Ring Muhly—A Grass That Grows in Circles

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George F. Howe, Emmett L. Williams, and John R. Meyer*

Abstract

There is a grass that grows in ring-like patterns at the Van Andel Creation Research Center (VACRC), Chino Valley, Arizona. We discuss some aspects of the morphology, growth habits, and possible ecological benefits of *Muhlenbergia torreyi* which is also known as the "ring muhly." A study of its growth rate and growth pattern is being initiated at VACRC. We recommend ring muhly as a subject of future investigations by other creationists. In this paper we also comment on the origin of grasses and their significance in the creation model.

Muhlenbergia is primarily a New World genus having 160 species (Peterson and Ortiz-Diaz, 1997, p. 222). Studies of genetic affinities in the annual members of this genus are being conducted and the work of Duvall, Peterson, and Christensen (1994) is illustrative of such research. Unfortunately, these studies thus far do not include *M. torreyi*.

Muhlenbergia torreyi is a short grass that starts as one small clump. As years go by, the plant enlarges outward forming a circle with an expanding radius (Figure 1). Such a striking shape is what led people to give it common names like "ring muhly," "ringgrass," or "fairy ring." It can be found growing in every county of Arizona and it thrives best between 4000 and 7000 feet in altitude. It lives on rocky slopes, dry ridges, or sandy plateaus in thin soils like those at VACRC (McDougall, 1973, p. 50-52). It also occurs on deeper soils where it often indicates disturbance or declining site condition because of factors such as overgrazing. Hanson and Smith (1928, p. 142) indicated that in the vicinity of Fort Collins, Colorado, ring muhly was a dominant grass on "...compact soils that contain available moisture during part of the growing season in only the surface 6 to 24 inches." They also found that ring muhlenbergia "...indicated shallow well-developed hardpan-like structure," (p. 142). *M. torreyi* thrives over much of the western United States from Kansas and Wyoming to Texas (Hitchcock, 1971, p. 402) and in

Figure 1. This clump of *Muhlenbergia torreyi* has developed into a circular pattern. The wrist watch gives size and perspective.

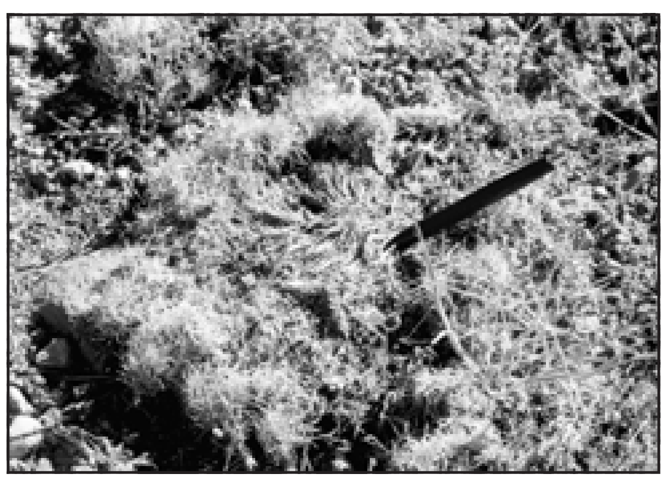

Figure 2. The pen tip pierces a zone of dead plant organs left behind by the growing fringe at the left.

*George F. Howe, 24635 Apple Street, Newhall, CA 91321-2614
Emmett L. Williams, 7312 Club Crest Drive, Flowery Branch, GA 30542-5590
John R. Meyer, 6801 N. Highway 89, Chino Valley, AZ 86323
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Figure 3. Ring muhly plants form fascinating geometric patterns.

Figure 4. *M. torreyi* **plants in this view are 8 cm or less in height. The taller plants are other grasses.**

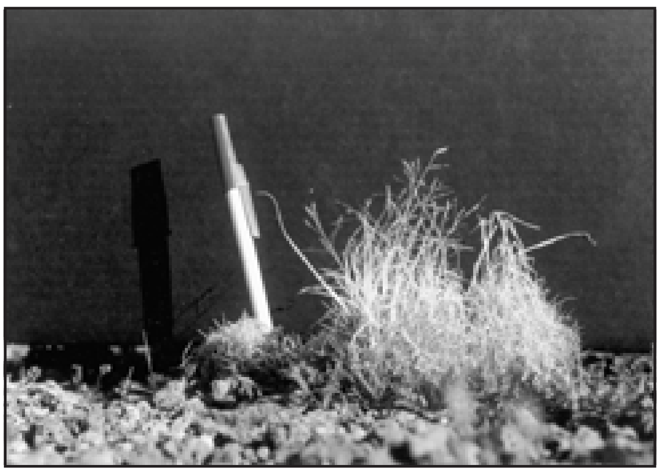

Figure 5. A branching inflorescence or flower cluster of ring muhly seen to the right of the pen, against the black background.

Figure 6. Individual leaves of muhly grass are about one inch long (left of pen).

northwestern Argentina (Peterson and Ortiz-Diaz, 1997; Missouri Botanic Garden, 1996).

Growth of the expanding ring muhly colony occurs on the outer edge of its circumference while dead leaves and stems of previous years accumulate inside that circle (Figure 2). In some cases the original ring apparently changes to yield an arc, when part of the colony dies. Sections of surviving arcs can ultimately assume configurations that are almost linear. A field of ring muhly thus displays such patterns as circles, arcs, and lines forming a pleasant geometric maze across the ground (Figure 3).

M. torreyi was one of the first plants to attract our attention during early visits to the CRS property at Chino Valley. At first we did not know its proper classification (Howe, 1984, p. 13) but Joneen Cockman identified it and has filed specimens of it in the CRS Herbarium.[1] Ring muhly currently grows most extensively on the eastern portion of the CRS property and also flourishes on a broad grassy belt which separates the front VACRC fence from Highway 89, a strip which is periodically used by power company trucks. This may indicate that *Muhlenbergia torreyi* is a grass that can withstand moderate vehicular traffic.

Ring muhly's hollow stems (culms) range from eight to 40 cm in height (McDougall, 1973, p. 52) but in ours they were generally quite close to the lower end of this height range (see Figure 4). We transplanted some clumps of ring muhly and raised them in an environmental chamber where they were well watered. Under those conditions for a few weeks, new leaves formed and the distance from the soil to the tip of the top leaf was 16 cm.

The flower cluster bears flowers on each of its many branchlets (Figure 5). The individual leaf blades of *M.*

[1]This herbarium is an ongoing project and has been the subject of another report (Cockman, 1988, p. 187).

Figure 7. Mat-like disk of dead rhizomes, living arc, and root system are visible here.

Figure 8. Photograph showing some of the root system attached to the plant itself.

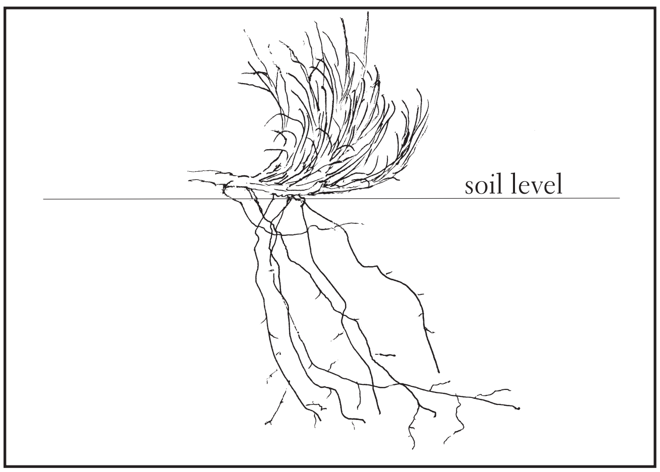

Figure 9. Sketch showing how roots arise for about one inch along rhizome and extend forward ahead of the arc.

Figure 10. The level of the soil inside these rings (right) is slightly higher than the bare ground level near the ruler (left).

torreyi growing in the field were about 3 cm long (Figure 6 and Figure 7) but the leaves forming on well-watered plants in our growth chamber were up to 6.2 cm in length. New leaves form during rainy seasons but this plant carries on with its life in the dry seasons as well because the little green leaves are rolled lengthwise ("involute") which helps them conserve water.

The leaves maintain a healthy pastel green color even during the midsummer drought and throughout the winter. This means that muhly grass is a plant for all seasons—a perennial that is ready to carry out photosynthesis whenever temperature and other environmental factors permit.

While growing outward, a muhly grass ring leaves a thick mat of dead stem and leaf material (Figure 7)—see Weaver and Albertson, 1956, p. 218. Measuring 10 large colonies, we found the average mat width to be 12 cm. Vertically, the mat is several centimeters deep, lying directly on the soil.

Growing outward from the edge of the colony are the roots of *M. torreyi* (Figures 7 and 8). In the colony we inspected, these were about four inches long and they extended beyond the edge of the colony, into fresh soil. Functional roots were present for about one inch along the rhizome horizontally (Figures 8 and 9).

We suspect that the expanding ring growth pattern helps these colonies obtain unobstructed space (for continued growth) and fresh supplies of mineral nutrients. Inside each circle or arc the soil level is slightly higher than the level of exposed soil nearby (Figure 10). We inspected several colonies and found that the level of soil inside was often about two cm higher than the soil outside the ring. Perhaps this difference results from the buildup of old leaves and stems, as well as from airborne

Figure 11. Ephemeral grasses and flowering herbs are seen here blooming inside a muhly ring (11a above) and right in the arc itself (11b below).

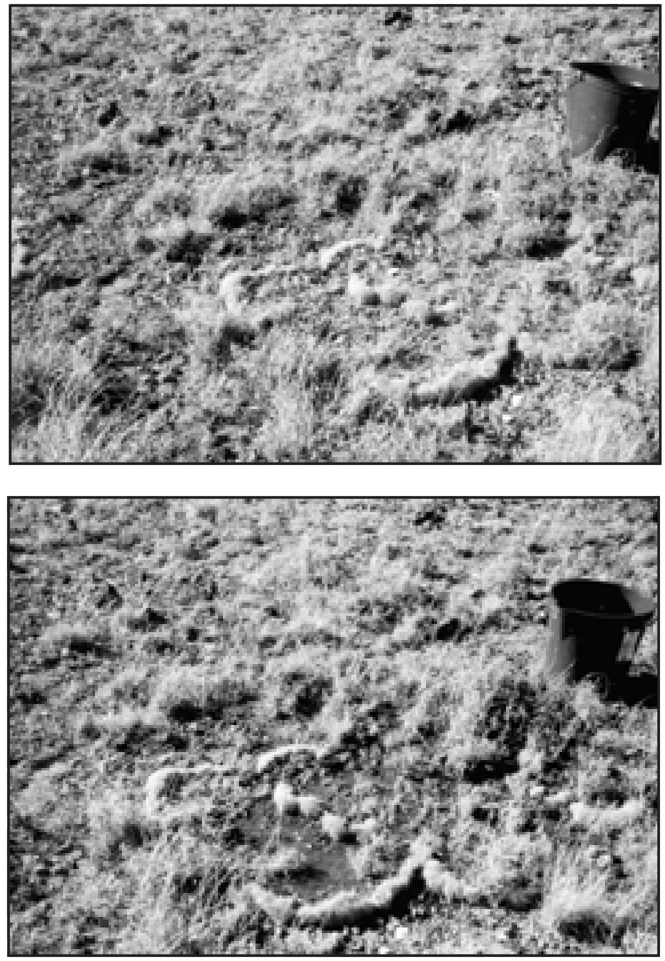

Figure 12. Cluster of *M. torreyi* plants before water is added (12a above) and the same cluster of plants after a pail of water has been poured into the center (12b below). Note how the water has been somewhat confined by the grass plant fringe (darker soil within).

soil particles that accumulate inside the arc. The colonies may collect wind eroded soil, as happens around the stems of creosote bushes where mounds are formed. Mineral and organic matter inside these expanding *M. torreyi* colonies may foster the growth of various ephemeral plants which are seen to germinate and bloom inside the rings (Figure 11).

Many arc-shaped colonies are arranged at approximately right angles to the direction of water flow downslope. *M. torreyi* plants may possibly reduce sheet erosion of soil during rain storms by serving as living terraces. Muhly's series of arcs, circles, and linear shapes may very well modify and divert the flow of water across the soil surface. We tried pouring gallons of water into circular colonies and found that they readily absorbed the moisture and prevented it from running directly downhill (Figures 12a and 12b). After a rain storm this inner band of dead tissue serves as a sponge, hoarding water and making it available to the ring of living plants attached.[2]

We have noticed that these circular or arcuate colonies never reverse themselves by growing inward toward the center from which they arose. Perhaps the growing edge of ring muhly plants deposits some chemical compounds that prevent growth back into the dead mat—a phenomenon known to plant ecologists as "autotoxicity." The production of fairy rings in sunflower species (*Helianthus seaberrimus* and *H. tuberosus*), for example, has been shown to occur because of a labile chemical substance derived from the underground plant parts—a material that prevents the sunflower from growing backward into the ring (see Muller and Muller, 1956, p. 354). If autotoxicity prevails inside ring muhly colonies, the toxin appears to have no inhibitory effect on certain other herbs which grow right inside its rings (Figure 11). It is

[2]There is another grass at VACRC that can yield circular and arcuate colonies—the blue grama grass (*Bouteloua gracilis*) (Figure 13).

Figure 13a. *Muhlenbergia torreyi* **colony to the left. To the right is a portion of a blue grama ring (***Bouteloua gracilis***). Note the greater height of blue grama plants.**

also noteworthy that new muhly colonies can arise inside an old colony ring, just a few inches back from the old colony's growing arc (Figure 14).

M. torreyi is familiar to ranchers and range-management personnel and two of them considered it to be undesirable: "Two undesirable grass species, sixweeks fescue and ring muhly, were present in the pastures in all three periods" (Klipple and Costello, 1960, p. 21). These writers probably classed ring muhly as undesirable because "It was not grazed by the cattle . . ." (p. 21). In two comprehensive studies of grazing on New Mexico rangeland (Donart, Parker, Pieper, and Wallace, 1978; Pieper, Donart, Parker, and Wallace, 1978) there was no mention of any aversion of cattle to the ring muhly.

Even if it were unpalatable to range cattle, ring muhly has other attributes that would easily remove it from the category of pest. It probably plays an important role in soil enrichment and soil conservation. Weaver and

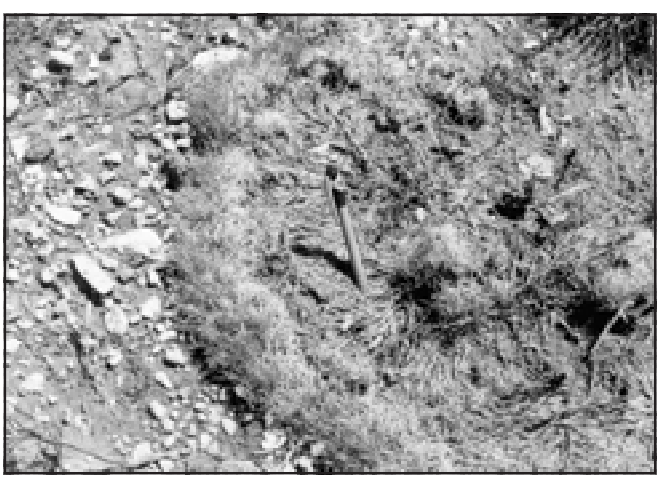

Figure 14. New ring muhly plants can originate inside an old arc, several cm behind the growing front.

Figure 13b. A ring-like colony of blue grama close up. Note the culms and flower stalks which are taller than those of *M. torreyi***.**

Albertson (1956, p. 218) found that *M. torreyi* had an extensive root system with a wide lateral spread. Its roots occurred throughout the upper 2.5 feet of soil and some of them went as deep as 4.5 feet. This means that muhly, like other range grasses, brings buried calcium and other mineral nutrients back into circulation from the subsurface zones where they have been deposited.

One of the research reports we found dealing with ring muhly showed that it was unaffected by treatments with the pelleted herbicide tebuthiuron applied to range land in New Mexico to kill sagebrush (McDaniel and Balliette, 1986, p. 276). Peterson and Ortiz-Diaz (1997) found by studying alleles for enzymes that the South American *M. torreyi* populations have recently dispersed from the U.S. and from the Mexican populations both of which have greater genetic variation than the Argentine populations. In a Colorado study, ring muhly was shown to make up 3% of the vegetational cover on short grass prairies (Kinraide, 1984, pp. 279-280). In an earlier paper (Kinraide, 1978), he showed that in El Paso County, CO, *M. torreyi* associates positively with the cholla cactus (*Opuntia imbricata*). Holechek and Pieper (1992) mention *M. torreyi* as one of the grasses in the short grass prairies they studied in New Mexico to determine the number of cattle to put on various rangelands. Also in New Mexico, ring muhly was one of the dominant plants on blue grama uplands studied to determine the effect on nitrogen fertilization (Donart et al., 1978. The nitrogen fertilized plots were significantly more productive than unfertilized control plots. It also figured in another study by these same authors (Pieper et al, 1978) to determine how the grazing pattern would affect livestock production on New Mexico rangelands. While grass production was greatest under a rotation system, livestock production was best under continuous grazing.

We are curious as to how rapidly a growing arc of *M. torreyi* will move across the soil. To that end, nine locations were selected where we have placed rebar pegs at the very front edge of ring muhly colonies (Figure 15). Measurements in future years should demonstrate the rate at which these arcs grow forward in the desert-

Figure 15. Rebar pegs near pen in the center (and at the top) are stationed at the leading edge of ring muhly colonies to permit growth measurements in later years.

grassland conditions of central Arizona. Individual small clumps will be marked to discover how long it takes this grass to change from a clump to a ring shape. We also wish to observe how the clumps get started in the first place and how some of them turn into arcs instead of rings.

Several questions emerge from our study. If ring muhly is tough enough to resist moderate truck traffic, why did it make up only 3% of the cover in a short grass prairie study? When muhly grows under conditions of ample moisture, does it still maintain an expanding circular pattern? Is *M. torreyi* rejected by cattle and if so, why? Is it eaten by sheep? Does ring muhly grow best where it has little competition from other grasses? If so, is it a "pioneer" in ecological succession within grasslands? These and several other questions regarding its possible autotoxicity need to be addressed. We commend ring muhly to researchers as a prime organism for studying the Creator's handiwork and as an example of a providential piece in the jigsaw puzzle of western ecosystems.

Appendix—Grasses and Creation

One of the locations where grasses are mentioned in the Bible is in Genesis 1:11-12. Here they are listed as having been formed by the Lord on day three. This is an amazing record because grasses are considered by macroevolutionists to be among the most "highly advanced" flowering plants. Their inclusion on day three of the Creation week, along with all other plants, is at odds with long-age schemes of accommodating day three with the supposed "ages" of plant-fossilization. It is likewise in direct conflict with all evolutionary theories—theistic evolutionism, agnostic evolutionism, deistic evolutionism, or naturalistic evolutionism. Apparently God made grasses and all other flowering plants at the same time that He created the "lower plants" like mosses and algae. The evolutionary series of plant development, as derived from the fossil record, is explained by the creationist as the result of pre-Flood ecological zonation and other factors relating to the dynamics of the deluge. While it is possible that the Creator performed some "microevolution" to yield new species *within* the kinds, it is important to affirm that no biologist has every witnessed the origin of a new kind (baramin) in nature. Perhaps future studies on the genetics and biochemistry of the many *Muhlenbergia* species will suggest where the boundaries of God's created kinds actually lie in this genus and how much change has occurred since the creation event.

Acknowledgments

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Book Reviews

***Field Studies in Catastrophic Geology* by Carl Froede**
Creation Research Society Books, St. Joseph, MO. 1998. 120 pages, $15
Reviewed by John Woodmorappe

The author is a creationist and also a professional geologist who works for the United States Government. This is a book which is loaded with pictures and descriptions of the geology of many places in the US. Naturally the geology of the southeast US is emphasized as that is the home of the author. Particularly impressive are the photographs of dinosaur fossils, shell beds, layered volcanic deposits, lava flows, sandstone dikes, large boulders, ripple marks, and large turbidites. A series of simple diagrams assist the reader in understanding the contents of the book.

The book contains an introduction by Dr. Emmett Williams and an afterword by Dr. Henry M. Morris. Here is how the latter assesses the work:

> Thankfully, Carl Froede is one of a growing number of younger geologists (and may their tribe increase!) who are not ashamed of God's Word and are also well trained and experienced in the earth sciences and are now seeking sacrificially to reinterpret all the geologic data in the context of the literal and divinely inspired record of Scripture (p. 73).

The work of Froede and other creationist geologists stands as an open rebuke to the many compromising evangelical geologists who buy into the uniformitarian long-age system of geology. Froede also deftly shows the errors of the neo-Cuvierist position (that is, those who accept a time-compressed version of the geologic column as reality, and who thereby relegate the Flood to only a small portion of the sedimentary record).

There are separate chapters on such topics as geological time, pseudo-environmental facies, fossiliferous storm deposits, clastic dikes, paleocurrent analyses, turbidites, and other matters relevant to modem geology. The book includes a short glossary for those not acquainted with geologic jargon.