

## Buffelgrass webpage under construction, check back soon

### Buffelgrass Fact Sheet

#### Origin/History

- Native to Africa, Asia, and arid and semi-arid Europe <sup>15</sup>
- US Soil Conservation Service brought to southwest in early 1940s <sup>2</sup>
- T-4464 is most common variety in North America <sup>3,22</sup>

#### Distribution

- Occurs in the following US states: AL, AZ, CA, FL, HI, LA, MO, MS, NM, NY, OK, TX (also in Puerto Rico and the Virgin Islands) <sup>4</sup>
- In Arizona, occurs in Pima, Pinal, Maricopa and Yuma counties <sup>5</sup>
- Has invaded and become established in disturbed and intact desert scrub environments in Australia, Hawaii and the southwestern US <sup>22</sup>
- High salinity, freezing temperatures, tight clay soil, deep sand, high water table and poor surface drainage limit distribution <sup>14</sup>
- More than 1 million ha in central Sonora, Mexico, have been converted from native desert scrub and thorn scrub to *P. ciliare* pasture since the 1940's <sup>28</sup>

#### Growth Form/Reproduction

- Bunchgrass, sometimes stoloniferous <sup>1</sup>
- Reproduces by seed sexually and apomictically <sup>1</sup>
- Seed set much more likely when plants cross-pollinate than when self-pollination occurs <sup>6</sup>
- Plants can propagate by rhizomes <sup>7,22</sup>
- Seeds are viable in the soil for up to 4 years <sup>8</sup>
- Seed dispersal occurs by water, wind, animals (livestock and wild) and humans (on clothing and via vehicles) <sup>1</sup>

#### Germination/Growth

- Seeds can mature within the range of a few months up to 18 months <sup>7</sup>
- Germination occurs between 50° F and 104° F, with best rates of germination occurring at 86° F or alternating with nighttime temperatures of 68° F <sup>9</sup>
- Three-month-old seed from 30 *P. ciliare* ecotypes germinated at an average rate of 162% <sup>10</sup>
- Minimum precipitation needed for germination in a glasshouse is 0.124 in. on each of two consecutive days <sup>11</sup>
- Optimal soil depth for germination is 1 – 2 cm <sup>7</sup>
- Germination occurs at soil pH levels from 3.0 to 7.0; rarely outside that range <sup>12</sup>
- Leaf growth occurs when mean minimum temperature is above 50° F; active growth occurs only when mean minimum temperatures are between 59-68° F and mean maximum temperatures are below 104° F <sup>3</sup>
- Dormant, mature plants put on new growth after soil temperatures exceed 75° F and precipitation begins <sup>14</sup>
- Can reproduce within the span of six weeks, and can produce inflorescences multiple times a year; has been observed to reproduce in less than 6 weeks <sup>15,41</sup>

- Seedling establishment occurs most frequently at the start of the wet season <sup>22</sup>
- Production decreases as plant density reaches 5 – 10 plants/yd<sup>2</sup> <sup>14</sup>
- After a dense patch burns, open areas allow increased solar radiation at the soil surface, resulting in increased photosynthesis and colonization <sup>18</sup>
- Withstands extreme environmental conditions: strong wind, soil erosion, nutrient-depleted soils and aridity <sup>29</sup>
- Seed dormancy increases if water stress occurs when seeds are maturing <sup>34</sup>
- Seed dormancy decreases when soil fertility and temperature increase <sup>34</sup>

### Soil Preferences

- Requires well-drained soils; doesn't do well in saturated soils <sup>13</sup>
- Does best in sandy loam soils; does poorly in sand because of low water-holding capacity and poor fertility <sup>14</sup>
- Seedlings do not survive on silt, silt loam, silty clay loam, silt clay, or clay soils <sup>3</sup>
- Spreads in areas with low N and organic C levels <sup>13</sup>

### Climate/Precipitation

- Thrives at elevations from sea level to 1300m (4265 ft) <sup>15</sup>, but can be established from seed at elevations from 19 – 2720 ft. It has been collected in New Mexico at 5597 ft <sup>3,42</sup>
- To establish and persist, needs 90 growth days in summer; observations at Saguaro National Park suggests it needs about 12-24 days <sup>3,41</sup>
- In North America, spread occurs in areas where mean minimum temperature range is between 41 - 59° F in the coldest month and mean maximum temperature range is between 75 - 90° F <sup>13</sup>
- 95° F is the optimum temperature for photosynthesis <sup>7</sup>
- Performs best in arid regions with rainfall during the growing season of 71 to 98 inches <sup>33</sup>
- Favorable rainfall ranges from 8 in. (in the Turkana Desert and northwestern Mexico) to 49 in. (in Australia); desirable rainfall can occur bimodally in summer/winter or summer/fall, bimodally in summer, or during a summer peak <sup>3</sup>
- Establishment and potential spread most likely in areas with annual precipitation of 13 – 22 in.; minimum precipitation required for establishment and spread is greater than 67 in. in summer <sup>3</sup>
- Does well in areas where precipitation ranges from 6 – 24 in., mostly occurring in summer <sup>16</sup>
- In Australia, has withstood 5-day flooding with no plant loss, and 20-day flooding with 20-85% losses (dependent on the cultivar); taller, ungrazed cultivars were more resistant to flooding <sup>17</sup>
- Dormancy occurs in response to water stress <sup>19</sup>

### Competition

- Plant is very tolerant of heavy grazing <sup>20</sup>
- Tolerates short periods of over-grazing; prolonged heavy grazing results in decreased root growth <sup>14</sup>
- May inhibit germination and growth of legumes by producing phytotoxic chemicals <sup>21</sup>
- In northeastern Queensland, Australia, herbaceous species richness decreased in areas where *P. ciliare* was dominant; at some scales, species richness declined as *P. ciliare* biomass increased <sup>25</sup>
- In Organ Pipe Cactus National Monument, it outcompetes several native shrubs, such as creosote, saltbush and bursage, and associated native grasses and forbs <sup>22</sup>
- Replaces native pili grass (*Heteropogon contortus*) communities in Hawaii <sup>30</sup>

- Invasion can negatively affect animal community structure by filling in open spaces needed by some bird species <sup>14</sup>
- In parts of central Queensland, Australia, it displaces riparian acacias and eucalypts, as well as native grasses <sup>38</sup>

### Ecological Processes

- In the arid southwest, it promotes wildfire and re-sprouts readily after fires, excluding native vegetation and, thereby, altering plant communities <sup>22</sup>
- In areas where *P. ciliare* is present, soil water infiltration decreases and nutrient cycling is altered <sup>23</sup>
- Changes soil by increasing organic matter content, which insulates the soil surface <sup>13</sup>
- Depletes soil nutrients nitrogen and phosphorus <sup>24</sup>
- In areas with high rainfall, *P. ciliare* grasslands have organic carbon- and nitrogen-poor soils <sup>13</sup>
- In areas where rodent middens or fires have resulted in high levels of nitrogen and phosphorus, it can displace and kill native vegetation <sup>32</sup>
- Soil erosion often increases when *P. ciliare* becomes established, causing increased surface water runoff and degraded water quality <sup>31</sup>
- Buffelgrass fuel loads of 1- 4 tons per acre were found on Saguaro NP <sup>26</sup>  
This is more than 2 times to 4,000 times usual Sonoran Desert fuel loads  
(including non-native grasses such as red brome and Mediterranean grass) <sup>26,27,43-45</sup>

### Expansion

- Modeling suggests that *P ciliare* has the potential to cover 53% of the Mexican state of Sonora, based on elevation, soil type and rainfall <sup>35</sup>
- Imaging technology suggests that *P ciliare* pastures increased from 7700 ha to more than 140,000 ha in Sonora between 1973 and 2000 <sup>36</sup>
- At Saguaro National Park in Tucson, Arizona, *P ciliare* is increasing at an annual rate of 35.5% <sup>37</sup>

### Management

- Effective management involves an integrated approach, including manual control followed by chemical treatment and restoration <sup>22</sup>
- Manual removal can control small patches of *P ciliare* if the entire root is removed to prevent re-sprouting <sup>22</sup>
- Cutting or mowing can be used prior to herbicide application to decrease biomass, thereby requiring less herbicide to be used <sup>22</sup>
- Continual, heavy grazing may decrease root depth and make herbicide treatment more effective; it may also make the plant less resistant to drought <sup>22</sup>
- *P ciliare* is less likely to become well-established in areas with dense vegetation and low light levels <sup>22</sup>
- Repeated manual or chemical control within a growing season, within years and for several years is necessary to exhaust viable seed in the soil <sup>41</sup>

### Yield/Forage Value

- Under cultivation, annual productivity of *P. ciliare* is between 1 and 37 MT/h, depending on environmental conditions<sup>39</sup>
- Seed yield in Tanzania was 150-210 kg/ha without added nitrogen<sup>7</sup>
- In Queensland, seed yield without irrigation or added nitrogen was 8 kg/ha<sup>7</sup>
- *P. ciliare* is considered a highly nutritious pasture grass in hot, arid regions. One hundred grams of green grass contains 110 g protein, 26 g fat, 732 g total carbohydrate, 319 g fiber and 132 g ash. One hundred grams of hay reportedly contains 74 g protein, 17 g fat, 792 g carbohydrate, 352 g fiber and 117 g ash<sup>40</sup>

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