KUTC Fact Sheet

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Building and Maintaining Trails

Tips and techniques for rural communities in Kansas

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Trails have a long and storied history in the United States, as they have allowed thousands to enjoy the natural beauty of many national and state parks. Urban and rural communities are turning to trails to connect green spaces and create opportunities for outdoor activity in everyday life. To encourage frequent use of these trails, there are several factors worth considering with regard to trail design and long-term maintenance including site characteristics, anticipated users, trail type and trail surface material. Combined these factors will ultimately decide the frequency, intensity and cost of maintenance of a trail.

This fact sheet outlines some considerations for initial design and long term maintenance of trails and provides a list of resources for more information on this topic.

Designing for use

Site assessment not only helps to identify the specific uses of a trail, but also the long-term maintenance required. To begin, identify what type of programming, or use, the trail will have, and the type(s) of users for the trail. There are a variety of trail types. A few include:

- ADA-accessible routes
- Recreational trails
- Hiking trails
- Shared-use paths
- Bicycle paths

A dad and his sons enjoy a ride on a rail-trail in Garnett, Kansas.

- Mountain biking trails
- Equestrian trails
- All-Terrain Vehicle trails
- Off-Highway Vehicle trails[3]

Amenities will be based on the type of trail and user. For example, bicyclists may need bike racks that are easy to use and highly visible while equestrians will require hitching posts, water troughs and rest areas large enough to accommodate a horse.[3] Likewise trails that accommodate elderly persons will require additional seating and rest stops along the route to ensure users have adequate opportunities to rest if needed. The needs of each desired user group should be matched to the type of trail desired and included in the initial planning of a trail to ensure that each user group will receive adequate facilities and support.

Designing for accessibility

Accessibility for a trail should be included in considerations for trail type and site selection. Certain types of trails will naturally allow more accessibility for individuals who are elderly, disabled or developmentally impaired. For example, a recreational trail usually has a more level slope and surface than a hiking trail and can be easier to navigate for people with limited strength or balance. On the other hand, users who have mobility limitations while walking may be able to access some nature trails using Off Highway Vehicles (OHVs) such as four-wheelers. Understanding the capabilities of your anticipated user can help in determining the trail type and design to allow for maximum accessibility.

When designing a trail, consistency among trail elements is important. For example, if users with limited mobility attempt to navigate a level, paved trail, they would likewise expect an accessible bridge over a stream, not a fallen log. If there is no consistency in the level of access along a trail, users will either turn back or attempt to

Seasonal Maintenance Checklist

Prior to Memorial Day. This may be the maintenance period that involves the most work. The objective is to get the trail ready for the spring hikers. In addition to general trail cleanup:

- Remove tree limbs and fallen trees from the trail, and prune encroaching limbs as needed
- Repaint or replace the blazes [guide signs] if they are faded or missing. (Be sure that they are not obscured by vegetation—consider growth that occurs before the next maintenance)
- Make sure that all signs and trail emblems are in place and well maintained
- Inspect for water in the trail and take corrective action
- Carefully inspect all bridges—immediate safety needs should be met and tasks which are too large for immediate action noted
- Maintain all trailheads, campsites, and other support structures
- Keep a list of larger jobs or those that require different tools that will require attention at some other time
- Schedule time for major projects that were identified—round up tools and helpers
- Pick up litter

Mid-Summer. Early July is a good time to take care of annual growth to keep the trail clear and relatively easy to hike. The hiker should not be assaulted by weeds and briars. Some of the key jobs for mid-summer are to:

- Mow or cut all weeds, brambles, briars, and high grass encroaching on the trail. On sections of the trail that pass through fields or other places receiving direct sunlight, mowing may have to be done on a more frequent basis—perhaps monthly throughout the summer. Brambles and briars may need to be grubbed out by the roots to prevent rapid regrowth
- Prune all brush and limbs that have grown into the trail clearing—all blazes and signs must be visible
- Complete the larger jobs that could not be accomplished the previous spring
- Maintain and improve water bars, drainage ditches, and all trail structures
- Be alert for noxious or exotic plant species—remove, kill, or inventory them for future vegetative management projects
- Pick up litter

Fall. Fall maintenance is geared toward preparing the trail for the winter months. This is a time to:

- Finish any uncompleted jobs and recheck blazes and signs—replace and repair as necessary
- Be sure that any campsites and shelters are clean and in good repair
- Contact landowners to thank them for their support
- Pick up litter

Source: National Park Service. Handbook for Trail Design, Construction and Maintenance.[1]

continue navigating the trail, putting themselves at a higher risk of injury.[3]

Other design elements to consider when providing accessibility are rest areas, seating, signage and adequate passing space throughout the trail. For users with limited mobility, providing frequent, level sections is important; benches or seating along a trail also allow users to rest. Signage that is easily accessible should be provided and can include using large lettering, Braille panels, raised lettering, or audio boxes that play prerecorded trail information at the push of a button, providing users with visual impairments important information.[3]

Trail materials and maintenance

A variety of materials can be used to construct a trail. Each surface material (or "tread type") has pros and cons. The table on page 3 outlines the pros and cons of each tread type to help identify which one most closely fits the desired trail type and anticipated users.

Seasonal checklist template

When trying to keep track of the maintenance for each season, it is useful to use a checklist to help make sure nothing is forgotten. Most trail segments need maintenance about three times per year. The table above is an example of a three-season checklist, and can be used as a template to further tailor to specific trails or communities.

Plants and animals can affect maintenance

A biological inventory will assess the environmental aspects of a site, including the users, wildlife and surrounding plants. This is important for identifying additional considerations for trail maintenance. For example, identifying the types of animals near a trail will help identify their possible effects. Burrowing animals such as gophers and moles can burrow under a tread making it uneven and loosening it which then promotes the erosion of a trail.[2] When conducting a biological inventory don't forget to include the added stress to a trail caused by humans and livestock in consideration to how that will affect the future maintenance of a trail.

Tread Type Pros and Cons

Tread Type	Pros	Cons
Crushed Gravel	• Considered by some to be more natural looking • Good for flat areas out of flood plains • Softer on joints (running) • Cheaper initial installation cost • Permeable surface, allows water to soak into the ground instead of adding to the stormwater runoff	• High ongoing maintenance costs • Difficult to maintain consistent surface quality • Environmental damage caused by gravel erosion • More difficult to use in winter due to soft, wet and dirty conditions • Gravel migrates on steep trail slopes • Difficult to ride bikes on steep slopes and in loose gravel • Difficult to remove silt deposits after heavy rains. • A dirty surface during and many days after rains • Very difficult to meet ADA surface standards • Less stability for running and walking in loose gravel
Asphalt	• Best initial surface (smooth, no cracks) • Slightly cheaper than concrete in initial cost	• Edges crack with vegetation • Limited tread width, generally 8 ft. or wider • Constant maintenance of crack filling and sealing; needs to be accessible for the required equipment • Must be completely overlaid approximately every 8-10 years • Little structural strength to span over soil problems below • Requires greater initial excavation (harming trees) to provide the required rock base depth • Impervious surface
Concrete	• Best ADA surface long term • Best longevity; Should last 20+ years • Best consistency of surface • Steel in concrete keeps it from deflecting preventing tripping hazards or barriers for wheel chairs • Cleaner surface during and after rains; keeps commuters clean as well as less wear and tear on bikes • Does not require gravel base rock so impact on trees is less than asphalt • Reduces gravel runoff in creeks and natural areas when it rains	• More expensive (initial installation) • Harder on joints (running) • Less natural looking than gravel • Impervious surface • Can wash out underneath the concrete causing sinking and cracking during storm events
Paving Stones/Bricks	• Available in many sizes, shapes and colors • Uniform in size • Easy to acquire and handle	• Heavy to transport • Expensive
Bedrock	• Durable • May be readily available on site • Low maintenance	• Can become slippery, especially for horses or when wet • May not extend the entire length of the trail • May require large amounts of soil to be removed • Impermeable
Vegetation	• Plants hold soil in place to prevent erosion • One of the cheapest options for installation; can use existing vegetation • Permeable, allows water to soak into the ground and not add to stormwater runoff	• Will not survive high traffic • Needs full sunlight • Increases ticks and other pests along walkways • Can include noxious plants like poison ivy
Woodchips	• Useful for newly constructed trails or temporary • Can raise the tread above muddy areas • Suppresses vegetation growth	• High labor costs and time • Must be replaced every 3 years or sooner, depending on weather • Washes out and migrates easily

Source: University of Arkansas. Nature Trail Development on Small Acreages.[6]

Surrounding plants should also be considered in terms of trail maintenance. For example, in wooded areas there will be the added burden of keeping tree roots and saplings from weakening the integrity of a trail. Taking an inventory of the area's plants will also help you identify plants that may be poisonous, such as poison ivy. Maintenance not done regularly can cause hazardous conditions for users and decrease their overall enjoyment of the trail.

By conducting a thorough biological inventory sensitive areas and wildlife will be identified. Sensitive areas can include a wetland, wildlife reserve or farmland, and while these areas may be ideal near a trail, special consideration should be given to the construction and maintenance. Once identified, proper measures can be taken in the design and site selection to protect these sensitive areas, including: barriers between users and vegetation, the use of native species for landscaping, limiting of chemical weed killers, and reducing non-native or invasive species.[12]

Funding

Funding for trail development is available from a variety of sources. When looking for funding for trails, look for grants that promote active living, physical health, mental well-being, and education as well as transportation. Trails are being used for more than physical activity so don't limit the search to just transportation! For example, in Klamath Falls, Oregon, trails are being used in a "Walk with a Doc" program that allows patients to walk with their doctor and ask health-related questions. Other communities have adopted "walking

Columbia, MO Trail examples and associated costs

Gravel build-up in natural areas after flooding.

Asphalt settling where base failed on Lions-Stephens Trail.

Gravel wash out at Bear Creek Trail bridge.

Annual cost to maintain a ¼ mile of trail.

Trail Type	*Annual Cost*
Concrete	$745
Asphalt	$2,168
Gravel (in non washout/flood areas)	$1,320
Gravel (in washout/flood areas)	$4,226

Source: http://atfiles.org/files/pdf/ColumbiaMOsurface.pdf [8]

classroom" models that allow children's classes to be conducted outside, along trails, engaging them in a more active learning environment. Consider the specific programming, or use, of the trail and look for ways it can be multi-disciplinary to open up a wider range of grant opportunities.

A few agencies have already compiled lists of available grants, including the *Rural Health Information Hub* which can be found at https://www.ruralhealthinfo.org/funding/types/grants-and-contracts and the *Rails to Trails Conservatory,* found at http://www.railstotrails.org/build-trails/trail-building-toolbox/acquisition/financing-and-funding/. More information on funding bicycle and pedestrian projects under the Federal Transit and Federal Highway programs can be found at http://www.fhwa.dot.gov/environment/bicycle_pedestrian/funding/funding_opportunities.cfm.

An important source of funding in Kansas for trail development and improvement is the Sunflower Foundation. They issue an annual call for projects for community-based new trails or trail expansion; existing trail enhancements/improvements; and trail connectors.

The Foundation also provides funding for school-based new trails.

Maximum funding available for these projects ranges from $20,000 to $55,000. Criteria and information on applying for funding can be found at the Foundation's website at http://www.sunflowerfoundation.org/user/file/Funding-at-Glance_SFTrails.pdf.

Grants for trails are also available from the Kansas Department of Wildlife and Parks. Contact Kathy Pritchett for more information at kathy.pritchett@ksoutdoors.com or visit http://ksoutdoors.com/KDWPT-Info/Grants for more information.

A few local and regional examples of community trails

Lawrence, Kansas. Lawrence has a variety of trail types, including crushed gravel along the Kansas River as well as paved asphalt and concrete. A unique aspect to Lawrence's trail systems is the city's partnership with a non-profit, the Lawrence Mountain Bike Club. The club has agreed to build and maintain the river trails, reducing the burden of maintenance for the city.

Columbia, Missouri. Columbia has made use of several crushed gravel trails and has extensively documented the effects of storm water runoff and flooding on trails. Mike Snyder, from Columbia's Parks and Recreation Department is a good contact if there are any questions about maintenance costs: Mike.Snyder@como.gov.

Garden City, Kansas. Garden City has a paved 3.5 mile bike and

REFERENCES AND OTHER RESOURCES ON TRAIL MAINTENANCE

Federal Resources

1. http://www.nps.gov/noco/learn/management/ncttrailconstructionmanual1.htm
The manual was created by the National Park Service and covers trail standards, layout, structures (such as bridges), plotting with GIS and signage, safety considerations and maintenance. Specifically in maintenance, the manual covers an assessment and inventory (Appendix 2), maintenance activities, frequency of maintenance, organizing the crew, cleanup, and maintenance tips; all of which could be used as a template for communities.

2. http://www.fs.fed.us/t-d/pubs/pdfpubs/pdf07232806/pdf07232806dpi72.pdf
Federal Forest Service brochure. Interesting points include the natural effects on trail construction and maintenance, including designing a trail for "critter" consideration, i.e. don't build switchbacks across a ridge or other major "game route." The intent being to keep the trails in as good a condition as possible. Extensively covers controlling surface water and a variety of other considerations.

3. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalks/chap5a.cfm
Good section on conflict among user groups as well as considerations for people with disabilities in regards to trail design.

4. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2/pdf/14chapter13.pdf
This PDF covers the FHWA Universal Trail Assessment Process, including how to become a certified Trail Assessment Coordinator. Has a great example of a trail access information strip.

Local Resources

5. http://www.lawrencemountainbikeclub.org/trail-maintenance/
An idea for alternative maintenance, the Lawrence Mountain Bike Club has an agreement with Lawrence Parks and Rec to build and maintain the River Trails.

6. http://www.uaex.edu/publications/pdf/MP488.pdf
Document produced by the University of Arkansas that covers the entire trail development process. Particularly helpful parts are the sections on trail maintenance and tread type for appropriate uses. The document also includes information on how to plan for trails, considering plant and wildlife impacts and trail usage.

7. www.marc.org/walkfriendly
The Walk Friendly Community program is part of a national program. The program is comprehensive and it requires intra departmental communication and coordination. The assessment tool is thorough and provides relevant examples for each of the questions that it ask.

8. http://atfiles.org/files/pdf/ColumbiaMOsurface.pdf
Document from Columbia, Missouri's Dept. of Parks and Rec that covers "choosing the right trail surface" for your community. Outlines pros and cons of different surface types, as well as maintenance concerns. Gives examples of when gravel trails are not appropriate, such as in areas that flood often.

General Resources

9. http://www.ct.gov/deep/lib/deep/outdoor_recreation/trails/eac/multi-use_trail_surface_study.pdf
Document from Connecticut, created by the CT Equine Advisory Council. Covers projects for multi-use paths, including horse paths. Includes prices as well as maintenance considerations.

10. http://www.americantrails.org/resources/ManageMaintain/
A gold mine of information on trails.

11. http://www.railstotrails.org/build-trails/trail-building-toolbox/trail-building-and-design/surfaces/
List of different types of trails, information on designing for user types, developing trails in sensitive areas, and accessibility.

12. http://ksoutdoors.com/KDWPT-Info/Grants/Helpful-Links-for-the-Recreational-Trails-Program-Grant
Contains links to resources on accessibility requirements and other resources related to federal grants.

pedestrian trail that extends through the city, connecting with their sports complex. The trail, named Talley Trail, has excellent amenities, including seven gazebos, several benches and a Funshower water tower to help both people and pets cool off.

Coffeyville, Kansas. Coffeyville has taken an innovative approach to trail development and funding. They have received three Brownfield Grants from the Environmental Protection Agency. A brownfield is land previously used for industrial or commercial use and may have some level of contamination that needs to be cleaned up. With these grants the City is planning to develop a bike trail system through reclaimed brownfield areas. The project is currently underway, with the ultimate goal of connecting to the city's parks.

Pratt, Kansas. Pratt has developed several trails within their community, one of which allows All-Terrain Vehicles (ATVs). The trail is a one-mile loop that has cross-over loops at one-quarter, one-half and three-quarter miles. The Kansas Department of Wildlife and Parks and the City of Pratt worked together to build the nature trail in the Ninnescah River section of Lemon Park, an 80 acre park.

Parting thoughts

Choosing a trail type that matches the anticipated or desired user(s) will create an overall positive user experience, creating increased support for future projects and upkeep. Meanwhile, the site selection and design of a trail, when combined with appropriate material, can greatly reduce the annual maintenance costs of a trail. Funding for trail development can be found from a variety of sources. Identifying multiple uses for a trail may expand opportunities for development and maintenance. Finding partners for maintenance, such as local bike clubs or service organizations, can also help reduce the costs of maintenance. Ultimately, the right trail will look different for each community based on the unique site attributes, budget and use.

Trail in a Box — "Just Add Volunteers"

Let's say you have identified volunteers to create a nature trail, but you are short on tools, or don't know what tools you may need. "Trail In A Box" is for you. It is a tool box on wheels with everything a group of community volunteers needs to create a public nature trail. Groups can apply to use it through the Kansas Trails Council, which launched the program in 2013.

Most natural surface trails are built by volunteer groups. These groups often lack the costly tools or expertise needed to build a trail — that's where Trail In A Box comes in. There are currently three trailers in the Trail In A Box program, which communities can borrow for up to several months at a time.

The link in the Source below contains more information on the program and a short video by Mike Goodwin of the Kansas Trails Council who gives a tour of some of the main trail-building tools that are loaded on the trailers. Check it out!

Tools in a Trail In A Box trailer:

Brush mower • Chain saw • String trimmer and blade attachment
Leaf blower • 10 Pulaski axes • 5 McLeod rakes • 10 By-pass loppers
5 hand saws • Stone-moving winches, chains and levers
Sledge hammer and hand hammers • Post hole digger • Shovel
Leaf rakes • Backpack herbicide sprayer • Trail surveying equipment
Goggles, ear protection, and other safety equipment • First aid kit.

Source:
http://www.sunflowerfoundation.org/what_we_do/healthy_living/sunflower_trails_profile_trail_in_a_box

We hope this overview of considerations for trail maintenance will help your community advance its goals toward creating and maintaining trails to enhance community connectivity and health.

Helpful contacts in Kansas

Here are the names of a few people who work extensively with trails and can help point you in the right direction in your efforts to build and maintain trails:

Mike Goodwin, Treasurer, Kansas Trails Council, 785-221-1794, goodwinmw@gmail.com, http://www.kansastrailscouncil.org/ Goodwin is also Coordinator for Get Outdoors Kansas; http://www.getoutdoorskansas.org/trails.

Trent McCown, Manager, Kansas Prairie Spirit Rail Trail Park, 620-474-1435, trent.mccown@ksoutdoors.com.

Questions? Contact Lisa Harris at the Kansas University Transportation Center at 785-864-2590 or by email at LHarris@ku.edu. ■

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