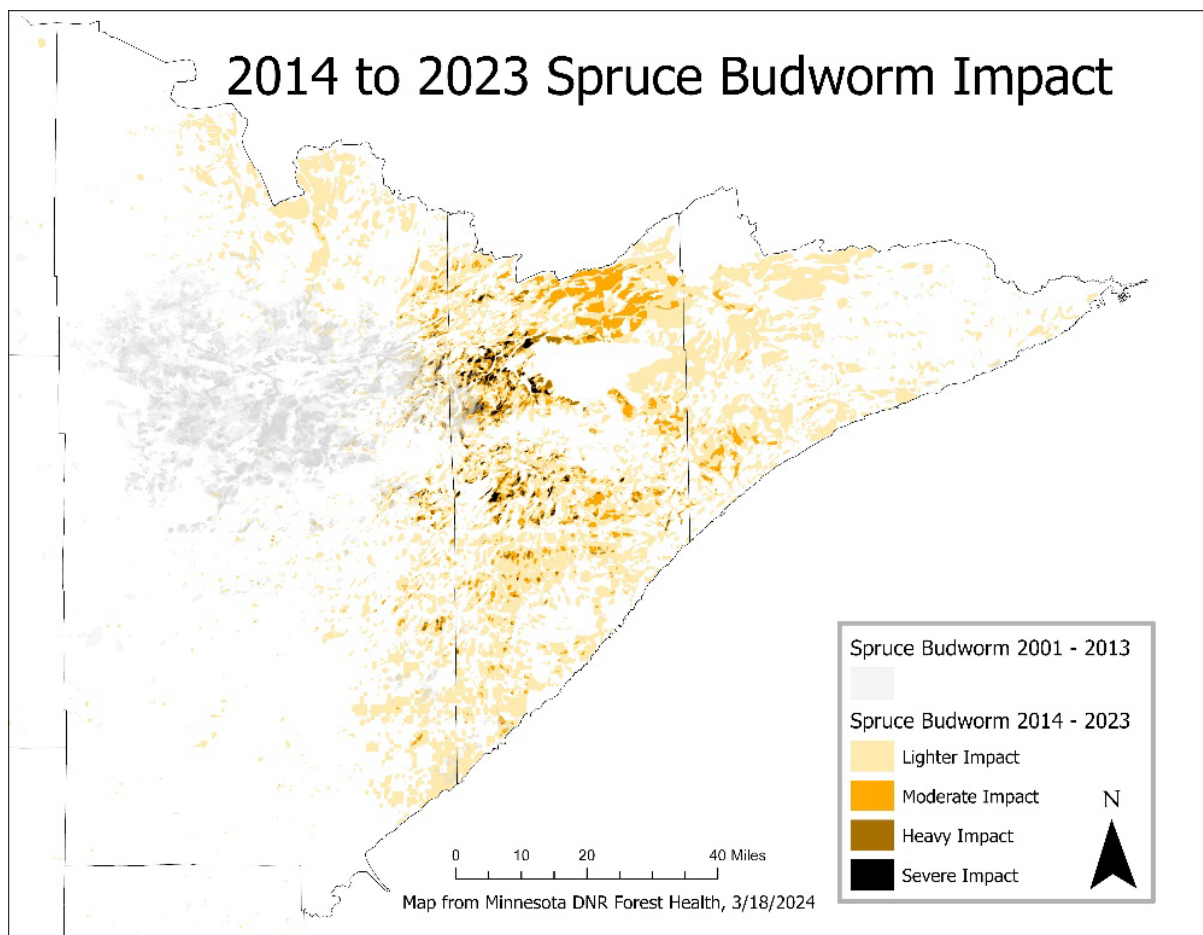


## Spruce Budworm Situation Update

*Minnesota DNR Forest Health, April 2024*

During the last 10 years, defoliation and mortality from a spruce budworm outbreak was mapped on 1.4 million acres centered in west-central Lake County in northeast Minnesota. Of the land impacted, the majority is on federal land, while 9% is DNR-owned (130,000 ac). Even though our analysis covers the last 10 years, the outbreak started in this area in 2013. The previous outbreak centered over this area occurred from 1966–1976.

Damage from spruce budworm has resulted in abundant fir and spruce mortality. This has caused serious concerns about increased wildfire potential, streambank soil erosion, loss of timber value, and conditions that favor abundant balsam fir that could promote another outbreak in 30–60 years.



*Spruce budworm outbreaks centered in various parts of northeast Minnesota overlap one another at their edges and cannot be definitively analyzed separately. For example, the central area of the prior outbreak was central St. Louis County (gray area in map). That outbreak occurred from 2001–2013, slowly migrating eastward across St. Louis County to the present-day outbreak center. Therefore, the spruce and fir mortality from Birch Lake in far west-central Lake County west to central St. Louis County is greatly underestimated in the above map. The prior outbreak impacted 567,900 acres of land, 15% of which was DNR land.*

Outbreaks of spruce budworm occur primarily due to an abundance of older balsam fir on the landscape, and they predictably occur every 30–60 years if older balsam are abundant. In a 100-mile-wide area centered over the current outbreak zone (Isabella, MN), balsam fir is the second-most abundant tree (over 5 inches in diameter). The U.S. Forest Service owns the vast majority of the two budworm-susceptible forest types in that zone (it owns 58% of balsam fir forests and 64% of white spruce forests) (USFS Forest Service).

There is no current evidence that a changing climate is promoting spruce budworm outbreaks in Minnesota. The current outbreak was predictable based on tree species and forest stand age inventory. Additionally, the current outbreak is not out of the ordinary. There have been extensive documented outbreaks in the past 100 years, but a lack of a normal fire return interval for these forests has most likely exacerbated the outbreaks. Before extensive fire suppression, spruce budworm outbreaks occurred, but possibly at a smaller scale as there was less mature balsam fir as a result of wildfires.

## Spruce Budworm Wildland Fire Risk Summary

- An experimental burning program from 1978 to 1982 was conducted in Ontario. The goal was to determine forest fire potential after a 6-year budworm outbreak. It was found that forest fire potential was greatest 5–8 years after trees died. This was due to crown breakage and windthrow peaking during this time, thus creating a fuel complex rearrangement that increased surface fuel loads (Stocks 1987).
- Researchers modeled the probability of fire ignition in Ontario based on historic cumulative spruce budworm defoliation, fire ignitions, fuels, and weather variables. They found that budworm feeding increased or decreased the probability of ignition, depending on cumulative years of defoliation. The probability of ignition increased after 8–10 years of cumulative moderate to severe defoliation, whereas the ignition probability decreased after only 1 year of moderate to severe defoliation. The correlation between ignition probability and cumulative years of defoliation were similar in two separate ecoregions (James et al. 2017).
- Stand breakdown and fuel accumulation was assessed via transects in plots seven years following mapped defoliation (1977-1983). Crown breakage increased by almost 200% and surface fuels increased by 145% during the four years following a 5-year spruce budworm outbreak (Watt et al. 2020).

## Spruce Budworm Ecological Ramifications

- A spruce budworm outbreak will not dramatically alter species composition (Ghent et al. 1957).
- Mortality of overstory trees will recycle stands to a younger age structure. This will set the stage for another outbreak once the regenerating trees mature (MacLean 1985).
- In 40–60 year old aspen mixedwood forests in Minnesota, a 4–6 year severe outbreak of spruce budworm followed by two severe windstorms in the region increased release and/or recruitment of mostly quaking aspen and red maple, but also balsam fir, white spruce, and other species after stand age 70 (Reinikainen et al. 2012).
- Researchers applied a landscape succession and disturbance model to assess the relative strength between spruce budworm outbreaks and fire disturbances in the Boundary Waters Canoe Area. The model suggested budworm disturbance could partially mitigate longer-term future fire risk by reducing live ladder fuels. However, the model indicated budworm disturbance

did little to reverse the long-term forest compositional trends (dominated by aging and abundant balsam fir), partly caused by reduced fire rotations (Sturtevant et al. 2012).

## Current Budworm Management in Minnesota

### DNR Forestry

1. LSOHC council recommended approximately \$900,000 from Outdoor Heritage Fund for forest restoration from spruce budworm damage.
  - Heather Baird, Ted Dick, Tim Quincer, Sascha Lodge and Mike Reinikainen wrote proposal. DNR Wildlife Division led submission of proposal and testifying to LSOHC about the proposal.
  - LSOHC recommended 27% of what DNR originally proposed.
  - Will be used in northeast Minnesota for site prep, seeding, planting, and tending and as match on federal grant (see below).
2. USDA Forest Service Community Wildfire Defense Grant for \$3.9 million
  - Mike Reinikainen and others applied for this grant.
  - Will fund reduction of woody debris resulting from spruce budworm damage on Forestry, AMA/WMA, and Parks & Trails administered lands.
  - Woody debris may be piled, mulched, burned, or utilized. Follow-up site prep, seeding, planting, and tending will be carried out using Outdoor Heritage Funds
  - DNR should learn in spring of 2024, if funds will be received.
    - Tower and Two Harbors Forestry Areas submitted acreage needs.
3. Timber Utilization Project
  - Forestry's Utilization and Marketing team (U&M) is developing a process to define when a tract of timber is deemed non-marketable and treatment can be pursued through a silvicultural contract.
  - Developing contract language to allow for the utilization of timber if the contractor has the ability to.
4. Canadian Export Potential
  - U&M is in the early stages of working through the process to get Minnesota wood certified to meet Canadian lumber codes (this process will take years).
  - There is potential for more roundwood exports to Canadian sawmills.
5. Other Wood Market Efforts
  - U&M is promoting the current wood available in the Arrowhead.
  - Working with existing businesses to identify opportunities to increase balsam fir and spruce consumption.
  - Working with entrepreneurs and researchers to develop products and facilities to increase fir and spruce consumption.
6. White spruce/fir cords offered for harvest and sold by DNR for fiscal year 2023.
  - Tower Area offered 7,800 cords and sold 7,917 cords.
  - Hibbing offered 2,582 cords and sold 2,436 cords.
  - Cloquet offered 3,212 cords and sold 2,934 cords.
  - Two Harbors offered 17,312 cords and 6,091 cords.

## USFS

- Tofte Ranger District:
  - Has offered or is working on offering selling several timber salvage sales.
  - Working on several restoration projects in response to budworm, using mechanized equipment.
  - Used USFS/DNR forest health aerial survey data for the last several years.
- Lacroix Ranger District: 11,567 acres of fuels and reforestation projects related to spruce budworm damage over next 20 years.

## The Nature Conservancy

- Working with different agencies to help them deploy treatment options, so they can get a feel for cost and effectiveness that may inform a strategy. The Nature Conservancy views this work as an opportunity to treat these acres followed by their “resilience forestry” tree planting work.
- Not treated many acres yet, but completed treatments have mostly been site prep followed by planting on approximately 70 acres on county land (Lake County), 150 acres on private land, 30 acres on state land, and 50 acres on US Forest Service land.
- Applied and were awarded a \$550,000 grant from Conservations Partner Legacy Program. Work involving this money will start in spring/summer 2024.
- The Nature Conservancy wants to support agencies trying different things to get acres treated from both a fuels reduction and reforestation perspective. They’ll have budworm recovery in mind as they apply for future funding that can be used on public lands.

## Lake County

- Awarded \$200,000 in 2023 out of Great Lake Restoration Initiative (GLRI) funds, selected by the USFS, to restore riparian forest impacted by spruce budworm.

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