

Community Forestry in the Santa Fe Municipal Watershed¹

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Executive Summary

In the fall of 1997, a Santa Fe National Forest planner invited skeptical environmentalists and natural resource agencies to collaborate on planning a project to reduce the risk of crown fire in the Santa Fe municipal watershed. The outcome was a plan incorporated into an Environmental Impact Statement, with an unprecedented community-driven monitoring component to ensure that ecosystem values were protected as thinning and controlled burns were carried out. As of 2009, the thinning work has been completed, fire has been applied to most of the thinned areas, and monitoring results suggest that effects on wildlife and other ecosystem elements have been neutral or beneficial. A watershed management plan has been adopted by the City, essentially continuing the management initiated under the EIS. However, a plan for a similar fuel reduction project in another area of the Santa Fe National Forest has elicited alarm from some elements of the community, reminiscent of the reaction to the municipal watershed project a decade ago. Community forestry is an ongoing process, not a hurdle to be cleared and left behind.

1.0 The Germ of an Idea

In July 1995, the City of Santa Fe completed the purchase of the city's water system from Public Service Company of New Mexico (PNM), the last of the private utility companies that, beginning in the late 19th century, had developed the reservoirs and water delivery infrastructure on the Santa Fe River east of town. In February 1997, the City and Santa Fe National Forest (SFNF) signed a Memorandum of Understanding to cooperate in the development of a management plan for the upper portion of the Santa Fe River watershed, "to maintain and/or improve the water quality and quantity for present and future Santa Fe generations."

The cooperative planning effort began with joint action to prepare an "Upper Santa Fe Watershed Existing Conditions Report," finalized in July 1998. That report focused to a considerable degree on the fire hazard in the forest, especially the mid-elevation Ponderosa and mixed conifer forest surrounding the reservoirs, and recommended mechanical thinning and controlled burns to reduce the fuel loading in those stands. Given the location of the watershed in the "wildland-urban interface" (WUI) zone, the authors recognized the need to "establish test or pilot projects to educate the public on techniques used to reduce fuels;" "develop a display which will help the public understand the fire ecology of the area;" "increase public involvement, education and awareness."

¹ Pending publication by the Santa Fe Watershed Association as one in a series of White Papers.

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Decoding the bureauspeak, the City and SFNF knew they would be dealing with adversarial environmentalists in the community who would oppose any action involving removing trees. How could they avoid getting tied up in litigation, and instead get to work on preventing a major fire that could eliminate half of Santa Fe's water supply?

Susan Bruin, a SFNF planner, had worked on highly controversial forest plans in Oregon and California. She had learned the benefits of sitting down with the people who opposed a particular Forest Service plan, to understand each other's positions and work out compromises that addressed concerns on both sides of the table. It was Susan who suggested that if a respected environmental group could convene a gathering of natural resource managers, environmentalists and other interested parties, they would be more likely to be open to what the Forest Service had to say.

2.0 Meeting at Audubon

At Susan's instigation, the Randall Davey Audubon Center took on the role of hosting a meeting in the fall of 1997 at which the Existing Conditions study, still in draft, would be presented by the researchers who prepared it. Audubon invited every environmental group in town as well as representatives from the natural resource agencies ranging from the National Park Service to the County Extension agent, to participate in a discussion of the findings on the condition of the municipal watershed. As the existing condition of the watershed was presented and discussed, resource by resource, the meeting participants sorted themselves into various cadres. One group agreed with the Forest Service and City that the watershed forest was overgrown and, left untreated, threatened a fire that would be disastrous to the City's water supply, to homes in the WUI and to much of downtown Santa Fe that would be flooded in post-burn runoff events. A second group agreed that the forest was ecologically out of balance due to the long suppression of fire in the watershed, but were concerned that the Forest Service lacked the research-based approach that was needed to address all the ecosystem ramifications of a change in management. A third group was convinced the Forest Service had a hidden agenda and was really just planning a commercial logging project. At the end of an afternoon dense with content, Ms. Bruin extended an open invitation to participate in the scoping process required by the National Environmental Policy Act (NEPA) prior to any management action taken by the Forest Service.

3.0 The Partners Process

It was a self-selected group that came to the monthly scoping meetings facilitated by Ms. Bruin in early 1998, and stayed to populate subcommittees and participate in the work of defining the project to take place in the Santa Fe municipal watershed. Non-Forest Service participants came to be known as "Partners." The main Partner groups were the City, New Mexico Environment Department, Santa Fe Watershed Association, Audubon, and the Forest Watch project of the Rio Grande Chapter of the Sierra Club. There were also individual Partners, several of whom were professionals in watershed management, forestry or biology. The mainstream environmental groups stayed away, citing reasons from lack of funding for their staff to participate, to concern over losing their ability to appeal the outcome. The

Forest Service was of course well represented, but constantly shifting personnel assignments led to a lack of continuity. Forester Bill Armstrong was an exception: even as his duties changed, his commitment to planning and then executing the project in the municipal watershed was unwavering, and he brought a wealth of experience and familiarity with forestry research to the Partners process.

Early in their monthly meetings, the group arrived at a general agreement that there was a high probability of crown fire in the Santa Fe watershed. Further, they agreed that the forest condition was due to management policies that had led to growth of dog-hair thickets with ladder fuels; and that the solution was to thin the forest so that naturally occurring ignitions could take place without erupting into crown fires, and prescribed burns could be used to maintain a healthy forest. A minority opinion was that we didn't really know the fire regime in this forest, we were just assuming it followed the pattern of other Ponderosa and mixed conifer forests that had been studied; that there had been little research on the impacts of the thinning prescriptions that were being proposed – instead, the thinning advocates just knew something about the ecological consequences of crown fires and were interpolating from that extreme.

Despite the diversity of opinions present in the group, all agreed that the central questions to be addressed were:

- (1) How to reduce tree densities in a way that caused the least possible disruption to the forest ecosystem and the town of Santa Fe? The answers to this question involved many months of evaluating options ranging from helicopter and balloon logging, to removal only of trees six inches in diameter, to modeling of fire behavior with zero to highly intensive thinning, and much more.
- (2) How will we know the impacts of what we're doing? The response here evolved toward monitoring and adaptive management – the latter a term to describe the process of monitoring, interpreting the monitoring results, and potentially changing the management approach if the monitoring results indicated undesirable outcomes of the initial prescription.

As the Partners began to arrive at a broad consensus regarding the need for active management and monitoring of the forest in the municipal watershed, the group recognized the importance of bringing the broader public into the dialogue so that they could follow the argument and arrive at similar conclusions.

4.0 Public outreach

4.1 Show-me

The most powerful way to tell the story of the fire history of the Santa Fe watershed and its current fire-prone condition, it was agreed, was to bring the public into the mysterious area just east of town that had been off-limits to visitors for seven decades. Let them fall in love with the beauty of it and learn the importance of the watershed to the City's water supply. Get them to understand that the condition of the present forest is not "natural", but a product of human use and management decisions. Show them the four-inch-diameter

“cookie” sliced from the end of an 80-year-old Ponderosa that grew in a dense grove, compared with the one cut from a Ponderosa of the same age from a more open site, a healthy twelve inches across. Let them connect the dots, that it’s no favor to the forest to try to save every tree in it -- that a healthy Ponderosa pine/mixed conifer forest should have places where sunlight strikes the forest floor, where grasses and bushes thrive to support diverse wildlife populations.

To their credit, despite their long history of keeping the Santa Fe watershed closed to public use³, the City and Forest Service recognized the overriding benefit of enlisting the public on the side of forest management in the area by offering watershed tours. The first was organized by SFWA in May of 1998, the second by the City in September of the same year. In 1999, SFWA conducted four tours between July and December. The tours were always co-led by a forester and a spokesperson from the SFWA, and usually a City Water Division staffperson was also involved. Each leader contributed their own perspective: the City would focus on the importance of the reservoirs and their potential loss following a major fire, the Forest Service would talk about the condition of the forest, how it got that way and what it would take to put it right, and SFWA would speak to enhancing the ecological condition of the forest as well as managing it for human benefit. The tours were so popular and effective at informing the public that, as the Environmental Assessment (subsequently converted into a full Environmental Impact Statement) took shape, monthly tours became part of the plan for public outreach during implementation of the proposed forest treatments.

On the tours, the question often arose, “What will the forest look like when it’s been thinned to the density you’re talking about?” In response, in the fall of 1999 about eight acres of City land below Nichols Reservoir were turned into a demonstration area to illustrate the thinning prescription followed by a controlled burn. The demo plots were allowed under a categorical exclusion from NEPA, given their limited area and their use for research purposes. Under a State Division of Forestry program, a group of state prisoners thinned the plots from several hundred to about 80 trees per acre. Several models were tried for handling the felled trees and slash. In some areas, the tree boles were left on the ground, roughly at right angles to the slope. In one unit, the logs were bucked into firewood lengths and thrown into a dumpster, which was hauled to Open Hands; this non-profit group had the firewood split and made it available to clients of its weatherization program. The slash (limbs and needles) was piled or scattered, allowed to dry, and ultimately a controlled burn was conducted on the area to reduce these fuels.

The burn phase was delayed for too long, and then conducted hastily in May, 2001 after the trees broke dormancy. The result was that some trees were killed and others scorched beyond what had been intended. The result was not pretty, and distressed some visitors who saw the demo plots soon after the burn. A class from the College of Santa Fe mapped a portion of the burned area and tracked the survival rate of the scorched trees: their report of the post-burn tree mortality was used to argue against the treatment plans by the most

³ After three centuries of logging, firewood collection, grazing and farming in the municipal watershed, in 1932 the area was closed to the public by order of the Secretary of Agriculture to protect the water quality of the reservoirs.

consistently oppositional of the local environmentalists, Sam Hitt⁴. Within a season, however, the burn scars were softened by a vigorous stand of grasses and forbs. “Fire is a blunt instrument,” observed SFNF forester Armstrong, “But if you don’t like the look of a few scorched trees after a controlled burn, try a few thousand acres of scorched earth after a crown fire.”

Hitt steadfastly refused to participate in the Partners process. Nonetheless, his comments from the sidelines, in op eds and interviews in the press, always with the thinly veiled threat to protest any Forest Service plan for thinning in the watershed, made him an absent but effective Partner. As one example, Hitt went on record that he would support the thinning of smaller trees, six inches or less in diameter. The City, which was growing ever more concerned over the threat of fire as the lengthy NEPA process continued, decided to get something done on its own land while waiting for the Forest Service to act. They chose to follow Hitt’s “six-inch” prescription, assuming (correctly, as it turned out) that the most avid environmentalist could not object to that modest treatment. They hired a local contractor and thinned 42 acres in early 2000, cutting only six-inch and smaller trees with total removal of downed material, at a cost of over \$1400 per acre. This project proved highly beneficial as another “demo plot:” it was almost impossible to see where the thinning had been carried out, it caused so little change in the condition of the forest. The fire danger was still extreme: there were still abundant ladder fuels, and the density of remaining trees would lead to fire leaping from tree to tree to crown. From an ecological standpoint, no openings had been created to enhance the growth of grasses, forbs and bushes in the understory. This preliminary, costly treatment did not substantially reduce the level of effort when full treatment was finally applied in the area.

In other “show-me” efforts, Bill Armstrong conducted Saturday hikes in the Jemez and other neighboring forests where the kind of thin-and-burn prescription contemplated for the Santa Fe Municipal Watershed had been applied. In a location above Santa Clara Pueblo, a forest fire had originated downslope of the tour site, burned fast and fierce upslope to a previously treated unit and then “dropped to the ground.” On one side was blackened earth and dense ranks of black tree skeletons; on the right, a green, diverse woodland with a few scarred but vital trees. The treated area had not only survived, but thrived.

4.2 Scare me

Those opposed to thinning in the watershed often accused the Forest Service and Partners group of using scare tactics to bring the public around to acquiescing to thin-and-burn treatments in the Santa Fe watershed. “Fire is a natural process,” they said. “The best defense in the WUI is to clear the needles off your roof and move flammables away from the house.” Foresters who had been around fire for decades shook their heads. “It’s impossible

⁴ Sam originally represented Forest Guardians, but during the period that the Santa Fe Municipal Watershed project was being planned, Hitt departed that group and founded Wild Watershed. Under new management, Forest Guardians changed tactics and began to work with other environmental groups on collective action toward effective monitoring of the planned treatments; then changed again, and declined to participate pro or con.

to exaggerate the danger,” they said. “The forest really is that dense, and that dry; all that’s lacking is ignition, and you’ve got an inferno on your hands.”

Then came the Cerro Grande Fire. On May 4, 2000, Bandelier National Monument in the Jemez Mountains west of Santa Fe started a controlled burn, part of a ten-year plan to reduce fuel accumulations to reduce the danger of severe fire. Strong spring winds sprang up and the fire blew out of control, ultimately burning 48,000 acres and creating a plume of smoke that stretched across the Oklahoma panhandle. The town of Los Alamos was evacuated and over 400 families lost their homes to the fire. People in Santa Fe watched the towering smoke clouds over the Jemez range, smelled smoke for a week, and thought “it can happen here.”

4.3 Tell me

To capitalize on this “teachable moment,” SFWA and SFNF threw themselves into putting together a “Forest Forum on Wild and Prescribed Fire.” On very short notice, an impressive panel of forest researchers agreed to speak at a public meeting to talk about fire ecology, fire history and the kind of forest treatments that were required to avoid a Cerro Grande. The meeting was set for late June. On May 30th, the Viveash Fire in the Pecos Wilderness blew up: it looked like an atom bomb had been detonated east of Santa Fe, and 28,000 acres burned. The Forest Forum, held in the auditorium of the State Land Office, had a standing-room audience of over 200; it was taped and played repeatedly on public TV. The public was eager to listen and ask questions about forest management plans in the City’s watershed.

The Partners group developed an active outreach committee. Rather than holding a series of meetings hosted by the Forest Service, the Forest Service and Partners asked for ten minutes to an hour at the regularly-scheduled meeting of over two dozen environmental and community groups, from the Sierra Club to the Parent-Teacher Association of the elementary school nearest to the watershed. Now, the tone of the questions was less often, “How dare you cut down all those trees?” and more often, “How can you be sure you won’t lose control of a controlled burn?” – a legitimate concern, in light of recent history, and the foresters gave thoughtful responses, emphasizing monitoring of the fuel and weather conditions and having a sufficient team available to jump on any escaped fire. The format seemed to engender trust and civility – a contrast to the “us versus them” tone that characterizes so many presentations of Forest plans. The community was becoming informed, and taking responsibility for managing their local environment.

5.0 NEPA process

5.1 Active Dialogue

The scoping effort, resource studies and drafting of an Environmental Impact Statement (EIS) proceeded parallel to the outreach efforts described above, and each process informed the other. When the Canyon Road Neighborhood Association learned that the SFNF/Partners group was evaluating hauling thinned trees out of the watershed, they collected three

thousand signatures on a petition that opposed that option. They argued that the number of logging truck trips required to haul out the downed timber would create significant traffic problems, as well as destabilizing historic houses and walls as the heavy trucks traveled the narrow residential streets that were the only route away from the watershed. The option was eliminated from consideration.

In community meetings about developing plans for forest treatment in the watershed, the sense from the public was that riparian areas should be left untouched. Forest biologists pointed out that the restriction of flooding in the Santa Fe River subsequent to construction of the reservoirs had changed the character of the riparian zone, and conifers had displaced riparian vegetation to a considerable extent. They suggested that conifers in the riparian zone be removed to open up the area to be colonized by a diverse riparian assemblage of vegetation dominated by cottonwoods. Whatever the merits of this treatment on ecological grounds, it was abandoned because the planners were certain the community would feel outraged to see large (well-watered, healthy) trees cut. "It's a deal-breaker," advised several of the nationally-known forest researchers who visited the watershed prior to speaking at the June, 2000 Forest Forum. "People will get so mad over a few big trees coming out that they'll oppose the rest of what you want to do. Reducing the chance of a crown fire in the rest of the watershed should trump tweaking a narrow riparian corridor."

After the Cerro Grande fire, Los Alamos County set to work to deal with fire-killed trees and to reduce fuel loading on County lands that had escaped the fire. There were several sites to be treated where material could not be removed or burned because it was contaminated by past activities of Los Alamos National Laboratory. The County advertised nationally for proposals for forest treatment within these constraints. A contractor from Colorado won the job: his solution was a "tree-eater", a track machine that quickly reduced a tree to splinters. SFNF forester Bill Armstrong administered the contract for the County, and was so impressed with the results that he proposed the same approach for the Santa Fe watershed. The Partners expressed concerns that chip depth would be so great as to suppress understory vegetation, and that deploying such a machine on the steep slopes of the watershed would cause erosion. After a tour of the Los Alamos project organized by Armstrong, the Partners agreed that the approach had merit, and it was included in the toolkit for the watershed project.

In another example of the active dialogue between the planners and the public, some opponents of treatment in the watershed accused City staff of advocating forest thinning because they hoped it would increase runoff into the City reservoirs. The Partners were able to explain that they had rejected making increased runoff an objective of the project, because it was inconsistent with protecting the quality of water in the City reservoirs, the overall goal of forest management in the municipal watershed. A project with the objective of maximizing water production would involve far more aggressive thinning than a project built around modeling a natural fire regime in the forest to reduce the risk of crown fire (which would produce massive water quality impacts) and improve understory vegetation (which would result in reduced erosion, with water quality benefits.)

Twenty-three authors – most of them Forest Service staff -- are credited with preparing elements of the EIS or, in the case of consultant Karen Yori, compiling the final draft document, which was released in May 2000. A footnote to the list of contributors notes the informal input of numerous other reviewers. Of importance to the history of community forestry in the Santa Fe Municipal Forest is that the unprecedented, wide-ranging monitoring plan appended to the EIS was the work of a Monitoring Subcommittee made up entirely of Partners.

5.2 The Monitoring Appendix

The Monitoring Subcommittee began work in 1999, tasking themselves with determining what questions the monitoring effort should be designed to answer; following from that, what ecosystem elements should be measured, and how, and by whom, and how the results should be fed back to the Forest Service for adaptive management. By the summer of 2000, they had a working draft calling for monitoring of water quality, runoff volumes, river geomorphology; soil erosion, vegetative ground cover; fire and fuel parameters, air quality; wildlife habitat and diversity; heritage resources and social impacts. However, the EIS was nearing completion and SFNF was reluctant to delay it by incorporating the monitoring plan into the document. Notwithstanding, SFWA partnered with the City and SFNF to obtain a Section 319 grant from the Environmental Protection Agency. Most of the money went to SFNF to fund treatments; SFWA's grant was for the purpose of organizing a peer review panel to oversee the monitoring effort, and report regularly to the public about the project. The City provided a match for the grant in the form of a paired basin study to look at effects of the treatments on runoff and water quality.

In August 2000 following the Forest Forum, SFWA convened a meeting of fifteen Santa Fe's environmentalists representing half a dozen groups, to try to get them to clarify what specific issues they had with the thinning and burning treatments that the Forest Service proposed to apply in the Santa Fe Municipal Watershed. The "areas of concern" listed in a memo summarizing that meeting were:

1. *What exactly is the Forest Service proposing to do? How many trees per acre will be left, on average?*
2. *Does the Forest Service have adequate stand data to support their treatment plans?*
3. *Assuming there is a plan that can be supported by the environmental community, how will the treatments be monitored to ensure conformance with the plan?*
4. *What monitoring will be in place to determine the effect of treatments? Who will conduct the monitoring? Santa Fe National Forest may be mandated to monitor for certain parameters; but can the results be trusted if the Forest monitors its own actions?*

Forest ecologist Melissa Savage (The Four Corners Institute) followed up with a letter to Susan Bruin representing the environmentalists' conviction that monitoring be given the same weight as the treatments themselves. She tasked the Forest Service with fully funding a monitoring effort along the lines of the draft plan. Responding to this signal from the environmental community, the monitoring plan – which SFWA had redrafted into a matrix,

assigning responsibilities to particular parties for elements of the plan – was incorporated in an appendix to the EIS, which was formally released for comment in March 2001.

The monitoring matrix provided an outline and attempted to assign responsibility to various parties to more fully define, fund and carry out the work, starting as soon as possible so as to establish baseline conditions prior to treatment. The Albuquerque branch of the Rocky Mountain Research Station (RMRS), a research arm of the Forest Service' Southwest Region, stepped forward to apply some funds they had in hand to monitoring bird species, small mammals, and habitat variables in half the area planned for treatment. "Habitat variables" included such parameters as the presence of snags, downed logs and ground cover, which provided data for interpretation not just in terms of wildlife but also the status of ground cover pre and post-treatment, which in turn could be analyzed for erosion potential.

The RMRS study was far and away the most extensive and best funded of all the elements of the monitoring plan, with the longest-term commitment to continuing it for a period of years. The RMRS project managers were very open to input on their monitoring design from the Monitoring Committee and the nascent Technical Advisory Group, established by the Santa Fe Watershed Association to serve as the peer review group that the environmentalists deemed essential to a credible monitoring effort. They revised their monitoring design at least twice in response to comment, had their plan reviewed by a consulting statistician, and provided all interested parties with lengthy explanations of their reasoning for their final design.

Notwithstanding, the most resolutely oppositional members of the environmental community concluded that RMRS was a branch of the Forest Service, and therefore likely to "cook the books" to show favorable results of the treatments. Further, they argued that RMRS had selected a flawed approach to monitoring birds, rather than the design put forward by the biologist they chose as their champion. On these and other grounds, they appealed the September 28th Record of Decision by the SFNF Supervisor, in which he designated his preferred alternative treatment from those presented in the EIS.

The Record of Decision was upheld over the appeal on January 11, 2002. The decision was based on there having been abundant opportunity for the appellants to have expressed their concerns during the course of planning the project; the unprecedented level of monitoring to ensure that ecosystem elements would be protected; and the plan's commitment to adaptive management.

6.0 Challenges to implementation

With the EIS finalized, many Partners thought SFNF would get right to work on the project. It was not to be.

To begin with, the left hand at the Forest Service doesn't necessarily respond to what the right hand is doing: just because an EIS was in progress didn't mean anyone had gone after funding to carry out the project it described. Furthermore, the EIS had been prepared at SFNF Headquarters, whereas implementation would have to come from the Española Ranger

District, which was also tasked with major recovery efforts following the Cerro Grande fire and the 2002 Borrego Mesa Fire. The prevailing attitude at the District was “We know you Santa Feans think it’s important to get this thinning done, but we have a big district and this project isn’t our only priority.” Even though \$419,000 was available from the 319 grant obtained by SFWA, the District did not mobilize to make use of it.

Delays in implementation were also caused by the need to obtain archaeological clearance prior to thinning or burning in the watershed. This clearance needed to be anticipated, funded and carried out before the forest treatments could begin, and those steps had not been taken. Now, a nervous City and community eager to see the watershed project begin were told that other projects were ahead of us and we’d have to wait our turn.

On the positive side, the delay in initiating treatments made it possible to collect pre-treatment data for all of the various monitoring elements; but RMRS began to express concern that there would never be an “after” phase to their monitoring. In addition, 2002 was an exceptionally dry year, and the prospect of losing the watershed to a disastrous fire was an increasingly likely scenario. The danger of fire led the District to terminate the informational hikes in the watershed, along with recreational access to other areas of the forest.

6.0 Political action

SFWA had not come this far toward restoring the watershed, to see the forest go up in smoke as the community waited for bureaucratic processes to play out. The SFWA director (author of this paper) worked with newly elected City Councilor David Pfeffer, drafting a resolution that was passed by the Council in summer 2002. The resolution stressed the danger of fire in the watershed and enumerated the funds and staff time the City had committed to planning watershed treatments to address the problem. It identified the need for funding for the Forest Service to implement the project; and called on the Congressional delegation to provide the funding to see the project through, including all monitoring commitments.

Senator Bingaman responded with an earmark appropriation in the amount of \$1.5 million per year for three years, with the funding first becoming available in December 2003. On the strength of these monies provided specifically for the Santa Fe Municipal Watershed project, implementation got underway.

8.0. Getting down to business

Bill Armstrong was designated the Contracting Officer on the project, and set about locating a competent thinning contractor. He found what he needed in Forest Rehab, a small Montana company that had moved from logging into forest restoration, carrying out “thinning from below” (cutting the smaller trees) and thin-and-burn projects using a combination of chainsaw crews and “masticator” machinery, depending on slope, exposed rock and other factors. Don Peterson, co-owner of the company and a constant presence in the field, was thoroughly attuned to protecting fragile soils, water and heritage resources. He had the flexibility to respond when the decision was made to retain Southwestern white pine

in mixed conifer areas (further discussion below). He was receptive to guidance to leave a “clumpy” pattern of trees with irregular small openings in the forest – preferred for ecological reasons -- rather than an even spacing of trees such as would be preferred for timber production.

Once Forest Rehab was on the ground in February 2003, the thinning proceeded apace. By the end of 2003, about 1300 acres had been thinned and Forest Service crews had burned about 800 acres of piled slash in the thinned area.

Responding to the pressure from the community to get the watershed thinned, and particularly the interest from New Mexico’s Senators in pursuing the project, District Ranger John Miera created a “project implementation team” with representation from SFNF, the City, SFWA, the New Mexico Environment Department (NMED) and staff from Senator Bingaman and Domenici’s offices. Monthly meetings of the team made it possible to identify and resolve barriers to moving the project forward, including funding, archaeological clearance, resolution of air quality regulations to allow controlled burning to take place under a wider range of conditions, and many other issues. These meetings were essentially a continuation of the Partners process, and while initially there was often eye-rolling impatience on the part of SFNF staff to have to brief these community members and listen to their concerns, on balance the group was effective at maintaining momentum on the project.

9.0 Adaptive management

The good news about the sudden rapid progress of thinning in the watershed was the reduction in fire danger. The bad news was that it became evident that the careful, scientifically defensible approach we had taken in developing monitoring designs was not suited to providing rapid feedback that would make it useful in adjusting management approaches on the ground. This did not mean that adaptive management was abandoned as a project element; however, the adaptations were based on informed observers’ professional judgments, rather than a statistically significant number of samples producing a clear trend that managers could act upon. Long-term data collection efforts, particularly the paired basin study and the RMRS habitat/bird/mammal work, will be valuable to long-term management of the Santa Fe watershed and in planning similar forest restoration projects in comparable environments, but they were not well suited to guiding forest management in the watershed month by month.

Examples of adaptive management employed in the Santa Fe municipal watershed project include the response to community input at the project planning stage, described in Section 5.1 above. Others include:

Retaining Southwestern white pine. This species is disappearing in other parts of New Mexico, due to attack by the white pine blister rust. The Santa Fe watershed appears to be a refugium for the species, perhaps because of the scarcity of *Ribes* (gooseberry) bushes, which are essential in the life cycle of the disease. Moreover, white pines are immune to the dwarf mistletoe that frequently affect Ponderosa pine and Douglas fir. Consequently, the decision was made to favor retention of Southwestern white pine when

selecting trees to thin. The EIS had simply specified leaving a mix of species in the treated forest.

More area treated than anticipated in EIS. Forest Rehab was able to conduct thinning operations in areas that had been thought to be too steep. SFNF managers made the call that thinning more units within the 7,270 acres described for treatment in the EIS, further extended the treatment benefits.

Use of tree mastication machine. Where conditions allowed (not on extreme slopes or rocky sites), Forest Rehab used a track-mounted machine fitted with a grinding/shredding device called a “Fecon head.” Various described as a “shredder”, “chunker” or “masticator,” this machine can reach to the top of a 20-foot tree and grind it to the ground in a matter of seconds. Taller trees are battered midway up the trunk until the top is felled, and then the top is shredded on the ground followed by shredding the standing bole of the tree. The shredding was a version of a lop-and-scatter treatment described in the EIS, with the felled trees reduced to chips and chunks ranging from splinters to pieces roughly a foot long and three inches in diameter. The masticated material was broadcast thinly over the forest floor, with no appreciable depth of accumulation; nonetheless, soils remained moist under the shredded material longer than where slash was piled.

The shredding treatment relaxed the timeline for post-thinning burns, which allowed greater flexibility in implementing the treatments. Although it is essential that the shredded areas eventually be burned to maintain the tree density achieved by the treatment, the widely-spread shredded material does not contribute to immediate fire danger. Contrast this to slash-piling, where the piles must be burned as soon as conditions allow. The piles are more combustible than the same materials scattered over the forest floor, due to the fact that the piles are a concentration of fuels stacked in such a way as to maximize ventilation. The shredded material is less concentrated and more compact, lacking the ventilation factor.

More aggressive burning. Initially, the SFNF Española District took a go-slow approach to burning in the watershed. They were limited in part by New Mexico’s Air Quality regulations, which specified a narrow range of atmospheric conditions during which burns could be conducted. They used hand crews to burn in 70- or 80-acre units when snow was on the ground, which made access difficult and often limited the effectiveness of the fire. The small units meant that burning had to be conducted on many days to cover the entire treated area; the more burn days, the more smoky days, the more complaints regarding air quality impacts.

In 2008, the District changed tactics. Rather than burning small units by hand in winter, they used helicopters to ignite fires over larger areas beginning in September immediately after the monsoon. This had the advantage that the ground and fuels were moist so that fires would stay within controllable limits. In addition, the smoke rose higher and dispersed better under September conditions, producing fewer air quality complaints.

10.1 Status of treatments

5000 acres of the Santa Fe Municipal Watershed have been thinned; 4200 of those acres have been burned, and 200 acres have been burned twice in the years since they were initially thinned. More acreage was burned in the 2008-09 season than in any previous year, for the reasons explained above.

10.2 Status and results of monitoring

Monitoring is currently limited to tracking air quality and fire parameters in connection with burning, and the ongoing FS Rocky Mountain Research Station (RMRS) habitat/bird/small mammal study. Beginning in 2002, RMRS has collected data on small mammal and bird populations, as well as some vegetation components, in the Santa Fe Watershed and surrounding forest areas. Despite some issues with changing treatment locations and annual fluctuations in populations, RMRS has been able to analyze effects of the thinning on a wide variety of species. Due to different habitat associations of different species, some species increased and some declined on treated as compared to reference areas. Most species, however, remained unchanged, indicating resilience to thinning. No small mammals declined in response to thinning, and for those bird species that were more common on reference forests than thinned forests, this effect only lasted for one or two years. In addition, a number of bird species that have been identified as declining in the southern Rocky Mountains were those that preferred thinned sites. This may be due to the relative rarity of more open forest habitat due to widespread fire suppression effects in the region. The study continues, although monitoring efforts have been reduced somewhat due to funding reductions.

From 2001 through 2006, a paired basin study was conducted by City consultant Watershed West on two side-by-side sub-watersheds of about 400 acres each on the southeast side of McClure Reservoir. The study concluded that there was a 50% increase in flow following thinning of the Treated Basin, with no increase in turbidity. A consultant to the Interstate Stream Commission, Amy Lewis, has reactivated data collection at the paired basin flumes for a long-term study of the water budget of this landscape.

Erosion was a significant concern at the initiation of the project. SFWA set up a set of erosion bridges on the demo plots soon after they were thinned. It quickly became clear that it would be impossible for the small non-profit to maintain this intensive data collection effort, let alone extend it to a representative portion of the total project area. Other approaches to erosion measurement were proposed, including having the City conduct a bathymetric survey of the reservoirs as a baseline should major erosion take place following a large fire (this possibility is still on the table.) Another proposed approach was to use small catchments, cleaned after each storm event, for a volumetric measurement of soil movement: no one stepped forward to conduct this project, and experts called into question the validity of extrapolating from a few point measurements to the entire treated area.

Ultimately, TAG member Kevin Buckley modeled the change in erosion potential due to the treatments, using the Revised Universal Soil Loss Equation (RUSLE). Soil, slope, precipitation and other parameters were derived from the SFNF Terrestrial Ecosystem Survey, and the single variable that could be affected by forest treatments – “cover” – was taken from the habitat data collected by RMRS. In 2005, when he made his report, relatively few of the RMRS data points were within treated areas; however, based on the available data, it appeared that there was no increase and possibly a decrease in erosion potential in treated as opposed to untreated areas. The analysis can be repeated and updated as additional RMRS data becomes available.

Results of NMED’s monitoring of water quality, fish populations and benthic invertebrates, and channel geomorphology are as reported in Grant, 2004 (see Section 12.0, References Cited.) None of these studies indicated impacts of thinning.

Fire history studies have been conducted in two phases, in 2004 and 2008, by University of Arizona researchers Jeff Balmat and Ellis Margolis. They conclude that over the past four centuries, widespread fire has occurred on average once every 18 years in ponderosa pine and once every 27 ½ years in mixed conifer. Fire occurrence was associated with anomalously wet (El Niño) years followed by anomalously dry (La Niña) years: the wet years encouraged growth, and then the dry years reduced it to fuel for fire. The last fire in the spruce forest in the upper watershed took place in 1685, and occurred over 93% of the sampled spruce forest: a stand-replacing fire.

10.3 Public outreach

Guided hikes in the municipal watershed were put on hold in 2002 due to concerns that hikers might be caught in a wildfire, or complicate efforts to combat a wildfire, during that very dry year. By the time the fire danger had declined, there had been an almost complete turnover in City and SFNF staff with responsibility for the watershed. The newcomers cited the post-9/11 Bioterrorism Act (PL-107-188) as a reason to permanently suspend guided hikes in the watershed. SFWA continued to lead hikers in from the east to the watershed boundary to observe the effects of thinning, but eventually that fell afoul of an absentee landowner’s objections to hikers crossing his property. SFWA continued to work with the City to allow watershed tours, and has been successful in reinstating regular hikes to familiarize the public with their watershed and what it takes to keep it healthy.

At the same time that the watershed tours have been reactivated, the chief opponent to the Santa Fe Watershed project has been mobilizing opposition to municipal-watershed-style forest treatments in the Hyde Park area of the SFNF. “Op eds” and letters to the editor in 2009 have been making the same arguments against thinning and controlled burns that were made ten years ago. However, the Forest Service reports a significant increase in community support for this kind of forest management. 850 acres were burned in September 2009, causing considerable smoke on the city’s eastern skyline. Concerned citizens called the Forest, but when they were told that a controlled burn was in progress, they understood the necessity for those treatments.

10.4 Community forestry goes mainstream in Santa Fe

In 2008, SFWA obtained a grant from the Community Forestry Restoration Project which allowed them, in concert with SFNF, the City and other players, to develop a watershed management plan for the Santa Fe Municipal Watershed. An important element of the plan was “payment for ecosystem services” -- having a portion of everyone’s City water bill go toward continued fuel management in the watershed to reduce the risk of fire. The City adopted the plan, and in 2009 the New Mexico Finance Authority’s Water Trust Board awarded \$1.3 million to the City to help implement the plan.

11.0 Lessons learned

- It’s up to a community to manage their forest. With the high turnover of Forest Service staff, the reluctance of the agency to engage in controversial actions, funding problems and competing priorities, a project can get lost without community buy-in and long-term engagement.
- There are things a community can do for their forest that the Forest Service can’t do, including lobbying for funding and engaging in public debate over forest management, by “op ed” or otherwise.
- Trust between the parties is crucial. Trust comes about through spending time together; through open communication; through study and discussion of the science bearing on resource management issues; through monitoring and reporting of monitoring results (“trust but verify.”) It’s important to connect the community to the resource – the idea of an on-line video of the watershed comes up regularly in discussions of public outreach, but everyone knows you can point a camera at the pretty things and avoid the things that may tell a different story. People trust their own eyes; let them use them.
- Don’t expect the public to invest their time to learn about forestry issues. Don’t hire a hall, hold a meeting and call your public outreach accomplished. Meet the public on their terms, at the meetings they attend anyway – church gatherings, business groups, and so on.
- There are limits to what volunteers can do. It needs to be someone’s job to represent the public to the Forest Service and vice versa. Except in those rare cases where an energetic, well-informed, well-organized retiree can take on these tasks, the community will need to find a way to pay for the work of that representative. The same is doubly true for the expensive, important work of resource monitoring and maintaining records of that work. No central repository exists for the results of monitoring in the Santa Fe Municipal Watershed, and as a result, it is necessary to contact each of the groups and individuals involved in monitoring to learn about outcomes. If we really care about our forests, we must measure their vital signs, early and often; review and analyze that data; and make results readily available to any interested party.

12.0 Chronology

- 1997 SFNF documents overstocked, fire-prone condition in Upper Santa Fe Watershed Existing Conditions Report. Initiates process that includes City, environmental groups and others in a “Partners process” to determine an appropriate response to the existing conditions in the City’s municipal watershed.
- 1998 Partners group begins work on existing/desired conditions (pre-NEPA) process in roughly monthly meetings. SFWA organizes first public tour of municipal watershed in May. City holds its first public tour in September.
- 1999 SFWA conducts four tours in the second half of the year, leading to making monthly tours part of the public outreach plan in the EA/EIS. Through involvement of State Forestry Division, 8 acres of demonstration plots in the municipal watershed are thinned by convict labor (October-November), as part of the “show-me” effort of the draft EA process. Subcommittee of Partners group formed to plan monitoring. SFWA sets up erosion bridges for erosion measurement; subsequently concludes this does not provide meaningful data.
- 2000 City contractor thins 42 acres of City land, cutting only 6-inch diameter and smaller trees with total removal of downed material, at a cost of over \$1400 per acre. City offers monthly guided walking tours of watershed spring through fall, with SFNF and SFWA participation. Cerro Grande Fire, May 4. Viveash Fire May 30. Forest Forum on Wild and Prescribed Fire, organized by SFWA with participation by SFNF and others (June). Pre-NEPA process converted to development of full Environmental Impact Statement (EIS) following public concern in wake of major fires. SFWA organized environmental groups (August) to clarify areas of agreement and disagreement with SFNF plans; monitoring and adaptive management emerge as a means to obtain environmental groups’ acceptance of thinning/burning project. SFWA drafts “monitoring matrix” for inclusion as appendix in EIS.
- 2001 319 grant received by SFNF and SFWA with City as matching partner, to fund treatments by SFNF and coordination of monitoring by SFWA. SFWA sets up Technical Advisory Group (TAG), begins producing quarterly status reports on forest treatments and monitoring, funneling TAG comments to SFNF or monitoring groups as appropriate. City walking tours continued with SFNF/SFWA participation. Demo plots burned in May; delayed treatment caused some scorch and subsequent tree mortality. Draft EIS published in May, described thinning/burning within 7,270 of the 17,000 acres of the watershed that fall outside of the Pecos Wilderness. SFNF Record of Decision: September 28th. EIS appealed.
- 2002 EIS upheld over appeal, January 11th. SFWA pressures City, congressional reps, elsewhere to get project implemented; drafts City Council Resolution prompting Sen. Bingaman to introduce \$1.5 million line item for treatments in municipal

- watershed into 2003 budget request. Walking tours cancelled due to fire danger. SFNF archaeologists obtain State Historical Preservation Office (SHPO) approval for thinning of 1100 acres out of total project area of 7000 acres. Rocky Mountain Research Station (RMRS) biologists implement ecosystem monitoring on 3000 acres, funded through SFNF and RMRS grant sources. SFNF crews thin about 11 acres. Thinning contract written and advertised; Montana-based firm Forest Rehab selected as thinning contractor (December).
- 2003 Concern expressed by Sen. Bingaman that even with earmark funding provided, project was not progressing (Santa Fe New Mexican 2/19/03: “Senator tours Santa Fe watershed...”; Journal North 2/19/03: “Bingaman Keeps Eye on Thinning”). Partners Project Team (subsequently termed “Implementation Team”) established (March), convened by SFNF with representation from City, SFWA and others. Committed to monthly meetings to coordinate information and activities and trouble-shoot issues. City decides that its responsibilities under the Bioterrorism Act (PL 107-188) mean that public tours in the watershed would not be allowed. Lightning-caused fire (June) burned ~3 ½ acres, not in treated area. SFWA continues quarterly reporting and TAG meetings to track forest treatment and monitoring activity.
- 2004 U of A fire history /climate study in upper Santa Fe watershed (summer). Final report for 319 grant summarizes project activity and monitoring results to date. 3058 acres thinned to date by a combination of chainsaw crews and a track-mounted tree shredder; 800 acres of piles burned.
- 2005 SFNF announces beginning of planning for Hyde Park thinning/burning project (July). SFWA holds Forest Forum 2005 in October to report on monitoring results and apply pressure to complete the treatments in the municipal watershed. Speakers include Congressman Udall, the Regional Forester and Santa Fe National Forest Supervisor; Sen. Domenici stopped in during the round-table session.
- 2006 80 to 100 acres burned during the winter. NMED Air Quality regulations limited the “burn window.”
- 2007 Again, only limited burning achieved.
- 2008 SFWA and partners receive Collaborative Forestry Restoration Program grant to develop a watershed management plan for the municipal watershed. The plan includes a payment-for-service approach allowing the City to charge water customers for forest management activities that protect the water supply and reduce fire risk. SFNF changes burn tactics and increases area of burn treatments by a factor of 10.
- 2009 City Water Division is funded by the NM Finance Authority Water Trust Board to cover the first five years of the 2010-2029 watershed management plan.

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In addition to the documents listed below, this paper was reviewed, edited and corrected by the following people whose contributions are gratefully acknowledged: Bill Armstrong, Karen Bagne, Susan Bruin, and Sandy Hurlocker.

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