SUSTAINABILITY INITIATIVES BY STUDENT ORGANIZATIONS FUNDING PROPOSAL

Part I - General Information

Name of Student Organization	CNRE Leadership Institute Stadium Woods Initiative
Contact/Responsible Person	Olivia Plant
Contact Office Held/Title	Project Manager
Contact Email Address	oliviap@vt.edu
Contact Telephone Number	(434) 485 - 9087

Part II - Project Cost Information

Estimate Cost of this Proposal	$4,800	See Part III.C
Estimated Savings –	N/A	See Part III.D
Net Cost of this Proposal	$4,800	

Part III - Supporting Information

A. Please describe your sustainability initiative and attach supporting documentation.

Inspired by numerous classes that utilize Stadium Woods as a case study and outdoor classroom, the CNRE Leadership Institute Stadium Woods Initiative is proposing the implementation of three trashcans, four educational signs, and strategic trail closures in order to increase the aesthetic value, passive educational opportunities, and ecological integrity within Stadium Woods (See Appendix D). These practices are prescribed in the Forest Stewardship plan created by graduate student Rodney Walters in 2016 (See Appendix A and B).

- **Trashcans** placed in high pedestrian traffic areas of stadium woods would encourage visitors to properly dispose of waste, reducing litter in the forest and increasing the aesthetic value of the woods. Trash accumulation in the woods after home football games has become a serious issue; The police chief of Blacksburg has even asked fraternities on campus to provide assistance in keeping trash out of the woods by standing near the woods and Center St. with trash bags for people to dispose of their waste on the way to Lane Stadium. Trashcans are proposed where there is the highest visitor traffic: The Corps of Cadet's repelling tower, the ingress/egress road, and the main corridor through the South end of the woods.

- **Educational signs** would serve as passive learning opportunities for visitors to the woods, acknowledging the wood's history as a resource for Virginia Tech, its ecological benefits, and its significance as an uneven age, old growth, white oak forest. Signs are proposed for the historical WWII veteran housing site, Hurricane Hill, at the North end of the woods, at the previously proposed site of the football practice facility, at the ingress/egress road, and at the main corridor through the South End of the woods.

- **Trail Closures** of poorly located social trails would prevent further erosion and runoff from the woods, and protect the integrity and structure of the forest ecosystem and its soils. Trail closure locations are directly sourced from the Forest Stewardship Plan (See Appendix C).

Stadium woods is a valuable green space on Virginia Tech's campus because of its historic significance, educational value, and ecosystem services. According to the Forest Stewardship Plan, Stadium Woods is over 300 years old Faculty utilize the woods as a classroom to cover a variety of topics including ecology, recreation, dendrology, policy, conflict, history, and ornithology. The Forest Stewardship Plan also reveals that the ecosystem services provided by Stadium Woods are valued over $50,000 annually. Our initiative aims to begin the restoration of Stadium Woods as directed by the Forest Stewardship Plan so that it may continue its service to Virginia Tech for generations to come.

B. How does this initiative help to achieve the goals of the Virginia Tech Climate Action Committee Resolution and Sustainability Plan?

- *Policy Point #1: Virginia Tech will be a Leader in Campus Sustainability. Sustainability is an integral part of the fabric of the university as it pursues enhanced economic stability and affordability, diversity and inclusion, environmental stewardship, expansion of knowledge, and education of future leadership.*

    - The proposed trail closures in stadium woods would result in reduced trail erosion, sediment loss, understory trampling, vegetation loss, soil compaction, root zone compaction, and maintenance costs. Environmental stewardship of stadium woods is vital for conserving this valuable green space and education/research resource for future generations to enjoy and learn from.
    - The proposed educational signs will provide students, visitors and the surrounding Blacksburg community the opportunity to learn about the history of Virginia Tech and the ecology of the woods. Stadium woods is already used for a variety of education opportunities at Virginia Tech and in the surrounding community, and the proposed educational signs will further enhance the educational value of the woods to students and the general public.
    - The proposed trash can units will further promote Virginia Tech's commitment to sustainability and environmental stewardship by reducing littering in the woods. High volumes of people pass through the woods, especially during football season, and providing these people with access to trash receptacles will reduce the amount of trash accumulated in stadium woods, reduce cleanup costs after

home football games, and further advance Virginia Tech's commitment to environmental stewardship.

- *Virginia Tech Sustainability Definition: Sustainability is the simultaneous pursuit of environmental quality, economic prosperity, and social justice and equity, through action, education and engagement to address current needs without compromising the capacity and needs of future generations.*
    - The proposed improvements in stadium woods embrace the definitions of sustainability per the Virginia Tech Climate Action Committee Resolution by taking action to improve environmental quality, providing opportunities for education experiences and encouraging engagement of students and the community with campus green spaces.

- *Virginia Tech Sustainability Vision: Virginia Tech serves as a model community for a sustainable society. Sustainability is an integral part of the fabric of the university as it pursues enhanced economic stability and affordability, diversity and inclusion, environmental stewardship, expansion of knowledge, and education of future leaders.*
    - The proposed improvements in stadium woods would further advance Virginia Tech's commitment and mission to be a model community for a sustainable society by supporting environmental stewardship and educational opportunities.

C. What is the cost of your proposal? Please describe in adequate detail the basis for your cost estimate.

The total cost of the project is estimated to be $4,800 and includes $2,400 for waste stations, $1,300 for signs, $500 for trail closures and $600 contingency (about 15%), This total comes from the number of signs and trashcans suggested for implementation multiplied by their individual unit costs (See supporting documentation Appendix F & G) plus an overestimate of costs ($500) for trail closures to ensure sufficient funds. Our organization's budget calculates the cost of trail closures if we were to perform the labor ourselves (See supporting documentation Appendix E).

D. Will your proposal produce cost savings for the University? If so, how much? Please describe in adequate detail the basis for your savings estimate.

Though our project will not produce any direct savings for the University, it will serve to better Stadium Woods which provides ecosystem services which have an annual worth over $50,000.

E. Is this funding request an Ongoing or One-Time change **(please check one)?**

■ **One-time** ☐ **Ongoing**

F. Is funding available for this request from another source? If yes, describe the funding (source, amount, etc.)

There is no additional funding for this project available.

SUSTAINABILITY INITIATIVES BY STUDENT ORGANIZATIONS FUNDING PROPOSAL

Part IV- Requestors/Reviewers	
Olivia Plant, College of Natural Resources, Leadership Stadium Woods Initiative Prepared By (Name of Contact for Student Organization)	Date 11/16/2017
Brian Bond, Professor, Sustainable Biomaterials Department, College of Natural Resources Reviewed By (Name of Appropriate University Official)	Date 11/16/2017
Denny Cochrane, Sustainability Program Manager, Office of Sustainability Reviewed By (Name of Office of Sustainability Representative)	Date 02/19/2018

Supporting Documentation

Appendix A: References to pertinent excerpts in *Stewardship Plan for Virginia Tech's Old-Growth Forest near Lane Stadium* by Rodney Walter (2016): Link to full Document: https://www.facilities.vt.edu/content/dam/facilities_vt_edu/planning-and-construction/projects/stewardship-plan-for-vts-og-forest.pdf

I. 3.2.3 Explore Opportunities to Increase Forest Connectivity
   A. Install interpretive signs at strategic locations to educate and inform visitors (pg 137)
II. 3.2.5 Explore Funding Sources for Forest Stewardship (pg 146)
III. 3.3.1 Encourage Forest Based Activities and Events
   A. Endorse Stadium Woods as a destination site to promote Virginia Tech's commitment to sustainability and to enhance economic development (pg 148)
IV. 3.3.3 Recreation and Leisure
   A. Install a well-designed interpretive nature/recreation trail describing features of historical and biological interests (with interpretive signage) (pg 155)
V. 3.4.1 Soil Management
   A. Initiate erosion prevention and mitigation practices on existing trails and elsewhere if/when needed (pg 160)
   B. Trail closure location map (pg 162)
VI. Appendix A: Official University Statements Affirming Virginia Tech's Commitment to Sustainability, Principles of Community, and Educational Mission (pg 212)
VII. Appendix G: Stadium Woods Area (pg 236)
VIII. Appendix L: i-Trees Canopy Report Data (i-Tree 2016) and Urban Tree Canopy (UTC) Analysis (Virginia Tech 2016) for Stadium Woods
IX. Appendix P: Guidance for Managing Informal Trails by J. Marion as found in (Wimpey 2011c) (pg 311)
X. Appendix R: Trail Management Plan Options For "Stadium Woods" (SW) By Rodney Walters (pg 332)

Appendix B: Executive Summary of Stadium Woods Forest Stewardship Plan by Rodney Walters.

Executive Summary

The rare old-growth urban forest near Lane Stadium on the campus of Virginia Tech covers approximately 11.5 acres. It contains over 250 large trees, including dozens of white oak trees that have been estimated by scientists to be over 300 years old (Section 2.3). Research has further shown the old-growth urban forest to have a balanced, uneven-aged structure, which is rare, particularly for forests in urban settings. Evaluations reveal consensus in perspectives among stakeholders in that this forest patch, as the only untouched greenspace left on campus proper, has historical, educational, and research importance. The forest provides significant ecosystem services and is ecologically unique and rare (Sections 1.1, 2.2.1, 2.3, and 2.5). It reflects and contributes to the importance of the region's natural environment as a premium example of a white oak late successional primeval forest community (Section 2.3). The importance of this forest, unofficially known as Stadium Woods (SW), was elevated after the Athletic Practice Facility Site Evaluation Committee (APFSEC) was appointed by Virginia Tech's President Charles Steger and an environmental consulting firm was hired to conduct evaluations on SW to address a 2012 building land use dispute (Sections 1.2 and 2.2).

This Forest Stewardship Plan (FSP) is a thorough compilation of research findings and prioritized recommendations for the protection and posterity of the urban old-growth forest. This FSP includes executive oversight input from a joint venture between Virginia Tech's Vice President of Administration and the College of Natural Resources and Environment's (CNRE). Using the initial findings of the ad hoc APFSEC (Section 2.2), this FSP provides recommendations to sustain SW as a multifunctional, interconnected, and integrated forest that functions as a green infrastructure facility for Virginia Tech and the Town of Blacksburg. This

FSP is aimed at minimizing human impacts and maintaining the forest's functionality as a high-quality ecosystem that provides maximum benefits while incurring minimum costs over time (Sections 2.3.6, 2.4, 2.5.4, 2.5.5, 3.2, 3.2.1, 3.3.3, and 3.4.1.).

The intention of the FSP is to help foster an intrinsic appreciation for the forest ecosystem and serve as a guide for the use and management of SW while protecting its ecological health. The FSP recommendations are based upon research strategies that provide a set of actionable objectives for Virginia Tech's operations and management that considers both the prevailing needs of the associated community stakeholders and operational constraints in the application of best management practices (BMP's) and standards of forest and tree stewardship

(Sections 1.2, 2.2, and 3). The recommendations of the FSP were formulated to meet the needs of its associated community members and stakeholders and to sustain the quality of the SW ecosystem over time and are summarized as follows:

- ☐ Prevent or limit development and activities that degrade the forest and injure its trees.
- ☐ Manage risks to ensure human safety.
- ☐ Minimize soil and native plant disturbances caused by invasive plant species, human trampling, and/or deer browsing.
- ☐ Provide a historic continuity in the species composition reflective of the region by ensuring native species regeneration/planting as revealed by historical ecology.
- ☐ Engage partners to develop and maintain social capital and other resources for the stewardship of the forest (Loeb 2011; Mansourian et al. 2005; Steckel et al. 2014) (Sections 3.1, 3.1.1, and 3.5).

Based upon feedback received from two separate SW stakeholder meetings, one consisting of the Town of Blacksburg community group and the other embodying the Virginia Tech community group, the overall majority of stakeholders determined that restoration is the

preferred stewardship priority for SW (Section 2.2.1). The Virginia Tech community group also stated that SW provides aesthetics and beauty and is important as a gateway and pedestrian traffic flow area while the Blacksburg community group emphasized that SW is important for future generations (Section 2.2.1). Areas of agreement were also discovered by conducting a strengths, weaknesses, opportunities, and threats (SWOT) analysis as a part of the stakeholder meetings. These meetings and analyses disclosed that:

- SW provides educational value, service learning, and volunteer occasions as strengths and opportunities;
- Concerns exist about the impacts of stadium football pedestrian traffic and current lack of funding and human resources to limit damage and degradation as weaknesses; and
- The football traffic, potential future development, and probable use impacts of the adjacent private land as threats.

A 2012 statistical analysis of SW stakeholders indicated an overwhelming agreement among respondents that SW enhances campus and community life, that it should be protected, and that the public should know that Virginia Tech has an old-growth forest patch located on its campus. Additionally, strong agreement was expressed that a plan should be prepared to address the needs of all the SW stakeholders, even if compromise be required from each of the involved stakeholders. The analysis also indicated that SW has recreational value as a natural forest area, should have trails, and is a part of Virginia Tech's game day experience. Stakeholders indicated that SW is vital for teaching, research, and outreach; has significant historical value; and is important for Corps of Cadets and ROTC training. Additionally, the analysis specified that SW provides ecological values that are very essential to SW stakeholders including storm water mitigation, pollution filtration, carbon sequestration, and biodiversity in the form of native plants and wildlife. The survey also recognized that invasive plant removal is needed. Strong agreement was specified in managing SW for wildlife, tree and forest health, and forest

longevity. Very strong agreement was expressed by the survey for managing SW for safety, protecting SW over long timespans, and adopting a use and management plan for the SW old-growth forest fragment (Section 2.2.1).

A commitment to Virginia Tech's principles of community and sustainability in support of collaboration among SW stakeholders will facilitate a balanced approach toward the achievement of the long term-goal of restoration. The utilization of appropriate environmental management techniques will best consider and balance multiple stakeholder interests while protecting the SW ecosystem by considering ecological, community, and management perspectives and, ideally, by incorporating the FSP into the Virginia Tech Long Range Development Plan (Sections 1.3, 2.1, 2.2, 3.1, and 3.2).

SW is a rare high-quality old-growth forest ecosystem that can provide many beneficial functions for the communities of Virginia Tech and the Town of Blacksburg if it is well managed (Sections 2.5, 2.6, and 3.2). SW also is vulnerable to several factors that represent common threats to urban forest fragments across the nation. They include the inherent yet manageable risks that trees pose to property and human safety, human development pressures (parcelization/fragmentation), degradation caused by invasive species, and the ever present shortages of economic resources (Sections 2.3, 2.4, and 2.6). SW must be supported and maintained because it is small and it is located in an urban setting, making it vulnerable to human impacts such as invasive plant species, human trampling, edge effects, and dumping. Budgetary and/or priority constraints associated with the upkeep of the forest represents a noteworthy challenge because nominal budgetary and personnel resources are available for making substantive progress towards the accomplishment of the primary objective of restoration. Therefore, innovative solutions will be required in order to uphold and enhance the SW high-quality ecosystem for the purpose of sustaining its positive functional benefits over time

(Sections 2.3.1, 2.3.4, 2.3.6, and 2.6.2).

SW imparts both costs and benefits for community members and stakeholders. The costs associated with SW include the direct expenses of managing and maintaining the forest, indirect liability and damages risks associated with the forest, and opportunity limitations in the form of land use prospects (Sections 2.4, 2.5, and 2.6). The benefits provided by SW include: improvements to water quality, moderation of peak stormwater runoff flow rates, air/water pollution filtration, reduction of urban heat island effect, carbon dioxide sequestration, noise level buffering, economic advantages, improvements to health and well-being, improved social connections, and aesthetics (Section 2.5). SW contributes to the well-being of students, community members, and stakeholders who wish to maintain, enhance, and protect the historical, educational, and environmental functions of SW through the application of the recommendations of the FSP (Sections 2.1, 2.5, and 2.6). Assessments of natural and man-made features in SW (geology, soils, vegetation, wildlife, ecosystem considerations, safety, security, and ecosystem services) provided detailed information about SW and further informed environmental, social, and management needs and considerations (Section 3). With the overarching goal of restoration in mind, economic, social, and ecological aspects were examined to formulate a set of general goals for SW:

- Effective planning and administration for the forest to deliver:
  - Leadership and accountability for the forest
  - A safe and secure forest
  - A forest with an identity
  - A forest unified with other campus greenspaces
  - Capital investment for the implementation of the stewardship plan

- Engagement with the forest to facilitate:
  - Diverse partners are engaged in stewardship of the forest
  - Educators and researchers are utilizing the forest
  - Service-learning and participatory land care are commonplace
  - The forest is a destination for low-impact recreation and leisure

- Stewardship of the forest to ensure:
  - Soil, leaf litter, and woody debris support ecological function of the forest
  - Forest composition, structure, and health are supported by regeneration of native plants and control of invasive plants and pests
  - Native wildlife is in balance with the forest and cause minimal human conflicts
  - Ecosystem services are sustained by a healthy, functional forest (Section 3.1.2)

Once these goals were created, literature on the science and practice of forestry, urban forestry, and ecology were researched to produce a set of recommendations in conjunction with information from:

- Stakeholder communications and meetings,
- Client based communications and meetings,
- Information from academic research (the application of information to stakeholder interests/concerns),
- Best management practices from arboriculture and forestry (professional experience and research), and
- Advice from scientific experts, and natural resource management professionals who have formal training, experience, and credentials (Section 3.1.2)
- Advice from scientific experts, and natural resource management professionals who have formal training, experience, and credentials (Section 3.1.2)

The FSP recommendations are based on a middle-of-the-road approach that balances the feedbacks and requests of the stakeholders in a way that requires compromises from everyone in the consideration of the widest range of needs possible. It is important to note that the mutually exclusive nature of some stakeholder requests indicates that it is not realistic for the FSP to satisfy all the wishes of every stakeholder group (Sections 1.5, 2.2, and 2.5.5). Although budgetary and personnel limitations exist, the FSP addresses steps that will be necessary to effectively achieve the desired stewardship priority and the primary objective of restoration while acknowledging that the implementation of some recommendations will not be possible until more funding for the SW forest becomes available in the future (Section 2.2). For this

reason, it is important to work with community groups who are providing social capital (educational and voluntary services) to help maintain the integrity of the SW ecosystem (Section 2.2). The FSP provides an initial framework of an ongoing process that is intended to evolve over time through an adaptive management approach that will incorporate knowledge and experiences gained through the application of restoration actions and facilitate the needs and values of the associated communities over time while simultaneously allowing for the quick implementation of recommendations (action objectives) as resources become available (Section 1.4).

Restoration of SW, based upon stakeholder interests (Section 2.2.1) and characteristics of the surrounding native Appalachian forests, shall be defined as a mature white oak old-growth forest (non-native and invasive plants are managed and kept in check) that sustains a healthy regeneration of understory layers that grow from a conserved soil structure and supports the above-ground ecosystem (Section 3.2). Ecological restoration is the long-term primary objective for SW and represents the principle consideration for the integration of all the goals and actionable objectives for SW. All management decisions should be weighed according to how well they will meet the stewardship priority (primary objective) as a basis for the decision supporting rationales (Sections 2.6, 3.2, and 3.1.2).

The FSP presents 14 primary recommendations (actionable objectives) that have been designed to effectively achieve the primary long-term stewardship goal of restoration to and sustain the benefits of the woods for current and future generations. The FSP recommendations contain assessments that were determined in conjunction with operations staff on their cost based on technical and financial barriers and are listed as high cost, medium cost, and low cost. The recommendations also contain priority assessments based on stewardship importance and are demarked as high priority, medium priority, or low priority based upon factors such as safety,

ecosystem health, community concerns, and availability of resources. The FSP recommendations are listed as follows:

1. Continue to administer the forest restoration planning and management framework and apply green infrastructure planning principles (medium cost, high priority) (Section 3.2).
    a. Strengthen partnerships for the funding and care of SW by brokering facilitated open discussions about interests and values to obtain stakeholder understandings and agreements (high cost, high priority).

2. Establish a positive identity for the woods by providing the campus community with the opportunity to participate in a constructive rebranding of the woods (low cost, high priority) (Section 3.2.1).

3. Identify and manage risks in and around the forest to ensure safety and security (medium cost, high priority) (Section 3.2.2).

    a. Develop and implement a tree risk management plan under the direct supervision of a qualified professional, such as an arborist with the TRAQ credential (high cost, high priority).

        i. Retain the services of a Tree Risk Assessment Qualified (TRAQ) arborist.

        ii. Inspect trees regularly and after severe wind events and storms and before fall and spring football games by a qualified professional.
        iii. Mitigate tree risks in a timely manner when they have been reported or discovered.

        iv. Conduct tree risk inspections and mitigations according to the American National Standards Institute (ANSI) *ANSI A300 (Part 9)* and International Society of Arboriculture (ISA) *Best Management Practices for Tree Risk Assessment.*

    b. Prevent tree damage that may lead to structural defects (low cost, high priority).

    c. Convert dead trees into snags to mitigate risks and create wildlife habitat (medium cost, medium priority).

        i. Drop the tree or branches into the woods (nutrient cycling, reduces human trampling, wildlife habitat) if a tree needs to be cut down or mitigated for safety reasons.

    d. Remove hazardous debris, such as concrete chunks, cinder blocks, and pieces of rebar and pipes sticking up from the ground to increase safety (but retain historically important artifacts) (low cost, medium priority).

e. Communicate safety awareness to visitors as part of interpretive signage (medium cost, high priority).

f. Plan and implement pedestrian flow controls to enhance security, minimize exposure to potential hazards, and reduce ecological impacts, such as forest floor trampling by humans (high to medium cost, high priority).

    i. Utilize temporary fencing, signage, natural debris materials (deadwood and brush), natural plant material landscapes, and permanent fencing/gates to direct pedestrian traffic.

4. Enhance visitor security (high cost, high priority) (Section 3.2.2).

    a. Establish security enhancements with improved fencing, gates, lighting along paved trails, emergency call boxes, signs and cameras (high to medium cost, high to medium priority).

        i. Install improved fencing along the east Virginia Tech boundary along with gateway areas that facilitate a transition from the Town of Blacksburg to campus.

        ii. Install uniform and aesthetically pleasing lamp posts and lighting along the paved east pathway that match the updated lighting on the west pathway.

        iii. Install security cameras and signs that communicate the area is under surveillance.

    b. Increase personal safety by controlling invasive understory plants and smoothing out mowing edges to provide lines of sight for defensible space and improved security (low to medium cost, high priority).

    c. Install traffic control security gates to provide clearly marked transition zones and to regulate vehicle traffic (medium cost, medium priority).

        i. Prevent any vehicles from driving or parking in SW critical root zones.

5. Unify or connect the forest with other campus green spaces and amenities to increase multifunctionality (high to medium cost, medium to low priority) (Section 3.2.3).

    a. Integrate Stadium Woods into the Virginia Tech master planning process and incorporate the forest into a comprehensive natural land area parkway system involving the use of green corridors (campus trails, walkways, habitat steps, and greenspaces) (low cost, high priority).

b. Integrate Stadium Woods' paved pathways into the existing recreation trail system
c. (medium cost, medium priority).

d. Install interpretive signs at strategic locations to educate and inform visitors (medium cost, medium priority).

6. Establish governance for the forest (medium cost, high priority) (Section 3.2.4).

    a. Create a steering committee of stakeholder representatives so Virginia Tech can proactively reduce risks, address needs, and effectively resolve issues. (low cost, high priority).

        i. Use the existing Virginia Tech Arboretum Committee with two additional members, a Town of Blacksburg official and a Virginia Tech student. This new structure also meets the required Tree Campus USA standards for a campus tree advisory committee. If this recommendation is implemented, the Arboretum Committee will need to officially change their membership structure through a formal review and voting process.

    b. Support Virginia Tech protocol of contacting event planning for approval to conduct activities in Stadium Woods so events may be coordinated and establish an appropriate professional to manage the complexities associated with the forest (low cost, high priority).

        i. Establish a governing body and/or responsible professional to manage the complexities associated with the forest.

    c. Utilize a deliberative process to formulate an agreement among stakeholders on the preservation issue (high cost, high priority).

    d. Develop a Virginia Tech Stadium Woods information webpage to further affirm SW's value and to inform and aid in future management (low cost, high priority).

7. Seek alternative and creative funding for the maintenance and restoration of the forest (low cost, high priority) (Section 3.2.5).

8. Continue to encourage and cultivate organizational activities and partnerships to uphold Virginia Tech's covenant and sustain the forest over time (low cost, high priority) (Section 3.3.1).

    a. Endorse Stadium Woods as a destination site to promote Virginia Tech's commitment to sustainability and to enhance economic development (low to medium cost, high priority).

9. Enhance opportunities for teaching and research in the forest (low to medium cost, high priority) (Section 3.2.2).

    a. Create a meeting/class area adjacent to the forest that harmonizes with the landscape (high cost, medium to low priority).

10. Support and enhance both active and passive low-impact recreation (high cost, medium priority) (Section 3.3.3).

    a. Complete the north side loop around the forest so the trail will form a complete track circuit fitness trail and include two exercise stations (medium cost, medium priority).

        i. Support fitness trails to provide running, walking, and exercise trails around the forest and connect to other Virginia Tech fitness trails and the Huckleberry Trail.

        ii. Install exercise stations on the trail around the outside of the forest.

    b. Install a well-designed interpretive nature/recreation trail describing features of historical and biological interest or exterior forest observation spaces to provide passive recreation opportunities along the edge of the forest (high cost, medium priority).

    c. Enhance specific trails with boardwalks and hand rails to protect sensitive areas and facilitate access by people with physical limitations (high cost, low priority).

11. Encourage service-learning activities and participatory land care (low cost, high priority) (Section 3.3.4).

12. Protect soil and maintain water quality (low cost, high priority) (Section 3.4.1).

    a. Practice soil conservation management (low cost, high priority).

        i. Retain litter layers and coarse woody debris on the forest floor to maintain nutrient cycling and ensure long-term soil productivity and health.

        ii. Prevent/reduce any activities that may disrupt the soils that support the forest flora and/or manage to reduce human impacts.

    b. Initiate erosion prevention and mitigation practices on existing trails (medium cost, high priority).

    c. Install ephemeral stream along the emergency access road to allow rain water to flow away from pedestrian traffic, improve water quality, and protect/create habitat (high cost, low priority).

13. Restore, protect, and cultivate natural vegetation to increase health and maintain forest structure (low cost, high priority) (Section 3.4.2).

    a. Reduce mowing to facilitate understory regeneration along the north and east edge of SW to allow natural forest succession to expand the buffer zone (low cost, high priority).

    b. Retain and protect old-growth forest structure by leaving standing snags and fallen woody debris in place wherever feasible (low cost, high priority).

    c. Control invasive plant species throughout the forest (low to medium cost, high priority).

    d. Facilitate regeneration of native plants in canopy gaps and plant native trees in areas impacted by edge effects and human visitors (low cost, high priority).

        i. Manage north and south sections of woods according to specific needs of each section. For instance, the northern section of the woods may require a greater invasive plant species removal effort in conjunction with the reestablishment (by replanting) of the midstory and/or understory layers.

    e. Evaluate existing visitor-created informal trail system by initiating a proactive management approach that provides a balance between visitor access and long-term ecosystem quality (low to medium cost, high priority).

14. Minimize wildlife conflicts and enhance habitat (medium cost, medium priority (Section 3.4.3).

    a. Minimize conflicts and limit populations of nuisance animals (e.g. feral cats) by discouraging their presence (low to medium cost, medium to high priority).

    b. Monitor for deer overabundance to protect native plant biodiversity and forest regeneration by deterring or controlling browse in sensitive areas (low to medium cost, medium to high priority).

    c. Enhance bird habitat by retaining old-growth forest structure and protecting native plant diversity (low cost, high priority).

Successful restoration will require organized leadership, base-line studies, dedicated people, effective community involvement, adequate funding, and coordinated planning to

protect, manage, and restore SW. The high degree of complexity associated with the SW ecosystem creates uncertainties in some cases with regard to balancing stakeholder wishes. These issues, however, may be addressed by employing an ongoing learning process of collaborative planning, action, monitoring, and evaluation (Sections 1.4 and 2.2.2). Urban forests generally require lower levels of maintenance than other urban landscapes, yet they still require some amount of ongoing care. This is because urban forest ecosystems are not self-sustaining, due to the human impacts that inevitably occur over time in urban settings (Section 3.5).

The search for innovative approaches in the face of economic and social challenges offers many opportunities for the communities of Virginia Tech and the Town of Blacksburg. The vision of restoration may be accomplished through effective leadership and the social capital of community members working together in partnership with the private sector toward this common goal. These opportunities include the processes of service, learning, teaching, research, and community around an active engagement with SW (Section 3.5). Such an endeavor has the capacity to provide social connections and facilitate a sense of place that produces the combined efforts that encourage volunteer stewardship, opportunities for donations, and mutual learning and understanding to occur (Johnston and Hirons 2014). Performed well, these activities will create synergies to elevate the community spirit by bringing volunteer groups, private endorsements, and public officials together to yield an attractive destination site that serves as a source of community pride and enhances the image of Virginia Tech and the Town of Blacksburg.

Appendix C: Trail Closure Map recommendation sourced directly from Stadium Woods Forest Stewardship plan.

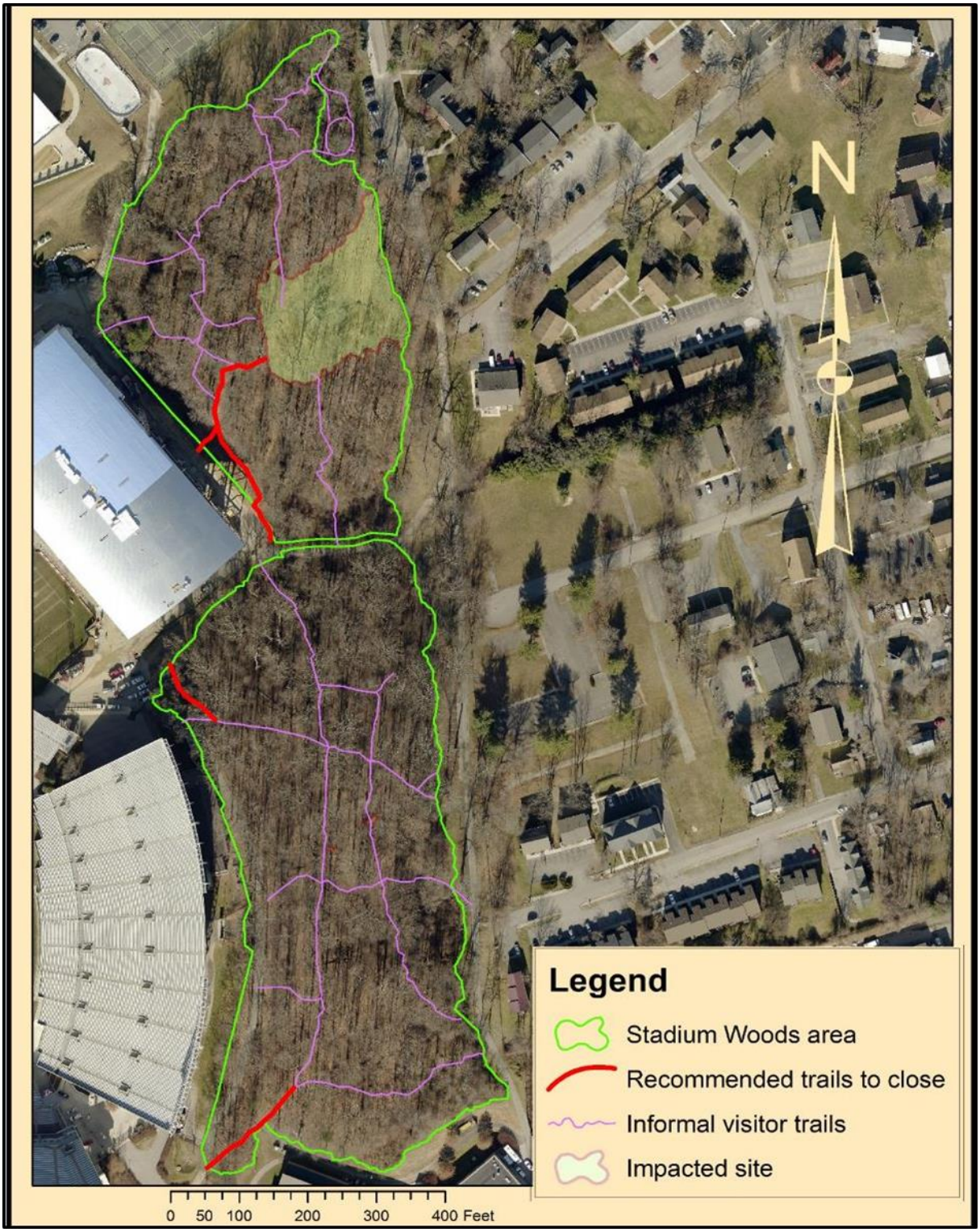

Figure 1: Recommended trail closures per *Stewardship Plan for Virginia Tech's Old-Growth Forest near Lane Stadium* by Rodney Walter (2016), Section 3.1.4 (pg 162).

Appendix D: Map of suggested sign and trashcan locations based on traffic flow through the woods and cultural/historical significance.

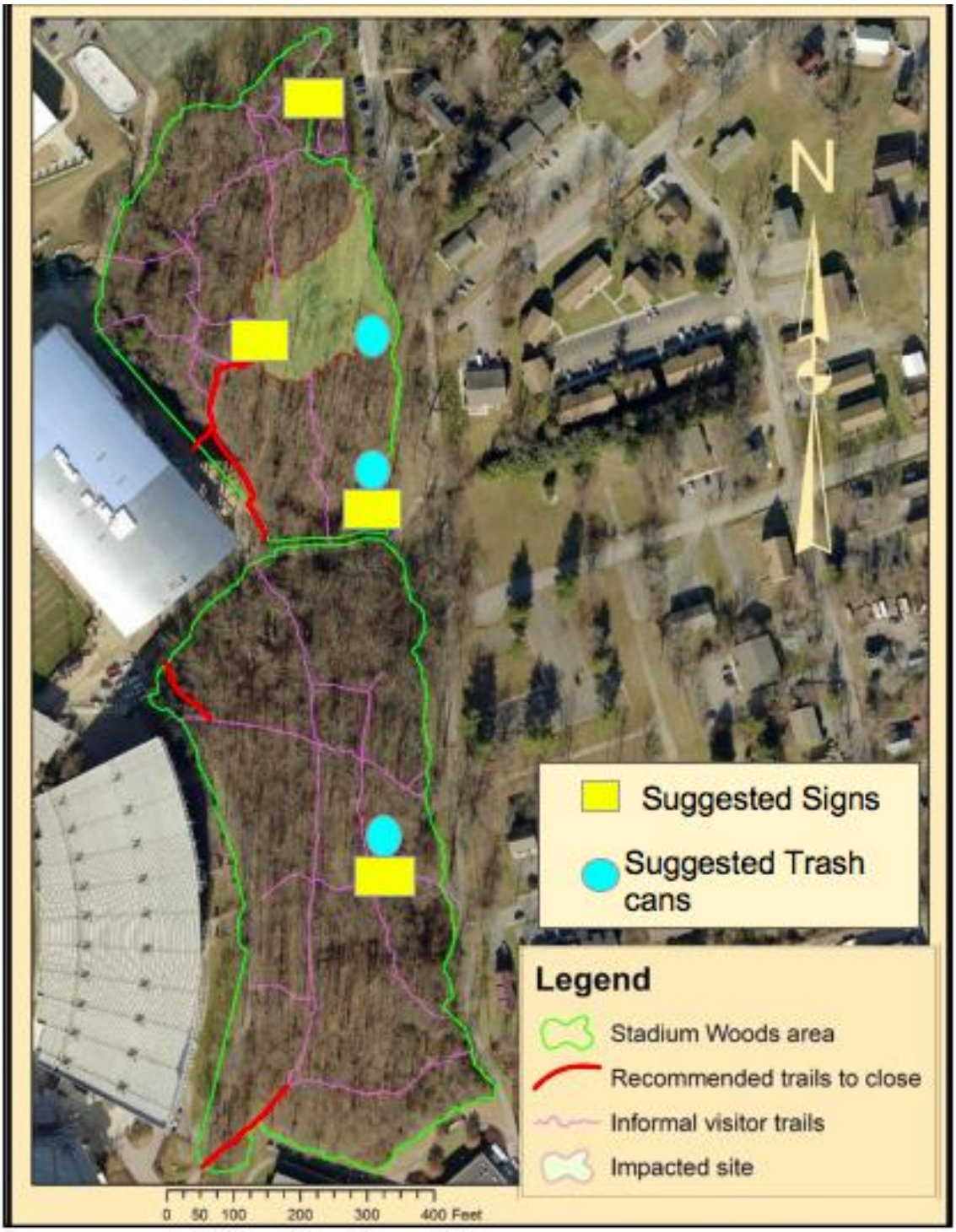

Figure 2: Suggested locations of educational signage and trash cans in stadium woods imposed on trail closure recommendation map.

Appendix E: Organization/Team founding document and project plan.

CNRE Leadership Institute: Stadium Woods Initiative Project Outline

Mission Statement:

To provide Virginia Tech and the surrounding communities access and educational opportunities in Stadium Woods by increasing its integrity and aesthetic value.

Objectives:

1. To fundraise $1200 to sponsor education signs in Stadium Woods by the end of spring semester in order to increase education opportunities in Stadium Woods.
2. To fundraise $2400 amount to sponsor trash can placement in Stadium Woods by the end of spring semester in order to increase the aesthetic value and integrity of Stadium Woods.
3. Provide technical assistance and signage for trail closures of social trails in Stadium Woods to help in restoration efforts and increase the integrity and aesthetic value of the woods.
4. Organize one trash cleanup day per semester through Greek Life Organization in Stadium Woods in order to increase aesthetic value and integrity of Stadium Woods.

Deliverables:

1. Funding
   - Pursue funding through the university's "Green RFP" initiative to help fund educational signs, trash cans, and trail closures in Stadium Woods by 11/10/17.
   - Create a GoFundMe page by 11/6/17 in an effort to raise $X dollars to sponsor educational signs and trash cans for Stadium Woods by the end of spring semester.
   - Write personal, handwritten letters to friends and families to encourage donations towards our GoFundMe account by March 2018.
2. Service
   - The CNRE Leadership team will assist in trail closures within stadium woods on (date) to increase the integrity and aesthetic value of Stadium Woods.
   - Host trash clean up days each semester in Stadium Woods with volunteers from Greek Life organizations (12/3), (date second semester).

Budget:

Item:	Number of Items:	Cost:	Total Cost:
Gloves	30	1.5	45
Trashbags	1	15	15
Silt fence (50ft long)	1	14	14
Wooden stakes (25 pack)	1	7	7
Signs/Flyers	75	0.15	11.25
		Total:	**92.25**

Appendix F: Cost estimate for educational signage similar to signage proposed in application. Application cost estimate based on 4 proposed signs.

Estimate

EnviroSigns Ltd
2700 Fulton Dr NW
CANTON, OH 44718
ph. 888-492-5377
fax 330-455-2220
email: bob@envirosigns.com

Estimate: 01 888865

Printed 5/16/2007 8:42:54AM

Description: **Durareader with Standard Pedestals**
Prepared For: Leigh Lally ph: (540) 231-4679
Company: Virginia Polytechnic Institute & State Universil
email: laleigh@vt.edu

Leigh:

Here is the quote for your project.

Design not included. If you would like us to do your layout and design, I will be happy to discuss and revise this quote. Our charge for design work is $75 an hour. If you are doing your own design, please follow our guidelines at http://www.envirosigns.com/enviroreader/designguide.htm - other files may be used but we will need to charge design ti to convert to files needed.

Quote based on customer sending completed files. Any additional design time due to illustrations needed, incomplete files from customer, or any additional design required requoted before we begin.

For the DuraReader a minimum of 1 color laminated proof is highly recommended and 1 tabloid size paper proof is recommended for each sign so you can verify exactly what the colors will look like and do a final proofing of text and layout. If no color proofs are requested, we will use our best judgement to match your colors but you must accept those colors. If no paper proofs are ordered for a sign, there can be no changes later for misspellings or layout. These offer ar excellent last minute chance to pass them around and see if there are any misspellings.

Notes:
Tax not included. If tax exempt, please provide federal id number or tax will be added to the final cost.

DEPOSIT: Please include a deposit of 1/3 the total cost along with the approved quote. The job cannot be entered into l production schedule until we receive the deposit. Balance is due upon receipt of the merchandise.
We do accept government purchase orders.

Actual production does not begin until customer's final approval of sketch, if applicable.

It is important to send files as per our design guidelines found on our website at http://www.envirosigns.com/enviroreader/designguide.htm. Low resolution or incomplete files may need additional desi time so please double check before sending.

Any changes to this quote will need to be requoted. Any required file manipulation after submitting your final files will be quoted prior to commencing work at the rate of $75 per hour.

Thank you!

Bob Blick
dba EnviroSigns
bob@envirosigns.com
www.envirosigns.com
888-492-5377

Product	Font	Qty	Sides	Height	Width	Unit Cost	Item Total

No proof needed: (initial/date)_____/_____

Estimate

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Estimate: 01 888865

Printed 5/16/2007 8:42:54AM

Product	Font	Qty	Sides	Height	Width	Unit Cost	Item Total
1 Dura-Reader 1/2"		12	1	12	12	$104.00	$1,248.00
Color:							
Description:	1/2" Exterior Phenolic Panel with Digital Graphics						
Text:	includes 4 threaded inserts and tamper proof screws per panel for easy pedestal install						
2 Pedestal (aluminum)		12	1	1	1	$156.00	$1,872.00
Color:	Black				Includes Discount:	($468.00)	
Description:	Aluminum pedestal for DuraReader panels - powder coated black Other colors available for an upcharge Unless noted, top plate is 12" x 12" and there is a single leg						
Text:							
3 DuraReader Proof		1	1	1	1	$35.00	$35.00
Color:							
Description:	15" x 18" Lab Test Proof (in thin laminate) - does not represent the final product but is a facsimile to show colo and resolution - At least 1 color proof per job is recommended although your particular project may require mo Please call to discuss if you have any questions about this proof.						
Text:							
4 Paper Proofs		4	1	1	1	$8.00	$32.00
Color:							
Description:	Tabloid size paper proof of the entire sign. Last chance to check for layout, fonts, spelling - before final print.						
Text:							
5 Design Not Included		1	1	1	1	$0.00	$0.00
Color:							
Description:	Design costs are not included. Estimate based on receiving files as per our design guidelines at http://www.envirosigns.com/enviroreader/designguide.htm - If we have problems with the completed files - we contact you before we go any further to discuss a solution If you would like us to do any design work, please let me know and I can redo this estimate.						
Text:							
6 SHIPPING CHARGE		1	1	1	1	$269.00	$269.00
Color:							
Description:	Shipping costs are estimated						
Text:							
7 Crating/Packaging		1	1	1	1	$55.00	$55.00
Color:							
Description:	Durareader panels are specially crated in a custom made wooden boxed and packed so there is no movemen						
Text:							

No proof needed: (initial/date)_____/_____

Estimate

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2700 Fulton Dr NW
CANTON, OH 44718
ph. 888-492-5377
fax 330-455-2220
email: bob@envirosigns.com

Estimate: 01 888865

Printed 5/16/2007 8:42:54AM

Notes:

Line Item Total:	**$3,511.00**
Tax Exempt Amt:	**$3,511.00**
Subtotal:	**$3,511.00**
Taxes:	**$0.00**
Total:	**$3,511.00**

Deposit Required: **$1,755.50**

Company: Virginia Polytechnic Institute & State Universit
48 Sterrett Facilities
Complex-(0160)
Blacksburg, VA 24061

Received/Accepted By:
/ /

No proof needed: (initial/date)_____/_____

Appendix G: Email Communication with Jack Washington concerning pricing of suggested practices.

Washington, Jack Nov 8 (6 days ago)

to me, samwl4, Denny

Hello Olivia and Sam,

Thanks for taking the time to come chat about Stadium Woods / the Green RFP today.

I chatted with Denny and he said you can take until next Friday (10/17) to submit your proposal. As far as cost estimates go, he indicated that you should only be looking for rough order of magnitude costs. For selected projects, the actual budget request will be refined with the budget office through early 2018. You can use some of the numbers / guidelines below for the projects in which you're interested.

- **Trash Cans:** You can use $800/can. This number comes from a recent project Facilities did in Roanoke.
- **Interpretive Signs:** Please see the attached cost estimate. It was $3,500 for 12 signs. However, you can probably break that up into smaller increments through looking at the line items. There's also some PDF and Illustrator files in there. After speaking with Leigh, you might be asked to be involved with the layout of, and content for, the signs. However, our campus landscape architect and arboretum committee would likely also be involved.
- **Trail Closures:** I think you were on the right track before. A Google search should yield a rough cost for a custom sign. That plus the costs of fencing and posts you find through HomeDepot.Com, or a similar site, will be sufficient. The cost doesn't need to be exactly right, it's just a way for the reviewers to compare projects (e.g., a $5,000 project vs. a $25,000 project).

Please feel free to follow up with any further questions.

Sincerely,

Jack Washington
Program Coordinator
Office of University Planning
230 Sterrett Drive
Blacksburg, VA 24061

Appendix H: Excerpt of Appendix P in the Forest Stewardship Plan concerning trail closure methods and signage.

Site Management Actions

A variety of site management actions are available for closing informal trails. Close lightly used trails by actions that naturalize and hide their tread disturbance, particularly along initial visible sections where visitors make the decision to venture down them. Effective actions include

raking organic debris such as leaves onto the tread, along with randomly placed local rocks, gravel, and woody debris designed to naturalize and hide the tread. These actions also lessen soil erosion and speed natural recovery. On trails that have been effectively closed, transplanting plugs of vegetation at the beginning of wet seasons can hasten natural recovery. Revegetation work conducted before successful closure is achieved can be a frustrating waste of time and materials if visitors continue use of the trail and trample the transplanted vegetation.

Figure 1. Examples of informative trailhead sign (left) and trailside prompter signs that can assist management efforts in closing informal trails.