Article

Setting Up a Horizon Scanning System: A U.S. Federal Agency Example

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Abstract

Managers and policy makers are continually working toward a desired future within a context of rapid and turbulent change. To be effective in this context, they must look ahead to anticipate emerging trends, issues, opportunities, and threats. Horizon scanning is a foresight method that can help managers and policy makers develop and maintain a broad and externally focused forward view to anticipate and align decisions with both emerging (near-term) and long-term futures. This article reports on the design and early stage development and implementation of a horizon scanning system established for the U.S. Forest Service (USFS), Strategic Foresight Group, and developed cooperatively with the University of Houston Foresight Program. The goal of the project is to develop an ongoing horizon scanning system as an input to developing environmental foresight: insight into future environmental challenges and opportunities, and the ability to apply that insight to prepare for a sustainable future. In addition, the horizon scanning system is supported by volunteers from within the Forest Service. By including participants from throughout the Forest Service, the project seeks to foster a culture of foresight within the organization, and eventually to develop a more forward looking organizational structure for the USFS and other natural resource management agencies. Lessons learned from the experience to date are shared as well as future challenges for keeping the horizon scanning system in good working order—current, relevant, and consistent.

Keywords

foresight, horizon scanning, forestry, emerging issues, policy

Introduction

Managers and policy makers are continually working toward a desired future within a context of rapid and turbulent change. To be effective in this context, they must look ahead to anticipate emerging trends, issues, opportunities, and threats. Horizon scanning (also referred to as environmental scanning) is a foresight method that can help managers and policy makers develop and maintain a broad and externally focused forward view to anticipate and align decisions with both emerging (near-term) and long-term futures. Horizon scanning is defined as "the acquisition and use of information about events, trends and relationships in an organization's external environment, the knowledge of which would assist management in planning the organization's future course of action" (Choo 2002, 84).

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Horizon scanning has long been practiced in the military, the intelligence community, and the business world. Business research has demonstrated that effective horizon scanning improves organizational performance (Choo 2002). In recent years it has been increasingly used in other public sector fields, such as human health (Douw and Vondeling 2006) and education (Munck and McConnell 2009). But the use of formal horizon scanning in natural resources and environmental organizations has been limited (Sutherland and Woodroof 2009). Among the few examples are scanning exercises related to biodiversity (Sutherland et al. 2008), global conservation issues (Sutherland et al. 2015), and environmental issues with implications for the U.S. military (U.S. Army Environmental Policy Institute n.d.).

The Millennium Ecosystem Assessment concluded that "over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber, and fuel" (Millennium Ecosystem Assessment 2005, p. 1). Surprises are increasing along with the expanding scale of human impacts (Gunderson and Longstaff 2010). Hibbard et al. (2007) refer to the period following World War II as the "Great Acceleration," a time of significant increase in the scope, scale, and intensity of impacts on the social-ecological system. At the same time, the rapid pace of technological change has the potential for sweeping environmental effects, such as genetic engineering and nanotechnologies, and makes the future landscape more challenging to discern (Olson and Rejeski 2005).

In the face of such profound and uncertain change, foresight developed through horizon scanning is not an attempt to "predict the future." It is simply not possible to accurately predict the future of complex social-ecological systems for long timeframes. Efforts devoted to social and environmental prediction have been plagued by a host of shortcomings, and unjustifiable faith in these predictions have contributed to unmanageable nuclear waste disposal practices, poisoned mining sites, inaccurate expectations of shoreline erosion rates, and overoptimistic cost estimates of artificial beaches (Pilkey and Pilkey-Jarvis 2007; Sarewitz et al., 2000).

The inability to accurately forecast the future of complex social-ecological systems stems from many factors, such as the emergent nature of these systems and their sensitive dependence on initial conditions. Emergent properties of a system cannot be predicted from the parts (de Haan 2006). The prevalence of surprise in social-ecological systems (Gunderson and Longstaff 2010) implies that some important uncertainties in long-term forecasts are irreducible and that traditional scientific tools and models are blunt instruments for studying a future that does not exist.

The goal of horizon scanning, therefore, is not to try to accurately predict the future, but to identify, compile, and analyze the various signals of change. These signals can be explored to stimulate thinking about the range of future possibilities. While getting "the future" precisely right is futile, it is possible to use signals of change identified in horizon scanning to map plausible scenarios and pathways to the future (Hines 2009). Horizon scanning serves as an early warning system to identify potential threats and opportunities. Some characteristics of horizon scanning that distinguish it from typical activities that planners use to survey future conditions include (Bengston 2013):

- It emphasizes "weak signals" or early indicators of potential change,
- It is comprehensive across a wide range of sectors,
- It emphasizes external trends and developments, and
- It includes possible wild cards or low-probability, high-impact events.

This article reports on the design and early stage development and implementation of a horizon scanning system established for the U.S. Forest Service (USFS), Strategic Foresight Group, and developed cooperatively with the University of Houston (UH) Foresight Program. The goal of the project is to develop an ongoing horizon scanning system as an

input to developing environmental foresight: insight into future environmental challenges and opportunities, and the ability to apply that insight to prepare for a sustainable future (Bengston 2012). Broadly speaking, the objectives of the horizon scanning system are to find, collect, and analyze the signals of change, and to identify emerging issues suggested by these signals that could affect forests and forestry in the future. This project will also use this information to support the development of scenarios of the future of forestry that integrate signals of change and emerging issues into each scenario. Once the scenarios are crafted, indicators based on signals of change for each scenario will be identified. Going forward, the horizon scanning system can be used to monitor these indicators and provide early warnings that the future seems to be moving toward a particular scenario (Schwartz 1996). This information can alert decision-makers to adjust plans accordingly and take timely action where necessary.

In addition, the horizon scanning system is supported by volunteers from within the Forest Service. By including participants from throughout the Forest Service, the project seeks to foster a culture of foresight within the organization, and eventually to develop a more forward looking organizational structure for the USFS and other natural resource management agencies.

The next section of this article explains the approach taken to develop the Forest Futures horizon scanning system. This is followed a summary of what has been learned so far, and next steps for the project.

Methods for Setting Up a Horizon Scanning System

The Forest Service partnered with the UH's Foresight Program to design and implement the horizon scanning system, driven by a small core team with members from both organizations. The Foresight Program trains students in the concepts, theories, and frameworks for understanding, forecasting, and influencing the future (Hines 2014). A core approach called Framework Foresight was developed in the UH Foresight Program for exploring the future of any topic (Hines and Bishop 2013). The primary focus for this horizon scanning project involves the first two steps of the Framework Foresight process: *Framing* the topic and its boundaries and *scanning* to identify emerging issues. Framing and scanning provide the foundation for forecasting, depicted as the baseline and alternative futures in Figure 1. The baseline future or "business-as-usual" assumes continuity with the present without major surprises: trends stay on track, plans are fulfilled, and mainstream projections are on target. Emerging issues, however, may indicate potential alternative futures, that is, alternative outcomes to the baseline. Thus, the identification of emerging issues provides early warning for potential shifts or discontinuities from business-as-usual and helps frame alternative future scenarios.

Framing

The process begins with framing the domain or topic to be explored. The goal is to scope the topic so that it is neither too broad nor too narrow (Hines and Bishop 2015, 374). For this project, natural resources and the environment were considered as a broader scoping and forests as narrower. After doing some preliminary scanning, it was decided that forests would provide more focus to scanners. Natural resources-related scanning hits (e.g., energy, water) were too broad, but they could still be included as they related to forests. Thus, scanners primarily focused on forests but were open to how other natural resources might affect forests. This provided a more useful and focused framing than the future of natural resources with a secondary focus on forests.

Domain mapping. The domain map is a visual representation of the boundaries and key categories to be explored, or framed, in scanning. Simple diagrams can be used to represent key categories and subcategories. Mind mapping software works well for this. We used the cloud-based Coggle tool <https://coggle.it/>. Most domains can be usefully mapped with three to six main categories and two to four

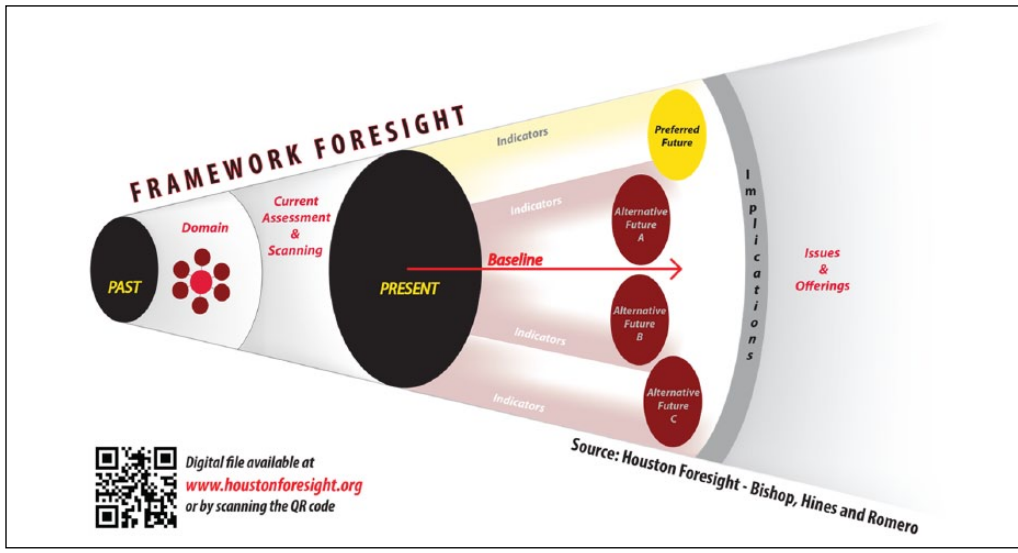

Figure 1. Key framework foresight elements for scanning project.

subcategories of each of those. Typically maps also include a third level (subcategories of the subcategories). Beyond that, the map becomes messy as a communications tool, although the greater level of detail in a domain map can be helpful to scanners.

A domain map has three primary functions: defining the boundaries of the scanning world, organizing the data for analysis, and as a communication device for scanners. Detailed domain maps are helpful for those setting up and managing the scanning process. But for most scanners, especially in a volunteer capacity, a more streamlined/simplified domain map is more instructive and functional.

The process of creating the domain map is an iterative one. It starts with identifying the important categories and subcategories for understanding a particular domain. If the topic is a new one, this can be challenging, and it may require some preliminary background research to get a basic grounding in the topic. The client or end user of the horizon scanning system should be involved early in the process of defining the domain because they know their domain well. This was the case for the USFS employees who were involved in this project.

Important questions to help identify key topics in a domain map include the following:

- What are the key activities that take place in the domain?
- Who are the key stakeholders in the domain?
- What has been driving change in the domain?

In some cases, one of these questions will prove fruitful as an organizing theme. In the USFS case, a hybrid of all three proved useful. Six first-level categories formed the core of the map. Twenty second-level categories were linked to them. Third- and fourth-level categories were identified as appropriate, resulting in nearly one hundred categories in total. Each of the primary categories is represented as a main branch: ecosystem, industry, institutions, stewardship, climate, and STEEP (Social, Technological, Economic, Environmental, and Political) (see Figure 2). The ecosystems branch could not only be viewed as a stakeholder but is also the context for most USFS activities. The industry branch represents a key external stakeholder. The institutions branch focuses on internal stakeholders. The project team debated about whether to include this in a domain map for horizon scanning because these internal categories are not ones that are scanned for. Since the institutions branch represents, in part, the client, it was decided to keep it in to remind scanners of whom

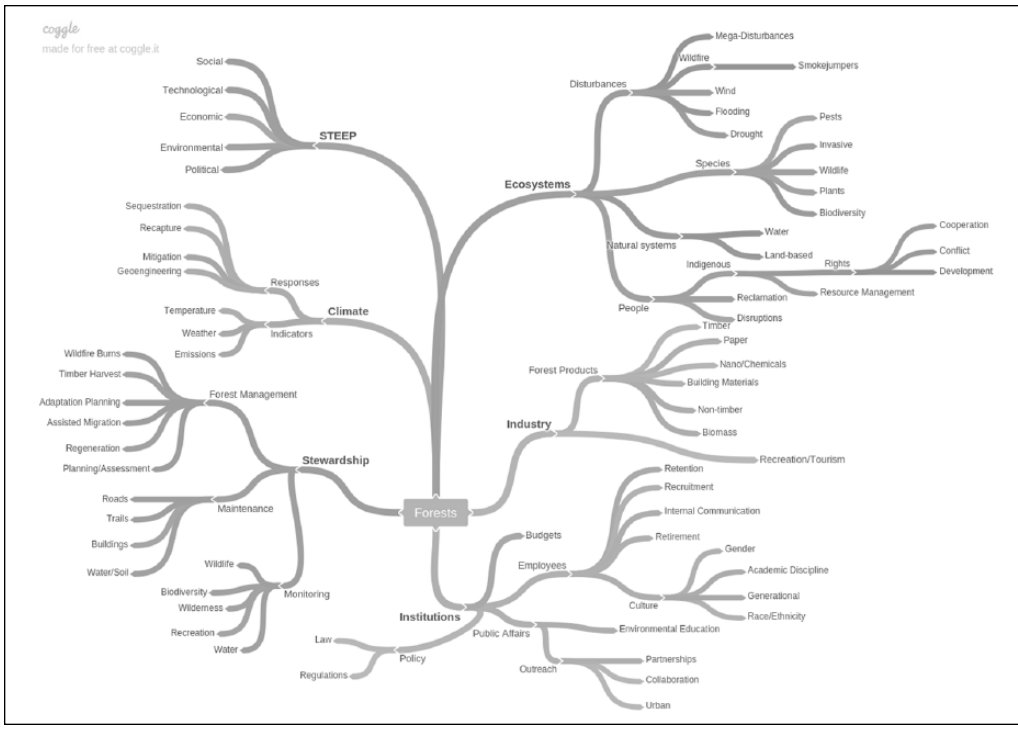

Figure 2. Forestry domain map.

the scanning was ultimately being done for. The stewardship branch is the most focused on key management activities of the Forest Service. The early iterations of the map included a branch of "issues," dominated by climate change. After the preliminary scanning revealed the huge impact of climate change, it was given its own branch, and the more general "issues" were dropped. It was also judged by the core team that a general category of "issues" was not helpful to guide scanning because the identification of specific emerging issues was a key deliverable of the project. Finally, the broader context within which forests were contained was represented by using the standard STEEP categories. This broader context was important to be represented on the domain map as a reminder of the context for emerging issues that could affect forests and forestry. In some domain maps, the STEEP categories are represented as an outer circle around the other scanning categories to represent the broad milieu for forests.

The Houston team drafted a first iteration to share with the USFS team, but this can also be done together. In this project, the Houston team started with preliminary first-level categories and a few subcategories, and assigned four student scanners to different pieces of the map for preliminary scanning to see how fruitful, or not, the categories proved to be. Each student scanner was given one of four initial principal categories to scan for, and everyone was responsible for scanning for STEEP as a secondary responsibility. We did not actively scan for the institution's category in the primary domain map pilot testing.

Our experience is that this preliminary scan to test the categories can be done in about a half-day. The team then reconvenes to revise and create a second version of the map. This was then shared with the USFS team for their input and feedback, and was revised again as needed. A couple of iterations of revisions is enough to get started. Minor tweaking of the map can happen throughout the project, and this was our experience in this project—several small changes to the map were made along the way.

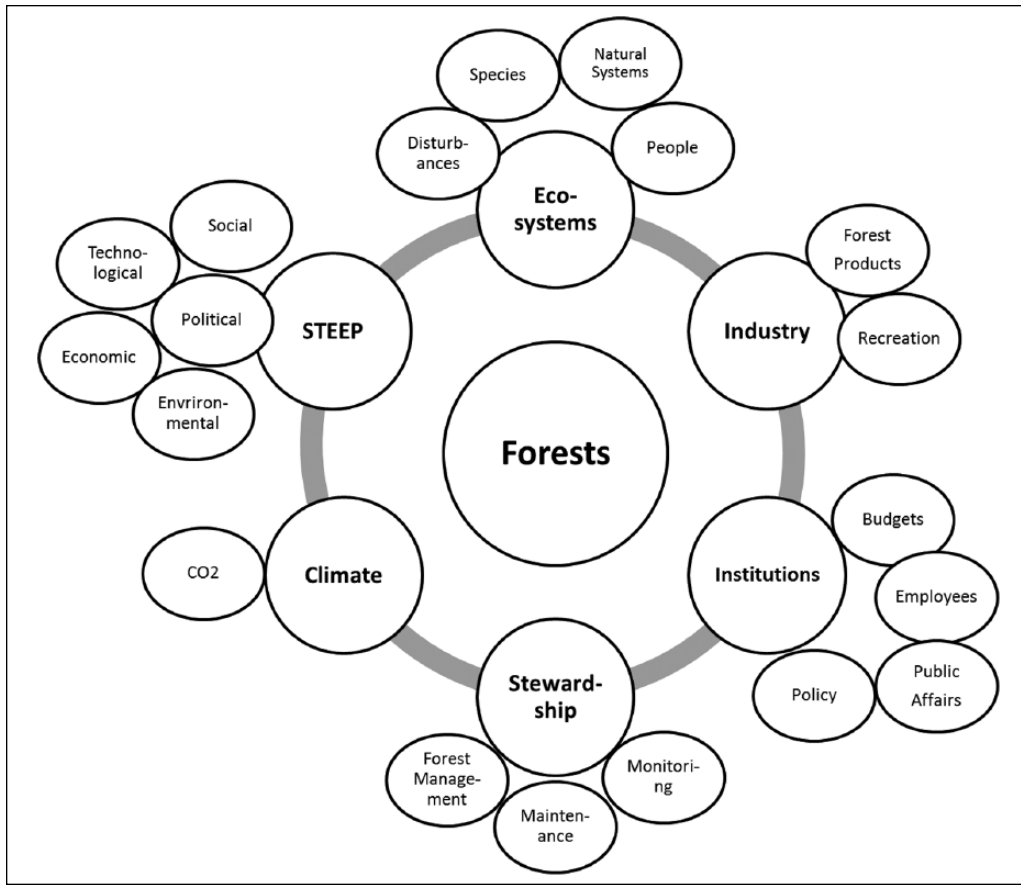

Figure 3. Tagging domain map.

The detailed domain map can be intimidating to those not involved in creating it. Scanners often add to it as they become more comfortable with it. A greater number of subcategories is helpful to them in providing greater guidance for the scanning. But for those new to the project—in our case new volunteer scanners from the USFS—the map is likely to be seen as too busy and complicated. Thus, we created a simplified version (see Figure 3) for inclusion in the Scanner Guide (to be described ahead) as a means to assign consistent tags to emerging issues.

Geography. Geographically, the focus was on the United States, but it was clearly within scope to scan for developments in other regions as they might be relevant. For example, a scanning hit describing a major nanocellulose project in Sweden (http://www.vireoadvisors.com/blog/2017/3/14/swedish-processum-to-lead-major-nanocellulose-project) indicates growing research activity related to wood-based nanomaterials outside of the United States, which could affect forests and forest management in the United States.

Timeframe. Forestry is a challenge to communicate to "outsider" scanners from the perspective of the breadth and timeframe of the field. Forestry management often looks out one hundred years into the future, due to the nature of forest ecosystems. However, technology and industry change rapidly in the emerging wood and fibers tech sector, especially in nano-biotechnology. This means that time horizons for certain areas of our domain could look out hundreds of years, while other areas of the

domain could experience significant change within a year (see Bengston et al. 2017). At the same time, the Forest Service is influenced by the regular short-term nature of budgets and elections that figure into any government agency. Therefore, domains need to be understood as multifaceted eras. For practical purposes, we used 2030 as the primary time horizon. There was some subsequent learning on time horizon that we will discuss later.

Stakeholder analysis. Another important aspect of framing is to identify stakeholders who could be interested in using the information, and who may have some influence over the project or power to make decisions based on foresight produced. Key internal and external stakeholders for the horizon scanning project were identified through discussions with the Forest Service team. Likely internal (USFS) stakeholders included the Forest Service Chief's Office, USFS Washington Office leadership, USFS Regional Foresters, National Forest and Regional Office planners, USFS Research Station leaders, and the Strategic Foresight Group itself. External stakeholders included state foresters, wood industry associations, environmental NGOs, forestry societies and organizations, forestry academics and scientists, international forestry organizations, and the foresight community.

A stakeholder map was created by positioning each stakeholder group on a 2 × 2 grid along the dimensions of their likely degree of interest in the information produced by the horizon scanning system and their perceived power to make decisions or policy based on the information. The resulting stakeholder map can be used to identify individuals or groups to contribute to the horizon scanning project as volunteer scanners or to help in the analysis of the emerging issues. In addition, the stakeholder analysis can help the project team develop multiple communication and dissemination products tailored to key stakeholder groups and an overall communication strategy. This enhances the chances that stakeholders will use the emerging issues in decision making because the information is specifically designed for their needs.

Guiding question. A guiding question captures why the topic is being investigated. Framework Foresight suggests there are two useful types of guiding questions: strategic and exploratory. A strategic question guides a project motivated by a specific purpose. For instance, "should we invest in Blockchain technology?" The project is then designed to provide insight to help answer the question. An exploratory project, on the other hand, does not have a specific purpose, and the guiding question is more open-ended and aimed at learning what the key issues or questions are for a broad topical area. Our project was exploratory, and the guiding question was, "What emerging issues might affect forests, forestry, and the USFS in the future?" While the horizon scanning and guiding question for identifying emerging issues is exploratory, the project also had the goal of setting up a formal ongoing horizon scanning system.

Framing sets the stage for the next step: scanning.

Scanning Process

Horizon scanning has sometimes been criticized for a lack of rigor, and most good scanners have difficulty communicating their process for scanning (Hines 2003). Scanning, and futures research in general (Burns 2005), is sometimes viewed as more art than science. Horizon scanning is often characterized more by informal guidelines than methodological rigor, especially when compared with the many variations of forecasting techniques.

A "Scanner Guide" can bring internal guidance to support rigor and ensure consistency to the scanning process (Figure 4). The guide is aimed specifically at the goal of establishing an ongoing (internally sustainable) scanning system. The chief benefit of a Scanner Guide is to assist in building the volunteer scanning team. Horizon scanning is not part of anyone's official job description at the USFS and requires volunteer scanners. The project team agreed that having a strategy for scanner engagement would be critical to the ultimate success of establishing an ongoing scanning system. The scanners will be drawn primarily

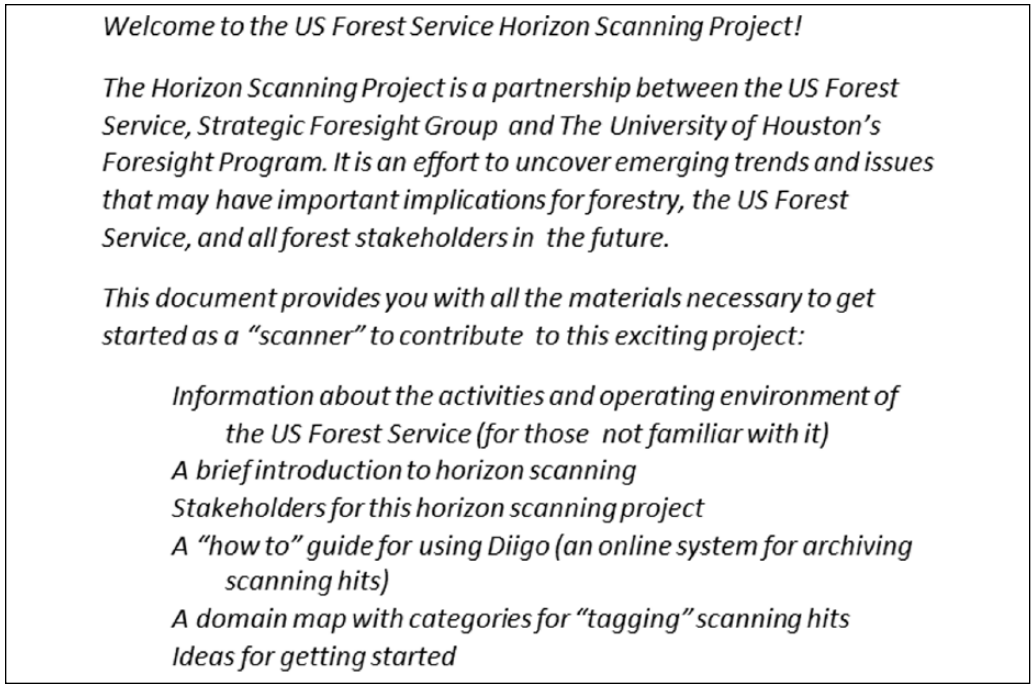

Figure 4. Scanner guide introduction and contents.

from current USFS colleagues, former (retired) USFS employees, and for the first few years will also include Houston Foresight student interns.

The Scanning Guide is envisioned as a living document that is continuously updated as new insights are gained into improving scanning effectiveness. The project is already on Version 9 of the guide, although many of the upgrades were fairly minor. The guide was developed for both the Forest Service volunteers and the UH Foresight students. A challenge in developing the guide was to make it relevant to the diversity of scanners: The USFS team has more in-depth subject and technical knowledge, while the Houston Foresight students are already familiar with scanning. For scanners associated with the Forest Service, the forestry information in the Scanner Guide serves only as a general refresher, while their main focus will be on understanding what scanning is and how to effectively perform the function. For Houston Foresight students, the main focus is on learning more about the Forest Service and forestry, while the scanning materials is simply a refresher.

Another way to increase the rigor in scanning is to define a systematic scanning process. Hines (2003) proposed a generic four-step scanning framework, called FAFA:

- Find: identify where and how to look for scanning hits
- Analyze: use cross-level analysis and cross-layered analysis
- Frame: develop a framework for organizing insights
- Apply: use the results in work processes

The FAFA framework provided a starting point to further refine a methodology for scanning projects. Figure 5 depicts the subsequent scanning process that is currently being taught by Houston Foresight (Hines and Bishop 2015, p. 381). This version suggests three principal steps in scanning: find, collect, and analyze.

Find. Find is the process of searching for and identifying potential scanning hits. Scanning hits are new, unique, and potentially disruptive ideas that could at some point have important impacts or become drivers of change or

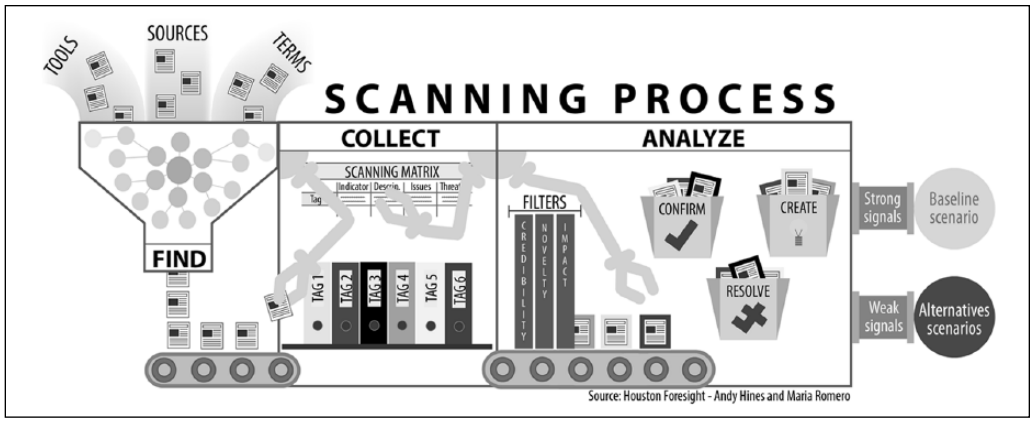

Figure 5. Scanning process.

emerging issues. The task of the scanners is to seek out these ideas and capture them.

The domain map categories from framing provide a useful jumping-off point to organize the search. The categories on the domain map can be used as primary search terms, accompanied by futures-oriented terms, such as "future," "trends," "issues," "long-term," "change," "vision," "2030," and so on. Getting the right search terms is less important than it was in the past, because many search engines now work well with natural language inputs. But having a list of potential search terms is useful to help beginner scanners get started. Many tools are available for finding and monitoring up-to-the-minute information, such as Internet feeds and alerts, as well as sources beyond simple search engines such as specialized databases.

Collect. Collect is the process of storing and categorizing scanning hits after they have been identified. There are several online cloud-based bookmarking tools with tagging capabilities that can handle group inputs. The convenience and functionality of these sites over an old-fashioned spreadsheet list and tags are compelling. First and foremost, a geographically diverse team can add their scanning hits to a private project library whenever and wherever they are. A spreadsheet can be used in a cloud-based file-sharing system as well, but it takes far more time and runs the risk of version control problems. The Diigo site was used in the USFS project (www.diigo.com). Diigo is easy to access and has a user-friendly interface, setup, and export functions that are well-suited for a virtual team scanning project.

The purpose of collecting is to keep track of the scanning hits that might provide the basis for identifying an emerging issue. As scanners find an article, blog post, video, or whatever item they would like to collect as a scan hit, they use a "Diigolet" icon installed on their web browser to link it to the team library in Diigo. The Scanner Guide provides instructions for scanners on how to set up their web browser and link to the Diigo account. For each scanning hit, the scanner provides a short summary of why they selected the article. This can simply involve cutting and pasting a descriptive paragraph from the piece itself and/or can include commentary from the scanner. The scanner also adds a sentence or two about potential implications of the scanning hit for the project, in our case the implications of the scanning hit for forests, forestry, and the USFS.

It is crucial that scanners tag their scanning posts with a set of descriptors. This keeps the scanning library organized and easily searchable. Framework Foresight uses the domain map hierarchy as the basis of the tagging system. For example, if a scanner finds an innovative new use for a paper product, they would tag it with "Industry," "Forest Products," and "Paper." This is not an exact science, but more precise tagging aligned with the domain map leads to more efficient searching of the library

of scanning hits and aids in the analysis and communication of results. The tagging system enables a visitor to the library to quickly access, for example, all the ecosystem-related articles. The library's front page keeps track of the top ten tags, which can provide an indication of whether certain topics are being neglected or overemphasized.

A tagging system based on the domain map is useful in organizing the scanning library (Houston Foresight 2014). For the USFS project, the first- and second-level domain map categories were to be used at a minimum as tags. Third- or even fourth-level tags could be included, and it was suggested to include a few article-specific tags as well if necessary. Scanning is an iterative process, and there is flexibility to add new tags or even edit the map as the scanners learn more about the topic and emerging issues.

Analyze. Analyze is a sense-making activity that involves prioritizing the various scanning hits collected. Framework Foresight suggests three degrees or levels of analysis, ranging from a simple triage to multicriteria rankings to sophisticated weighted indices. Some horizon scanning efforts include pruning scanning hits that are deemed less relevant. This is effective when the focus of the horizon scanning effort is more targeted. In our case, all scan hits were kept in the data base.

The triage level of analysis involves making a quick judgment about a scanning hit. Framework Foresight uses a simple three-level ranking system:

- A "1" or low score is assigned to those hits judged to be "confirming" what is already fairly well-known. In our terminology, it confirms the baseline future. For example, a scanning hit suggesting that wildfire management will consume a growing share of the USFS budget.
- A "3" or medium score is for those hits that "resolve" in favor one of the major known alternative futures. It may be an issue in dispute, a driver that could play out in different directions, or a fundamental uncertainty, and the hit provides evidence for one of the possible alternatives. For example, a scanning hit providing evidence of a paradigm shift in fire management from a "war on fire" to "living with fire."
- A "5" or high score is assigned to scanning hits that suggest a "novel" future possibility and have enough plausibility to be worthy of further consideration. For example, a scanning hit describing genetic engineering to reduce the impacts of forest fires by making trees less flammable.

The triage analysis can be used in several different ways depending on the goals of the analysis. It could eliminate scanning hits from analysis that were scored 1 if confirmational scanning hits were not important for decision makers to weigh possible future policy directions. In addition, the triage analysis could just select the 5s if the goal is to provide emerging issues on novel emerging issues. There may also be a reason to tweak the scores in a particular project. For example, if the decision maker or client is most interested in more plausible and less speculative futures, the resolving hits may be scored higher than the novel hits.

The second level of analysis evaluates the scanning hits that made it through triage and are further filtered using seven criteria: credibility, novelty, likelihood, impact, relevance, time to awareness (Timeliness 1), and time to prepare (Timeliness 2). Two or three criteria from this list are often sufficient for narrowing down the scanning hits at this level of analysis. There are several questions used for each of the seven criteria to determine a scanning hit's level of each criteria. The questions are as follows:

Credibility

- Is the source reputable?
- Are there confirmations elsewhere?

Novelty

- Is the hit new? Or has it been widely reported?

- Is it new to the client/audience?

Likelihood
- What are the chances that the hit will occur, and that it will amount to something?

Impact
- Will it change the future?
- If it does change the future, how big a change will that be?

Relevance
- How important is that change to the client or the domain?
- Is the relevance direct or indirect?

Timeliness 1 (time to awareness)
- How long before this information is widely known?
- When will it appear in a mainstream newspaper or magazine?
- Are there resources to influence the potential outcome suggested by the hit?

Timeliness 2 (time to prepare)
- How long before this hit begins to change the future?
- Is it too late to do anything about it?
- Is it so far off that action now would be premature?

Answers for each criterion will determine which scanning hits should be used in an analysis. As with triage, this is determined by the goal of the analysis. For example, if the goal is to find novel scanning hits from credible sources that take a long time to prepare for, those scanning hits can be identified and analyzed.

The third level of analysis is a weighted index. This can be done by using the seven criteria above and weighting criteria deemed more important to the project. Then a total number can be calculated for each scanning hit, and this can be used to list the scanning hits in order of importance according to the weighted criteria. This is "over-kill" for most projects, but in a scanning project in which the scanning hits themselves are the deliverable, this could be a useful option. In addition, this analysis option could also serve to give more weight to scanning hits with long or varied time horizons, which could be important for identifying emerging issues for forestry where the ultimate impacts to forests may happen decades or centuries into the future.

Lessons Learned

This section describes what has been learned so far as the project enters its second year of operation.

1. Background information versus scanning

The Framework Foresight process makes the distinction that background information or background research covers the recent history and current conditions of the domain being explored, and scanning covers what might be changing in the future. Thus, scanning hits should be relatively new in terms of when they were published—within the last few years is our general rule of thumb. If something interesting was said ten years ago, that is history and part of background information. In some cases, that "something said" was largely ignored and thus appears as new information. Our view is that it is still part of history and background research. For example, in the early 1960s, Omer Stewart (2002) identified the role of fire as important for ecological systems across the world and that fire has been used for thousands of years by indigenous people. This work was largely ignored by foresters and ecologists for decades. Now, however, there is a major shift in ecological thinking that conforms to many of Stewart's ideas. While these ideas seem new on the surface, they should be considered part of the historical background and not part of future emerging trends.

2. "New to me versus new to the world"

This is similar to the point above but can involve recent information. The problem of "new to me versus new to the world" is frequently encountered in teaching beginning

foresight students about scanning, and the use of websites such as "How Stuff Works" as a source of scanning hits should be discouraged. These are great sources of background information and can seem like new ideas or trends, but they are really just new to the scanner. Everything can seem new and interesting to one who is exploring a topic for the first time. But some of this may be "old hat" to those with experience in the field. Thus, it is important to calibrate whether something that seems new really is new. Having experts in forestry from the USFS involved was important in identifying forestry related hits that were not new to the agency or the field of forestry but may seem new to student scanners. Ecosystem management or ecological forestry, for example, seem to be new concepts to nonforestry professionals; however, they are concepts with decades-old roots and far from novel within forestry.

3. How to handle "coaching" of volunteers

Some volunteers may not read the Scanner Guide and just plunge in and add hits that are off-track or below standard. Coaching and other reminders about the goals of the scanning project can help keep scanners focused on useful hits. Our approach was to be careful to avoid being perceived as condescending or overly academic in giving feedback to volunteer scanners. If the feedback is seen as too harsh, the volunteers may become discouraged and drop out. Instead, we conducted team "check-ins" to provide scanning tips. For instance, the issue of background information being tagged as new scanning hits (see #1 above) prompted the suggestion to focus on recent emerging issues and developments—within the past year or so—rather than things that happened years ago. Other ways that scanners can go off-track are either being too focused on the present, so the hits proposed are not sufficiently future oriented (e.g., entering an article about ongoing deforestation in the tropics), or the scanner entering hits that are potentially game changing but for a different domain (e.g., entering an article about the detection of gravitational waves to a horizon scanning effort about forestry).

4. Moving beyond forests and forestry

A challenge for outside scanners, and in framing the domain, was trying to get "beyond forests" or "beyond trees." The Forest Service deals with many concerns affecting forests and forestry organizations, including climate change, wildlife, outdoor recreation, water, grazing, urban forestry, indigenous rights, and many more. And all of these concerns are affected by social, technological, economic, and political change. For instance, the Scanner Guide suggested that scanners "focus" mostly (but not entirely) on "outside" issues and change, that is, things that are originating outside of the field of forestry and natural resources but could affect the field in the future. Many leaders and policy makers within the field are already aware of emerging issues and change originating within the sector. This issue inspired a special project to develop a list of sources for the scanners to start with.

5. Staying connected

This is the opposite of the previous issue. Some scanning hits seemed to be entirely disconnected from the concerns of forestry. Granted, there was an explicit goal of connecting the external world to the Forest Service, but there did need to be some connection. The suggestion here was to ask scanners to add a comment after the description of their scanning hit explaining its possible implications or relevance to forestry or the Forest Service. For example, a possible implication for forests and forest management of self-driving cars is that their adoption could encourage more sprawling development patterns (as long commutes are no longer wasted time), resulting in increased fragmentation of forests.

6. Stretching into the future

The project team also sought to find a way to encourage scanners to get further into the future. Scanners were asked to tag each of their hits with the appropriate horizon (Figure 6):

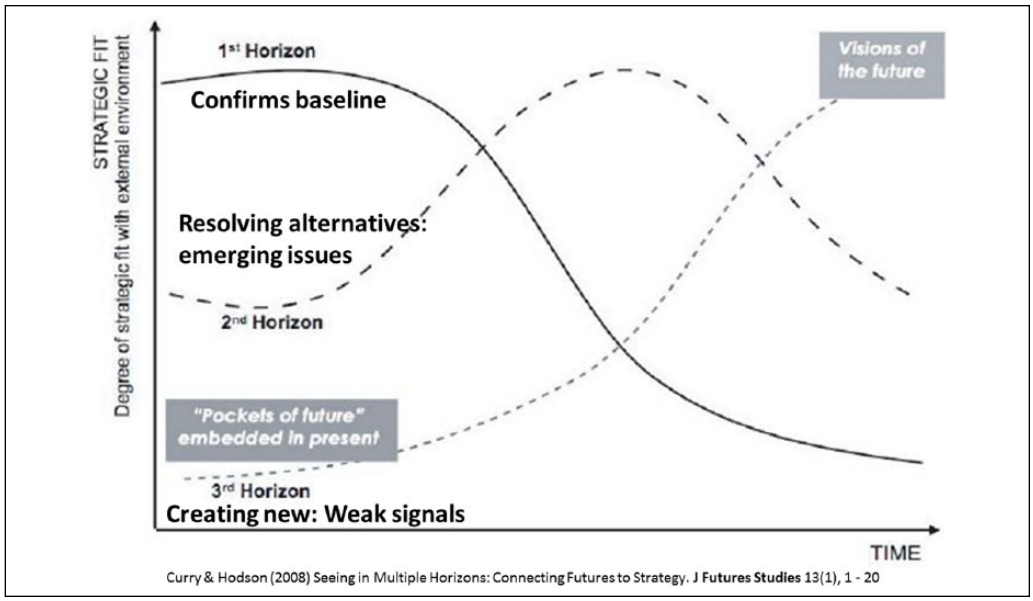

Figure 6. Tagging on the three horizons.
Source. Curry and Hodgson (2008).

- *Horizon 1*: focuses on the current prevailing system—the baseline—as it continues into the future, which loses "fit" over time as its external environment changes.
- *Horizon 2*: an intermediate space of transition in which alternative futures begin emerging as the first and third horizons collide.
- *Horizon 3*: focuses on "weak signals" about the future of the system, which may seem marginal in the present, but which could signal significant change in the long-term

The judgment of which time horizon is most appropriate for a scanning hit is subjective, but the process of tagging hits with time horizons may encourage more long-term thinking and more Horizon 3 hits, that is, if someone sees all their hits seem to be in Horizon 1 or 2, they could make an adjustment in their scanning approach.

At the time of this writing, the breakdown of hits by time horizon is 42 percent Horizon 1, 38 percent Horizon 2, and 20 percent Horizon 3. It is not surprising that there are fewer Horizon 3 hits, but that will be monitored going forward.

7. Tagging discipline

Tagging "discipline"—that is, accuracy and completeness in assigning descriptive tags to scanning hits—can be a challenge. The tagging instructions in the Scanner Guide reminded scanners to refer back to the domain map: "Tags should be 1st level [of the domain map], 2nd level, 3rd level, something specific to the piece, and then which time horizon the hit targets." Addressing this level of feedback may be a bit much to ask volunteers. The Houston team has occasionally performed tagging tune-ups and edited the library of scanning hits. Tagging discipline will be increasingly important as the library grows. As of this writing, there were already more than seven hundred hits in the library, so finding items of interest would be a challenge without an accurate tagging system.

8. Current issues

To properly frame emerging issues it is important to first identify a list of existing or current issues

facing the USFS. There is no clear source with a formal list of issues for the agency. Therefore, the USFS-UH team reviewed Forest Service strategic plan (USDA Forest Service 2015) and other planning documents, to identify current issues. A list of thirteen widely recognized current issues were identified, including the growing effects of climate change, more frequent and intense wildfires, and increasing forest fragmentation due to development. This list of current issues was added to the Scanner Guide to help scanners focus on additional emerging issues identified through horizon scanning rather than well-known current issues.

Going Forward

This horizon scanning system is in the early stages of implementation. Our plan is to continue to raise awareness about this system through ongoing communication with key policy makers and decision makers in the agency, especially in the Washington, D.C. office. Our hope is to develop one of more high-level "champions" for this work who will spread awareness of the effort and help disseminate specific scanning products (e.g., scanning newsletter, blog posts, analyses of key emerging issues identified through scanning, etc.).

The challenges identified in the preceding section should provide plenty of work for the project team to keep the horizon scanning system in good working order—current, relevant, and consistent. There is plenty of additional work to communicate horizon scanning hits and to develop information to feed into additional strategic foresight projects, like the integration of the horizon scanning system with scenario development. Beyond what has already been identified, there are a few other opportunities that the project team would like to explore.

1. Strategies for communicating results

As is to be expected in the beginning phase of a scanning project, a significant amount of information has been gathered. The Diigo scanning library is large and growing. Synthesis always lags behind gathering, but we have now reached the time for more emphasis on synthesis and communicating results. The team is working on developing a horizon scanning newsletter and periodic reports. This article, and other planned journal papers as well as conference presentations, will also communicate results of this horizon scanning effort.

Because of the long-term nature of forests and forest ecosystems, the agency has always had a long-term (Horizon 3) time perspective. Our intention is that scanning will broaden this long-term perspective to include emerging issues and weak signals of change that are in the external environment and which could significantly affect forestry in the future.

2. Options for organizational structure

The primary goal for this project has been to get the horizon scanning system up and running and generating useful foresight for the organization. A complementary and longer-term goal is to integrate foresight more tightly into the organization's culture, decision making, and policy making. It is too early to tell what effect, if any, the effort has had. The current scanning system is designed around a volunteer model. The team acknowledges that this could be a challenging model to rely on for the long term. Volunteers have many things competing for their time. Once a proven concept, foresight may garner support to continue as a staffed, dedicated effort. The project might explore different options in terms of developing ways to embed foresight into the organization.

3. Transitioning the horizon scanning system to the Forest Service

The joint project has the ultimate goal of developing a system that can be run without assistance from the Houston Foresight program. It may be that Houston Foresight students could continue as interns, but the goal remains that the system be self-sustaining. An assessment of the system to determine its effectiveness and ongoing needs may be needed as the transition to full operation by the Forest Service approaches.

Conclusion

The USFS-UH horizon scanning project has provided an opportunity to experiment real-time with academic approaches and in-the-field practice of strategic foresight methods. Horizon scanning has often proven elusive to teach and to institutionalize within organizations. The project team has used a learning, iterative approach to develop the scanning process that we hope will be sustainable within the organization beyond the initial project. This article has described the set-up process and what has been learned to date. The challenge ahead is for the process to produce useful results such that formal horizon scanning will become an indispensable component of the work of the USFS as it moves into an increasingly uncertain and challenging future. In addition to serving the needs of the USFS, it is hoped that this project might also provide useful lessons for futurists and their clients in setting up systems in different fields.

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