

## Evaluation of Douglas-fir Tussock Moth-Impacted Site Visits near Colorado Springs, Colorado

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### **Introduction**

On February 18 and 19, 2016, Rebecca Powell and Sky Stephens, Entomologists with USFS-Forest Health Protection (FHP) participated in several site visits west of Colorado Springs, Colorado. These sites included property managed by the Pike National Forest, City of Colorado Springs and private inholdings on the Pike National Forest and were identified by Oscar Martinez, District Ranger Pike's Peak District (Map 1). They were joined by Dan West, Entomologist with the Colorado State Forest Service, and Denis Will, Certified Forester and Arborist with the City of Colorado Springs on February 19<sup>th</sup> for site visits around the Helen Hunt Falls area of North Cheyenne Canyon Park. The purpose of these site visits were to evaluate impacts of Douglas-fir tussock moth defoliation and determine site access for future field assessments.

### **Site Assessment and Condition**

The sites visited varied in stand composition from pure Douglas-fir to mixed conifer including stands with a significant limber pine component.

- Vicinity – Map 1

Much of the area depicted by Map 1 has highly variable defoliation levels by two native insects; Douglas-fir tussock moth (DFTM) and western spruce budworm (WSBW). Most areas can be divided into three impact characteristics based on elevation. The upper slopes above 8,000 feet, are predominately spruce and mixed conifer forests and show light to moderate defoliation by WSBW. These areas have indications of historic defoliation by WSBW including spike tops and narrow crown development (Fig. 1). These sites had no indication of current DFTM activity. The mid-slopes, between 7,000 and 8,000 feet, become increasingly mixed conifer with some aspects and drainages dominated by Douglas-fir. These areas had highly variable impacts by DFTM ranging from light to severe defoliation, particularly where Douglas-fir is dominant. The lower slopes, below 7,000 feet, have an increasing component of ponderosa pine and Gambel oak. These areas had highly variable impacts by DFTM concentrated in



stringers of Douglas-fir ranging from light to severe.

- Sites 1 and 2 – North Cheyenne Canyon Park, Helen Hunt Falls

Sites 1 and 2 were mixed conifer sites with light to severe defoliation activity. Four areas were evaluated for their use in future egg mass surveys. Sites below and at Helen Hunt Falls trailhead had light defoliation by DFTM. Several egg masses and cocoons were observed including a few new egg masses. Many of the cocoons and egg masses assessed showed signs of parasitism. No egg masses or cocoons were found at sites above Helen Hunt Falls, off of the parking area for Buckhorn Mountain Trail. The area along Gold Camp Road traveling east showed varying levels of defoliation by DFTM on host trees (Fig. 2) with some severe defoliation within the viewshed. Impacts by DFTM in this area were largely limited to Douglas-fir dominated slopes and drainages. Two areas in the immediate vicinity of Helen Hunt Falls may be suitable for additional DFTM surveys.

- Sites 3, 4 and 5 – Old Stage Road

Much of the property along Old Stage Road was signed as private property and was not investigated beyond a visual ‘windshield’ survey. Sites along Old Stage Road were similar in insect and disease activity as the general vicinity and showed highly variable levels of DFTM activity driven by forest composition, aspect and elevation. No areas were identified as suitable for additional DFTM activities. Sites could be reconsidered with cooperation with the Colorado State Forest Service and private property owners.

- Site 6 – Gold Camp Road

Site 6 was in an area with a significant component of limber pine. No DFTM activity was observed in this area. The area was not completely assessed due to road access issues. This portion of the Gold Camp Road (northeast of Stables at Broadmoor) is gated and has been closed due to a collapsed tunnel.

- Site 7 – Antenna Farm

Site 7 was also located in a restricted access area and was not accessible. The National Forest lands evaluated between the Stables at Broadmoor and the Antenna Farm along Old Stage Road had similar levels of DFTM in the viewshed as observed throughout the surrounding area ranging from light to severe and were driven by forest composition, aspect and elevation.

## ***Douglas-fir Tussock Moth Lifecycle and Behavior***

### ***Description***



The Douglas-fir tussock moth is a defoliator of Douglas-fir, true firs, and spruce. The adult male moths are gray-brown in color with a size ranging from 1-1 ¼ inches with feathery antennae. The adult female does not fly, has undeveloped wings and is grayish in color. Her antennae are threadlike and she has a larger abdomen than her male counterpart (Fig. 3). Larvae have fine hairs which develop into tufts later in the larval stage. Older larvae will have two tufts behind the head, one posterior tuft and four “tussocks” along their back. (Fig. 4). Cocoons are present on host tree branches where egg masses are laid by the female on top of the cocoon (Fig. 5).

### Life Cycle and Behavior

The Douglas-fir tussock moth has one generation per year. Eggs masses overwinter and will hatch in late May to early June. This egg hatch coincides with bud burst of the host tree. Approximately one week after hatch the young larvae will begin feeding on current year foliage. They develop through 5-7 instars as larvae, prior to pupation in late July to late August. Adults emerge 10-18 days later depending on temperature.

Douglas-fir tussock moth is limited in dispersal due to the female adult being flightless. Larvae produce silk threads which assists their dispersal by wind to nearby trees during the first two instars. Most larvae travel less than ¼ mile, with rare exceptions exceeding that distance.

In outbreaks, it is characteristic of Douglas-fir tussock moth populations to collapse after 1-3 years, with 8-10 years between outbreaks. Resulting damage to trees from defoliation can be top-kill, growth reduction, predisposition to bark beetles, and potentially tree death. Feeding damage is evident on the current year’s foliage, which will turn brown and have a withered appearance. As the larvae go through successive instars they will begin feeding on older needles if all current-year foliage has been consumed.

### Natural Controls

Douglas-fir tussock moths are controlled by several natural agents, helping to maintain tussock moth populations at endemic levels. Overwintering eggs masses, larvae, and pupae can all be affected by parasitic insects, predacious insects, and some bird species. These natural controls are most effective at endemic levels and do not control outbreak populations. A naturally occurring nuclear polyhedrosis virus (NPV) can significantly impact larvae and pupae populations and typically result in a precipitous drop in populations.

### Chemical Applications

There are registered insecticides that have been utilized with various results to reduce DFTM populations and reduce defoliation impacts. A natural pesticide that can be used is *Bacillus thuringiensis* or B.t. There are also growth regulator pesticides that disrupt growth and ultimately kill larvae. Other chemicals have been labeled for direct control of feeding on host foliage. All chemical applications must be done in accordance to labeling.



## ***Management Recommendations***

Douglas-fir tussock moth management should be tailored to site conditions, level of insect activity and management objectives. No single management recommendation is appropriate. Some basic guidelines for decision making are:

- Defoliation severity and tree mortality are not well documented in this area. A number of trees with severe defoliation. Previous DFTM events in the area resulted in 30 to 40 percent tree mortality after severe defoliation.
- Future defoliation likelihood may be estimated by looking for viable egg masses on a site.
- Low to moderate impacts by DFTM are likely to be tolerated by most hosts. These hosts will likely tolerate DFTM during this outbreak, but may have increased susceptibility to other insects and disease including Douglas-fir beetle.
- Moderate to severe impacts by DFTM may warrant more aggressive control.
- Individual, high-value tree protection can be accomplished by topical applications of chemicals that disrupt DFTM feeding or development.
- Stands of hosts can be made more resilient through forest management: favoring non-host trees, and reducing understory host component.
- Management of DFTM may be incorporated into long-term forest management plans, including forest health and fire reduction activities.

## ***Conclusions***

The Lakewood Service Center staff is available to assist the City of Colorado Springs and our many mutual partners- in addressing DFTM. If you have any questions regarding this site visit report, please contact Rebecca Powell ([rebeccapowell@fs.fed.us](mailto:rebeccapowell@fs.fed.us) or 303-236-8008) or Sky Stephens ([ssstephens@fs.fed.us](mailto:ssstephens@fs.fed.us) or 303-236-9552).



**Figures**



**Figure 1.** Spike top characteristic of western spruce budworm activity).



**Figure 2.**View from Gold Camp Road north of Helen Hunt Falls.





**Figure 3.** Douglas-fir tussock moth adults. Male (left) and female (right).



**Figure 4.** Douglas-fir tussock moth larvae



**Figure 5.** Douglas-fir tussock moth egg mass (L) and cocoon (R)



# Maps

Map 1 Potential Douglas-fir tussock moth assessment sites.

