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Summary of Central Cascades Adaptive Management Partnership Poll

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In December 2004, the Central Cascades Adaptive Management Partnership (CCAMP) and Pacific Northwest Research Station distributed an informal five question poll to regional and forest level planners/leaders listed in the national Forest Service directory (see poll below). The poll asked five open-ended questions about managers' use of historic disturbance regime information in forest planning. Participation was voluntary. Fifty-eight people responded to the poll.

Researchers in the Department of Forest Resources at Oregon State University entered these responses into a qualitative data analysis software program, ATLAS.ti. Responses for each question were categorized and combined into major themes here for discussion purposes. Although qualitative data is not normally displayed in a percentage format, this liberty was taken here simply as a means to help categorize responses.

Neither the poll, nor the resulting summary is considered to be a scientific analysis. This was not a random-sample survey. The tables and figures in this report refer only to the percent of voluntary respondents who answered each question. Findings are not representative of all regional or forest level planners and leaders.

CCAMP POLL

You received this e-mail because you are listed in the USFS directory as a regional or forest level planner/leader. Please distribute to districts or others who may be able to answer this poll.

TEN MINUTE POLL ON USING HISTORIC DISTURBANCE REGIMES*
PLEASE RETURN BY JANUARY 20!!

Background: An effort is underway to consolidate information on how historic disturbance regime knowledge is being used in forest resource planning. We expect to summarize findings in a General Technical Report (USFS PNW Research Station) sometime in 2006. Historic disturbance information, RNV (Range of Natural Variability), or HRV (Historic Range of Variability) concepts are being widely used to guide stand treatment prescriptions as well as landscape management plans throughout the country in both federal and state agencies. Using ecological information to describe how landscapes have varied over time can provide context for making management decisions. Whether the disturbance factors were primarily fire, flooding, wind, or other processes, researchers and managers are working to uncover their influence and understand their short- and long-term effects.

Hence, this 10 minute Poll....

If you are -- OR EVEN IF YOU'RE NOT! -- using this concept, we are interested in hearing from you! If you are not using it, please reply and tell us why.

Please copy these questions, paste them into an e-mail with your responses, and ship it back to us. We will be sharing some of this information at a workshop being held January 25, 2005 in Corvallis, Oregon.

Question 1: Are you using historic disturbance regime information in the management of your unit? Please elaborate .... is the information used at the stand or landscape level -- or both? What is your source of information about stand and landscape histories and disturbance regimes?

Question 2: What was your motivation for using this concept? What is its primary objective? i.e. guiding fuels treatments, maintaining habitat for T&E species, meeting biodiversity objectives, etc.?

Question 3: How's it going? Do your peers and publics see this as a valid approach? Do you feel it has enough scientific rigor? Are there major roadblocks to its success?

Question 4: What type of tools are you using to help with this? VDDT? SIMPLE? RMLANDS? OTHER?

Question 5: What do you think are the most critical research needs at this time?

YOUR NAME:

POSITION:
UNIT:

THANKS FOR YOUR HELP! WE WILL DISTRIBUTE THE COLLATED RESPONSES.

Cheryl Friesen, Science Liaison, Central Cascades Adaptive Management Partnership
Fred Swanson, Pacific Northwest Research Station

SUMMARY

Poll respondents

- Fifty-eight people responded to the CCAMP poll.
- Forest Service employees comprised 83% of the poll's respondents.
- Although people responded from all Forest Service regions, approximately one-half of respondents work in the Pacific Northwest.
- Most respondents (83%) are using historical disturbance regime information, some (13%) are trying to use the information, and two (4%) have not been using it.

Scale of information used

- Nearly all respondents are using historical disturbance regime information at the landscape level or greater.
- Nearly half of respondents are also using the information at the stand level or smaller.

Terminology employed

- Approximately twenty different terms were used to describe the information these respondents employ in management.
- HRV and historical disturbance regime information were the most commonly used terms.

Sources of information

- Most respondents use more than one source of data for historical disturbance information.
- Sources of information included the following: current and historical documents such as historical journals, maps, and particularly research studies; field data; local or expert knowledge including traditional Native American knowledge; classification systems or management analyses such as watershed analyses; and computer models.

Motivation and objectives for use of information

- Respondents mentioned nearly forty different objectives for using historical information.
- Nearly one-half of respondents listed fire and fuels management issues, habitat issues, biodiversity issues, and increased understanding of disturbances as a primary objective.
- Approximately one quarter of respondents describe addressing agency requirements, restoration issues, social considerations, determining how to prioritize treatments, and forest health issues as a primary objective.
- About one-sixth of respondents described ecosystem services, old growth, sustainability, and economic considerations as a primary objective.

Validity and scientific rigor

- Nine respondents stated that their use of historical disturbance regime information was going well, while three stated that it was not.
- Nearly two-thirds of respondents felt that their peers saw the use of historical disturbance regime information as valid.
- Nearly half of respondents felt that the publics with whom they interact generally consider the use of this information as valid.

- However, half of the respondents also stated that specific organizations, particularly environmental groups, still question how historical disturbance regime information is interpreted and used to determine particular treatments on the ground.
- Over half of respondents believe that the scientific rigor surrounding historical disturbance regime information is high, while nearly one-third believe it to be low. One-sixth of the respondents do not feel that they have enough information to decide.

Roadblocks to success

- Although respondents listed numerous issues as roadblocks to success, these issues fell into four primary categories: social/political, scientific/informational, ecological, and institutional.
- Only three respondents perceived that there were no roadblocks to success.
- Over half of respondents described social/political roadblocks—ones that result from lack of agreement and conflict over how resources should be managed.
- Nearly one-half of respondents described roadblocks surrounding the use of scientific information in management, such as the lack of scientific information on historical disturbances, conflicting scientific information regarding appropriate treatments, and the differences between the scale of available data and the scale at which management is applied.
- Nearly one-third of respondents described ecological roadblocks that influence their use of disturbance information, particularly the amount of deviation from historic conditions.
- Over one-quarter of respondents mentioned institutional roadblocks, including insufficient resources, bureaucracy, and questions surrounding implementation.

Tools used

- Four broad categories of tools are typically used by respondents: simulation models and field data, and to a lesser extent, decision support systems and expert information.
- Only six respondents stated that they did not use any of the tools listed.
- Most of the tools used are landscape-level models and data.

Research needs

- Research needs fell into four primary categories: ecological research, general scientific research issues, social/institutional research, and computer modeling.
- Over half of the respondents need further ecological research, particularly on the impacts of climate change, the effects of disturbances on objectives, invasive species issues, or fire.
- Over half of the respondents referred to the need for more scientific data on historical disturbances, greater peer review of existing data, greater research at broader scales, or increased monitoring.
- One-fifth of respondents need social or institutional research that can help them address conflicting values and objectives for forest management.
- Three respondents believe that research on simulation and spatial modeling tools is needed.
- Although social/political issues were considered the primary roadblocks to success, only on-fifth of respondents described needing research that could contribute to social or institutional concerns.

Table 1. Organizational affiliation of respondents.

Organization	*n*	*%**
Forest Service	48	83
BLM	5	9
Other	5	9
Total	*58*	*101*

* Numbers do not equal 100% due to rounding.

Table 2. Forest Service region in which the respondent works. [1]

Forest Service Region	*n*	*%*
R6: Pacific Northwest	29	51
R4: Intermountain	7	12
R1: Northern	5	9
R5: Pacific Southwest	4	7
R9: Eastern	4	7
R8: Southern	3	5
R2: Rocky Mountain	2	4
R3: Southwestern	2	4
R10: Alaska	1	2
Total	*57*	*100*

Table 3. Responses to question: "Are you using historic disturbance regime information in the management of your unit?"

Use information	*n*	*%*
Yes	45	83
Trying	7	13
No	2	4
Total	*54*	*100*

Table 4. Responses to question: "Is the information used at the stand or landscape level – or both?"

Scale used	*n*	*%*
Landscape (and greater)	49	98
Stand (and smaller)	22	44

Scale used	*n*	*%*
Landscape only	28	56
Both landscape and stand	21	42
Stand only	1	2
Total	*50*	*100*

[1] Except for Table 1, the percents described in this summary refer to the percent of respondents who answered a particular question, not the percent of total CCAMP poll respondents (n=58).

Terms used

Forty-three respondents mentioned specific terms to describe the information that they used in the management of their unit (Table 5). Because some of the respondents used more than one term to describe their work, the numbers do not equal 100%. Historical range of variability (HRV) was used by 35% of respondents. For instance, Forest Service employees from Region 4 wrote, "*Yes, our newly (2003) Revised Forest Plan uses HRV as a primary source of guidance for vegetation management*." The term "historic disturbance regime information" was used in the poll's first question, and so likely influenced the number of people mentioning that specific terminology. Natural range of variability (NRV) was used by 7% of respondents. A Forest Service employee from the Pacific Northwest mentioned, "*We have been challenged on some projects for are interpretation of the NRV but not its application. My general sense is that environmental community accepts the concept of managing land within NRV*."

Each of the following terms: expected range of variability (ERV), potential natural vegetation (PNV), historic range of natural variability (HRNV), and future range of variability (FRV) was used by one respondent to describe their management. A Forest Service silviculturalist from the Pacific Northwest wrote, "*Given the nature of our work we are often put in a situation where HRV is not attainable and we are left with trying to determine what I recently read described as the "future range of variability" (FRV) (NCSSF, 2005).*" Thirty percent of the respondents used more generic terminology to describe the information they use in management, including "knowledge regarding natural disturbances", "historic fire frequencies", "historic and current landscape disturbance", "change in stream conditions", and "historic fire return intervals."

Table 5. Specific terms employed to describe information used in management.

Terms	*n (out of 43)*	*%*
HRV	15	35
Historic disturbance regime information	12	28
NRV	3	7
Historic conditions	2	5
ERV, PNV, HRNV, FRV	1 each	2 each
Other	13	30

Sources of information

Most respondents mentioned that they use at least one source for historical disturbance regime information (Table 6), and many use several different sources of information. For instance, a Forest Service employee from the Pacific Northwest mentioned, "*I utilize historical documents, aerial photos, scientific papers, and field observations of undisturbed areas*." Over half of the respondents who mentioned a source of information referred to current or historical documents, including research publications (25 respondents), agency records (12), photos and maps (10), or other historical accounts such as journals and literature.

Nearly one-half of the respondents referred to field data such as dendrochronology (8 respondents), aerial detection (7), survey data (6), fire history records (6), paleoecological

sampling (2), and climate data (2). Over one-quarter of respondents referred to local or expert knowledge, including Native American knowledge, as a source of information. An ecologist from the Pacific Northwest wrote, "*Info from Native American interviews, historical documents, BLM land surveys, fire lookout panoramas, fire history studies*."

One quarter of the respondents also referred to classification systems or management analyses as sources, such as Fire Regime Condition Class assessments (7 respondents), watershed analyses (3), and the Interior Columbia Basin Ecosystem Management Project (2). For instance, a planning forester from the Pacific Northwest wrote, "*Sources are field reconnaissance and aerial photo interpretation with some field verification. Have also used the recently completed FRCC mapping, but it is not especially accurate, especially for site-specific use*." Finally, about one-sixth of respondents mentioned computer programs, such as GIS databases and growth and yield models, as sources without referring to the source of the data within those programs. Employees from ODF noted, "*There are a variety of sources of information about stand and landscape histories. The most recent information is in Geographic Information System (GIS) databases of stand management activities, fire boundaries, and stand inventory information.*"

Table 6. Responses to question: "What is your source of information about stand and landscape histories and disturbance regimes?"

Source	*n (out of 51)*	*%*
Current/historical documents	31	61
Field data	25	49
Local or expert knowledge	14	28
Classification systems/ management analyses	13	26
Computer models	8	16

Motivation and objectives

Fifty-five respondents discussed their motivation or objectives for use of historical disturbance regime information (Table 7). Because respondents tended to combine their responses to the two questions on motivation and objectives, results have been combined as well.

When asked about their objective for using historical disturbance regime information, nearly half of respondents mentioned each of four primary issues: fire and fuels reduction using fire; habitat (including improving habitat diversity, T&E habitat, wildlife habitat, and riparian habitat); biodiversity; and increased understanding of historical disturbances so they can better determine appropriate treatments. A Forest Service NEPA coordinator from the Southwestern Region noted, "*The primary objective is for fuel reduction and reducing the risk to private property from wildfire. This also ties in with some day being able to reintroduce fire back into the ecosystem on a regular basis, which then ties in with providing for fire fighter safety*." A Forest Service employee from the Pacific Northwest Region wrote, "*Writing a prescription for forest management keeps all resources in mind. The primary focus would be to maintain a diverse, healthy, balanced forest and landscape that provides for habitat for a wide variety of plant and animal species*." A Forest Service wildlife ecologist from the Rocky Mountain Region

described, "*…predicting the consequences of management is very difficult without an understanding of the native disturbance regime of a system.*" The poll's question offered fuels, T&E habitat, and biodiversity as potential objectives (see Appendix A); consequently, these objectives were probably mentioned more frequently than they would have been otherwise. For instance, respondents occasionally mentioned "all of the above" in response to the question.

Nearly one-third of respondents mentioned various agency requirements, including forest planning and complying with agency directives and regulations, as their primary motivation for using this information. Three Forest Service employees from the Intermountain Region wrote, "*The HRV process was the "best available science" at the time, and was an approach being advocated by our Regional Office when we began Forest Plan Revision.*" The same number of respondents also mentioned the desire to restore ecosystems, particularly to historic conditions, as an objective. In response to this question, a Forest Service silviculturalist from the Pacific Northwest wrote, "*Restoration of species and their ecological function. In some situations species composition has been so modified on the landscape that land managers are no longer aware of what role a species played on their landscape. I work with units to try to determine the historic distribution and composition as a potential basis for restoration objectives.*"

One quarter of respondents mentioned the need to prioritize treatments and consider social issues as objectives for using this information. Social issues that they believed needed to be considered included protection of wildland-urban interface, Native American cultural resource values, and creating a "defensible" management approach. Finally, one-fifth of these respondents described forest health issues, including addressing invasive species, insects, and disease. A Forest Service employee on the Boise National Forest wrote, "*Since the early 1990 the Boise has been involved in Forest Health related issues (large uncharacteristic wildfires began in 1986 then continued into 1989, 1992, 1994, 1996, 2000, 2003 - major insect epidemics in 1988-1992 (bark beetles, 1992-1994 (tussock moth) and we are continuing to experience higher than historic levels of Douglas-fir beetle attacks.*"

Table 7. Responses to question: "What was your motivation for using this concept? What was its primary objective? i.e. guiding fuels treatments, maintaining habitat for T&E species, meeting biodiversity objectives, etc.?"

Objectives	*n (out of 55)*	*%*
Fire issues	26	47
Habitat (T&E, wildlife, riparian, diversity)	25	46
Biodiversity	24	44
Increased understanding	23	42
Address agency requirements	16	29
Restoration	16	29
Social considerations	14	26
Prioritization of treatments	13	24
Forest health	11	20
Ecosystem services	9	16
Old growth	8	15
Sustainability	8	15
Economic considerations (e.g., timber production)	5	9

Progress on use

Of the fifteen people who responded directly to the question, "how is it going?", the majority wrote that it was going well or alright (Table 8). One-fifth wrote that it was going slow or not well. Over one quarter of these respondents noted that their work was progressively getting better because either public knowledge on the topic was increasing or the rigor of the information was increasing.

Table 8. Primary categories of responses to question: "How is it going?"

	n (out of 15)	*%*
Well	9	60
Not well	3	20
Knowledge or rigor improving	4	27

Validity of approach

Forty-eight respondents discussed the level of support or factors influencing support of historical disturbance regime information in management (Table 9). Of the individuals who responded to this question, nearly two-thirds believed that there is general support for the use of this concept from their peers. A BLM employee from the Pacific Northwest wrote, "*I was on an ID team where Bruce Babbit, Gov. Kitzhaber and his science team came and reviewed the project we designed using it. They were all very impressed. One of the things they stated was that they liked the way our specialists spoke one another's languages and using the HRV concept helped us have a common language*." One-half of respondents believed that the public generally supports the use of this concept, although three of these respondents noted that certain members of the public disagree with the general consensus.

Although most respondents perceived that they have received support for the use of this concept, one-half of them referred to two factors that hinder the support that they do receive. First, using historical disturbance regime information was described by two respondents as a low priority by the public and/or Forest Service leadership. Second, although the public is perceived to generally understand the concept, twenty-two respondents noted that the certain publics question the use and particularly the interpretation of how that concept should be expressed through management treatments on the ground. A Forest Service employee from the Intermountain Region wrote, "*I'm not sure that many of our detractors agree with our disturbance interpretations and timelines (i.e. how intense they were and how frequently they occurred). To many of them, it's just another excuse to disturb what's going on currently*."

Respondents wrote that the greatest opposition to the use of this concept arises from certain individuals and organizations, particularly non-local environmental groups, who believe that forests should be left alone, undisturbed by any human management practices. A botanist from the Southern Region stated,

> "*We do have opposition stem from two fronts: one considers that the approach is entirely or mostly invalid and that the local forests have largely existed unaffected by*

humans until Europeans arrived, and therefore believes we should leave it be or greatly scale back all actions ; the other considers it valid, but the interpretation in error and too conservative regarding certain disturbances and too aggressive regarding others, and therefore believes we should modify actions."

The lack of support from these people is perceived to result primarily from two underlying issues: 1) people hold different perspectives on the appropriateness of human interference in the restoration of an ecosystem and 2) certain publics lack trust in the Forest Service. A Forest Service ecologist from the Southwest Region noted, "*The trust factor with the public is big; too often seen as a ploy to increase timber harvest*."

Table 9. Responses to question: "Do your peers and publics see this as a valid approach?"

Support for approach	*n (out of 48)*	*%*
Peer support	29	60
Little peer support	1	2
Public support	23	48
Little public support	6	13
Issues hinder support	24	50

Scientific rigor

Over one-half of the thirteen respondents who described the level of scientific rigor surrounding the use of historical disturbance regime information believed it had sufficient scientific rigor (Table 10). Nearly one-third believed rigor to be fairly low and two respondents felt that they did not have sufficient information to decide the level of rigor of historical disturbance regime information. While a Vegetation/NEPA/Planning staff officer stated, "*There is plenty of scientific rigor*," a forest silviculturalist wrote "*We do not have enough scientific rigor - we are still fumbling with how figure it out*."

Table 10. Responses to question: "Do you feel it has enough scientific rigor?"

Level of rigor	*n (out of 13)*	*%*
Rigor is fairly high	7	54
Rigor is fairly low	4	31
Level of rigor is unclear	2	15

Roadblocks to success

When asked about roadblocks to the success of using historical disturbance regime information, only three respondent stated that there were none (Table 11). The remaining 43 respondents listed 28 different issues that hindered their ability to use the concept. These

roadblocks were classified into four primary categories: social/political barriers, scientific/informational barriers, ecological barriers, and institutional barriers.

Social/political roadblocks describe issues where people, particularly external publics, do not agree on how natural resources should be managed. The majority of respondents mentioned at least one social/political roadblock to success, including conflicting forest management objectives of different publics (11 respondents), certain organizations' primary focus on species to the exclusion of ecosystem concepts (5), litigation (4), the difficulty of balancing the need for human-induced disturbance with concerns about its use, particularly regarding fire (4), a lack of public trust in the Forest Service (2), the difficulty of balancing grazing interests and concerns (2), and the lack of transparency of modeling efforts (2). When asked whether there were any roadblocks to success, a BLM employee from the Pacific Northwest wrote, "*Yes, but not because of the study of past conditions. The roadblocks are of a social and political nature, where the laws and the courts are used to settle disputes with little regard for past conditions. Opposing sides are good at finding the science to support their opinions and objectives*."

Scientific/informational roadblocks, which was cited by nearly half of these respondents, describe issues that influence our ability to manage even if everyone could agree on the management objectives. These roadblocks included a lack of scientific information about historical disturbance regimes (14 respondents), a concern that scientific information tended to be at too broad a scale for effective use in forest management on the ground in particular locations (5), and conflicting scientific information about what treatments were most appropriate (3). For instance, an environmental coordinator from the Pacific Northwest wrote, "*Major roadblocks are that our Forest historical archives don't give enough detail in the early part of this century. Maps of forest types weren't prepared until the 1930's and contained different definitions for veg. types than we use now, so they are not directly comparable*."

About one-third of these respondents mentioned ecological roadblocks to success. These roadblocks refer to ecological issues that influence the use of disturbance information even if social/political and scientific/information roadblocks did not exist. Respondents primarily discussed how using historical disturbance regime information to achieve historic conditions was likely not a realistic management goal, in part because the ecosystems (and climate) have changed dramatically since pre-settlement conditions. Two ODF employees wrote, "*While managing forest ecosystems to sustain the complexity produced by historic disturbance regimes may also sustain historical biodiversity, pre-settlement conditions are often not a realistic goal because the landscape condition has been changed by human-caused disturbance. Attempting to restore earlier landscapes may not lead to resilience in the face of new forces such as climate change, mega fires, exotic species invasions, or pollution*."

Finally, approximately one-quarter of these respondents mentioned institutional roadblocks to success. Institutional factors that were cited as influencing management included a lack of sufficient resources, including time and money, for management (9 respondents), a lack of understanding of how to move from scientific understanding to management implementation (3), and the difficulty of dealing with bureaucratic and analytical processes (3). Three employees from the Intermountain Region wrote,

> "*Major roadblock is resources to plan and accomplish vegetation treatments at a scale that matches HRV (i.e. our analysis showed that even with a greatly accelerated program of treatment (for which we are not even close to having funding), aspen cover types would not be back within HRV for 50 years). Our annual monitoring reports are*

showing that even the relatively conservative objectives (i.e. we thought realistic from a budget perspective) for vegetation treatments we set up in the Revised Plan cannot be achieved at current funding levels."

Table 11. Primary categories of responses to question: "Are there major roadblocks to success?"

Roadblocks	*n (out of 46)*	*%*
Social/political	26	57
Scientific/informational	22	48
Ecological	14	30
Institutional	12	26
No roadblocks	3	7

Tools used

Respondents use a variety of tools for helping with historical disturbance regime information (Table 12). The majority of respondents use simulation models, particularly at the landscape level. Landscape-level simulation models included Vegetation Dynamics Development Tool (VDDT) (20 respondents), Simulation Patterns and Processes at Landscape Scales (SIMPPLLE) (7), landscape management systems (2) and others. Stand-level simulation models included primarily Forest Vegetation Simulator (FVS) (5 respondents) and other models such as ZELIG and Fireshed.

Field data was the next largest category of tools mentioned. Nearly one-third of these respondents used at least one type of field data, including GIS databases (6) and ecological classification (4). Other field data that was mentioned by only one respondent included Ecoplot data, Forest Inventory and Analysis (FIA) data, hazard rating, Interagency Vegetation Mapping Project (IVMP) data, and satellite imagery vegetation information.

Five respondents use decision support systems, such as Spectrum (4) and Analytical Tools Interface for Landscape Assessments (ATtILA) (1), while four respondents use primarily expert knowledge as a tool. Six respondents mentioned that they did not use any of the tools listed in the question (i.e., VDDT, SIMPPLLE, Rocky Mountain Landscape Simulator (RMLANDS)), and two of them wrote that they are using their own modeling approach or are tailoring a model for use in their own region. Finally, three respondents noted that the use of historical disturbance regime information should be conducted with a more "*broad brush"* approach than certain modeling tools suggest. A Forest Service employee from the Eastern Region noted, "*Region 9 is planning to use VDDT for the fire regime condition class mapping. The mapping process is out of phase with (behind) our forest plan revision. I suspect the final result will be a product that will imply much greater precision and reliability of information than on-the-ground realities warrant*."

Table 12. Primary categories of responses to question: "What type of tools are you using to help with this? VDDT? SIMPLE? RMLANDS? OTHER?"

Tools used	*n (out of 51)*	*%*
Simulation models total	30	59
Simulation models, landscape level	29	57
Simulation models, stand level	9	18
Field data total	16	31
Field data, unspecified	4	8
Field data, landscape level	10	20
Field data, stand level	6	12
No tools listed/use own model	6	11
Decision support system	5	9
Expert information	4	8
Need a broader approach than models	3	6

Research needs

Interestingly, although the greatest number of respondents mentioned social/political roadblocks to success (Table 13), when asked about the most critical research needs at this time, only one-fifth of respondents mentioned research into social or institutional aspects of their work. Instead, over half described the need for better research on the ecology of historical disturbance regimes. In particular, respondents wanted to have better scientific information on the expected impacts of changes in climate on their ability to manage for historical conditions (10 respondents), the effects of disturbances in creating the objectives they seek (8), issues that address invasive species (6), and a better understanding of fire and fire history for their region (5). When asked about critical research needs, a Forest Service employee from the Eastern Region wrote, "*Effects of historic disturbance on non-native invasive plant species. Historic disturbance within an altered landscape - are some parts of the landscape so altered or fragmented that it is not effective to try to reintroduce a historic disturbance regime*?"

Over half of respondents also described general scientific issues as their most important research needs, such as the need for more historical data on disturbances (7 respondents), the need for greater peer review and rigor of this scientific information (6), and the need for monitoring (5). Two employees from ODF wrote, "*The most critical research needs will always include the direct effects of any disturbance on forest structure, composition, function, intensity, and the spatial extent*." Greater peer review and rigor of historical disturbance regime information was also important for six respondents. A forest ecologist from the Northern Region wrote,

> "*the greatest need [is] to credibly and scientifically validate results of the application of these concepts/principles on various scales - especially the project level. There seems to be enough in the literature to support using all this - but nothing for results (especially economic and social) - and nothing to put it all together in a neat package that can validate and substantiate all the steps involved to carry this out to completion - on the level sufficient for Region, Forest, and District understanding across Regional*

differences (for mixed subalpine types, for instance - mixed lethal fire regimes, etc)…there still seems to be disagreement within the scientific community as to the overall effectiveness - so consistency would be good – from the research and NFS field implementation perspectives together. We need validation sufficient to end the discussion (arguments) - institutionalize the process – and focus on getting the job done."

Four respondents noted that broader scale research across large areas and different ownership and landscape boundaries was needed. A Forest Service employee from the Pacific Northwest wrote,

"*I think that larger scale/real world studies are the most helpful in making the case that various treatments are effective. Burning and studying two hectares on the experimental forest don't help; applying several different treatments across the ENTIRE experimental forest, setting a summertime fire, and measuring the effects would be helpful. Keep in mind that each project area our team tackles, each year, is 15000 to 30000 acres.*"

Four respondents also noted that research-management technology transfer was a critical research need. For instance, a Forest Service employee from the Intermountain region wrote, "*Technology Transfer and Research Synthesis- related to fuels treatments...the recent RMRS Publications summary identified a significant amount of work going on to synthesize research findings, but it is not being effectively transferred to NFS units.*" Finally, four respondents noted that researchers need to better quantify information on expected and natural range of variability.

One-fifth of these respondents described social or institutional issues as a critical research need, including dealing with conflicting values and objectives for forest management and the treatments necessary to achieve those objectives, learning how to implement stated objectives, and educating the public on the need for considering historic regimes. A Forest Service employee from the Southwestern Region described,

"*We know a lot about fire return intervals and the role fire plays in these ecotypes, but there are many tradeoffs that I am not sure the public is willing to buy. For example, many people want to see a resilient forest but may not buy into the concept of what we believe the forests looked like prior to fire suppression. There is still much discussion about how many trees should be left and what size. Maybe some social research on what the public thinks the forests should look like. What conditions do they relate too, open stands or tree thickets, or something in between.*"

The discrepancy between the number of respondents who described social/political or institutional roadblocks and those who described social/institutional research needs could be a potential fruitful area for further questions. It could be important to learn whether these respondents believe that scientific research cannot be brought to bear on social or institutional roadblocks. Finally, three respondents felt that research on simulation tools and spatial modeling tools were needed. Two respondents co-wrote,

"*This clearly points to the need for two basic types of tools to support National Forest planning efforts: 1) Simulation/stochastic modeling tools that can be used by typical interdisciplinary teams and stakeholder groups; and 2) Visual display tools that are*

GIS-based, to depict spatial relationships and conditions. These tools can be and have been used effectively to facilitate web-based public involvement and interaction in recent planning efforts. They can also help to position the agency to respond to the President's "e-government" initiative, as well as to meet the electronic information requirements of the Freedom of Information Act."

Table 13. Primary categories of responses to question: "What do you think are the most critical research needs at this time?"

Research needs	*n (out of 50)*	*%*
Ecological research	29	58
Scientific research generally	27	54
Social/institutional research	10	20
Computer modeling	3	6