Developing an Adirondack Park Trail Register Database to Support Recreation Management and Community Planning

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We compiled 8000+ trail register sheets into a relational database of the spatial and temporal distribution of trail use in the Adirondack Park. We estimated over 560,000 user days in 2012. We also sampled the origins of trail users to develop geographic and travel cost analyses. Quantifying recreation use in the Adirondack Park contributes to multiple Northern Forest objectives.

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http://www.nsrcforest.org

Project Summary

Recreation is a very important economic driver and landscape attraction in the Adirondack Park, NY. Since its protection in 1892, the Adirondack Park remains a patchwork landscape of public and private lands and serves as a global model for sustainably balancing economic development with conservation objectives. The landscape's protective policies result in limited opportunity for extractive resources or intensive development, transitioning the region toward an economy supported predominantly by recreation and tourism.

Despite the significance of recreation, little systematic or empirical information exists for measuring or monitoring recreation use across the landscape's expansive system of trails and recreational assets. The New York State Department of Environmental Conservation (NYSDEC) maintains a system of more than 250 official trail registers, used primarily for search and rescue, which contain a wealth of data describing when, where, how, and by whom the trail network is being used. Trail registers are a direct and voluntary mechanism for monitoring recreation use, with an approximated 95% compliance rate across the Adirondack Park (Dawson, 2012). With partial support provided by the Northern States Research Cooperative, the Adirondack Park Regional Geographic Information Systems Consortium collaborated with the NYSDEC to collect, digitize, and analyze spatially represented trail register data from 2012.

The resulting Adirondack Park Trail Register Database (ADK-TReD) consisted of data from 212 trail registers provided by the NYSDEC. A multi-stage sampling approach recorded all entries indicating the total users in each group and their length of stay, a sample of every 5th origin and destination indicated by the user, and dates for reference in Microsoft Excel. All associated information for register locations and trail segments were spatially referenced in ArcGIS 10. Using Program R, the database has been queried and analyzed for temporal and spatial trends at multiple scales that describe recreation across the landscape.

ADK-TReD describes the recreation choices of over 433,000 users on more than 193,000 days on designated trails. This database can be leveraged to inform recreation management, community planning, and tourism marketing, and to identify opportunities for economic development or stewardship across stakeholders, as well as to address broader research questions. As a major recreation hub of the Northern Forest, The Adirondack Park can serve as a model for understanding the links between natural resources, recreation, and sustainable landscapes.

Background and Justification

Adirondack Park (ADK) and Recreation

- 1892 legislation established the Adirondack Park (NY) to protect State interests in forest and water resources from threats of development and resource extraction (Harris et al. 2012). The “Blue Line” boundary of the Park has expanded to include new land acquisitions over time.
- Today’s Park is 6-million acres of private (42%), public (45%), and mixed[1] (13%) lands (LA Group 2014).
- Recreation occurs across all public lands, including a 2,350 mile trail network maintained by the State, and is a major driver of the Park economy (Mather 2001; Hubacek et al. 2002).

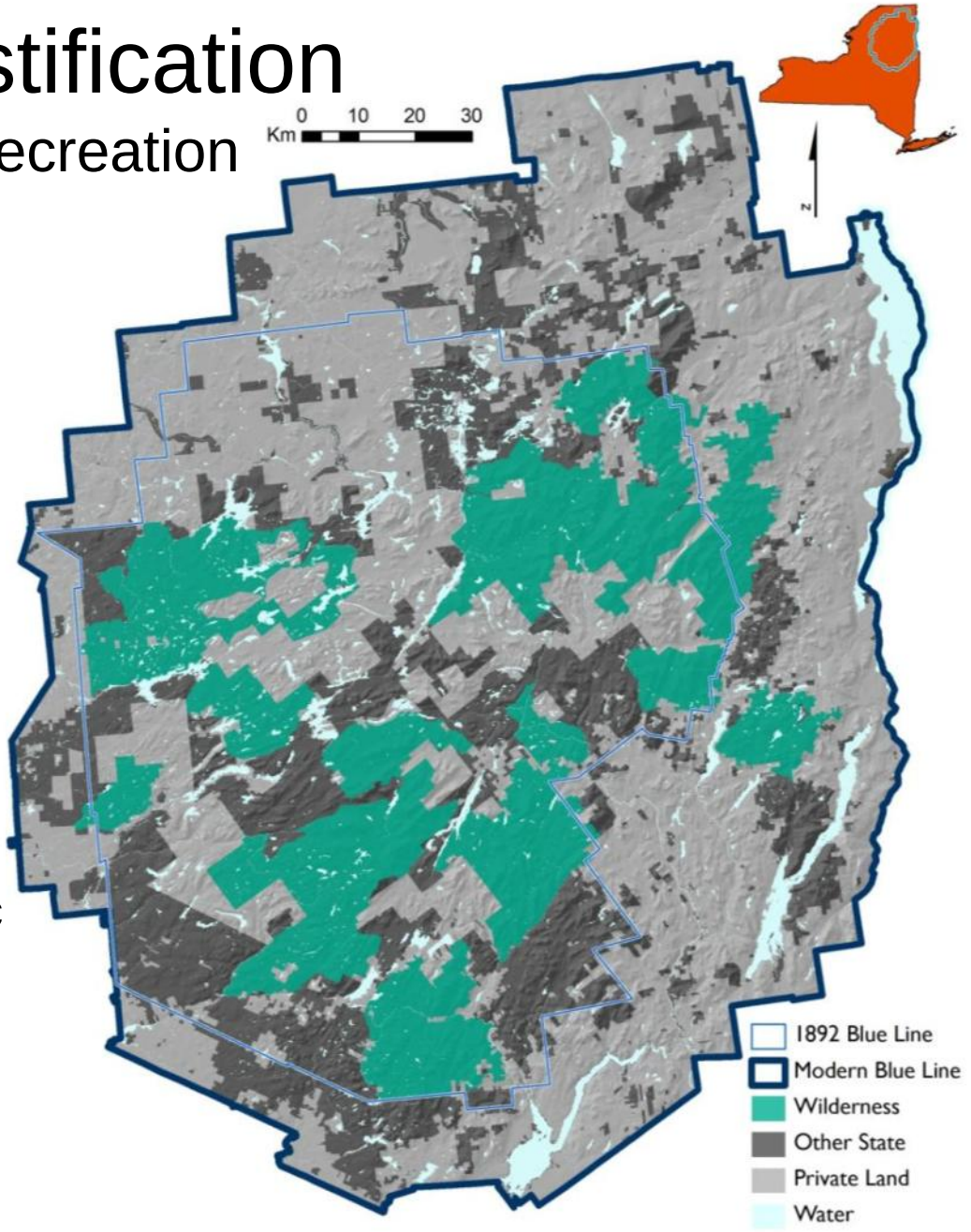


Fig. 1: Select ADK land classifications.

[1] Mixed landscapes contain some form of easement which disaggregates property rights and title among multiple agents, often including the State.

Background and Justification

Fig. 2: ADK trail register.

Monitoring Recreation Use

- *Why monitor recreation use?*
  - Locate user hotspots, plan or allocate visitor facilities, staff, and services, schedule maintenance (Cessford and Muhar 2003).
  - Identify social, economic, and political significance of recreation (Cessford and Muhar 2003) and respond with sustainable management practices (Hadwen et al. 2007)
- *How to monitor recreation use?*
  - Multiple direct or indirect methods, including voluntary self registration (Cessford and Muhar 2003, Dawson and Hendee 2009, Muhar et al. 2002, Roggenbuck and Lucas1985).
  - Trail register compliance rate ranged from 18-89% across 16 Wilderness studies (Roggenbuck and Lucas 1985), but from 61-118% with a 95% overall compliance rate in a recent ADK study (Dawson 2012).
- *Monitoring recreation in the ADK*
  - Trail registers are maintained by the NYSDEC for search and rescue purposes, and contain hard copy data on trail recreation use such as:
    - Date of use
    - Address of origin (i.e., place of residence)
    - Contact information (i.e., phone number)
    - Total number in group
    - Length of stay (days)
    - “Check out” box
    - Intended type of use or destination along the trail network

Background and Justification

A digital database of trail register data can be used to estimate recreational activity, to analyze seasonal and spatial trends at multiple scales (individual trails vs. Park units), and to evaluate how different user groups from different regions may benefit from the recreational opportunities in the region. The database supports research on protected areas, as well as management and community development objectives in the Adirondack Park.

Fig. 3: Conceptualization of the major applications of ADK-TReD.

Methods

Accessing Trail Register Data

- Trail registers are stored in wooden kiosks or boxes, located at the start of trails or other recreation access points frequented by visitors. The project began with a list of 269 known ADK trail registers.
- In collaboration with the NYSDEC, our team accessed and recorded trail register data from 2012 in Microsoft Excel.
- Each trail register was spatially referenced in ArcGIS 10.

Fig. 4: ADK trail register in the field.

Fig. 5: Voluntarily registration.

Fig. 6: Trail register data in hard copy.

Fig. 7: Team recording trail register data.

Methods

Recording Trail Register Data in Microsoft Excel

- **Every** entry of use statistics
  - –Group Size (number of individuals)
  - –Length of Stay (time spent on trail)
- **Every 5th** entry of visitor demographics
  - –Origin (city/province and state/country)
  - –Destination (the objective of the trail use)
- **Date**
  - –1st of each month
  - –1st on each page
  - –Memorial Day and Columbus Day weekends

UID	Name	Mgmt Unit	Office	Page	Date	Month Number	State	City Original	NYSCity Matched	NYSCounty Matched	Group Size	Length of Stay	User Days	Destination	Notes	ADKCity	Type
21804	11th Mountain	Siamese Poi	Warrensb	1	1/7/2012	1					1	1	1			Johnsbui	Regular
21804	11th Mountain	Siamese Poi	Warrensb	1		1					1	2	2			Johnsbui	Regular
21804	11th Mountain	Siamese Poi	Warrensb	1		1					2	1	2			Johnsbui	Regular
21804	11th Mountain	Siamese Poi	Warrensb	1		1					1	1	1			Johnsbui	Regular
21804	11th Mountain	Siamese Poi	Warrensb	1		1	NY	Binghamton	Binghamton	Broome	2	3	6	Ponds, Lean-to		Johnsbui	Regular
21804	11th Mountain	Siamese Poi	Warrensb	1		1					1	1	1			Johnsbui	Regular
21804	11th Mountain	Siamese Poi	Warrensb	1		1					1	1	1			Johnsbui	Regular
21804	11th Mountain	Siamese Poi	Warrensb	1		1					1	1	1			Johnsbui	Regular
21804	11th Mountain	Siamese Poi	Warrensb	1		1					2	1	2			Johnsbui	Regular
21804	11th Mountain	Siamese Poi	Warrensb	1		1	NY	Schroon Lake	Schroon	Essex	1	1	1	Trail		Johnsbui	Regular
21804	11th Mountain	Siamese Poi	Warrensb	1		1					2	1	2			Johnsbui	Regular
21804	11th Mountain	Siamese Poi	Warrensb	1		1					1	1	1			Johnsbui	Regular

Fig. 8: Example of recorded trail register data in ADK-TReD.

Methods

Querying the Trail Register Database

(Conducted in Program R; spatial queries conducted in ArcGIS 10)

- User characteristics
  Ex: What is the proportion of visitors from outside New York State?
- Trail characteristics
  Ex: Do trails with higher mileage attract visitors who stay longer?
- Management unit or land use classification
  Ex: Do similar areas receive similar profiles of use?
- Local community demographics
  Ex: Is there a correlation between trail use and tourism economies at the local scale?

Results/Project Outcomes - Overview

- ADK-TReD database contains the spatially referenced data of 212 trail registers. Data queries rely on Program R and ArcGIS 10.
- In 2012, the trail register system recorded 433,042 users across 193,279 days, resulting in 562,502 users days[1].
- Groups consisted of 2-4 individuals (66%) on day trips (88%).
- The majority of sampled groups were residents of New York State (70%), while nearly a third of those users were residents of the Adirondack Park.
- Usershed Concept (Eagles et al. 2014)
  - "area from which tourists come from for a destination"
  - Useful for measuring attraction, market segmentation, identifying travel routes, understanding the needs of the traveler, and measuring loyalty.
  - Can be represented as a map and summarized by straight or travel distances, at multiple scales.

[1]User Days = individual group size x individual length of stay

Results/Project Outcomes - Management

These figures indicate where and when users visit the trail registers. This information is imperative for informed management decisions.

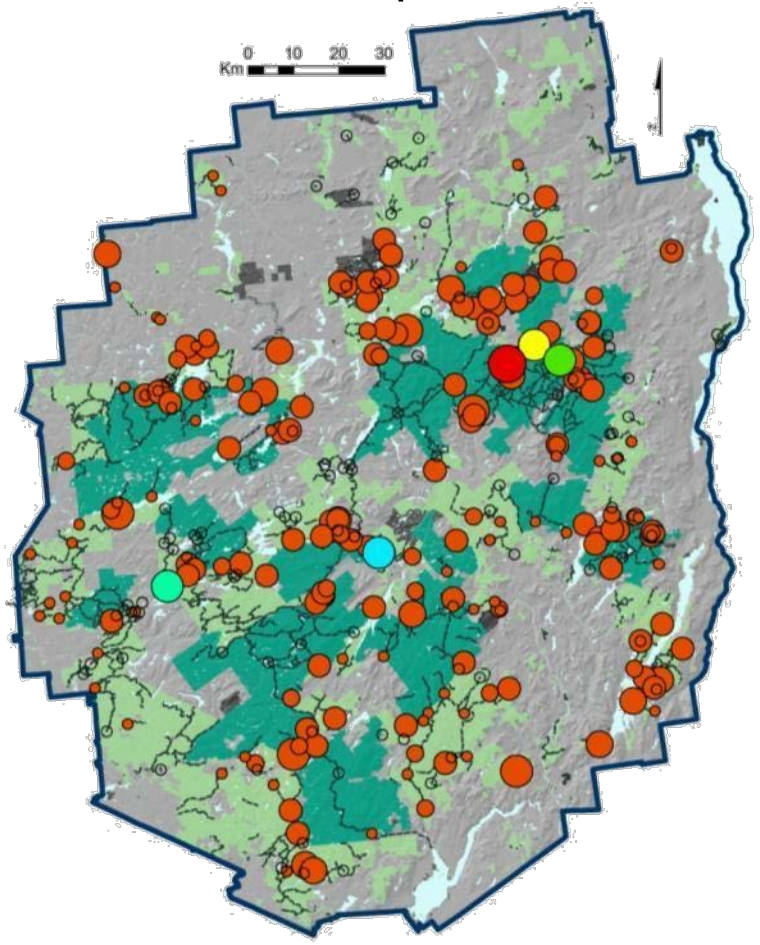


Fig. 9: Spatial distribution of use. Point size indicates degree of use. The five most popular registers are coded by color and listed in the table. These registers are spatially dispersed.

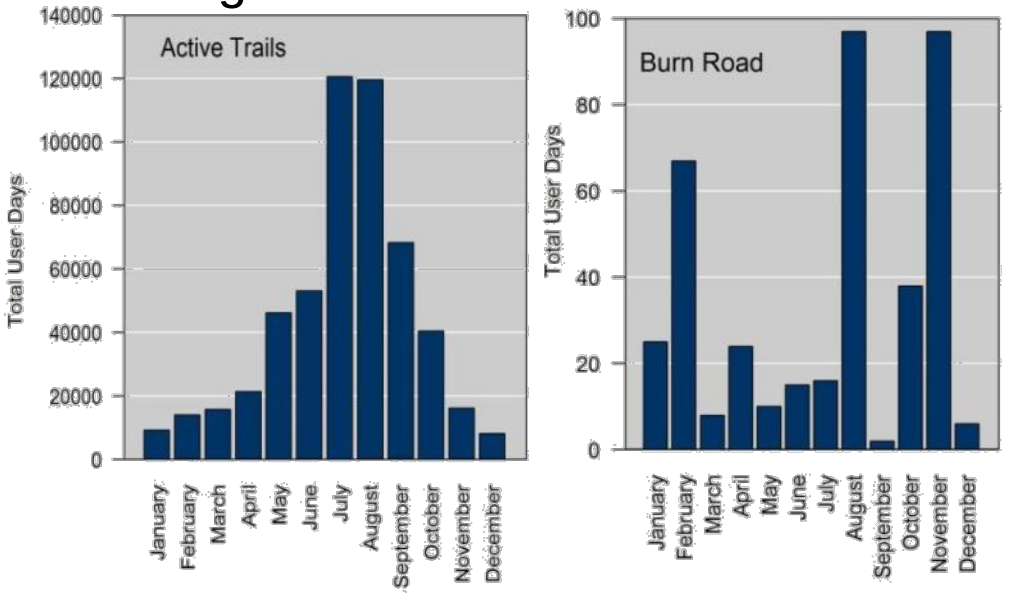
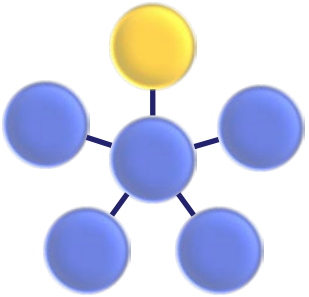


Fig. 10: Temporal distribution of use. For all active trails, use peaks during summer months. Individual trail analyses (Burn Road) reveal clear differences.

Trail Register	User Days
Adirondack Loj	54,511
Rondax/Bald Mt.	30,388
Sawyer Mt.	26,236
Johns Brook Lodge	23,126
Cascade Mt.	19,382



Results/Project Outcomes – Marketing and Economic Development

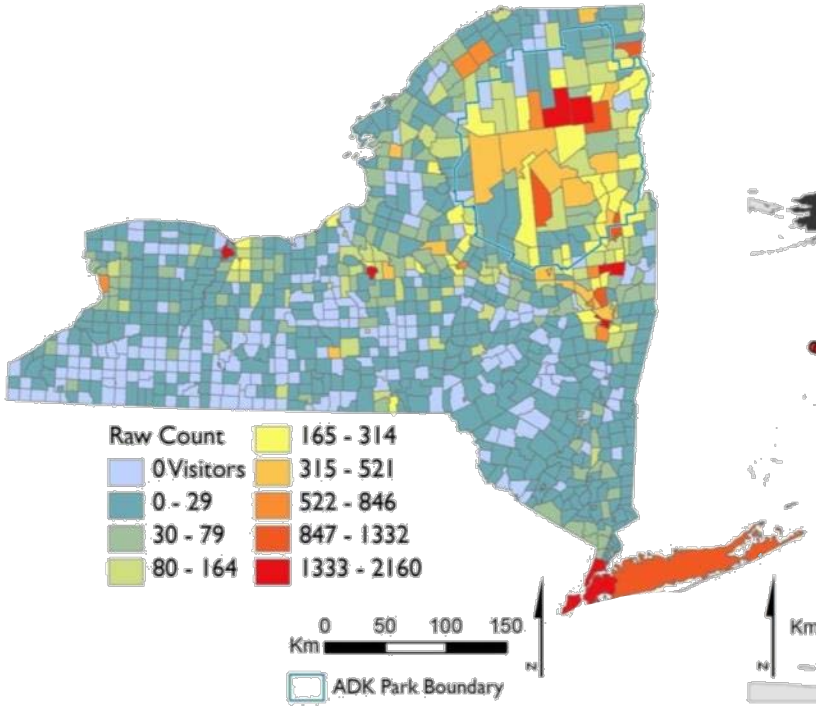


Fig. 11: New York State usershed. With known origins, destinations, and a regional road network, GIS analysis[1] can identify users' likely routes through communities and past alternative recreation opportunities. Results inform targeted marketing along travel corridors, and amenities to support specific user patterns.

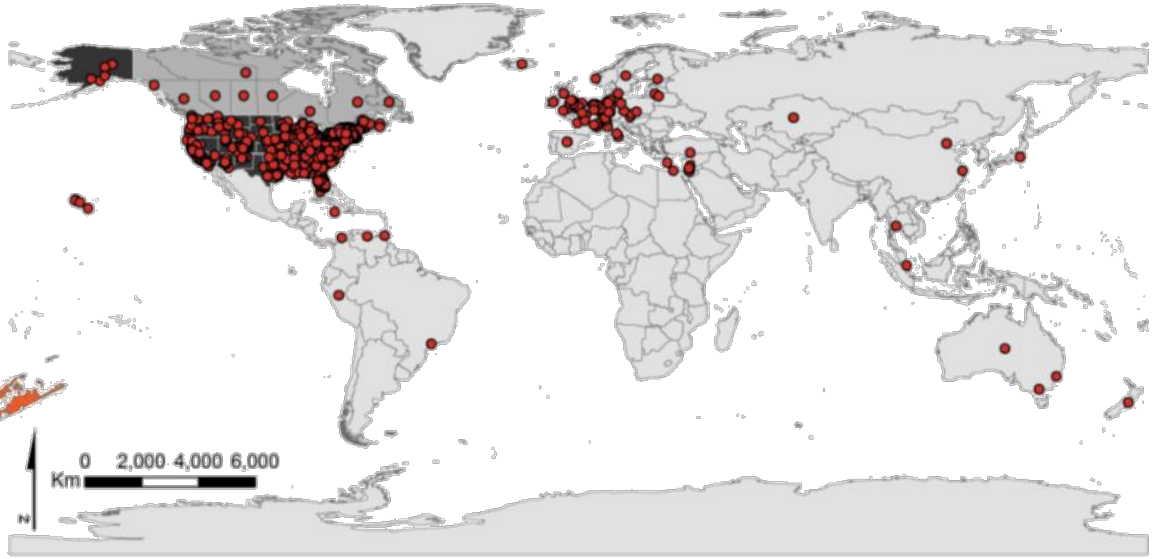
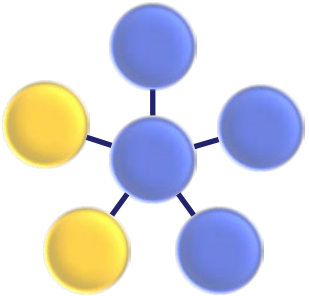


Fig. 12: Global usershed. Indicates the global value of the ADK based on straight-line distances[2] and could justify investment and advertisement of specific regional amenities. Preliminary results indicate significant differences ($p<0.001$) straight distances to ADK management units.

[1]OD Cost Matrix Analysis in Network Analyst Extension (ArcGIS 10).
[2]Distance function (Vincenty's Formulae for and oblate spheroid) in SDMTools package (Program R).



Results/Project Outcomes - Stewardship

ADK-TReD supports public-private partnerships by identifying trails as *locally* significant in terms of use or economic impact.

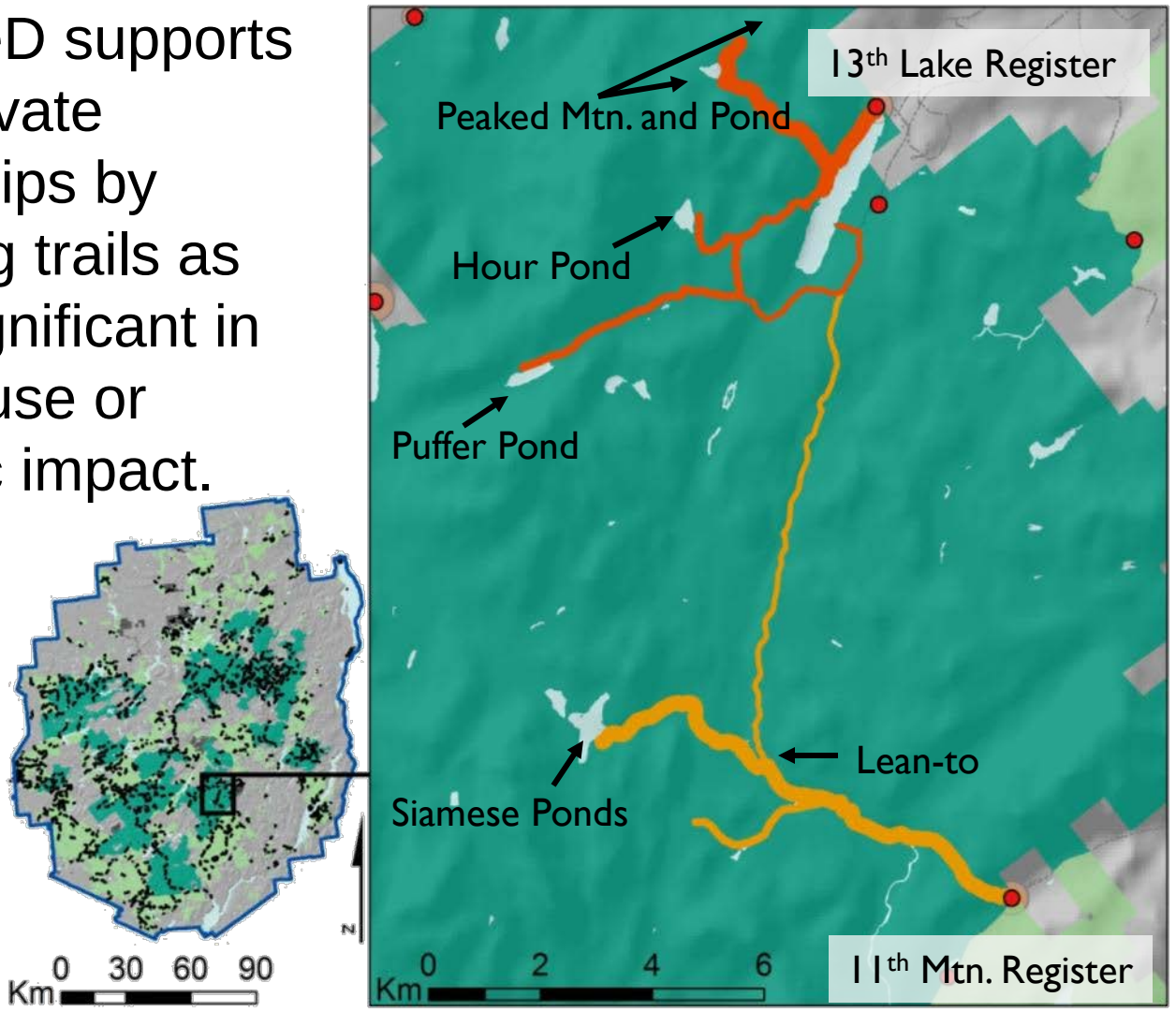


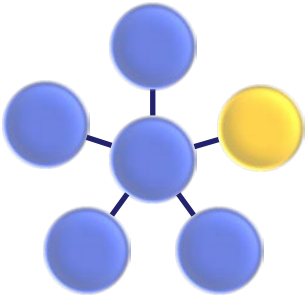
Fig. 13: Distribution of users along the trail network. Identifies the degree of use along specific trail segments. Can be analyzed by the usershed concept.

Results/Project Outcomes - Research

Ongoing work will continue to investigate the Adirondack Park as a model of sustainability, and to further explore the broader *social*, *economic*, and *political* significance of recreation to a region.

Broader research questions:

- Have Adirondack Park policies supported recreation activities, which support local economies and community well-being?
- How has recreation impacted preservation *policies* and land-use *decisions* in the Adirondack Park? What is the potential for future impact?
- Does the *landscape* matter?
  - Is recreation supported by characteristics of biophysical and/or social systems?
- Can we characterize the various *beneficiaries* of recreation?
  - Characterizing stakeholders
  - Identifying the appropriate public for participatory engagement



Results/Project Outcomes - Outreach

- ADK-TReD has been presented at several regional conferences and the NYSDEC Forest Preserve Advisory Committee (FPAC) meetings

- NYSDEC has begun to use our results through targeted queries, to draft management plans for newly classified state lands.

- Developing a pilot project with ADK local communities to build capacity for natural resource and community planning that leverages ADK-TReD data.

- Pursing possibility to establish as a long-term monitoring program with volunteer groups in the ADK.

Implications and Applications in the Northern Forest Region

- The Adirondack Park is a primary recreation destination in the Northern Forest region, drawing visitors from all the NF states and eastern Canada.
- Recreation is the primary resource in the Adirondack Park, and this project is the first to quantify recreational activity Park-wide. We also assessed how residents of the NF region use the Adirondack trail system.
- We show how these data can support management, community planning, economic development, collaborative decision-making and research.
- We demonstrate the value of monitoring trail use and other recreational activities for other public lands in the NF region. The Adirondack trail registers may be used as a model for other public lands or recreation destinations in the NF region, such as National Forests and Parks.
- These applications can be translated to the broader northern forest using similar long-standing methods, or might motivate the implementation of novel methods for collecting and analyzing data on recreation use.

Future Directions

- Dissertation research on Adirondack recreation as an ecosystem service drawing on registry data.
- Travel-cost valuation of trail recreation across the Adirondack Park.
- Master's research on modeling invasive species risk based on origins of trail users and proximal landscape characteristics.
- Development of data-sharing protocol with NYS DEC and stakeholders.
- Continue trail registry sampling and database population.
- Coordination with NYSDEC and other partners to initiate sampling of boat launches, campsites and other locations.
- Application of trail use data in community-based planning and participatory decision-making in the southern Adirondacks 'Great South Woods.'
- Application of trail use data in regional trail-and-hut planning efforts.

List of Products

In addition to the ADK-TReD database itself, which enables query, analysis, and mapping of 2012 trail use estimates across the Adirondack Park, the project has also supported several presentations and posters at regional conferences:

Presentations:

- Larkin AM, Beier CM. 2014. Understanding Recreation in a Complex Landscape: Building a Trail Use Database. *Third Annual Symposium of Interdisciplinary Scholarship in Land Use and Ethics*, Newcomb, NY.
- Larkin AM, Beier CM. 2014. Adirondack Park Trail Use Database: Construction and Potential Applications. *Adirondack Research Consortium 2014 Conference*, Lake Placid, NY
- Larkin AM, Beier CM. 2014. Constructing a trail use database to estimate recreational activity across the Adirondack Park. *Northeastern Recreation Research Symposium*, Cooperstown, NY.

Posters:

- Rockefeller DM, Larkin AM, Beier CM. 2014. Invasive species risk and vulnerability mapping for Adirondack Park recreational infrastructure. *Adirondack Research Consortium 2014 Conference*, Lake Placid, NY; *Northeastern Recreation Research Symposium,* Cooperstown, NY; *SUNY-ESF Spotlight on Student Research & Outreach*, Syracuse, NY.
- Larkin AM, Beier CM. 2014. Using ADK-TReD to quantify recreation and support management and planning in the Adirondack Park, NY. *SUNY-ESF Spotlight on Student Research & Outreach*, Syracuse, NY.

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