The Social Values of Crested Wheatgrass: Pros, Cons and Tradeoffs

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ABSTRACT: The social values of crested wheatgrass are based on the biological characteristics that make it perhaps the most valuable plant available for range revegetation. Negative social aspects of crested wheatgrass arise from its foreign origin, in a general distaste for exotic species. A balance between these points can be developed under management programs that emphasize species diversity and reduction of monoculture size and extent. Most importantly, the introduced label on crested wheatgrass should be replaced by the recognition that it is now a North American range plant, proven by 90 years of testing and use. The grass should now be included in range management criteria and continue to be used in revegetation programs whereever it can best meet management objectives.

INTRODUCTION

Crested wheatgrass first gained wide attention in the drought-ravaged Great Plains of the 1930's. In the search for ways to stabilize the blowing, eroding, abandoned wheatfields of the region, it was crested wheatgrass that appeared to offer the best chance to quickly re-establish grassland. After the successful reseeding program, Dillman (1946) wrote:

> "The demand for wheat before and during the First World War brought about a marked change in agriculture of the great plains. Several million acres of native grasslands in the Northern Great Plains area of the United States and Canada were broken up and seeded to wheat during the period of 1905 to 1920. There appeared to be no need for a new dryland grass at that time. Finally the dry years of the middle thirties came on and abandoned wheat lands were in urgent need of grass. One could hardly have foreseen the heroic role that crested wheatgrass was to play in this living drama of the dry plains. It was the only grass available that would adequately fulfill this role. Already it's hardiness, productiveness, and longevity had been proved by experiments of the U. S. Department of Agriculture and state agricultural experiment stations."

Forty years later, however, Abbey (1986) in a general diatribe against livestock and ranchers was writing:

> "They (cattle) are a pest and a plague. They pollute our springs and streams and rivers. They infest our canyons, valleys, meadows, and forests. They graze off the native bluestem and grama and bunch grasses, leaving behind jungles of prickly pear. They trample down the native forbs and shrubs and cactus. They spread the exotic cheat grass, the Russian thistle and the crested wheat grass. Weeds."

It is clear that in the intervening period, a more complex and mutually opposed set of attitudes about crested wheatgrass had developed. The change was not linear, that is, the 1946 appraisal of crested wheatgrass did not evolve into the 1986 expression, but rather the latter joined the former. Today numbers of people entertain a general disdain of the grass; numerous other remain its apologists and, inevitably, an even larger group adopt intermediate positions.

The disagreement is a social rather than biological or technical problem, because crested wheatgrass and its main uses remain the same. Like all biological organisms, it has a set of characteristics that equip it to survive within a certain environment or, turned the other way round, crested wheatgrass has fitted itself to a certain environment through the process of selective change. Biologists speak of the environmental niche of an organism. In the case of crested wheatgrass, the niche is rather broad and extensive: the high, seasonally cold, semiarid, and often somewhat salty rangelands that occupy considerable portions of the Eurasian and North American landmasses. The general area of adaptation in North America is the Intermountain and Northern Great Plains regions of the United States and Canada. All or major parts of 11 states (Washington, Oregon, Nevada, Idaho, Utah, Montana, Wyoming, Colorado, North Dakota, South

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Dakota, Nebraska) and 3 provinces (British Columbia, Alberta, Saskatchewan) form its general distribution (Rogler 1960). The total acreage of crested wheatgrass is unknown, although Holechek (1981) suggests there may be 20 million acres in the United States and another 6 million in Canada.

The biological characteristics that enable it to prosper in that environment have long been known and, indeed, lie at the core of its widespread acceptance and support as a plant material suited to the reclamation of ravaged rangeland. The papers of this symposium and those found elsewhere in a very extensive body of literature bear ample witness of its characteristics. Today it is fair to say that crested wheatgrass is perhaps the most important range grass in North America and that we know more about it than any other grass of the western rangeland.

BIOLOGICAL CHARACTERISTICS AS SOCIAL VALUES

The Pros

Briefly, what makes crested wheatgrass what it is? Put another way, what gave it the social values associated with it in this century? As pointed out by Dewey (this volume) and many others, it is first of all not just a species, but rather a species complex of related varieties or cultivars commonly referred to as crested wheatgrass. The center points of the intraspecific variation are usually standard or Nordan (Agropyron desertorum), Fairway (Agropyron cristatum), and to a lesser extent Siberian (Agropyron fragile). Between them is found an unusually flexible biological entity, adapted to a wide variety of soil and climatic conditions within its zone of distribution.

Crested wheatgrass is a prolific producer of relatively large, viable seeds that germinate readily under a fairly wide range of moisture and temperature conditions (Young and Evans this volume). Once germinated, the seedlings display a strong vigor (Johnson this volume) that allows crested wheatgrass to rapidly establish in most seeded areas. Unlike many other grasses, crested wheatgrass is an agronomically forgiving species. Its requirements for proper seeding are less rigid, allowing it some prospect of establishment even when the seeding process is conducted improperly. Once established, the grass is tolerant of extremes in cold and drought, and remains productive under a wide range of growing conditions. Normally, crested wheatgrass outproduces the native grasses in its area of adaptation. Moreover, it is long-lived, persisting for many years in seeded stands (Rogler and Lorenz 1983).

Because of its germination, establishment and growth characteristics, crested wheatgrass offers a potential for providing early ground cover and site stabilization of reseeded lands. Like any biological organism, it has its environmental limits. But those limits are broad enough to allow it to be seeded on some very harsh sites with a reasonable prospect of success. Sometimes an assist in the planting year -- in the form of an unusually wet spring or a bit of irrigation -- will allow it to establish on sites otherwise hostile to revegetation. Thus its initial role of the 1930's continues today. It is often the only plant material available to revegetate some sites, at least to some degree. And it continues to offer the immense social value of relatively rapid, easy establishment on dryland plantings for early control of the site.

As forage for livestock and to a lesser extent for big game, crested wheatgrass has several valuable characteristics, among them the capacity for early spring greenup. Far earlier than the native grasses, it develops green growth, sometimes carrying over the winter green foliage developed under favorable conditions of the previous fall. This makes the grass of particular value for a livestock operation, equalled only by Russian wildrye (Psathyrostachys juncea).[1] It offers much-needed early spring forage for livestock and big game (Urness this volume), and enables vital early-spring deferment of native grasses in grazing systems of management. Later in the summer and fall, crested wheatgrass becomes dry and rank, especially if not grazed earlier, but retains the capacity for greenup again under fall rains. But it is as spring forage that crested wheatgrass is most useful.

Another forage characteristic of great value is the exceptional ability of crested wheatgrass to tolerate grazing, far more than any native grass of similar adaptation. This feature probably arises from having evolved over the centuries with large grazing animals on the Eurasian steppe. Its ability to withstand grazing endows it with exceptional value in grazing operations. It literally can open the spring forage bottleneck so common to Intermountain area livestock operations.

Far more than other valuable perennial grasses like smooth brome (Bromus inermis), timothy (Phleum pratense) and orchardgrass (Dactylis glomerata), crested wheatgrass is remarkably well behaved. Unlike many other introduced plant species, it stays where it is seeded and only sparingly volunteers into nearby areas. Indeed, many observers have commented on its occurrence in drillrows long after seeding. It shows little capacity to invade undisturbed rangeland; only scattered plants appear. On the other hand, crested wheatgrass is remarkably persistent in seeded stands. Many seedings established in the 1930's remain productive; some are even older.

Because of its wide use and productivity, a great deal of crested wheatgrass seed is produced annually. This in turn makes it relatively cheap in comparison to the seed of most other grasses. This is a characteristic of no mean consequence, because together with its easy agronomic utility, low price has been the determining factor in its selection by highway departments to stabilize roadsides, often creating strips of crested wheatgrass tens and even hundreds of miles long.

These biological characteristics endow crested wheatgrass with its social utility -- the 'pros' of its appraisal. On them has been based over a half-

[1] Nomenclature of the Triticeae grasses follows Dewey (1983).

century of widespread application in reseeding disturbed areas and improving forage production of western rangeland.

The Cons

At first glance it might appear that a grass with such obvious biological and social utility would have no characteristics that might imply a degree of disutility. But crested wheatgrass has a few, arising from the same characters producing its desirable features. Prominent among these are its high competitive ability that has allowed it to maintain seedings indefinitely. Many studies (DePuit this volume) have shown that even when seeded in mixtures as a minor component crested wheatgrass can assume dominance within a few years. That same competitive ability often forestalls secondary succession in seeded stands, essentially excluding major entry and establishment of native herbaceous species and most shrubs except big sagebrush (Artemisia tridentata). Indeed, Anderson and Marlette (this volume) have shown a lack of seed supplies of competing species in established sagebrush/wheatgrass stands, implying a successional stagnation. These results are by no means universal. There are many instances where crested wheatgrass has become a member of a vigorous seeded community with other introduced and native plants, or is found with many resident native species. There are even a few instances where crested wheatgrass has lost a competitive battle, notably with Russian wildrye. Nonetheless, reclamation of areas where the goal is reestablishment of native plant communities perhaps should not start with crested wheatgrass.

There is also objection to the frequent use of the grass in large seedings that form monocultures. Not only may successional change be blunted, but near-ideal conditions are created for epidemic outbreaks of insect pests such as black grass bugs (Labops and Irbisia spp.) as noted by Haws (this volume). And the large seedings are sometimes esthetically objectionable to many people.

While these negative aspects of crested wheatgrass culture are biologically well-founded, a much larger but less clear objection seems to issue from the fact that crested wheatgrass is not native to North America. As a general biological rule, there is good reason to prefer the use of natives instead of exotics because the gene pool of native vegetation is by definition adapted to the environmental conditions where it occurs. The adaptation of an exotic to those conditions is problematic, pending a long period of screening and study, and indiscriminate use could create new environmental problems (Black 1981). This statement is true over the whole range of adaptability. Plant species with insufficient adaptation to the environment in which they are introduced will not become established, or may not persist after initial establishment. The first category has of course no long term ecological consequences, but the latter could create problems if the introduced species are found unable to withstand subsequent environmental conditions.

At the other extreme, some plant species are all too well adapted, as the inadvertent release and subsequent distributional explosion of some species have shown. The alien annual cheatgrass (Bromus tectorum) is a prominent example, as are several noxious weeds such as leafy spurge (Euphorbia esula) and several knapweeds (Centaurea spp.). Avoiding these kinds of problems is almost an imperative, and fully justifies an extensive period of testing. On the other hand, some species equally well adapted but with inherent agronomic value, such as Kentucky bluegrass (Poa pratensis), are also widespread but for the most part have created no problems. This is also true of species widely used in a more agronomic sense, such as alfalfa (Medicago sativa) and, to a lesser extent, yellow sweet clover (Melilotus officinale).

Because crested wheatgrass was introduced to North America at the turn of the century, underwent extensive screening and testing until about 1920, and has been seeded on millions of acres since, it is clear that both the adaptation and agronomic utility of the grass have been established beyond question (Table 1). Hence it seems that objections to its use based solely on its not being a native species are simply prejudice, a form of 'botanical bigotry' as described by DePuit (this volume). Nonetheless, such perceptions do form a social 'con' of particular strength, now reflected in laws that mandate only native species be used to reclaim mined lands.

THE TRADEOFFS

A mature view of the social utility of crested wheatgrass in the late years of the twentieth century could well be based on the following observations:

First, the adaptation potential and agronomic qualities of the grass have been established through extensive testing and even wider practical use over many decades. The grass is exactly as it has been described: an introduced, cold-tolerant, drought-tolerant, highly productive and stable bunchgrass adapted to seeding rangelands throughout the Intermountain and Northern Great Plains regions of the United States and Canada. As such, it should continue to find many applications in reclaiming disturbed areas and reseeding rangeland to improve stability and production.

Second, it is equally clear that crested wheatgrass, just like any other biological resource, does not fit every situation, area or purpose. It is not, and never has been, a panacea. Its best uses must be defined by land managers and technicians able and willing to assess the ecological characteristics of a given site, evaluate that profile within an established set of management objectives, and then develop a treatment and management prescription. In this kind of an approach, crested wheatgrass will sometimes be useful, sometimes not. For example, an area whose ecological characters fit the adaptational profile of crested wheatgrass, but where management objectives call for the reestablishment of a diverse native community without particular reference to grazing use, should probably not be seeded to crested wheatgrass at all. In such case, the greater expense, difficulty, and problematic establishment of native species are worth their use.

Conversely, where the primary management objective is to develop an early spring grazing

Table 1.--An event chronology of crested wheatgrass since its introduction to North America.[1]

Year	Location	Event
1898	South Dakota	first introduction
1906	South Dakota	second introduction
1907-13	15 experiment stations	early testing
1915	North Dakota	forage research program
1921 (circa)	Montana	first general seeding in Great Plains
1923	South Dakota	first pasture experiment
1929	North Dakota	first offering of commercial seed
1932	North Dakota	first grazing study
1932	Saskatchewan	release of cultivar Fairway
1932	Idaho	first general seeding in Intermountain area
1937	west-wide	land utilization act seedings
1940's	Intermountain area	reseeding following big sagebrush control
1950's	Intermountain area	halogeton control seedings
1953	North Dakota	release of cultivar Nordan
1970's	west-wide	environmental concern
1984	Utah	release of cultivar Hycrest

[1]Compiled from Asay, Lorenz, and Young and Evans (this volume).

capability, or where a perennial ground cover must be immediately established, or where expense and ease of seeding are important, crested wheatgrass should be considered for its unquestioned values in those areas of concern.

Third, too-retrictive guidelines on use of crested wheatgrass, such as state regulations excluding use of all introduced species, are not helpful and often reflect ignorance of ecological understanding. Such regulations should be replaced by an ecological approach allowing maximum appropriate use of all available biological resources.

Fourth, many of the objections to the use of crested wheatgrass can probably be satisfied by management programs that emphasize species diversity and reduction of monoculture size and extent. For example, in many areas the introduced Russian wildrye and the rhizomatous native wheatgrasses western (Pascopyrum smithii) and thickspike (Elymus lanceolatus) have competed satisfactorily with crested. Where appropriate, these could be seeded with crested wheatgrass, or the planting area broken up along natural boundaries to reduce the extent of single-species monocultures. Special provisions can be taken as well to introduce adapted shrubs into a seeding, thereby increasing diversity and improving the overall grazing resource.

Fifth, and most important, the introduced label on crested wheatgrass, while historically true, has ceased to have meaning in ecological terms. The presence of crested wheatgrass in North America, like that of any other well-established introduced species, is impossible to reverse. In a continent full of human emigrants, crested wheatgrass and all of the other introduced plant species are their vegetative analogs; like them they are here to stay. The future ecological relationships of the Intermountain and Great Plains regions will necessarily contain crested wheatgrass. Hence, no useful biological purpose is served by continuing the distinction. The plant should now be included in vegetation classification schemes, contribute to range condition criteria, and be an indicator of range trend. It is in fact a North American range plant, and a particularly important and valuable one at that.

Equally, no important social purpose, save that of history, is served by continuing to label crested wheatgrass an exotic --a word that imputes a degree of instability and an ephemeral nature arising from its foreign origin. By any standard, crested

wheatgrass has disproved those allegations by its performance over the past 90 years. Hence it is high time that crested wheatgrass receives its citizenship papers and takes its place among the most productive, useful range plants in North America.

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