Native or Not:

Subjective Labels and Their Application in Wildland Plantings

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ABSTRACT

Biodiversity maintenance and ecosystem stabilization are primary considerations when selecting species for restoration of disturbed wildland communities. Selections based solely on ambiguous labels regarding point of origin (for example, native, introduced) often ignore realities of change caused by migration (both natural and human-facilitated) and long-term climatic shifts. Subsequently, natives are often, but not always, well adapted to the altered environments and uses of today's wildland communities. The utilization of broad-based releases and multi-germplasm blends increase genetic diversity and offer improved opportunity for success on variable environments. Evaluations of past plantings can provide valuable insight on the suitability of various species, both introduced and native, for wildland stabilization. An adaptive strategy enlightened by unbiased hindsight, while at the same time possessing a clear forward vision, will be increasingly important for managing wildlands in a changing world.

KEY WORDS: biodiversity, community stability, migration, plant material development

NOMENCLATURE: Welsh and others (1987)

Serious discussion concerning the relative merits of planting native versus introduced plants generally uncovers a lack of agreement of what is meant by the term "native." In the brief discussion that follows, we argue that because the quality of being native is subject to variability on both spatial and temporal scales, it must therefore be considered a label of uncertain value when planning restoration plantings. Subsequently, we contend that development and selection of plant materials to be used in wildland plantings should focus on restoring and enhancing ecosystem stability and biological diversity (Johnson and Mayeux 1992; West 1993; West and Whitford 1995). Such a focus will undoubtedly result in promotion and use of many species and biotypes that can be labeled "native." This is as it should be so long as selection is made based on a plant's capacity to contribute to reasonable goals of stability and biodiversity rather than depending solely upon ambiguous labels concerning point of origin.

SPECIES MIGRATION

All life forms have the capacity to colonize new habitats. However, the rate, frequency, and distance of dispersal vary tremendously by species. In addition to innate limitations to dispersal, migration is also restricted by geographic and climatic barriers. Mountains, canyons, deserts, rivers, and oceans are examples of barriers that limit effective dispersal of land based organisms including vascular plants. By restricting migration, these barriers provide the isolation necessary for evolution of a great diversity of organisms and communities located on separate sites of similar soils and climate. Few would argue against the value of this

Photo by Stanley G Kitchen

Figure 1 • Four-wing saltbush (Atriplex canescens) *is well-adapted to drought, grazing, and fire on arid and semi-arid sites in the western US.*

diverse genetic and ecological heritage, or that it should be protected.

In geologic time, many barriers to migration are somewhat short-lived. This fact combined with continual shifts in global climate results in a somewhat constant re-shuffling of biological components giving species distribution patterns a decidedly temporal dimension. For example, species of horse, camel, llama, and lion were part of the rich mega-fauna widespread in North America as recent as 14,000 y ago (Lundelius and others 1983). At the time these species were certainly native. Today, numerous bands of feral horses roam public lands in the western US. Although naturalized, these horses are not considered native any more than camels, llamas, or lions would be. Conversely, although we are somewhat uncertain of the timing for the first migrations, Native American man is really a relatively recent introduction.

Plant distributions and associations also changed dramatically in response to the Pleistocene to Holocene transition. In the Great Basin, western bristle cone and limber pines (*Pinus longaeva* D. K. Bailey and *P. flexilis* James [Pinaceae]) retreated from dominant positions on low elevation mountain slopes, foothills, and perhaps even valley locations to a relatively few subalpine islands (Thompson 1990). White fir (*Abies concolor* [Gord. & Glend.] Lindl. [Pinaceae]), Douglas-fir (*Pseudotsuga menziesii* [Mirbel] Franco [Pinaceae]), ponderosa and singleleaf pinyon pines (*Pinus ponderosa* Lawson and *P. monophylla* Torr. & Frem. [Pinaceae]), and perhaps Utah and Rocky Mountain junipers (*Juniperus osteosperma* [Torr.] Little and *J. scopulorum* Sarg. [Curpessaceae]) migrated from southern refugia and filled suitable habitats at lower elevations. Although some shrub and herbaceous species experienced similar migration patterns, many saw only minor elevational changes in distribution (Nowak and others 1994). As a result of these independent, species-specific responses to climate change, some species associations identified for Pleistocene and transitional communities no longer exist today (Thompson 1990). Our point is that choosing that moment in time that divides migrants of the past into either natives or aliens can be rather arbitrary.

Human activities often accelerate migration rates by increasing dispersal distance and by facilitating circumvention of natural barriers. Whether resulting from intentional or accidental translocation, the rate of human-assisted migration has increased as mankind has become more mobile. One result is that, during the last few centuries, many old-world plants have migrated to new-world habitats, crossing otherwise near impassable barriers.

SPATIAL PERSPECTIVE

The distinction between native and introduced is also less than clear when viewed from a spatial perspective. What is "native" can be based on geographies as narrow as a single watershed and as broad as hemispheres. An extension of this logic is the notion that rather than a simple matter of black and white, the quality of being native is viewed in various shades of gray. This comes as a result of equating linear distance with biological or genetic distance. Thus following this line of thinking, the greater the geographic distance between the seed source and planting sites, the "less native" and therefore less desirable an exchanged plant might be. Real world conditions of migration and gene flow tend to be much more complex than is represented by this simple correlation.

In summary, what plant species are growing on a site at a given point in time depends upon what has been able to get there and what has been able to stay there; which is to say, what has successfully migrated and adapted to changing biotic and abiotic environments. Secondly, even without human intervention, what species or even whole community that will occupy the site in some unspecified tomorrow may be different from what is found there today. Finally, whether by intent or accident, humankind has had a dramatic impact on migration rates on a global scale. Consequently, many North American ecosystems are significantly and perhaps irreversibly altered.

PLANT MATERIALS SELECTION

Given the certainty of global climate change, the inevitability of both natural and human-caused migration, and the consequences of migration on plant communities, we suggest that society and land managers should focus more on ecosystem health than on labels of origin as they consider the development and use of plant materials in wildland communities. Therefore, a first consideration of whether or not a particular species or germplasm is suitable for a given site should be the potential impact of that plant species on local plant community stability and biodiversity at genetic, organism, and landscape scales. Because biodiversity and stability are largely independent functions of plant communities (Harper 1977; West 1993), we can expect that many species may produce both positive and negative impacts, all of which must be considered. Consequences of seeding many species are not known. Improved evaluation of past plantings will improve diagnostic accuracy.

Secondly, given existing and anticipated ranges of variability for both abiotic (for example, climate, soils, fire regime) and biotic factors (for example, weeds, herbivory, soil microflora), will the species or germplasm in question establish and persist? Will it function in concert with other desired species in the community to meet the management needs (objectives) of the site? Management objectives might include soil stabilization, watershed protection, wildlife habitat preservation or enhancement, livestock forage, forest products, recreational opportunities, and so on. These criteria should form the basis for species selection on most seeding projects, not solely on a label meant to qualify species by point of origin. A few basic principles follow:

First—Many native species meet management objectives as well as, and often better than, introduced materials. For example, four-wing saltbush (*Atriplex canescens* [Pursh] Nutt. [Chenopodiaceae]) is a native shrub adapted to salt-desert shrub, sagebrush, and pinyon–juniper communities throughout the western US (Sanderson and Stutz 1994). It has good drought tolerance and has considerable resilience to heavy grazing and burning. Its stature and canopy structure provide good nesting and escape cover for many wildlife species. High nutritive quality, good palatability, and evergreen foliage make four-wing saltbush an outstanding forage plant for livestock and wildlife. No introduced shrub has been proven equal to four-wing saltbush when established on the arid and semi-arid sites to which it is adapted (Figure 1).

Second—Sometimes introduced species meet management objectives better than do natives. Although many have been evaluated, no native bunchgrass has demonstrated the capacity of crested wheatgrass (*Agropyron cristatum* [l.] Gaertner [Poaceae]) to suppress weeds on semi-arid rangelands. This capacity is critical when the primary management objective is to reduce high fire frequency and rate of spread associated with high density stands of introduced annual grasses like cheatgrass (*Bromus tectorum* L. [Poaceae]).

Third—Sometimes less is more. For the same reason that crested wheatgrass is superior to native bunchgrasses, such as bluebunch wheatgrass (*Elymus spicatus* [Pursh] Gould [Poaceae]), in suppressing cheatgrass, it can also be inferior under distinct management objectives. Crested wheatgrass' superiority in suppressing cheatgrass is due to more effective use of soil resources, particularly cool-season soil moisture, than that of natives (Eissenstat and Caldwell 1989). If however, a primary management objective is to promote a rich species mix, native bunchgrasses like bluebunch wheatgrass may become the preferred choice (Hall and others 1999). These species are slower to assimilate soil resources and therefore allow


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Figure 2 • A common garden study of bluebunch wheatgrass (Elymus spicatus*) revealed local ecotypes were not always best adapted to particular sites.*

stronger development of less competitive forb and shrub seedlings. Smooth brome (*Bromus inermis* (Leysser) [Poaceae]) and intermediate wheatgrass (*Elymus hispidus* [Opiz] Meld. [Poaceae]) are non-native sod-forming grasses which are particularly effective in reducing native biodiversity (Monsen and others 1996). Prudence would dictate that such species should not be used for wildland plantings where biodiversity is an objective. The decision regarding what grass or grasses are best to plant on a particular site must therefore wait until overriding management goals are clearly identified.

Fourth—Local ecotypes or biotypes of a species are not always the best adapted to a particular site. Bluebunch wheatgrass is highly variable across its full range of distribution (Figure 2). Collections from the Snake River Plain of southern Idaho perform poorly in common gardens not far from collection sites when compared to collections from the Palouse region of eastern Washington and northern Idaho (Monsen and others 1998). Often two or more accessions may be essentially equally adapted to a site, even though in any single growing season one or another may excel above the rest.

This leads to a fifth point. Due to environmental variability on both geographic and temporal scales, it is often advantageous to maximize gene pool size for any given species. Natural selection can then be allowed to fine tune the population for maximum fitness to the site. We contend that more extensive use of broad based releases and multi-germplasm blends, whether native or introduced, should be employed (Jones and Johnson 1998).

In conclusion, the need to conserve genetic and ecological diversity is a responsibility for all participating in the development and use of plant materials in wildlands. Those entrusted with the care of public land shave a moral obligation to promote the stability of a broad diversity of plant communities. However, reclamation or restoration by artificial plantings is only one of many management options that effect biodiversity. Proper management of livestock grazing, mining activities, timber harvest, recreational uses, and fire can have great impact on ecosystem stability and diversity independent of any action to seed.

When the decision is to seed, it should be done from an informed position, based on past experience. This backward vision must include an understanding of what has happened with seeding attempts that are now 5, 10, 20, even 40+ y old (Monsen and Shaw 1983, Monsen and others 1996). We must learn from past successes and mistakes. How to become so well informed will be a real challenge. To do so will require a more concerted effort by research and monitoring programs. Educational and training programs are also inadequate. Often those in position to make critical decisions are lacking in knowledge and experience with plant materials and planting practices. This must change if we ever hope to move forward. We will also need forward vision to anticipate the challenges that the human race will face as steward of the land in a world with a growing and increasingly more mobile population.

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