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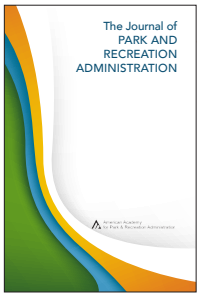

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Regular Paper

Information Sharing Among Park Professionals: Facilitating Ecological Restoration

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Executive Summary

Ecological restoration projects in nature preserves are most likely to be effective when those holding different roles within park agencies share information in a complete and timely manner. However, when the information contains sensitive material the transfer of knowledge can become difficult. Anytime sensitive information on topics such as endangered species or cultural artifacts is shared, there is a risk that the information could be used for unethical activities. With the potential for sensitive information to be used with corrupt intent, some park staff members could feel that sharing information might be outside of the best interest of the agency's mission to protect the ecological and cultural functioning of the nature preserve. Anytime information sharing occurs it is possible that knowledge could be acquired by corrupt actors potentially putting the material resources with the preserve lands at risk of damage. However, if information is not shared it would be a hindrance to ecological restoration projects.

To facilitate the sharing of information related to ecological restoration, park agencies with mandates to both provide for human use and preserve ecological conditions need to invest in both technical and social infrastructures. Park agencies gen-

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erally accumulate information across time in ways that staff members could access it, usually done in informal and decentralized ways. Organizations regularly utilize technical investments in computers and electronic filing to facilitate sharing information by providing the necessary tools. However, research in park management and ecological restoration has not fully explored the social investments that facilitate sharing information.

A conceptual framework is developed to explain the relationship between trust, risk, and information sharing in ecological restoration projects within a public park agency. A complementary mixed-methods approach was applied including nine in-person interviews and a survey (n=49; 96% response rate) distributed to all professional staff members of the Forest Preserves of Cook County, Illinois USA (FPCC). Acknowledging the role of information sharing in public park management, the FPCC developed a management information system to secure, transfer, and catalog relevant information for ecological restoration. The FPCC leadership was also aware of the need to invest in improving the social processes involved in information sharing, which led to the motivation for the study. Empirical evidence from the research supports that perceived material risk influenced trust, perceived individual risk, and willingness to information share. The survey findings indicate that when a respondent perceives a high level of risk, trust and information sharing are diminished; the survey findings are further corroborated by participant interviews. The qualitative evidence also gave reason to believe that participants conceived of risk as both a threat to the park resource they manage (ecological) as well as a threat to their professional development (individual). Results indicate that social factors impact intra-organizational information sharing in the context of park management for ecological restoration. The study supports the need for agencies to invest in both social and technical infrastructures when embarking on ecological restoration projects.

Keywords

Ecological restoration; information sharing; land management; organization; trust

Introduction

The numerous benefits of green infrastructure incentivize ecological restoration for many park agencies that have a mandate of providing for recreational and educational opportunities as well as protecting natural areas for future generations. To benefit the well-being of the public, park management agencies located in urban and suburban settings have developed green infrastructure through ecological restoration of their parks, preserves, and various other kinds of open space (Knox & Wagoner, 2019). The development of green infrastructure has been shown to control stormwater, reduce crime, enhance community well-being, improve human health, and increase property values (Kuo & Faber-Taylor, 2004; Kuo & Sullivan, 2001; Schilling & Logan, 2008; U.S. EPA, 2011; Wise et al., 2010). The need to improve on the process of ecological restoration has increased as the benefits and demand for ecological restoration projects have become realized. Ecological restoration is as much a managerial process as it is a set of outcomes, and one that requires consultation, monitoring, and documentation from a variety of expert groups over time (Williams & Brown, 2016). Decisions to engage in

restoration is a long-term organizational endeavor that requires park professional staff to share, access, and store information to achieve goals for protected area management.

Databases act as digital systems that store information related to restoration efforts, such as species inventory, spatial location of park resources, treatment practices, monitoring information, and cultural artifacts. An assumption underlying the effectiveness of an organization's information system is that park staff are willing to share information. This study adapted a model put forth by Mayer, Davis, and Schoorman (1995), to examine relationships between risks of sharing sensitive information about natural area resources and trust among park professional staff.

Barriers to sharing information within an agency's professional staff have commonly been considered technical problems, with solutions centered on enhancing software, updating computers, and provision of staff training. Although these technicalities warrant attention, social barriers have recently received attention because they can be just as prohibitive as technical barriers regarding intra-organizational information sharing (Brasier et al., 2017; Yang & Maxwell, 2011). Previous research has indicated that issues related to trust between individuals and their organizations have been linked to a propensity for staff to share information among themselves (Lin, 2007). Lack of trust may add to perceptions of risk, which would have implications for the achievement of the organizational mission of any park management agency.

In response to these challenges, the purpose of this research was to develop a conceptual framework to understand information sharing within a park management organization whose mission involved ecological restoration. Prior models have given reason to believe that trust is a critical aspect of intra-organizational information sharing (Mayer et al., 1995). However, most research on trust in park and recreation management has focused on trust across various stakeholder groups. Mowen et al. (2006) found that increased trust between citizens and park agencies has influenced funding levels for municipal park systems. Van Riper et al. (2016) explored how trust between whitewater rafting guides and their clients can help facilitate an enjoyable rafting trip. Knackmuhs and Farmer (2017) investigated trust between individual stakeholders and a municipal nature preserve as part of a process to mitigate the problems of whitetail deer overpopulation. Their findings implicated the importance of building trusting relationships with citizens as an essential part of implementing new policies. Our study hopes to expand on existing trust research by examining intra-organizational relationships within complex multi-year projects—such as those linked to ecological restoration. Such research would be useful to guide internal policies and the development of agency culture. The study adapted a model from organizational behavior literature to understand intra-organizational trust on information sharing. The objectives of the research were two-fold: (1) to understand the influence of perceived material risk on willingness to share information about park management, trust, and perceived individual risk; and (2) to assess the adaptability of the model for information sharing in ecological restoration.

Ecological Restoration and the Role of Trust

Ecological restoration is a unique form of land management that requires deliberate human actions to care for the land (Jordan, 2003). The way human actors go about conducting ecological restoration can be varied. In certain instances, ecological

restoration can take the form of prescribed natural regeneration. Under a regenerative approach, land managers regulate the amount of recreation and commercial activity on the landscape in hopes of allowing for regrowth that improves landscape functioning (Prach et al., 2001). In other situations, ecological restoration can be a complete reconstruction of the landscape where actors intensively shape the land through acts such as pruning, burning, and bulldozing (Clewell & Aronson, 2011). Across the various kinds of restoration projects, there are needs to document and integrate information from an array of natural scientists, social scientists, hydrologists, stakeholders, park professionals, and nearby residents (Hull & Robertson, 2000a). Park managers initiate ecological restoration projects by developing an understanding of site-specific ecological, cultural, and social characteristics (Tongway & Ludgwig, 2011). If information amongst staff and other stakeholders is not easily accessed and shared, park management will be hampered during both the goal-making process as well as the carrying out of site-specific restoration (Yang & Maxwell, 2011).

Informational Needs of Ecological Restoration Projects

Ecological restoration is a process that requires involvement from numerous stakeholders. Ideally, the process of ecological restoration occurs in four phases, each having a distinct set of information needs: 1) planning, 2) design, 3) implementation, and 4) aftercare (Rieger, Stanley, & Traynor, 2014). At all four of these stages, communication amongst park managers is valuable to the project's success. In the first phase, project planning has two cornerstones that function as information springboards for future development: engaging stakeholders and developing a restoration strategy (Hobbs & Harris, 2001). In the design phase, connecting information from the planning phase to landscape features requires spatial analyses to evaluate various options, leading to well-informed decisions (Howell, Harrington, & Glass, 2012). The project implementation phase relies heavily on the information generated from the first two phases of planning and design. The final phase is aftercare and is heavily reliant on resources and documentation from previous phases to monitor, evaluate, and if needed, take action to maintain restored landscapes (Tongway & Ludwig, 2011). Avenues of communication that facilitate the sharing of information amongst the park staff is a crucial aspect of navigating the four stages of ecological restoration.

Sharing information among stakeholders and staff is an essential aspect to understanding the history of the site, ecological issues at stake, and timelines needed to engage staff and professionals (Wyant, Meganck, & Ham, 1995). To restore a native ecosystem, it is important to understand how the landscape functions and for stakeholders to dictate the intended goal of ecological restoration (Hobbs, 2007). To inform intensive ecological restoration projects, information sources are varied and range from archives (both digital and hard copy), interviews, maps, site visits with various experts, and organizational policies (Rieger et al., 2014). Clear communication of knowledge about the site and the restoration goals is a crucial part of ecological restoration (Hull & Robertson, 2000b). The information shared during any given project is important both to monitor the current project and inform future ones (Clewell & Rieger, 1997; Jordan III & Lubick, 2011). Across all four stages of ecological restoration, organizational dynamics related to information sharing would be critical for success.

Trust between an Individual and their Organization

The collaborative nature of ecological restoration dictates that people must depend on one another, creating a need for trusting relationships (Dirks & Ferrin, 2001). Trust is a crucial aspect of one's willingness to share information (Lin, 2007). In relationships, a "trustor" grants trust to the "trustee" who receives (or earns) the trust of others (Jones & Shah, 2016; Sharp et al., 2013). Organizational research has consistently supported that trusting relationships are beneficial for sharing and using information at faster rates to achieve collective goals (McEvily, Perrone, & Zaheer 2003; Wang & Noe, 2010). With park agencies emphasizing site-specific restoration, the ability to share, exchange, and acquire information is important to foster (Rieger et al., 2014). Trust has often been thought of as a willingness to be vulnerable. Mayer et al. (1995) defined trust as:

> The willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party. (p. 712)

If one is vulnerable, there is an implication that something of value can be lost (Mayer et al., 1995). If a trustor-trustee relationship is strong, each would be willing to take on more risk in the sharing of information. The perceived risk-reward relationship is a core element in the act of trusting (Mollering, 2006). The risk-reward relationship fluctuates with context; trustors typically use ordinary situations to reduce risk by building a relationship with a trustee (van Riper et al., 2016).

In certain contexts, individuals can limit their risk by limiting participation in intra-organizational information sharing, that is, they will not share as much information about a restoration project with fellow staff members. It is reasonable to think that sharing information high in perceived material risk—such as information about endangered species or cultural burial sites—could potentially increase perceived individual risk. Individuals could control power within the organization by controlling the flow of sensitive information (Lin, 2007). Or another context, individuals could improve their standing within the organization by sharing information (Higgins, Judge, & Ferris, 2003). Appreciating the organizational context can affect whether or not information sharing is in one's best interest.

Context can vary greatly depending on the levels at which the intra-organizational relationship occurs. Organizations generally have three levels of functioning: the individual, the team, and the organization (Brasier et al., 2017). A trusting relationship can occur between all three levels of the organization. The organizational level reflects the institution as a whole. A team level is a group or office within an organization that works together as a functional unit. An individual level is a singular person within the organization. A distinguishing trademark of research on intra-organizational trust is that it accounts for relationships between two distinct levels of an organization (Klein Dansereau, & Hall, 1994). For the scope of this study, the trustor is the individual staff member and the trustee is the organization; the empirical portion of this research examines the individual-organizational relationship.

Impacts of Perceived Material Risk on Information Sharing

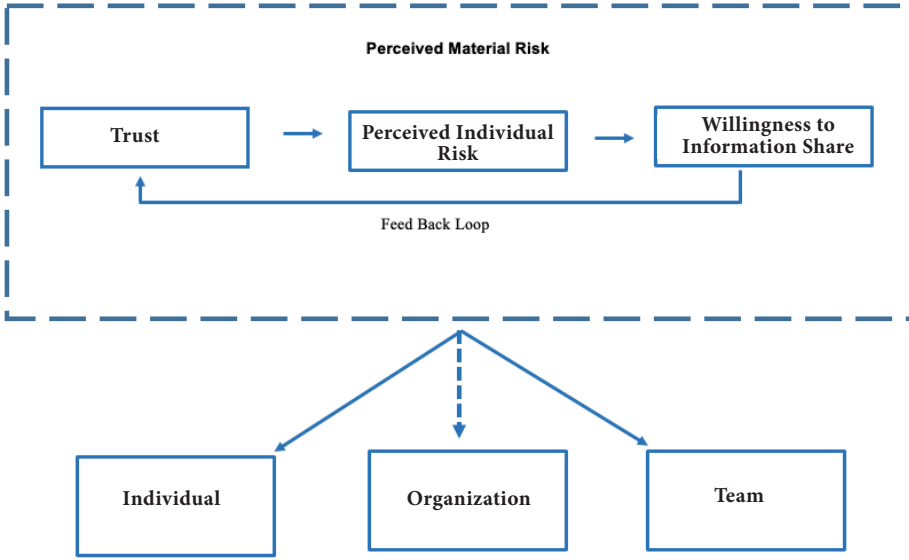
Human relationships are dynamic, creating different levels of trust across various contexts (McEvily et al., 2003). Some situations are more sensitive than others and, if

the amount of trust outweighs the amount of perceived individual risk, then the individual (trustor) and organization (trustee) would behave in a manner characterized as a trusting relationship (Schoorman, Mayer, & Davis, 2007). For some staff members, the stakes are high when engaging in information sharing. Perceived material risk is what one feels to be the likelihood and the amount of physical damage that could be done to either a cultural or an ecological resource if the shared information were used maliciously. Most professional staff care deeply about the broad goals of conservation related to any given restoration project. The amount of perceived material risk—that is what one considers to be the amount of damage and chance of causing harm to the resource—could affect the information-sharing behavior of any given staff member.

It is hypothesized that perceived material risk will impact trust, perceived individual risk, and willingness to information share. It is expected that as perceived material risk increases, perceived individual risk will increase, and trust and willingness to information share will decrease. Furthermore, it is worthwhile to note that information sharing behavior could differ depending on if it is at the individual, organizational, or team level. The focus of this study is on sharing between the individual and the organization (See Figure 1).

Figure 1

Hypothesized Model for Information Sharing in Ecological Restoration (Adapted from Mayer et al., 1995)



The hypothesized model for information sharing in ecological restoration is an adaptation from the Mayer et al. (1995) trust model. In the hypothesized model, the situational context for information sharing would reflect the level of perceived material risk. For this study perceived material risk is the level of risk a park manager perceives when an ecological or cultural resource is in jeopardy of being degraded. In any given restoration project, there could be a variety of valuable ecological or cultural resources perceived as needing protection and associated with a heightened level of material risk if their status were to become public. Conversely, there could be a variety of resources

that are commonly known; sharing information on their status would be perceived as low material risk. The empirical portion of this research examines the effect of situational contexts reflecting various types of perceived material risk to assess its influence on trust, perceived individual risk, and willingness to information share.

Methods

Study Site

This research was conducted in close collaboration with the Forest Preserve of Cook County (FPCC). Throughout the FPCC, much of the park land is embedded within urban and suburban settings, a mixed-use landscape that is a common trademark of the Midwestern United States. A mission of the FPCC is to provide educational, recreational, and ecological resources for the residents of Cook County, Illinois, USA, which is largely comprised of the Chicago metroplex. The proximity of the FPCC to a densely populated area poses challenges from illicit activities such as poaching, but also opportunities such as accessibility for nature-based recreational and educational opportunities to minority and socioeconomically disadvantaged communities that are typically underrepresented on federally protected landscapes. A byproduct of the wide-ranging goals of the FPCC is that they have experts from many different fields ranging from law enforcement, education, and wildlife biology collaborating in a way to maximize public benefit.

The population of interest for this study is the 51-member professional staff of the FPCC, of whom all are directly connected to landscape restoration projects. The professional staff is positioned across several divisions (or teams) of the organization. Over a hundred years of operations, the FPCC has amassed a wealth of information. The information has been compiled into thousands of documents on numerous topics such as phenological records, species list, contracts, maps, visual images of events and incidences, and recreational participation records. Documents and informational resources are stored in various formats and usually in physical records across each of its FPCC offices. These records are situated in filing cabinets and drawers of staff members' offices, as well as in garages, attics, and boxes places that are unorthodox and non-secure. The lack of a centralized location for information has been identified as a problem by the FPCC and was the impetus for developing a unified information sharing system for organizational operations.

The FPCC commemorated its 100th year in 2014 with an ambitious Next Century Conservation Plan (NCCP). As a goal of the NCCP campaign, the FPCC strived to integrate science, planning, and operations to be recognized as a premier park conservation organization. The FPCC's acknowledgment of the roles that information sharing plays in its mission has led to considerable investment to develop a digital information system. The investment in information sharing has focused on creating a digital library in an accessible format, as well as updating technological infrastructure for integration into daily decision-making. Investment in such a system has the potential to enhance evidence-based policies to achieve the goals of the NCCP.

Study Design

A concurrent mixed-methods approach was employed that included two phases of data collection and analysis. An online survey was administered to all staff members (N=51; response rate 96%), which included an experimental design in the form

of evaluation of three hypothetical scenarios that ranged from low to high perceived material risk. Second, in-person semi-structured interviews with FPCC professional staff were conducted (n=9). The online survey and in-person interviews were concurrent with one another, with the interim results from the survey being used to complement the questions posed during the interview to enhance their relevance and facilitate interpretation (Greene, 2007).

A concurrent mixed-methods design was identified as an appropriate fit for the research questions. In the summer and fall of 2017, both interview and survey data were collected. The concurrent mixed method design allowed for qualitative interview data and quantitative survey data to interact throughout the research process. The data sets interacted with the purpose of complementarity, which allows interview and survey data to build on each other throughout the research process for a better understanding of the research questions compared to either one alone (Halcomb & Andrew, 2009). Insight gained from the preliminary survey results was used to assist with additional questions to probe during the interviews. In another context, early interactions with interview participants were critical to developing the three treatment scenarios applied in the survey. The complementarity of the methods also carried into data analysis, quantitative survey findings and thematic analysis from the interview transcriptions found supporting conclusions, which enhanced the reliability of the research findings (Sedoglavich, Akoorie, & Pavlovich, 2015).

Online Questionnaire

The online questionnaire contained four sections: 1) background, 2) organizational factors, 3) individual characteristics, and 4) environmental factors. The questionnaire was shared using Qualtrics Software in Fall 2017. The surveys were given to 51 potential respondents, all of whom were staff members for the FPCC, with 49 individuals responding to yield a 96% response rate. As part of the invitation for the questionnaire, it was stated that the research was meant to enhance the capacity of the organization for ecological restoration. All of the surveys were administered online to staff members, even though the introductory letter offered an option to receive a questionnaire by mail.

Each questionnaire contained the three treatments characterizing three distinct situational contexts that were designed to examine the impact of perceived material risk on trust, perceived individual risk, and willingness to information share. Use of a within-subject treatment design exposes all research respondents to the full array of treatments (Cash, Stankovic, & Storga, 2016), with each respondent acting as their own control, with the unit of analysis being intra-individual differences. Within-subject designs are useful for populations that would yield a low sample size (Rosenthal & Rosnow, 2008). In the first treatment (low perceived material risk), information was related to the location of a public event and the timing of landscape maintenance and interpretive programs (Table 1, Box 1). The second treatment (moderate perceived material risk) was related to the creation of a new trail system that potentially could negatively impact restored land (Table 1, Box 2). The third treatment (high perceived material risk) was related to the location of a rare species that was commonly poached by the public (Table 1, Box3). The treatments in this study were developed in consultation with three individuals from the professional staff of the FPCC to enhance the realism of each scenario.

Table 1

Three Treatment Scenarios Related to Three Levels of Perceived Material Risk in the Questionnaire

Context	Scenario
Treatment 1- Low Perceived Material Risk	In this section, respond to questions related to the sharing of information related to a large-scale corporate volunteer event that will engage 250 people for Earth Day at a site that is saturated from recent heavy rain events. The event will require staff from various departments to coordinate with each other as there will be invasive plant removal work done as well as environmental education activities led by nature center and resource management staff.
Treatment 2- Moderate Perceived Material Risk	In this section, respond to questions related to the sharing of information for the installation of a new trail loop at a site that has a dedicated volunteer group, wetlands, and high levels of trail use from horseback riding community. This information to be shared will include ecological conditions, wetland impacts, volunteer efforts, and trail specifications.
Treatment 3- High Perceived Material Risk	In this section, respond to questions about recreational activities that are planned to occur adjacent to a population of a rare flower that is commonly poached by the public. The information to be shared will include detailed information about the rare wildflower at that particular site.

Note: 1. All respondents were presented with each treatment level. 2. After respondents were presented with the treatment level they were asked to respond to items related to trust, perceived individual risk, and willingness to information share.

The survey examined the impact of the treatments on trust, perceived individual risk, and willingness to information share. All survey data were collected online using Qualtrics software and then transferred to SPSS version 24 for analysis. The scale used to measure trust was adapted from van Riper et al. (2016) and Chen, Chuang, & Chen (2012). Perceived individual risk was adapted from Wasko and Faraj (2005), and willingness to information share was adapted from Cummings (2004). The above-mentioned survey items were measured on a 5-point Likert scale that ranged from "Strongly Agree" to "Strongly Disagree." Given strong internal consistency of trust, individual perceived risk and willingness to information share, a summated score was created for each construct.

After reliable indices were created, a repeated-measures ANOVA was conducted. The repeated measures ANOVA tested for differences in the within-subject linear contrast. If a significant difference was observed, a paired samples *t*-test and mean within-subject differential was conducted to identify treatment effects. Furthermore, a bootstrapping resampling method was used in the paired samples t-test to reduce the

concern of Type 1 error given the low sample size (Myers et al., 2010) and does so by resampling the data set which effectively reduces the influence of extreme scores (Myers et al., 2010).

In-Person Interviews

Interviews were conducted with nine members of the professional staff in the FPCC. These nine members were purposely selected to learn about staff members' perceptions of information sharing and focused on understanding, trust, perceived individual risk, perceived material risk, and one's willingness to information share. Purposive sampling was utilized to focus interviews on individuals from different perspectives from various levels of the FPCC. Key individuals were sampled who collectively reflected sub-units of the organization, such as wildlife, ecology, and restoration project management. Given the purposive sampling of the professional staff, the interview process was time efficient.

There are multiple examples in previous literature that utilize purposive sampling. Rodgers, Willcox, and Willcox (2017) used purposive sampling to engage with key informants from various stakeholder groups. Sharp et al. (2013) efficiently targeted participants from a wide set of categories of interest utilizing purposive sampling. Finally, Metcalf et al. (2015) utilized purposive sampling to achieve diversity in their sample of stakeholder groups. In our manuscript, purposive sampling is used as a way to target key participants relevant to managing long-term projects of ecological restoration

The probing questions asked during interviews explored Wh- questions (i.e., who, what, where, when, how) to gain in-depth knowledge, well-rounded perspectives, and insights to explain preliminary analyses from the survey (Wang & Yan, 2012). Following the interview, participants were invited to conduct a member check of the transcripts, which allowed them to redact any information, clarify or add content, and edit their text on the transcript. Conducting a member check of the interview transcript ensured the interviewees' intended meanings were accurately depicted (Kornbluh, 2015).

A total of nine in-person interviews were conducted and analyzed to explore the relationships between willingness to information share and perceived material risk. Audio recordings of the interviews were transcribed verbatim and then uploaded into NVIVO software version 11 for analysis. In the analysis phase, the interview participants were given pseudonyms as a way to keep confidential the identities of the participants. The names used in the results section are pseudonyms given to the research participant. Once pseudonyms were assigned, the transcriptions were thematically coded to identify instances of information sharing between the individual and the organization. Inter-rater reliability was established between the first two authors and a third party; an acceptable 90% agreement was found to identify willingness to share information (MacQueen et al., 1998). After reliability was established, 263 pages of transcripts were analyzed to identify common themes in regard to the role perceived material risk had in influencing participants willingness to share information. The quotes of the results section are illustrative of broader themes that were shared by a majority of the interview participants. In other words, all themes are reflected in the findings and surfaced across at least five of the nine interviews.

Results

Survey Results

Analysis of the survey and interview data revealed support for the hypothesized relationships between perceived material risk and trust, perceived individual risk, and willingness to information share. Specifically, results from the repeated measures ANOVA indicated that increases in perceived material risk were ultimately associated with negative changes in intentions to share information (Table 2).

Table 2

Results from Repeated Measures ANOVA

	Effect of Perceived Material Risk	Result
Willingness to Information Share	$F(1,40)=22.28$, $p<.001$, MSE=.265	Significant
Trust	$F(1,40)=16.61$, $p<.001$, MSE=.395	Significant
Perceived Individual Risk	$F(1,40)=76.82$, $p<.001$, MSE=.079	Significant

Paired sample *t*-tests on the within-subject mean differentials supported that the "high perceived material risk" treatment was associated with significantly: lower willingness to information share, lower trust, and lower perceived individual risk (Table 3). When the within subject differential is compared between the low and moderate perceived material risk treatment levels the respondents' trust, willingness to information share, and perceived individual risk were relatively unaffected. However, the within subject differential between the high perceived material risk treatment levels and the low and moderate level perceived individual risk greatly increases, and trust and willingness to information share significantly decrease. The within subject differential reflects a directional impact that is congruent with what was hypothesized across the treatment levels (Figure 2). Simply put Figure 2 illustrates that willingness to information share and trust decreased, and perceived individual risk increased when the information being shared was high in perceived material risk. The results of the ANOVA's within-subject mean differential were substantiated by the participant interviews.

Interview Results

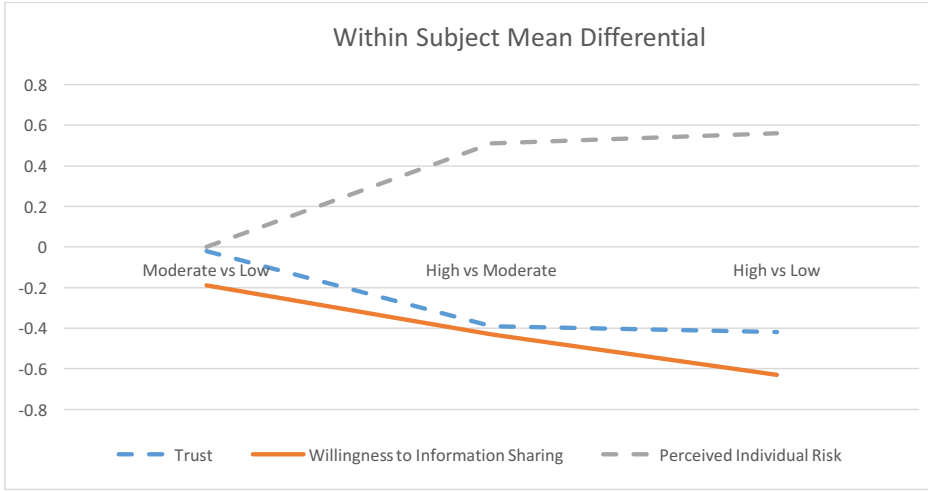
Analysis of the transcripts indicated participants perceived that sharing information was context specific. The four themes that surfaced across the analysis of the interviews were fear of jeopardizing resources, negative experiences with information sharing, trust matters when perceived material risk is high, and monopolizing information gives one status in the organization. Each of these themes are discussed in turn.

Table 3
Differentials between Treatment Levels

Domain	Treatment Levels[#]	Comparison	Within Subject Mean Differential
Willingness to Information Share	Moderate- Low	$t(43)=2.108$, $p=.041$	-0.19
	High- Moderate	$t(43)=4.583$, $p<.001$*	-0.43
	High- Moderate	$t(44)=5.389$, $p<.001$*	-0.63
Trust	Moderate- Low	$t(43)=.408$, $p=.685$	-0.02
	High- Moderate	$t(43)=4.414$, $p<.001$*	-0.39
	High- Low	$t(44)=4.511$, $p<.001$*	-0.42
Individual Perceived Risk	Moderate- Low	$t(43)=.000$, p=1.000	0
	High- Moderate	$t(43)=-10.446$, $p<.001$*	0.51
	High- Low	$t(42)=08.270$, $p<.001$*	0.56

[#] levels of perceived material risk
*Significant difference between the perceived material risk treatment level

Figure 2
Impact of Perceived Material Risk across Treatment Levels



Fear of Jeopardizing Resources

Participants felt that sharing information high in perceived material risk might "cross the line" of sharing too much and in turn potentially jeopardize material resources. Bill illustrated the thought process by stating,

> I think…from my perspective the idea of data management is obviously… important for sharing information over time. So that people [land managers] can have snapshots of projects and know a little bit about what happened in the past to help them inform the future and, then um help us [the organization] not make bad decisions because we just don't know enough… I think the rub is how do you do that [information share] at the same time not risking your conservation resources by making the information so easily available at the fingertips that people with nefarious ideas can go out and look for them.

The above comments reflected a recurrent theme that when information high in perceived material risk is shared, the chance of "nefarious" use is possible. Multiple times participants highlighted concerns that other staff members would misuse information high in perceived material risk. Therefore, interview participants like Bill expressed that they could reduce the risk of jeopardizing resources by simply reducing the amount of information they shared.

Negative Experiences with Information Sharing

In a different interview, Jill discussed a time when the organization's police force misused information high in perceived material risk, which resulted in resources being damaged. When asked about the prospects of sharing the misused information again Jill went onto say,

> Unfortunately, my sharing of information caused further damage to a natural area. This outcome makes me less likely to share… in the future. Going forward, I will not share maps of unauthorized trails. Instead, I will share general locations of where violations occur. I think this will make it more difficult for police to find violators and fix the problem … It [the information] is property of the forest preserve district. I generated it during work using forest preserve district resources. The forest preserve district owns it. I will never share it unless I am forced to and I might actually (pause) I would try to destroy it if I knew someone wanted it… I would delete it before letting someone have it.

The pronounced reaction to the protection of ecological resources shown by Jill was unique to information high in perceived material risk, and a reaction identified across several interviews. Previous negative experiences had left Jill less likely to share information high in perceived material risk in the future. Jill explained that when sharing information high in perceived material risk went awry, there were long-lasting impacts. That is, poor experiences build feedback loops that impede future information sharing.

Trust Matters when Perceived Material Risk is High

During the interviews, barriers with trust were not raised during discussions directed at issues of low and moderate perceived material risk. However, as conversations moved toward situations of high perceived material risk, such as threatened and endangered species and rare archeological sites, problems with trust were brought to the fore. For example, in an interview with a senior staff member, concerns about trust in the case of high perceived material risk were evident. Tim acknowledged trust was an important part of deciding whether to share information high in perceived material risk, as indicated by the following excerpt: "I would say there is a certain trust fac-

tor with sharing sensitive information." Tim indicates that it was "natural" for others to be concerned about the "trust factor" when deciding to share information high in perceived material risk. Tim never mentioned the need for trust when talking about sharing information that was low or moderate in perceived material risk. These findings signaled that trust was exclusively an issue at the high perceived material risk level.

Monopolizing Information gives one Status in the Organization. Interview participants emphasized the value of possessing knowledge high in perceived material risk and the status awarded within the organization for holding this knowledge. Several participants mentioned, "knowledge is power," although projected the behavior of holding onto knowledge high in perceived material risk as a behavior of others and not themselves. As an example of how this surfaced in interviews, Anthony stated:

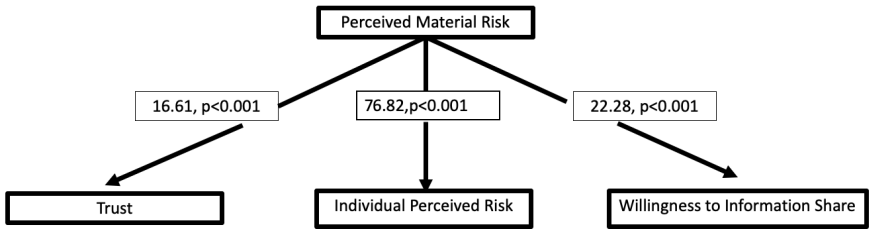
> Knowledge is power. In some cases, maybe [you] don't want folks to know a particular sensitive plant or animal species [knowledge high in perceived material risk] is out there on a particular site? Allows them [the individual] to control the flow of information? Allows them [the individual] to "need" to be involved in a certain project rather than just hand over a file.

Anthony described individuals as holding onto sensitive information, such as threatened and endangered species locations, to gain power and control. Various participants who were included in this study echoed the description from Anthony. All interview participants projected the behavior of holding onto high perceived material risk information as a pathway to gain power over others. The findings from the interviews converged with the results of the survey. The empirical evidence supports the applicability of the model for information sharing in ecological restoration to explain organizational behavior in FPCC's restoration projects.

Discussion

The results from both methods of this study support the adaptability of the model for information sharing in ecological restoration. Support for the model is particularly important given its characterization of sharing information as both a social and technical process. Empirical findings suggest that perceived material risk had an impact on trust, perceived individual risk, and willingness to information share as part of intensive ecological restoration projects. Our results also indicated that information high in perceived material risk was shared differently than information that was either low or moderate in perceived material risk. The results of the mean within-subject differential as well as thematic analysis from the interviews supported the finding that high perceived material risk influenced trust, perceived individual risk, and willingness to information share differently than low and moderate perceived material risk (Figure 3). When the information being shared was high in perceived material risk the results suggested trust and willingness to information share will be diminished while perceived individual risk will be heightened. Those findings are consistent with the Mayer et al. (1995) model.

Figure 3
Model for Information Sharing in Ecological Restoration



Stated differently, the level of trust and willingness to information share in any given relationship is not static or trait-like, but is dependent on the perceived material risk of the situational context. Staff members were less likely to trust their organization with sensitive information and thus were less willing to share information. In a natural resource management context, Stern and Coleman (2015) suggested that trust and behavior were affected by context. Our study contributes to previous studies by characterizing the ISER model and providing empirical support for some of its linkages — both qualitatively and quantitatively. An important finding is the variability exhibited in perceived individual risk, trust and willingness to information share even though the relationship between the individual and the organization has not changed—the variability is in part attributed to the amount of perceived material risk.

Implications for Park Management

Support for the model for information sharing in ecological restoration highlights the social process of park management. These findings have implications for ecological restoration projects where communication has an important role in transferring information amongst park staff over an extended time (Jordan III & Lubick, 2011; Rieger et al., 2014). At an elementary level, barriers to information sharing have commonly been considered a technical problem, previous solutions have tended to focus on adopting software, computers, and training. The empirical findings give reason to believe that barriers to information sharing within park agencies are also tied to agency culture surrounding trust and risk perceptions.

The model for information sharing in ecological restoration is applicable to agencies that manage parks and protected areas. Park organizations should recognize that each opportunity to information share is unique. Because information is shared by individuals in one situation, does not imply that information will always be shared. The study supports that perceived material risk is one of the many factors that reduce an individual's willingness to share information with the organization in which they belong. To improve the flow of information, park agencies could benefit by building capacity for social and institutional relationships to mitigate the negative impacts of perceived material risk (Reagans & McEvily, 2003).

Future Research

Future research needs to explore the impact that communication and organizational behavior have on ecological restoration. First, a limiting factor was the small

population of any given agency-based professional staff, with a high response rate of 96% there was sample size adequate for analysis herein; however, a larger multivariate set of analyses would not have been possible. Although the results are generalizable to the staff of the FPCC, future studies could apply the framework to a broader set of agencies to evaluate the impacts of risk on information sharing in ecological restoration. Second, the study findings support that as FPCC employees perceived an increase in material risk they become unwilling to share information and trust the organization. With at least one staff member concerned about "nefarious" activities of another co-worker regarding use of sensitive information, this suggests there may have been a previous instance in which material resources were in jeopardy due to sharing information. Further research at different park management agencies would be a way to control for organizational culture and strengthen support for the role of material risk in the model for information sharing in ecological restoration. Thirdly, the scales of organizational analysis in this research were not fully covered. This research focused on the relationship between the individual and the organization; however, institutions have at least three levels of functioning (e.g., the individual, team, and organization), and examining information sharing between other levels is warranted (Brasier et al., 2017). Finally, this study also focused on perceived material risk despite an array of relevant risk concepts. Social and individual risk (van Riper et al., 2016), as well as physical risk (Brannan et al., 1992), are also influenced by trust and would be meaningful to investigate.

Research on park agencies generally focuses on relationships between the agency and external groups, like citizens and stakeholders (e.g., Mowen et al., 2006; van Riper et al., 2016; Knackmuhs & Farmer, 2016). This work has provided evidence of the essential roles of trust in the advancement of new policy and practices. The contribution of this paper has extended the application of trust as being critical to the internal functioning of an agency. The model for information sharing in ecological restoration holds promise on which further research on intra-organizational trust could be conducted to enhance development of green infrastructure.

Conclusion

The main contribution of this manuscript is to provide support for a model that emphasizes that social factors impact the sharing of information. The model highlights that not all information is equal when it comes to sharing within a park staff. Information high in perceived material risk is associated with barriers to sharing compared to information low to moderate in perceived material risk. To facilitate consistent information sharing, park agencies need to consider ways in which to handle information high in perceived material risk both socially and technically.

For park agencies in peri-urban settings, being able to carry out ecological restoration is a core management approach that can provide both green infrastructure as well as recreational opportunities. By addressing social and technical barriers to information sharing, park agencies will be advanced in their ability to conduct ecological restoration. The progress made in developing strategies to carry out ecological restoration in an effective and efficient manner could mean communities reap more of the benefits tied to protection and restoration of natural areas.

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