

**U.S. FOREST SERVICE
NATIONAL STREAM AND AQUATIC ECOLOGY CENTER**

October 1, 2015

WINDY PARK: STREAM RESTORATION ASSESSMENT

Client: Ashley National Forest

Location: Windy Park, Utah

Date of Visit: 8/25/2015

On-Site Participants: Ryan Mower, Hydrologist, Ashley National Forest
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Summary: Windy Park has a high-quality wet meadow that is being threatened by headcut development and incision. The resulting reduction in the local water table levels will greatly reduce the areal extent of riparian-obligate vegetative species in this wetland. Without mitigation, the wet meadow will be replaced by upland vegetative species on terraces.

Fortunately, these headcuts are relatively low and can be arrested with a high level of confidence for success. The limited extent of incision can be filled and, in combination with grade-control structures, the wet meadow in Windy Park can be maintained and restored.

The following alternatives are suggested for consideration in Windy Park:

Alternative 1: No Action

Alternative 2: Livestock Grazing Exclusion

Alternative 3: Grade Control Structures and Infill, with Livestock Grazing Exclusion

Recommendation: Alternative 3 is recommended for implementation, since it would prevent the loss of additional wet meadow area and restore the lost meadow extent.

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INTRODUCTION

Active headcutting has been observed in Windy Park (Figure 1), a wet meadow just north of Government Park, Utah, on the Ashley National Forest. This park is used for Boy Scout activities. Windy Park is a headwater tributary to Oaks Park reservoir on Big Brush Creek, in the Green River watershed. This headcutting threatens the long-term existence of a wet meadow – if the headcutting is allowed to continue, the wet meadow will be drained and upland vegetation will replace riparian-obligate species. The assumed goal for this riparian corridor restoration is to, at the least, arrest the active headcuts and eliminate any additional loss of wet meadow. If possible, reestablishment of lost wet meadow is desired.

This stream restoration assessment report was developed to document site conditions, provide restoration alternatives, and recommend a restoration strategy. An overview of the hydrologic and geomorphic condition of Windy Park is provided. Following this, a restoration strategy is provided, including restoration alternatives. A few details are provided on what each alternative could consist of. This report is intended as a resource for the Ashley National Forest to make an informed decision on which restoration strategy to pursue, if any, for Windy Park, and to help lay the groundwork for accomplishing this project. The National Stream and Aquatic Ecology Center will be available on a limited basis for future technical needs regarding this project, if it proceeds – staff will be available to consult on the implementation of this plan.

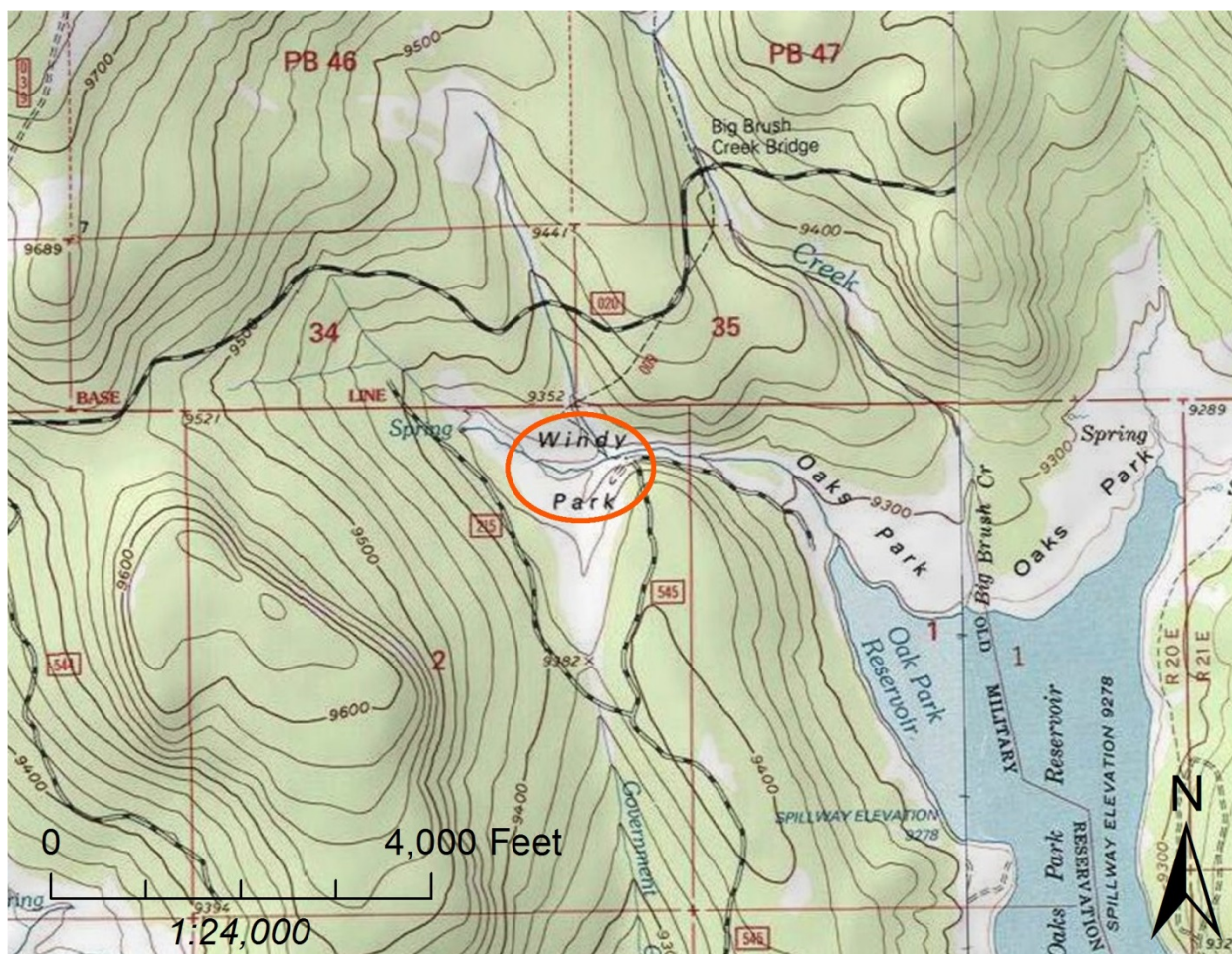


Figure 1: Area of concern in Windy Park (circled).

CURRENT CONDITIONS

The catchment (Figure 1) consists of 0.9 square miles at the point of impairment, a parallel sequence of headcuts. Average annual precipitation ranges from 27 to 29 inches, from PRISM (Daly et al., 2008). The aerial photo in Figure 3 shows the primary area of concern. The locations and directions of the photographs collected during this field visit and presented in this report are illustrated in these figures.

Figure 2 illustrates the current condition of the wet meadow. The wet meadow appears to be healthy, with a prevalence of water sedge and beak sedge present. From the point of the pedestrian bridge,

the meadow is about 750 feet long and 360 feet wide. However, headcuts have formed towards the lower end of the meadow, threatening the current hydrologic condition. Hoof shear and trampling was observed at some of the areas of incision.



Figure 2: Wet meadow in Windy Park.

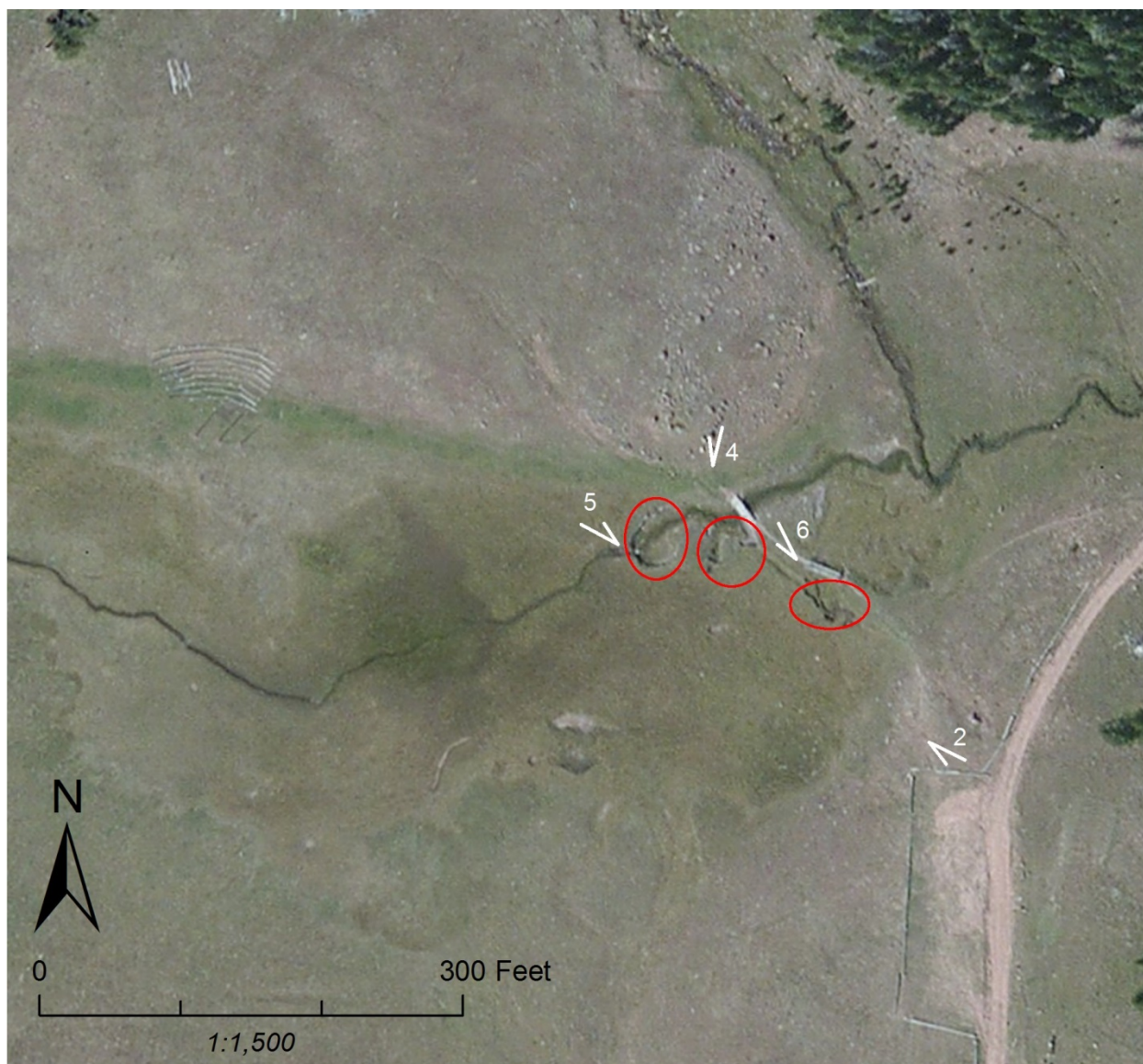


Figure 3: Aerial imagery illustrating Windy Park (6/27/2010). The annotated arrows indicate figure numbers of presented photographs, with directions. The red ellipses indicate points of incision.



Figure 4: Scarps and headcuts that have formed at the downstream limit of the wet meadow in Windy Park.



Figure 5: Active headcut at upstream end of scarp.

Figures 4 and 5 show the low scarps and headcuts that have formed at the downstream end of the wet meadow. Both the scarps and a point headcut are evident. The elevation drop is approximately 2 feet. It appears that the soil movement is through both bank failure and soil piping as the meadow soil horizons are drained. The headcut, as shown in the foreground of Figure 5, is extending into the wet meadow along the E-type stream channel (Rosgen classification), creating a linear

drawdown of the water table. It appears that this headcutting is continuing to propagate upstream, causing a gradual increase in the wet meadow impairment.

Historic aerial imagery was obtained to understand the rate of headcutting and scarp progression, and hence the rate of wet meadow loss. The scarp is not visible in aerial imagery collected in 1965; the impairment may have started before this date. However, the scarp is present in imagery collected in 1993. Using this latter imagery, it appears that rate of scarp translation is about 1 foot per year. The point headcut may be progressing at a more rapid rate.

Downstream of the scarp and headcut, a healthy sedge community has been colonized. This elevation marks the new level of a much smaller wet meadow that will eventually result from continued piping and incision processes.



Figure 6: Early headcutting present slightly to the east of the primary points of incision.

Additional headcutting (Figure 6) is present just to the east of the scarps and headcutting illustrated in Figures 4 and 5. This headcutting is less mature, but also threatens to reduce the elevation of the groundwater table in the meadow.

Downstream of the pedestrian bridges the stream appears to be slightly incised – this reach may have supported a wider riparian zone and wet meadow in the past.

Willows were not observed in or immediately downstream of the wet meadow.

CONDITION AND RESTORATION POTENTIAL SUMMARY

The Windy Park wet meadow is in the process of being impaired by incision induced through soil piping and headcutting. Boy Scout activities and livestock grazing may be contributing to the erosion of the scarps and headcuts. The Boy Scouts have made attempts to minimize and ameliorate their impacts. Additionally, grazing impacts, while evident, do not appear to be severe. Without action, the scarps and headcuts are expected to progress upstream, reducing the size and ecological benefits of the wet meadow. Action will be needed to stop the incision.

Fortunately, these scarps and headcuts are relatively low (~2 feet in height), and can be arrested with a reasonable amount of confidence for success. The amount of eroded material is low and could be relatively easily replaced. The sedge mats that have formed below the headcuts should be removed and placed on the newly filled surface. A restoration could be performed in combination with restoration activities in Government Park, providing a source for borrow material. Using such a regraded approach, combined with grade control structures, the riparian corridor has the potential for restoration to a sustainable wet meadow in Windy Park.

Historic livestock grazing practices may have likely initiated the headcutting and incision in Windy Park. While current grazing practices are apparently being done much more thoughtfully, the legacy of past practices necessitates the exclusion of restored areas in all proposed action alternatives. Not excluding livestock, at least temporarily, may likely lead to project failure. It is recommended that this exclusion exist for a minimum of 10 years.

Downstream of the pedestrian bridges the riparian zone may have narrowed due to incision. While this reach may have lost a wider wet meadow that may have formerly been present, the reach appears to be stable. Further evaluation would be needed to determine if any restoration activities along this reach would be recommended.

RESTORATION ALTERNATIVES

Three alternatives are proposed for Windy Park. The alternatives are summarized within each following paragraph.

Alternative 1: No Action

The no action alternative will result in conditions being unimproved in Windy Park, with the headcuts and scarps continuing their upstream propagation. The wet meadow will be gradually drained and the riparian-obligate species replaced with upland species. A much smaller wet meadow will eventually result.

Alternative 2: Livestock Grazing Exclusion

Current livestock grazing practices in Windy Park appear to be influencing riparian condition to an extent, as indicated by observed hoof shearing and trampling. Exclusion may allow healing of the channel form where it is impacted, but headcutting and incision has started and will likely continue even if exclusion is implemented. Exclusion alone will likely have minimal effects on headcutting and the eventual loss of the wet meadow.

Alternative 3: Grade Control Structures and Infill, with Livestock Grazing Exclusion

Combining grade control structures and fill with livestock exclusion would likely be a successful strategy for retaining and restoring the wet meadow. The relatively low drop of each headcut combined with low stream power in such a headwater stream provide conditions for durable grade control structures, though periodic maintenance will be needed. Grade control structures could consist of numerous types (this is elaborated on in the Restoration Details section). Log structures would probably be the best fit for Windy Park. Existing sedge mats present below the headcuts should be transplanted on top of the new filled surface, to restore the wet meadow.

The Boy Scouts have made attempts to mitigate their impacts on the riparian meadow, however their actions have apparently not been performed with proper technical guidance. A portion of Alternative 3 could potentially be done in cooperation with the Boy Scouts, under Forest Service supervision.

RESTORATION DETAILS

A few details regarding key features of Alternative 3 is provided below, specifically on grade control structures for arresting the headcuts and on fill locations (and sedge mat relocations). Details are also provided for the sedge mat transplants. A summary of the recommended features is presented in Figure 7.

If this project is done in coordination with the Government Creek restoration project, borrow material may be available from Government Park that could be used as fill. Otherwise, a local borrow source in Windy Park will need to be located.

A general reference available for stream restoration planning and design (Yochum 2015) is available [here](#), as TN-102 from the National Stream and Aquatic Ecology Center. This resource provides links to valuable technical guidance developed for practitioners.

Grade-Control Structures

Numerous types of grade-control structures have been used to provide grade control to arrest headcuts and retain constructed channel beds and floodplain surfaces. The best type for this situation is likely a log structure, similar to the structures presented in Figure 8. There are numerous

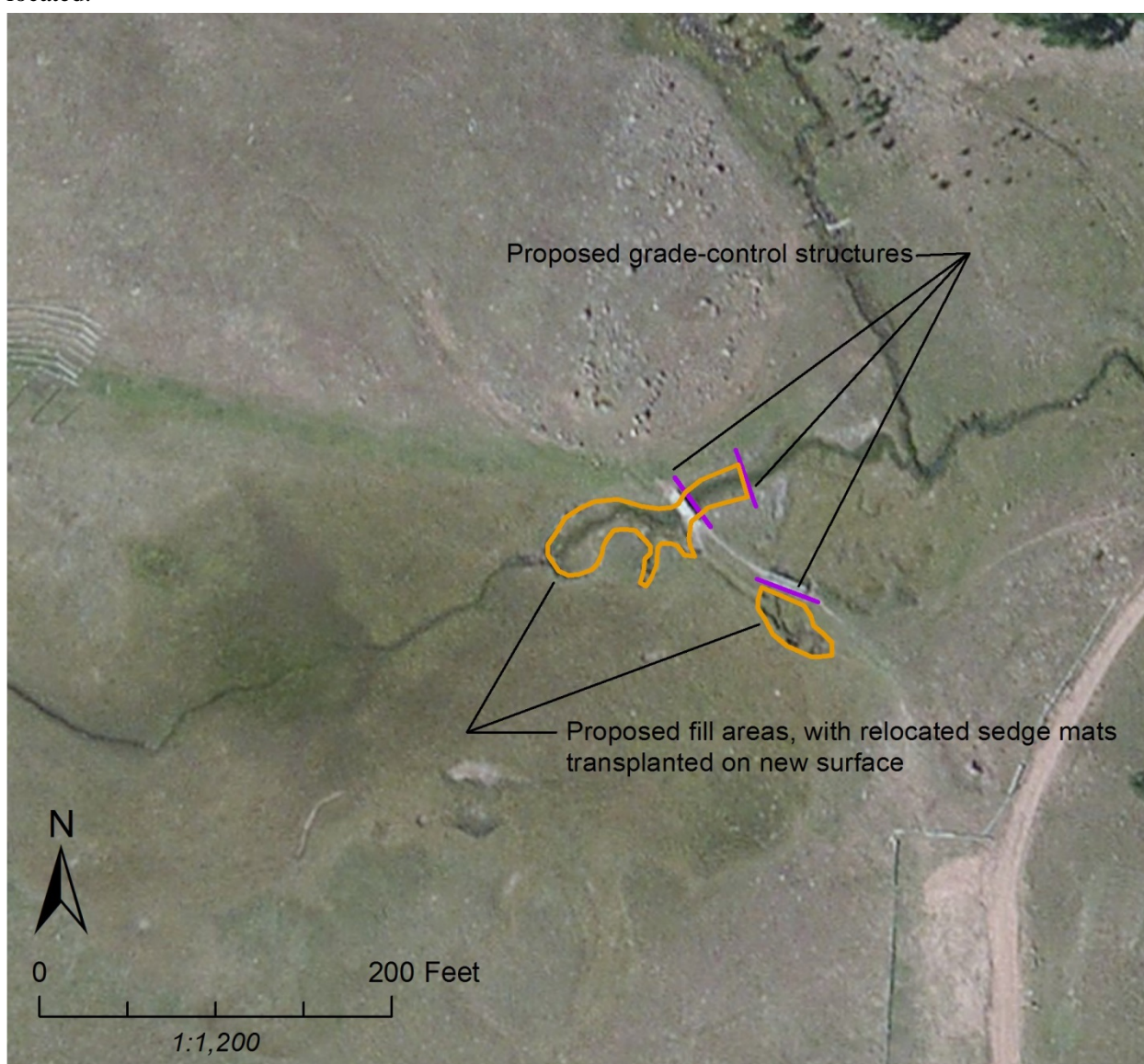


Figure 7: Alternative 3 proposal, with grade-control structures to arrest headcuts and fill (with sedge mat relocations) to restore the lost wet meadow area.

approaches to constructing a log grade-control structure; the National Stream and Aquatic Ecology Center can help adapt a design for use in Windy Park. Periodic maintenance may be needed for these structures.

Besides log structures, the following grade control structures have been utilized for arresting headcuts. These structures are less preferable in this wet meadow environment than log grade-control structures.

- Rock cross vanes
- Newbury riffles
- Gabions
- Loose rock structures
- Brush
- Earth check dams
- Concrete
- Sheet piling



Figure 8: Log grade control structures implemented downstream of the Waldo Canyon Fire (2012), Colorado.

Sedge Mat Relocation

The sedge mats that have formed below the headcuts should be removed and placed on the newly filled surface. A front-end loader can be used to transplant 4 feet by 8 feet mats of sedge material, with 8 to 10 inch thickness. Modification of the loader bucket with a sharp-edged steel plate may be needed. It can be best for these mats to be moist but well drained when cut from the borrow area. Avoid transplanting any observed weeds. Early season transplants can be most successful, but mats can be successfully transplanted at any time (Hoag et al. 2001).

RECOMMENDED RESTORATION STRATEGY

Alternatives 1 and 2 are not recommended, since both would likely result in the loss of additional wet meadow area. Alternative 3 is recommend for implementation, since it would prevent the loss of additional wet meadow and restore the lost meadow extent.

ACKNOWLEDGEMENTS

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REFERENCES

- Daly, C., Halbleib, M., Smith, J.I., Gibson, W.P., Doggett, M.K., Taylor, G.H., Curtis, J., and Pasteris, P.A. (2008). Physiographically-sensitive mapping of temperature and precipitation across the conterminous United States, *International Journal of Climatology*, 28: 2031-2064.
- Hoag, J.C., Wyman, S.K., Bentrup, G., Holzworth, L., Ogle, D.G., Carleton, J., Berg, F., Leinard, B. Users Guide to Description, Propagation, and Establishment of Wetland Plant Species and Grasses for Riparian Areas in the Intermountain West. (2001) USDA NRCS, Plant Materials TN-38.
- Yochum, S.E. (2015) Guidance for Stream Restoration and Rehabilitation, U.S. Forest Service, National Stream and Aquatic Ecology Center, Technical Note 102.1.