

PEOPLE AND PROJECTS: MY FOREST ENTOMOLOGY EXPERIENCES IN IDAHO









Local
Forest entomologist
In training

Fir engraver *Scolytus ventralis*

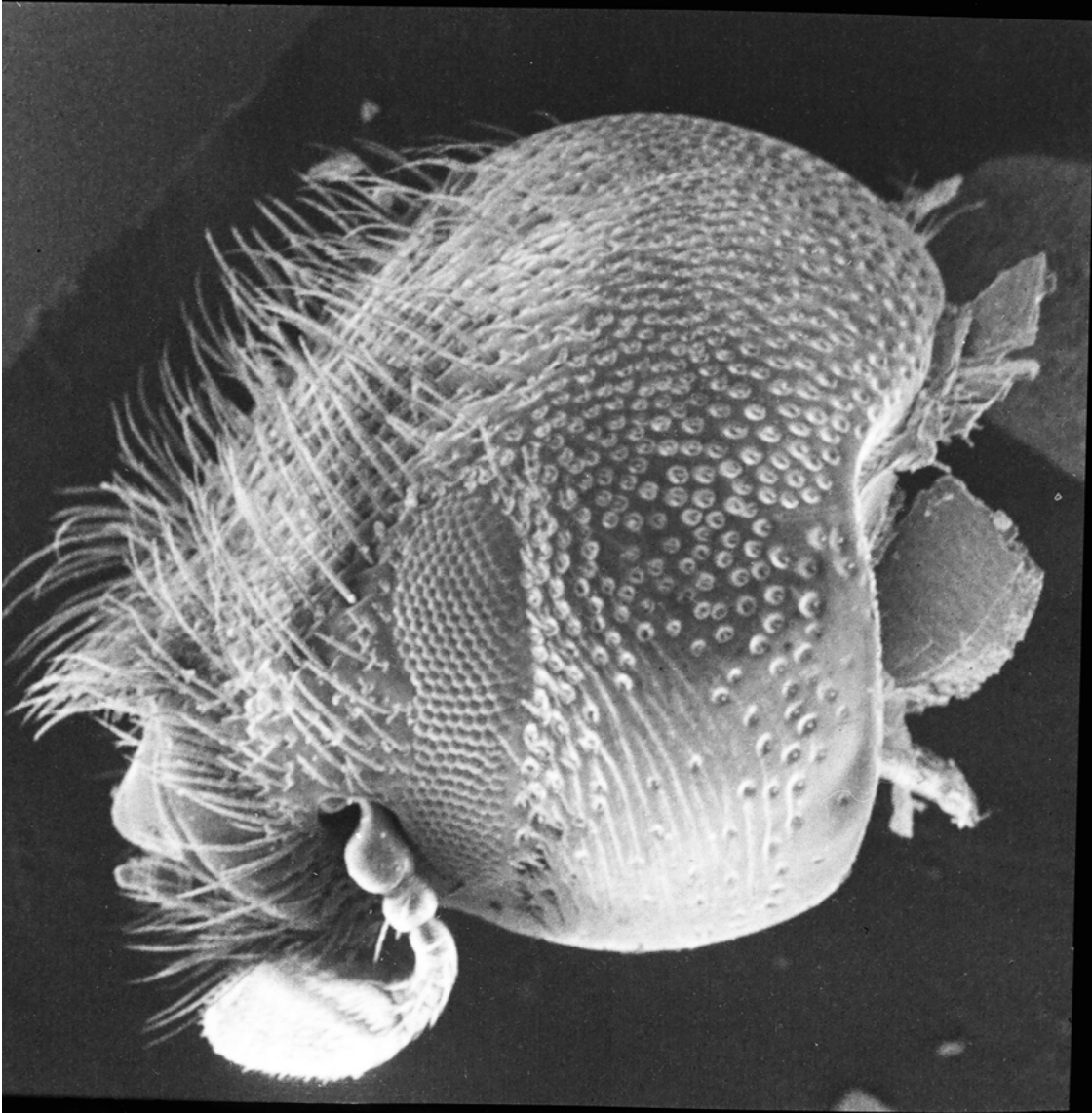




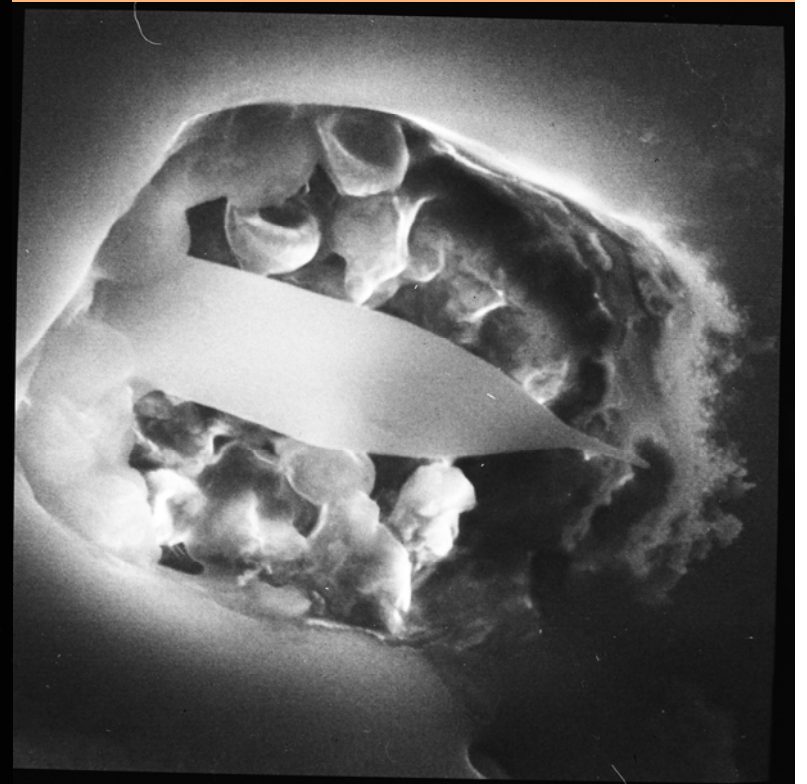
Mycangial pits

**Spores of
*Trichosporium symbioticum***

0 1 0 2



mycangial pits
on head of
Scolytus ventralis
Filled with spores





Doug-fir beetle killed timber

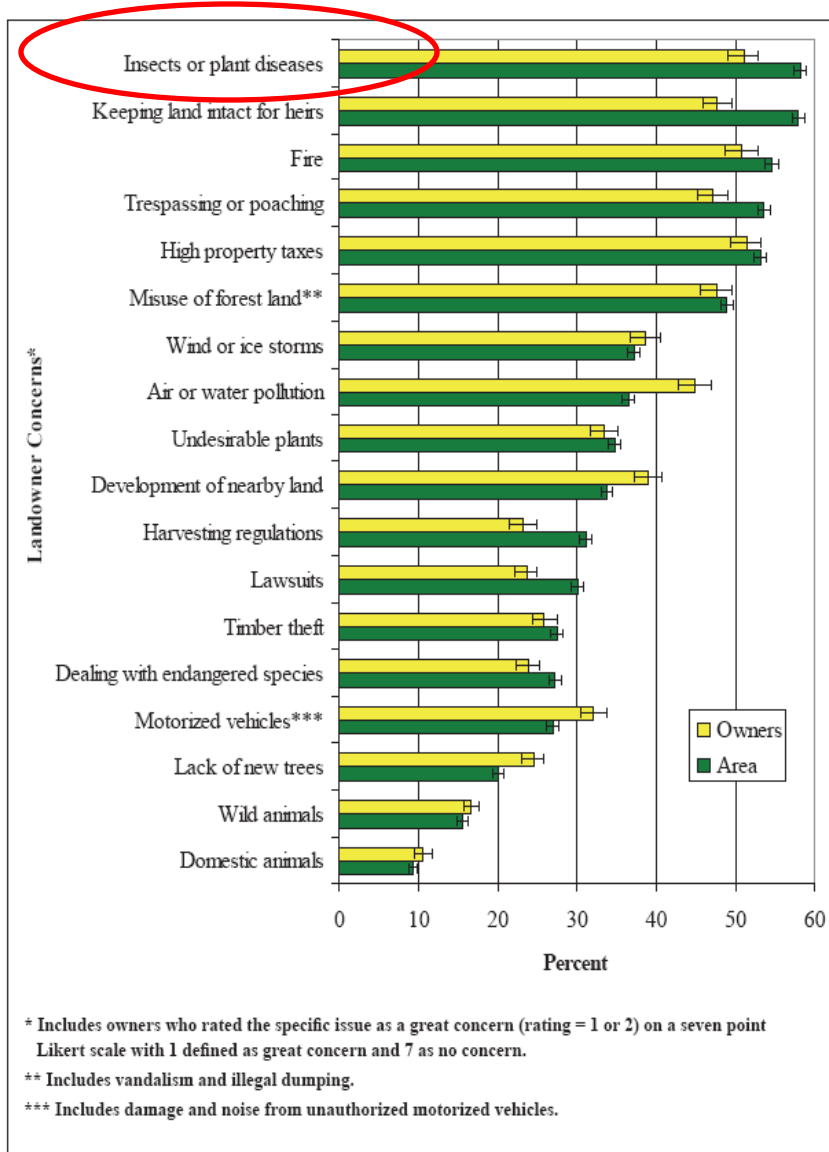


Figure 21.—Concerns of family forest owners in the United States, 2006. Error bars represent 68 percent confidence intervals.

#1 Concern of Family Forest owners

Insects or Plant Diseases

All
About
WPB



SAMPLE OF ACTIVITY

6 years: 2000 - 2005

▶ 3,114 PERSONAL, ON SITE
AND/OR PHONE CONTACTS

▶ 177 TRAINING
SESSIONS/CONFERENCES



▶ 8,697 PEOPLE
TRAINED
IN FORMAL SESSIONS





Doug-fir beetle Attacked trees



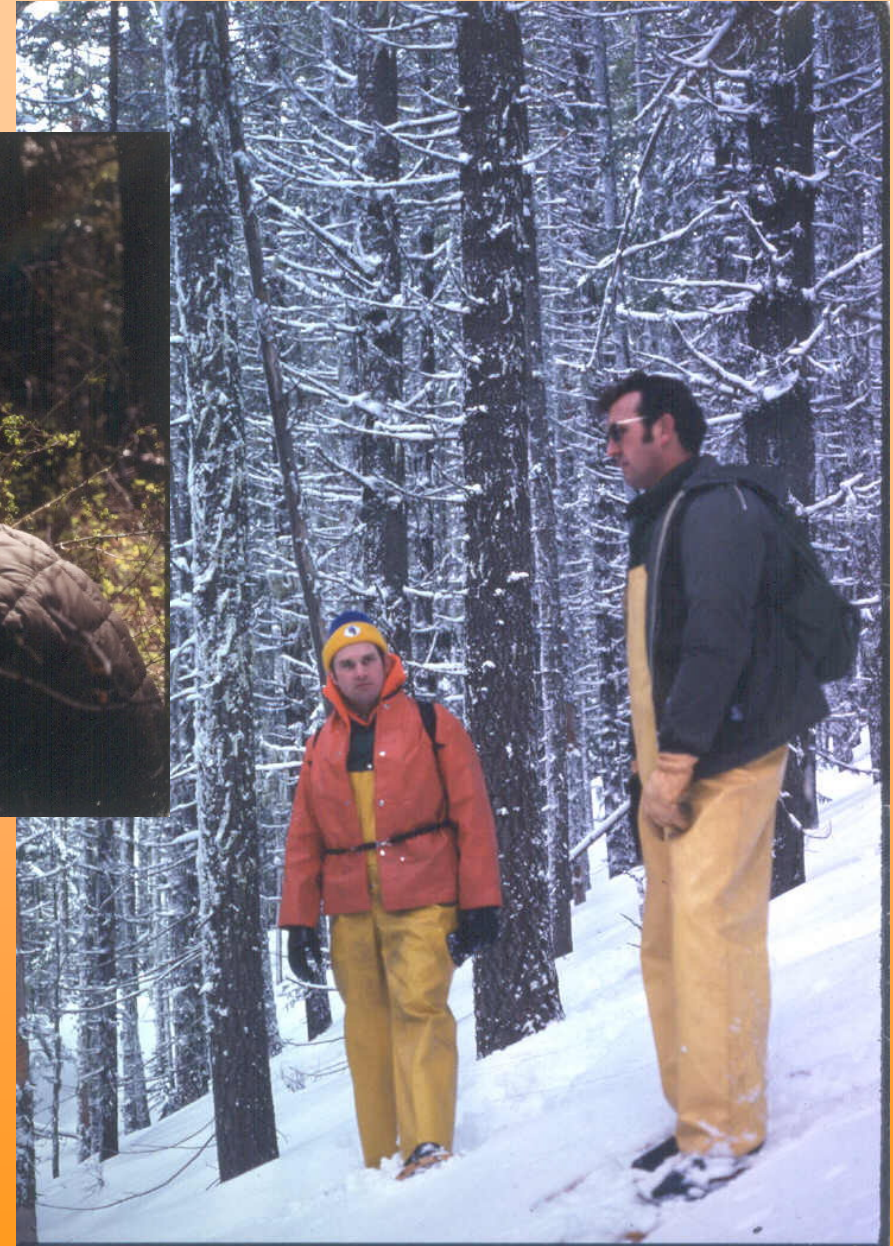
Mal Furniss, expounding
on the potential for DFB
population buildup
in down trees



Mark & I at work on An MCH plot



A fun day
in the snow
looking at DFB
plots





"The (picture) of a dense stand and of Chuck Heppner sums-up the 3 ingredients of a susceptible stand:"

- 1. Plurality of DF**
- 2. Mature DF**
- 3. Dense stand**

"Without any one of those characteristics there is no DFB.

"Further, in the northern RM, all outbreaks have developed (released) in snow- or ice-broken or downed trees that lack defensive response.

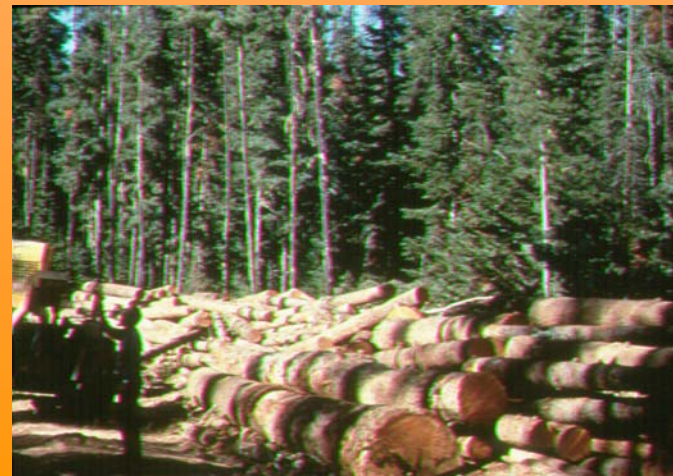
"The amount of subsequent tree mortality depends on the DFB population and extent of available susceptible trees.

"Live trees are a population sink and the DFB population decreases stepwise and subsides by the 3rd year."

Fall 1983 windstorm



Estimated 100 MM bd ft
10 MM bf of DF







MCH spring deployment to protect DF



Used in stands (large & small), house lots, parks & campgrounds; wherever DF needs to be protected from Doug-fir beetle

Most recent project with Mal



Feb 2009
Great day on
the Snake River



OUTBREAKS of TUSSOCK MOTH IN NORTH IDAHO

1. 1944-1947: 447,000 ac
Northern Idaho, Northeastern Washington
350,000 ac Benewah, Latah Clearwater Counties
395,535 ac treated with DDT 1947

2. 1955-1956: 40,000 ac
Northern Idaho, Northeastern Washington
30,600 ac Clearwater Co.; reported in Latah Co.
population subsided due to parasitism; No spraying

3. 1961-1965: 225,000 ac
Northern Idaho; Latah & Benewah Counties
120,000 ac Idaho treated with DDT 1965

4. 1972-1974: 115,000 ac
Northern Idaho; Latah & Benewah Counties
75,254 ac treated with DDT

5. 1985-1986: 85,500 ac
Northern Idaho; Latah & Benewah Counties
40,000 ac proposed for treatment with NP Virus
Population collapsed, project cancelled after spraying one block

6. 1974: more than 400,000 ac
Northern & Southern Idaho, Washington and Oregon
400,000 acres treated with DDT



Science at work!!!



2001 TREATMENT ACRES BY OWNERSHIP



•INDUSTRY	35,068	46%
•NIPF	31,835	42%
•U of I	2,524	3.0%
•CdA Tribe	447	0.6%
•City of Troy	1,231	1.6%
•Parks	755	1.0%
•IDL	4,632	6.0%

2001
TOTAL:
76,492 ac

2002 TREATMENT ACRES BY OWNERSHIP

INDUSTRY	21,769	72.3%
NIPF	3,820	12.7%
CdA Tribe	,150	10.5%
IDL	4,368	14.5%

2002
TOTAL:
30,107 ac

2 pesticides
Used 2001

Diffubenzuron
DFB
(Dimilin)
Insect Growth
regulator

Btk
(Foray 48B)
naturally occurring
bacterium

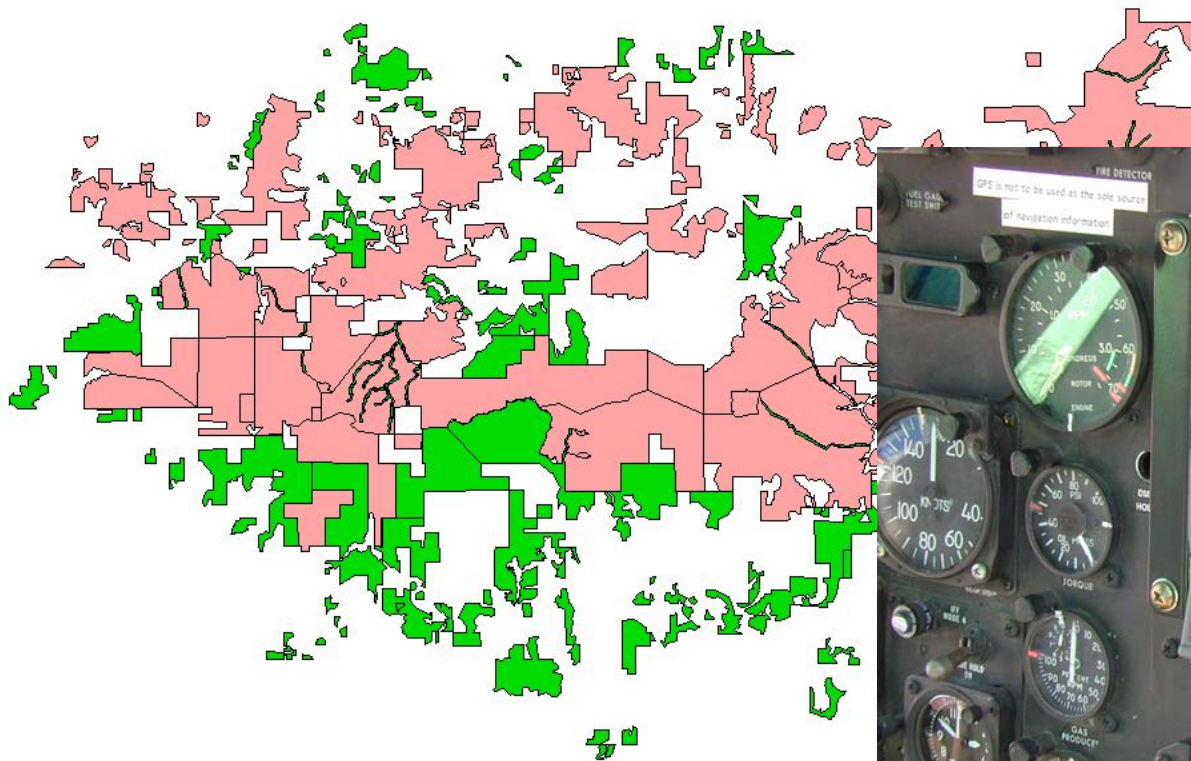
Dimilin
Only
In 2002



Moscow Mtn. 2001 Treatments

Salmon color = Dimilin; green = Foray (Btk)

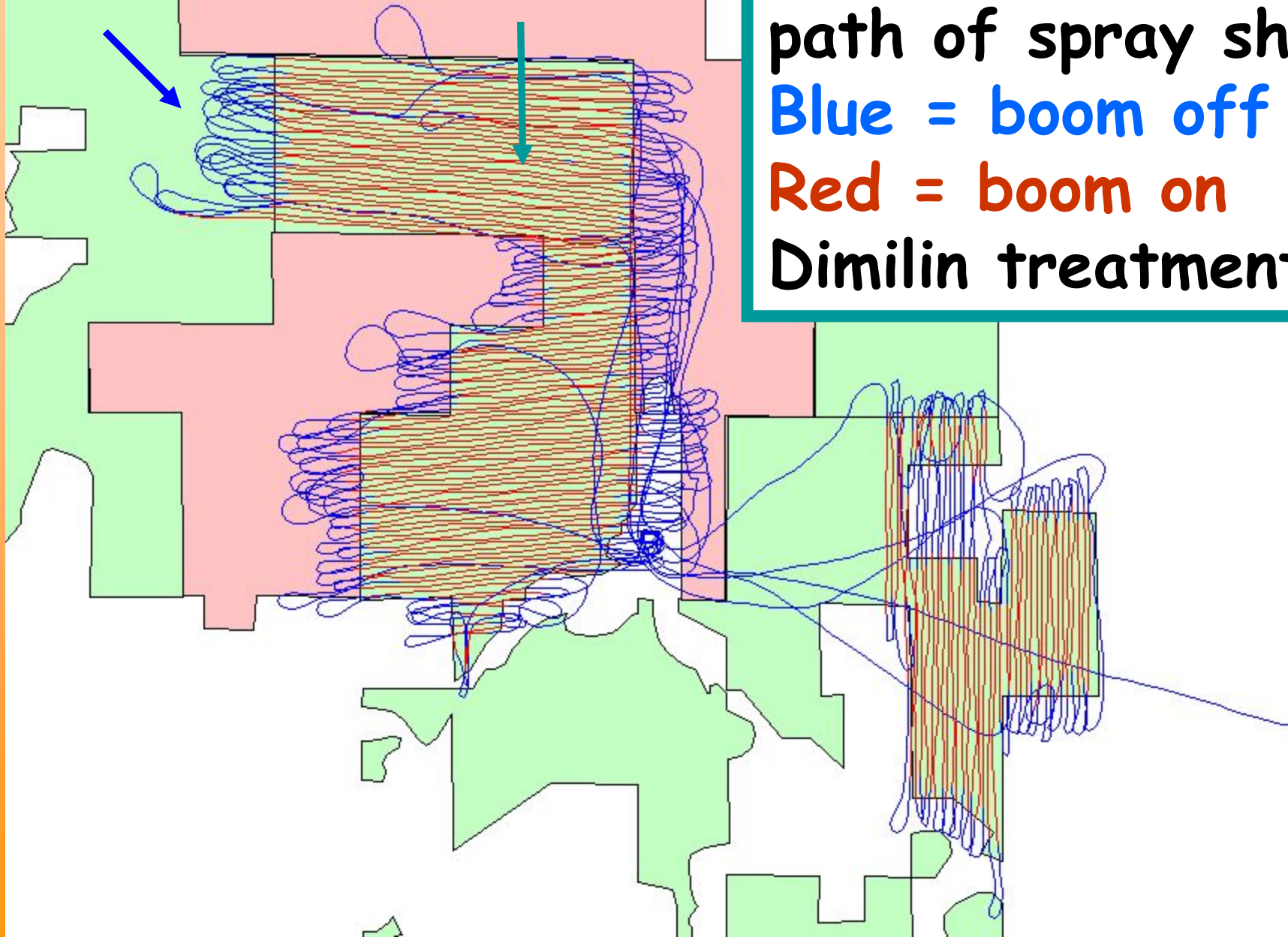
Used GPS aircraft guidance
(GypsEs)





Boom off Boom on

Aerial application
path of spray ship
Blue = boom off
Red = boom on
Dimilin treatment







100% mortality in
plantation



Sometimes - even non-hosts get eaten



Stanley Basin, SNRA



GRANT IMPLEMENTATION

Homeowner requirements:

- Remove dead and 'green' infested trees
- Thin dense stands of trees
- Apply preventative sprays and pheromones
- Implement restorative tree planting projects of species appropriate to the site



Jim
Rineholt



Removal of green-infested and dead trees



Private lot
before tree removal



Carbaryl treatment
to protect trees



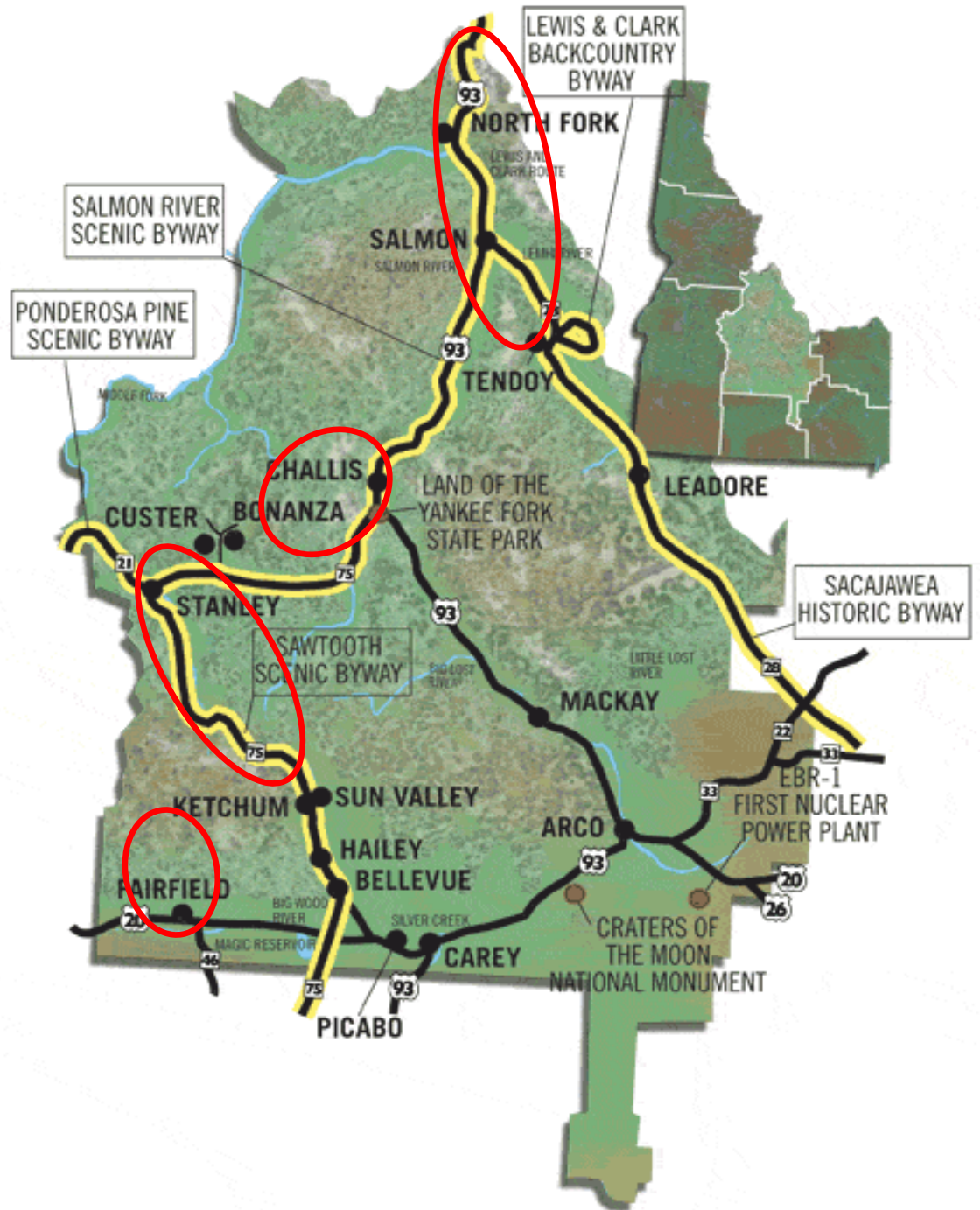
Finished product

Educating Homeowners



'Strategic' Planning

Current
Mtn Pine Beetle
and
Doug-fir Beetle
cost share
project areas

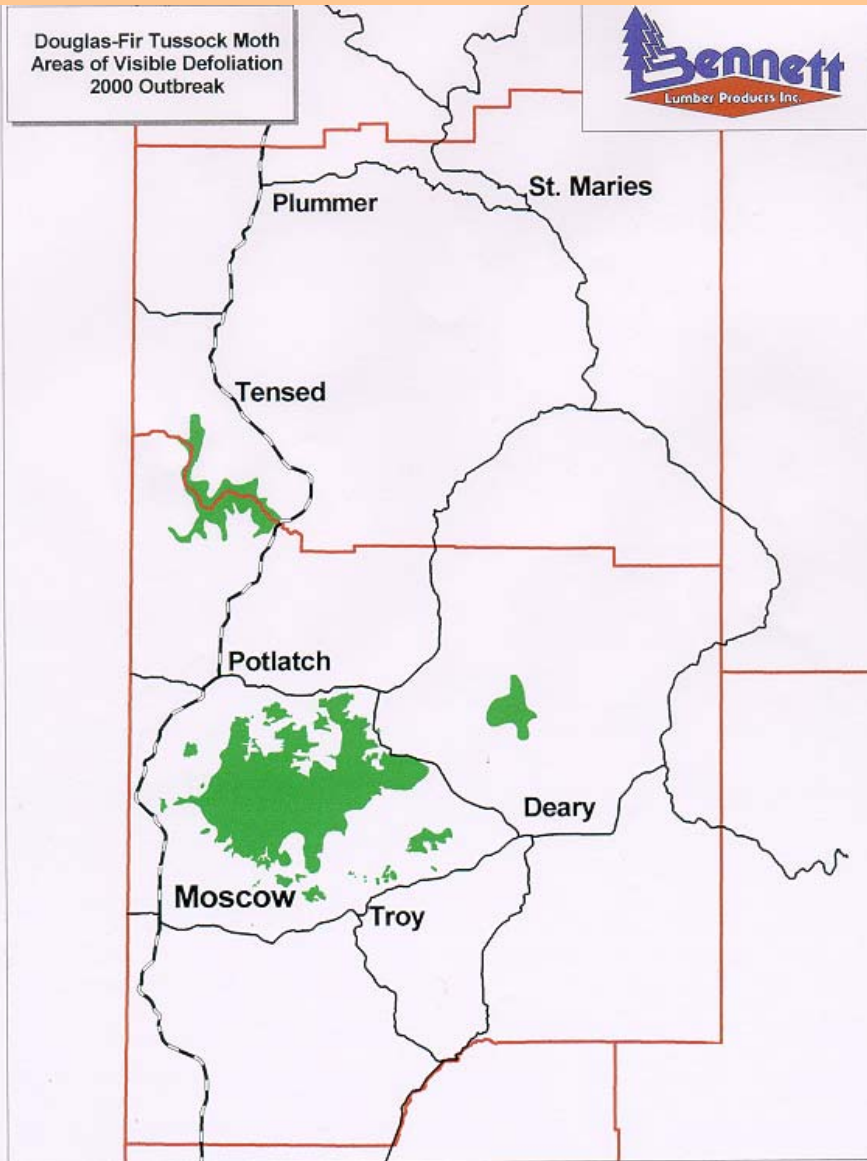
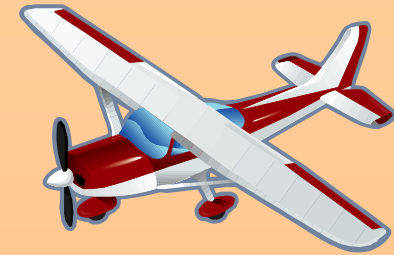


In 2004, the Idaho Department of Lands (IDL) with funding from the USDA FS, S&P Forestry began offering F.H.P. grants to landowners in central Idaho

Jim Rineholt, Accomplishment Report, 2008
Over \$1.5 million granted

Year	Infested trees removed	Trees sprayed (Carbaryl)	Pheromone pouches deployed (mch)	Acres Thinned	Acres Planted
2004	14,084	7,418	0	0	0
2005	5,709	7,801	1,275	21	3
2006	8,750	17,248	15,968	346	42
2007	719	4,623	29,930	0	0
2008	36	3,461	11,700	0	0
Total	29,298 (1,275 ac)	40,551 (1,421 ac)	58,873 (1,875 ac)	367	45

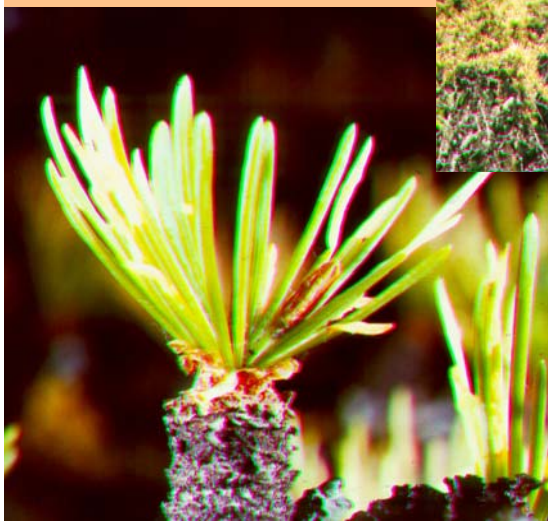
Annual aerial surveys

A stylized illustration of a purple and green biplane flying towards the left. The aircraft has a green fuselage with purple stripes and a purple tail section. It features a propeller, landing gear, and a pilot silhouette. The registration number '21-662L' is visible on the fuselage. The tail has a cross symbol and the number '21-662L'. The plane is set against a blue cloud-like background.

Aerially
visible
defoliation
2000 outbreak

Larch casebearer

Western spruce
budworm



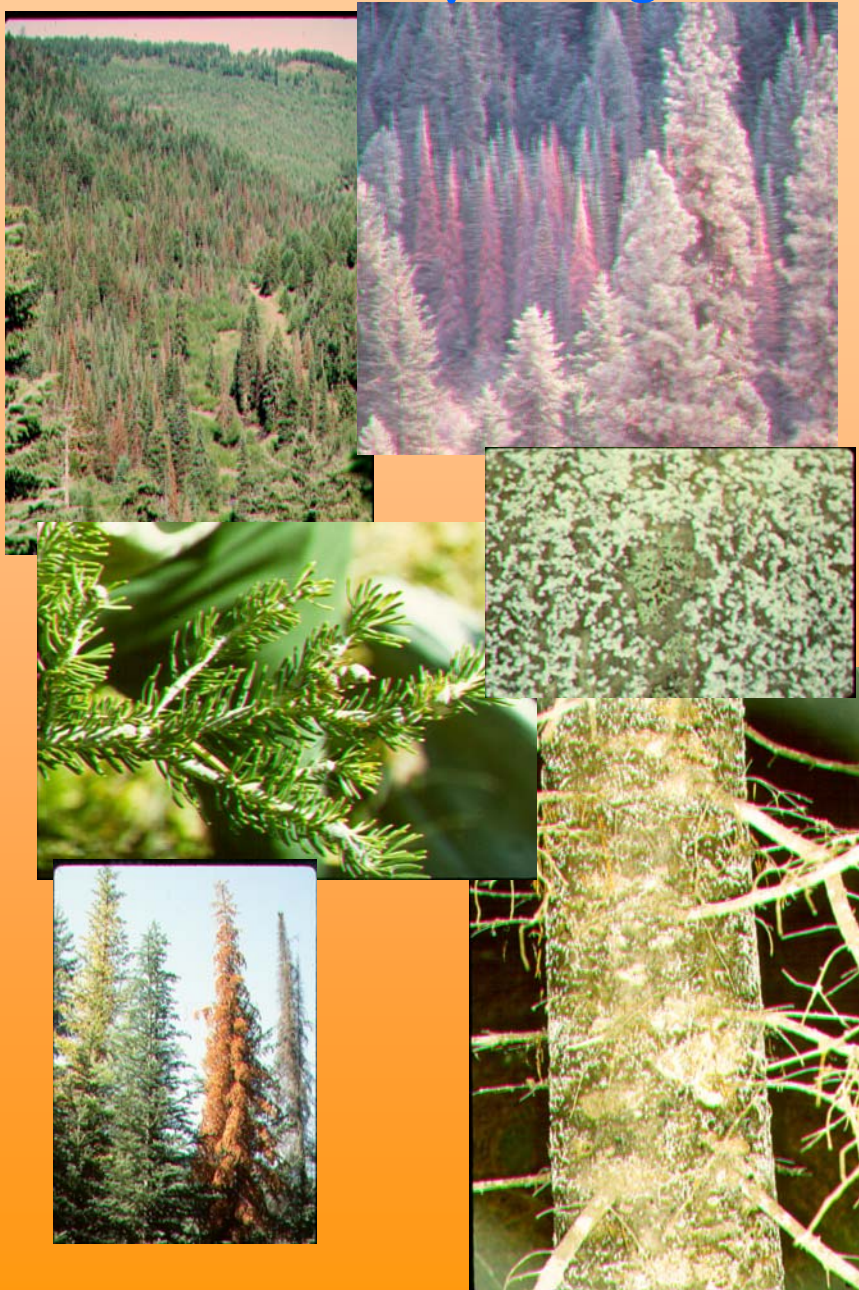
Douglas-Fir Tussock moth



Western pine-shoot borer



Balsam woolly adelgid



Cone & seed insects

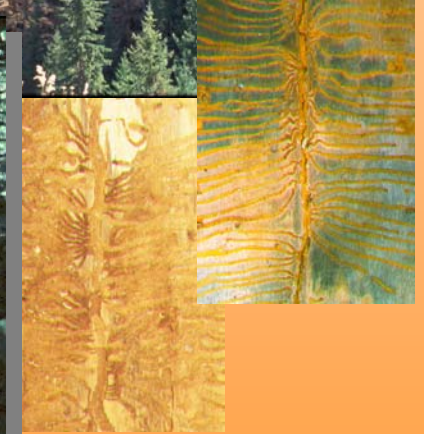


Exotic beetles



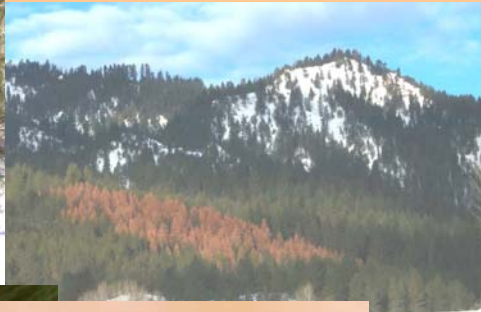
Spruce beetle

Doug-fir beetle



Pine engraver

Mountain pine beetle



Ambrosia beetles

Wood borers



Pine butterfly



Outbreak near
Cascade, Id with
Heavy defoliation.
Caused extensive
mortality of
ponderosa pine
with
subsequent beetle
attacks

Bark beetles and fire



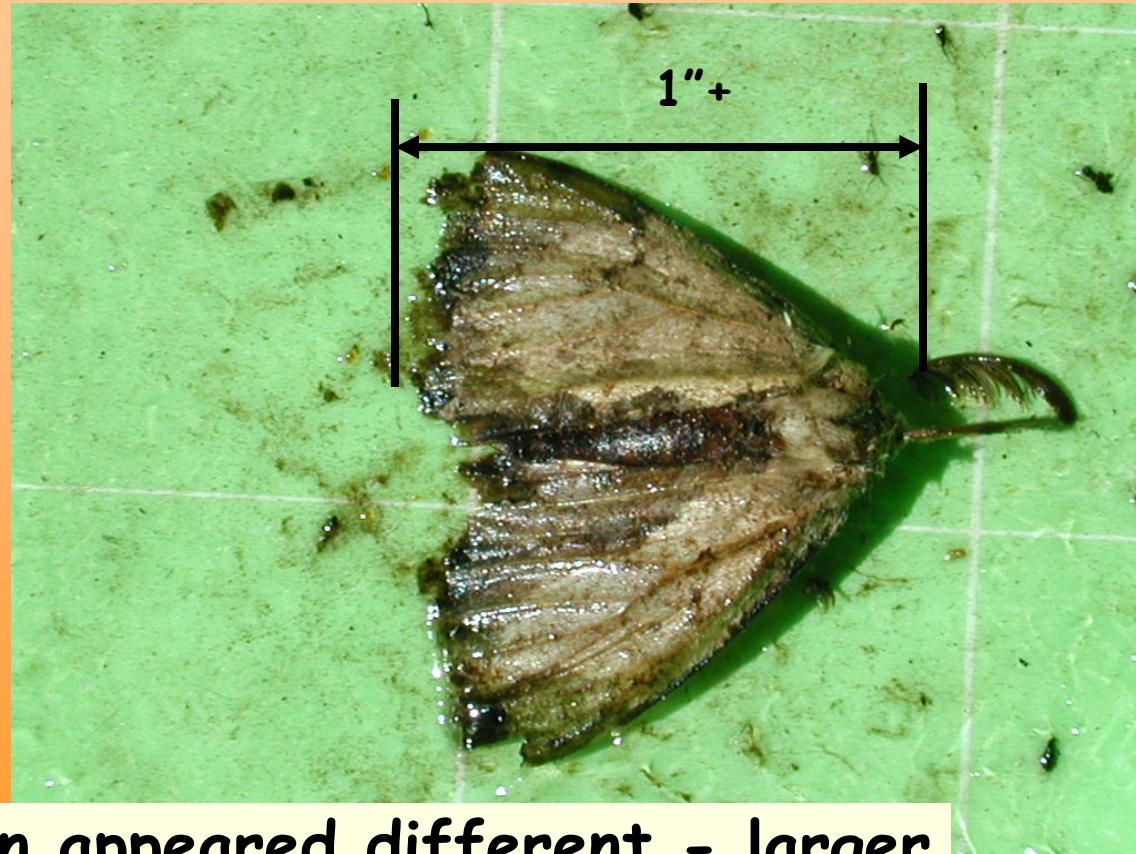
Middle Fork of Salmon River

Gypsy Moth

Treated populations
in
Sandpoint
Coeur d'Alene
Post Falls



'THE' Idaho AGM moth



The specimen appeared different - larger than our NA Gypsy Moth

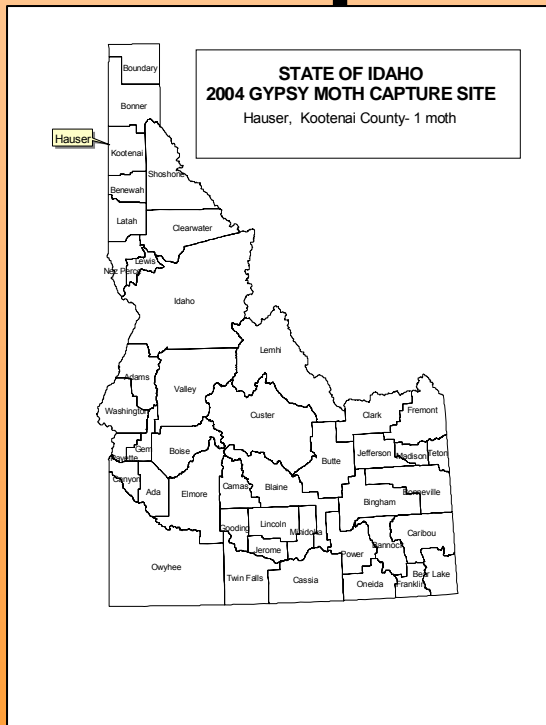
So we sent it to Otis Lab for analysis

Idaho AGM Capture

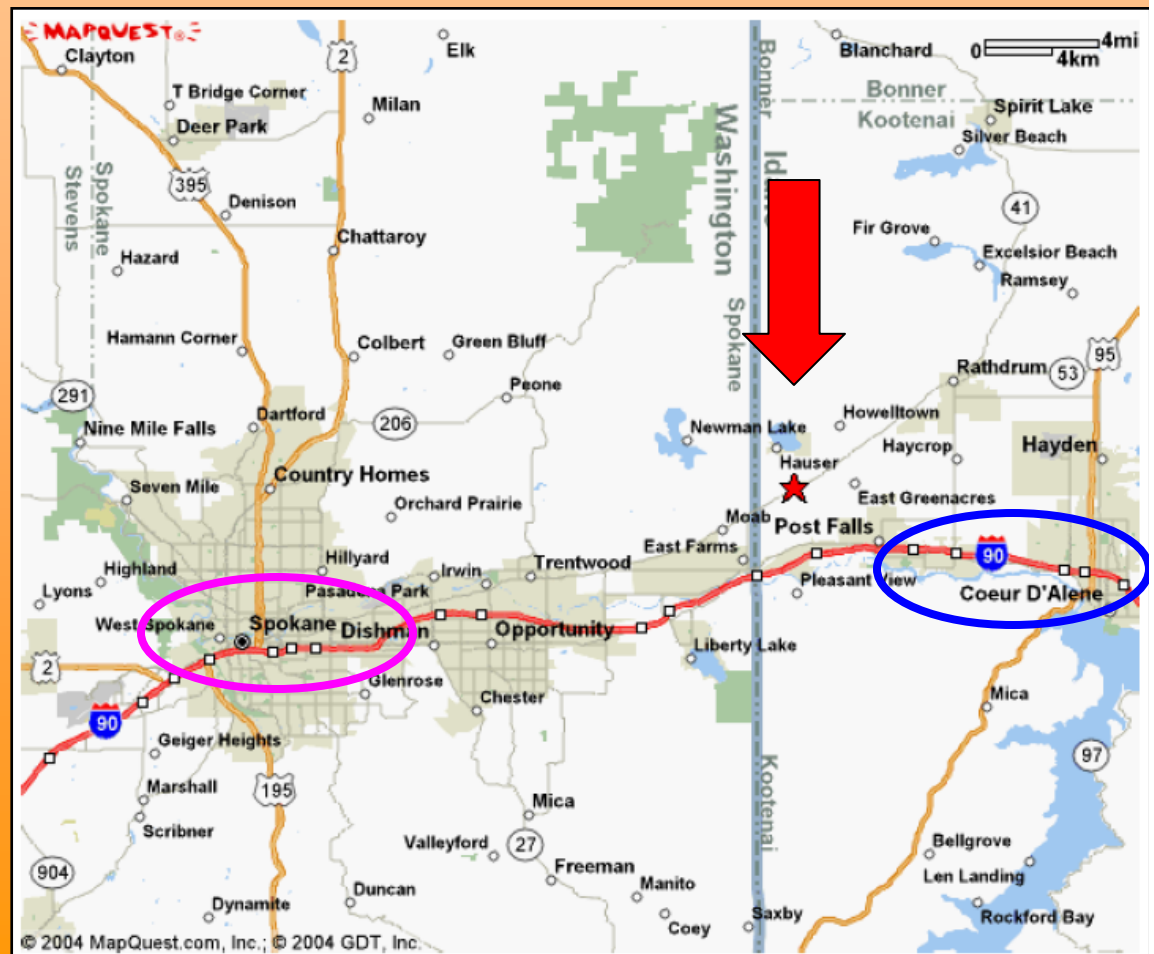
- From Vic Mastro - OTIS Lab, the Idaho specimen is a true **AGM**.
- The specimen was checked three times to make sure.
- The specimen is not a Hybrid.



2004 IDAHO Asian Gypsy Moth Moth Capture Site Location



Spokane, Wa
Coeur d'Alene, Id





Dewey Almas



David Beckman



Bill Ciesla, Hi-tech application test



Jed Dewey

Rick Johnsey
Washington NR,retired



Oregon Dept Of Forestry
Leroy Kline,retired



Post-rogaine



Leroy and Sylvia
Machu Picchu, Peru



Steve Kohler

**Montana Department of Forestry and Fire
retired,**

Collecting high-altitude Lepidoptera



Gregg DeNitto, Dayle Bennett
and Jill Wilson



Ken Gibson



Callow adults ?



Sandy Kegley, FHP, R1, Coeur d'Alene

Found in a book by Cort Conley
"Idaho Loners: Hermits, Solitaires, and Individualists"
a poem entitled "Hermits" by James Galvin

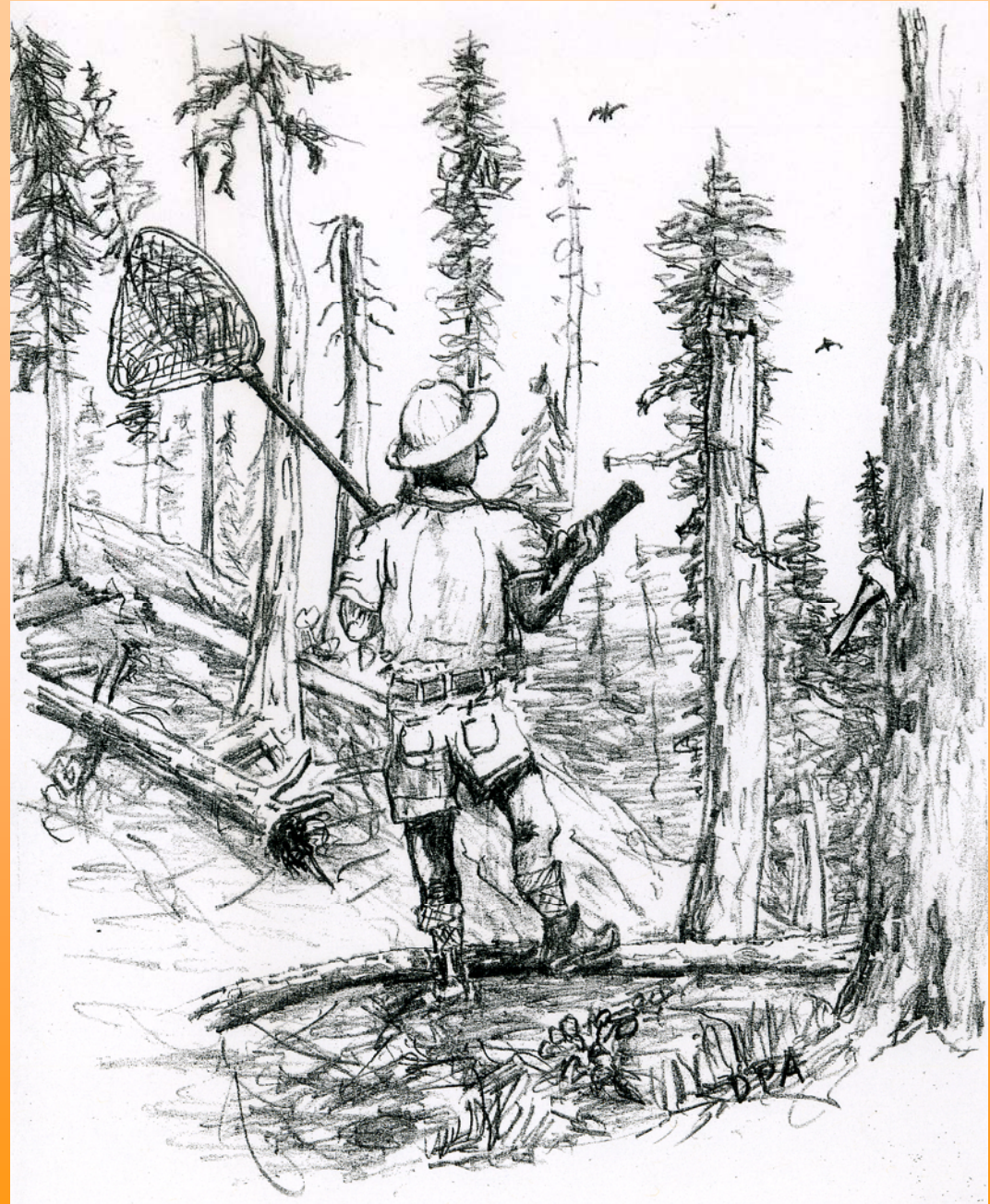
"In wet years the
land breathes out,
And a crop of limber pines
jumps into the open
Like green pioneers."



"In dry years
Beetles kill them with roadmaps
Under the skin."



IF A FOREST
ENTOMOLOGIST
IS WALKING
IN THE
WOODS



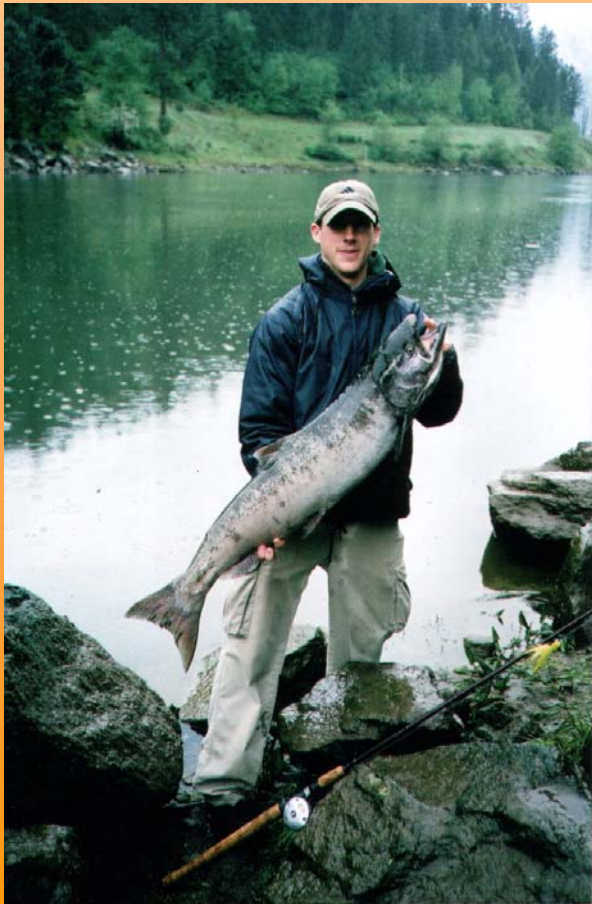


AND A TREE
FALLS ON
HIM

DOES
ANYBODY
CARE?

Sons 3 & 4

If we leave now
We can be there in
about 3 hours



People and Projects: My Forest Entomology Experiences in Idaho

Forest Entomologist and Forest Health Program Manager, Retired
Idaho Department of Lands, Coeur d'Alene, Idaho

Spokane, Washington -- March 2009

View pdf versions of [this text](#) (~.7 MB) or [Ladd's slide show](#) (~16 MB).

It is with great humility that I stand before you as the 16th recipient of the Founder's Award. It is an honor to be listed with those that have preceded me. I stand in awe of their great accomplishments in the world of forest entomology. It is also gratifying to have been privilege to work with several of my predecessors on numerous projects.

As I have contemplated this talk, I have concluded that if there are any actions that merit my nomination to this award, it is because of the people I have work with and the projects I have worked on, hence, this is what I want to tell you about, People And Projects.

A bit about myself: My father was a career US Forest Service employee, beginning his work as the FS director of a Civilian Conservation Corps project in North Central Washington, near the towns of Twisp and Winthrop where I was born. From there my family moved several times, north to south and back again, always in Region 6, and always on the east side of the Cascade Mountains. In this environment, I loved to run and explore in the forests, enjoying a freedom that my own children rarely had the opportunity to experience. I loved it. We moved from North Central Washington to Central Oregon near John Day and Seneca, then back to Washington to Naches, then up the Entiat River in Central Washington, and finally to Union, Oregon where my father retired. My first real job, beyond weeding the garden, was changing sprinklers in the apple orchards in the Entiat valley. I would arise early, and head for the orchards to change the sprinklers, then go fishing in the nearby river all day long, returning in the late afternoon to once again change the sprinklers, return home for food and rest, and then do it all over again the next day. My younger brother and I often accompanied my father as he went to the woods for his work. We would run and play, with great excitement. I remember one time encountering a very large rattlesnake as we were running through the brush. My brother undoubtedly set a record for the long jump as he vaulted over it.

My first exposure to forest entomology, though I did not recognized it for what it was, was when a western spruce budworm project was set up on the Forest Service compound in Union, Oregon. My mother worked counting or sorting or something. I

think that Dick Mason and Boyd Wickman were in charge of that project, though I did not meet them at that time. I was too busy with important teenage things. Things like sports, work, girls, overhauling the motor on my 1946 Plymouth Coupe, and installing a spit manifold with straight pipes, for which I received my first citation while loudly advertising my presence on my way out of the nearby town of LaGrande.

After High school, I attended the Eastern Oregon College of Education, (now Eastern Oregon University), in LaGrande, Oregon, then Brigham Young University for a couple of quarters. A roommate and I decided we were tired of classes and needed something different, so we returned home, signed up with the National Guard, and within a short time found ourselves on six-month active duty marching to the tune of a different drummer. After basic training at Ford Ord, California, we transferred to Fort Sam Houston, near San Antonio, Texas, learning how to be a medic. Upon returning home from the army, I was called on a mission for the LDS church, serving for 2½ years in the countries of Uruguay and Argentina, learning to speak Spanish in the process. My Spanish was eventually to be very useful in my first official job in forest entomology, a Scolytid collecting trip to Mexico. After returning home from South America I struggled with what to study. I returned to BYU to pursue a dental career, then big game management and finally found the world of entomology. Then I found that there was a discipline known as FOREST ENTOMOLOGY. Heaven was found for sure. I soon discovered that a world-renown bark beetle taxonomist, Stephen L. Wood, was on the staff at BYU. I had to wait to meet him as he was on a sabbatical digging out specimens for one of his many taxonomic tomes. Steve's work took him all over the world, especially throughout the America's. At that time he was getting ready for one more collecting trip to Mexico and hired me and one other student to accompany him. Real slave labor; I think I received something like 50¢ per hour, but it was a great experience touring all over the mountains of central and western Mexico, living out of the back of his camper. Each day we would spread out to search for specimens, finding many bark and ambrosia beetles including numerous new species. I can remember Steve's excitement once when I brought back a very large *Scolytus* specimen that he did not immediately recognize.

From BYU, I went to Washington State University to work with Alan Berryman, having received an NDEA Fellowship for work on a PhD program. I think Alan was disappointed that he could not get me involved in population dynamics studies, but I had other interests. I settled on the fir engraver, *Scolytus ventralis*, as the subject of my attention, working on the relationship of the beetle with an associated fungus, *Trichosporium symbioticum*. This fungus is always found with the beetle, being introduced into the tree as the beetles attack, growing through the phloem ahead of the feeding larvae, establishing a favorable environment. Through cooperation with forest entomologists all over the Western US and Canada who sent me infested bolts, I found the fungus to be present throughout the range of the beetle.

One very interesting aspect of my work was to discover spore-carrying mycangial pits stretching from one side of the beetle's head to the other. After some initial discovery

done with serial sectioning and staining, I arranged to look at some specimens with a scanning-electron microscope. The only one in the State of Washington at that time was located at the Batelle Northwest Atomic Reactor Works near Richland, Washington. After much negotiation, I made a visit. The security was so tight that they even escorted me to the rest room. The people were very cordial and helpful. For them it was a new experience, as they had never looked at anything that had ever been alive. We mounted my bark beetle heads on copper billets, coated them with a gold film in a vacuum chamber and put them under the eye of the scope. We all hooped with excitement when the heads came into focus, showing clearly the structures that I had seen in the serially sectioned slides.

After graduation, jobs were scarce. In desperation, I took a temporary position teaching human anatomy and physiology to nursing students seeking an RN degree at Peninsula College, in Port Angeles, Washington. I also taught invertebrate labs. Both the college and I were desperate, they, not to lose funding for a new program for registered nurses, and me to support a growing family; we had three children at that time. On many occasions I found myself closing the book on my studies and heading into the classroom to teach what I had just learned. I was gratified however to have all of the nursing students pass with flying colors the physiology/anatomy portion of their National Boards at the end of the term.

All of this fumbling around looking for jobs actually proved to be to my benefit. Unbeknownst to me at that time, there was a big outbreak of the Douglas-fir beetle developing in North Idaho. Decisions had been made to build a dam on the North Fork of the Clearwater River near the town of Orofino. In the process of clearing the land, extensive stands of large, mature Douglas-fir were cut and the logs decked, waiting for the reservoir to fill so they could be floated out. No one thought about the consequences of several years of setting the banquet table for the Doug-fir beetle with all of the cut logs, no one that is until the beetles ran out of logs, and simply flew to attack the widespread stands up the slopes. This resulted in a very large outbreak in standing timber and a massive salvage effort. It also provided the stimulus, with the encouragement of Mal Furniss, Bill Ciesla, Royce Cox of Potlatch Corp. and others of the Montana/North Idaho Forest Pest Action Council, (M/NIFPAC) for the State of Idaho to hire a forest entomologist. A resolution, proposed by Mal Furniss and written with the help of several others, was prepared and forwarded to the Idaho State Board of Land Commissioners, Boise, on Nov. 22, 1971. Less than a year later, I reported to work in Coeur d'Alene on October 2, 1972.

My employment with the State of Idaho was most enjoyable. It was truly amazing that I could be paid to go to the woods for work and study. Someone had to do it, why not me? In the position, I had the opportunity and challenge to work with nearly every major western forest insect and with several introduced species. I feel that I came on the scene at just the right time to be involved in so many new developments that could be used in the main elements of our program, i.e. survey, evaluation, control, and prevention techniques. I also had the opportunity to do be involved in research.

I always felt that the research conducted by so many University, US Forest Service and Canadian experts was just to help me have good tools to share with those looking for help. They did the research; I applied it. A major component of my job was to provide Forest Health information and recommendations to state forest managers, industry foresters and managers, to the approximate 34,000 non-industrial private forest owners in Idaho and to other State of Idaho Agencies. The reasons for owning forested land varies greatly, but potential impacts of insects and diseases on their trees always rated at or near the top of concerns. It doesn't matter why you like trees or what you want to do with them, when they suddenly start to die and turn brown there is great concern. Generally, no one wants that to happen on his or her property. I say generally, because on one occasion while visiting with a number of non-industrial private forest owners and waxing eloquent on the need and methods to keep beetles from killing trees, one lady raised her hand and clearly stated, "Well, I like woodpeckers." Gotcha! Well, most of the time, if landowners want dead trees, they will take care of the killing themselves. They don't want some bug doing it for them. People want living trees, and will do whatever it takes to keep them that way.

For these reasons, Forest Health and Forest Pest Management often presented a different challenge for the State of Idaho, its forest industry and forest-owning citizens, than it does for other agencies. For the State of Idaho, laws mandate that State owned forests be managed to produce income for the State endowments, the largest of which is education. Thus tree killing and growth loss are classed as damage to the resource and are to be dealt with as expeditiously as possible. The emphasis was always on preventing damage through stand management, but when damage occurred, there was an immediate salvage and utilization effort.

In our Idaho program, the main emphasis was always on prevention; truly, an ounce of prevention is worth a pound of cure. With this objective in mind, I sponsored and participated with the University of Idaho Extension, the US Forest Service and numerous other forest interest groups in producing hundreds of training sessions, field trips and conferences. In these sessions we provided information on insect identification, population status, insect/host interactions, and tree and stand management, all aimed at providing long-term suggestions for preventing problems from developing, or how to deal with them if they occurred.

From some IDL reports for the six years 2000 - 2005, I found the following information representing a sample of my participation in these activities:

- 3,114 PERSONAL, ON SITE AND/OR PHONE CONTACTS
- 177 TRAINING SESSIONS/CONFERENCES
- 8,697 PEOPLE TRAINED IN FORMAL SESSIONS

As I mentioned earlier, Mal Furniss, Research Entomologist at the Intermountain Station at Moscow, Idaho had a principal role in getting the forest entomologist position established by the State of Idaho. It was my distinct pleasure to work with Mal on several projects, mainly with bark beetles and pheromones. The first was with the pine engraver to determine the inhibition by Ipsenol to the attraction of bolts serving as bait.

We made little round cages of hardware cloth, covered them with stickem-special, put bolts of freshly cut ponderosa pine inside, and then observed the differences in catches between treated and untreated. I know that Mal prepared a publication for the Environmental Entomologist to report the results, but the only thing I remember was how sticky the whole mess was. I think the reason Mal invited me to participate in the study was that he needed an unknowing person to do the sticky work.

Of much greater significance, at least in terms of trees killed and impacts on the forest industry of Idaho was Mal's work on the Douglas fir beetle. As previously mentioned, this beetle got me my job, so it has always a favorite. It seemed to be for Mal also as he spent a good portion of his career discovering the parameters of susceptible stands, population dynamics of the initiation, duration and decline of outbreaks, and the role of pheromones, especially MCH, in regulating beetles, and in the opportunities for use of MCH in managing populations. I had the good fortune of working with Mal, and with Mark McGregor of FHP in Missoula, he for whom the Founders Award was initiated, in several of these studies. Mal recently sent me an e-mail message summarizing the relevant aspects of stand susceptibility and beetle outbreaks:

"The (picture) of a dense stand and of Chuck Heppner sums-up the 3 ingredients of a susceptible stand: 1. Plurality of DFB, 2. Mature DFB, and 3. Dense stand. Without any one of those characteristics there is no DFB. Further, in the northern RM, all outbreaks have developed (released) in snow- or ice-broken or downed trees that lack defensive response. The amount of subsequent tree mortality depends on the DFB population and extent of available susceptible trees. Live trees are a population sink and the DFB population decreases stepwise and subsides by the 3rd year." E-mail from Mal Furniss to Ladd Livingston, January 2009.

I worked with Mal on surveys to formulate these ideas, and I used these concepts in dealing with the DFB throughout my career. On State of Idaho lands, we commonly and successfully reduced stand density as a very effective preventive measure. We also used annual monitoring and immediate removal of infested trees as a tool to prevent population build-up. On State lands throughout Northern Idaho, we had a number of jypo loggers; who would literally scour the woods looking for new DFB beetle groups. As soon as a group of faders was found, they were in the local IDL office seeking authorization for a direct or salvage sale and immediate removal of the beetle-infested trees. After several field visits to show them how to recognize newly attacked trees, they were even finding new, current year attacks before the trees faded.

The development and use of MCH was another very exciting project with Mal. The successful testing of MCH, applied by helicopter, to prevent beetle attacks of felled trees led to an operational project using the same technique in North Idaho. In the fall of 1983 a severe windstorm ran the length of Dworshak Reservoir, the lake that filled behind the dam on the North Fork of the Clearwater River, the same drainage previously mentioned as the site of the DFB outbreak that lead to the entomology

position with the Idaho Department of Lands. Microbursts bounced from one side of the reservoir to the other, breaking and uprooting thousands of trees for miles along the reservoir damaging an estimated 100MM bf/ of timber of which 10MM bf was Douglas-fir. Nearly all of the affected land was owned by Potlatch Corporation, the State of Idaho, or the Federal Government and administered by the Corps of Engineers. Potlatch and the State immediately pushed forward with a very aggressive salvage program, retrieving nearly all the downed trees on their respective ownerships. However, the Corps of Engineers had no interest in conducting any salvage operations, and the State owned some land on the steep slopes immediately above the waterline that made salvage impossible. WHAT A QUANDARY! WHAT TO DO? This time everyone remembered well the impacts of leaving down trees for the beetles to infest and did not want it repeated. With the recent success of the helicopter applied MCH, Mark McGregor and I put together a project to do our best to prevent the buildup of the DFB populations. Mark worked to incorporate 2% MCH into macromelt plastic pellets and to get a seed spreader modified for the application. I worked to identify and map out all of the areas that needed to be treated. The Corps of Engineers participated by providing a floating, mobile helibase made up of several big barges they had used in the cleanup of the reservoir. We treated 2400 acres. In a post treatment evaluation, we found that the treated trees averaged just over two attacks per tree (98 trees sampled), while the untreated trees (88 trees sampled) averaged 51 attacks per tree. The bottom line was that we did not experience any increase of beetle activity in the treated areas, whereas there were increases in untreated sites.

In recent times, we have utilized MCH bubble caps in a wide variety of circumstances. There are hundreds of examples where MCH bubble-caps have been used to protect trees, continuing to this day. The list of Idaho users includes State Forest managers, NIPF owners, cabin and recreation site owners, State Parks, campgrounds, and large acreage owners, all of whom have experienced excellent success with this technique.

The Douglas-fir tussock moth has also been a repeating challenge for Idaho. Approximately every 10 years we have dealt with an outbreak in the northern portion of the state. The first for me was in 1974 when Idaho participated with Oregon and Washington in treating the tussock moth with DDT under emergency authorization, to the tune of \$4 million covering 400,000 acres in the three states. This was the last use of DDT in a forest environment in the USA. I visited near LaGrand, Or with LeRoy Kline, Entomologist with the Oregon Dept. of Forestry and saw first-hand the devastation that was occurring on private lands, heavily impacting the landowners. This strongly impress on me the need to be able to help these private woodland owners with their forest pest challenges.

The need for better understanding of population dynamics, stand susceptibility and different treatment methods and compounds lead to the Expanded Research, Development and Application program of the US and Canadian Forest Service, and the ultimate publication of the Tussock Moth Compendium, and many practical "How-To" guides. I had the opportunity of participating in this program, working primarily on the

Outbreak Detection and Evaluation component. We worked with Gary Daterman in his development of a pheromone based early detection system. We participated in testing strong baits, weak baits and in implementing an operational trapping program. I believe that we had the longest running trapping history in the program.

The last tussock moth outbreak that I dealt with surfaced in 2000. Aerial detection surveys mapped extensive defoliation in Northern Idaho across virtually the same geographical area as the previous Northern Idaho outbreaks. Egg mass levels were surveyed during the winters of 2000/2001 and 2001/2002. This information, coupled with the aerial defoliation survey maps, was used to determine potential spray boundaries. We worked with Imre Otvos, Pacific Research Centre, CFS, to determine if virus levels might be high enough to bring a collapse to the population. Unfortunately, that was not the case.

Landowners were given the option of participating if they desired. In 2000, of 1167 owners contacted, 484 decided to participate including industry, non-industrial private owners, the University of Idaho, Coeur d'Alene Tribe, City of Troy, State Parks and the Idaho Department of Lands. Two pesticides were applied, Dimilin 4L (DFB) (60,224 acres) and Foray 48B (Bt) (16,268 acres) The Foray was used for stream buffers, and as an option to the landowners who so chose. In 2001, we only used Dimilin. I believe that we were the first for an Interior West spray project, certainly for Idaho, to utilize GIS based mapping coupled with a GPS guidance system for the spray aircraft. We were fortunate, as the two counties involved had recently completed GIS based ownership mapping that we were able to incorporate directly into our mapping system. Bennett Lumber of Princeton, Idaho, provided expert GIS mapping assistance for the project. John Ghent, SE Area, Forest Health Protection, detailed to Idaho as an expert in the use of the GPS aircraft guidance systems, and provided excellent assistance. John used a modified version of the GypsEs guidance program used extensively in the east for accurate treatment of gypsy moth populations. Everybody, from the pilots to the landowners, even those who were not especially in favor of the project, was tremendously impressed with the accuracy of the application.

Costs of the projects were born primarily by the State of Idaho with a 10% cost share for the landowners. Success was determined by measurements of post-spray larval populations, numbers of egg masses, and by measured defoliation at the end of each season. By these measures, the projects were judged to have successfully protected foliage and prevented tree mortality. There were some areas of heavy tree mortality where no treatment was made, either as chosen by the landowner, or in areas of high tussock moth populations missed in the surveys.

Another project that was very enjoyable and that produced great accomplishments was dealing with a mountain pine beetle outbreak in the Stanley Basin, Sawtooth National Recreation Area (SNRA) of South Central Idaho. Private forests within the SNRA were hard hit by the beetle, and when you have only a few trees, the impact is heavy. Management was challenging as there are very strict guidelines pertaining to removal of

trees. Special authorization had to be given by the SNRA Management Board to allow the landowners to deal with the problem. I applied for and received USDA Forest Service, R-1 & R-4 Forest Health Protection cost-share grants for use by the landowners to deal with the problem. A cooperative agreement was developed between the State of Idaho and the US Forest Service that included the assignment of an SNRA forester, Jim Rineholt, as the lead contact person for the work. Basically, Jim became a Private Forestry Specialist for the State of Idaho, but paid by the US Forest Service. This arrangement worked extremely well as Jim was very familiar with the situation, the regulations, and with many of the private landowners. In 2004 the homeowners applied to the State of Idaho for the grants, identifying the bark beetle issues on their lands, developing work and financial plans and indicating how they would provide their share of the expenses, either directly with funds or by in-kind work on the projects. They agreed to remove dead and green infested trees, thin dense stands, apply preventive sprays and/or utilize pheromones (only MCH for DFB) and implement restorative plantings of tree species appropriate for the site. Jim and I worked together, holding many meetings and field trips to educate land owners about the beetle, how it attacks the trees, provided grant administration, suggestions for the home owners in making management decisions, helped them find competent contractors for tree removal and tree spraying, and in reforestation efforts.

Originally, the program concentrated on dealing with the mountain pine beetle and its management in lodgepole stands of the Stanley Basin, expanding into surrounding areas as the outbreak spread. Later MCH preventive treatments for the Douglas-fir beetle were included as this insect was also causing significant mortality. Currently the program reaches as far north as Salmon, Idaho and as far south as Fairfield, Idaho. As of 2008, over \$1.5 million of grant funds have helped in 84 projects. Accomplishments through 2008 are shown in the following table. A source of great satisfaction has been the many positive comments received from homeowners and homeowner subdivisions pertaining to the work.

Year	Infested trees removed	Trees sprayed (Carbaryl)	Pheromone pouches deployed (mch)	Acres Thinned	Acres Planted
2004	14,084	7,418	0	0	0
2005	5,709	7,801	1,275	21	3
2006	8,750	17,248	15,968	346	42

2007	719	4,623	29,930	0	0
2008	36	3,461	11,700	0	0
Total	29,298 (1,275 ac)	40,551 (1,421 ac)	58,873 (1,875 ac)	367	45

Jim Rineholt, Accomplishment Report, 2008

New levels of positive relationships were established between landowners, the US Forest Service, the State of Idaho, local loggers and spray contractors, and local communities. It all turned into a very positive experience. We certainly did our part to stimulate the local economy.

From day one of my career, I participated in annual surveys and in the preparation of reports of conditions. This was one of the requirements attached to the acceptance of federal cost-share funds. A most favorite component was aerial survey, riding in a small Cessna, up and down the canyons, tossed to and fro by the winds, with sharp turns at the end of each canyon to return. All while concentrating on keeping track of where you were, drawing in beetle spots, defoliation boundaries, and tree and insect or disease identification codes. All, without getting deathly air sick. My first flight was in the company of Roody Lood, R-1, Missoula, Mt. I sat in the back seat to learn the ropes. What I learned, and learned quickly, was that I was not cut out to be an aerial observer. My stomach could not take such excitement. I should have known it would be tough, as I never could endure carnival rides without getting sick. On that first training flight into the Bitterroot Mountains, I soon found myself lying like a pea-green blob of protoplasm on the back seat, not caring if the whole world was red with dead trees. Roody took pity on me and had the pilot land at a back-country airstrip where I oozed out of the plane and lay in the shade for hours, hoping to once again join the ranks of the living. After years of flying, I found that if I just gritted it out for about three days, I could then continue with the survey work without too much discomfort. Only once did I need the barf bag; that was when I conducted a special survey from the back seat of a paper piper that the State owned. We bounced through the air like a balloon caught in the wind. The pilot forever after apologized for "making me so sick." I do concede though, that if you really want to learn about forest ecosystems and tree species relationships coupled with insect behavior patterns, there is no better way to learn than from the seat of a small survey airplane. I finally did figure out how to meet the challenge though, by assigning Mr. Beckman to do the survey.

Through the years there have been many, surveys, evaluations, control projects and applied research projects. Some of these included the following:

- **Larch Case bearer:** Ground and aerial tests of Orthene®,
- **Western spruce budworm:** testing of Orthene®, surveys in Southern and Eastern Idaho, Control projects in southwest Idaho using Orthene and Sevin insecticides,
- **Douglas-fir tussock moth:** Testing Sevin-4 oil®, pheromone surveys, treatment projects as mentioned including treating tussock moth within the city limits of Coeur d'Alene, Idaho with Sevin sprayable and Sevimol insecticides,
- **Western pine-shoot borer:** Pheromone based control treatments,
- **Balsam woolly adelgid:** Surveys to determine the distribution in Idaho and ground applied pesticide treatment tests.

LeRoy Kline, Oregon Dept. of Forestry invited me to visit the site of an infestation of the balsam woolly adelgid (BWA) that was in the Blue Mountains of Eastern Oregon. I believe this was the first population found in the interior. It is of interest that this area of Oregon is in the direct path of the prevailing winds from the west as they traverse into Idaho, and it appears, bringing this insect with them. We later found heavy populations of the BWA infesting our subalpine fir right in the path of these winds in Idaho. Originally, we only found BWA populations in cool air-drainage subalpine fir in creek bottoms. Here, evaluations conducted by David Beckman, Insect & Disease Technician for the Idaho Dept. of Lands, found that as populations increased from very light to heavy, within five years the trees would die. The low elevation creek-bottom stands of subalpine fir in north-central Idaho have been virtually eliminated by this insect. Later, we also found the insect in high elevation stands, but it did not cause as heavy mortality at these sites as it did in the low elevation creek bottoms. We now have populations from south of the Salmon River to at least Coeur d'Alene, Idaho on the north.

- **Cone & seed insect treatments** at the Moscow White Pine Seed Orchard
- **Surveys for introduction of exotic beetles**
- **Spruce beetle:** One of the larger bark beetle outbreaks was of the spruce beetle in south-central Idaho, near McCall. Wind thrown spruce that went unnoticed for a year or so stimulated a very large outbreak. In 1985 salvage activity was initiated on State Lands. Over 43,287,000 board feet were sold bringing over \$6,450,780 (\$149/thousand) to the State. At that time, there were no restrictions on selling timber to out-of-state or foreign buyers, and, for one of the sales, the highest bids came from Japan. They wanted the spruce for the construction of musical instruments. That sale brought \$804,203 into the state endowment funds, but it also stimulated the forest industry of Idaho to ram a new law through the legislature, the Timber Supply and Stabilization Act, severely limiting out of state sales. They did not like the competition.
- **Douglas-fir beetle:** There have been many surveys, evaluations and management recommendations and projects for the Douglas-fir beetle, some of which have been mentioned. Over all, the Douglas-fir beetle has been the cause of more timber management activity than all the other beetles combined. It has been a constant cause of concern. As mentioned earlier, on State lands we implemented hazard rating

techniques and constant vigilance to remove freshly attacked trees, all in a constant effort to minimize losses.

- **More Bark Beetles:** pine engraver, mountain pine beetle, western pine beetle, woodborers, and ambrosia beetles. Evaluating populations throughout the state with recommendations for management.
- **A Pine engraver project:** Ken Gibson and I had the wonderful idea to see if we could keep the pine engraver from attacking piles of pine slash, as these often serve as sites of population build up. We established that we could readily shut down the attraction of baited funnel traps, but preventing attacks of the slash with pheromone-loaded plastic beads proved elusive. We could see treatment effect, but it would not last. Longer-lasting formulations perhaps might be the answer.
- **Pine butterfly:** Survey and evaluation of an outbreak in ponderosa pine near Cascade, Idaho where defoliation caused serious tree mortality and subsequent beetle attacks.
- **Fire/bark beetle relationships in Douglas-fir and ponderosa pine.** In several surveys and evaluations, I found a clear relationship between the build-up of the duff layer, presumably from lack of fire, and resultant damage from even low intensity fires, to the root crowns of trees. Trees were girdled by the fires, then attacked by bark beetles as the trees declined. I observed this in ponderosa pine and Douglas-fir stands in Idaho and in South Dakota.
- **Gypsy moth:** Another major effort during my career has been working with the gypsy moth. The need for survey work became apparent as the insect was found in neighboring states. Through time, and with cooperative agreements with other State of Idaho agencies the US Forest Service and the Animal and Plant Health Inspection Service (APHIS), the surveys became more organized, targeted and systematic, covering all urban areas of Idaho. In 1986, we trapped our first moth in Sandpoint, in northern Idaho. After extensive ground surveys we found a well- established population covering a major portion of the city. Later that same year we also found a population in portions of Coeur d'Alene. These finds led to plans and preparations for control projects in both cities using formulations of Bt. One aspect of the preparations was to conduct public meetings. In Sandpoint I had an especially interesting experience. After his retirement, Ron Stark, a former recipient of the Founder's Award and a man of great experience and knowledge, had become a resident of Sandpoint. Ron was well known for his feeling that we should stop spending so much on surveys for the gypsy moth in the west and let it become established, behaving in time, as a native insect. At the public meeting, who should show up, but the ancient professor himself, with a load of books under his arms large enough to nearly require a pack animal to carry them. His implication was that he was the knowledgeable professor, and that I was reacting more like Chicken Little, crying that the sky was falling in. I felt vindicated though, as after

considerable discussion and questions, Ron conceded that if something were to be done, at least we were using the correct pesticide and procedures in the project. The treatment projects did go forth, with the populations being declared eradicated after not catching moths in our traps for several years afterwards.

The final chapter of the gypsy moth story in Idaho during my tenure with the State ended on a more serious note. In 2004 we caught one moth in a trap near Hauser Lake, just north of Post Falls, close to the border with Washington. I looked at that moth and felt it had a slightly different look to it, so we sent it for DNA analysis. The results came back that it was an Asian gypsy moth. WOW! Did this cause some excitement! We had more high-level visitors than you could shake a stick at. This was the first time that an Asian moth had been found in the interior, away from a port area. The question was, how did it get there. The only plausible source seemed to be the railroad system, with multiple tracks in the immediate area. Protocol indicated a treatment of one square mile centered on the trap site. All residents within the treatment area were contacted, contracts let, and we proceeded with the project, treating 600 ac with Btk. Once again we utilized a GPS guidance system for the aircraft to assure accurate treatment. As follow up, we increased our pheromone based trapping survey to 25 traps per square mile within a 2 mile radius of the catch site and 16/mi² for the next 3 miles. After three years of not catching more moths, the area was declared to be gypsy moth free.

There have been many other projects of special interest over the years, including the following:

- As mentioned, I participated in the Expanded DFTM RD&A Project, report in Hawaii
- Participated in the CANUSA - WSBW RD&A project, report in Bangor, Maine.
- Served as a member of the Idaho Governor's committee on Carbon Sequestration on Idaho Agriculture and Forest Lands.
- Served as a member of the Management Team for the US Forest Service, Forest Inventory and Analysis (FIA) Program representing the Western States.
- Member of the Western Defoliator and Western Bark Beetle Steering Committees.
- Participated in a team effort to prepare an Assessment and Response to Bark Beetle Outbreaks in the Rocky Mountain Area for Congress, directed by FHP Washington Office.
- Team member for a North American Test of Criteria and Indicators for Sustainable Forestry, sponsored by the Center for International Forestry Research (CIFOR) of Indonesia, and the USDA Forest Service. Test was conducted in South West Idaho, hosted by the Boise National Forest, R-4.
- Conducted a national survey of Forest Health concerns and Research Needs for the Forest Health Committee of the National Association of State Foresters

- Participant in an American Forests Organization workshop, held in Sun Valley, Idaho, preparing a book on "Assessing Forest Ecosystem Health in the Inland West."
- Taught two semesters at the University of Idaho, Moscow, teaching the forest entomology portion of a Forest Health class, receiving very high evaluations from the students. They liked the practical approach to the subject.
- Founding member and career-long participant in an Urban Forestry Committee for the City of Coeur d'Alene, Idaho, serving for several years as chairman. We developed guidelines, statutes and code for the Urban Forests of the city.
- Served many years as the secretary/treasurer, then treasurer for this organization, the Western Forest Insect Work Conference. I would like to pay tribute to all those that have served and given of their time through many years to this organization. It is a wonderful forum for education, for discussion and sharing of information, support of students with opportunities for papers and scholarships, and support of each other, for friendship, and just plain good times. With our long history, all of the committees, and those who serve for each meeting, it all makes for the best organization of all.

I would also like to recognize several people whose support and cooperation have contributed greatly to the success of the Forest Health program for the State of Idaho:

Dewey Almas, my first Supervisor, who provided encouragement and freedom in the work.

David Beckman, Technician in the IDL FHP Program. Originally hired to work with Mal Furniss, continuing as a permanent employee. A constant source of support and hard work.

Bill Ciesla, as FHP program leader for R-1, Missoula, Montana, played a significant role in the establishment of the Idaho Program. Bill provided continuing support and suggestions as the program developed.

Jed Dewey, FHP Program Manager for many years in Missoula, was a constant source of support and guidance.

Rick Johnsey, Washington, DNR. Rick hired me to survey for European pine-shoot borer and later we cooperated on common insect populations.

LeRoy Kline, Oregon Dept of Forestry. Friend & mentor; helped with Douglas-fir tussock moth and balsam woolly adelgid.

Steve Kohler, Montana Dept. of Fire & Forestry; We worked together in the cooperative hiring of a forest pathologist that worked half time for each state.

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Ken Gibson, FHP Entomologist, Missoula, Mt, a friend who has been a constant source of ideas, support, and cooperation.

Sandy Kegley, FHP Entomologist, Coeur d'Alene, with whom I have enjoyed many discussions and projects, and to whom I owe the honor of having been nominated for the Founder's Award. Thank you Sandy!

In closing, I would like to share a few lines that show that the study of beetles in trees has been around for a good while:

Found in a book by Cort Conley "Idaho Loners: Hermits, Solitaires, and Individualists" -- A few lines from a poem entitled "Hermits" by James Galvin.

**"In wet years the land breathes out,
And a crop of limber pines jumps into the open
Like green pioneers.**

**In dry years
Beetles kill them with roadmaps
Under the skin."**

Finally, to help keep ourselves in proper perspective as forest entomologists, here is a quote from Ken Gibson, illustrated by Dewey Almas:

"If a forest entomologist is walking in the woods,



And a tree falls on him,



Does anybody care?"

*Drawings by **Dewey P. Almas**, my first Supervisor with the Idaho Department of Lands (Feb 2009).*