

**Visitor Use and Associated Benefits of the UMD Bagley Nature Area**

**Undergraduate Research Opportunity Program**

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Results

April 4, 2019

**Introduction**

The benefits associated with time spent outdoors such as a decrease in obesity, positive social impacts, improvement in mood and stress reduction are well documented (US Fish & Wildlife Service, 2016; Wolch et al., 2011; Benefits of Connecting Children with Nature, 2012; Izenstark & Ebata, 2014). There are also benefits to diverse populations spending time in nature such as increasing the physical activity of urban youth, increasing a sense of identity among recent immigrants as well as providing a sense of relief and self-efficacy (Babey, et al., 2008; Wong, 1997). The University of Minnesota Duluth (UMD) campus is unique in having a 55 acre nature area right on campus known as the Bagley Nature Area (BNA). This site is used extensively for nature-based instruction, as a park for students to enjoy, as a place to gain physical exercise in the outdoors, and by community members for exercise, wildlife watching, and time spent in nature. However, in spite of the diverse use this area receives, the full extent of visitor impacts on the site and the type of visitor (e.g. college classes, student use, athletic teams, community members) have not been reviewed since 2007 (Gilbertson, 2007; Gilbertson, Bates, & Pastor, 2007).

The purpose of this UROP study is to analyze data collected from users at the BNA to determine visitor use and visitor types. Data was collected via the use of electronic eye sensors and a discreetly placed trail camera. This data will be used to help guide management of the site and to determine the ways that the site is currently being used with the overall goal of managing this valuable campus and community resource in an environmentally sustainable manner.

### **Background Information**

Existing literature on visitor use surveys generally utilizes methods based on either carrying capacity or questionnaires given to users to collect behavior data. Carrying capacity methods often are highly focused on observing visitor use to observe patterns of impacts on the

environment in the area being studied (Godbey, et. al. 2005). However, the consistent overarching intent of visitor use surveys “Is to provide high quality visitor experiences, while protecting natural and cultural resources” (*Interagency visitor use management council*, 2018, pg.1 ). The carrying capacity method lacks the ability to identify what the benefits the users are seeking from a site or the behaviors that are being participated in. The intent of this research guides the paired collecting of quantifiable data on visitor use with trail camera photos to observe the types of activities being participated in to provide a broad picture to what activities the area is being used for as well as the volume of use. The guiding literature advises three steps to this process starting with assessing the goals of the site for management of the natural features, and visitor experiences. The second step is to understand how the visitor activities fit with the management goals of the site. Finally to create a management style to fit the dynamic nature of the particular site (*Interagency visitor use management council*, 2018, pg.1). However, the challenge is to match the needs and management style to the funding provided for the site. The site for this research is a University funded location and therefore is limited in the scope of management that may be ideal for the site (Fefer, P., & Urioste-Stone, D. 2015, Farrell, A., & Marion, L. 2002). This limits what the management team is able to do.

Other considerations for surveying a site is to contrast certain features such as the naturalness of the site versus developed areas, the activities being participated in and volume of use and how that affects the experience . The concern for naturalness verses openness of the site creates issues around enhancing the wilderness-like experience in exchange for a feeling of safety that is created by having an open line of site. This is contrasted by concerns for the environment and the impact of consistent low level use or creation of habitat fragmentation. These impacts in themselves can have long term negative consequences of declining visitation,

and economic impacts such as the need for more costly mitigation efforts from overuse. Activities being participated in at a site do not always compliment each other, such as runners and a class on the trail (Godbey, et. al. 2005). The steps of a visitor use survey can guide solutions to these issues with the initial step of assessing goals for the site which can guide management of conflicting activities. The site in question currently struggles with many of the issues presented in the current literature surrounding the management of visitors at natural sites. Figure one shows a map of the Bagley Nature Area.

**Figure 1: Map of the Bagley Nature Area**

## **Methods**

The methods I used were to gather the data from motion sensors that were installed in the fall of 2017 along with images from trail cameras placed in BNA on the UMD property to assess the user groups, types, and frequency to then guide management policies. The footage from the



trail cameras was assessed to determine user types and then to extrapolate potential benefits from BNA use.

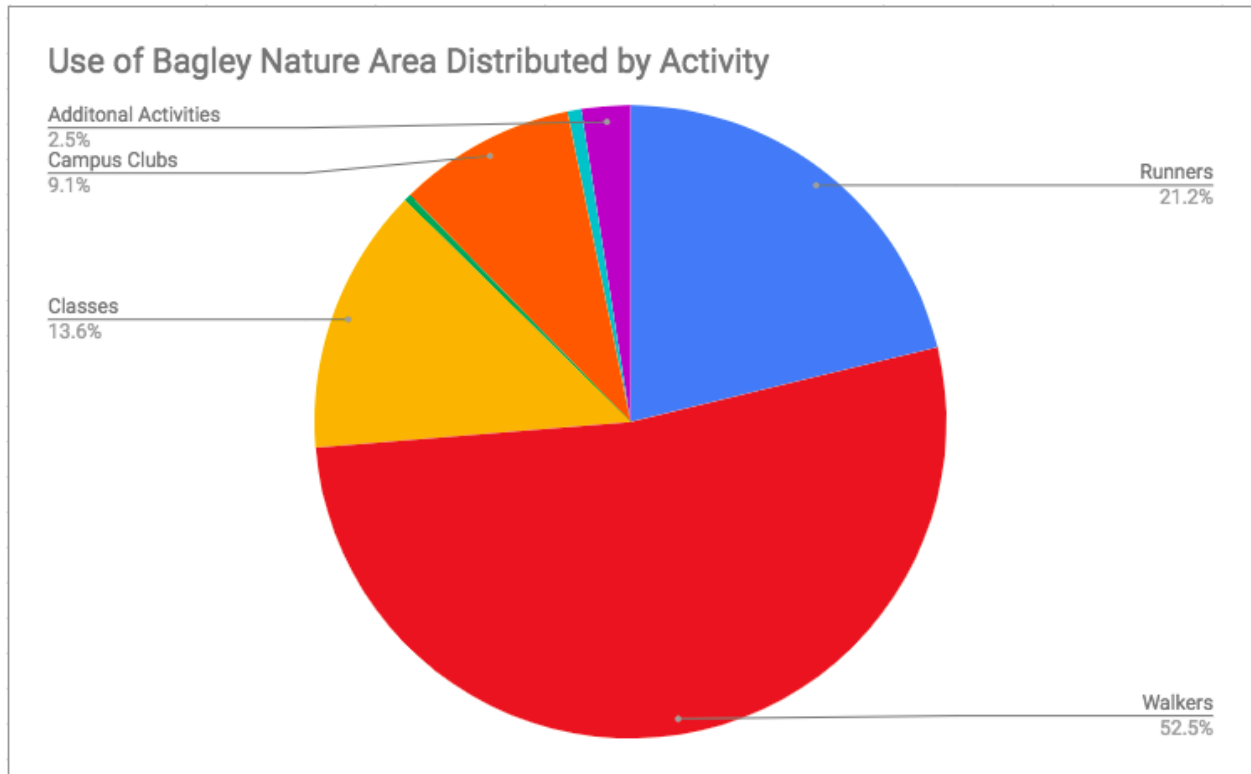
This project had three phases: First, background research & data collection. This phase included collecting data from the motion sensors and a trail cameras. This phase also included background research to understand what the impacts are for different user types and how to manage these impacts for visitor use in protected areas such as BNA.

I analyzed the data. I used the software for the motion sensors to assess data collected on numbers of users times of day plus weekly and seasonal patterns. I used the trail camera footage to assess user types and patterns in frequency of use by viewing the images and counting user types for time of day and activity.

Phase three is the management suggestions that I have laid out for BNA after completing the research on the visitor usage. These management policies have been created based on the maximum benefits for users given the organizational intent for BNA, as well as what types of benefits are being gained from using the site.

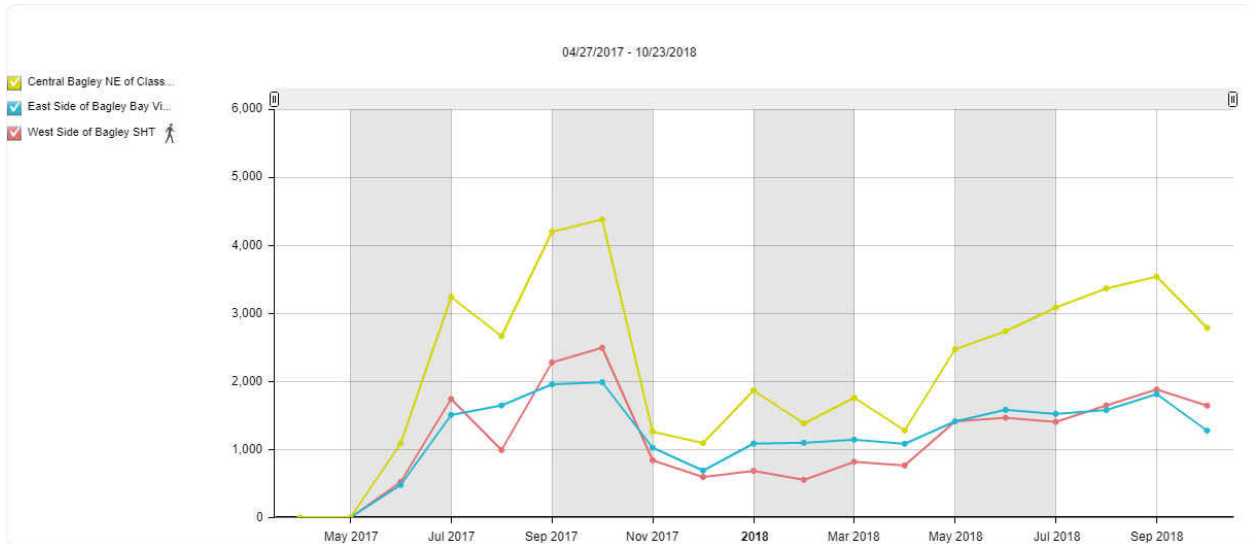
## **Results**

Figure two is a chart on the distribution of use by activity within BNA. This serves to show what the primary use of BNA is and help to understand what the site should be managed for.



**Figure 2: General distribution of User type**

Figure three is a graph showing the volume of visitor use distributed by month and sensor location. Showing the variation in volume both in location and by month helps to understand how the the distribution of the use itself is uneven and more heavily impacting certain location during certain seasons.



**Figure 3: Patterns of use by each trail sensor location**

The results of the data show higher volumes of use of BNA than expected, and a wide range of activities being participated in. The time range for the data collected by electronic sensors was between Thursday, April 27, 2017 and Tuesday, October 23, 2018, roughly a 18 month time period. The electronic sensors recorded 42,204 visitors for the central trail behind the classroom. Both other sensor locations recorded approximately 21,500 for the time period.

**Table 1:**

*Visitor frequency per sensor station*

## Key Figures

- Total Traffic for the Period Analyzed: 42,204
- Daily Average: 77
  - Weekdays: 78 / Weekend days: 77
  - Max. Average Value (October): 133
  - Min. Average Value (December): 35
- Busiest Day of the Week: Thursday
- Busiest Days of the Period Analyzed:
  1. Wednesday, October 04, 2017 (472)
  2. Saturday, September 15, 2018 (384)
  3. Wednesday, October 03, 2018 (351)

**Table 2:**

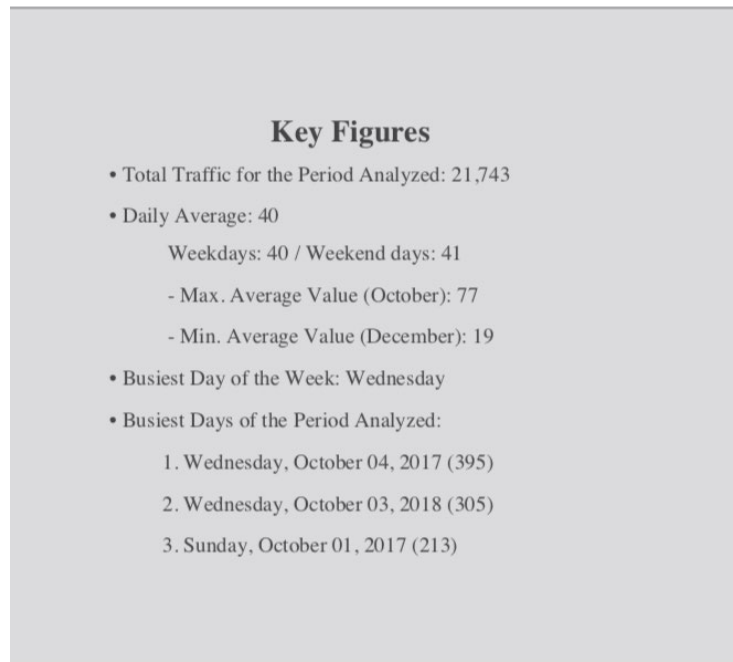


### *Visitor frequency for Bagley Sensor*



**Table 3:**

### *Visitor frequency for Bagley Sensor*



The trail camera recorded approximately 2,000 photos for the fall of 2017, and 4,000 for the fall of 2018. Analysis of these photos determined that 52.5% of visitors for those periods were people walking, the next two largest groups were runners (21%) classes (13.6%). Other activities recorded included: Campus Clubs, Hikers, Bikers, Photographers, Wildlife Watchers, Hammocking, Maintenance and Sledding. Cross Country Skiing is also highly prevalent however volume of use was not recorded for the trail camera due to the seasons it was active for. Visitor activity type was determined based on viewing the image and using the context to assess what activity was being engaged in.

**Table 2:**

*Distribution of user types*

User Type	Percent
Walking	52.5% (n= 221, 571)
Runners	21% (n=4,515)
Classes	13.6% (n=2,924)
Other	

**Discussion/Recommendations**

Based on the results this is a surprisingly high volume of use for the 55 acre site. While the maximum visitor use capacity of the site is unknown this raises the question of if the site is reaching capacity. This is further drawn into question with the future plans of the Duluth Traverse bike trail to add an additional use to the site and the ramifications that will have on the sustainability of the use. It is recommended there for that the University begin considering

options to control the volume of use to prevent long term negative impacts on the ecosystems of BNA as well as detracting from the experience visitors are seeking at BNA.

This Visitor Use Survey gives a baseline for BNA as it is the first to use the eco sensors and the trail camera to track the visitor use. The collection of data available particularly from the trail camera detracts from the reliability of the survey as the photos were only taken during fall semester seasons. However, the eco sensors give an idea of a baseline volume of use for one full year that can be utilized going forward. It is noted that despite the rules of BNA there is still frequent bike use within the nature area. As noted in the literature review this activity not only is against the rule but also is a conflict with the other activities occurring in BNA and likely detracts from user experience, therefore it is recommended that the management consider further options to making it a bike free zone.

Based on the data collected the recommendations moving forward with BNA are as follows: install more trail cameras in different locations around BNA - such as one facing the Pond, and one on top of Rock hill to collect more information about what activities are being done throughout the area. Secondly, conduct yearly collection of the data from the motion sensors to continue monitoring volume of visitor usage. This will serve to build up data over time and show trends in the volume of use for BNA.

## References

- 2016 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*(Rep.). (2018, April). Retrieved October 2, 2018, from Department of the interior website: [https://wsfrprograms.fws.gov/subpages/nationalsurvey/nat\\_survey2016.pdf](https://wsfrprograms.fws.gov/subpages/nationalsurvey/nat_survey2016.pdf)
- Babey, S. H., Yu, H., Hastert, T., & Brown, R. (2008). Physical Activity Among Adolescents. When Do Parks Matter? *American Journal of Preventive Medicine*,34(4). Retrieved October 2, 2018, from [https://www.researchgate.net/publication/5478861\\_Physical\\_Activity\\_Among\\_Adolescents\\_When\\_Do\\_Parks\\_Matter](https://www.researchgate.net/publication/5478861_Physical_Activity_Among_Adolescents_When_Do_Parks_Matter).
- Benefits of Connecting Children with Nature* (Rep.). (2012, January). Retrieved October 2, 2018, from Natural Learning Initiative website: [https://naturalearning.org/wp-content/uploads/2017/09/Benefits-of-Connecting-Children-with-Nature\\_InfoSheet.pdf](https://naturalearning.org/wp-content/uploads/2017/09/Benefits-of-Connecting-Children-with-Nature_InfoSheet.pdf)
- Farrell, T. A., & Marion, J. L. (2002). The Protected Area Visitor Impact Management (PAVIM) Framework: A Simplified Process for Making Management Decisions. *Journal of Sustainable Tourism*,10(1), 31-51. doi:10.1080/09669580208667151
- Fefer, J. P., & Urioste-Stone, S. D. (2015). *Visitor-Use Management in Protected Areas: Understanding Expert Perceptions of the Effectiveness and Sustainability of Applying the Visitor Experience and Resource Protection (VERP) Framework for Recreation Planning*(Unpublished master's thesis). University of Maine.
- Gilbertson, K. (2007) Visitor use inventory of the Bagley Nature Area. Unpublished report. ENED 4315 - Operations & Management class.
- Gilbertson, K; Bates, T. & Pastor, J. (2007). Pavilion prospectus for the Bagley Nature Area. Presented to Chancellor Kathryn Martin. January, 18.
- Godbey, G. C., Caldwell, L. L., Floyd, M., & Payne, L. L. (2005). Contributions of leisure studies and recreation and park management research to the active living agenda. *American Journal of Preventive Medicine*,28(2), 150-158. doi:10.1016/j.amepre.2004.10.027
- Interagency visitor use management council*(Rep.). (2018, November 30). Retrieved March 25, 2019, from National Park Service website: [https://visitorusemanagement.nps.gov/content/documents/highres\\_VUM](https://visitorusemanagement.nps.gov/content/documents/highres_VUM)

- Izenstark, D., & Ebata, A. T. (2017). The Effects of the Natural Environment on Attention and Family Cohesion: An Experimental Study. *Children, Youth and Environments*, 27(2), 93. doi:10.7721/chilyoutenvi.27.2.0093
- Wolch, J., Jerrett, M., Reynolds, K., McConnell, R., Chang, R., Dahmann, N., Berhane, K. (2011). Childhood obesity and proximity to urban parks and recreational resources: a longitudinal cohort study. *Health & Place*, 17(1), 207–214. <https://doi.org/10.1016/j.healthplace.2010.10.001>
- Wong, J.L., (1997) The cultural and social values of plants and landscapes. In J.A. Stoneham and A.D. Kendle (eds) *Plants and Human Well-Being*. The Federation to Promote Horticulture For Disabled People, Gillingham