Rebuilding the Forest Service: Part 2 Sidebars

An Interview with U.S. Forest Service Retiree, Phil Aune

Editor's Note: One of the questions we asked Phil Aune during our Q&A interview was how the forest planning process had changed over his years with the Forest Service. We expected a solid answer but what followed us astonished us. He sent us a summary or a much longer answer he had written several years ago. Clearly, there was no time during Aune's career, which began in the 1960s, when the Forest Service could "chop down trees whenever and wherever it wanted," an accusation often repeated during the 1980s spotted owl war.

Aune's summary follows his career track from the Sequoia National Forest [1960s] to the Six Rivers National Forest [early 1970s] and finally the Tahoe National Forest [1975-1987]. He also discusses the impacts of increasing regulation on Allowable Sale Quantities, rotation ages and economic considerations. Viewed through the lens of Aune's long career, it isn't hard to see how or why the U.S. Forest Service is now a shell of its former self.

Sequoia NF 1960's: *The 1959 Sequoia National Forest Timber Management Plan and the special Kern Plateau Plan.*

Walt Kirchner was the Timber Staff Officer when the plan was developed. He had previously led the Region 5 Timber Management Group as the Timber Management Planning Staff Officer. He was the leading expert on forest plans at the time. Developing these forest inventories plans was primarily a Regional Office function with the individual National Forest's cooperating by providing their individual Ranger District Management Plans.

These were extremely basic plans that identified key lands classes, management goals for each land class, and generally accepted prescriptions for each land class. Examples include the Water Influence Zone (WIZ) adjacent to lakes, rivers, and streams. The WIZ land class generally allowed lighter forms of timber removals using sanitation as the main prescription. Salvage was also allowed, but with major erosion restrictions.

Another land class was the Travel Influence Zones (TIZ). Like the WIZ, harvesting was limited and special clean up following harvesting was required, i.e., all visible slash from the road had to be completely disposed. On the Kern Plateau, stumps had to be flush cut with the slope of the land to reduce their visibility.

There were lots of other land classes and special case considerations. The rest of the land was called general forest land and was available for timber production. These land class designations and allowable actives were the responsibility of the District Ranger and required Forest Supervisor approval of each Ranger District Management Plan.

Prescriptions for timber management on the Sequoia National Forest were basically the same for four of the Ranger Districts - the Cannell Meadow Ranger District being the exception for management of the Kern Plateau. The prescriptions for the four similar Ranger Districts were based on using Unit Area Control (UAC) as the guiding requirement for managing General Forest lands suited for timber production.

Walt Kirchner was the leading advocate for UAC in Region 5. Special forest wide rules were developed and used in implement. As an example: A group (stand) with 51 percent or more of the trees identified by risk rating as high-risk trees could be clear cut and reforested.

If less than 50 percent of the trees in the group were classed as high risk, an intermediate cut was allowed and only the high-risk trees could be removed. Minor amounts of thinning to improve spacing was also allowed.

On the Kern Plateau, the focus was on accessing the area that had a major lack of roads and clean up as much tractor ground (less than 35% slope) as possible. No intensive management or use of UAC was allowed. The goal was to get the land accessed and improve the overall health of the forest.

The key component of the allowable prescription was to remove high risk and very high-risk trees based on the likelihood of mortality in a 5-10 year period. A 5-year likelihood was used for the General Forest and the 10-year likelihood for the TIZ and WIZ land classes.

The likelihood of dying was based on a risk rating system. For ponderosa and Jeffrey pine, the risk rating system was first developed by Salmon and Bamberg, Pacific Southwest Research Station in the 1940s. They identified crown factors at the time of mortality on trees they measured; characterized a lot of green trees and went back and determined how long each tree with their specific green tree characteristic before mortality occurred and when the tree died.

For the green trees identified, they measured things like needle complement with one year of needles being the worst score for that element.

Next was needle color. The highest risk was for a sharp contrast in color with the top internodes lighter in color than the bottom of the live crown.

Then came needle length. Again, if the needles in the upper crown were shorter than the needles in the lower crown, that increases the risk factor. Twig and branch condition was the next variable with the higher risk trees having large amounts of dead twigs and branches resulting in higher point scores in the overall risk rating. Two other variables were also important. Recent lightning strikes automatically gave the tree a very high-risk rating (10+) points. For mechanical risk, the tree had to have a lean greater than 30% from vertical.

Bottom line adding the points up for each tree gave you the final decision for cutting. If the tree had greater than five points it was classed as a high-risk tree and suited for cutting in General Forest areas. The tree had to have more than 10 points to be classed as a very high-risk tree and suited for cutting in the WIZ and TIZ land classes.

We did not have an elaborate rating system for red and white fir. Predicting relative risk to insects is difficult at best. Dr. George Ferrell, an entomologist at the Pacific Southwest Research Station attempted to develop a fir risk rating system using crown characteristics that was not very useful. He found that a perfectly healthy fir tree had a 12 percent chance of dying within ten years. What did help was pathogen activity and frost cracks. The red fir stands on the Kern Plateau were loaded with Indian paint fungus and such an infection was a key factor used in determining which trees to cut.

This was the system we used on the Kern Plateau to accomplish our sanitation objectives. Trees with two or more frost cracks were very high risk and trees with just one frost crack were only classed as high risk with the same removal requirement for the forest zones.

Finally, these early plans did not have the negative influences of practices that increase the Allowable Cut. My third case study [below] will discuss ACE further. For this generation of plans, ACE was not a major factor.

Implementation of these complicated prescriptions for the Sequoia was complex and rigorous. Training of the sale layout and marking crews was essential. Fortunately, Walt Kirchner headed a two-week timber cruising and marking school every year that was mandatory training for all people involved with timber sale preparation. The first week was generally cruising and grading certification and second week focused on understanding of marking requirements.

Sidelight: When I was a Junior Forester[JF], I was assigned to the Cannell Meadow District and the Kern Plateau. We marked around 120 million board feet of timber using these prescriptions and I think I became an expert on such marking. It was a little frustrating for me because I wanted to practice a little bit of more intensive even-age management.
Part of being a JF was going to Professional Orientation in San Francisco. Imagine about 30 young men going to San Francisco after at the end of a field season where they were lucky to have a day off. We must have been quite a sight.
I remember meeting Will Charter [Director of Plans and Silviculture] in 1966 as part of our tour of the Regional Office. Sitting in his office, I asked him why in the heck were there no plans for intensively managing the Plateau that allowed clearcutting and even-age practices. He calmly replied with something like this, "Go back and reread the Kern Plateau Management Plan. The first cutting cycle was set up to do exactly what you are doing - accessing the area and salvaging and sanitizing it by removing potential mortality. After the areas were accessed in the second cutting cycle more intensive even age and group selection practices would be allowed." So, I left his office with my tail between my legs and headed for the bars on Broadway later that night along with all the other JF's

Six Rivers NF early 1970's: ***Mad River Ranger District***

I was implementing my first Timber Management Plan developed using linear programming. This was a single resource Timber Management developed along the lines of the Sequoia with inventory, land class acreage and prescriptions used as the driving force. The big exception to the Sequoia was the use of lineal programming RAM analysis.

As the District Silviculturist, I was responsible for implementing the technical aspects of the plan. Having learned my lesson on the Sequoia Plan from Will Charter, I dove into the lengthy plan as soon as I landed the job. Following are some of the unique aspects of this plan besides the use of RAM:

Since the major planning aspect for the Six Rivers NF was intensive timber management using even-age objectives, clear cutting was the major practice historically used on the Forest. But how do you decide on which stands to clear-cut in the plan and in reality?

The basic concept was to assess the stocking level of the stands based upon comparison to fully stocked stands in normal Yield Tables. For the Douglas-fir Forest types, McArdle's Bulletin 201 was used throughout Region 6 and to some extent, the Forests of northern California.

Region 5 forests were out of the range of Bulletin 201 sample area, whose plots were mainly in Oregon and Washington. A compromise was used to determine full stocking. From the ten-year Forest Inventory and Analysis [FIA] plots, the heaviest stocked plots were combined and compared to Bulletin 201's Normal Yield Tables for the ages.

The data from Bulletin 201 and the FIA plots were regressed and plotted showing the differences by age class of the two data sets. Full stocked Six Rivers FIA plots were significantly lower than the same ages for Bulletin 201 and they became the "Normal Basal Area" [NBA] for the Six Rivers. For clearcutting, those stands with the lowest actual stocking as compared to the Six Rivers NBA were the highest priority for implementing the Timber Management Plan clear cutting goals.
Most of the logging in those days was with the large tower high lead yarders like the BU-99.
On-the-ground clear cut design requirements for use of the tower yarders often included cutting some of the better stocked stands for economical timber sales. As with all plans developed in this period, volume was the controlling variable for accountability. Acres or area covered by the prescriptions harvest was not even considered for accountability.

The second unique aspect was an allocation for Overstory Removal. These prescriptions and associated volume were to come from two story stands that had a significant difference in tree size between the stories in multi-storied stands.

The goal was to remove the upper large trees and leave a fully stocked stand after logging. That was relatively easy to do with good sale layout and excellent sale administration working closely with the loggers on tractor ground. The main problem was the steeper ground and the fact that the large high lead yarders could simply not leave a satisfactorily stock stand on steep slopes.

However, in the early 70's the Washington 108 class skyline yards came onto the scene. These running skyline yarders with interlocking drums could easily log about 90 feet laterally on both sides of the skyline setting before moving to the next setting.

The last unique aspect was intermediate harvest assignments primarily with commercial thinning of stands. Heavily stocked stands were the target using the Six Rivers Normal Basal Area as the guiding factor for candidates stands to thin. The operation and planning question was, what Basal Area levels should the stands be thinned down to so that they could recover and be thinned again in ten years?

This information was also needed for the planning of future thinning treatments for stands clear-cut and regenerated. The first thinning for these new stands was predicated on having at least 200 trees per acre left 50 years after reforestation, generally with an average diameter of 12 inches at dbh.

What was used as the source for thinning existing and future stands? One of the leading textbooks on forest growth was Ausmann's textbook on Forest Growth. Ausmann's text relates to large studies on commercial thinning in Europe and subsequent thinning responses over a wide range of initial basal areas and basal areas responses after thinning.

Ausmann's text described that universally, stands thinned in Europe using the practice of thinning from below to around 55 percent of Normal Basal Area (NBA)recovered to at least 90% of NBA after ten years. Our actual thinning response knowledge from research plots and practical experience was extremely limited, so the use of Ausmann's 55 percent of normal became the guideline in the Six Rivers Timber Management Plan.

How did all this translate to the Mad River Ranger District? We were allocated a 50 million board foot/-year target. We had some years between 1970 and 1975 where that goal was not accomplished. The target was also specific to clearcutting: 32 million board feet [MMBF] per year overstory removal; 12MMBF per year and thinning, 8 MMBF year.

We were close to our targets for clearcutting and overstory removal. We underperformed in our thinning goals. Part of the reason was steep land thinning. In the entire north coast area at that time there was not a record of steep land thinning.

In about 1972 or 1973, Agriculture Secretary Earl Butz demanded an increase in harvest on the National Forests. The constraint was that the extra volume could only come from Intermediate Harvest [Sanitation and thinning]. Nationally, Intermediate Harvest goals were universally down on just about all National Forests. Such was the case on the Six Rivers and of course, the Mad River Ranger District.

My District Ranger assigned our additional target of around 8 MMBF to me since our sale prep department was having difficulty in getting our normal target accomplished. I knew of several candidate areas and stands that needed thinning. Most were on steep ground. Fortunately, running skylines were now working in our area. Without them, we never could have achieved any steep land commercial thinning.

I worked alone for the entire Butz Cut [as I loved to call it] doing stand exams, skyline logging plans, and preliminary road layout. Our forest logging engineer came out to help with the final road design since we had a major road design problem with a 19 percent adverse haul into a 50-foot radius curve. We appraised the use of a road grader to assist the trucks when hauling on this road. After about two months on what was called the Button Sale was completed and sold as the first commercial thinning on steep ground on the Six Rivers National Forest.

A few details about the 110-year-old stands in the Button Sale: They averaged 240 square feet of basal area per acre and the thinning goal was to thin down to approximated 140 square feet of basal area slightly above the 55% of Normal concept.

Live crown ratios averaged around 20 percent with 100 percent crown closure. All marking was leave tree marking. There were 0.4 old growth trees per acre in the stands and they were to be left standing since they would do too much damage to the remaining growing stock. Our plan was to take them out when the stand was clear cut. The sale sold with about 8 MMBF of volume for about $90/MBF [thousand board feet]

The Project Sales Officer who administered the sale came storming into my office one day and said something like, "who in the hell left those old growth hooters?" He knew it was me and he wanted me to amend the prescription to take those trees out. Remembering what Will Charter said to me when I was a JF, I told the guy to reread the project plan, prescriptions, and environmental analysis where the rational for leaving those trees was carefully explained. He and I are still great friends.

Ten years after the Button Sale was completed, the Six Rivers National Forest invited me back to do a timber workshop at Mad River with the highlight a field review of the Button Sale. At that time, I was the Forest Silviculturist on the Tahoe National Forest.

During the indoor portion of the workshop, I was asked to explain the background and rational for timber management during my tenure on Mad River. I started out explaining the Timber Management Plan that they were still working under. The National Forest Management Act [NFMA] had recently passed and no further work on updating Timber Management Plans was allowed. I was surprised at their incredible lack of understanding of the plan and how it was built even though they were still implementing the goals.

For me, the highlight was the field review of the Button Sale. My replacement at Mad River had completed stand exams on the entire sale area. Here were some of the highlights:

1. Basal Area per acre had grown back to the original 240 square feet per acre.
2. Average live crown ratio had increased from 20 to 40 percent.
3. Crown closure had grown back to full crown closure as the leave tree crowns expanded.
4. Increment borings showed that in the first three years after thinning, there was very little annual ring growth increase. After three years, the annual ring growth increases to about three times the annual ring growth before thinning. For the first three years, the live crowns were rapidly expanding and before full crown closure occurred, the understory tanoak expanded greatly due to the increase light available for their growth.
5. Last but not least, the entire sale area had the largest number of nesting spotted owls on a per acre basis of any other area in the entire Six Rivers NF. The area was deemed as a spotted owl nesting area after the Button Sale was finished. They were non-issue at the time the sale was sold and logged. So, what did they do? The spotted owl habitat areas were placed off limits to any harvesting.
6. The positive thinning response for the 110-year-old stand is the oldest thinning response data for Douglas-fir that I could find in the available literature. Most thinning studies were in young growth Douglas-fir stands.

Final thought on the Mad River and Six Rivers experience:

This is where I learned about the impacts of the Allowable Cut Effect (ACE). The bottom line was that there was no real accountability on the plan prescription goals for clearcutting, overstory removal and thinning. As long as we were producing our total annual harvest, that is all that really counted.
Of course, the biggest problem was meeting the thinning goals. During my five years on the Ranger District, we only produced 8 MMBF of thinning and we were technically responsible for 40 MMBF for the five-year period. The only Forest Service person who actually discussed this with me was Klaus Barber who was one of the two people in the Regional Office working on Timber Management Plans. At a cocktail party after one of our meetings, Klaus asked me something like, "How are you meeting your thinning and overstory removal goals?"

He knew that we were relying on clearcutting as our major practice and had just recently started with our overstory removal program. Welcome to ACE!

Tahoe National Forest 1975 -1987.

As the Forest Silviculturist I was responsible for our Forest Planning as well as my normal silvicultural responsibilities. When I arrived, our Forest Timber Management Officer basically said, "Welcome to the Tahoe National Forest. We must get our revised Timber Management Plan out by 1977, and we are already behind. That is your top priority."

Like a lot of the National Forests in the Sierra Nevada range, they were partially cutting their forests basically using economic selection prescriptions removing large high value trees. Very little clearcutting was used with the exception being huge emphasis on salvage after fires.

The Tahoe had an excellent record and outstanding examples of salvage and reforestation after fires.

Quite a few of the foresters of that era were University of California graduates who were taught silviculture by Herr Professor Dietrich Mulder a German transplant who really espoused uneven age management and the selection system. Humboldt State foresters were finally starting to make inroads into this culture by the mid 60's.

The first step in developing a new Tahoe Timber Management plan was to complete our inventory in 1976 from the aerial photos that were flown in 1975. The first job was to develop stratified type maps from the photos.

Jack Levitan was an outstanding timber management planner in the Regional Office. He took the lead in planning and completing the inventory. I called Jack to see what we needed in a good candidate for the inventory and developing the plan. He said we would need someone with a working knowledge and understanding of higher algebra and could at least converse in Calculus.

Checking around the Forest, only two young foresters really met the math criteria. One was a bright young lady working in sale preparation on the Dowieville Ranger District. She was having trouble with some of the attitudes of some of the Neanderthals on the District. I went to my boss and asked him if we could bring in Jane LaBoa to fill my planning assistant position. It took a day to get permission and she was offered the job. She immediately accepted and did a wonderful job and subsequentially, had an exemplary Forest Service career.

Working with Jack Levitan, Jane developed and handled the inventory with a contract for professional services for the type mapping. There were some really bad examples of poor performance on this first step in planning and we were all focused on developing the best type maps possible from the aerial photo typing.

Over the winter, the aerial photo typing was completed, and type maps produced. For the inventory, we converted the individual types into 24 distinct strata for inventory purposes. That created the basis for our stratified sampling to inventory develop the FIA data for each stratum used in further planning. According to Jack Levitan, the end product was the best type mapping, stratification, and inventory he had ever been associated with in his career.

The conclusion of the Forest Inventory Analysis data and trends between decades was that the Tahoe National Forest was partial cutting its forests to death. It was time to begin emphasizing regeneration cutting as the priority.

So, the plan revision started out with strong fundamentals. The land classification used in the new Timber Management Plan came from Ranger District Multiple Use Plans updated to the mid 70's. The results were in similar land classes to those mentioned earlier on the Sequoia National Forest.

The last major variable was the set of prescriptions for inclusion into the RAM Prep module. For the Tahoe. We had three major forest types: Sierra Nevada Mixed Conifer, Red fir, and Eastside Pine. The Mixed Conifer and Eastside Pine strata had the full suite of prescriptions available all the way from individual tree selection to clear cutting. For the Red Fir strata, clearcutting was not allowed due to the difficulties of planting red fir. Local experience had clearly shown that red fir could easily be regenerated using the shelterwood system. Three steps of the shelterwood and thinning prescriptions were allowed.

For calculating Normal Basal Area for fully stocked stands we used Dunning and Reinke's Bulleting 354 Yield Tables for Sierra Nevada Mixed Conifer Stands. For red fir, we used Schumacher' Yield Tables for Red Fir Stands and for Eastside Pine, Meyer's Ponderosa Pine Yield Tables. We did not have to develop our

local Normal Yield Tables like we had to on the Six River's National Forest.

RAM prep was now completed, and we were ready to use the linear program to analyze and determine potential allowable harvest levels by prescription. The only constraint was to maintain our existing harvest level of 149 MMBF per year. The initial RAM allocations came back and were generally feasible and needed their normal tweaking to remove the obvious errors. The biggest change resulting from this analysis was that we needed to rapidly expand our regeneration prescriptions across the forest. The strata with the highest difference from full stocking were the first priority for regeneration practices in all Forest Types. Targets were assigned for clearcutting in each of the Mixed Conifer and Eastside Pine stratums.

For the red fir type, targets for shelterwood's were assigned. The targets were both volume and area-based targets. This was a huge change for the Tahoe as we had to accomplish about 3,000 acres per year of regeneration harvesting. In the previous decade, the Forest only accomplished less than 100 acres per year. What a major change in the approach to management.

When we published the final Timber Management Plan and Environmental Impact Statement [EIS], opposition mainly centered on the huge increase in regeneration harvesting. The Plan and EIS prevailed, and we began implementing the Plan in 1977 before the actual plan was final.

Implementing the plan was actually easier than most plans since each General Forest stratum had specific goals for prescriptions, acres, and volume. Ranger District Silviculturist and sale planning had to complete a Compartment Inventory and Analysis (CIA) identifying data similar to FIA for each stratum within each Compartment (around 5,000 acres).

The first priority was to the sort stands by socking levels with the poorest stocked stands compared to Normal BA as the highest priority for regeneration. Generally, it was not feasible to regenerate all of the poorest stocked stands because of clearcutting and regeneration unit size limits, road locations and operational logging requirements. Stands that were fully stocked could only be thinned. Most sales had about 75 percent of the poorest stocked stands and scheduled for regeneration.

Side note: How in the heck did they come up with the CIA acronym for compartment planning? I asked RO timber planner Klaus Barber about that, and he smile and said, "we wanted to make our covert planning operations overt."

The biggest ACE effects in this Timber Management Plan were helicopter logging ground and Roadless Areas with both contributing to our current ASQ as though they were being done. Our appropriated road budgets were low during this period and generally all roads had to be paid for by the timber removal. Generally, there were significant problems as to why these areas remained roadless since most of the Tahoe National Forest was roaded.

The 1977 Tahoe Timber Management Plan was the last Timber Management Plan produced in Region5 [if not the nation]. The Sierra, Six Rivers and Klamath were slightly behind the Tahoe in developing their Timber Management plans. When the NFMA Regulations were completed and issued. Every National Forest was ordered to stop their individual resource planning efforts and begin their Forest Plan efforts under NFMA. I think that was around 1979.
The three National Forests that did not finish their plans were identified as Accelerated Forests for developing their NFMA Forest Plan anticipating what the final Regulations would include. The Tahoe and the rest of the timber producing forests were given a lower priority for starting their NFMA Plans.

The southern California National Forests were given the lowest priority for developing Forest Plans. The biggest reason for this early priority systems was that there was to a lack of qualified analysists that had working knowledge of FORPLAN.

FORPLAN was an acronym for FORest PLANning. It was a large scale computer tool for stratifying forest characteristics into many more layers than we have before its' development. The early versions overwhelmed our computer capabilities. A single well thought out run would take so much time that the results took at least an overnight run to complete or abort.

I was assigned as the timber management representative for our NFMA Planning Team and unfortunately after completing the 1977 Tahoe Timber Management plan, my assistant, Jane LaBoa, transferred to another Forest. We knew that we really needed help with FORPLAN, and we started to recruit a replacement for Jane with someone who had modern planning skills.

It was a little easier to hire in those days and we knew of a UC Berkeley grad student that was working on his master's on the UC Berkeley Sagehen Basin fishery experimental area. We had all met him while he was working on his master's project, and his name was Chris West. There was no question as to his qualifications and energy. So, we offered him the job. It was that simple because we had a great Administrative Officer who was focused on results rather than process and he personally guided his job offer through the maze of personnel requirements.

When Chris arrived, we still had all our recent inventory and forest stratification available for linear programming. Chris began working with the other resource specialists to see how they could become involved in using the analytical powers of FORPLAN.

Meanwhile, I had to completely check our database for the NFMA Suitability requirements. The requirements were simply to identify all lands within the Forest as Capable, Available and Suited (CAS) for the production of timber.

Capable was simple: Forest lands capable of growing trees at least 20 cubic feet per acre per year. Internally, some folks within the Forest Service disagreed with this minimum standard. When questioned on why they disagreed, they simply said it was way too low. My reply was that the worldwide standard for productive forest land was land growing at least one cubic meter per hectare per year and that was equal to about 14.7 cubic feet per acre per year.

For the Tahoe NF, this concern was not even relevant. Our driest and poorest conifer stands were capable of at least 50 cubic feet per acre per year. The only significant forest type that was a concern was our live oak Hardwood stratum. Our black oak hardwood stratum was generally capable of growing above 85 cubic feet per acre per year.

The second question was "Available." Lasts that were not available had been administratively withdrawn from timber production by a higher authority: Wilderness Areas, Wild and Scenic Rivers and Special Interest area.

After the first two screens, we were left with lands "tentatively" suited for the production. Final suitability was to be determined by the goals of each alternative assessed in the Forest Planning process. On the Tahoe, we started with 794,374 acres of National Forest land and water within the proclaimed boundary.

I will never forget that number because I had to check each analysis and FORPLAN run to make sure that exact number of acres was included. After the Capable and Available analysis, the Tahoe National Forest had 530,000 acres forest tentatively suited for timber production.

The number was basically meaningless except for one run where we maximized timber growth and yield to maximize present net value. This was our Timber Benchmark Run. Each resource area was required to develop its own Benchmark Run. We ended up with five or six Benchmark Runs with individual runs that focused on maximizing Wildlife, Water, Grazing, Recreation or designated Wilderness.

The Timber Benchmark was similar to the concepts espoused by former Undersecretary John Crowell when he asked to Forest Service to determine what would be the annual timber volume be if we maximized timber production on each National Forest?

The answer was around 22 billion board feet annually. This was during the time when the Forest Service was selling around 10 billion annually. For the Tahoe Timber Benchmark all of the Capable and Available lands were deemed suited for timber production. There were no special prescriptions for scenic vistas, wildlife habitat, water influence zones. This was a relatively easy run to set up in FORPLAN and we used it to demonstrate to our Management Team of Line Officers and Staff what FORPLAN could do.

Bruce Vanzee, our Forest Timber Staff and my boss, told me I had to present the FORPLAN assessment. I decided to describe some basic information about linear programming and specifically about FORPLAN. This was relatively short and to the point .

Then I focused on the results. On the positive, the Tahoe could accelerate our sale program for 147 MMBF per year to 365,000 MMBF while producing more than three times our net revenue from the timber sale programs.

Then I said, "Now here is the bad news. We have to clear cut around 235,000 acres in the first decade." After considerable muttering and watching Forest Supervisor Lancaster's face turning a bright shade of red, I said something like "are you interested in how we can constrain the FORPLAN analysis to produce reasonable and implementable results?"

They quickly learned that as Line Officers, they controlled the land class and prescription choices allowed for each land class and inventory strata. I used California Highway 49 as a specific example. The question to be answered was how far out did they want to go with a visual corridor where human activities should be subordinate to the general view?

We could use an arbitrary distance, or we could develop specific boundaries based upon vegetation type size and arrangement while considering influence of specific terrain factors. We could also emphasize special features like fall colors and scenic vistas if that is what was desired. I then told them it was up to them, not the computer to design the forest conditions they would like to see.

The computer will tell them the consequences of their decision in whatever quantifiable variables they wanted to see. I also mentioned that such an analysis would keep Chris West very busy. Eventually we did hundreds of FORPLAN runs to help them refine their options for the final alternatives under consideration in the Land Management Plan EIS.

We were fortunate that our Management Team was actively involved with the decision on land class and acceptable prescriptions. In contrast, during the development of the 1977 Timber Management Plan.

They were somewhat lacking in personal involvement because we were simply implementing their existing Ranger District Multiple Use Plans. FORPLAN gave them a fresh start to completely reassess their Ranger Districts and evaluate options for management that they never had in previous planning efforts.

Final Allowable Sale Quantity [ASQ]. The ASQ came in two major classes: Reg Class 1 and 2. Reg Class volume came from lands where timber production was the main emphasis. Reg Class 2 included volume from special land classes that allowed timber harvest to achieve the overall objective for the special interest area. Those two Reg Class made up the bulk of our ASQ.

Ted Stubblefield expressed his concern about the Allowable Cut Effect bringing in too many lands, practices, and other issues that were generally not being accomplished or implemented in implementation of the plan, essentially overpromising what would be the true non-decline even flow ASQ. We had the same concerns on the Tahoe National Forest. From what I recall, here were the final potential ACE problems:

1. Roadless Areas
2. Helicopter Logging
3. Conversion of Capable and Available Hardwood types into conifer stands.
4. Inability to use herbicides

For each land classes and or prescriptions, these variables were identified for FORPLAN analysis When we completed our final alternatives, each alternative assumed that these variables were not problems to be considered and addressed in the EIS and Record of Decision.

We then ran the same alternative with each problem or ACE consideration as a restriction, so we knew the consequences and impacts on each of the resources and economic results. Of course, we were really focused on consequences on the ASQ as explained in the EIS.

In order to achieve the full ASQ for each alternative, the four ACE conditions or problems had to be solved and no longer an issue.

For example, roadless areas had to be accessible, helicopter logging had to be economically viable funding and implementation of hardwood conversions had to be available. Herbicides or significant increases in funding for brush and weed control had to be available.

If these four problem areas were not solved, they became what we called "Separate Non-Interchangeable Cuts" (SNIC). That was proposed and it was accepted by the Regional Office.

Remember that I talked about the Sierra, Six Rivers and Klamath being the lead Forests in NFMA Planning. Actually, this really hurt them. Remember that the Planning regulations came out in 1979 and were revised in 1982. The net effect of this delay was to put the accelerated forests way behind the Forests who started later. The net effect was that the later starting Tahoe National Forest was the first R-5 Forest to have Regional Office approval to be sent to the Washington Office for their initial review of the early NFMA Plans.

John Fedkiw, a PhD research economist and policy analyst, led the review and we all anxiously awaited his and the Washington Office [WO] review. When the WO review results came back, we were surprised when we got a C+ grade from Fedkew. We never knew that he gave out grades for forest planning. Anyway, his big issue was the SNIC ASQ requirement.

There was nothing in the regulations that allowed or prevented this approach. To us ground pounders, this was the only logical solution to misuse of the ACE.

Rotation ages: Determining rotation ages [the tree age at harvest] for timber stands regenerated is a key part of all forest planning efforts.

Rotation ages are not relevant to any of the selection systems, only to even age management systems. For even age management systems rotation ages are calculated at the point where Mean Annual Increment [MAI] crosses Period Annual Increment [PAI] when plotted on a graph with years on the x axis and growth on the y axis. This is called the culmination of MAI. PAI is the annual growth throughout the life of the period. For example, from Year 1 to Year 80. MAI is the annual growth for a period of time [generally ten years]. For example, from Year 70 to Year 80. Growth can be measured in either board feet or cubic feet or their metric equivalents. For NFMA Plans, we used cubic feet. Normal yield tables provide the basis for rotation age calculations.

For Sierra Nevada Mixed Conifer Stands we used Bulletin 354 as mentioned earlier. The only problem was that these tables had growth data for about 10 site classes and each one would need independent rotation age calculations. It was the same for red fir and pine yield tables.

Once we had the basic rotation ages calculated from the yield table calculations, NFMA put another major constraint on the rotation ages used in planning. The regulations stated that rotation ages should be the age where 95% of the culminated of MAI. So, for each site class in the given yield table calculation we had to take 95% of the CMAI value and find that age where that value occurred.

That would be the minimum rotation age for all similar stands in the FORPLAN analysis. Example: For a mid-range site index Mixed Conifer, the biological rotation age was around 110 years old, and yield was 220 cubic feet per acre per year at that age. You simply took .95 of that value [209 cubic feet per acre per year] and looked in the Yield Table for that site class value when the PAI was 209 cubic feet per acre per year. That was now the minimum rotation age. The rational for this was that it takes a long time to reach the ultimate biological rotation age. During the last few decades, the PAI only increased slightly as the decades increase.

Bottom line. Remember the biological rotation age for the above example was 110 years old. Doing the 95 percent calculation lowered the minimum rotation age to 60 years. What this did to our FORPLAN runs where the objective was to maximize present net value? The program initially clearcut of poorly stocked stands, plant, weed and clearcut again as soon as they reached age 60.

Clearcutting acres increased with increases in time and by the time we reached the third or fourth rotations, the area clearcut annual decrease as the age classes started to become a balance of even aged stands. It took several long-term cutting cycles to reach our goal of equal age classes across the Forest in the General Forest land class of Reg Class 1. Lands.

Economic considerations: Remember, the NFMA Regulations were written by a team of scientists that we loved to call "13 Wise Men." Included were several forest economists including Dr. Dennis Teagarden from the University of California at Berkeley. There is no doubt that the heavy emphasis on economic decision making influenced the ultimate outcome of the original NFMA Plans. More importantly, it influenced how everything was set up. The economic factors heavily impacted the timber resource area with the discussion on rotation ages above as a good example.

Another example of the impact of economics is our SNIC ACE effect [discussed earlier] on the use of herbicides. Opposition to herbicide use was huge even though we were still using the practice at the time of the planning decision process.

We had to develop intensive local costs and values for each of our practices. For herbicide use we had excellent records for the past five years on all costs associated with herbicides from planning to application to monitoring. The forest owned a Hyrdo-ax used in masticating brush that had gotten out of hand. We tried several hand cutting contracts to for our assessment of those costs. In those days, our herbicide costs were around $50/acre from planning to monitoring. Hydro-ax was about $125/acre and hand cutting around $250/acre.

We developed cost values for three slope classes, all forest types, prescriptions, and proximity to roads. In the FORPLAN analysis of no herbicide, all herbicide cost values were shut off and the program used the higher cost value and every other cost and output values like ASQ, or constraints were left as they were in the alternative under consideration. Since clearcutting was the generally the dominant first decade practice, we ended up with substantial increase in the release [free to grow above brush] cost and substantial decrease in the present net value.

The biggest impact on timber was the use of maximize present net value as the objective function for all alternatives presented in the EIS. That was mandated. For the value of our timber, we used the last five-year average selling price of timber sales by logging method, timber type. The Tahoe was one of the higher valued timber sale forests in Region 5 at that time. With our high stumpage prices and low post sale costs, maximizing present net value as the objective had some of these effects:

1. Short rotations. Carrying the cost one single dollar beyond 30 years becomes a problem no matter what the long-term values are in determining the present net value and the internal rate of return on your investment.
2. Higher value timber was an easy target in the early decades.
3. Lower cost timber was an easy target in the early decades.
4. Accessed stands were an easy target in the early decades.
5. Low-cost prescriptions with low-cost post sale treatments were easy targets.
6. The problematic ACE areas were put off into the later decades.

There were other major problems, but these highlight some of the biggest. Anything that had high cost, longer time periods, or other negative present net value considerations were put off or simply not used in the FORPLAN solution.

None of these economic decision support tools were used or available in our earlier Timber Management Planning efforts. Today, based on my experiences evaluating Forest Service timber plans and activities, economics rarely plans a significant role in outcomes let along a clear understanding of the economic consequence of their actions.

Sidelight: My final FORPLAN story

Early in the planning process, we had planning meeting where National Forest with similar conditions [For example: the national forests in the Sierra Nevada Range] would get together to talk about problems and solutions.

The early meetings centered around the use of FORPLAN. The audience was usually the individual Forest Planning Teams and the Forest Supervisors. At one of these meetings, after about a half hour of agonizing FORPLAN discussions, one of the Forest Supervisors got up and said, "I will be God damned if I am going to let FORPLAN decide how to run my forest." He must have missed the discussion on how FORPLAN was used as the tool to analyze and determine the quantifiable consequences of his instructions on where and how to manage his forest.

Conclusion:

As to the question, were the cuts set too high? The answer is "Yes" if the Forest Plan ignored the ACE factors, and the Plan did not adequately deal with the implications. The answer is "No" if the Forests were allowed to deal with the ACE problem.

We will never know the actual results of the NFMA Plans since NW Forest Plan/FEMAT and the Sierra Nevada Framework trumped all of the earlier planning efforts.

The ASQ and the ACE issues were diminished so far back in the orders of timber sale priorities that they were not even relevant. The actual accomplishments under these Regional Plans have never even come close to what was financed and projected for the preferred alternative. The real ACE today is a negative ACE resulting from the lack of management and the need to actively manage our forests.