MANAGING MAMMAL DAMAGE AGENTS IN MPB-KILLED STANDS & PROTECTION OF NEW PLANTATIONS

Progress Report – August 2009

NIFR 2009-10

Submitted to:

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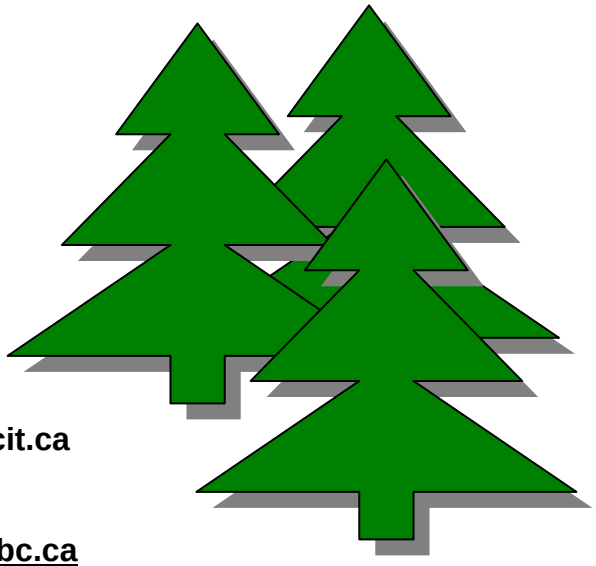
Forests For Tomorrow



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EXECUTIVE SUMMARY

The following progress report details results to date of the vole and hare monitoring project being conducted in the Northern Interior Forest Region (NIFR). A final report and presentation of the results will follow in November 2009.

In forestry, voles of the genera *Microtus* are considered the major mammalian species affecting coniferous and deciduous tree plantations. Populations of some species of voles tend to have cyclic fluctuations in abundance in northern latitudes with a peak every 3 to 5 years. Snowshoe hares (*Lepus americanus*) are also a major problem and have a 9- to 11-year fluctuation in abundance. Damage to seedlings and young trees can be severe during periods of irruption in their abundance. The next anticipated peak in abundance of voles and hares is 2009-2011.

There is concern that underplantings in MPB-killed stands in the Northern Interior Forest Regions may experience significant damage from voles and snowshoe hares. However, population fluctuations of voles (both *Microtus* spp. and *Clethrionomys gapperi*), and status of snowshoe hare populations, are poorly known in these areas.

Monitoring of voles and snowshoe hares was initiated at six locations: three areas in MPB-killed non-merchantable pine stands (Quesnel, Prince George, and Vanderhoof) and three locations in MPB-killed merchantable pine stands (West Quesnel, Fort Fraser, and Fort St. James). Monitoring was initiated in 2006 using a combination of live trapping for voles and hares in non-merchantable stands; and pellet plots for hares in both non-merchantable and merchantable stands.

Objectives in 2009-10:

Objectives from the 2009-2010 FFT proposal:

(1) Maintain monitoring of vole populations in MPB-killed non-merchantable stands and control sites. Are we heading towards an irruptive peak in voles?

(2) Maintain monitoring of snowshoe hare populations in MPB-killed non-merchantable stands, and relative habitat use by hares in both MPB-killed non-merchantable and merchantable stands and control sites. Are we heading towards a peak in abundance of hares?

(3) Assess whether abundance of voles and hares is related to understory vegetation. If there is a relationship between these species and vegetation, we then can predict which sites are most susceptible to damage.

(4) Maintain monitoring of damage trials to quantify damage to freshly planted seedlings in the NIFR by snowshoe hares and voles. Does damage occur in year two after planting or is it restricted to the fall following planting?
(5) Maintain monitoring of seedling survival in trials treated by brushing and diversionary food. Did these treatments enhance seedling survival?

Results and Management Recommendations:

Recommendations – Objective 1 (monitoring vole populations): Given that:

- Voles typically have cyclic fluctuations in abundance in northern latitudes with a peak every 3 to 5 years.
- Abundance of voles was low in 2009 (Fig. 1).

Management Recommendations:

1. Seedlings planted this year should be safe from vole damage this winter and would not require protection. If voles remain low through winter, then damage levels next fall should be low. However:

    - Abundance of meadow voles in non-merchantable stands is equal to, or exceeds, that in clearcut stands (optimal habitat for meadow voles; Fig. 1). MPB-killed non-merchantable stands have developed into optimal habitat for meadow voles.
    - We have not seen peak abundance of voles (> 30 individuals/ha) over the 4 years of the monitoring program.

    Thus, it is likely that:

    - Voles may experience irruptive population growth in the next year or two.
    - MPB-killed non-merchantable stands will provide optimal habitat for voles.
    - Damage to seedlings planted prior to the peak will may be susceptible to significant damage from voles in these stands.

Monitoring Recommendation:

2. Continue monitoring vole populations in MPB-killed non-merchantable stands and control sites. Are we heading towards a cyclic high in abundance?

Recommendations – Objective 2 (monitoring hare populations**)**: Given that

- Abundance of hares continued to increase from 2006 to 2008 based live trapping (Fig. 2) and pellet-plot surveys (Fig. 3 & 4), especially in unspaced stands.
- Abundance of hares appeared to be similar between 2008 and 2009 based on live trapping (Fig. 2) and pellet-plot surveys (Fig. 3 & 4).
- In general, merchantable stands are used little by snowshoe hares (Fig. 4).

Management Recommendations:

3. It is safe to plant this year and next year (on some sites; see Objective 3 below) and damage levels should not exceed those seen last fall. Merchantable stands are safe to plant, given low cover. However:
    - It is unknown whether this lull is a temporary conditions or whether hares have reached their peak.

Monitoring Recommendation:

4. Continue monitoring hare populations in MPB-killed non-merchantable stands and control sites. Are we still heading towards a peak in abundance?

Recommendations – Objective 3 (relating cover to damaging agents**)**: Given that:

- The increase in abundance of voles in MPB-killed non-merchantable stands (Fig. 1), relative to clear cuts, may have resulted from the increase in herbaceous vegetation seen between 2007 and 2008 in non-merchantable stands (Fig. 5).
- Use of MPB-killed non-merchantable stands by snowshoe hares appears strongly linked to percent cover of shrubs and trees (Fig. 6).

It is likely that:

- Controlling the herbaceous understory may reduce susceptibility of seedlings to vole damage in MPB-killed non-merchantable stands.
- Controlling shrub and tree cover will reduce susceptibility of trees to hare damage in MPB-killed non-merchantable stands.

Management Recommendation:

5. Should vole experience irruptive population growth in the next year or two, controlling herbaceous and low-shrub cover prior to planting may reduce their abundance and susceptibility of planted seedlings to vole damage.

6. On those sites with high hare abundance or shrub and tree cover, controlling this vegetation will substantially reduce hare abundance in the stands and proportion of seedlings damaged by hares (see objective 5 below)

Monitoring Recommendations:

7. Monitor voles on MPB-killed non-merchantable stands where vegetation control has been implemented. This would provide an evaluation of the effectiveness of vegetation control to reduce abundance of voles; thus, reducing susceptibility of planted seedlings to vole damage.
8. Continue monitoring the understory and canopy cover in MPB-killed non-merchantable stands. Specifically, the detailed vegetation survey conducted in 2008 should be repeated in 2010.

Management Recommendations – Objective 4 (monitoring survival trials**)**: Given that:

- Damage to seedlings by hares is primarily restricted to the few months following planting (Fig. 7).
- Hares preferentially are feeding on planted seedlings (i.e., seedlings are preferred food items for many months following planting).
- On most sites with moderate to low levels of hare use, seedling survival is very high (Figs. 7 & 8B).

Management Recommendation:

9. On sites with moderate to low levels of hare use, continue planting as seedlings appear to survive moderate levels of clipping following planting.
10. Plant larger trees to further enhance survival of seedlings following hare clipping (see trials by Gord Dow, MOFR, Prince George).
11. Plant nursery-grown trees with reduced fertilization (see trials by Gord Dow, MOFR, Prince George). However:
    - Susceptibility of seedlings to damage by voles is unknown.

Monitoring Recommendation:

12. Continue monitoring seedling survival in MPB-killed non-merchantable stands if voles are undergoing irruptive population growth.

Recommendations –Objective 5 (evaluate damage-reduction techniques**)** : Given that:

- Brushing appeared to be an effective treatment to reduce stand use (Fig. 8A) by hares and to significantly reduce damage to freshly-planted seedlings (Fig. 8B).
- On most sites with low to moderate use by hares, seedlings appear to survive clipping by hares.
- Seedling survival on sites with high hare numbers and cover is much lower (Fig 7: 93G056-030 & 93G065-035).

Management Recommendation:

13. Consider brushing those sites with a high abundance of hares (as evaluated by density of pellets seen on the ground) or high cover of shrubs and trees (i.e., low herbaceous (food) layer).

Monitoring Recommendation:

14. Consider additional brushing trials as results are based on two replicates. If sites are to be brushed, establish pellet-plot and survival trials prior to planting to provide further support for the observed results noted above.

And given that:

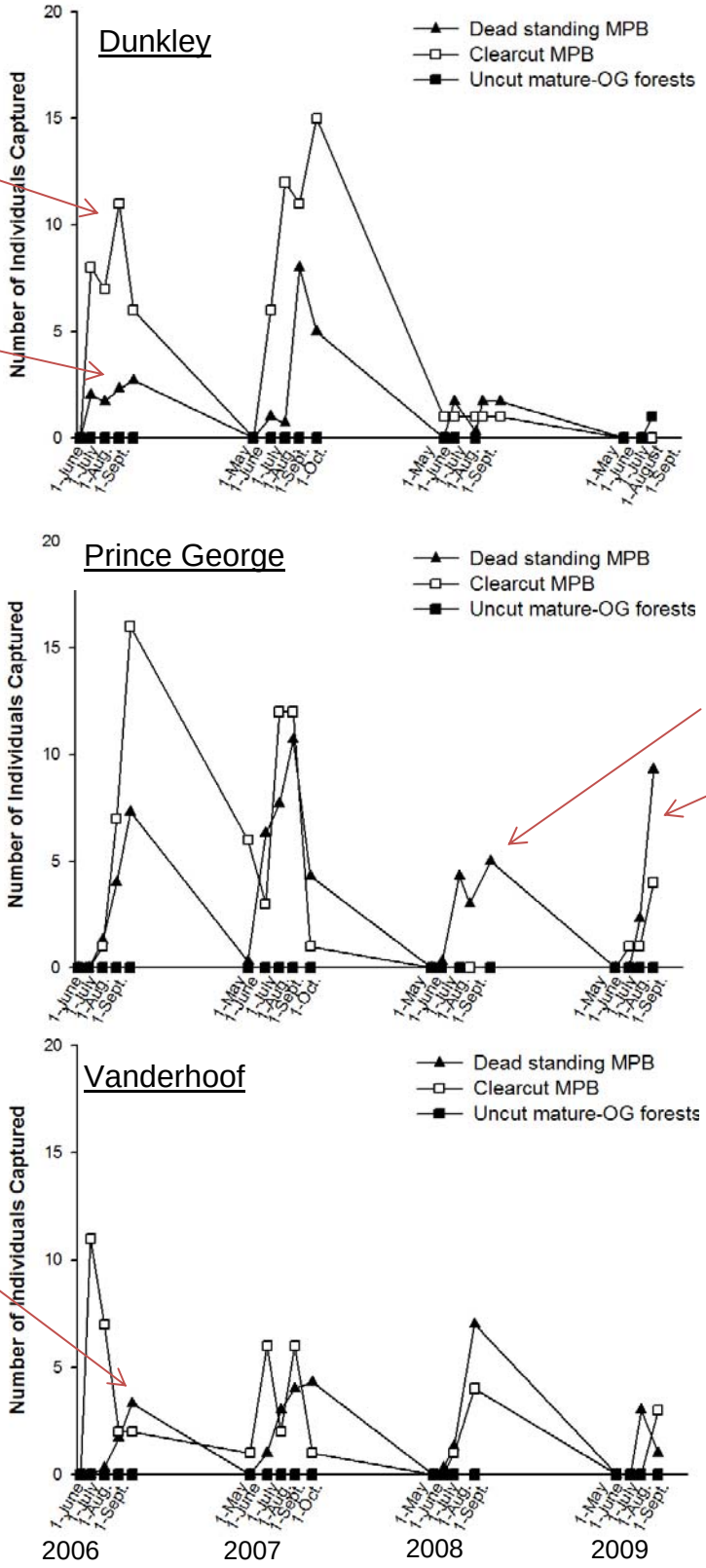
- Vole abundance may irrupt, and susceptibility of planted seedlings to damage may increase, in the next two years.
- Damage occurs over a relatively short time period and stops following the crash in abundance of voles.

Monitoring Recommendation:

15. Evaluate the effectiveness of diversionary food as a damage-reduction technique. This technique can be applied in late fall (if peak abundance is expected), when other techniques are not available – namely, reducing ground cover prior to peak populations. Evaluating diversionary food or vegetation control as effective damage-reduction techniques will provide useful management tools throughout the next anticipated peak, and those that may follow (2-3 vole cycles), during which these dead MPB stands (or fire-regenerated stands) are being re-established.

Figures follow.

Figure 1. Number/ha of meadow voles (*Microtus pennsylvanicus*) in MPB-killed non-merchantable stands from 2006 to 2009.

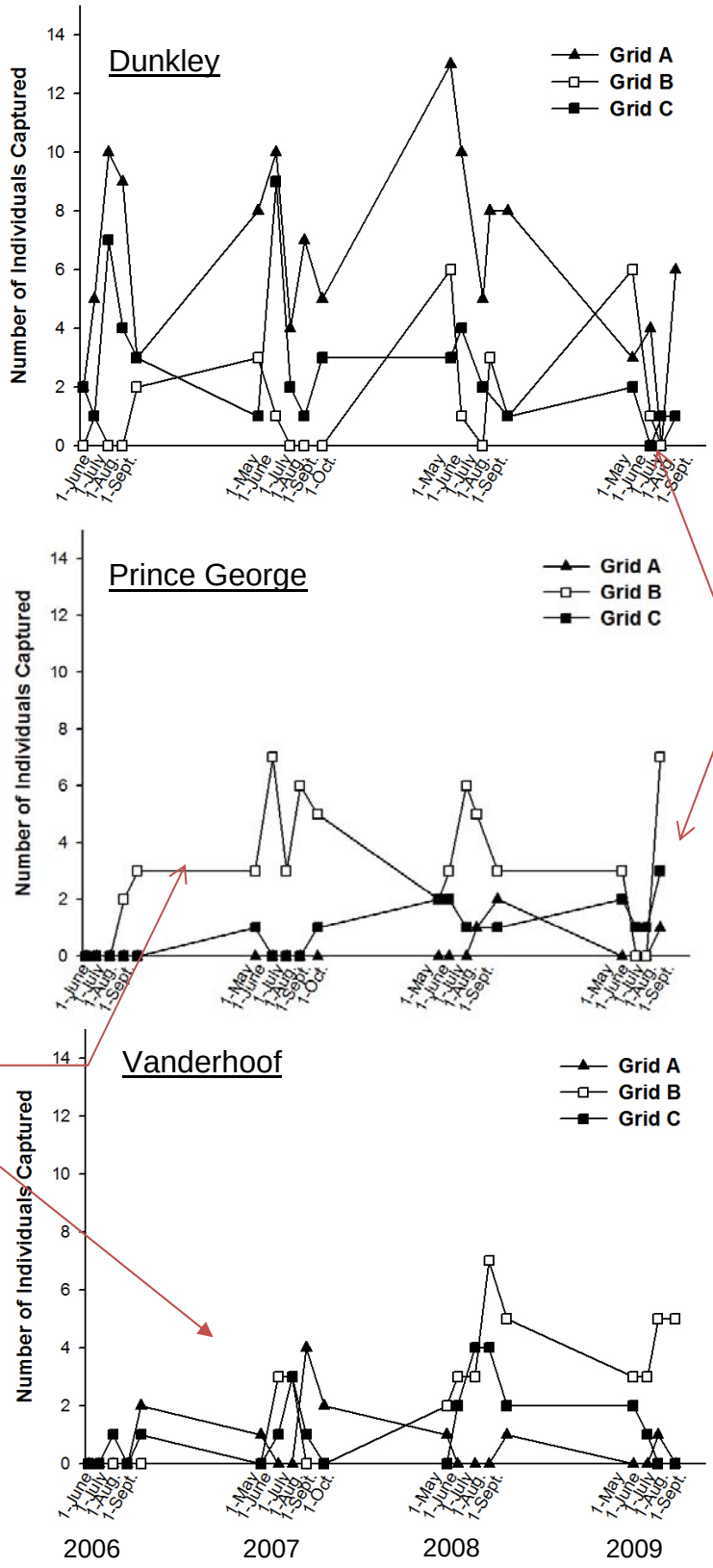


Note:
- Abundance of voles higher in clearcuts than dead standing MPB stands in 2006.
- In 2007, difference is less.

In 2008 & 2009
- Abundance of voles in dead standing MPB stands exceeds that in clearcuts.
- Clearcuts typically provide optimal habitat for meadow voles in forested environments.
- MPB-killed non-merchantable stands are developing into optimal habitat for meadow voles

Abundance has generally been low (< 15 individuals) for 4 years.

Figure 2. Number/ha of snowshoe hares (*Lepus americanus*) captured in MPB-killed non-merchantable stands from 2006 to 2009.



- Low numbers here are the result of bear disturbance
- Overall, abundance in 2009 is similar to that seen in 2008.

There has been a general increase is abundance of hares from 2006 to 2008.

Figure 3. Mean (± 95% CI) number of snowshoe hare pellets/ha (x 1000) in the three MPB-killed non-merchantable stands (A, B, & C) and an unthinned (UT) live stand at each of the sites in the three NIFR areas from 2006 to 2009.

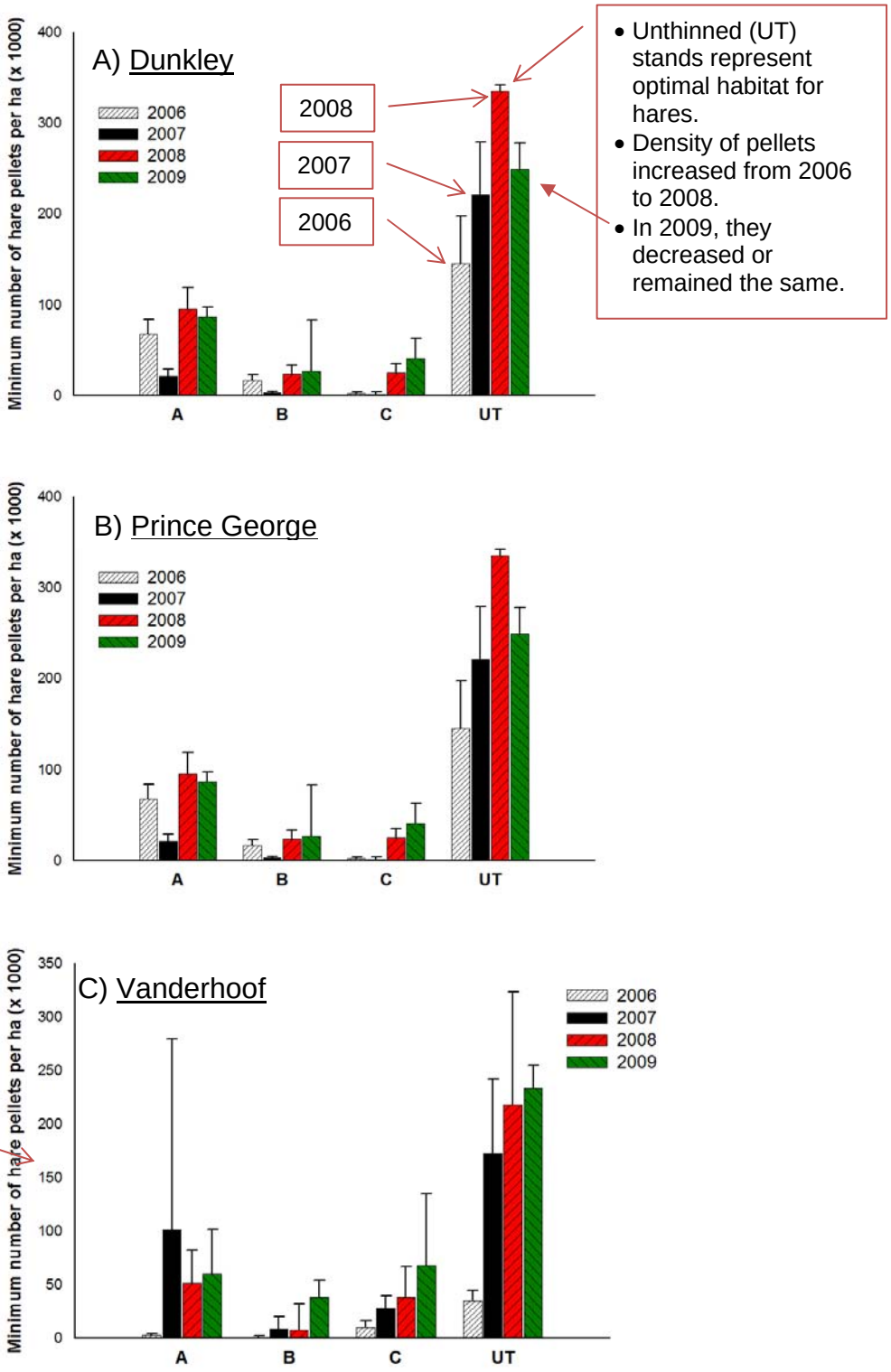


Figure 4. Mean (± 95% CI) number of snowshoe hare pellets/ha (x 1000) in the three (A,B, & C) merchantable MPB-killed stands and an unthinned (UT) live stand at each of the sites in the three NIFR areas for 2007 to 2009.

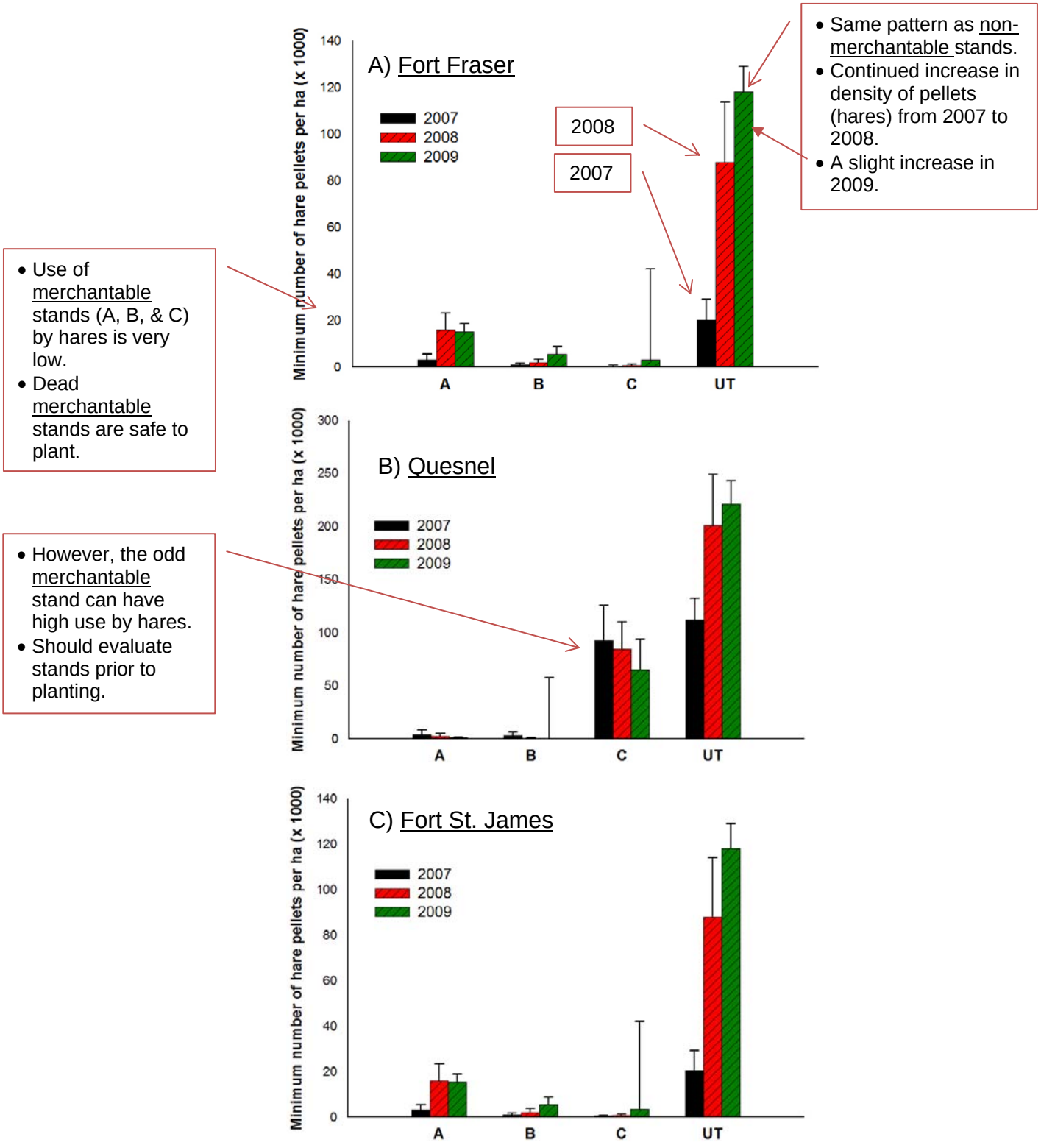


Figure 5. Mean (n=3; ± 1 SE) total volume of herbs in three MPB-killed stands (A, B, & C), 1 salvage clearcut (site D);1 uncut forest (E); and 1 live overstocked stand (Unthinned) at each of the sites in the three NIFR areas for 2007 and 2008.

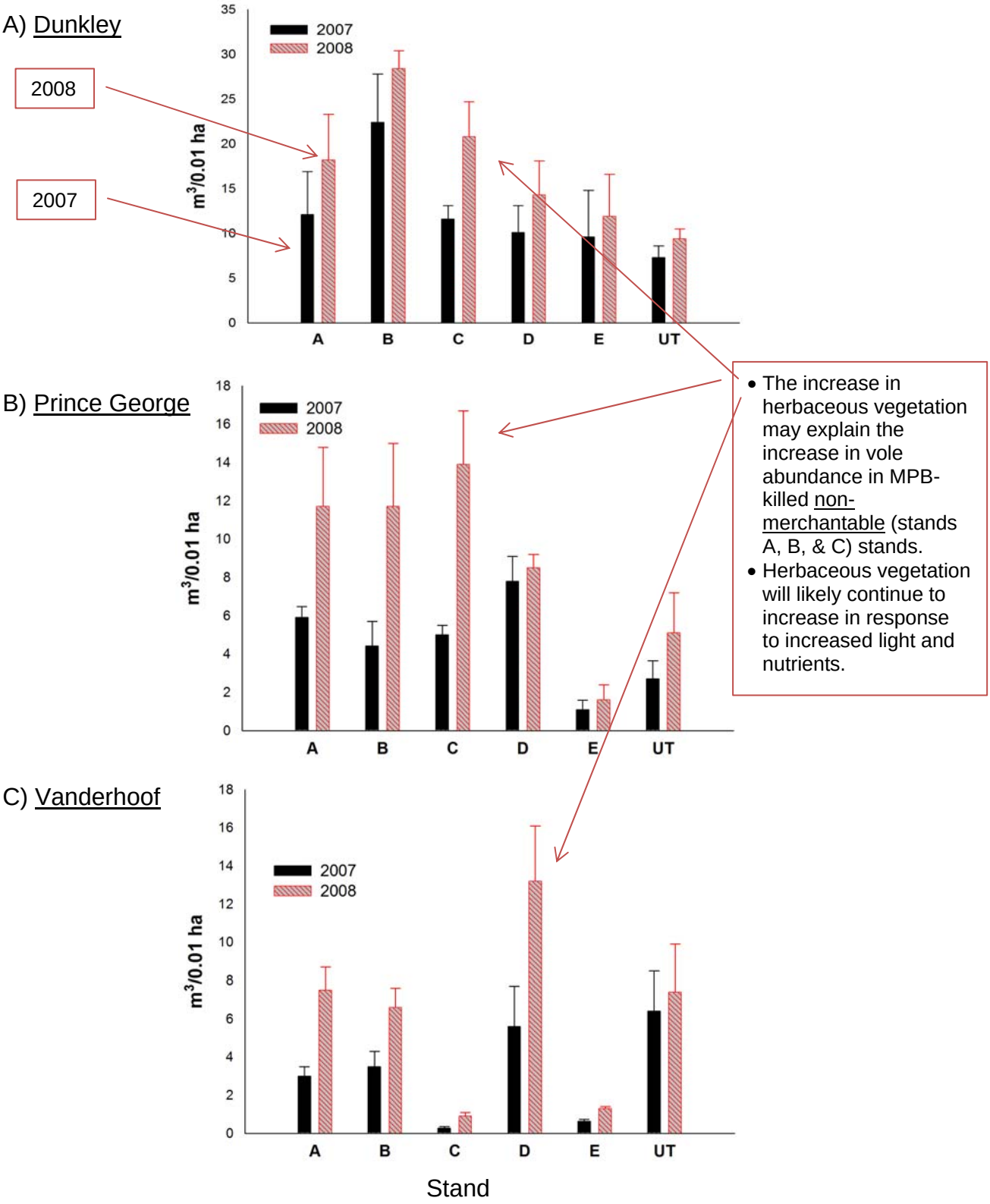


Figure 6. Mean number of hare pellets (per m^2) versus percent cover of trees and shrubs. Data source was from 9 non-merchantable stands and 6 unspaced controls.

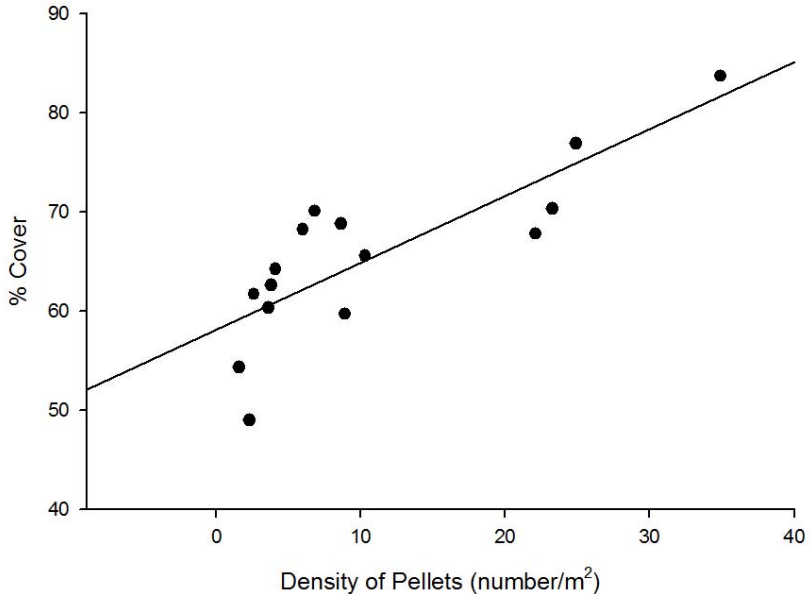


Figure 7. Mean (± 95% CI) number of seedlings damaged in four MPB-killed non-merchantable stands in the NIFR region in August 2007 to May 2009. Surveys for 93G056-030 and 93G065-035 were not conducted in 2009. Percentage of trees alive include both trees not clipped by hares and clipped trees (if alive). Thus, even though damage may have exceeded 50%, many trees survived clipping.

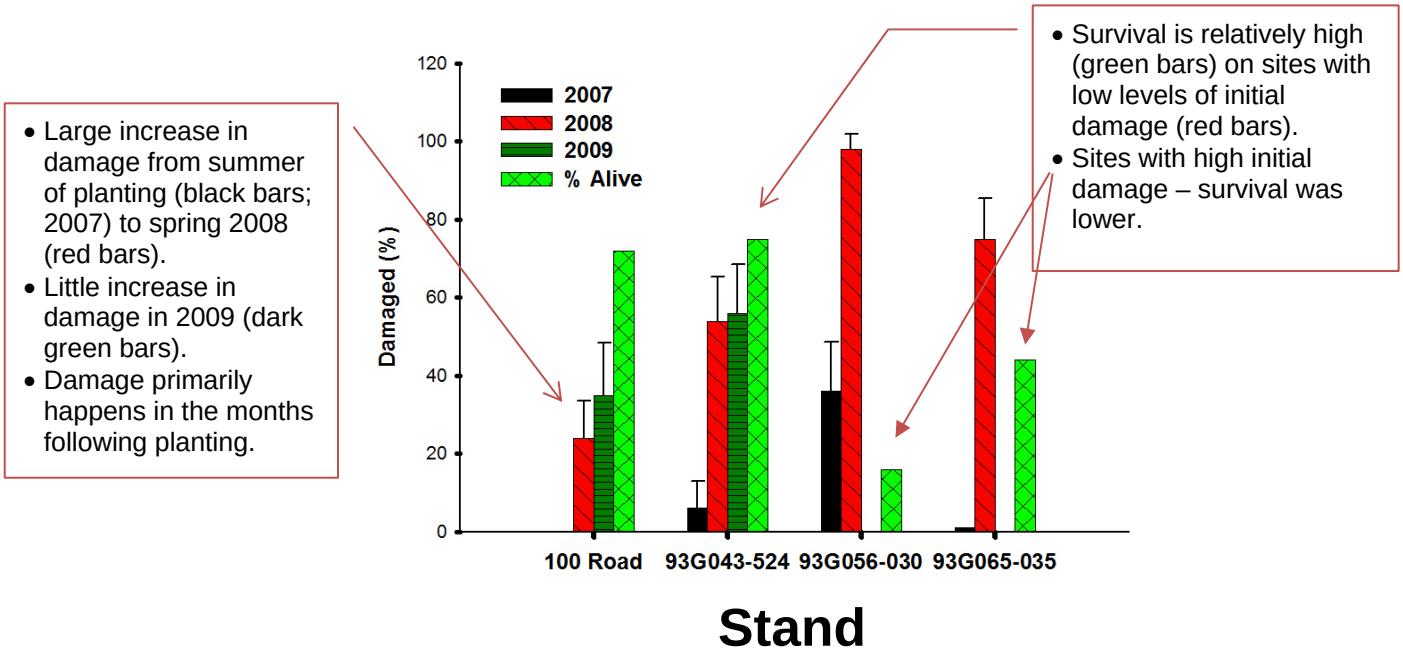
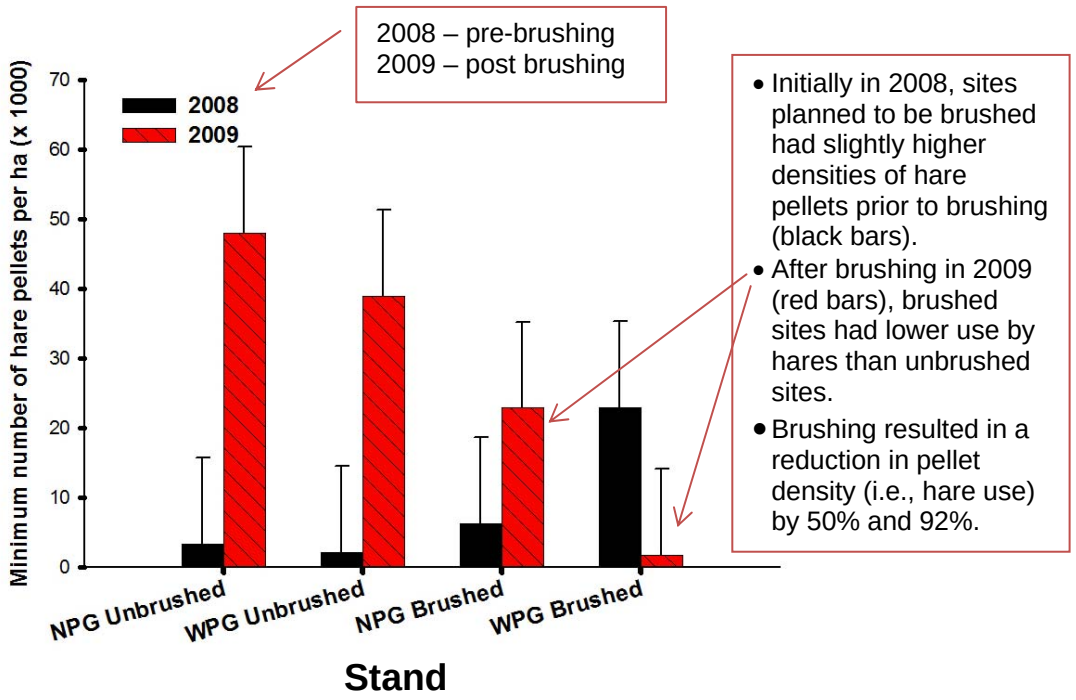


Figure 8. Mean (± 95% CI) number of A) hare pellets (per ha) and B) seedlings damaged in two brushed and two un-brushed sites located north (NPG) and west (WPG) of Prince George, B.C. from 2008 (pre-brushing) to 2009 (post brushing). Green cross-hatched bars in B represent the percentage of live trees present (clipped and unclipped) in 2009.

A.



B.