

1 I, GUY L. PINJUV, declare and state as follows:

2 Qualifications

3 1. My name is Guy L. Pinjuv. I am a forest scientist with more than 6 years
4 of research experience with both private and governmental organizations in the United States and
5 New Zealand. I have a B.A. in physics and a B.S. in forestry timber resource management from
6 the University of Montana, a M.S. in forestry from Northern Arizona University, and am
7 currently doing Ph.D. research in hybrid forest growth modelling at the University of Canterbury
8 in New Zealand. Before starting my Ph.D. research I was a research forester, and forest
9 economic analyst for the Pacific Northwest Research Station of the USDA Forest Service in
10 Portland Oregon. I have published papers in Forest Products, Forest Service General Technical
11 Reports and have completed studies on fire reduction and ecological restoration treatments that
12 have been presented to the United States Congress. I have been a private forest consultant for
13 non-profit organizations in Northern Arizona. I am currently researching forest growth modelling
14 systems that predict the growth of forests in New Zealand on both physiological principals of
15 tree growth and statistical models of historical growth measurements. This research includes
16 modelling forest canopy structure and root zone water balance as predictors of tree growth.

14 Information Reviewed

15 2. I reviewed the following documents produced by the 2002 Addendum
16 Marks Creek Watershed Analysis (hereafter "WA"), the 2002 Bandit II Environmental
17 Assessment (hereafter "EA"), and the 2002 Resource Report and Biological Evaluation for
18 Aquatic Species Bandit II Planning Area (hereafter "BE"). I also reviewed related scientific
19 literature. A list of scientific references is included at the end of this declaration. In my review, I
20 also drew on my own professional judgement and experience.

21 The EA and BE failed to quantitatively and scientifically back up statements relating to
22 the alternatives likely effect on tree growth to provide shade to the adjacent watershed intended
23 to reduce water temperatures. The EA claims (on page 73 of the online document under the
24 section on Fish Habitat and Riparian Areas) that the selected alternative (alternative 4) will not
25 increase and will likely reduce incident sunlight on the adjacent watershed. The EA states
26 "*Commercial harvest and pre-commercial thinning within RHCAs are designed to maintain or*

1 *improve existing shade conditions, to promote development of large-sized trees”...” Removing*
2 *smaller trees (less than 20 inches DBH) would Increase growth rates of the remaining trees*
3 *because there would be less competition for nutrients, sunlight, and water. Increased growth*
4 *rates would result in growing larger trees over time. Hardwood enhancement would help to*
5 *improve vegetative diversity, increase shade, and improve stream bank stability”.* This claim is
6 not based on any scientific and quantitative effort to calculate the potential changes in forest
7 canopy structure and leaf area index that will reduce direct and diffuse sunlight onto the
8 watershed produced individually by activities proposed under alternative 4. A determination of
9 the effect of a forest harvesting project on tree growth requires a quantitative estimate of the
10 amount of canopy or leaf area that will result in the remaining forest and its geometric properties
11 that will absorb and block sunlight that would otherwise be incident on the watershed. As leaf
12 area index (LAI) or the shading properties of the remaining stand is cited in the EA as a
13 justification for providing shade to watersheds under alternative 4, it is critical that an accurate
14 sub-model to predict LAI is used or developed to back up these claims. Development of such a
15 model would need to incorporate driving variables that will predict LAI as some function of pre-
16 measured plot variables such as stand basal area. Fownes *et al.* (1990), used a generalized form
17 of an equation to predict individual tree Leaf Area (LA) from stem diameter in tropical forests
18 and a similar model may be used to evaluate the effects of alternative 4.

15 Any thinning of a forest stand would increase the amount of solar radiation, water, and nutrients
16 available to remaining trees and also increase the amount of solar radiation incident on the
17 adjacent watershed. Residual tree growth would only increase on sites where water was a
18 limiting factor for photosynthesis and where there would likely be an increase in the availability
19 of Nitrogen (Atwell et al. 1992) in a Nitrogen limiting environment. This increased growth may
20 not provide more shade to the adjacent watershed if there were few understory trees to block
21 incident sunlight at low sun angles (Stenberg 1995, Anderson 1966). The reason that tree growth
22 would increase on residual trees would be because of an overabundance of the resources needed
23 for growth. If maximization of productive leaf area is the goal (which would indicate that
24 alternative 4 would increase shade), the optimal strategy is to maintain an inefficient deep
25 canopy to increase light interception efficiency (Stenberg 1995). The assertion made in the EA as
26 to weather the remaining trees, after years of growth would provide more shade to the watershed

1 than the original forest condition is unsubstantiated. To adequately address this question one
2 would have to take into account all sun angles throughout the course of a year and know exactly
3 how much foliage would be grown and at what height on the remaining trees to absorb incident
4 sunlight (Edwards and Thorpe 1976, Anderson 1966). It is a fact that the intended actions
5 proposed under alternative 4 will initially increase the amount of sunlight on the watershed, and
6 it is also possible that this result would not decrease in following years even after canopy closure
7 since there would be little to no understory vegetation to block incident sunlight from low sun
8 angles (morning and evening hours of daylight).

9 The Failure to credibly estimate the effects of Alternative 4 on decreasing the amount of
10 incident solar radiation on the adjacent watershed usurps the determination that the harvest plan
11 meets INFISH objectives and fish habitat conditions in the EA and BE.

12 I declare under penalty of perjury that the foregoing is true and correct. Executed this
13 ___th day of January 2004 in Christchurch New Zealand.

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15 GUY L. PINJUV

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10 **Literature Cited**

11 Anderson, M.C., 1966. Stand structure and light penetration-a theoretical analysis. *Jol. Of Appl.*
12 *Ecol.* 1:41-53.

13 Atwell, B.A., Kriedemann, P.E., Turnbull, C., 1999. *Plants in action; adaptation in*
14 *nature and performance in cultivation.* MacMillan Education Australia Pty.
15 Ltd. 627 Chapel Street, South Yarra 3141. 664 pages.

16 Edwards, D.A.C., Thorpe, M.R., 1976. Interception of diffuse and direct-beam radiation by a
17 hedgerow apple orchard. *Ann. Bot.* 40: 603-613.

18 Fownes, J.H., Harrington, R.A., 1990. Modelling growth and optimal rotations of tropical
19 multipurpose trees using unit leaf rate and leaf area index. *J. App. Ecol.* 27: 886-
20 896.

21 Stenberg, P., 1995. Simulations of the effects of shoot structure and orientation on vertical
22 gradients in intercepted light by conifer canopies. *Tree Physiology.* 16:99-108.