WESTERN NORTH AMERICAN DEFOLIATOR WORKING GROUP (DWG) MEETING

FEBRUARY 18-19, 2004

USDA FOREST SERVICE
PACIFIC NORTHWEST REGIONAL OFFICE
PORTLAND, OREGON

MEETING NOTES

Participants: Bob Backman (WA-Dept. Natural Resources, Olympia, WA), Darren Blackford (R4-Ogden, UT), David Bridgwater (R6-Portland, OR), Beverly Bulaon (R1-Missoula, MT), Bob Cain (R2-Lakewood, CO), Bruce Hostetler (R6-Sandy, OR), Imre Otvos (PFC-Victoria, BC, Canada), Dave Overhulser (OR-Dept. Forestry, Salem, OR), Robert Progar (PNW-Corvallis, OR), Iral Ragenovich (R6-Portland, OR), Karen Ripley (WA-Dept. Natural Resources, Olympia, WA), Terry Rogers (R3- Albuquerque, NM), Dwight Scarbrough (R4-Boise, ID), Don Scott (R6-LaGrande, OR), Kathy Sheehan (R6-Portland, OR), John Wenz (R5-Sonora, CA), Beth Willhite (R6-Sandy, OR). (See attached list of members)

Guest Participants: Kim Mellen, Regional Wildlife Ecologist, (R6-Portland, OR), Doug Daoust, Group Leader, FHP (R6-Portland, OR)

MEETING SUMMARY

Action Items for 2004

1) Continue support of, and participation on, the TM BioControl-1 (TMBC) ad-hoc committee. Communicate DWG TMBC issues to ad-hoc committee and other entities as appropriate (Wenz) (page 10)

2) DWG will coordinate activities associated with testing potential improvements to the DFTM Early Warning System (Ripley, Wenz, Ragenovich) (page 12)

3) Compile an annotated list of published literature, reports, data sets and other information sources concerning the effects of defoliators on forest vegetation and the consequent effects on forest resources. Identify opportunities to communicate results to appropriate resource managers. (Willhite, Bulaon, Progar) (pages 12-13)

4) Check files in FHP-R4 Boise for any work on WSBW mating disruption conducted by Julie Weatherby. (Scarbrough) (page 14)

5) Communicate result of discussion on the feasibility of using WSBW pheromone for mating disruption to Steve Burke, Hercon. (Wenz) (page 14)

6) Contact Chris Niwa (PNW, Corvallis) to obtain a more complete summary of the results of her work with Charlie Sartwell and Gary Daterman using WSBW pheromone traps to predict subsequent defoliation. (Wenz) (pages 14-15).

7) Communicate to appropriate entities, concern over a declining capability in FHP, especially in the West, to develop and utilize state-of-the-art pesticide and other agent (e.g., pheromones) application technologies in large-scale aerial suppression projects (Wenz) (page 17)

Other Decisions/ Actions.

1) Modified the DWG "Statement of Purpose" to include Homoptera (page 3).

2) DFTM Early Warning System. Reminder that each Region/State /other cooperator should send their trap catch data to Kathy Sheehan (R6-Portland) annually for inclusion in the west-wide database. In addition, be sure to order traps baits, etc. from FHTET- Ft.Collins (Sheryl Romero) as per the annual, January/February, call letter.

Next Meeting: TBA, tentatively in Coeur d' Alene, ID.

OLD BUSINESS

A) Status of Action Items from 2003 Meeting

1) Continue consolidation of documentation of past defoliator committee meetings and convert into digital format (Hostetler, Sheehan). Status: *Completed.* All information related to the DWG dating back to 1988 has been placed on a CD. The information is also available on the R6 FHP website. Kathy Sheehan (R6-Portland) volunteered to coordinate this ongoing effort and the DWG Chair will send her the meeting notes and other updates on an "as-needed" basis.

2) Continue support of, and participation on, the TM BioControl-1 ad-hoc committee; communicate need to develop technology for early detection of NPV virus in increasing DFTM

populations to STDP-Insect Management Technical Committee (Wenz). Status: *Completed/ Ongoing* (page 10).

3) Work with R6-FHP to facilitate an update of the status and evaluation of all required monitoring following the 2000 and 2001 DFTM suppression projects using TM BioControl-1 in Washington and Oregon (Ragenovich, Wenz). Status: *Completed* (pages 10-12).

4) Form committee in 2003 to address issues associated with defoliator (specifically western budworm) effects assessment. (Bulaon, Progar, Willhite). Status: *Completed/ Ongoing* (pages 12-13).

5) DWG will coordinate activities associated with testing potential improvements to the DFTM Early Warning System (Wenz, Ragenovich). Status: *Ongoing* (page 12)

NEW BUSINESS

A) Purpose of the Western North American Defoliator Working Group (DWG)

Dave Overhulser noted that Homoptera (eg., balsam woolly adelgid, hemlock woolly adelgid, spruce aphid etc.) are not officially addressed by any of the current working groups and suggested that the DWG formally include such insects . This suggestion was approved by the DWG. The "Statement of Purpose", approved by the DWG in December, 2001, is thus amended below to formally include Homoptera under the aegis of the DWG.

The purpose of the Western North American Defoliator Working Group (WNADWG) is to provide a means to address issues associated with western defoliator ecology and management. The WNADWG meets annually or more frequently as needed. The group is composed of professional forest pest management specialists, scientists and resource management specialists representing federal, provincial, state and local governments, universities and private interests.*

Specifically, the WNADWG provides a forum to:

1) Discuss current defoliator conditions in western North America;

2) Identify and discuss issues and concerns related to western forest defoliator ecology and management;

3) Address short- and long- term research, technology development and management needs for western forest defoliators;

4) Communicate issues, concerns, recommendations, priorities and needs to appropriate entities.

* Includes Homoptera.

B) Forest Health Monitoring Meeting Report (Ripley)

The annual Forest Health Monitoring (FHM) Work Meeting was held in Sedona, Arizona February 9-13, 2004. The meeting theme was Drought, Bark Beetles and Fire and included presentations on that theme, FHM Program-activity related presentations, 10 Focus work group sessions, and over 55 posters. A field trip to bark beetle and drought affected stands in the vicinity of Flagstaff was included.

The theme-related presentations included papers on weather patterns, bark beetle impacts to pinyon-juniper forests, and consequences of drought. The monitoring presentations included bark beetle monitoring with pheromone-baited traps and Urban FHM pilot project results. Focus group topics were: Ozone, National Risk Map, Riparian Monitoring, Urban Monitoring, Weeds, Analysis & Reporting, Intensive Site Monitoring, Invasives, Aerial Survey, and Sudden Oak Death.

The meeting was really good. There's been excellent work done on the effects of beetles, drought and fire (suppression) in Arizona in recent years. There's more information about climate patterns coming out all the time – the drought in the SW is supposed to persist. And significant amounts (like 80%) of the pinyon have already been killed in many areas. It's stunning.

The meeting notes will be put up on the FHM website in the next couple of months. The website is: http://www.na.fs.fed.us/spfo/fhm/index.htm
Or, you can get more information from your local federal or state FHM cooperators.

C) Healthy Forest Restoration Act (Scarbrough)

Dwight Scarbrough gave a brief presentation on the Healthy Forest Restoration Act of 2003 (HFRA). and provided several handouts and maps. The HFRA includes a number of provisions intended to expedite the preparation and implementation of hazardous fuels reduction projects on federal lands and assist rural communities, States and landowners in restoring healthy forest conditions on State and private lands. Forest Health Protection is expected to play an important role in the planning and implementation of projects under the HFRA and there will be an impact on FHP workloads. Expectations for accomplishments under this legislation are high and there must be appropriate levels of accountability. One area of concern involved the use of the recently revised Categorical Exclusions (CE's). Forest Health Protection must ensure, from an insect and disease perspective, that the CE's are being utilized appropriately.

An Interim Field Guide was in the process of being put together at the time of this meeting and the sections applicable to FHP and insects and diseases were handed out and discussed. The discussion focused on how hazard and risk were being defined and used within the Field Guide. The Interim Field Guide is located at the following website:
http://www.fs.fed.us/projects/hfi/field-guide/web/toc.php

A brief summary of the timeline and the major points of this legislation follows:

The Healthy Forests Initiative was introduced by the President in August 2002 at the height of one of the worst fire seasons the Nation has ever experienced. The dangers and losses associated with catastrophic fire extended into the 2003 fire season.

On November 21, 2003, Congress made a strong bi-partisan commitment to reduce the threat of catastrophic wildfire to communities and restore our nation's forest and rangelands by passing HR 1904, the Healthy Forests Restoration Act of 2003.

On December 3, 2003, the President signed into law the Healthy Forests Restoration Act of 2003 to reduce the threat of destructive wildfires while upholding environmental standards and encouraging early public input during review and planning processes. The legislation is designed to help further the President's Healthy Forests Initiative pledge to care for America's forests and rangelands, reduce the risk of catastrophic fire to communities, help save the lives of firefighters and citizens, and protect threatened and endangered species.

- The Healthy Forests Restoration Act:
  - Strengthens public participation in developing high priority forest health projects;
  - Reduces the complexity of environmental analysis allowing federal land agencies to use the best science available to actively manage land under their protection;
  - Provides a more effective appeals process encouraging early public participation in project planning; and
  - Issues clear guidance for court action against forest health projects.

The following websites are also a good sources of information:

1) Healthy Forest Initiative: http://www.fs.fed.us/projects/hfi/,

2) Healthy Forest Restoration Act of 2003: http://www.theorator.com/bills108/hr1904.html

3) USDA Forest Service and Department of the Interior
Joint Categorical Exclusions for Hazardous Fuels Reduction and for Fire Rehabilitation:
http://www.fs.fed.us/emc/hfi/

4) USDA-FS Categorical Exclusions for Limited Timber Harvests:
http://www.fs.fed.us/emc/lth/index.html,

5) US Department of the Interior Healthy Forest Initiative: http://www.doi.gov/hfi/newhfi/

DISCUSSION TOPICS

Douglas-fir Tussock Moth

A) Status of DFTM Mating Disruption Project – 2003 (Ragenovich)

In the late fall of 2002, we conducted DFTM pheromone elution studies from four brands of slow releasors. Releasors were tested in both the greenhouse (APHIS PPQ lab in Otis ANGB, MA) under controlled conditions, and in the field (Tucson, AZ) where formulations were exposed to weather conditions. Releasors tested were the Hercon flake, the Scentry fibre, 3M microencapsulated beads and a liquid polymer by Shin-etsu Corp. In the greenhouse, additional comparisons were made between the center-sealed and end-sealed Scentry fibres, on Hercon previous year's, and new flake formulations, and on 3M previous year's and new formulations. Formulations were placed on three substrates – canvas paper, fine wire mesh screen, and needles of potted trees. Twenty-five drops/fibre/flakes from three replications of each formulation on each substrate were collected at 7 to 10 day intervals for 72 days. Samples were sent to Rick Kelsey at the PNW Corvallis lab for gas chomatograph analysis to determine how much material had eluted and how much remained in the samples.

Results:

- The formulations on all three substrates (paper, screen and needles) all released at a similar rate. There was no releasor that was consistently different whether on needles, paper, or screens. (Figure 1)

- There does not appear to be any significant difference between the old and new formulations of 3M microencapsulated – i.e. both the old and new formulations released about the same under greenhouse conditions.

- There does not appear to be any difference in performance between old and new formulations of Hercon flakes under greenhouse conditions.

- There does not appear to be any difference in performance between the end-sealed and center-sealed Scentry fibres. (Figure 2)

- Under greenhouse conditions, the Scentry fibres still retained most of the pheromone after 72 days. (Figure 2)

- Under field conditions, all formulations released pheromone at a faster rate than that in the greenhouse. Of those, the 3M microencapsulated formulation and the Hercon flake formulation released most consistently over the exposure time. (Figure 3)

- In the field, the effective release rates for the Shin-etsu formulation and the Scentry fibre formulations was only about 16 – 20 days. By the end of 20 days the Shin-etsu

formulation had essentially released all of its pheromone. At the end of 16 days the Scentry fibre stopped releasing, although pheromone was retained in the fibre. (Figure 3)

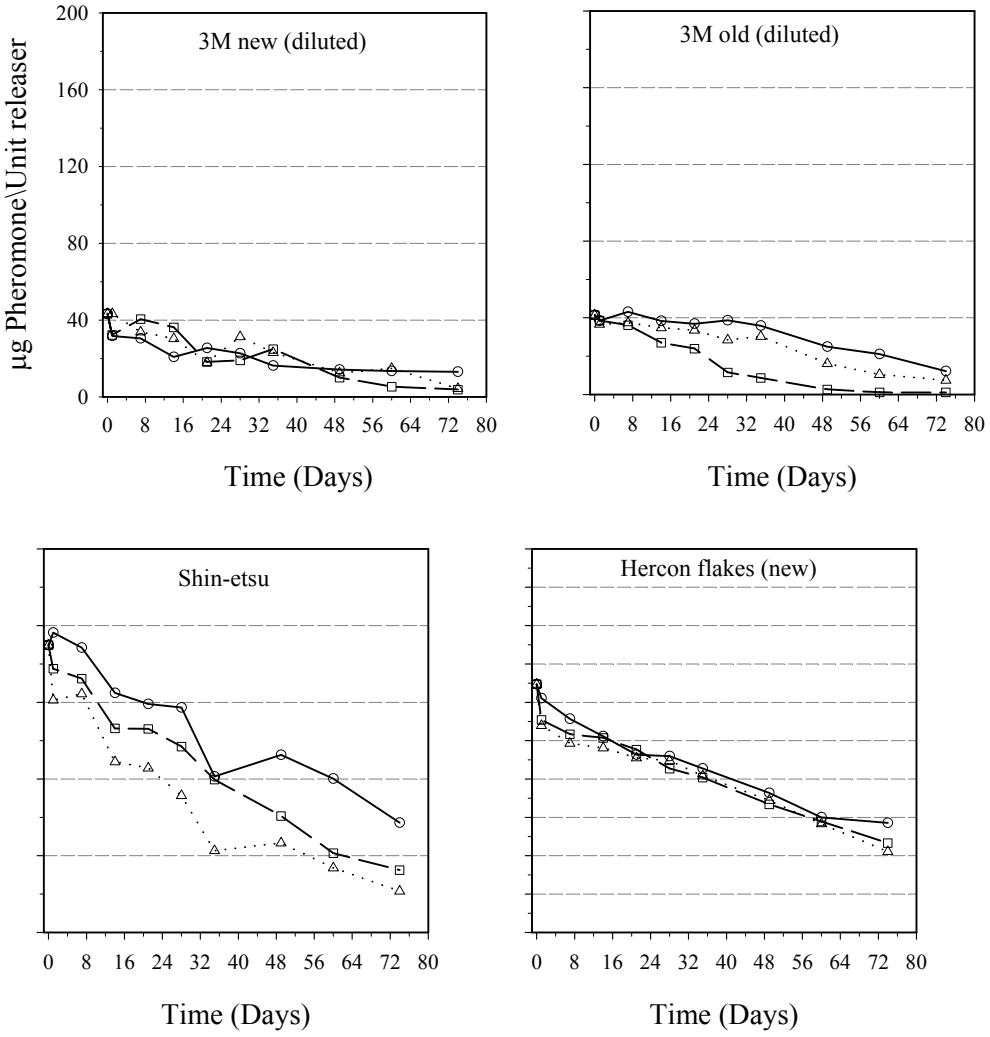

Figure 1. Graphs comparing pheromone release from the three types of material: needles (○); paper cards (□); screen (∈); used to support the releaser devices during the first greenhouse experiment.

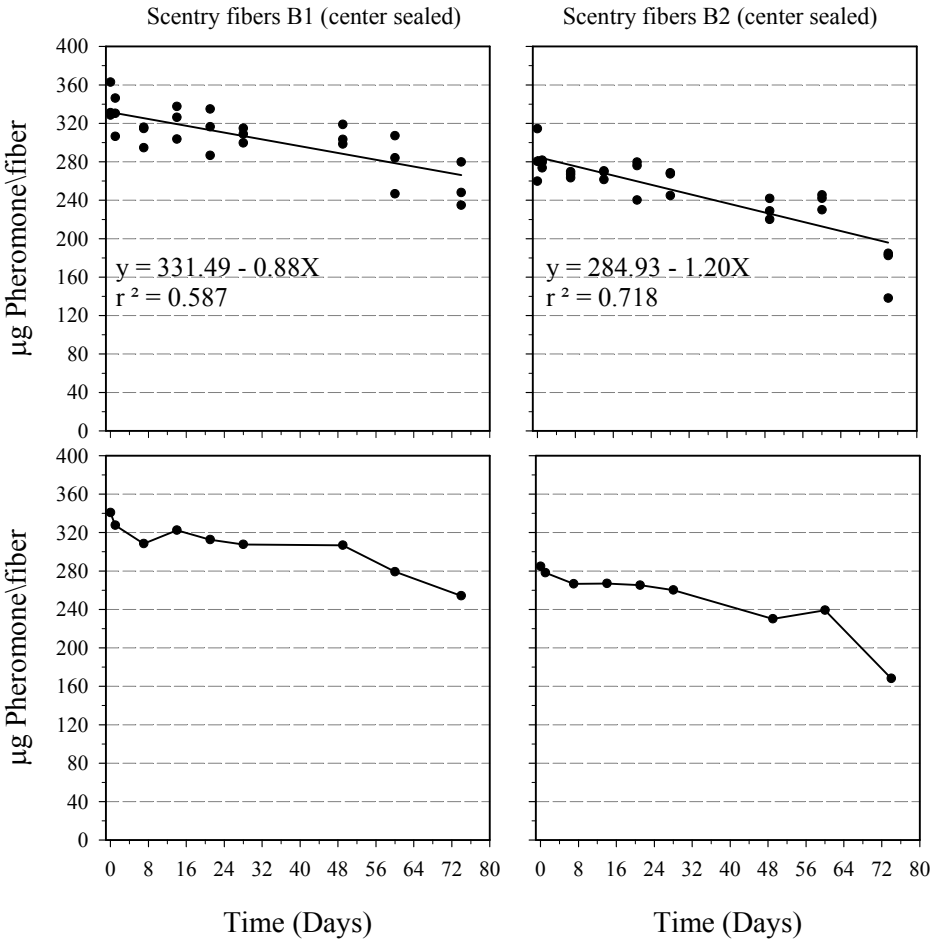

Figure 2. Scentry fibers (center sealed) or (end sealed) in petri dishes during the second greenhouse experiment. The top graph is the scatter plot and regression line with three replicates at each sample date. The bottom graph is a simple line plot using the means of replicates on each sample date.

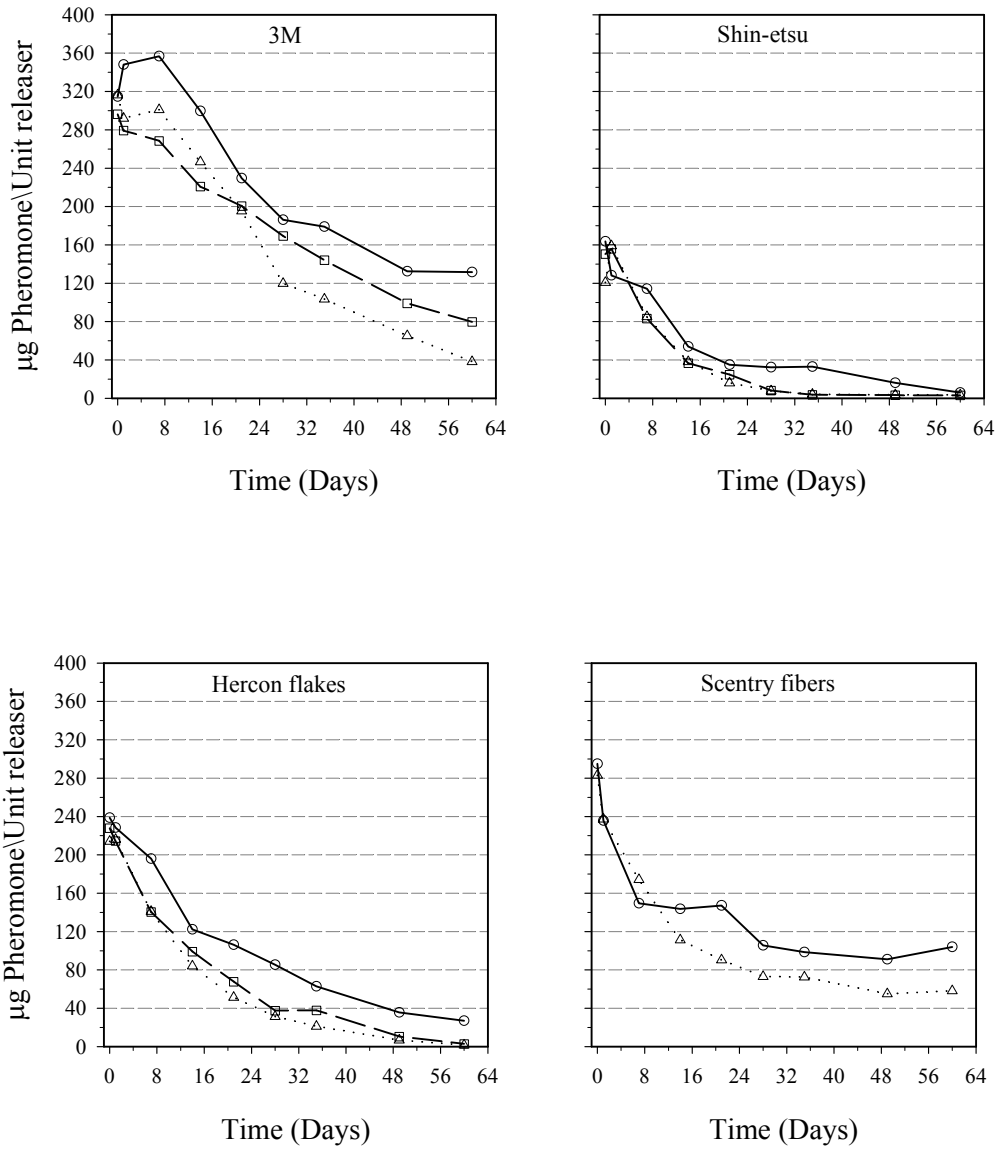

Figure 3. Graphs comparing pheromone release from the three types of material: needles (○); paper cards (□); screen (∈); used to support the releaser devices during the field experiment.

B) <u>TM-BioControl-1</u> (Wenz)

The DWG continues to support the efforts of the ad-hoc committee headed by Allan Bullard (FHTET, Morgantown, WV) to address the several issues associated with TM-BioControl-1 (TMBC). Discussion of these issues is summarized as follows:

1) It is estimated that about 228,000 to 273,000 acre-doses of TMBC are currently available after the most recent outbreak cycle.

2) This MAY be enough for the next outbreak cycle (early warning system pheromone trap catches in California and southern Oregon in 2003 indicate that populations may be increasing) but problematic for subsequent outbreaks. There is a continuing need to address the issue of future TMBC production.

3) It was also suggested that EPA be contacted to determine if there is a need to maintain the Goose Lake colony.

4) The Goose Lake colony has been maintained under the direction of Imre Otvos at the Pacific Forestry Centre (PFC), Canadian Forest Service, Victoria, BC, with funding support from the U.S. for the past several years. Imre said that we can't count on PFC to continue this service past 2005. If the colony needs to be maintained, there is an urgent need to have a functioning alternative in place by January, 2006. This means that transition to the new facility should be initiated soon; in 2005 at the latest.

5) Efforts continue to get TMBC registered in California. A meeting was held with CA-EPA, Department Of Pesticide Registration, on March 23, 2004 (Jack Stein, Dave Bakke, John Wenz) to initiate (again) this process.

6) The DWG reaffirmed as a priority the need to develop technologies that would allow early detection of the NPV virus in increasing DFTM field populations so that predictions of the effects of the virus on specific DFTM populations would be available for timely, effective, use by decision-makers evaluating DFTM management alternatives.

Members of the DWG are currently participating on the ad-hoc committee and the DWG is available to provide whatever assistance is needed. John Wenz will communicate the 2004 DWG discussions to Alan Bullard (2004 Action Item #1).

C) <u>DFTM Project Efficacy Monitoring</u> (Wenz, Ragenovich)

The issue of project efficacy monitoring following the 2000 and 2001 DFTM suppression projects in Washington and Oregon was discussed at the 2003 DWG meeting. The DWG is on record (3400 memo from the DWG to the Director, FHP-WO, February 6, 2001) as supporting the importance of, and funding for, quantitative monitoring to document treatment efficacy in terms of meeting specified project objectives. The DWG requested information on the status of the 2000-2001 DFTM suppression project monitoring efforts from FHP R6 (2003 Action Item #3). The following list of monitoring-related reports was compiled:

DFTM Suppression Project, Oregon-Washington, 2000-2001: Chronological List of Monitoring-Related Reports

1) May-June, 2000. Anonymous (Wallowa-Whitman and Umatilla National Forests). Monitoring Recreational Experiences of National Forest Visitors during the Tussock Moth Spray Project. 1 p.

2) August 31, 2000. D.W. Scott. Virus and Parasite Monitoring- Preliminary Report. BMPMSC-00-12: 8 pp.

3) November 24, 2000. DeMeo, T., Boula, Kathryn and M. Fedora. Monitoring the Effectiveness of Aerial Spraying to Control Douglas-fir Tussock Moth; With Specific Reference to the Effectiveness of Spraying On Reducing Defoliation in Riparian Zones Of Value to Bull Trout. 7 p. (accompanied by 7 page powerpoint presentation).

4) December, 2000. N. Greear. Douglas-fir Tussock Moth Project Final Report 2000. BMPMSC-01-04: 50 pp + maps and appendices.

5) July, 2001. Anonymous (Okanogan-Wenatchee National Forest). Douglas-fir Tussock Moth Project Final Report July 2001- Methow Valley Ranger District. 159 pp.

6) November 15, 2001. Scott D.W. and L. Spiegel. Evaluation of TM BioControl-1 Treatments to Suppress Douglas-fir Tussock Moth in the Blue Mountains of Northeastern Oregon and Southeastern Washington One Year After Treatment. BMPMSC-02-02: 8 pp.

7) July 17, 2002. D.W. Scott. Evaluation of Douglas-fir Tussock Moth on the Heppner Ranger District, 2001-2002. BMPMSC-02-06: 25 pp. .

8) January 13, 2003. Scott D.W. and L. Spiegel. One and Two Year Follow-up Evaluation of TM BioControl-1 Treatments to Suppress Douglas-fir Tussock Moth in the Blue Mountains of Northeastern Oregon and Southeastern Washington. BMPMSC-02-02: 21 pp.

9) Undated. C. Mehmel. Two-Year Follow-up Evaluation of TM BioControl-1 Treatment to Suppress Douglas-fir Tussock Moth on the Okanogan National Forest in North Central Washington. 7 pp.

10) April 18, 2003. K. Woodruff. Assessment of Changes in Canopy Closure in Response to Douglas-fir Tussock Moth Outbreak and Subsequent Aerial Control Project, USFS, Methow Valley Ranger District, Washington. 6 pp.

After discussion, it was concluded that:

1) Region 6 made a reasonable, conscientious effort to comply with project monitoring requirements;

2) The monitoring efforts generally found that (a) populations in untreated areas declined due to naturally occurring virus before causing significant resource damage and that therefore

(b), the efficacy of the TMBC treatment on DFTM populations and defoliation could not be reliably evaluated and (c), that it would be risky to extrapolate conclusions on the efficacy of TMBC from this suppression project for use in decision-making for future DFTM outbreaks;

3) There did not appear to be an overall, formal, coordinated attempt to organize , document and synthesize project monitoring. Monitoring efforts seemed to be planned and implemented independently. A more coordinated effort would facilitate and improve interpretation, understanding and reporting of monitoring and project results.

D) Early Warning Pheromone System (Ripley/ Backman)

It is appropriate to consider improvements to the DFTM early warning system (EWS). The DWG coordinates testing of any proposed changes to the EWS over adequate time frames and geographical areas using agreed upon standardized protocols before the proposed changes are considered for integration into the operational EWS.

A new plastic lureholder developed by Phero Tech was discussed that might be an improvement over the pin and block system currently in use. Bob Backman conducted some limited testing in 2003 by adding a 6th trap with the new lureholder to 170 regular 5-trap EWS plots. In general, the new lureholder seemed to work adequately - it was easy to use, held the bait tightly and did not come lose from the trap, even under windy conditions or when purposely tossed about. However, it was difficult to draw conclusions from the test with respect to comparative trap catches because many of the plots caught none to few moths. When trap catches were compared only on sites where at least one moth was caught, the new lureholder tended to catch fewer moths: The regular traps caught moths in 137 out of 385 traps (.358 = 36%) while traps with the new lureholder trap caught moths in 11 out of 77 traps (.143 = 14%).

The DWG felt that additional testing in 2004 was warranted over a wider geographical area, hopefully with higher populations, and using 5 standard traps matched with 5 traps using the new lure holder on each plot. Karen Ripley agreed to coordinate this effort (2004 Action Item #2).

As a follow-up, Karen Ripley contacted John Borden of PheroTech. He agreed to provide 300 free lures and lureholders to conduct the test in 2004. Cooperators are being sought to place 10 traps (5 standard EWS and 5 lure holder traps) per site on a total of 60 EWS sites where DFTM are likely to be in the 25-40 moths per trap range. Please contact Karen Ripley if you'd like to participate. karen.ripley@wadnr.gov

Western Spruce Budworm

A) Effects Assessment (Willhite, Bulaon, Progar)

Western Spruce Budworm activity and associated defoliation is increasing in several areas throughout the west. There was considerable discussion of issues associated with budworm management. A basic concern involves the quantitative documentation of defoliator (western budworm in particular) effects (specifically non-commodity effects) and associated issues. These

issues include the need for better coordination with wildlife biologists and other resource specialists and how to effectively implement and fund complex monitoring/assessment studies.

Kim Mellen, Regional Wildlife Ecologist, R6 participated in the discussion and provided the following comments:

The key to the impact of budworm on wildlife habitat is **how much mortality** occurs. If entomologists can predict the amount of mortality, or the expected range with some probability attached, then the wildlife folks can get a fairly good idea of how it will impact wildlife habitat. It would be important to know how the mortality will **affect vertical and horizontal cover**. Also the **species and size of trees killed that will produce snags**, and the probability that bark beetles will invade the dead trees. It sounded like predicting mortality is difficult, but perhaps and expert system or model could be developed that incorporates things like stand density, presence of other stressors (drought, other disease agents, other insects).
If budworm causes mortality it will create better habitat for some species and degrade habitat for other species - it will be a trade off. For example:

- mortality of understory trees degrades
    - hiding cover for deer and elk - especially important in areas of high road density
    - habitat for species that rely on closed canopy, multi-story stands (e.g. spotted owl and some songbirds)
- mortality of trees creates snag habitat
    - small snags, especially if invaded by bark beetles, creates foraging habitat
    - larger snags provide for nests for cavity-nesting/-roosting species
- mortality opens up stands for species such as the white-headed woodpecker, Lewis' woodpecker that use primarily open forests
- mortality may create a high fuel load that makes the stand prone to stand replacing fire, which again may be good for early seral species, but not for late seral species - though Beth indicated that mortality of the understory may actually reduce ladder fuels, at least in the area she referenced

Other stray thoughts:

- treatment of budworm with BT can have a negative impact on the food supply of bats and many birds during a critical time for feeding young as all larval lepidoptera are killed - based on work by Torgy Torgersen - many of the birds (and ants) that use dead wood also feed heavily on budworm larvae

Following discussion, the DWG decided to have a small group initiate compilation of an annotated list of published literature, reports, data sets and other information sources concerning the effects of defoliators (and associated biological factors and conditions) on vegetation and the consequent effects on forest resources, especially non-commodity resources including wildlife, riparian habitat, fuels and late seral stage (old growth) characteristics (2004 Action Item #3). In addition, the group was to identify opportunities to coordinate and communicate such findings with appropriate resource specialists. The overall purpose is to improve the quality of FHP suppression/ prevention project decision-making.

B) <u>Western Spruce Budworm and Mating Disruption</u> (Ragenovich)

There was a short discussion on the feasibility of using WSBW pheromone for mating disruption. Since WSBW is a fairly mobile insect, and gravid female moths could disperse back into treated areas, it was felt that it would not be beneficial to pursue testing mating disruption. Dick Reardon had offered to conduct elution studies on the pheromone in different slow-release devices, similar to the tests done for DFTM, however, it was unanimously decided not to pursue this at this time due to a low probability of success and higher priorities. Dwight Scarbrough will check the files in Boise to see what, if any work, Julie Weatherby might have done with mating disruption (2004 Action Item #4). John Wenz will communicate this decision to Steve Burke, Hercon (2004 Action Item #5).

C) <u>Western Spruce Budworm Trapping/Defoliation Study</u> (Ragenovich, Niwa**)**

Iral Ragenovich discussed a study, conducted by Charlie Sartwell, Gary Daterman and Chris Niwa in the early to mid-90's, designed to determine whether you could predict WSBW defoliation with pheromone-baited traps. John Wenz subsequently contacted Chris (2004 Action Item #6) and she provided the following:

There were three main steps in the development of this system:

1. **Determining bait strength.** The goal was to determine what strength of bait, when deployed in a sticky trap for the entire flight period, would reflect a range of subsequent defoliation levels. Of particular importance was that the trap would not become saturated with moths at low or moderate WSBW densities. Moths were trapped in three areas in eastern and central Oregon representing a range, low, moderate and high, of WSBW population densities. Three bait strengths (0.01, 0.001 and 0.0001% by weight of 92:8/E:Z-11-tetradecenal) were deployed in each of the areas. The two stronger baits showed very little variation in moth capture between the areas with different levels of defoliation; and many traps were full in areas with low subsequent defoliation. Only the 0.0001% bait captured a range of WSBW moths that reflected subsequent defoliation.

2. **Predicting subsequent defoliation.** Using the 0.0001% bait strength, 27 USDA-FS milk carton traps (DFTM traps) were deployed in each of seven areas in Oregon. All areas were about 20,000 acres in size and traps were deployed throughout the WSBW flight period. The following year, after all feeding had ceased, defoliation was assessed on 81 trees per area. Twenty-five new shoots per branch on four mid-crown branches per tree were rated using a six class scale (0=no defoliation, 1=1-25%, 2=26-50%, 3=51-75%, 4=76-99% and 5=100%). On an area basis, catches of moths were highly correlated with severity of defoliation in the subsequent year. Captures of an average of 40 or more moths per trap predict defoliation ranging from 60-100% the following year. This

pheromone-based method is strictly for predicting defoliation on an area wide basis; it is not intended for use with individual or small groups of traps.

3. **Technology transfer to a commercially available lure source.** In an effort to transfer the WSBW trapping methodology to a commercial source, PNW Research Station worked cooperatively with PheroTech for three years testing lures and traps. The PheroTech polyurethane bait compared well with the USDA-FS polyvinyl chloride bait at all WSBW defoliation levels tested. Trapping results with commercial Delta traps were not consistent with the USDA-FS milk carton traps over a range of WSBW defoliation. Therefore, the use of pheromone trapping to predict subsequent WSBW defoliation is only calibrated for the PheroTech bait in combination with USDA-FS milk carton traps.

Chris Niwa and Dave Overhulser are currently working on a report describing how to use pheromone traps to predict subsequent WSBW defoliation. It will include information on: obtaining traps and baits, number of traps needed, timing the survey, assembly of traps, field placement of traps and evaluating trap catches. The draft report will be available in May, 2004.

Homoptera- Sucking Insects

A) Balsam Woolly Adelgid in West (Overhulser)

- Iral Ragenovich (FHP, R6) and Russ Mitchell (USFS retired) are revising the BWA Forest Pest leaflet.

- Helen Maffei (FHP, R6) is developing a project to identify sub-alpine fir showing possible resistance to BWA.

- Oregon Department of Forestry and USFS (R6) personnel received an STDP grant to develop an alternative signature method to improve aerial detection of BWA using epiphytic lichen loads on declining subalpine fir.

- Observations by Beth Willhite, Karen Ripley, and Bob Backman of increases in BWA gouting on trees defoliated by western spruce budworm were discussed.

- Jed Dewey (USFS retired) was said to have encountered BWA in the Lolo Pass area of western Montana. This maybe a significant eastward expansion of BWA range from Idaho.

B) Hemlock Woolly Adelgid (HWA) (Overhulser)

- Scott Salom (Professor of Entomology at VPI) is interested in developing collection sites in Washington/Oregon for *Laricobius nigrinus*, an important predator of HWA. Hemlock seed

orchard blocks with HWA infestations that are not treated with insecticide are potential collection areas for this beetle.

- Maggie Byrkit, an OSU graduate student under Darrell Ross, has completed a study on HWA predators present on western hemlock in Oregon.

C) <u>Spruce Aphid</u> (Overhulser/ Lynch)

Dave Overhulser (OR DNR) presented the following paper prepared by Ann Lynch (USFS-RMS, Flagstaff, AZ).

Spruce aphid, *Elatobium abietinum* (Homoptera: Aphididae), activity has greatly increased in recent years. There were sporadic spruce aphid outbreaks in Oregon and Washington on Sitka spruce from the 1920's through the mid-80's. However, defoliated acreage has exceeded 5,000 ac almost 1 year in 2 since 1986, and exceeded 40,000 in 3 of those years. Similarly, activity in Alaska was very infrequent from the 1920's through the 1980's, but defoliated acreage has exceeded 20,000 ac 5 times since 1992. Spruce aphid dispersed into the Southwest in the 1970's, and incurred one wildland outbreak in 1988. Since 1995, there have been 4 outbreaks defoliating 10,000 ac or more (2 exceeded 150,000 ac), and the insect has dispersed to at least 5 mountain ranges. In both the Pacific Northwest and the Southwest aphid outbreaks appear to be associated with warmer than usual winters.

Ann Lynch at the Rocky Mountain Research Station has been conducting research on this insect. Her work has focused on population dynamics, weather patterns associated with outbreaks, and impact in high-elevation Southwestern ecosystems. Results (Lynch 2004, in press with *Western North American Naturalist*) to date show that, in the Southwest:

- Engelmann spruce is much more susceptible than Colorado blue spruce
- Mortality of 24-40% can be expected within 5 years in heavily defoliated Engelmann spruce
- Mortality of trees both severely defoliated by spruce aphid and severely infected by dwarf mistletoe approaches 70%
- The smallest trees within the stand are the most severely defoliated
- Tree survival is associated with retention of foliage in the top of the tree crown
- Site and stand factors do not appear to greatly influence risk

These results indicate that spruce aphid will alter the character of the future forest, given the frequency of outbreaks and severity of impact. Research on weather patterns and population dynamics should provide an idea of how much of the interior Engelmann spruce forest is at risk.

Working with cooperators in the Pacific Northwest and Europe, Ann has begun preliminary work to calibrate a European population dynamics model to coastal PNW populations. Ann is also analyzing PNW weather records from NOAA and NWS in order to identify weather patterns associated with outbreak years, hoping to explain why aphid activity has increased so much in recent years. In addition, Ann, Mark Schultz, and Dave Overhulser are working on compiling an

historical record of spruce aphid activity for western North America. Any extension records from British Columbia and California would be very useful to this effort.

Gypsy Moth (Bridgwater)

Washington trapped 59 male moths in 2003 in 17 areas; 14 in Port Ludlow, 17 in Belleview, 5 in Roanoak and 8 in Lewis County. The rest of the moth catches were single catches scattered around western Washington. These sites in 2004 will have more intensive trapping. In Port Ludlow 3 viable egg masses were found, 2 in Belleview and none in Roanoak or Lewis County. However, new pupae were found in Lewis County. In 2004, Washington expects to have ground application eradicative treatments of 5-15 acres in the three sites where alternate life stages were found.

Oregon caught 27 moths state-wide; 17 in Eugene, 2 in Gresham and 3 in one trap near the community of Aims. The rest of the catches were scattered singles. In 2004, all sites with positive catches will be intensively trapped. The only site where additional life stages were detected was the Eugene area. Here they found old pupae cases, additional live male moths, female moths laying egg masses and other viable egg masses. Oregon is planning to aerially treat 183 acres of the Eugene site this year to eradicate that introduction.

Pesticide Application Technology

The DWG identified a concern over the declining capability of FHP to develop and utilize state-of-the-art pesticide and other agent (e.g., pheromones) application technologies. The discussion focused on the declining expertise and capability in the workforce to plan and implement large-scale aerial spray projects, but also recognized other related problem areas including data gaps, the need to improve predictive model capabilities and non-target effects. Wenz is to communicate this concern to appropriate entities (2004 Action Item #7).

DEFOLIATOR CONDITIONS REPORTS- 2003

Region 1: North Idaho (Randall)

Douglas-fir Tussock Moth

- No visible defoliation in 2003.
- Trap catches remain low.
- Sandy Kegley remeasured her permanent plots, hopes to get a report out soon.

Hemlock Looper

- Aerial surveys conducted in 2002 picked up significant defoliation from hemlock looper.
- On the Nez Perce NF about 30,000 acres were defoliated in 2002.
- On the Clearwater NF 25,000 were mapped in 2002, but David Beckman from the Idaho Department of Lands indicated that defoliation was actually higher.
- Carol Randall toured 2002 defoliated area on the Nez Perce NF in August 2003 and was unable to find any looper larvae or signs of defoliation. Trees impacted by defoliation in 2002 mostly had lush new growth. Very few trees had signs of permanent damage in the form of topkill. The few trees observed with dead tops lost < or = 3' of terminal growth. No defoliation was detected in ADS on the Nez in 2003.
- No field checks were made in 2003 in the 2002 defoliated portions of the Clearwater NF. Aerial surveys in 2003 recorded 24 acres of looper defoliation, however much of the area defoliated in 2003 was not surveyed in 2003 according to David Beckman of the Idaho Department of Lands.

Budworm Complex

- Last year we reported approximately 9,000 acres of predominantly hemlock defoliation we attributed to western spruce budworm (WSBW) on the northern portion of the Idaho Panhandle National Forests (Kaniksu Reporting Area).
- Our identification of western spruce budworm was based upon 1 smallish larvae with classic WSBW coloration and marking and 4 adults collected near Priest Lake, Idaho. Frank Merickel, curator of the W.F. Barr Entomological Museum at the University of Idaho, verified identification based on voucher specimens in the museum's collection.
- In 2003 we discovered that R6 also mapped defoliation in hemlock adjacent to areas mapped in Idaho. R6 tentatively identified the responsible agent as the western black-headed budworm.
- In 2003, spring, FHP personnel installed permanent plots in 6 areas which experienced defoliation in 2002. Defoliation summaries from these plots are being analyzed.
- Because of the confusion over the identity of the defoliating agent, Carol Randall collected 14 adult moths from areas in Idaho defoliated in Sept 2003, and Larry Stipe collected 5 moths from an area near Libby, Montana which was first defoliated in 2003.
- These 19 moths and the 4 collected in 2002 were prepared by Frank Merickel and forwarded to a tortricid specialist in Los Angeles for positive identification. The results were a bit surprising, 4 different species of *Choristoneura*: 6- *C. orae*; 12- *C. occidentalis* (WSBW); 1- *C. lambertiana* (Sugar Pine Tortrix); and 4- *C. retiniana*. The most numerous were the WSBW. No black-headed budworms were present in our sample.

- The area of hemlock defoliation in N. Idaho expanded to 18,000 acres in 2003 and extended from the Wallace District of the Idaho Panhandle National Forest (Shoshone Creek) to the Canadian boarder. In Montana 350 acres of hemlock defoliation was mapped for the first time in 2003 near Libby, Mt. In all areas, defoliation is concentrated in the tops of the trees, and has not yet resulted in more than the top 3rd being stripped of foliage.
- It is possible that we have missed sampling the black-headed budworm in these areas. In 2004 we plan to sample both larval and adult stages throughout the summer in Idaho to insure that we have identified all species responsible for the defoliation we are witnessing. We will also remeasure defoliation on our permanent plots.
- Though hemlock is the most severely impacted species, other conifers are being nibbled on as well- including larch, white pine, Engelmann spruce, and to a lesser degree Douglas fir and grand fir. Defoliation on these other species has, so far, been minimal and concentrated on current year foliage.
- There is a historical precedence for what we are witnessing. In 1922 Mr. Rust, entomological ranger for the Bureau of Entomology in Coeur d'Alene Idaho, was dispatched to an area of hemlock defoliation near Priest Lake, Idaho. Mr. Rust examined the area and "found that not only the hemlock but the larch, cedar, white pine, white fir, and Engelmann spruce was being severely defoliated by a small worm or caterpillar. A number of these caterpillars were collected and reared to adult moths at the Coeur d'Alene Station which were determined by Mr. Heinrich, Specialist in Forest Lepidoptera, Washington D.C., as the spruce budworm." (Evenden, James C. 1922. Spruce budworm in northern Idaho. USDA Agricultural Research Administration Bureau of Entomology and Plant Quarantine Forest Insect Investigations, Northern Rocky Mountain Field Station Coeur d'Alene, Idaho)

Region 1: Montana and Idaho Department of Lands (Bulaon)

Compiled by Dave Beckman(IDL), Larry Stipe (R1-Missoula), Carol Randall (R1-Coeur d'Alene), and Beverly Bulaon (R1-Missloula)

Pest	Acres affected
Western Spruce Budworm	
Hemlock (Idaho only)	17,336
Douglas-fir (Montana only)	124,142
Western False Hemlock Looper	713
Douglas-fir Tussock Moth	416
Pine Sawfly	
Gallatin NF only	236
Forest tent caterpillar	
Turtle Mtns (North Dakota)	17,719

Gypsy Moths 0

- One moth caught in Yellowstone campground in third year of delimitation trapping.

State of Idaho	**Acres affected**
Western Spruce Budworm	
Northern	17,300
Southern	187,105 (77K Heavy)
Hemlock Looper	24
Douglas-fir Tussock Moth	2,989 (southern Idaho only)
Balsam Wooly Adelgid	24,539 (14,011 trees – N. Idaho only)

- This figure may be greatly underestimated since most heavily infested areas were not flown in 2003.

R2: Colorado/Kansas/Nebraska/South Dakota/eastern Wyoming (Cain)

Western Spruce Budworm – 20,000 acres primarily in southern Colorado and southern Wyoming. Appears to be building in the Front Range but not yet being detected in aerial survey.

Douglas-fir tussock moth – no forest reports of defoliation – minor ornamental activity in the Front Range in spruce. No moths captured in monitoring traps.

Western tent caterpillar building in the southern Front Range. Large aspen tortrix numbers are low. Aerial survey detected 5,500 acres of aspen defoliation in Colorado and 167acres in Wyoming.

Elm leaf beetle very high across eastern Colorado (Leatherman).

Ponderosa pine needle miners have been low in the Black forest area for two years (Leatherman).

Pine sawflies – Neodiprion spp. local hot spots in the Black Forest (Leatherman). European pine sawfly in Scots pine in Nebraska.

Bagworms in Nebraska – causing mortality in eastern red cedar windbreaks southeast of Lincoln.

Linden looper on west slope in Gambel oaks are down (Leatherman).

Jack pine budworm --- defoliation undetected for third year following significant outbreak in large planted portion of the Nebraska National Forest; *Ips* spp. now at high levels in defoliated areas, killing weakened trees.

Gypsy moth --- 12 moths were caught in South Dakota, all but two in Pennington County (Black Hills), where two multiple catch traps were recorded; six moths were caught in Wyoming, three near a residential area in Jackson (Teton County), one in Pinedale Campground in Pinedale (Sublette County), and two in Yellowstone National Park (NOTE: all Wyoming captures were submitted for DNA testing and were found to be of European strain); 1 in Colorado; 4 in Nebraska; no data available in Kansas.

Region 3: Arizona/New Mexico (Rogers)

Western spruce budworm activity continued to decrease in 2003, with 167,330 acres of defoliation detected vs. 210,335 acres in 2002. In Arizona, defoliation was recorded in Grand Canyon National Park (1,210 acres) and on the Navajo Indian Reservation (22,860 acres). In New Mexico, budworm defoliation was detected on the Carson (62,700 acres), Cibola (205 acres), Gila (1,195 acres), Lincoln (15 acres), and Santa Fe (18,675 acres) National Forests; the Jicarilla Apache (5,520 acres), Mescalero Apache (20 acres), and Taos Pueblo (1,385 acres) Tribal lands; and 53,540 acres of State and private lands. Although budworm activity decreased in most areas, including chronically-affected areas of northern New Mexico, a notable increase occurred on the Navajo Reservation in 2003.

No Douglas-fir tussock moth defoliation was detected in the region by aerial survey in 2003. However, several white fir that appear to have been defoliated by tussock moth were observed from the ground in the Sandia Mountains, Cibola National Forest

New Mexico fir looper activity increased in the Sacramento Mountains in 2003, with 7,205 acres of defoliation detected vs. 3,865 acres in 2002. Defoliation was detected on the Sacramento (6,615 acres) and Smokey Bear (200 acres) Ranger Districts of the Lincoln National Forest, and on the Mescalero Apache Indian Reservation (390 acres).

Defoliation from an unidentified looper continued but decreased in the White Mountains in 2003, with 1,035 acres affected compared to 6,615 acres in 2002. All the 2003 activity was recorded on the Fort Apache Indian Reservation.

Over 120,000 acres of spruce aphid defoliation is reported from Arizona in 2003, following two years in which none was detected. Activity was observed on the Apache-Sitgreaves National Forest (49,385 acres); the Fort Apache (71,585 acres) and San Carlos (90 acres) Indian Reservations; and 60 acres of State and private lands. No spruce aphid activity was detected in New Mexico.

Scale continues to affect piñon at several locations in the woodlands of Arizona and New Mexico, although none was mapped during the 2003 aerial surveys. Ongoing outbreaks covering thousands of acres occur on federal lands in the San Mateo and Datil mountains, in Lincoln County near the Capitan mountains, and in smaller pockets south of Capitan. Other woodlands with reported damage include private lands south of Willard, east of El Rito, south of Corona, and east of Silver City. Woodlands near Silver City have suffered tremendous mortality due to a combination of this insect, drought, and bark beetles. Damage to landscape piñon continues to be common statewide in New Mexico.

In Arizona, moderate to heavy defoliation of piñon was observed from the ground on the Prescott, Coconino, and Apache-Sitgreaves National Forests.

Aspen defoliation, decline, and mortality caused by one or more of the above insects, disease, and abiotic factors increased in 2003, with damage recorded on 72,925 acres vs. 59,490 acres in 2002. Aspen has been declining throughout the northern half of Arizona since a frost event in June 1999, followed by several years of drought. Many areas in northern and eastern Arizona experienced widespread mortality in 2002 and 2003, particularly on lower elevation sites. See *Activities* section in this report for additional information.

In Arizona, aspen defoliation/decline was detected on the Apache-Sitgreaves (30,720 acres), Coconino (5,845 acres), Kaibab (950 acres), and Tonto (20 acres) National Forests; BLM lands (15 acres); Fort Apache (21,000 acres) and Navajo (13,945 acres) Indian Reservations; and 430 acres of State and private lands. In New Mexico, aspen defoliation was mapped on the Carson (680 acres), Cibola (1,175 acres), Gila (220 acres), Lincoln (315 acres), and Santa Fe (1,605 acres) National Forests; Mescalero Apache (60 acres) and Taos Pueblo (25 acres) Tribal lands; Valles Caldera National Preserve (35 acres); and 380 acres of State and private lands.

Region 4: South Idaho (Scarbrough)

Information provided by Phil Mocettini and Kathy Matthews.

Douglas-fir Tussock Moth (*Orgyia pseudotsugata)*

In southern Idaho, tussock moth defoliation continued on approximately 3,100 acres of Sawtooth National Forest and Bureau of Land Management lands near the Nevada/Utah border

Western Spruce Budworm *(Choristoneura occidentalis)*

Western spruce budworm defoliation continued to increase. The majority of the defoliation is still concentrated on the Boise and Targhee National Forests in southern Idaho (approximately 88,300 acres and 69,700 acres, respectively). Over 13,600 acres of defoliation was mapped on the Salmon-Challis National Forest. Defoliation also occurred on three other National Forests, the Caribou (100 acres), Payette (267 acres) and Sawtooth (394 acres). In addition, 85 acres were defoliated on the Sawtooth National Recreation Area. Budworm defoliation also effected over 8,700 acres of state and private lands in Idaho.

Gypsy Moth *(Lymantria dispar)*

Just over 500 traps were set in the southeast region of Idaho by FHP through the Boise Field Office. No male moths were captured. The southwest and northern regions of Idaho were trapped by the Idaho Department of Lands.

Forest Tent Caterpillar *(malacosoma spp.)*

No notable forest tent caterpillar defoliation reported.

Region 4: Utah, Nevada, & Western Wyoming (Blackford)

Edited and submitted by Darren Blackford; Information provided by "Aerial" Al Dymerski

Douglas-fir Tussock Moth (*Orgyia pseudotsugata* (McDunnough))

Utah. No notable Douglas-fir tussock moth defoliation reported.

Nevada. In 2003, over 7,700 acres of trees were defoliated on the Jarbidge (7680 ac.) and Mountain City RD's (72ac.). This is an increase of about 6,900 acres from 2002.

Western Wyoming. No notable Douglas-fir tussock moth defoliation reported.

Western Spruce Budworm (*Choristoneura occidentalis* Freeman)

Utah. There were 2,160 of light- and 6,806 of heavy-defoliated acres detected on the Dixie NF. This is a decrease of approx. 100 light- and an increase of approx. 5,300 heavy- defoliated acres from 2002.

Over 200 defoliated acres were detected on Heber and Spanish Fork RD's of the Uinta NF. This is a decrease of approx. 100 acres from 2002 in these areas.

Over 1,200 defoliated acres were detected on the Price and Sandpete RD's of the Manti-La Sal NF. This is an increase of approx. 500 acres detected in 2002.

There were 3,087 light- to heavy-defoliated acres detected across the Fishlake NF. This is an increase of approx. 1800 acres reported in 2002 (primarily in Richfield RD).

Nevada. No notable western spruce budworm defoliation was detected for 2002 or 2003.

Western Wyoming. There were nearly 1,600 defoliated acres detected across the Big Piney, Greys River and Jackson RD's of the Bridger-Teton NF. For 2002, no notable defoliation was reported.

Gypsy Moth (*Lymantria dispar* (Linnaeus))

Utah. In 2002, a total of 3,812 gypsy moth traps were placed statewide by state and federal crews which produced one male gypsy moth capture from Hill Air Force Base (HAFB), located just south of Ogden. In 2003, a total of 3,534 gypsy moth traps were placed statewide by state and federal crews. A delimitation survey conducted in the HAFB area for 2003 produced negative captures. A second-year delimitation survey occurred at Lake Fork Guard Station, adjacent to Moon Lake campground, Ashley NF in 2003, which also produced negative captures.

However, two male moths were captured on the north slope of the Uinta Mountains in northeastern Utah, which will require delimitation trapping in 2004 and 2005. Please see handout.

Nevada. Negative captures.

Western Wyoming. Negative captures.

Forest Tent Caterpillar (*Malacosoma spp*.)

Utah. Over 100 acres of aspen were defoliated on the Salt Lake, Ogden, and Logan RD's. There were no defoliated acres reported for these areas in 2002.

Nevada. Nearly 8,000 acres of aspen were defoliated on all districts surveyed in central and eastern Nevada. This is a decrease of approx. 200 acres from 2002.

Western Wyoming. No notable forest tent caterpillar defoliation reported.

Miscellaneous Agents in Utah

Needle Cast Disease. Over 7,300 acres of needle cast disease were detected on ponderosa pine on the Cedar City, Powell and Escalante RD's of the Dixie NF. There were no acres detected for neither 2002, nor any prior to 2002. This has not been ground-truthed. Perhaps elytroderma or mycosphaerella?

Aspen Leaf Blight. No new detections of aspen leaf blight were reported for this year. This is down from 700 acres reported in the Dixie NF and 400 acres in the Uinta NF from 2002.

Aspen Decline. No new detections of aspen decline were reported for this year. This is down from 100 acres reported in Kamas RD of the Dixie NF and 2000 acres reported in Heber RD of the Uinta NF from 2002.

Miscellaneous Agents in Wyoming

Aspen-Cottonwood mortality. Large tracts of mortality recorded in drainages south of Hillard Flat, on the southern edge of Mumford Ridge, south of Murray Reservoir, along drainages north of Cottonwood Mountain, and along drainages of Willow Creek and Little Sage Creek (reported by Les Koch). This has not been ground-truthed to verify causal agent.

Region 5: California (Wenz)

Contributors: John Dale (FHP), Brian Mattos (YNP), Laura Merrill (FHP), Dave Schultz (FHP), Sheri Smith (FHP), John Wenz (FHP)

CALIFORNIA BUDWORM, ***Choristoneura carnana californica***
Defoliation on Douglas-fir was extremely difficult to find on the east side of Trinity Lake, an area where populations have been highly variable over the past 20 years.

CALIFORNIA OAKWORM, ***Phryganidia californica***
Individual coast live oak sustained defoliation in several areas of Monterey and Santa Cruz Counties. Defoliation was also observed in parts of San Luis Obispo County – Nipomo, Los Osos, Cambria (combined estimate of 500 coast live oaks) and around Lake Naciemento (about 500 coast live and blue oaks). Tanoak defoliation in Mendocino County was observed in several dozen trees in the Smithe Grove near Piercy and on about 6 acres near Comptche.

DOUGLAS-FIR TUSSOCK MOTH, ***Orgyia pseudotsugata***
Average trap catches for 2003 showed increases in many plots compared to 2002 catches (Table 1). Data were collected for 163 plots (5 traps/plot) during 2003. There were 106 (65%) plots with an average of <25 males per trap and 57 plots (35%) that averaged 25 or more moths per trap. In 2002, only 4 % of the plots averaged >25 males moths per trap. Plots that averaged >25 moths per trap for 2003 were located on the following Ranger Districts: Amador, Placerville, and Pacific (Eldorado NF), Hat Creek (Lassen NF), Beckwourth and Mt. Hough (Plumas) Greenhorn and Tule River (Sequoia NF), Bass Lake (Sierra NF), Calaveras, Miwok and Summit (Stanislaus NF) and Downieville, Foresthill and Nevada City (Tahoe NF). In addition to these plots monitored on National Forest lands, there were three plots that exceeded 25 moths/trap on lands of other ownerships. One plot was located in Yosemite National Park, one on Bureau of Land Management land near Widow Mountain, west of Bieber in Lassen County, and one plot monitored by the California Department of Forestry near Hilton, Modoc County. Catches of male moths increased for all plots on private land in Lassen, Modoc, and Shasta Counties; it was the third highest catch for this set of plots in the past 16 years.

FALL WEBWORM, ***Hyphantria cunea***
Defoliation of madrones by the fall webworm was not noticeable in the Klamath and Trinity River drainages (M261A) in 2003. Most madrones have responded to the abundant precipitation from the previous winter and appear very healthy. However, madrones are dying from a combination of insect and fungal leaf spot defoliation, a canker disease and the effects of recent drought.

Conversely, defoliation of madrone by the fall webworm was reported to have increased at various locations on the Foresthill Divide, Placer County. Defoliation was particularly noticeable in the vicinities of Michigan Bluff and Sugar Pine Reservoir. To the south across the Middle Fork of the American River, scattered light to moderate defoliation of madrone was present in localized areas along the Georgetown Divide in Eldorado County.

FRUITTREE LEAFROLLER, ***Archyps argyrospila***
Fruittree leafroller – Defoliation, primarily to California black oak, by *Archyps argyrospila* continued for what may be an unprecedented fifth year in the San Bernardino Mountains. Defoliation was heavy in the same areas infested for the past 4 years (ca. 25,000 to 30,000 total acres). Coast live oak and interior live oak are also hosts.

GYPSY MOTH, ***Lymantria dispar***. The California Department of Food and Agriculture (CDFA) trapped six male moths as of August 20, 2003 – by county: Los Angeles 2, Riverside1, San Bernardino 1, San Mateo 1, Santa Cruz 1. This is three more than captured in 2002.

The first capture of an Asian gypsy moth in California occurred in Los Angeles on July 9, 2003 at a site along South Avalon Boulevard. This area is considered a high risk area for introudction of Asian gypsy moth and the GM/Delta trap density in the area was at 10 traps per square mile. The CDFA has increased the trap density to 25 traps per square mile in a nine square mile area around the find.

LODGEPOLE PINE NEEDLEMINER, ***Coleotechnites milleri***
The lodgepole needleminer outbreak in Yosemite National Park that started with the 1992-94 generation continued at moderate to high levels in 2003. High levels of defoliation with a relatively low rate of tree mortality occurred throughout previously infested areas. The outbreak extended somewhat in the southern part of the infestation area southwest into the Sunrise and Echo Creek drainages of the upper Merced River watershed. Moderate tree mortality continued in and around the Sunrise High Sierra Camp following continued heavy defoliation.

PANDORA MOTH, ***Coloradia pandora***
The pandora moth outbreak, first detected in June 2002, continued on the Mammoth and Mono Lake Districts, Inyo National Forest. Adult flight and egg deposition were observed from late-June to mid-August. Early stage larvae and light feeding injury/defoliation on Jeffrey and lodgepole pines were observed over about 40,000 acres. Locations involved include the Crestview Roadside Rest area, an area west of Hwy 395 between the Mammoth Scenic Loop Road north to the Obsidian Dome and Hartley Springs area, south and east of Lookout Mountain, south and east of Dry Creek, and east of Hwy 395 from Wilson Butte around the Bald Mountain road toward the Indiana Summit Research Natural Area. Moderate to heavy defoliation is expected in the spring and early summer of 2004. Pandora moth outbreaks usually last for three to four generations and pandora moth activity is anticipated at least through 2006-2007.

R6: Oregon/Washington

Summary of Status of Defoliators in the Pacific Northwest Region (Ragenovich)

Western Spruce Budworm and Associate Budworms – Total acres of visible defoliation in Washington and Oregon in 2003 – 146,000. Defoliation was primarily in Washington, decreasing around Yakima, but increasing on the southern part of the Wenatchee NF. There are

some areas of defoliation showing up in eastern Oregon. An associated budworm complex caused defoliation in Northeastern Washington and on the Idaho Panhandle. There is Modoc budworm in the Warner Mountains in southern Oregon.

Note: Don Scott (FHP LaGrande, OR) provided a report entitled "2003 Western Spruce Budworm Infestations in the Blue Mountains- Northeastern Oregon" that includes a table showing annual acres infested with WSBW in northeastern Oregon and southeastern Washington since 19070. Copies of this report can be obtained by contacting Don.

Douglas-fir Tussock Moth - Outbreak has subsided and endemic conditions occur. Some higher trap catches are occurring in the area of south central Oregon. We will continue to monitor this to see what it may mean.

Balsam Woolly Adelgid – Acres detected have increased in the last three years. Some increases are due to a change in observer skills and signatures that the observers are reporting; however, overall populations are up and there is more damage.

Hemlock Looper – Populations have declined.

Gypsy Moth – 702 acres were treated on private and Siuslaw NF lands in 2003 for eradication of an introductions two years before. No moths have been trapped in 2003 in the treatment area. Some new introductions have been detected in both WA and OR (see Gypsy Moth discussion)

Washington: Department of Natural Resources (Ripley)

In addition to Iral Ragenovich's report for Region 6, the tent caterpillar outbreak in central Puget Sound is collapsing; hemlock looper has pretty much collapsed in the Arlington and Baker Lake area, but mortality is being observed in defoliated areas; and that although the western spruce budworm seems to have resurged in the vicinity of Mt. Adams and Mt. Rainier National Park, it's much more noteworthy that defoliation is again visible in northeastern Washington perhaps signaling the beginning of new activity.

Oregon: Department of Forestry (Overhulser)

Western Spruce Budworm
In 2003 western spruce budworm defoliation was detected in Grant, Harney, and Hood River Counties on a total of 4,615 acres. This is about double the acreage affected in 2002, but defoliation was considered light.

Larch Casebearer
Defoliation by larch casebearer was virtually absent in Oregon from the early 1980's to 1998. Starting in 1999, larch casebearer defoliation has been mapped every year somewhere in eastern Oregon. In 2003, 7,998 acres of western larch defoliation were detected, a substantial increase from the 248 acres detected in 2002.

Modoc Budworm
After tow years of no detected defoliation, a 700-acre patch of Modoc budworm defoliation was mapped in white fir stands on the western flank of the Warner Mountains in Lake Co.

***Neodiprion* Sawflies**
There were several reports of sawflies defoliating ponderosa pine plantations in the Willamette Valley.

Balsam Woolly Adelgid
Declining sub-alpine fir stands were detected on 109,159 acres in 2003, a large increase from the 35,328 acres mapped in 2002. Most of this increase can be attributed to the improved ability of surveyors to detect infested stands using lichen loads as a signature.

Pandora Moth
This was the off year for defoliation taking place in lodgepole pine stands in northern Klamath County. Whether this outbreak has collapsed or continues will become apparent in the spring of 2004. Defoliation was severe enough in 2002 that some lodgepole pine was apparently killed along Hwy. 97.

Western North American Defoliator Working Group

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