



Technical Note

Principles of Vegetation Management

Introduction

Vegetation management is critical to establishing desirable plant species and to achieving reclamation objectives. For purposes of simplicity and clarity four Technical Notes on vegetation management have been developed. They are:

1. **Principles of Vegetation Management** describes the fundamentals of successful vegetation management and provides linkages to both the vegetation establishment technical note and to operational vegetation management treatments and processes.
2. Vegetation Management Treatment Options identifies an array of vegetation management treatment categories and discusses their strengths and weaknesses.
3. Operational Vegetation Management provides guidance on prescribing, integrating and deploying vegetation management treatments to cost effectively achieve reclamation objectives.
4. Special Considerations in Herbicide Use provides specific guidance around herbicide use for vegetation management - particularly with respect to regulatory requirements, safety, environmental protection and prescription.

The following principles of vegetation management blend biological precepts and human expectations of plant communities. They are broad in scope and can/have been broadly applied across agricultural, industrial, forest and landscape ecosystems. They are premised on a focused, objective-based, integrated approach to vegetation management. This approach will give most consistent success over time and is generally most cost effective - especially if the cost of failure is considerable. While frequently touted as novel or progressive, the integrated approach was articulated as early as 1958 by Niering¹, more

¹ Niering, W.A. 1958. Principles of Sound Right-of-Way Vegetation Management. *Econ. Bot.* 12(2):140-144.

recently these principles have been applied to forest vegetation management with considerable success (Wagner², 2005; Wagner *et al*³).

Principles of Vegetation Management

1. Ensure vegetation management is undertaken with a clear, measurable objective. Objectives for vegetation management for reclamation purposes should include:
 - a. Desired species - plant community composition - this is especially important given that the 2010 Reclamation Criteria for Wellsites and Associated Facilities on Forested Lands⁴ requires demonstrating a presence of a functioning ecosystem before a reclamation certificate can be issued. Thus the objective should broadly describe a combination of species or life-forms representing success. This description should include both preferred and acceptable species. Preferred species represent an ideal or prescribed outcome. Acceptable species reflect a functioning ecosystem but may arise from climatic or other forms of variability altering plant community assembly over time.
 - b. Species included in the objective should be consistent with growing conditions on the reclaimed site and coherent with the adjacent landscape. Plant species should be chosen based on their ability to survive on the reclaimed site as described by:
 - i. Local soil conditions including compaction, texture, moisture and nutrients.
 - ii. Meso-climatic conditions including susceptibility to winter injury, slope and aspect.
 - iii. Regional climatic conditions and variability.
 - iv. Compatibility between species to ensure successful establishment of a range of species and lifeforms.
 - c. The objective should identify plant species and densities that will trigger vegetation management interventions. Examples of trigger species include - noxious or restricted noxious weed species likely to be found on the wellsite, agronomic grass and legume species used to stabilize soil on road cuts and in ditches, native species likely to limit establishment of functional plant communities.
2. Make a vegetation management plan. The plan should spell out the objective as discussed above and identify likely actions or sequences of actions should a trigger species and/or density be identified. The plan should identify specific, not generic, treatments. For example, should an

² Wagner, R.G. 2005. Top 10 Principles for Managing Competing Vegetation to Maximize Regeneration Success and Long-Term Yields. Symposium Paper. The Thin Green Line. Thunder Bay, ON. July 26-28, 2005.

³ Wagner, R.G., K.M. Little, B. Richardson, K. McNabb. 2006. The role of vegetation management for enhancing the production of the world's forests. *Forestry* 79(1):57-79.

⁴ Alberta Environment, 2010. 2010 Reclamation Criteria for Wellsites and Associated Facilities for Forested lands Alberta Environment, Edmonton, Alberta. 99 pp.

unacceptably high density of low shrubs be identified on site (based on competitive interactions between tall shrubs and desired tree species) the plan would dictate specific treatments, such as single-stem, selective herbicide treatment NOT simply say use herbicide. The plan should schedule vegetation monitoring activities including both timing and type of monitoring.

3. Work with plant community succession attempting to guide or nudge its direction. Select objectives and plant species consistent with the site. Choose and deploy vegetation management treatments that achieve the desired effect with minimum disruption to the rest of the plant community - see the example in item 2.
4. Prompt action is critical to success. Prompt treatment before undesirable vegetation dominates the site is critical successful vegetation management. Promptness improves vegetation management effectiveness for several reasons:
 - a. Desirable or acceptable plant species are likely better able to take advantage of growing space opened by vegetation management if they have not been nearly overwhelmed by competitive interaction with undesirable species.
 - b. Most vegetation management treatments are more successful in controlling small individual plants than they are at controlling well established plants. This is particularly true when attempting to control root reproducing species like bluejoint reedgrass or Canada thistle. By extension, there are generally more treatments suited to controlling small, poorly established plants than there are treatments suited to controlling well established plants.
 - c. Controlling undesirable plants after they have released seed will necessitate ongoing treatments until that seed bank is reduced, or desirable vegetation overtakes the site.
5. Integrate treatments for success. Specific vegetation management treatments are generally more effective in achieving certain objectives (see Vegetation Management Treatment Options.) Effectiveness of vegetation management can be greatly increased by using a sequence of treatments to integrate effects into fully effective control. For example, when controlling root sprouting species herbicides that translocate only moderately well may provide broad spectrum control of population numbers but do not provide lasting control due to inability to translocate throughout the root system. In these circumstances using cultivation to break up root systems, waiting for re-sprouting then spraying with the herbicide is likely to yield far more robust control.
6. Monitor vegetation frequently, especially after treatments or during periods of climatic stress. Monitoring helps identify need for follow-up treatments, or to deal with any other issues that may have developed and helps ensure quick response to issues. Likewise monitoring helps ensure treatments were successful - for example, some herbicide treatments can fail during

periods when climatic stress (extreme moisture or extreme drought). Linking monitoring methods to the objective will greatly improve the likelihood of success.

Critical Points

1. Integrate vegetation management into the overall vegetation strategy for the wellsite.
2. Choose and describe objectives when developing a vegetation management plan.
3. Integrate vegetation management treatments to address vegetation size, numbers and species to improve chances of success.
4. Apply treatments promptly.
5. Attempt to guide, not overwhelm plant community development.
6. Recognize the importance of stochastic factors like climate, herbivory and severe weather in vegetation management success.
7. Monitor vegetation frequently to provide the opportunity for prompt, proactive treatment.