Buffelgrass Facts and Figures

August, 2019

Threats to the Ecosystem

Fire is the **greatest threat** because of radical changes in fire regime in desert areas.

- Buffelgrass will allow **more frequent fires**.[47,48]
  - Buffelgrass creates **combustible fuel** that is present year round (it is a perennial plant).
    - The Sonoran Desert historically burned every ~ 250 years or more when annual plants boomed after wet periods, and even then fires were mild and patchy. [1-4]
    - **Frequency will increase** because of continuous grass that allows fire spread from backyards to natural areas.[33,35-37,47,48]
- Fire **size will increase** because fuel allows fire to spread further, burning more area.[2, 5-7, 47,48]
- More grass means **increased fire intensity.**
  - Buffelgrass **fuel loads of 1- 4 tons per acre** were found on Saguaro NP. [8,9,62] Similar fuel loads have been recorded in Australia.[59]
    - 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). [8-12]
  - Buffelgrass fire **temperatures** were recorded at **1300-1600 F** [8,62] versus 190 – 750 F recorded in wildfires fueled by desert annual plants.[13]
  - Rate of buffelgrass fire spread was recorded at **2-3 mph** under moderate weather conditions. [8, 61]
    - Predicted rate of spread is 4-48 times faster than usual Sonoran Desert fires.[14]
  - Buffelgrass **flame length recorded at 12-18 ft** under moderate conditions.[8,61]
  - Buffelgrass fires miss very little: 99% of available fuel was burned in one experiment.[8]
- **Damage from wildfires will be unprecedented.**
  - Previous fires in the Sonoran Desert were fueled primarily by non-native annual grasses (red brome/Mediterranean grass), [3,15,16] and resulted in 20-80% saguaro mortality and significant mortality to other desert vegetation including barrel cacti, cholla, and paloverde tree. [1,2,6,10,17-22]
  - Damage from buffelgrass fires will increase to levels not experienced before because of more fuel. [6,9,18,20,23,47]
- Fire damage will likely lead to **increases in other invasive species and buffelgrass.**[31,33,47]

Signature and common species of the Sonoran Desert are threatened

- Buffelgrass increases exponentially.[45]
- Untreated areas were documented with a 350% increase of buffelgrass over two years in one place in the park.[50]
- Buffelgrass *directly* affects plants through **competition and habitat alteration.** [6,7,16,24-26, 45,47,48,60]
  - Above 40% buffelgrass cover, native plant cover is very low.[8, 45,61]
  - Large patches of buffelgrass "may be largely devoid of native vegetation."[45]
- Buffelgrass may have chemical compounds that inhibit germination and growth of other plants.[46,49]
- Buffelgrass *indirectly* affects plants and animals from **fire-induced mortality.**
  - **Native species did not evolve with fire**; many desert plants are fire-intolerant, and animals move too slowly to escape or are not adapted to the fire-altered habitat.[6,22,27-31,47,48]
- Buffelgrass has been documented as reducing condition of desert tortoises through habitat changes, with the potential for more severe long-term impacts.[58]
- Recurrent fires could cause **localized extinction** and result in vegetative type **conversion into a grassland or scrubland** [7,8,9,32-34,61] and an overall **decrease in Sonoran Desert biodiversity.**[16,24,27,28,38,61]

Public safety and the economy

- **Public safety and private property will be threatened** by intense wildland urban interface fires.[8,14,15,39,62]
- Tucson's **economy will be harmed**, because it depends on tourism, which depends on the Sonoran Desert's unique plants and animals.[44,48].
- **Real estate values may decline** because of the threat of fire and damaged environment. [44]

Saguaro National Park's Buffelgrass Efforts

Saguaro National Park is among the leaders in the efforts to control buffelgrass.

- Park employees and volunteers are **using herbicides** and **manually pulling and digging up** buffelgrass.
    - Pulling and spraying both require **at least 3 years of repeated treatments** because of seeds left in the soil [41,42]
- We are also **conducting or funding research and monitoring** to find the best ways to control buffelgrass and protect native species.
- Park research shows that herbicide can still effectively kill buffelgrass when the plant is in early dormancy (~50% green).
- The Park uses glyphosate as an herbicide, which must be absorbed through green leaves. The Park has experimented with other herbicides, and has funded research using grass-specific herbicides, but glyphosate still remains the best option currently available—least toxic and most effective.
    - Glyphosate has low toxicity, but it is an eye irritant.[57]
    - The NPS follows EPA guidance on herbicide use. The EPA currently does not consider glyphosate a carcinogen.
    - Results of numerous studies of its links to cancer have been contradictory. The World Health Organization considers it a probable carcinogen[51], and the state of California do consider it a known carcinogen.[52] WHO places glyphosate in the same class as eating fried food and working a night shift.[53] California places it in the same category as tobacco smoke[52].
    - The WHO states that the probability of developing a cancer "will depend on factors such as the type and extent of exposure and the strength of the effect of the agent."[51]
    - Cancer Assessment Review Committee of the EPA found that glyphosate should be labeled as "not likely to be carcinogenic to humans"[54] and the European Food Safety Authority and European Chemicals Agency both determined that glyphosate was unlikely to pose a carcinogenic hazard to humans.[55,56]

Facts and figures about Saguaro National Park's efforts:

- Buffelgrass was introduced into southern Arizona beginning in the 1930's for erosion control and for livestock forage.
- Numerous strains have been collected throughout its range (stretching from Africa to India) in attempts to find species and cultivars to improve forage production and soil conservation. The strain in Southern Arizona is cultivar T-4464. That strain was collected in the Turkana Desert in Kenya in the 1940's by a scientist from South Africa. Seed was shipped to the US Department of Agriculture in 1946. T-4464 was released by the Soil Conservation Service in 1949, and by 1985, seed companies in Texas had sold almost 8,000 tons of seed, and Texas ranchers had established it on about 10 million acres of land.[63, 64]
- 1970's-1980's, buffelgrass widely planted in the area for erosion control.
- **1989 first known observation** of buffelgrass in the Park (photograph from saguaro monitoring)
- 1991 first written record of buffelgrass in the Park
- 1993 staff and volunteers **begin manual removal of buffelgrass**

- 2000 increased awareness and park attention to buffelgrass; establishment of Invasive Plant Program
- 2002 extensive survey of buffelgrass at both districts estimated ~175 acres of buffelgrass
- 2003 spatial logistic regression model produced which predicts buffelgrass could occupy up to 100% of the Arizona Upland of the Sonoran Desert biome within the park [42]
- 2002-2004 research project to evaluate various control methods
- 2004 Environmental Assessment and Exotic Plant Management Plan
- **2005 begin use of herbicides to control buffelgrass**, complementing manual removal
- Fall 2012, estimate of **over 2,000 acres of buffelgrass** in the park
- 2013-2014 Environmental Assessment used to evaluate potential use of aerial spraying for areas too remote or too rugged for ground treatments
- **2014 aerial spraying of buffelgrass began,** complementing ground spraying and manual removal.
    - Numerous mitigations enacted to protect human safety and natural and cultural resources.
        - No-spray zones around private property (1/8 mile from private land and 1/4 mile from occupied buildings).
        - Large droplet size to prevent drift, keeping the herbicide on target.
        - Strict weather guidelines, especially wind, to reduce drift.
        - Spraying where buffelgrass is 50% or more of the plant cover. (Few native plants are present in these dense patches.)
    - Three years of intense monitoring has found that aerial spraying reduces buffelgrass dominance, and that saguaros and palo verdes suffered minimal damage.[50] This is probably due to the waxy cuticle present on cacti and small leaves and differences in metabolism in palo verde.
    - 2017 will be the final year of intense monitoring, but long-term monitoring of saguaros will continue
- Volunteers contribute over 3,000 hours annually to help control buffelgrass
- Estimated costs average $500/acre (range $200-$600/acre) for chemical treatments

Community Efforts

The fight against buffelgrass is a **community-wide** effort.

- Multi-partner Buffelgrass Working Group implementing the Southern Arizona Buffelgrass Strategic Plan
- Pima County hosts educational trainings and speakers bureau; developed outreach materials
    - See: https://tucsoncleanandbeautiful.org/buffelgrass-education-removal/
- Pima County ordinance to control buffelgrass when deemed a threat to human safety and property
- Rural Metro developing strategies for prevention/education/mitigation, and modifying training to reflect new fuel source
- Region-wide volunteer efforts to map and pull buffelgrass, and numerous "weed wacking" groups in the area (see http://www.desertmuseum.org/buffelgrass/volunteer.php)
- Annual, community-wide Beat Back Buffelgrass Day, with over 1,000 volunteers per year.

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Resources

www.buffelgrass.org
http://www.nps.gov/sagu/naturescience/invasive-plants.htm

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* Note: There is disagreement in the taxonomy of buffelgrass. In Asia and Australia and in older American literature, buffelgrass is called *Cenchrus ciliaris*, but most American literature calls it *Pennisetum ciliare*.