Monitoring Conducted

Managing Insect and Disease Populations

Monitoring for insect and disease conditions on the Forest is critical to anticipating and mitigating insect and disease outbreaks. This is accomplished through coordination with Minnesota land management agencies as well as Northeastern Area State and Private Forestry. Methods include annual aerial surveys, trapping (for example, gypsy moth and emerald ash borer), and public education. Results are generally available in the fall.

Drought Conditions

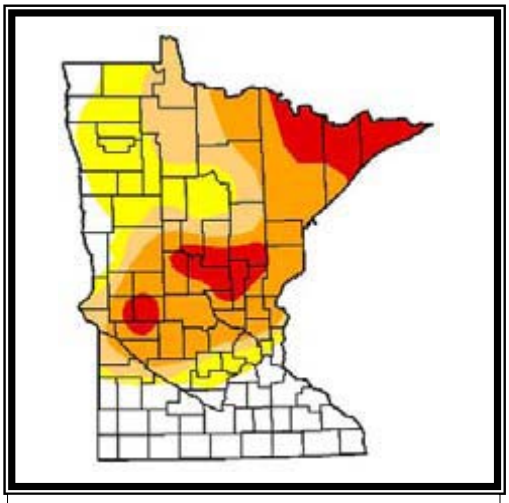

Figure 1. Drought conditions in MN 9/4/07. Source: Federal Conditions Report, MN DNR. **Red is extreme drought conditions**

Insects and Disease Summary Points

- A significant increase in Spruce Budworm population continues to be observed with much of the infestation occurring within the BWCAW. This insect defoliated approximately 135,000 acres on the Forest during 2007, which is an increase of approximately 20,000 acres defoliated above that in 2006.
- Treatment of gypsy moth populations with the pheromone *Disparlure* continues to be the most effective tool in managing the insect while minimizing environmental impacts. An additional 7,328 acres is proposed for treatment in 2008.
- Vegetation manipulation was used extensively to mitigate potential insect and disease impacts. Practices implemented included the planting of 1,012,000 red pine, white pine, jack pine, birch, northern red oak, spruce and other native species on 1,993 acres, seeding 46 acres to conifer species, and improving 4,124 acres through TSI treatments.
- Conduct annual aerial insect and disease surveys and "trapping" techniques to monitor introduction or progress of invasive insect and diseases, especially gypsy moth and emerald ash borer.
- Implement the firewood restriction on bringing out-of-state firewood onto National Forest lands in Minnesota through public education and law enforcement.

Drought conditions (Figure 1) carried over from 2006 into 2007 with a relatively dry and warm winter. From June through August, conditions were excessively dry and warm. Starting in August and into the fall of 2007, moisture returned to the northern forests. Weather related conditions, when spread over multiple years, often exacerbate conditions that favor adverse and intensified insect and disease activity. These weather conditions cause trees to be stressed and limited in their ability to successfully combat insect and disease attack.

Spruce Budworm

Spruce budworm a native insect continues to defoliate fir and spruce in northeastern Minnesota where it has been continuously mapped since 1954. Over this 54-year period, an annual average of 220,000 acres of defoliation has occurred across all ownerships. Multi-storied stands of balsam fir and white/black spruce, which are favored by spruce budworm, are widespread across the Superior National Forest (SNF). An example of defoliation in spruce and fir is shown in Figure 3.

While remaining relatively static between 2001 and 2005, a significant increase was observed in 2006 and continued in 2007 with infestations on the SNF concentrated in central St. Louis County on the Laurentian and

LaCroix Ranger Districts. Scattered infestations also were found on the Kawishiwi, Gunflint and Tofte Ranger Districts. An estimated 80-90 percent of the infestation occurs within the Boundary Waters Canoe Area Wilderness (BWCAW) north of Vermillion Lake. In all, spruce budworm defoliated trees on an estimated 135,000 acres of National Forest land during 2007. This is an increase of approximately 20,000 acres defoliated from the previous year.

Direct treatment of Spruce Budworm infestation continues to be limited due to the presence of the insect in mixed ownership patterns and within the BWCAW. The Forest is proactive, however, in treating current vegetation to lessen its future susceptibility to Spruce Budworm.

Figure 2. Spruce budworm defoliation. Source: MNDNR.

Aspen Defoliation, Dieback and Mortality

Aerial survey found an estimated 30,000 acres of aspen defoliation, dieback and mortality on the Forest in 2007 (see Figure 3). Ground checking done in the fall was not able to pinpoint a cause. Some evidence of leaf rollers and leaftiers was found but not enough to explain all of the defoliation. To the north, Ontario reported large areas of defoliation due to large aspen tortrix.

As with the spruce budworm activity, much of this condition (an estimated 60-80%) is confined to the Boundary Waters Canoe Area Wilderness. It is likely that these conditions are due to a combination of drought in 2002-2003 and 2006-2007, forest tent caterpillar activity in 2000-2003, site factors and advanced age of the aspen forest type.

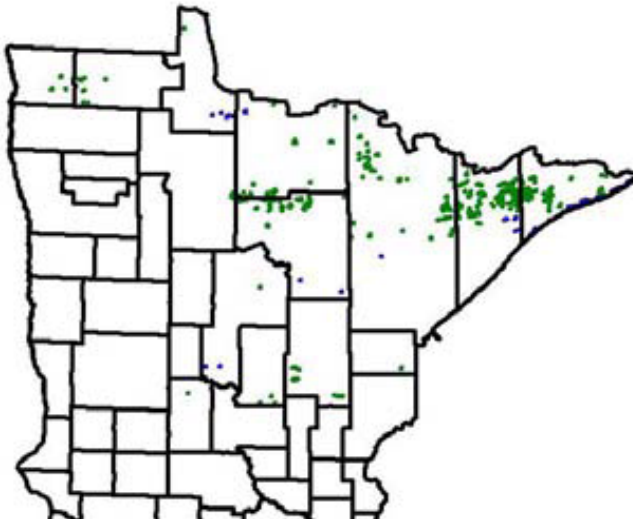

Figure 3. Aspen defoliation or dieback; cause unknown. Green=defoliation; blue=mortality. Source: MN DNR 07.

Invasive insects are posing an increasing threat to forested ecosystems on all ownerships in northeastern Minnesota. The two most immediate threats include *gypsy moth* and *emerald ash borer*. Other insects, less imminent but still of concern, include the *Sirex wood wasp* and *Asian longhorned beetle*.

Gypsy moth

In 2007, no active treatment of gypsy moth (*Lymantria dispar L)* occurred on the Forest. The Minnesota Department of Agriculture continued to monitor gypsy moth populations through moth trapping. The larger 133,000 acre non-reproducing infestation on the North Shore was treated in 2006. 2007 moth catches in these treated areas were significantly down and the treatment was characterized as a success.

However, exceptionally high numbers of male moths were trapped in the fall of 2007 (see Figure 4), again along the North Shore but in areas adjacent to those treated in 2006. Approximately 7,328 acres of National Forest land are tentatively planned for mating disruption treatment in 2008.

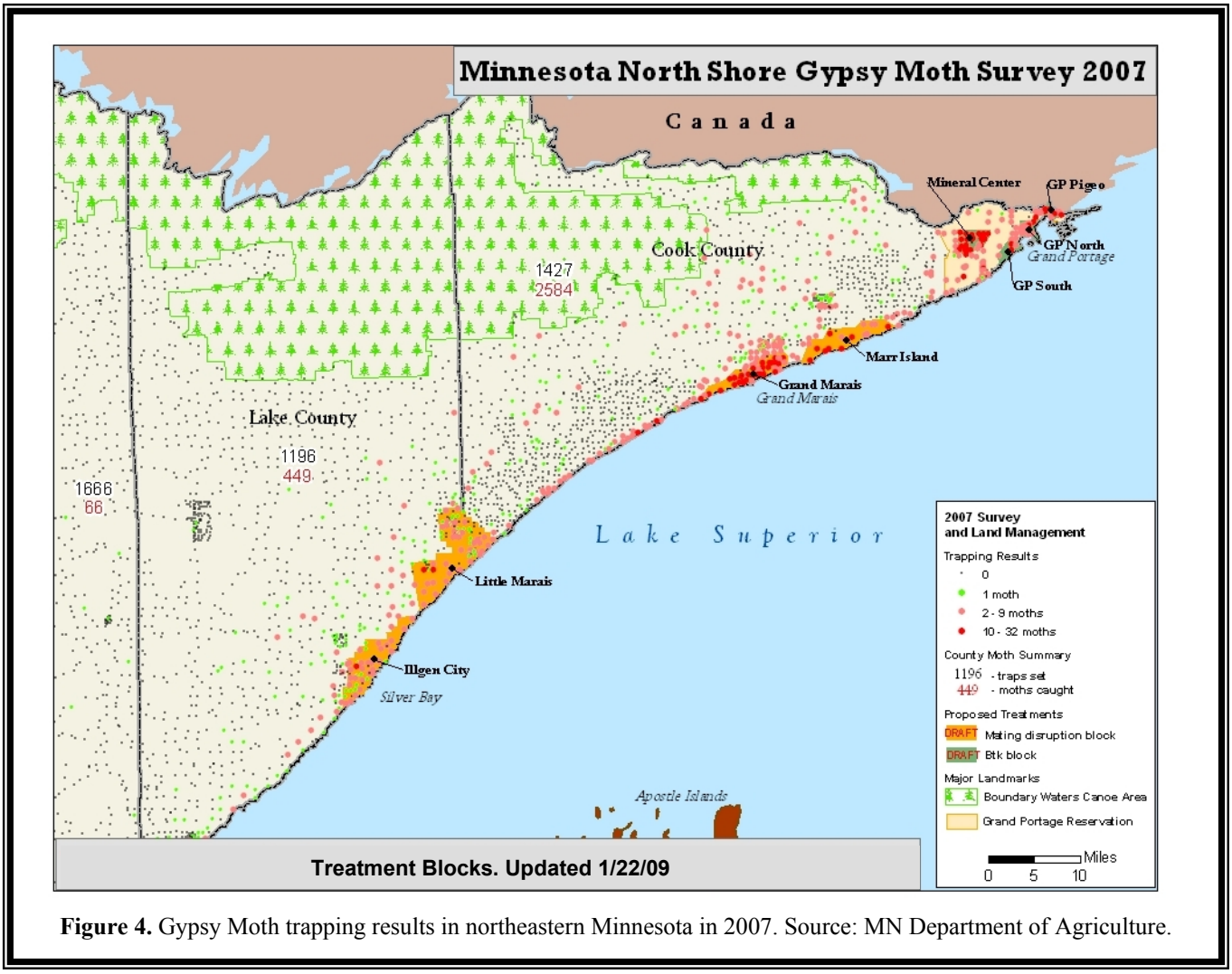

Figure 4. Gypsy Moth trapping results in northeastern Minnesota in 2007. Source: MN Department of Agriculture.

Emerald ash borer

Emerald ash borer is another invasive insect with the potential to cause extensive, if not complete, mortality of the ash forest type. The invasive insect has been responsible for essentially 100% mortality of ash in areas where it has become established. Presently, the "front" for that insect is in Michigan and Wisconsin and is thought to be actively spread through the transportation of infected wood, primarily firewood. While no insects have been found on the SNF (or in Minnesota), monitoring through "trap trees" in high use recreation areas is actively being implemented by the State. The Forest is actively collecting ash seed to a) have the ability to reforest this species; and b) pursue opportunities to develop genetic traits enabling the species to withstand the emerald ash borer.

The US Department of Agriculture is implementing an aggressive trapping program in anticipation of the arrival of emerald ash borer. A restriction against bringing firewood from out of State is in effect.

Ash decline and mortality in northeastern Minnesota, primarily from drought but also human impacts, continues to be of concern. Through reduction in tree vigor and health, these conditions also cause stress in the trees and make them more susceptible to attack by insects and disease. Ash provides valuable native diversity on the Superior NF. An example of decline in ash is shown in Figure 5.

Figure 5. Ash decline due to emerald ash borer. Source: Federal Conditions Report MN DNR 2006

Forest Managed Towards Healthy Condition

Methods of restoring or maintaining healthy forest conditions are, to a large extent, accomplished through vegetation manipulation. These treatments are designed and monitored to meet the Forest Plan goal of "promoting ecosystem health and conservation". Vegetation treatments can maintain or increase diversity of native tree species while providing densities that favor forest vigor on a landscape scale.

During 2007, vegetation manipulation was used extensively to mitigate potential insect and disease impacts. Several projects to improve forest composition and density approved prior to the Revised Forest Plan but implemented during 2007 included the Behind the Ridge, Sawbill Camp, and Holms/Chipmunk projects. Vegetation manipulation resulting from decisions approved under the Revised Forest Plan included the Dunka, Virginia, Tomahawk, and Inga South projects. A more thorough discussion on treatment acres can be found in the *Timber* Chapter of this report.

Other projects or practices implemented in 2007 that promote forest health included reforestation and timber stand improvement (TSI). Approximately 1,012,000 native seedlings (including red pine, white pine, jack pine, birch, northern red oak, spruce) were planted on 1,993 acres, 46 acres were seeded to conifer species, and 4,124 acres were improved through TSI treatments.

In 2007, the Forest actively treated 184 acres of terrestrial, plant Non-Native Invasive Species (NNIS). Important species treated included loosestrife, spurge, tansy and thistle and treatment sites ranged from 0.1 to 6 acres in size. Refer to the *NNIS* Chapter for more information.

Much of the invasive insect and disease activity is believed to have been introduced (or has the potential to be introduced) into the State through transportation of firewood for personal use. In cooperation with the Chippewa NF, the Superior NF enacted a restriction against transporting firewood, brought from outside the State of Minnesota, on National Forest lands.

Evaluation and Conclusions

Managing Insect and Disease Populations

Spruce Budworm

The resurgence of spruce budworm on the Forest may indicate an increasing trend similar to the mid 1980's. Management activities, while designed to reduce habitat favorable to the spruce budworm, are inadequate in intensity and extent due to much of the budworm being within the BWCAW. However, this insect has been a chronic presence on the SNF for many years and could again decrease as its food source becomes more limited.

Gypsy moth

Currently, no successfully reproducing populations are known on the Forest. However, continued high captures of the males moths indicate the gypsy moth still poses a significant threat to the forested ecosystem on the SNF. The SNF, working with partners, has initiated prompt management actions once populations are detected.

Reproducing populations treated near Tower, MN in 2005 were treated and confirmed eradicated in 2007. Of particular interest was the approximately 133,000 acres (of which 72,600 were on National Forest lands along the North Shore) that were treated with the mating disruption pheromone *disparlure* in 2006. 2007 moth catches in these treated areas were significantly down and the treatment was characterized as a success.
A proposal is being reviewed to again treat the insect through mating disruption again along the North Shore in 2008. The State of Minnesota continues its aggressive trapping program to monitor this insect population.
A restriction against bringing firewood from out of State is in effect.

Forest Managed Towards Healthy Condition

When the reforestation planting and TSI acres accomplished in 2005 and 2006 are combined with 2007 accomplishments, the SNF to date has enhanced vigor and composition through TSI on approximately 13,124 acres and planted approximately 6,993 acres. Figures 7 and 8 display these accomplishments.