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MEMORANDUM

DATE: July 19, 1996 5400.1

TO: S. M. Nesta, Ecology, Bldg. T130C, X6386

FROM: *M.B. Murdock*
M. B. Murdock, Ecology, Bldg. T893B, X3560

SUBJECT: TRANSMITTAL OF 1994 BURN REPORT - MBM - 040 - 96

Enclosed is the final draft of the report on the 1994 grassfire burn in the northeast Buffer Zone of Rocky Flats Environmental Technology Site.

Should you have comments or require further information, please call me at extension 3560.

MBM:mbm

Enclosure:
As Stated

- cc:
- C. S. Evans
 - M. M. Fink
 - J. K. Nelson
 - T. R. Ryon
 - ERPDP Records File (2)



ADMIN RECCRD

BZ-A-000482

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REPORT ON MARCH 1994 GRASSFIRE IN NORTH BUFFER ZONE

July 19, 1996

INTRODUCTION

On March 22, 1994, a grass fire pushed by brisk winds scorched approximately 69 acres in the north-central Rocky Flats Environmental Technology Site (Site) Buffer Zone (see Figure 1). This fire started in the roadside borrow area south of Highway 128, and was pushed by north winds. The affected area included mesic mixed grasslands of a Rock Creek hill slope, and xeric tallgrass prairie, dominated by big bluestem (*Andropogon gerardii*), on the pediment dividing Rock Creek and Walnut Creek. Xeric tallgrass prairie at the Site has been identified by the Colorado Natural Heritage Program (CNHP) as a globally important and rare plant community deserving of preservation and restoration (CNHP 1995). A small area of tall upland shrubland on the northeast perimeter of the burn was also affected. The timing was such that most perennial vegetation was still dormant, and early spring ephemerals and early weedy annuals were active and blooming. The fire was hot and fast moving, but was controlled by local fire fighters as it reached roads and downslope areas of the grasslands. Nearly all plant litter within the burn area was consumed, leaving plant crowns and ash as the predominant ground cover. Vehicular traffic within the burn area was subsequently prohibited to reduce erosion.

After the fire, Ecology personnel proposed a quantitative comparison study of vegetative growth in adjacent burned and unburned areas. DOE, RFFO, however, instructed that no special quantitative comparative studies be undertaken. DOE did, however, indicate an interest in qualitative observations of the aftereffects of the burn. Ecologists made observations of both short-term and longer-term effects in the burn area over the 1994, 1995, and 1996 growing seasons. These are discussed below.

FIRE AFTERMATH

In 1994, when the fire occurred, some early spring perennials had leafed out, and were blooming. Not surprisingly, these fire-adapted species quickly produced new leaves and buds, and completed a somewhat retarded reproductive season. This quick recovery demonstrated that most plants had not been damaged by the fire. As the growing season progressed, it became clear that the greatest damage had been to the early spring annuals. The burned and unburned areas were divided by a "two-track" dirt road that had acted as a firebreak on the west margin of the burn. Comparisons between the burned and unburned areas showed that such weedy annual alien species as cheatgrass (*Bromus tectorum*), camelina (*Camelina microcarpa*), and alyssum (*Alyssum minus*), present in both areas before the burn, were entirely missing from the burn. These species were mentioned, in addition to musk thistle (*Carduus nutans*), by the CNHP (CNHP 1995) as problem alien species that are degrading the xeric tallgrass prairie at the Site. Prickly pear cactus (*Opuntia sp.*) were heavily damaged by the fire, but the remaining live pads quickly started to regenerate. After the fire, above ground portions of yucca plants (*Yucca glauca*) appeared dead, but as the season progressed, new growth emerged from the center of the leaf rosettes.

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Because the burned area was a target weed control location, the immediate area had been characterized during 1993 to estimate musk thistle densities, and to characterize the native grassland vegetation. Interestingly, the fire did not kill the musk thistle rosettes that had survived the winter, though most plants were somewhat to severely damaged by the fire.

General wildlife and bird surveys performed on established survey transects that cross the burn showed only short-term drops in wildlife activity. Surveys performed within days of the fire confirmed that birds and other wildlife were continuing to use the area as usual. As the season progressed, greater numbers of birds were often recorded in burned portions than in unburned portions.

By the end of the 1994 growing season a visual comparison of between areas revealed apparently healthy grasslands with no visible differences in growth and production. The only obvious differences between adjacent burned and unburned areas were:

- No discernible plant litter in the burned area -vs- abundant plant litter in the unburned area
- Absence of several early spring weedy annuals in the burned area -vs- abundant early spring weedy annuals in the unburned area
- Recovering yucca and cactus plants within the burn -vs- undamaged plants in unburned areas
- Visible evidence of still scorched old vegetation and ash within the burn -vs- no evidence of fire in the unburned area

CHANGES WITHIN THE BURN AFTER THREE GROWING SEASONS

Two significant changes were noted within the burn area by the end of the 1995 growing season. The musk thistle population suffered an apparent decline, and the big bluestem showed a remarkable resurgence. Musk thistle had been prevalent within the burn area in 1993 (before the burn), but by the end of the 1995 growing season, the thistle density was visibly reduced. Japanese brome, alyssum, and other weedy annuals within the burned area are rare or nonexistent. The big bluestem population had likely not actually increased in a year, but the robustness of the plants had. This was probably due to the removal of dead plant litter (thatch), and greater availability of nutrients leaching into the soil from the ash, a normal process after fire. Although 1995 experienced higher than normal precipitation, the big bluestem within the burn area evidenced greater flower and biomass production than comparable populations on other parts of the Site (M. Murdock - personal observation).

Further qualitative observations made during 1996 indicate a continuance of these visible changes within the area of the burn. Musk thistle density has continued to decline, and the density of Japanese brome, alyssum, and other weedy spring annuals within the burned area remain much lower than in the adjacent unburned areas. Big bluestem continues to exhibit greater robustness within the burn, and the accumulated plant litter in unburned areas is denser than within the area of the burn. Litter from Japanese brome is markedly less dense in the burn area than in adjacent areas that are otherwise quite similar. In general, burning the area appear to have reduced the density of weedy species, and to have increased the vigor of the native species (J. Nelson, M. Murdock - personal observations).

CONTROLLED BURNING—HABITAT MANAGEMENT AND RESTORATION TOOL

During a tour of the Site's tallgrass prairie areas in early October 1995, plant ecologists from the Jefferson County Nature Association (JCNA) were shown the results of the 1994 burn. They were especially interested in the big bluestem restoration, and noted that they have seen such tallgrass prairie restoration through fire when the litter mass around the plants is burned off (pers. comm. S. White & D. Buckner). The main purpose of the JCNA visit was to evaluate portions of the Buffer Zone for potential as tallgrass prairie study areas. The JCNA is interested in finding large contiguous areas of big bluestem complex communities that are equivalent to those in an area proposed for mining adjacent to the Site. The JCNA hopes to find tallgrass prairie, in the vicinity of the planned mining, that can be preserved to offset that which will be destroyed by mining. The JCNA's plan is to study enhancement and restoration of local tallgrass prairie test plots using fire, haying, and other litter reduction techniques to test management strategies. Tallgrass prairie has been found to suffer a decline when long-term fire suppression allows heavy litter buildup (pers. comm. S. White & D. Buckner). Such long-term fire suppression has been practiced at the Site since the early 1950s.

Interestingly, although the Colorado Natural Heritage Program (CNHP) was apparently unaware that the 1994 burn had occurred, their December 1995 report (CNHP 1995) advocates the use of fire for weed control. The following excerpt from their report reflects the opinion of the RMRS Ecologists as well. "Fires are an integral part of the evolution of grassland communit[ies]...and it is believed that, under normal conditions, wild grassland fires occurred every 10-15 years (Brewer 1994). Fire has been well documented to not only... help control the spread of exotic species, but also increase overall species diversity (both floral and faunal) within the burned area...(Anderson 1982, Collins et. al. 1985, Hatchet. al. 1990, Hosten 1992)." This report also presented the CNHP finding that the Site's tallgrass prairie community is a globally significant plant community and should be preserved. Because other ecologically significant communities and at-risk species are found at the Site, CNHP has proposed that the entire Site and adjacent surrounding lands be set aside as a Conservation Site.

Although quantitative studies were not conducted on the 1994 grassfire area, qualitative observations have yielded some interesting information that may be useful in planning ecological maintenance in the Buffer Zone. The results indicate that fire may be used in weed control and tallgrass prairie restoration at the Site. A program of carefully controlled burns could benefit wildlife habitat by restoring the tallgrass communities that are heavily relied upon by prairie species such as the grasshopper sparrow. Properly-timed burns can provide non-chemical weed control. Burning as a weed control method can augment the biological weed control agents that have been introduced to the Site in recent years.

It has been Site policy not to use herbicides in sensitive areas and close to drainages. This restriction of herbicides can make noxious weed control difficult, but limited and judicious use is preferable ecologically because it limits the introduction of potentially harmful chemicals into the ecosystem. Burning, an often used weed control technique, may offer a viable alternative in some areas of the Site..

Judicious use of fire for weed control and habitat improvement would likely not impact arthropod, bird, and mammal populations as severely as widespread herbicide and pesticide chemical applications. Fire can be applied to small patches of habitat in a mosaic of burn areas each year.

With small burns, perhaps 50 to 75 acres at a time, large portions of the Buffer Zone could be treated over a period of several years. Carefully controlled small burns, even in the early fall, could be planned to have minimal effect on bird and small mammal protective cover areas, while controlling weeds and providing a long-term benefit to these species through rejuvenation of their grassland habitats. Any burns would have to be conducted October through mid-April to avoid impacts to nesting birds.

SUGGESTED BURNING STRATEGY

DOE, RFFO should seriously consider use of controlled burns for habitat restoration and weed control at the Site. The results of the March 1994 burn indicate that limited-area grass fires can provide a natural means of grasslands habitat restoration and weed control. Burns in riparian channels, around pond margins, in shrublands, and in riparian woodland complex habitat should be avoided to prevent possibly adverse impacts to Preble's meadow jumping mouse habitat. The Site should consider including controlled burns in an integrated weed control and habitat improvement program.

It will be necessary for DOE, RFFO to discuss plans for controlled burns at the Site with stakeholders and regulatory agencies. The Site's Air Quality specialists must be included in any planning to allow completion of any necessary air quality emissions permits. The Colorado Department of Public Health and the Environment, must approve a burning permit before controlled burning will be permitted at the Site. Timing of any burns may be regulated by permits rather than the optimum point in a target species' lifecycle. (Previous attempts to burn the South Interceptor Ditch met with seasonal limitations due to Denver's Clean Air Act restrictions). The Environmental Protection Agency may also have jurisdiction over burns at the Site. Burning will have to be performed only when weather conditions permit, to prevent the possibility of an out-of-control wildfire. Personnel conducting the controlled burn must be fire-fighting personnel properly trained in wildfire suppression and control techniques. Other agencies and habitat management groups such as the Colorado Division of Wildlife, U. S. Forest Service, U. S. Fish and Wildlife Service, Jefferson County Open Space, Boulder County Open Space, and Boulder City Open Space may be able to provide considerable expertise on appropriate scheduling, burn area preparation, burn area size, and other details.

RMRS recommends that burns for specific problem weeds be attempted on schedules that would do the most damage to those species while limiting damage to other species. It will be necessary to do further investigation into effective weed control by fire-management before a plan can be developed for the Site. Certain factors, such as fire's effectiveness in destroying seeds of problem species, the need for additional post-fire treatment, the advisability of reseeding, and the most effective timing to prevent damage to desirable species would require evaluation on a case by case basis. A large body of information is available through existing literature on this subject, and literature searches could produce such information in a matter of a few weeks. The most time consuming part of the planning process could be expected to be negotiation with the regulators to obtain burn permits.

Examples of possible target species and areas that may benefit from controlled burning are detailed below.

- Experimental burning of diffuse knapweed (*Centaurea diffusa*) during October when basal

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rosettes of that species are still active, and at "seed set" may help control the spread of this species. Information from the local weed control coalition suggests that burning may be an effective means of reducing the seed crop. If burned in October, many plants with mature seedheads could be destroyed before the November winds break them loose and transport them across the Site, scattering seeds as they tumble. Above-ground rosettes should be killed or severely stressed before the harsh winter weather moves in. Perhaps the best strategy would be a small-scale experimental burn followed by application of Transline, an herbicide that was used successfully in September 1994 on knapweed. Several areas on the western side of the Site, as well as the Operable Unit 1 French Drain area, could derive significant benefit from such an action.

- Dalmation toadflax (*Linaria dalmatica*) produces new growth shoots very early in the spring. Burning in March or April could kill new shoots and stress the parent plants enough to weaken the established plants. Following burning with herbicides and further burning may help gain control of this aggressive weed. The primary problem area for this species is the long ridge (Whitetail Ridge), on the east side of the Site, that divides lower Walnut and Woman Creek drainages.
- More information on the effectiveness of burning Canada thistle (*Cirsium arvense*) is needed, but the U. S. Army Corps of Engineers (COE 1994) suggested the use of late spring controlled burns to reduce Canada thistle invasion at the Site. Several areas in the Rock and Woman Creek have severe infestations of this species. The most effective timing for burning Canada thistle would be as flowers are maturing, prior to the release of seeds. Burns in these problem areas would require very careful control to prevent spread of the fire to sensitive riparian areas. Small areas could be burned if the perimeter were mowed, and, perhaps, watered prior to the burn.
- The 1994 burn showed that musk thistle populations can be impacted by early spring burning. Several areas with heavy musk thistle growth occur on the eastern portion of the Site. Such areas as the abandoned prairie dog town south of the East Access Road, and parts of the lower Woman Creek drainage may benefit from burning. Appropriately timed, not only could musk thistle be addressed, but cheatgrass as well. An early spring burn would probably accomplish this.
- Burning thatch and competing weedy species from areas with good populations of big bluestem and little bluestem (*Andropogon scoparius*) can increase the productivity of those species, and help re-establish the balance of tallgrass species within areas that have suffered degradation. Burning in the March to April time frame would ensure that the bluestems and other perennials were still dormant, and would severely thin the weedy spring annuals. Good candidate areas for such treatment include Operable Unit 11, the southwest portion of the Site, and the long pediment between Rock Creek and Walnut Creek.

CONCLUSIONS

The accidentally-set fire in the Buffer Zone during March 1994 has provided an excellent example of how fire can enhance native grasslands at the Site. Not only did the fire fail to damage the native grasslands on the Site, but it stimulated improvement in the condition of the xeric tallgrass prairie within the burn. As an added benefit, the fire also reduced the population of undesirable weeds in the burned area. The effects of the fire have provided a fortuitous opportunity to explore the feasibility of using fire at the Site for weed control and habitat restoration. The monitoring in the accidental burn provided data indicating early spring may be

an excellent time for controlled burning in the xeric tallgrass prairie areas. Birds are not yet nesting at that time, and the desirable perennials and warm-season species are not yet active. Observations in this area also indicated that an approximately 70 acre burn would not be an undesirable size for a controlled burn.

While fire is only a partial answer to problem weed control, it could be integrated into a site-wide weed control program. Small -area controlled burns could be used to good benefit in several problem weed areas. These areas are also largely xeric tallgrass prairie areas that may benefit from removal of thatch and alien competitors. A controlled burn program could serve the dual purpose of weed control and habitat restoration. Development of a controlled burning plan would require coordination with several other on-site groups, as well as consultation with regulatory agencies. Such a plan would require commitment of trained wildfire fighters; cooperative planning between the contractors coordinating herbicide application and site ecologists; negotiation and acquisition of air quality emissions permits; and consultation with wildlife agencies. Due to the need to negotiate with the Colorado Department of Public Health and the Environment, the Environmental Protection Agency, and wildlife agencies, DOE, RFFO would need to be an integral participant in planning such a program.

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Figure 1.
Extent of March 1994 grassfire.

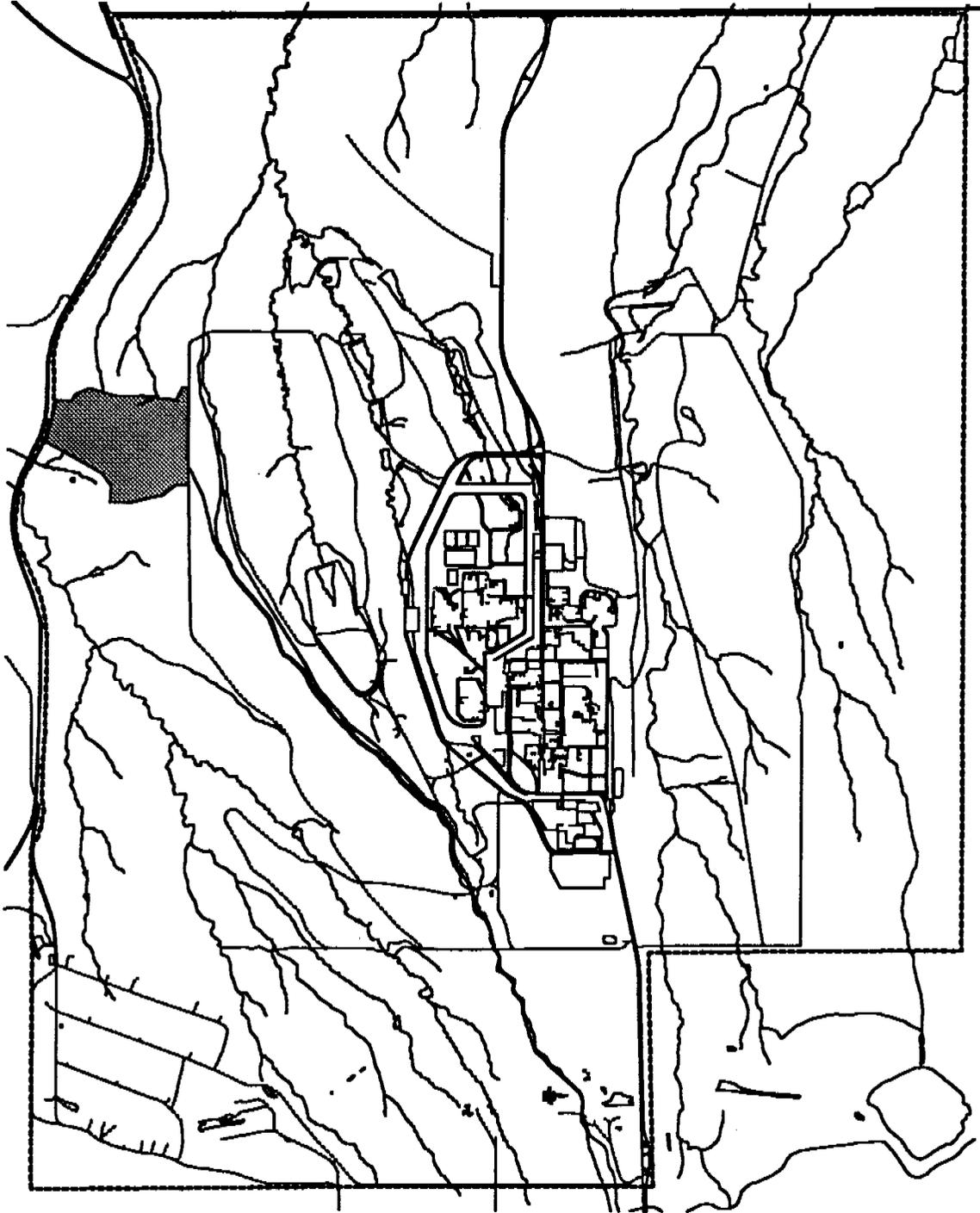
- Legend:
-  Burn site
 -  Open water
 -  Paved roads
 -  Unpaved roads
 -  Streams
 -  RFETS Boundary



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Data source: Coverages
provided by RMRS-Data
Management, 1996.

U.S. Department of Energy
Rocky Flats Environmental
Technology Site
Golden, CO



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