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Marc J. Stern
Virginia Tech, mjstern@vt.edu

S. Andrew Predmore
University of Illinois-Springfield, spred2@uis.edu

Wayde C. Morse
School of Forestry and Wildlife Sciences, Auburn University, morsewc@auburn.edu

David N. Seesholtz
Focused Science Delivery Program, Pacific Northwest Research Station, USDA Forest Service, dseesholtz@fs.fed.us

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Marc J. Stern [a,*], S. Andrew Predmore [b,1], Wayde C. Morse [c,2], David N. Seesholtz [d,3]

[a] Department of Forest Resources and Environmental Conservation, Virginia Tech, 304 Cheatham Hall (0324), Blacksburg, VA 24061, United States
[b] Department of Environmental Studies, University of Illinois-Springfield, Public Affairs Center, Room 314, Springfield, IL 62703, United States
[c] School of Forestry and Wildlife Sciences, Auburn University, 3301 Forestry & Wildlife Bldg., Auburn, AL 36849, United States
[d] Focused Science Delivery Program, Pacific Northwest Research Station, USDA Forest Service, 1249S Vinnell Way, Suite 200, Boise, ID 83709, United States

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ABSTRACT

The National Environmental Policy Act (NEPA) requires U.S. Forest Service planning processes to be conducted by interdisciplinary teams of resource specialists to analyze and disclose the likely environmental impacts of proposed natural resource management actions on Forest Service lands. Multiple challenges associated with these processes have been a source of frustration for the agency. One of these challenges involves administrative appeals through which public entities can challenge a Forest Service decision following a NEPA process. These appeals instigate an internal review process and can result in an affirmation of the Forest Service decision, a reversal of that decision, or additional work that re-initiates all or part of the NEPA process. We examine the best predictors of appeals and their outcomes on a representative sample of 489 Forest Service NEPA processes that were decided between 2007 and 2009. While certain factors associated with pre-existing social contexts (such as a history of controversy) or pre-determined elements of a proposed action (such as the extraction of forest products) predispose certain processes to a higher risk of appeals, other practices and process-related strategies within the control of the agency also appear to bear meaningful influence on the occurrence of appeals and their outcomes. Appeals and their outcomes were most strongly related to programmatic, structural (turnover of personnel in particular), and relationship risks (both internal and external) within the processes, suggesting the need for greater focus within the agency on cultivating positive internal and external relationships to manage the risk of appeals.

1. Introduction

The National Environmental Policy Act (NEPA) of 1969 requires all federal agencies to analyze and disclose the likely environmental impacts of any major land management actions. While some projects are categorically excluded from detailed analyses, NEPA processes generally involve the development of a purpose and need and a proposed action, public scoping to define relevant issues associated with a proposed action, the development of alternative courses of action to achieve the purpose and need, analyses of the likely environmental and socioeconomic impacts of those alternatives, the development of a document that discloses those likely impacts, and an official document that discloses the final decision and its rationale. Public comment periods and other various forms of public involvement typically occur at multiple points throughout the process, especially during scoping and following the initial drafting of the disclosure document. In the U.S. Forest Service, the process is conducted by an interdisciplinary team (ID team) of resource specialists and other agency staff, one of which is designated the ID team leader (IDTL). The final product of the ID team is a document, an Environmental Impact Statement (EIS) or Environmental Assessment (EA), which discloses all relevant analyses related to the likely impacts of each potential alternative action designed to meet the purpose and need. A line officer, typically a district ranger or forest supervisor, is tasked with making the decision on a course of action and documenting his or her rationale. The decision maker (DM) can be involved to varying degrees throughout the NEPA process (Stern and Mortimer, 2009; Stern et al., 2010a).

Regulations derived from the 1993 Appeals Reform Act (16 U.S.C. Section 1612) provide entities external to the agency the ability to challenge the resulting decisions of NEPA processes which lead to the development of an EA or EIS (36 CFR 215) through an administrative appeal. This ability protects "the right to object" to Forest Service actions for individuals and groups external to the agency, a right long supported by both the agency and those external to it (Coulombe, 2004). The U.S. Forest Service has averaged over 400 appeals per year over the past five years (USDA Forest Service, 2012). Appeals may relate to claims about insufficient analysis of effects, incomplete or improper public involvement, compliance with regulations or policies, or substantive arguments about the rationale leading to the

* Corresponding author. Tel.: +1 540 231 7418.
E-mail addresses: mjstern@vt.edu (M.J. Stern), spred2@uis.edu (S.A. Predmore), morsewc@auburn.edu (W.C. Morse), dseesholtz@fs.fed.us (D.N. Seesholtz).
[1] Tel.: +1 217 206 7895.
[2] Tel.: +1 334 844 8086.
[3] Tel.: +1 208 373 4170.

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responsible official's decision or the appropriateness of the decision itself, among other claims. Appeals can result in an affirmation of the Forest Service decision, a reversal of that decision, or additional work that re-initiates all or part of the NEPA process. As such, appeals can identify problems or mistakes that might be resolved prior to implementation of a project. They can also provide an avenue for conflict resolution prior to facing legal challenges. Alternatively, they can be viewed as merely another mechanism to challenge agency actions regardless of the quality of the process. Regardless of their outcomes, appeals require considerable time and effort on behalf of the agency to conduct a thorough review and issue a ruling. Moreover, appeals delay and can prevent proposed resource management implementation (Teich et al., 2004; USDA Forest Service, 2002).

While recent studies reveal the desire of the agency to avoid appeals (Mortimer et al., 2011; Stern et al., 2010a), Stern and Mortimer (2009) uncovered a sentiment within the Forest Service that appeals are often outside the control of the Forest Service. That is, certain individuals or groups may plan to appeal no matter how well a process is run (Selin and Chavez, 1995). Moreover, recent studies suggest that certain types of projects, such as those involving timber harvest, are more likely to be appealed regardless of other process characteristics (Jones and Taylor, 1995; Laband et al., 2006). This raises a question regarding whether the agency has the ability to influence the frequency with which projects are appealed or the outcomes of appeals through any of its own efforts within its NEPA processes. This research addresses that question. We first examine some of the ways ID teams appear to respond to perceptions of increased risk of appeals. We then examine the contextual variables and process characteristics that best predict the occurrence of appeals and their outcomes.

2. Conceptual framework

Previous research on administrative appeals has focused on the characteristics of appellants (e.g., Jones and Taylor, 1995; Teich et al., 2004), upon appellants' perceptions of equity in the public involvement process (Germain et al., 2001), and upon the subject matter of the project and its context (Laband et al., 2006). We conceptualize appeals as a form of project risk. This conceptualization provides for a view of the potential precursors of appeals to emerge from sources both within and outside the control of the agency.

Project risk can be defined as the probability of the occurrence of an undesirable event and the significance of that occurrence (Pritchard, 1999). In our cases, we focus on appeals as the undesirable event and their outcomes as a measure of their significance. Most of the literature associated with project risk resides within the fields of management and information technology. Within that literature, numerous sources of risks and risk management strategies are identified. We focus on those that translate most directly to Forest Service NEPA processes.

2.1. Risk sources

We concentrate on what we call *programmatic*, *structural*, *technical*, and *relationship* risk sources. Numerous authors (Datta and Mukherjee, 2001; Ward, 1999) stress the importance of understanding the project environment to initiate any assessment of risk. In NEPA processes, that environment is influenced by multiple factors, some of which are determined at the outset of the process as the project is initially defined. We use the term *programmatic risk* to refer to sources of risk that emerge as a result of the initial project design and location. These risk sources include the complexity and scale of the project and the social and political environment in which the process is to take place. Each of these factors may be directly related to the specific nature of the proposed action, not only in terms of scope, but also in terms of purpose. For example, larger projects or those involving the extraction of timber may generate greater public interest than smaller projects associated with restoration (Laband et al., 2006; Mortimer et al., 2011). Programmatic elements influence each of the other sources of risk, as they set the baseline conditions in which a project takes place.

The availability of necessary resources to successfully complete the process also poses risk to a project's effective completion (Moynihan, 1997; Perminova et al., 2008; Reed and Knight, 2010; Royer, 2000; Tesch et al., 2007). These resources may include staff time, materials, and sufficient budgets to complete tasks. We refer to these as *structural risk sources*, involving such elements as team size and prioritization of staff time.

Technical risk emerges from challenges related directly to competence and performance. In particular, decisions regarding technology selection, methodology selection, scientific analyses, and project revision can impact outcomes through enhancing or curtailing performance and problem solving (Dey, 2001; Pritchard, 1999). Within the NEPA context, technical risks may be inherent within project design, impact analyses, procedural compliance, and disclosure elements of the process. The competence of individuals performing these tasks may be based upon their pre-existing knowledge, training, experience level, and general abilities.

Relationship risk includes risk that can emerge from both internal and external relationships (Datta and Mukherjee, 2001; Hillson, 2003; Tesch et al., 2007). External relationships have been well-studied in natural resource management, with multiple studies focusing on public involvement, conflict, collaboration, and their outcomes (Innes and Booher, 2004; Leach, 2006; Lewicki et al., 2002; McCool and Guthrie, 2001; Predmore et al., 2011a; Wondolleck and Yaffee, 2000). Internal relationships have been less frequently studied in the natural resources literature. Stern and Predmore (2012), however, have demonstrated the importance of relationships internal to the agency in Forest Service NEPA processes, including those within the ID team and between the ID team and the DM. Elements of team harmony, intra-team collaboration, IDTLs' leadership styles, and communications with the DM were each predictive of process outcomes.

2.2. Risk management

Risk management strategies generally involve three common steps, regardless of the specific framework being followed: risk identification, analysis, and response (Dey, 2001; Pritchard, 1999; Project Management Institute, 2004; Reed and Knight, 2010; Ward, 1999). This study does not directly address risk identification and analysis. Rather we focus upon actions that might best be considered potential responses to emergent risks. Responses to perceived risk may occur implicitly or explicitly. Our data do not speak to whether responses to risk within the NEPA processes surveyed are deliberate or not. We explore which practices seem to be more common when greater external controversy, a proxy for the risk of appeals, is expected. We then examine the influence of these and other practices upon the occurrence of appeals and their outcomes.

We posit that higher levels of expected controversy are related to heightened concerns about potential appeals. In response to these concerns, ID teams and DMs may alter certain aspects of their processes to minimize the risk of appeals (MacGregor and Seesholtz, 2008). We hypothesize that ID teams work more collaboratively, legal counsel is more often consulted, external contractors are more often used, the DMs become more involved in the process, and public involvement techniques may be altered on processes with higher levels of expected controversy. Freeman et al. (2011) suggest that projects that generate greater levels of external interest drive team members to collaborate more to mitigate perceived risk that emerges from additional public scrutiny. Related research by Stern and Predmore (2012) suggests that effective DM engagement is particularly important in more challenging processes. DMs may also perceive

Table 1
Indexes developed through exploratory factor analyses.

Index	Survey items comprising the index
Team disagreement (α = .831)	How much disagreement was there between ID team members regarding each of the following items? (1 = no disagreement, 2 = very little, 3 = some, 4 = a moderate amount, 5 = a great deal) • The purpose and need • The proposed alternatives • The preferred alternative • How to accomplish ID team tasks • The approach that was taken for public involvement • Interpersonal disagreements, not necessarily related to the task at hand
Directive leadership style (α = .705)	5-point scale: 1 = strongly disagree, 2 = disagree,3 = neutral,4 = agree, 5 = strongly agree • I set clear goals for the team • I established clear standards for team members' performance • I established clear deadlines for the team
Empowering leadership style (α = .728)	5-point scale: 1 = strongly disagree, 2 = disagree,3 = neutral,4 = agree, 5 = strongly agree • I worked collaboratively with team members to develop goals for the process • I worked collaboratively with team members to develop agreed upon procedures for getting work done • I encouraged team members to share their own solutions to problems
Supportive leadership style (α = .611)	5-point scale: 1 = strongly disagree, 2 = disagree,3 = neutral,4 = agree, 5 = strongly agree • I made an explicit effort to show my appreciation for team members' work • I made an explicit effort to try to reduce time and task burdens on team members associated with the process • I went out of my way to try to create a friendly team work environment for team members
External accountability (α = .843)	Please rate the intensity with which you felt each of the following pressures during this particular NEPA process (5 point scale: 1 = not at all; 2 = slightly; 3 = moderately; 4 = strongly; 5 = very strongly): • Pressure to ensure that the process was responsive to public input • Pressure to maintain the agency's credibility with the public • Pressure to maintain the agency's credibility with other agencies • Pressure to maintain the agency's scientific credibility
IDTL's belief in substantive public involvement (α = .664)	5-point scale: 1 = strongly disagree, 2 = disagree,3 = neutral,4 = agree, 5 = strongly agree • Public involvement should aim to ensure that public knowledge is incorporated into agency decisions • Public involvement should focus on soliciting comments that improve the analysis of potential impacts • Public involvement should help the public better understand our rationale for management actions • Comments from the public that reflect points of fact are particularly valuable to the NEPA process
IDTL's belief in normative public involvement (α = .678)	5-point scale: 1 = strongly disagree, 2 = disagree,3 = neutral,4 = agree, 5 = strongly agree • Comments from the public that reflect values and opinions are particularly valuable to the NEPA process • Public involvement should aim to help the agency understand the preferences of the public • Public involvement should aim to ensure that public values are incorporated into agency decisions

greater risk in delegation to subordinates in cases where external relationship risks are greater (Martin, 2012). External contractors are often used when external conflict is present, and consultation with legal counsel may also be more common (Stern and Mortimer, 2009). Multiple authors suggest that public involvement techniques should be tailored to the specific contexts in which a process takes place, especially with regard to expected levels of controversy (Creighton, 2005; McCool and Guthrie, 2001; Smiley et al., 2010; Walters et al., 2000). We make no specific hypotheses about which particular techniques will be more common in these situations.

3. Methods

3.1. Sampling

From March 17 to April 9, 2010, we conducted an online survey of 489 unique IDTLs of 489 unique NEPA processes that were completed between January 1, 2007 and December 18, 2009. The sample distribution across administrative regions, project type, and EISs versus EAs, reflects the diversity of the overall population of 1724 NEPA processes completed during the time period of the study (Stern and Predmore, 2011). Using the U.S. Forest Service Planning, Appeals, and Litigation (PALS) database and subsequent communications with contacts listed within that database, we were able to identify 653 unique IDTLs that were responsible for 993 separate NEPA processes. To avoid having multiple surveys filled out by the same person, we limited the sample using set criteria. When a choice had to be made concerning which NEPA process should be surveyed for a given IDTL who served on more than one team, we gave first preference to Environmental Impact Statements (EISs) over Environmental Assessments (EAs), because the former were rarer in our sample. Second, we selected the project that was most recently completed. After selecting NEPA processes using these criteria, our sample consisted of 653 NEPA processes (436 EAs) that were led by 653 different IDTLs. The response rate among IDTLs was 75%. For further details on sampling, see Stern and Predmore (2011).

3.2. Measurement

3.2.1. Appeals

Appeals and their outcomes were obtained using the PALS database. For each process within the survey, two binary variables were created. The first indicated whether an appeal based on NEPA was filed. The second variable coded the outcome of that appeal as positive or negative from the Forest Service's perspective. Processes in which the original Forest Service decision was affirmed or the appeal

was otherwise dismissed were coded as a "positive" outcome for the Forest Service. Appeals in which the decision was reversed (entirely or in part) or the Forest Service withdrew the original decision were coded as a "negative" outcome for the Forest Service.

3.2.2. Risk factors

Independent variables are organized by their relationships to different forms of risk and risk management. We used exploratory factor analysis (principal components extraction and varimax rotation) to reduce multiple survey items into groups of closely related items that comprise a single coherent construct, using procedures described in DeVellis (2003). In each case, the related items were equally weighted and summed to create an index. Cronbach's alpha scores, which are measures of internal consistency of the latent factors, are provided for each in Table 1. Scores above 0.6 are considered to reflect acceptable levels of internal consistency for use as latent variables, though higher scores are preferred (Gay, 1991).

3.2.2.1. Programmatic risk. We used purpose codes assigned within the PALS database to determine the purpose(s) of the NEPA processes within the sample. We reduced the original 18 codes into ten purposes of interest for examination within this study. The first two codes reflect multiple purposes within the PALS database. We labeled the first "integrated without timber" (6% of the sample) and the second "integrated with timber" (16% of the sample). We also coded projects based on whether any forest products were planned to be extracted at all (23%), as Laband et al. (2006) found this characteristic to be an important predictor of appeals on fuels reduction projects. The other eight purposes reflect a singular or clearly dominant single purpose within the PALS database. They include fuels reduction (18%), species and watershed management (14%), infrastructure/special permits (14%), grazing and range allotment (11%), recreation and travel management (9%), timber harvest as a sole purpose (8%), non-timber vegetation management (7%), and minerals development (4%). We also recorded the number of original purpose codes associated with each process as a measure of complexity. Values ranged from one to eleven purpose codes.

Additional measures of programmatic sources of risk involved the IDTL's perception of the complexity of the proposed project, the degree of uncertainty of the likely effects of the proposed project at the outset of the process, and the expected level of public controversy about the project at its outset. Each was measured on a three point scale. Complexity ranged from fairly simple to somewhat complex to very complex. The uncertainty and expected controversy measures ranged from low to moderate to high. We also asked IDTLs to express their level of agreement on a five-point scale with the following statement, "The project had a clear and unambiguous purpose and need." The scale ranged from strongly disagree (1) to strongly agree (5). All agree/disagree statements in the survey were measured on this same five-point scale.

3.2.2.2. Structural risk. Structural sources of risk emerge from the (un) availability of resources to complete the process effectively. We measured these risk sources through the degree of prioritization of the process by the responsible official and the degree of personnel change, or turnover, during the process. IDTLs were asked the extent to which they agreed or disagreed with the statement, "The decision maker prioritized this process on the forest/district." Prior research suggests that prioritization by the DM typically involves relieving ID team members of other duties and providing the necessary time and resources to complete the process more efficiently (Freeman et al., 2011; Stern and Predmore, 2012; Stern et al., 2010b).

A scale was developed to measure the extent of turnover of personnel during the process, combining three binary variables that represented whether turnover on the ID team, of the ID team leader, and the DM took place during the process. The sum of these variables served as a measure of the extent of turnover, such that a score of 1 indicated personnel change at only one level, a score of 2 indicated personnel change at two levels, and a score of 3 indicated personnel change at all three levels during the process.

3.2.2.3. Technical risk. We measured sources of technical risk through assessing the prior experience and training of the IDTL, their perceptions about the quality of the science and disclosure achieved in the process, and the use of legal consultation and external contractors. Prior experience was assessed in two ways by asking IDTLs the number of times they had served on an ID team or functioned as a team leader on prior NEPA processes. Two Forest Service trainings were considered particularly relevant to procedural compliance, 1900–01 on Forest Plan Implementation and 1900–03 on Social Impact Analysis. The 1900–01 is considered the Forest Service's core introduction to NEPA and project level planning. The 1900–03 course emphasizes the importance of people and social effects in agency decision-making through social impacts analysis. Both courses have been taught since the early 1990s, though each is taught less frequently today. Binary variables were created to represent whether the IDTL had participated in either training (as an attendee or an instructor) or not.

IDTLs' opinions about science and disclosure were each measured using the agree/disagree scale on the following statements: "The process employed the best available biophysical science;" "The process employed the best available social science;" and "Full disclosure of potential impacts was achieved."

IDTLs were also asked the extent which they consulted with legal counsel in the process and the extent to which external contractors were used in the process on a four-point scale: not at all, minimally, moderately, and extensively.

3.2.2.4. Internal relationship risk. Risk may emerge from relationship challenges between team members, team leaders, and DMs. We assessed the involvement of the DM throughout the process by asking the IDTL to indicate whether the DM was not involved, peripherally involved, or directly involved in multiple activities, including the development of the purpose and need, scoping, alternatives development, analyses, developing public involvement strategies, conducting public involvement, interagency coordination, writing the EA or EIS, and responding to public comments. We also asked IDTLs the extent to which they agreed that "The decision maker had an overall positive influence on the process." IDTLs were also asked the intensity with which they felt pressure to meet the specific demands of the DM on a five-point scale, ranging from "not at all" to "very strongly." Finally, IDTLs were asked about the extent to which they agreed with the statement, "The final decision matched the general consensus of the ID team," to gauge the level of accord between the ID team and the DM.

We examined IDTLs' leadership styles by first asking them about the extent to which they agreed with the statement, "I felt empowered to be the team's clear leader." IDTL empowerment measured in this way has been shown to be highly predictive of IDTLs' perceptions of process outcomes (Stern and Predmore, 2012). We also examined three leadership styles: directive, empowering, and supportive (Table 1). Directive leaders set clear goals for their teams and provide detailed guidance for how to get the work done, often relying on their position of power to promote work efficiency (Pearce and Sims, 2002). Empowering leadership involves the devolution of power to team members and their engagement in cooperative goal-setting, which tends to catalyze greater team cooperation (Pearce and Sims, 2002; Sarin and O'Connor, 2009; Waugh and Streib, 2006). Supportive leadership involves creating a worker-friendly environment by developing both an appreciative and protective work environment (Rafferty and Griffin, 2006) and working to minimize workload burdens on ID team members (Stern and Mortimer, 2009; Stern et al., 2010b). These leadership styles, as measured in this study, are not mutually exclusive.

Two survey items were used to assess accountabilities felt by the IDTL to the ID team. IDTLs were asked the intensity with which they felt

pressure "to meet ID team members' standards for scientific rigor" and "to communicate the consensus opinion(s) of the ID team to the decision maker" on a five-point scale, ranging from "not at all" to "very strongly."

Relationships within the ID team were measured in two ways. IDTLs were asked to indicate any stages of the process within which "the team worked together, collaborating across areas of expertise and openly deliberating most aspects of the project as a group." Responses were coded as binary variables, with a 1 indicating stages in the process during which this work style was dominant and a zero indicating a less collaborative style. Stages considered were the development of the purpose and need, scoping, alternatives development, analyses, writing/editing, developing public involvement strategies, and response to public comments. The team disagreement index (Table 1), meanwhile, reflects the extent to which ID team members disagreed with each other throughout the process. While the literature suggests that disagreement about tasks and other project elements can be healthy for teams (Amason, 1996; Fisher and Ellis, 1990; Simons and Peterson, 2000), this index, based on the response patterns of IDTLs, more specifically appears to measure what might be considered unhealthy disagreement, as interpersonal conflict co-varied directly with the other measures in the index.

3.2.2.5. External relationship risk. Relevant external relationships include those with other agencies and the various external public entities that show interest in the process. IDTLs were asked their level of agreement with the statement, "Other agencies were effectively engaged." The external accountability index reflects pressure felt by the IDTL to manage a wider array of external relationship risks (Table 1).

Other measures regarding external relationships are more directly related to risk management and its consequences. We first asked IDTLs the extent to which they employed twelve public involvement techniques (Table 2). Regardless of the specific techniques employed, the nature of public interactions may be closely related to the beliefs of those carrying them out (Stern et al., 2009). IDTLs' beliefs about public involvement were categorized into four primary points of view (Table 1). *Substantive public involvement* most closely reflects agency guidance that public comments should be "substantive," or focused on incorporating points of fact from the public into agency analyses (Dietz and Stern, 2008; Koontz, 1999; Predmore et al., 2011a). Meanwhile, *normative public involvement* focuses on incorporating values, opinions, and preferences of the public into agency decision-making (Innes and Booher, 2004; Predmore et al., 2011a). An *instrumental* view (Dietz and Stern, 2008; Innes and Booher, 2004; Koontz, 1999) of public involvement is reflected by a single agree/disagree statement: "Public involvement processes should aim to achieve public buy-in for the proposed action." Another single agree/disagree item represented a fourth point of view: "Public involvement is a procedural requirement that rarely contributes meaningfully to making better land management decisions."

Finally, we asked IDTLs to rate how influence over decisions within the process was divided between the Forest Service and the public at five different stages: developing the purpose and need, issues identification, alternatives development, analysis, and final decision. The degree of public influence was measured along a 5-point Likert-type scale with a score of 1 representing that decisions in that stage were made entirely by the Forest Service, 2 representing mostly Forest Service influence, 3 representing equal Forest Service and public influence, 4 representing mostly public influence and 5 representing entirely public influence.

Table 2
Differences in expected levels of controversy for different forms of ID team work styles, public involvement techniques and decision maker involvement (independent sample t-tests).

Process characteristics	Presence (n)	Mean	t	p
Collaborative deliberation on the ID team:				
During the development of the purpose and need	Yes (159)	1.99	4.37	<.001
	No (324)	1.69		
During scoping	Yes (102)	2.05	4.43	<.001
	No (381)	1.72		
During the development of alternatives	Yes (213)	1.96	4.61	<.001
	No (268)	1.66		
During impact analyses	Yes (99)	1.88	1.45	.149
	No (387)	1.76		
While writing the EA or EIS	Yes (25)	2.20	2.94	.003
	No (460)	1.77		
While developing strategies for public involvement	Yes (73)	1.95	2.07	.039
	No (409)	1.76		
While responding to public comments	Yes (108)	1.95	2.68	.008
	No (377)	1.74		
Techniques considered by IDTL to be a "major" component of public involvement in the process				
Written response in the formal document	Yes (292)	1.89	3.95	<.001
	No (181)	1.62		
A formal advisory committee was formed	Yes (9)	1.78	−0.34	.973
	No (463)	1.79		
Meeting with different interest groups separately from each other	Yes (91)	2.19	6.07	<.001
	No (380)	1.69		
Open public meetings in which participating public was addressed as one audience	Yes (132)	2.04	4.77	<.001
	No (341)	1.69		
Public was divided into smaller groups to work together, separated by interest	Yes (10)	2.30	2.27	.024
	No (462)	1.78		
Public was divided into smaller groups to work together with mixed interests together	Yes (14)	2.36	3.01	.003
	No (458)	1.77		
Public comments explicitly responded to prior to the draft document	Yes (141)	1.79	0.18	.857
	No (329)	1.78		
Public comments given an immediate verbal response	Yes (33)	1.64	−1.25	.212
	No (434)	1.80		
Project described in a formal presentation followed by a collection of formal comments	Yes (62)	1.98	2.30	.022
	No (409)	1.76		
Intentional engagement in interactive personal dialog with members of the public about the project	Yes (145)	1.90	2.18	.030
	No (327)	1.74		
Project information displayed on posters or flip charts for the public to peruse	Yes (59)	2.10	3.68	<.001
	No (412)	1.75		
Project information described on brochures or other handouts	Yes (56)	2.09	3.31	.001
	No (414)	1.75		
Direct involvement of the DM:				
Development of purpose and need	Yes (240)	1.88	2.78	.006
	No (229)	1.69		
Scoping	Yes (186)	1.93	3.55	<.001
	No (285)	1.69		
Alternatives development	Yes (236)	1.84	1.66	.098
	No (240)	1.73		
Analyses	Yes (87)	1.87	1.28	.202
	No (390)	1.76		
Developing public involvement strategies	Yes (192)	1.92	3.30	.001
	No (280)	1.70		
Conducting public involvement	Yes (176)	1.98	4.84	<.001
	No (295)	1.65		
Interagency coordination	Yes (132)	1.95	3.03	.003
	No (317)	1.72		
Writing the EA or EIS	Yes (44)	1.82	0.29	.772
	No (437)	1.78		
Responding to public comments	Yes (123)	1.77	−0.31	.756
	No (353)	1.80		

3.3. Analysis

We first examine whether ID teams work more collaboratively, legal counsel is more often consulted, external contractors are more often used, DMs become more involved in the process, or public involvement techniques are different on processes with higher levels of expected controversy. Second, we examine the bivariate relationships of each of the risk factors measured in the study with the occurrence of appeals. Third, we explore possible mediating effects of expected levels of controversy upon those relationships. A mediating effect occurs when a relationship between two variables is largely accounted for by a third variable. When the third variable is controlled for, the strength of

Table 3
T-tests comparing IDTL perceptions of appealed processes vs. processes that were not appealed.

Process characteristics (range)	Appeal?	Mean	t	p
Number of purpose codes in PALS database (1 to 11)	Appealed	2.91	2.7	.008
	Not appealed	2.34		
Complexity (1 to 3)	Appealed	2.20	5.5	<.001
	Not appealed	1.84		
Expected controversy (1 to 3)	Appealed	2.17	7.4	<.001
	Not appealed	1.65		
The final decision matched the general consensus of the ID team (1 to 5)	Appealed	3.92	−4.5	<.001
	Not appealed	4.26		
Extent of turnover (1 to 3)	Appealed	1.21	3.5	<.001
	Not appealed	0.86		
Pressure felt by IDTL to meet ID team members' standards for scientific rigor (1 to 5)	Appealed	3.02	2.2	.029
	Not appealed	2.76		
Pressure felt by IDTL to meet the demands of the decision maker (1 to 5)	Appealed	3.26	3.4	.001
	Not appealed	2.82		
Degree of consultation with legal counsel (1 to 3)	Appealed	1.84	7.4	<.001
	Not appealed	1.27		
Degree to which IDTL felt empowered to be the team's clear leader (1 to 5)	Appealed	3.69	−1.8	.075
	Not appealed	3.87		
Degree of public influence during alternatives development (1 to 5)	Appealed	2.17	3.1	.003
	Not appealed	1.94		
IDTL belief in substantive public involvement (1 to 5)	Appealed	4.17	−2.0	.043
	Not appealed	4.27		
IDTL belief that public involvement should aim to achieve buy-in from external stakeholders (1 to 5)	Appealed	3.03	−2.5	.015
	Not appealed	3.26		
Level of disagreement on ID team (1 to 5)	Appealed	2.06	4.4	<.001
	Not appealed	1.76		

the original relationship is reduced or eliminated (Baron and Kenny, 1986). This allows for an examination of which factors are most likely to be directly influencing the occurrence of an appeal and which show relationships with the occurrence of an appeal primarily because they more commonly occur in instances of heightened expected controversy.

Following tests for mediation, we run a conditional binary logistic regression analysis to generate the most parsimonious model of the most predictive combination of risk factors forecasting an appeal. Finally, we run bivariate and binary logistic regression analyses to determine which risk factors and strategies are the best predictors of appeal outcomes.

4. Results

4.1. Agency responses to expected controversy

Table 2 shares the results of independent samples t-tests which examine the relationships between expected levels of controversy and collaborative ID team deliberation at different stages, public involvement techniques, and DM involvement. Collaborative work styles were more common in cases with higher expected levels of controversy at all stages except for impact analyses. All but three public involvement techniques were more centrally used on more controversial processes as well. The techniques most commonly noted as major components of public involvement on more controversial processes included written responses to public comments in the final document, intentional engagement in interactive dialog, responding to comments prior to the draft document, addressing the public as a single audience in an open public meeting, and meeting with different interest groups separately from each other. DMs were also more directly involved in numerous tasks in more controversial projects, including the development of the purpose and need, scoping, developing public involvement strategies, conducting public involvement, and interagency engagement. IDTLs also consulted legal counsel more frequently ($r = .419$; $p < .001$), but external contractors were not more commonly used on more controversial processes ($r = .054$; $p = .235$).

4.2. Factors predicting appeals

Of the 489 NEPA processes surveyed, 132 were appealed. Tables 3 and 4 display all statistically significant binary relationships between all risk factors discussed above and the occurrence of an appeal. Table 3 contains the results of t-tests, which compare the means of risk factors on processes that were appealed to those that were not. Table 4 contains the results of chi-square tests, which examine relationships between binary variables representing risk factors and appeals. Only statistically significant relationships are shared in the tables. No other relationships were observed at $p \leq 0.05$.

Statistically significant relationships between a number of the items and expected levels of controversy raise the question of whether their relationships to appeals are direct or are mediated by expected controversy. Mediation occurs when one variable (expected controversy in this case) accounts for the relationship between a certain predictor and the dependent variable (in this case, the occurrence of an appeal; Baron and Kenny, 1986). Three conditions indicate the presence of mediation: (1) a significant relationship between the predictor and the mediator; (2) a significant relationship between the predictor and the dependent variable; (3) a meaningful change in the relationship between the predictor and the dependent variable when the mediator is accounted for (Baron and Kenny, 1986). The change can be a reduction or elimination of the relationship between the predictor and the dependent variable, indicating partial or complete mediation. Table 5 tests the third condition for cases in which the first two conditions have already been met (Tables 2, 3, and 4). We test two additional variables which also satisfy the first two conditions. Disagreement on the ID team was positively correlated with expected levels of controversy ($r = .304$; $p < .001$) and processes with greater expected levels of controversy showed greater public influence during alternatives development ($r = .215$; $p < .001$).

The mediation tests reveal that ID team collaboration, DM involvement, and public influence during alternatives development were mediated by expected levels of controversy. As such, they themselves

Table 4
Chi-square tests comparing IDTL perceptions of appealed processes vs. processes that were not appealed.

Process characteristics	Pearson χ^2 statistic	p	Relation to appeals
IDTL had participated in 1900–03 Social Impact Analysis training prior to the process	7.0	.008	More appeals
Deliberative ID team collaboration during scoping	4.4	.035	More appeals
Deliberative ID team collaboration during alternative development	5.4	.020	More appeals
Deliberative ID team collaboration while responding to public comment	4.5	.034	More appeals
Direct involvement of the DM in developing public involvement strategies	4.0	.046	More appeals
Direct involvement of the DM in conducting public involvement	4.1	.043	More appeals
Responding to comments in the written document was considered a major component of public involvement	11.7	.001	More appeals
Project included the harvest of forest products	26.2	<.001	More appeals
Project included fuels reduction	4.8	.029	Fewer appeals
Project included species and watershed management purpose	7.2	.007	Fewer appeals

Table 5
Tests for mediation effects of expected controversy. Each predictor variable is regressed (binary logistic regression) on appeals alone, and then together with expected controversy. Changes in Beta (β) coefficients and their significance between the two models indicate mediation.

Predictor alone	β	p	Predictor and mediator	β	p	Mediation
Deliberative ID team collaboration during scoping	0.50	.036	Deliberative ID team collaboration during scoping	0.23	.354	Complete
			Expected controversy	0.99	<.001	
Deliberative ID team collaboration during alternatives development	0.48	.020	Deliberative ID team collab. during alt. development	0.23	.290	Complete
			Expected controversy	0.98	<.001	
Deliberative ID team collaboration responding to public comment	0.50	.034	Deliberative ID team collab. resp. to public comment	0.32	.193	Complete
			Expected controversy	1.0	<.001	
Direct involvement of DM in developing public involvement strategies	0.42	.047	Direct involvement of DM in developing public…	0.24	.286	Complete
			Expected controversy	0.95	<.001	
Direct involvement of DM in conducting public involvement	0.43	.043	Direct involvement of DM in public involvement	0.14	.550	Complete
			Expected controversy	0.95	<.001	
Consultation with legal counsel	0.83	<.001	Consultation with legal counsel	0.58	<.001	No
			Expected controversy	0.75	<.001	
Responding to comments in the written document was considered major component of public involvement	0.94	<.001	Responding to comments in the written document…	0.77	.002	No
			Expected controversy	0.96	<.001	
Degree of public influence in alternatives development	0.43	.003	Public influence in alternatives development	0.26	.099	Moderate
			Expected controversy	0.98	<.001	
Disagreement on the ID team	0.63	<.001	Disagreement on the ID team	0.38	.015	No
			Expected controversy	0.94	<.001	

cannot be interpreted as causal mechanisms for appeals. Rather, they merely occur more often in contexts in which appeals are more common. These particular variables were thus not entered into regression analyses predicting the occurrence of an appeal. ID team disagreement and focusing heavily on written responses to public comments in the final document were not mediated by expected levels of controversy and thus exhibited a more direct relationship with appeals occurrence.

Table 6 shares the results of conditional binary logistic regression, which provides the most parsimonious model that best predicts appeals in the sample. The model contains the inclusion of forest products in the proposed action, the IDTL's expected level of controversy and perception of complexity of the project, agreement between the ID team and the DM's final decision, the IDTL's attendance of the 1900–03 Social Impact Analysis training prior to the process, the extent of turnover of personnel, and the IDTLs' belief that public involvement should aim to achieve buy-in from external stakeholders. These seven variables predict with 79% accuracy which processes within the sample were appealed. Agreement between the ID team and the DM's final decision and the IDTL's instrumental belief in public involvement predicted fewer appeals; all others factors in the model predicted a higher likelihood of an appeal.

4.3. Factors predicting appeal outcomes

Of the 132 processes that were appealed, 88 processes were either dismissed or the Forest Service decision was affirmed. In 44 cases, the Forest Service withdrew the decision, had its decision reversed, or was taken to court by the appellant. We label the first 88 outcomes as "positive" and the others as "negative." Tables 7 and 8 show all statistically significant and marginal bivariate relationships between risk factors and appeal outcomes. Table 9 shares the results of conditional binary logistic regression predicting appeal outcomes. The best predictors of negative appeal outcomes for those processes that were appealed include the turnover of personnel, meeting with public interest groups separately from each other and the inclusion of fuels reduction in the project. ID team collaboration and agreement between the ID team and DM's final decision were marginally related to better outcomes. Also, projects including multiple purposes not including timber tended to fare better when appealed as well.

5. Discussion

As hypothesized, a number of practices were more commonly employed in processes that were expected to be more controversial. We interpret these findings to suggest that Forest Service teams are actively managing risk within their NEPA processes, either implicitly or explicitly. ID teams tended to collaborate together more closely and DMs would become more directly engaged in processes with greater perceived external relationship risks. Moreover, certain public involvement techniques tended to receive greater emphasis in these processes, including written responses to public comments, more public meetings, meeting with different interest groups separately from each other, engaging in intentional dialog with stakeholders, and displaying information on posters and brochures, among others. Comparing these risk management strategies to the practices most closely associated with appeals and their outcomes provides insight

Table 6
Best binary logistic regression model predicting the occurrence of an appeal (Nagelkerke $R^2 = .290$).

Observed	Predicted		Percentage correct
	No appeal	Appeal	
No appeal	310	24	92.8%
Appeal	73	55	43.0%
	Overall percentage correct		79.0%

Predictors	β	p	Exp (β)
Forest products extracted	1.26	<.001	3.50
IDTL's expected degree of controversy at project outset	0.81	<.001	2.26
The final decision matched the general consensus of the ID team	−0.41	.010	0.67
IDTL had attended 1900–03 Social Impact Analysis training prior to this NEPA process	0.73	.024	2.07
IDTL perception of the complexity of the project	0.46	.024	1.58
Extent of turnover of personnel	0.26	.029	1.30
IDTL belief that public involvement should aim to achieve buy-in from external stakeholders	−0.28	.032	0.76

Table 7
T-tests comparing IDTL perceptions of appealed processes with good outcomes vs. those with negative outcomes.

Process characteristics	Outcome	Mean	t	p
Extent of turnover of personnel	Positive	.091	−5.1	<.001
	Negative	1.82		
The final decision matched the general consensus of the ID team	Positive	4.02	1.8	.082
	Negative	3.73		

into the effectiveness of current common risk management practices within Forest Service NEPA processes.

We examined multiple categories of sources of risk: programmatic, structural, technical, external relationships, and internal relationships. Certain risk sources appeared to drive appeals and their outcomes more than others, though elements of each category were influential. The factors most strongly associated with the occurrence of an appeal included complexity (programmatic), controversy (programmatic), forest products extraction (programmatic), turnover of agency personnel (structural), and the IDTL's prior attendance of the 1900–03 Social Impact Analysis training (technical). Greater consensus between the ID team and the DM with regard to the final decision (internal relationship) and the IDTL's belief in instrumental public involvement (external relationship) were negatively associated with the occurrence of appeals. Fuels reduction and fish and wildlife projects (programmatic) were less commonly appealed than other project types.

The process characteristics most strongly associated with appeal outcomes each predicted worse outcomes. They included turnover of agency personnel (structural), meeting with different interest groups separately from each other (external relationship), and the inclusion of fuels reduction within the process (programmatic). ID team collaboration and greater consensus between the ID team and the DM about the final decision (internal relationship) were marginally associated with better appeals outcomes for the agency.

Some elements of programmatic risk may be largely outside the control of the Forest Service, though project design elements, such as the inclusion of timber harvest, may influence the complexity and controversy of the project. They may also manifest in different ways. For example, while fuels projects were less commonly appealed, they fared worse when they were appealed. Fuels reduction projects may be unique in a few ways. Because they concern public safety in many cases, outright opposition to the premise of such projects may be somewhat less common. Moreover, their occurrence in the wildland–urban interface may make them somewhat more palatable to common appellants who object to active management in more pristine areas. Each of these factors may contribute to fewer appeals. As such, when appeals occur in these cases, they may more commonly indicate a significant problem with the process rather than an ideological issue with the project's overall premise, leading to a greater percentage of upheld appeals.

Table 8
Chi-square tests comparing IDTL perceptions of appealed processes with good outcomes vs. those with negative outcomes.

Process characteristics	Pearson χ^2 statistic	p	Relation to outcome
Deliberative ID team collaboration during scoping	2.9	.090	Better (marginal)
Deliberative ID team collaboration while responding to public comment	3.6	.057	Better (marginal)
Meeting with different interest groups separately from each other was considered a major component of public involvement	6.5	.011	Worse
Fuels reduction purpose	7.0	.008	Worse
Multiple purposes not including timber	4.8	.028	Better

Table 9
Best binary logistic regression model predicting appeal outcomes (Nagelkerke $R^2 = .321$).

Observed	Predicted		Percentage correct
	Negative	Positive	
Negative outcome	22	19	53.7%
Positive outcome	12	76	86.4%
	Overall percentage correct		76.0%

Predictors	β	p	Exp (β)
Extent of turnover of personnel	−0.93	<.001	0.39
Meeting with different interest groups separately from each other was considered a major component of public involvement	−1.07	.026	0.34
Fuels reduction purpose	−1.35	.029	0.26

Elements of structural, relationship, and technical risks sources may provide more actionable pathways for risk management. Turnover of personnel (structural risk) can disrupt projects in multiple ways, posing technical challenges associated with transferring knowledge and introducing new or different skills and expertise, internal and external challenges associated with changing social and professional relationships, and general changes in workflow and styles (Jafari et al., 2001; Moynihan, 1997). Limiting turnover of personnel during NEPA processes could prove helpful to mitigating appeals risk.

Internal relationships also proved important. Greater ID team collaboration during scoping and while responding to public comment were each associated with better appeal results for the agency. However, increased DM involvement showed no statistically significant relationship with appeals outcomes. This suggests that the quality of DM interaction may be more important than its quantity, particularly for creating a sense of empowerment for the IDTL and the ID team (Stern and Predmore, 2012). As such, the only elevated practice associated with internal relationships on controversial processes that appeared to be beneficial was greater cross-disciplinary deliberation on the ID team. Greater ID team collaboration has been positively linked to other perceived outcomes of Forest Service NEPA processes as well (Stern and Predmore, 2012).

External relationship risks may be affected by both public involvement techniques and the beliefs of the ID team leader. Though more common on controversial projects, dividing the public into separate interest groups for interaction was related to worse appeal outcomes. As such, while this technique may have benefits, it does not appear to be a consistently effective practice for preparing for an appeal situation. This strategy has been identified primarily as one of conflict avoidance and containment of public input (Predmore et al., 2011b). ID team leaders' beliefs in instrumental public involvement were related to fewer appeals. These results mirror findings associated with other outcomes as well, suggesting that a genuine belief in the value of public involvement and open two-way dialog may prove more fruitful than a defensive or dismissive stance toward it (Innes and Booher, 2004; Stern and Predmore, 2012).

The only measure of technical risk associated with appeals and their outcomes was the IDTL's prior participation in the 1900–03 Social Impact Analysis training. Our data provides no explanation for why those participating in this training experienced a higher occurrence of appeals. The finding demonstrates, however, that efforts at enhancing competence may be insufficient, or even detrimental in some cases, to effective risk management.

Other sources of technical risk, such as employing best available science and achieving disclosure, were not related to appeals and their outcomes. There may be a number of potential explanations. Response patterns suggest that IDTLs typically feel that they accomplish these tasks quite well, with only 4% and 2% scoring below the midpoint

on the 5-point scale for each, respectively. While these may be areas in which the Forest Service excels and are thus less vulnerable, this also might highlight a shortcoming of the study associated with only asking the opinions of the IDTLs about the quality of the science incorporated into the process. The lack of variability suggests that high quality science may be considered more or less a taken-for-granted element of these processes by those leading these teams. As such, wide variances in the representation of science within each process were not detected within the study. Alternatively, these elements may not be particularly relevant to appeals. In other words, programmatic, structural, and relationship forms of risk may simply be more sensitive appeal triggers than technical challenges. This interpretation would support the notion that technical fixes to process-related or sociopolitical challenges may not bear much fruit in terms of deflecting appeals.

6. Conclusions

Certain programmatic elements that are inherent within the context of specific places and/or design of particular projects clearly predispose certain process's to a higher risk of appeals. However, while agency personnel have commonly reported that appeals are often outside their control, this research suggests that certain practices within the agency's control associated with structural and internal and external relationship risk management may influence the occurrence and outcomes of appeals. In particular, using public involvement to achieve buy-in, creating consensus between the ID team and DM, and limiting turnover of personnel during a process may represent useful risk management approaches.

NEPA processes are complex interactions and the same risk management strategies are unlikely to be successful in every case. How risk is assessed may differ from one operational unit to another and from one time to another for a particular unit. Land managers would benefit from assessing programmatic, relationship, structural and technical risks for individual projects and their program as a whole to ensure it is within the capability and capacity of their organization. Additional research could continue to monitor risk management strategies to test the validity of the findings discussed herein.

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Marc J. Stern is an Associate Professor in the Department of Forest Resources and Environmental Conservation at Virginia Tech in Blacksburg, Virginia, USA. His research focuses on the human dimensions of natural resource planning and management and environmental communications. He teaches classes in social science research methods, environmental education and interpretation, and conflict resolution.

S. Andrew Predmore is an Assistant Professor in the Department of Environmental Studies at the University of Illinois-Springfield. His research interests revolve around the relationships between public involvement, environmental values, environmental discourse, and planning outcomes, particularly on public lands. He teaches courses in Environmental Ethics and Natural Resources Policy and Administration.

Wayde C. Morse is an Assistant Professor in the School of Forestry and Wildlife Sciences at Auburn University. He researches the influence of policy on both social and ecological outcomes with focus on conservation easements, volunteer tourism, landscape values mapping and outdoor recreation, including a recent study of the influence of Costa Rica's policy of payments for ecosystem services on landowner decision making and program conservation and development goals. He teaches courses on Ecosystem Services, Ecotourism and Environmental Interpretation.

David N. Seesholtz is a research liaison with the U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Focused Science Delivery Program. David leads a research project titled NEPA for the 21st Century, which examines how the Forest Service and other federal agencies accomplish their National Environmental Policy Act requirements. He has also served as a line officer on multiple forests in the U.S. Forest Service.