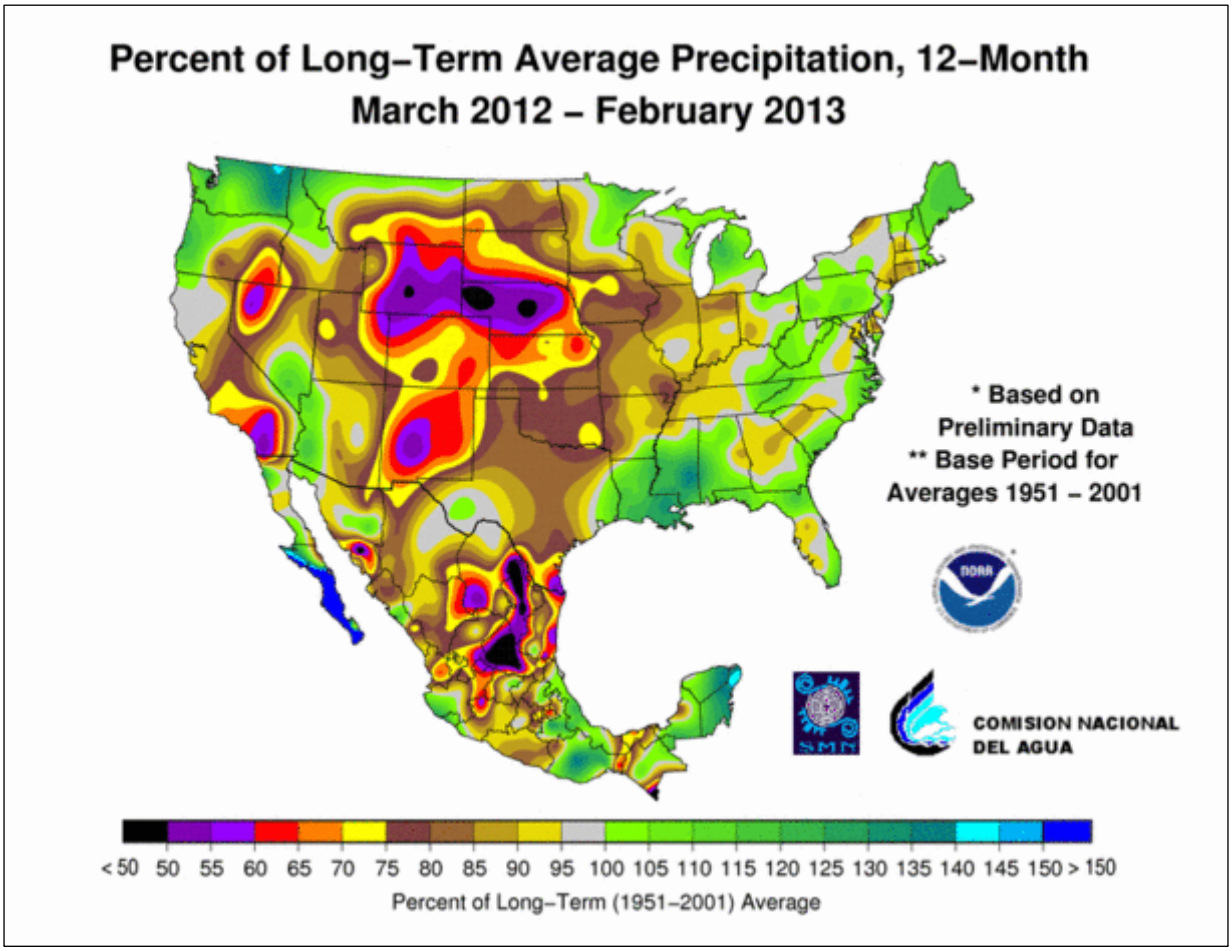
Bark beetle activity following the Little Bear Fire.

New Mexico continued to feel the effects of drought conditions from the previous few years during 2012. This manifested itself in many ways and depending on a person's point of view and what professional field they are in had a differing impact. From a fire standpoint, the largest fire in state history was recorded in the Gila (Whitewater-Baldy Complex) and the Sacramento Mountains saw the most destructive fire in state history (Little Bear Fire) damage or destroy 254 structures. In the world of forest insects and diseases, the year was a mixed bag with the majority of damage agents trending in an upward direction. The state also saw the first widespread impacts from an intentionally introduced species on salt cedar in riparian areas.

It is important to remember that New Mexico is part of the global climate patterns and this plays a large and important role in the seasonal weather that the state experiences. In the most general terms, years experiencing El Niño conditions will have wetter winters and increased precipitation over a normal year. Those years falling into a La Niña pattern are generally drier throughout the year. Last year saw a shift away from two years of La Niña conditions and a very dry period to a neutral condition, even though it looked like we may move towards a wetter El Niño pattern (which did not develop). It is important to consider these climate cycles because they play an important role in the incidence of insects and diseases. Everything from bark beetle outbreaks to foliar fungi infections are related to the amount of moisture and plant stress that is occurring. Many times the full impact of these climatic patterns are not seen for one to three years following the climate event. This was the case in the early 2000's when La Niña conditions persisted from 1998 to 2001 but a major piñon Ips outbreak did not reach its maximum for several years.

The large fires that the state has experienced over the last few years can also play an important role in increasing the population of destructive forest insects. Following a fire, the trees have been placed under a high degree of stress and the soil is generally dried out due to heat, possible loss of canopy exposing the soil surface to increased evaporations and numerous other factors. Trees under stress become very susceptible to attacks from insects and it is not uncommon to see pockets of tree mortality caused by insects surrounding fire scars.

Each year, and on a national scale, state and federal forest health professionals perform surveys of the forested lands to map and monitor the incidence of insects and diseases. Much of this work is conducted through aerial surveys, mostly from small single engine, high wing airplanes. A significant amount of this report is derived from these surveys. It is important to continue to conduct these surveys as they give a historical picture of the state of the forest health in the region. In 2012, the surveyors moved from a tree per acre approach for the survey to a percent class method. This should allow for increased utilization of data and a more accurate representation of what is seen on the ground.



National Climatic Data Center

New Mexico continues to have below average precipitation causing increased stress on trees.

Observed Conditions:

Different insects and diseases cause different types of damage to trees. Some injure or consume only part of a tree and some trees are able to respond to that injury (usually defoliation). In other cases the damage is too great and the tree is killed (mortality). Overall, state and private lands in the state had over 204,000 acres of insect and disease damage surveyed in 2012, an increase from 154,000 in 2011.

Defoliation:

There are many insects and diseases that will cause defoliation. Due to the dry climate in New Mexico, there is rarely any significant defoliation attributed to fungal agents. Most of the defoliation that is seen is caused by insects and often the larval stages of moths and butterflies.

Western Spruce Budworm (*Christoneura occidentalis*):

By far the most extensive damaging forest insect in the state. This small brown mottled moth is found throughout western North America and can cause a substantial amount of damage and growth loss in spruce, Douglas-fir and true fir trees. The main issue is the larvae that feed on old foliage and then burrow into the expanding buds to begin feeding on new needles which continues as the needles expand and growth occurs throughout the season.

Spruce budworm damage in northern New Mexico.

The mixed conifer forests throughout New Mexico, but particularly in the northern region, have experienced a high degree of infestation for many years now. The result of repeated defoliation can be seen by stunted growth, dead tops, and tree mortality. While the budworm itself does not kill the tree, it can effectively starve the tree by reducing the amount of starches and sugars that the tree can produce. Over time the tree is unable to maintain its health and can eventually die. Infestations are also able to weaken the trees and make them more susceptible to other damaging agents over time.

The last year saw a slight increase in the acreage of state and private lands affected by western spruce budworm. In 2012 there were 135,000 acres affected, about 210 square miles. This is an increase from 2011 of approximately 4,000 acres. Over the last few years the budworm population and acreage has been on the rise and has more than doubled from the 2010 survey.

From a management perspective there is little that can be done to deal with the current population. The insect is so wide spread that it is economically and ecologically very difficult to address the outbreak (incumbent population at this point). In areas that are widely impacted land managers may look at alternative species plantings to reduce the impact.

Pine Sawflies:

New Mexico has several pine sawflies species affecting a variety of pines. There are five species found on ponderosa and others on piñon. Sawflies are not actually flies but are small wasps that lay eggs on needles and the larvae that hatch in-turn defoliate the trees. They prefer to feed on older foliage and can make trees look very sparse. Younger instars (larval stages) feed in groups but the older instars will feed singly and consume most of the needle.

Sawflies are most often observed attacking more open grown trees and will attack the same tree several years in a row which may result in partial dieback or mortality of the tree. Sawflies tend to be more of an issue in open woodlands than in dense forested areas. In New Mexico the woodlands are where a majority of the state and private lands are and approximately 60% of the sawfly damage

in 2012 was seen on non-federal lands (2,900 acres). The population has increased significantly over the last year and it is expected that 2013 will demonstrate another increase in the population.

Aspen Defoliation:

Fall colors are a big part of the economy and tourism industries whether you are in the northeast United States or in New Mexico. The primary tree that people travel to look at in New Mexico are aspens (although there are some significant areas of maples) and defoliation of these hardwoods can have many different economic and ecologic impacts. The primary insect affecting the aspens is western tent caterpillar. Like the western spruce budworm, this species is most prevalent in the northern counties of the state and in particular in the mountains outside of Chama, near the Colorado border.

This gregarious feeding larva of a moth gets the name tent caterpillar because they create silken tents in the trees that they use for predatory and environmental protection. They mostly occur in the spring which makes them more damaging than their fall webworm relatives. The issue with spring defoliators is that they are reducing the photosynthetic area the tree will use to create sugars and starches (energy) for growth and maintenance over the year.

Western tent caterpillar had a strong year increasing in acreage over 30% over 2011 area. This defoliation is spreading from a rather centralized area in a consistent manner, slowly expanding its range and not making any large leaps in any given year. The total area defoliated was almost 43,000 acres in 2012. Fortunately, tent caterpillars tend to have population spikes and then crashes after a few years which means that the population may start to drop soon.

This aspen defoliation is a separate issue from sudden aspen decline (SAD), which appears to be drought related and not driven by insects or diseases. That said, the last couple of years of dry weather may have an impact on aspen health and potentially increase the occurrence of SAD in the state. Research and monitoring is continuing on this front.

Piñon Needle Scale:

These small insects feed on the sap flowing through the needles on piñon trees. The acreage increased from the previous year when no acreage was observed during surveys. The effects of the needle scale may seem small individually but with a high enough population they can be quite detrimental causing premature needle drop from the tree, reducing photosynthetic area and stressing the trees. This can result in decreased growth, deformed growth, and eventually leads to a pre disposition to other more harmful insects like bark beetles. Over 1,600 acres of piñon needle scale were observed in 2010, no acres were mapped in 2011, and just over 400 acres were surveyed in 2012.

Piñon needle scale can be prolific.

A mix of other defoliators were observed throughout the year including Douglas-fir tussock moth, fir loopers, fall webworm, and elm leaf beetle. The area affected by each of these was small, but in some cases the damage was very noticeable and considerable. One such case was the elm leaf beetle that seemed to have a strong year in the middle Rio Grande valley, causing a significant amount of defoliation (or skeletonization of elm leaves) in the late summer. There is typically some elm leaf beetle activity in any given year but it seemed especially severe in 2012.

Tiger moth larvae feed on young ponderosa pine each each spring.

Mortality Agents:

Of the insects and diseases that kill trees in New Mexico, bark beetles are the number one issue. For the most part all of the species that were observed in 2012 had increased in area affected over 2011. One of the major reasons for this is the multiple years of drought that the state has experienced. Trees and bark beetles evolved together over the millennia and have evolved defenses that work well when trees are not under high stress levels. When trees are stressed, often the first thing they stop producing are the defensive mechanisms that protect them from bark beetles and associated fungi.

Pine Bark Beetles:

Ponderosa pine has a number of bark beetles that attack and successfully kill trees. These include western pine beetle (*Dendroctonus brevicomis*), roundheaded pine beetle (*Dendroctonus adjunctus*) and a number of *Ips* species. Through aerial surveys, almost 2,000 acres of western pine beetle were mapped on state and private lands. These are typically found in pockets or patches across the landscape with anywhere from one tree affected to several hundred in one area. This is an increase from the previous year of over 72 percent. In general, western pine beetle prefers to feed on larger material and mature trees. It often attacks the trees that the mountain pine beetle would in the states north of New Mexico. You may notice that the entire tree is fading instead of just parts of the tree when attacked by western pine beetle.

Ips species are prevalent all over the state. They have the capacity to cause significant damage to the state forest resources (like the piñon *Ips,* but that is for later). The area of *Ips* actually decreased in 2012, going from 7,200 acres to 5,800 acres. This may be a result of the area flown which did not include the large fire areas of the Whitewater-Baldy Complex or the Little Bear fire, both areas that have seen a rise in beetle activity in recent years. *Ips* species prefer to live and feed in smaller diameters of trees or parts of trees. For this reason it is common to see a tree that the top has been killed but not the entire tree.

Bark beetle entry holes with frass (chewing dust). Note the lack of a pitch tube due to lack of moisture.

Roundheaded bark beetles appear to be a significant issue in the Sacramento Mountains and behave much the same as western pine beetle. There is a noticeable area of impacted trees in the Ruidoso area which has caused concern about an increase in fire danger in the already fire prone areas. There is recent research that suggests that mountain pine beetle attacked and killed trees may increase fire risk while the dead needles are on the tree but once they fall to the ground the threat of a fast moving crown fire actually decreases. How applicable this is to landscapes that have a less widespread area of dead trees (like those found in NM) is yet to be seen or modeled.

Piñon Ips:

Area affected by the piñon *Ips* (*Ips confusus*) is on the rise throughout the state. Areas outside of Santa Fe, Las Vegas, and Albuquerque have all had a noticeable increase in fading and dead trees in 2012. This is nowhere near the levels that were seen in the early 2000's following that period of drought and La Niña cycles, but those levels were not reached for several years later. The area affected went from, around 370 acres to just over 3,600 acres (nearly a tenfold increase). It is unlikely that we will see an event like that of the last decade because many of the stress prone and weak trees were killed during that outbreak, reducing tree populations and thus reducing stress on the remaining trees.

Piñon trees are important to many New Mexicans for a wide variety of reasons from cultural significance to an economic benefit from the seeds. Piñon ips are host specific and they should not attack other species of trees. So an increase in bark beetles in one species should not inherently

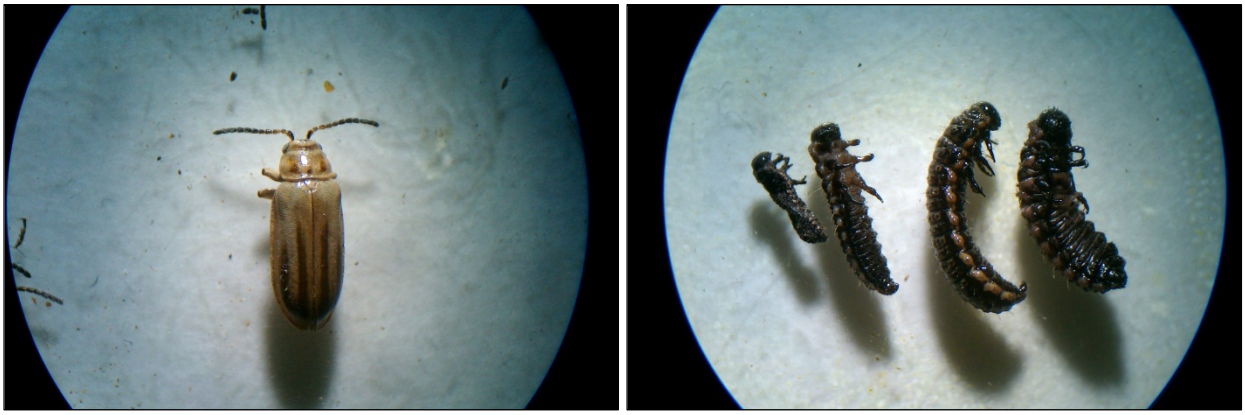
cause an increase in trees of a different species being attacked, but it may indicate that the conditions are right for beetles to attack all trees. With that said, while doing ground checks in the Gila, western pine beetles were found in piñon trees near attacked ponderosa pines.

Other Bark Beetles:

Several other species of bark beetles had an increase in observed occurrence over the 2011 and 2010 levels. This can be attributed to the on-going drought that is impacting species from the piñon and juniper woodlands up to the subalpine species.

Douglas-fir beetle increased from 250 acres to over 1,200 acres in the higher elevation species. Also observed at higher elevations were increasing mortality from the western balsam bark beetle, fir engraver, and the spruce beetle. The spruce beetle has been having a noticeable impact in the near-tree line spruce in southern Colorado and has gradually been working its way down to New Mexico and at this time was seen primarily near the Colorado border.

Emerging Issues:



The salt cedar leaf beetle caused the defoliation of many salt cedars in the middle Rio Grande Valley during the summer and is expected to continue in the future.

Drought continues to be one of the leading issues in forest health in the state. Stressing trees and forests, increasing and lengthening the time insects and diseases can be active, and in general reducing the health of the forests are all impacts that can be seen throughout the entire state. There are pockets of drought induced mortality where the trees were overstressed and simply died. The outlook for the coming year is neutral at this point with some models suggesting that there will be increased moisture and some showing continued drought. Whichever way the climate and weather go, we can expect to see higher acreages in the coming years.

An insect making its way along New Mexican waterways is the salt cedar leaf beetle (*Diorabda spp.*) which is an introduced defoliator of salt cedars from central Asia. This biocontrol was released in neighboring states and quickly made its way into New Mexico, first being observed in the San Juan river area and during 2012 it made a very noticeable appearance in the mid-Rio Grande valley. There was media coverage of the impacts and it can be expected that this will continue for several years to come as it takes up to a decade for the small beetle and larvae to cause mortality. This

emerging and evolving situation will continue to be monitored in the future for overall and specific impacts to the plants and ecosystems in the state.

Conclusion:

Insects and diseases have been rather active in the state over the last year and it is expected to continue in this line in the coming months. There is typically a delay in the time from drought formation and full insect activity and we may just be starting to see the full impact from the drought that started a few years ago, however, it is doubtful that this series of dry years will have the same impact that the drought at the beginning of the last decade had (especially in relation to piñon woodlands that are important to New Mexicans).

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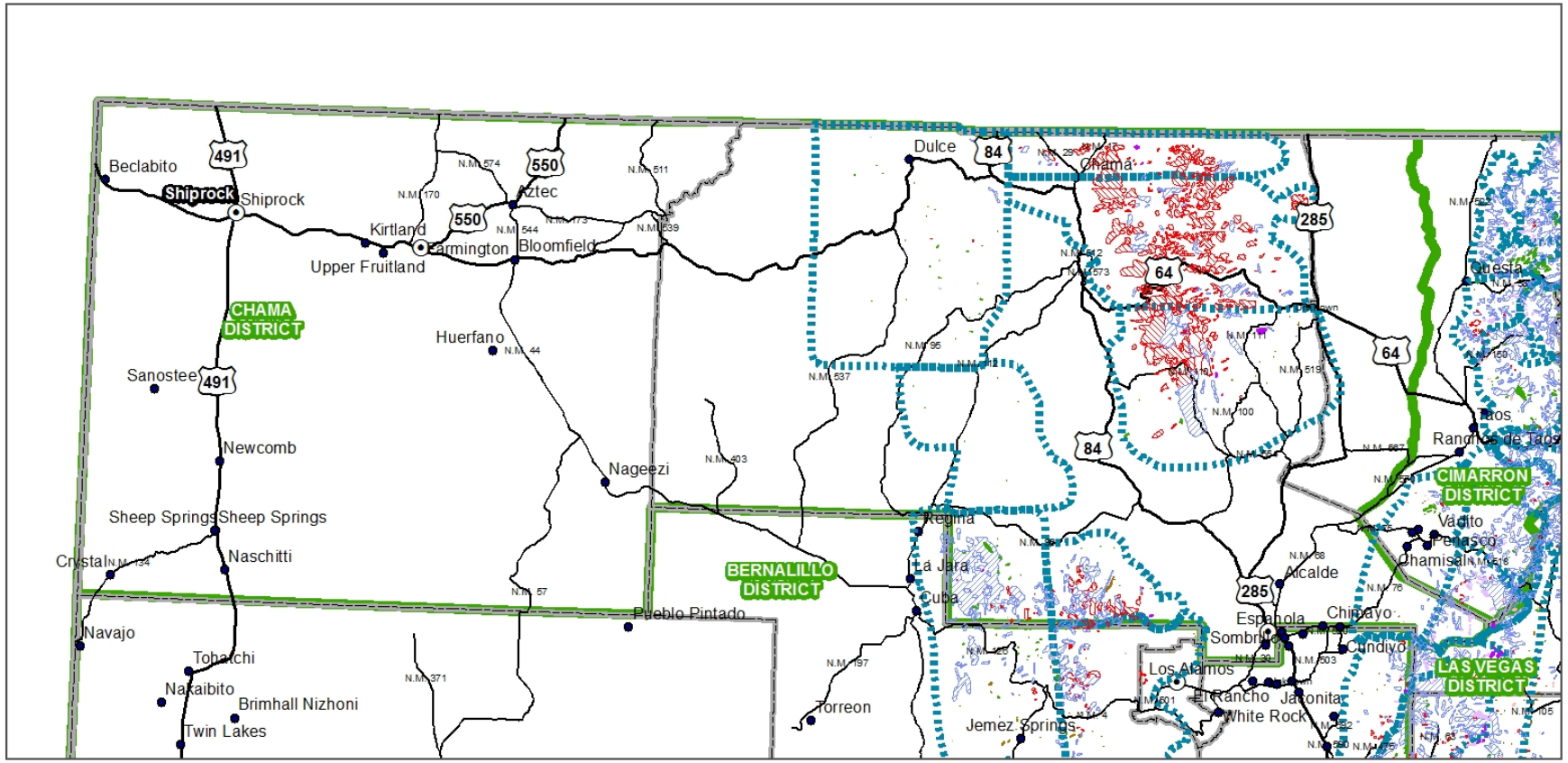
All Photographs by Danny Norlander unless noted

2012 Insect and Disease Activity
NMSF Chama District



Mortality Agents

- Aspen Decline
- WBBB
- Douglas-fir Beetle
- Ponderosa Mortality
- Fir Engraver
- Piñon Ips
- Spruce beetle

Defoliators

- Western Spruce Budworm
- Aspen Defoliation - heavy
- Aspen Defoliation - light
- Unknown Pinon Defoliation - light
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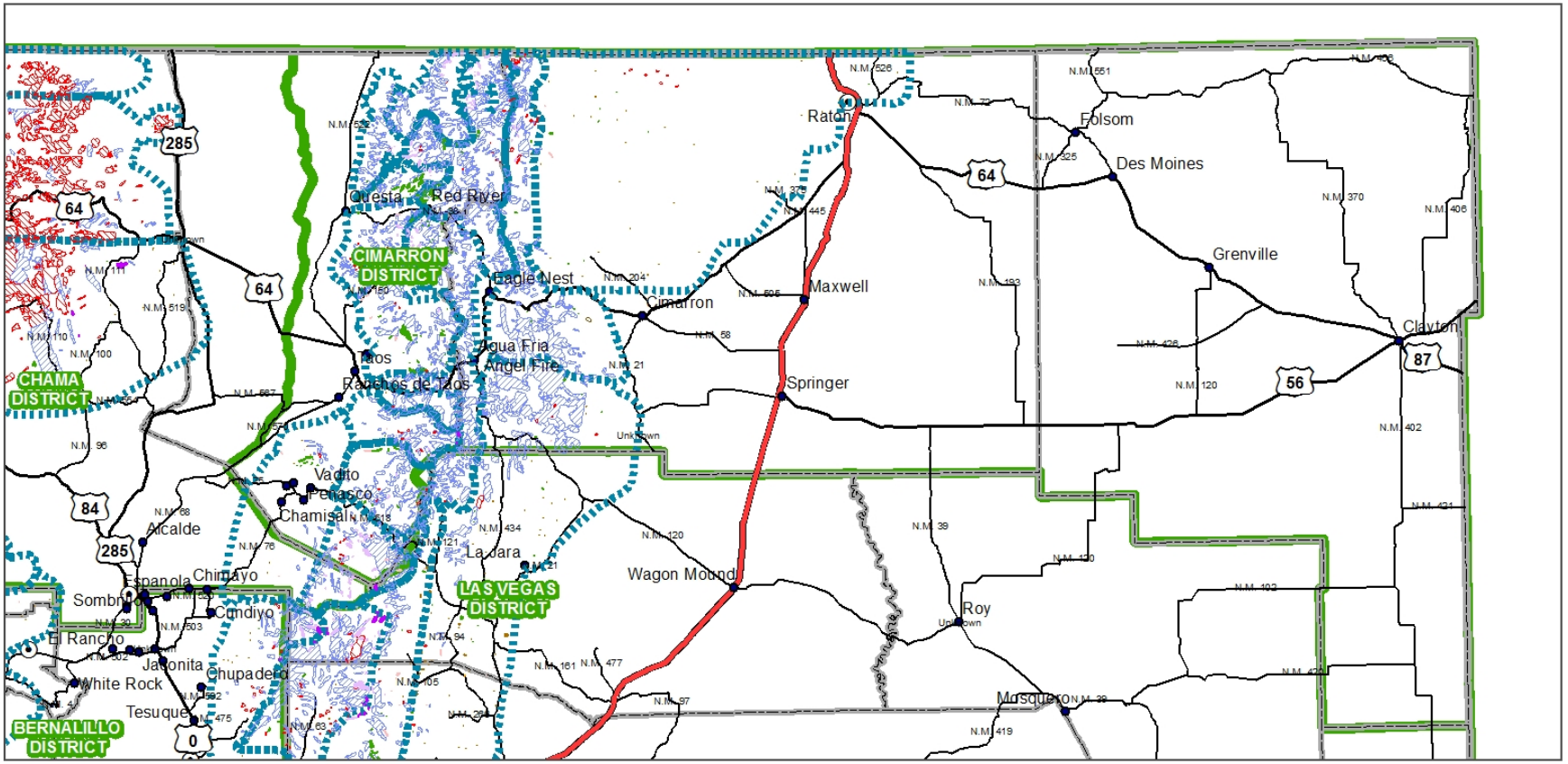
- Pinon Needle Scale - light
- DFTM - light
- Unknown defoliation - light
- Sawfly Defoliation - light
- Oak Defoliation - light
- Cottonwood def - heavy

2012 Survey Extent

N W E S

CHAMA DISTRICT
CIMARRON DISTRICT
BERNALILLO DISTRICT
LAS VEGAS DISTRICT
SOCORRO DISTRICT
CAPITAN DISTRICT

2012 Insect and Disease Activity
NMSF Cimarron District



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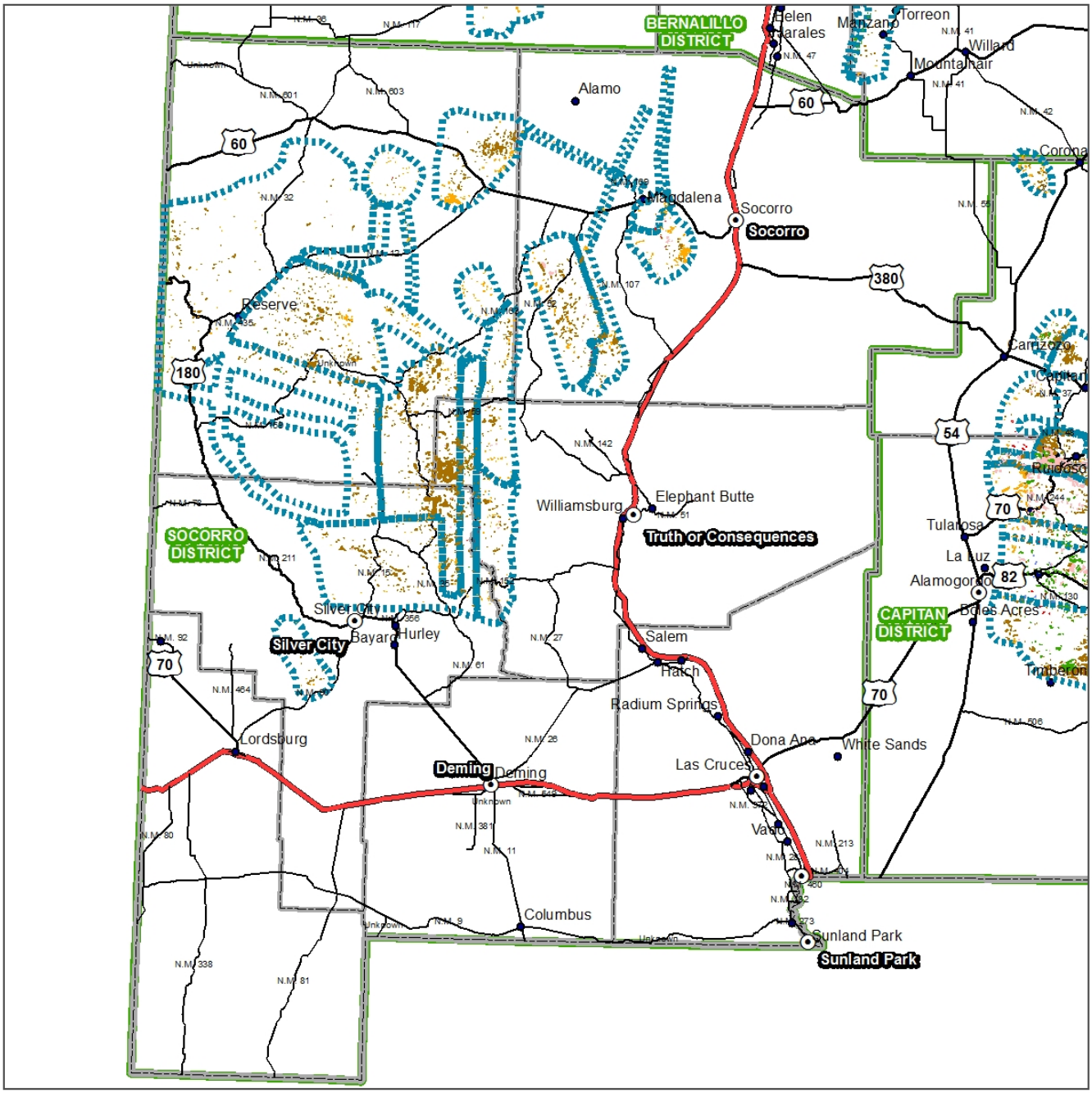
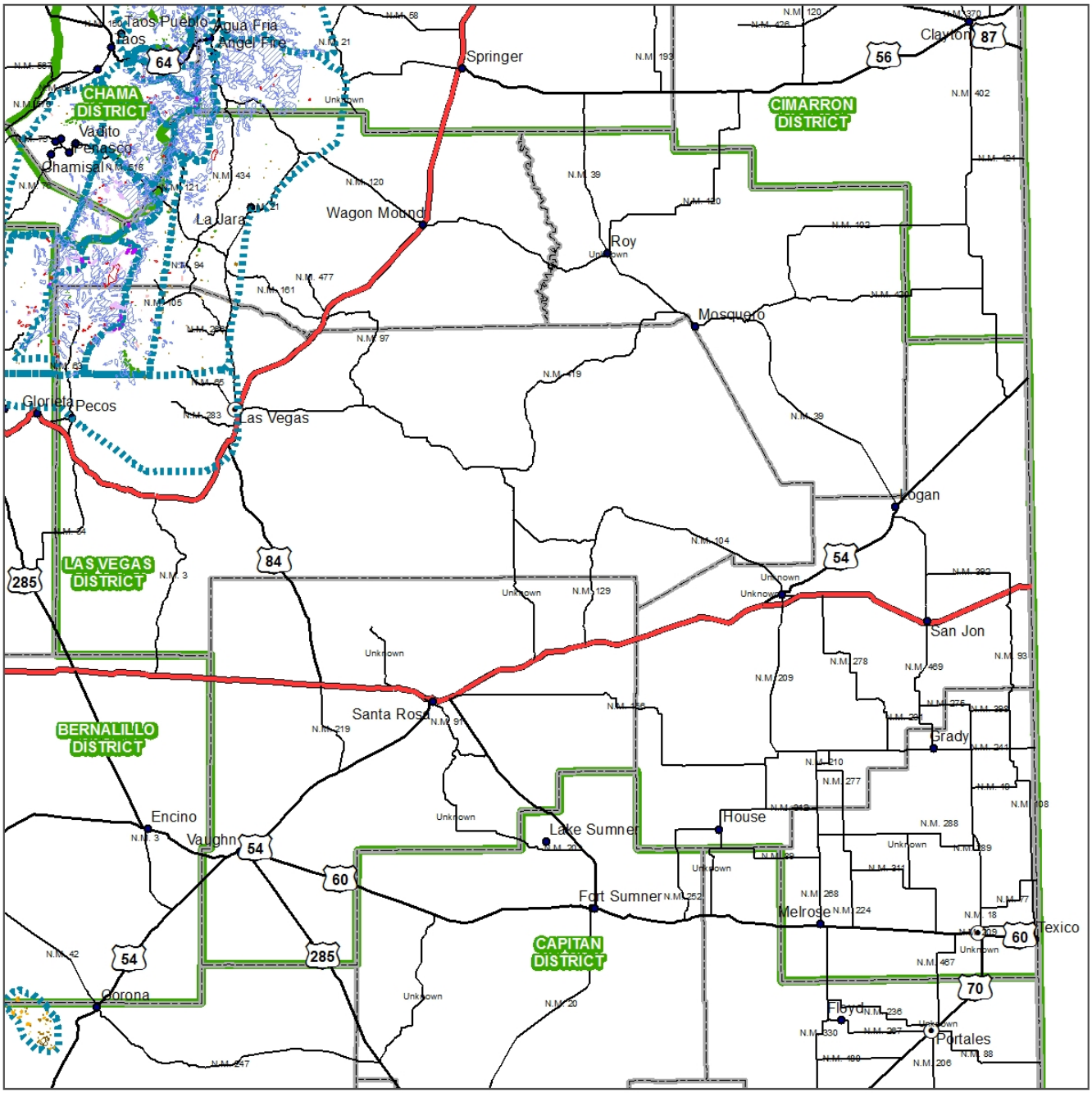
2012 Insect and Disease Activity
NMSF Socorro District



2012 Insect and Disease Activity
NMSF Las Vegas District



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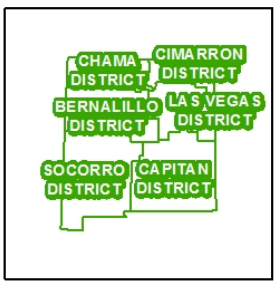
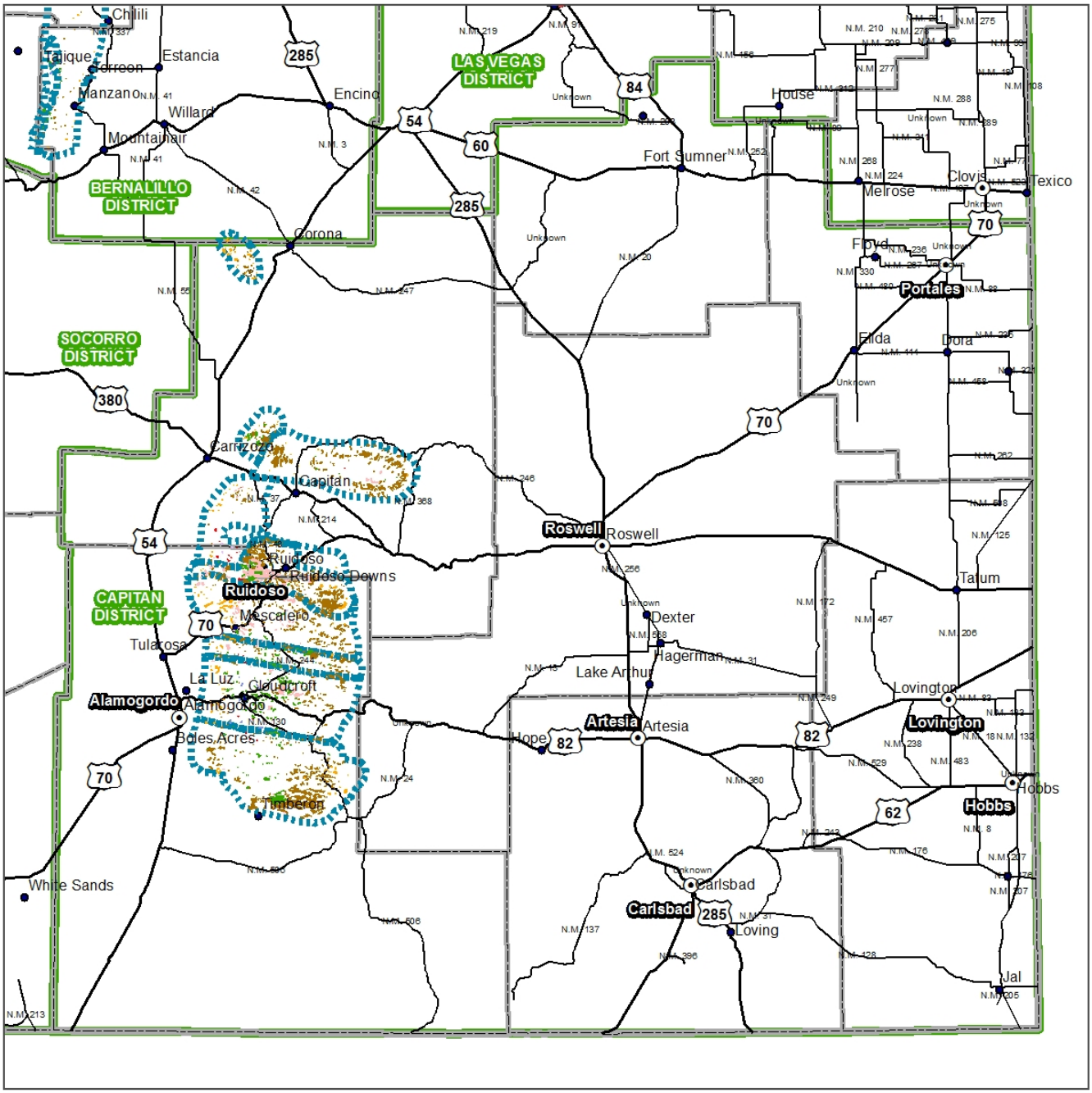


2012 Insect and Disease Activity
NMSF Capitan District



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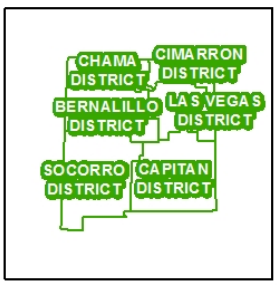
N W E S



2012 Insect and Disease Activity
NMSF Bernalillo District