PLANNING LEADERSHIP
A DISCUSSION OF
ONE FACET

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THOMAS R. MITCHELL, Ph.D.

Introduction

Forest planning can be a complex, difficult, frustrating effort leading to the creation of 12.5 pounds of paper used as door stops. Or, forest planning can be one of the most rewarding experiences within the careers of those involved, leading to a living, viable plan that guides management of a forest, well, for at least a decade. The difference between these two extremes is the leadership/team building/team leading skills of the planner/planning staff officer/team leader and how these skills provide an atmosphere for collaborative, creative problem solving for the planning team. Necessary leadership skills include:

- developing a sense of trust and security among members of the team
- matching personalities with "housekeeping" tasks of the team such as who will keep track of the stages of completion of various parts of documents
- discovering the motivation of each team member for joining the planning team and creating a shared vision of the purpose of the plan and what will be achieved
- a wide variety of technical skills from GIS and analytical modeling to development of public involvement/public information materials and presentations
- an in-depth knowledge of systems and ecosystems
- organizational political savvy to deal successfully with others in the Supervisor's Office as well as with Districts and the Regional Office to provide support, funding and time necessary for completing the plan
- politics, economics and sociology to deal successfully with the local communities and counties, State agencies, and the general public
- understanding of a broad range of laws and regulation including those that govern cooperating federal agencies
- development of a "language" for planning that fits the particulars of that forest, is shared among the team members and is easily understood/communicated to internal and external publics.

It would be a wonderful thing if any single person had this mix of skills and knowledge and the wisdom to use them appropriately. It also would be a very rare occurrence. There are courses and training and texts that cover many of these skills. One that isn't covered well elsewhere, though, is the last skill listed. This paper deals with that skill. That is, the development of a language for planning that is a shared language among team members, is easily understood by those not on the planning team, and that is consistent with the characteristics of the forest.

Is this a Real Problem

Is a “language” really needed for an interdisciplinary team?

Some say no.

Training for many of the professions involved in forest ecosystem planning includes, at least, an introduction to one or more of the other disciplines. This is particularly true of those with degrees in forestry. In addition, professionals who have worked on interdisciplinary teams in the past may have learned something of other disciplines and their languages.

Both of these situations are true.

Some professionals use one or the other or both of these statements to indicate that there is no need for developing a language for planning. They state that at least some of the people on an interdisciplinary team have forestry degrees and/or have worked on interdisciplinary teams in the past. Anyone selected for a forest planning interdisciplinary team, so they say, should already know the words the other disciplines use.

This may be true.

On the other hand, knowing the words doesn’t necessarily mean understanding the concept. As discussed later in this paper, even within one’s own discipline, the underlying assumptions and meanings for words and concepts might not have been fully disclosed or discussed and may not be fully understood or appreciated. It is in the process of explaining and teaching the concepts of one’s own discipline that all of the underlying assumptions, meanings and concepts can become apparent. And doing this in context of a particular forest and problems facing management of that forest with an interdisciplinary team will highlight those concepts most relevant. Concepts and assumptions brought to light here, may be different from those brought to light if the team had a different composition or were dealing with a different forest and set of problems.

In short, developing a language as an interdisciplinary team engaged in planning on a specific forest provides a mechanism for each member of the team to gain a better understanding of their own discipline and add the concepts and insights of their discipline(s) that are relevant to that forest and its problems. This also builds a language that facilitates the team working together to solve problems.

Language

Language is an interesting artifact. Without it, we can not communicate with each other. More importantly, without it, we can not think, much less solve problems. Almost as puzzling as the familiar question, “when a tree falls in the forest and there is no one there to hear it, does it make noise?” is the question “can we think about something if we don’t have a word for that in our language?” Reading works by authors who wrote years ago or decades ago or centuries ago, often we can see the author struggle to communicate a new revelation or discovery. If (s)he had written that 50 years later, it would have been so much easier, for, by then, the words, the “language” needed to discuss that new revelation would have been created and become part of common parlance. (Then again, 50 years later, the revelation or discovery wouldn’t have been new.)

Language is an interesting artifact for at least two other reasons. First, is having a single word mean many different things depending on the context of its use. This is most striking when a discipline adopts a word from common parlance and applies a very specific definition to it. In these cases, people outside the discipline think they understand what those inside are talking about, but often do not because of the differences in definition. For example, the words supply and demand are words with common parlance definitions related to the amount of something on hand (supply) or the amount that is needed (demand). To an economist, though, supply and demand are "schedules"/graphs/equations representing marginal costs and marginal revenues. The same is true about the word, average, for instance. It means one thing in common parlance and three different things in statistics.

A second phenomena that appears to add confusion is when many words are created to describe the same thing. A sigmoid growth curve is an example. It can represent response of plant growth to adding various amounts of fertilizer. The inflection point on this curve represents the point where the average increase in growth is greatest and adding more fertilizer will increase growth at a decreasing rate. This same point in economics represents the point where marginal costs equal average costs and if we are in a competitive market, this will be the point where marginal costs also equal marginal revenues which equals price or average revenue. This same "point" on a curve representing the growth of a tree is termed "culmination of mean annual increment" and then this is further altered to become "biological maturity" or the rotation age for trees. (Which, if applied in the same way to humans, would have most of us "harvested" at age 13.) And that same point on a curve representing the per acre growth rate versus number of trees per acre, represents the "full stocking" level for a stand of trees and more trees than this per acre is "over-stocked."

Implications of these vagaries of language pose significant barriers to communication within a team composed of people from different disciplines. Each discipline has a set of words that have specific meanings within that discipline and that vary from a common parlance definition. For instance, maturity as defined above for a tree and therefore, terms such as "over mature" mean something very specific to a forester. To a landscape architect or wildlife biologist or someone in the general public, these terms mean something very different – perhaps a vision of an elderly man wheezing as he walks with his cane. Thus, they all may agree in the office that harvesting an over mature stand of trees sounds like a proper thing to do. On the other hand, when they are out in the woods, they could disagree with this "prescription" violently because such stands are multi-canopied, provide vertical diversity for wildlife species, and provide a "feeling" or look of an "old growth" or mystical forest that enhances visual quality. If this type of situation, alone, can hinder effective communication and therefore creative problem solving within a team, what does it do when the team attempts to communicate with others on the forest or the public.

Complicating this situation even further, is how such languages are used in each discipline involved in forest planning. These languages tend to be "describe-prescribe" languages. In other words, a focus on classification of a stand, site, area and then based on the classification a prepackaged prescription – take two aspirin and call me in the morning. This means that the language used within each of these disciplines requires a specific set of data and measurements in order to classify an area or population. This can lead to over 400 different measurements that could be taken in the field in order to "classify" an area to meet the requirements of all involved disciplines. Not only is this a great deal of data to collect, store and process, this data can lead to confusion/disagreements in classifications. Is an area where there are trees and where the density of trees is low enough for grass to be growing under those trees part of a "timber stand" that includes neighboring areas where trees are denser but the same species and age. Or is this area part of a "range site" where adjoining areas have the same grasses and soils type. Is it neither? Is it both? Is it something that should be lumped in with one or the other neighboring areas or is it something that should stand alone. And if it stands alone, is it a range site and should be managed under range prescriptions or is it a timber site that should be managed under timber prescriptions.

As indicated in the above, each "classification" within a discipline often has a prescribed action or set of actions associated with it. For instance, if one measures the density of a timber stand and uses the correct stocking guides/tables, a stand could be classified as "overstocked" and the prescribed action is to thin that stand. This, of course, could be the opposite of a wildlife prescription for the same area based upon a need for hiding cover and/or vertical diversity within the larger area. Both of these prescriptions are correct within their respective disciplines but they call for exactly the opposite action on the stand. If two of the professions involved can not agree on what to do in an area, how can the team members representing those professions agree. As a result, the various languages imbedded in each discipline pose severe complications/limitations on a team's ability to work collaboratively and in a creative problem solving manner. In fact, differences in these languages, imbedded value judgements (over stocked, over mature, etc.), and prescriptions often lead to more disagreement and conflict than they do to collaboration.

This brings us to another barrier to "creative-problem" solving. Each prescription within a discipline was designed to achieve a specific goal/purpose. Often, these goals or purpose are implicit/unstated. For instance, most timber prescriptions are designed to achieve the maximum biological yield of saw timber; not the maximum volume of timber nor the maximum habitat for wildlife that use timbered areas as part/all of their habitat nor maximum amount of pole timber or non-motorized semi-primitive recreation, but the maximum yield of SAW TIMBER. Thinning guides are designed to place the full amount of available growth on the fewest number of trees on a per acre basis so that trees can grow to saw timber size as soon as possible. Selection of a harvest age at biological maturity where the annual growth rate is maximized (culmination of mean annual increment) maximizes volume of timber grown per acre. Though this is the purpose for which stocking guides and prescriptions were developed, this purpose is rarely stated or prefaced or footnoted. But professional foresters are taught that to be professionals, they should follow these stocking guides as well as harvest trees when they reach culmination of mean annual increment. Further, tools, such as timber harvest scheduling models, assume the same goals and purpose without explicitly stating this – if the planning team is not careful in application of such models, this can lead to having a computer model generated result, which must be correct because the computer said it, that was designed to achieve a goal that probably has little to do with managing the forest, solving problems facing that forest or maintaining the health and viability of ecosystems on that forest. So an on-the-ground practitioner assumes that to be a "professional" one applies the prescriptions as defined in her/his profession – in this case, in silvicultural guides, without ever questioning if the goal/purpose of that prescription fits the current situation.

What if the purpose of forest management is not producing the maximum biological yield of saw timber or maximizing the genetic variation among individuals within a wildlife species population or producing the maximum amount of forage for domestic livestock or maximizing the visual quality of a forest or any one of the many imbedded/assumed goals on which prescriptions are based. If it is to provide habitat for viable populations of all wildlife species, promote ecosystem health, provide a mix of recreation opportunities as needed/demanded/wanted by local, regional or national publics, then the languages of the various disciplines and associated prescriptions provide little to no guidance as to what to measure, how to classify the forest/parts of the forest, or what to do in terms of necessary actions. These languages, then, and associated prescriptions and goals brought to the table by each team member do more to hamper collaborative and creative problem solving than to foster understanding.

All of the above means that:

- communication among team members is hampered for each has been trained to use a different language associated with her/his own discipline.
- these different languages require different measurements for their classification schemes and this can overburden resources available for data collection, storage and processing.
- each language has imbedded value judgements/statements that impede understanding and communication (fair condition with improving trend, overstocked stands, poor vertical diversity, high quality water, etc.).
- each language has an assumed set of goals that are important to that discipline only and probably have little to nothing to do with the goals of managing a national forest.
- prescriptions provided by each discipline are narrowly focussed on a single aspect of a complex ecosystem and adherence to these will stifle all efforts at creative problem solving.

All of the above, though, is not saying that there is no worth in each discipline. On the contrary, the reason for having many disciplines represented as part of a team is that there is great knowledge imbedded within each discipline. This knowledge is essential for:

- assessing the current condition of the forest and included ecosystems
- identifying current and emerging problems that effect health and viability of these systems
- identifying sets of actions that will improve this health and viability
- creating ways to apply those actions that will lead to "production" of those things desired from the forest by the American public.

In sum, the knowledge locked within these disciplines is necessary and essential to forest planning. The problem, simply put, is to create a language where this knowledge is available to the team and all other interested parties without the burden of imbedded classification schemes, prescriptions, value judgements and goals. The problem is to develop a knowledge rich language that fosters collaborative and creative problem solving.

Language Development

Development of a language for forest planning is something that needs to be done on the local forest by the team doing the planning. All the rest of the planning process depends on this language, so it is very important that those doing the planning "own" this language. Developing such a language is a two phase process. Phase one is exploring, sharing and learning the knowledge imbedded in each discipline. Phase two, is applying that knowledge to the specifics of the forest in a way that creates a language for collaborative, creative problem solving by the team as well as by the team working with internal and external publics.

Phase 1. The purpose of the first phase is to extract the knowledge of each discipline without being tied to the imbedded goals, assumptions, prescriptions and value judgements of each discipline. Also, it is a time for generalizing that knowledge to some extent so that discussions and problem solving can take into consideration the changes that will occur over time and space. This is needed because there is a tendency in the "describe-prescribe" approach within most disciplines to focus on classifying the current condition of small areas/stands/sites and prescribing actions to be taken to move that specific area to a "desired" condition as defined by that discipline with little explicit consideration of time based changes or the spatial juxtaposition of other sites. For example, if you measure a stand of trees and it is "overstocked", then the prescription is to thin the stand to a desired stocking level. Implicit in this is that the trees will grow fatter faster over time, creating more saw timber sooner and be more valuable when these trees reach maturity/rotation age – with the implied action to harvest those trees when they do reach maturity. This string of events and alternative time streams of events are included only by implication in the prescription to thin the stand. This first step of developing a language must make such implicit implications explicit so that they are understood by all on the team.

Phase 1 is best accomplished "out in the field" but if the team has a good imagination, it can be done in the office as well. At first, it will require a good discussion leader who can keep the discussion focussed and who can help the team sort through the value judgements imbedded within their disciplines. So what does a team do at this phase?

There is an old story of the five blind people who each touch a different part of an elephant and try to decide what it is. In that story, each tells the others what (s)he thinks the elephant is like. Also, in that story, as each attempts this telling, the others disagree and there is an argument. Phase 1 in language development follows this story but attempts to avoid the disagreements and arguments. Generally, it follows these steps:

1. The team starts by walking into a site on the forest; e.g., a timber stand, a riparian area, an open area, a range site, a willow patch.
2. Each team member spends time examining the site and perhaps neighboring areas as well.
3. Members are gathered, someone is assigned to take notes, and each team member describes what they "see."
4. It will be normal for some to start using words/terms specific to their discipline: this is an over mature stand of hardwoods on Site Class 1 lands. When someone uses such terms, they must be challenged to describe what each of those terms means and the implications of these classifications. For instance, an implication of an over mature stand on a highly productive site is that the stand should be harvested as soon as possible and a new, vigorous stand of trees started. The implication of that is that the purpose of management is to maximize the biological yield of saw timber from the forest. The implication of that is that this prescription probably isn't suitable in context of forest ecosystem planning and management.
5. As each team member describes the site in their terms and then defines the terms being used as well as the "prescription" implications, the knowledge from that discipline starts to emerge. By making the imbedded assumptions and implications explicit, they can be winnowed from the kernels of knowledge included in that discipline's classification of the site. These kernels of knowledge often are as much of a revelation for the person representing that discipline as they are to the others on the team.
6. After each team member has gone through this exercise and presented what they see on this site to the satisfaction and understanding of the others on the team, a second question is posed to the team. That question is, what is the role of this site in its surrounding area. This question forces each member of the team to start seeing the forest rather than the trees. Most natural resource disciplines force a focus on small areas – a timber stand, a range site, an opening, a riparian area. The interplay/ecosystem dynamics between stands, sites, areas are often lost. Of course, there are disciplines included which take a broader geographic

perspective such as the landscape architect looking at "viewsheds", the hydrologist dealing with watersheds, or the wildlife biologist looking at the home range of larger animals and the role of this site/stand/area within that range. Again, each member of the team is extracting from their discipline the knowledge of that discipline and explicitly discussing that with the others. This is a discussion of the spatial dynamics of involved ecosystems. It can also be a discussion of the spatial realities from a management perspective. For instance, if this is a stand of timber on very productive soils, but it is over a mile to the nearest road, there are no other stands nearby that could be harvested at the same time and no other reason to provide access to this area, then harvesting timber here may be prescribed but is impractical. Discussions such as these improve each member's understanding of their own knowledge while at the same time, expanding the knowledge and understanding of all of the other team members.

7. The next question to be addressed by each team member is what is going to happen over time – to this stand/site/area and to the larger geographic area(s) discussed in item 6. In item 6, those who dealt with vegetation in their discipline were at a slight disadvantage for looking over space/geographically is often not included in their view. In item 7, those who often look over space/geographically are at a slight disadvantage for they normally focus on classifying and dealing with what is here now and not how that is going to change through time. It is here that the forester or range conservationist or botanist/plant ecologist can describe the natural growth and succession of plants on this type of site. That though the site now has a full canopy cover, in 10 or 15 or 20 years, insects will attack and kill most of these trees, as these fall, fuels will build up and grasses, shrubs and new trees may start to grow, etc. It is in these discussions that the time dynamics of involved ecosystems will be explored and brought to light.

8. Repeat items 1 through 7 for each type of site/stand/area on the forest. Actually, as this process is implemented, after 6 to 12 sites, discussions become repetitive and of marginal value because, by then, each team member has examined and brought into these discussions much of the knowledge they posses and much of the knowledge imbedded within their discipline. When this appears to be the case, modify the process. In this modification, have each member switch disciplines. For example, have the wildlife biologist expound on the silvicultural aspects of a site, the timber specialist describe the visual characteristics of the site, the landscape architect the hydrological characteristics and the soils specialist the wildlife characteristics and implications of the current site within the broader geographic area. Continue with this modification until everyone feels comfortable expounding on a site's characteristics from at least two if not three or four different disciplines. That is not to say that they are now all silviculturists or wildlife biologists or soil scientists, but that they all have an understanding and appreciation for what the other members of the team know and see and would prescribe if they were to stay with prescriptions from their own disciplines.

At the end of this process, four things of importance have been accomplished.

- Each member of the team has examined their own discipline, separated its knowledge from its imbedded assumptions and goals, examined its "prescriptions" and value judgements in light of other "views" of the same stand/site/area and dealt with the insights that discipline provides over both space and time. In short, each specialist has become much more knowledgeable about their own discipline.

- Each member of the team has learned some of the knowledge from the other disciplines included on the team. This includes developing an understanding of the value judgements and value laden terms of the other disciplines and the imbedded goals and assumptions included in the other disciplines. Combined with the revelations they have gained about their own discipline, they are developing a core understanding of the ecosystems of this forest.

- The team also has started looking at the spatial and temporal aspects of forest ecosystems. One or the other of these normally is missing in a specialists view. Those disciplines dealing with vegetation focus on small areas and temporal changes. Those disciplines dealing with large areas such as hydrology, visual quality or biologists who deal with habitat for wildlife with large home ranges, focus on patterns and spatial juxtaposition of ecosystem components. After this exercise, each member has been exposed to thinking about spatial and temporal patterns, changes, and how such factors effect how they view what is on a site, now.
- The team has moved from being a team of representatives of various disciplines – a multidisciplinary team – toward being a team where each member has knowledge from and a broader understanding and appreciation of the other disciplines – an interdisciplinary team.

At the end of this first phase in developing a language, the team has progressed to a point where they are able to deal with the systems nature of a forest. This process has shed light on the assumptions and goals and value statements that often lead to disagreements and hostility on such teams and the team has discarded these. What is saved is the knowledge from each discipline and implications of that knowledge over both time and space. Also, the team has started integrating the kernels of knowledge from each discipline to provide a basis for analysis of current ecosystem conditions on a forest as well as collaborative and creative problem solving. Finally, the team is now poised to use the knowledge it has uncovered to develop a language for planning.

Phase 2. Phase 2 involves collaborative, creative problem solving on the part of the ID team to forge a language/basic structure on which the rest of the planning process will be based. All work from this point on in planning will be based on and use the language developed at this step. Further, the language developed at this time will become the design criteria for all on-the-ground projects needed for implementation of the plan as well as monitoring and evaluation efforts. This is a phase often missed.

Simply stated, this phase involves design of dynamic equilibrium states of various types for all of the ecosystems on a forest with an emphasis on those that resolve "problems" facing management of that forest. Though the process for accomplishing this phase is fairly straight forward and doesn't require an understanding of the theory, a short discussion of some of the theory involved appears necessary.

A concept that seems to have been well learned by most is one often referred to as "cause and effect." This concept suggests that there is a simple, linear relationship between a cause and an effect – I hit a ball with a bat (cause) and that causes the ball to fly through the air (effect) – a nail in the tire caused it to go flat – loss of its wings caused the model airplane to fall from the sky. Though this concept is so easy to understand that it is pervasive in society, it is … at best, an over simplification and at worst, just plain wrong. Being over-weight is caused by over eating, so if we want to lose weight and keep it off, all we have to do is reduce how much we eat – right? – WRONG! If losing weight were that simple, then we would all be slim/trim and companies like Weight Watchers would all go out of business quickly.

Problems with the over simplification of linear cause-effect relationships become apparent when dealing with complex systems. This is one reason some who work with systems use the term "counter-intuitive behavior." Because from a simple cause-effect relationship, it would be intuitive that cutting down on calories will lead to long term weight reduction. But it doesn't, so we say, the system is counter-intuitive.

If cause-effect is not the concept, then what is?

I smack a ball with a bat … when the bat comes into contact with the ball, the force of the momentum of both the ball and the bat cause a change of "state" for both the ball and the bat – they deform. The ball, often because it is less hard that the bat, deforms more than the bat. Both the ball and bat as systems, react to this changed state through their elasticity and try to spring back into the shape they were before being deformed. It is this "springing" back into their original form that provides the force for the ball to soar through the air away from the bat. The "harder" the ball – to a point – the greater the elasticity of the "ball system". So tightly wound strands of rubber surrounded by a covering with a solid core will have a higher coefficient of elasticity and its springing back into shape will propel the ball further than a softer ball – a softball - and more than a rubber ball filled with air – a beach ball.

It is not: 1. Cause and then 2. Effect. It is more like:

1. An action (hitting the ball) changes the "state" of a system (deforming the ball and instead of having equal compression throughout the inside of the ball – part of the ball is compressed much more than the rest of the ball).
2. The inherent properties and internal operation of the system react to this changed state (the ball tries to equalize compression within itself by "springing" back into shape).
3. The "springing" back into shape against the bat provides the force for the ball to fly in the opposite direction.

Or more simply, actions change the state of a system, the system reacts to this changed state, and the system in this changed state creates what we define as effects.

What effects are produced depends on many factors. For the ball, this included its "hardness" and the elasticity built into it. For a system, it depends on the state of that system before actions were taken, the "health" of subsystems in terms of carrying out their "normal" functions, and the relative impact of the actions taken. Nicking one's self with a knife while pealing onions versus severing an artery are examples of "relative impact." Nicking a finger may cause you to bleed. but your body will quickly recover; well it will assuming that you have blood clotting agents operating at normal levels in your body, that you are not anemic or sick or that you are not allergic to onions. If you are sick or anemic or allergic or suffer from a disease where the clotting agents are non-functioning, this "action" may result in dramatic reactions within your body and ensuing dramatic "effects."

This concept is true for all systems including ecosystems. Actions that we normally call "causes" change the state of a system and/or one of its subsystems, the "normal" operation of that system in this altered state creates what we refer to as "effects." And again, the "effects" created by the system are dependent on the condition of the system before the actions were taken as well as the "health" of the system. What effects are produced when a 20 acre stand of mature hardwoods is cut? It depends. It depends on … site specific things like the slope, aspect, and soil type of the area, proximity factors such as the nearness to streams/lakes/aquifer recharge zones or whether it was the only stand in an area or if it was surrounded by other stands of mature hardwoods and factors related to its role in the larger systems of the area such as if it was a wind block for a home or field, if it is along a travel path/migration route for wildlife, if it is in a viewshed of a town or highway, etc.

We plan and manage many systems. The way we "manage" them, often, is by managing their "states". We determine what state various components/subsystems of the system must be in in order for the system, operating within its environment, to produce outputs that we desire. For instance, the pilot of an airplane changes the "state" of the airplane as (s)he adjusts flaps for take-off. This new setting provides greater lift at lower speeds. As the plane lifts off the ground, and the plane gains in speed which increases lift, that amount of lift provided by the flaps is no longer needed. So the pilot adjusts the flaps to reduce the amount of lift being provided by the wing. This change in the state of the airplane can cause the plane to go even faster and going faster means that the amount of lift being provided by the flaps is no longer needed and the pilot can reduce the flaps even more until they are fully stored. The pilot "flies" the airplane by changing the state of the system and knowing which changes will produce the outputs of speed, direction, attitude, and altitude desired for our trip from the bleak Milwaukee winter to the sunny beaches of Jamaica.

One last theoretical bit. We often manage systems to produce a "steady" output/effect – e.g. sustained yield. This requires continual actions on our part. For instance, in the plane example above, for at least part of the trip, we want to maintain a steady altitude and speed. To do this, the pilot is continually adjusting the amount of fuel the engines are using to provide the speed and because burning this fuel changes the weight of the airplane, the pilot is continually adjusting the "trim" on the plane so that just the right amount of lift is being produced by the plane passing through the air. The plane can be considered to be in a "dynamic equilibrium state" at this point. The desired altitude and speed are being maintained – are at equilibrium – but this is taking continual action of the pilot to make adjustments to the system to maintain that equilibrium – it is dynamic.

(This is putting "new clothes" on a concept as old as forestry. The concept of a "normal" forest is a dynamic equilibrium concept. That is, once you have an "even distribution" of age classes on a forest, you can, theoretically, harvest the same amount of timber each year/decade for ever. The "equilibrium" is the age class distribution and the amount of timber produced. The "dynamic" is continual harvesting of those acres that reach maturity so that they can then become the youngest stands and thereby maintain the even age class distribution.)

Restating the purpose of phase 2 then, it is to identify forest ecosystem states that can be achieved and maintained through time and these "ecosystem states" are designed so that when parts of the forest are in each of these states, the natural systems, interacting with their environment, will produce "effects" that are desired. (Planning is the design and selection of states to be achieved and management becomes the continual actions necessary to achieve and maintain those states. So what would monitoring and evaluation be?)

With this as a theoretical background, the process for phase 2 is as follows:

1. List, on separate sheets of flip chart paper, "problems" facing management of the forest. As each problem is written at the top of a sheet of flip chart paper, do the planning thing and rip it off the tablet and tape it to the walls. At the end of this exercise, the room should be well papered by these nearly empty sheets of paper – one problem per sheet. Examples include:

    - Local saw mills need timber to stay in business

- Some are requesting more opportunities for rock climbing
- Provide habitat for a viable population of an endangered woodpecker
- Elk are coming down to winter range early even in mild winters and are staying much later in the spring
- Use of some "jeep" roads developed in the late 1940's are causing erosion in some areas
- Because of fires and off forest construction, stream temperatures are rising and may cause a problem for fisheries.

2. One at a time, each problem is examined and the ID team is asked to describe the problem and its context. For example, the fourth problem above dealing with elk. They appear to be spending more time on winter range. This causes a problem because the condition of that range appears to be declining and the carrying capacity decreasing. In response to questions of why elk might be doing this, the wildlife biologist suggests that there may be a problem along the migration route. Past aerial photographs and maps are examined for changes along migration routes and it is discovered that over time, trees have invaded "open" areas of grass along migration routes. These areas were the result of wildfires in the more distant past and had provided spring-fall habitat for elk. With the tree invasion into these openings, there is less food for elk along migration routes, so they rush to get to the winter range.
3. Based on an examination of the problem, the team is asked to identify what an area would look like if it were to provide spring-fall range for elk. This could be something like:
   - It has to be along a migration route
   - There would be areas providing grasses, etc., that elk eat
   - These "open" areas will be used as long as they are within 300 yards of hiding cover, of areas where there are trees old enough and dense enough for an elk to feel it is hidden from view
4. The team is then asked, how could such a condition be achieved along the migration routes. Given that the problem has been caused by trees "invading" what had been "openings," an answer to this question could be, to cut trees when there is a large area of forest cover with no or few openings. This could become even more specific. For instance, the team could specify that within a larger area, there should be 12% to 17% of the area in "openings" and that such openings could be as small as 5 acres or as large as 30 acres – anything smaller or larger would probably not be used by elk in the spring-fall. Further, that such openings should have hiding cover along at least 75% of the border of that opening.
5. The team is then asked, how this condition could be maintained through time. This could lead to a conclusion by the team that cutting timber on an 80 to 100 year rotation through out the winter range area could create this condition and then maintain it through time IF harvests were spread out throughout the area each decade, followed the design criteria of 5 to 30 acres in size and were designed to provide cover around each created opening. Also, to create the additional "open" needed, roads used for logging could be seeded with grasses and closed to motorized vehicles when not used to support logging – for at least 7 out of every 10 years
6. Steps 2 through 6 are repeated for all "problems" and the conditions are described on the same flip-chart sheet as the problem.
7. The team is then challenged to identify "conditions" as listed on these sheets that could be achieved simultaneously on the same area and thereby address several problems at the same time. Again, using the above example, it would be relatively easy to see that creating the

condition necessary to provide spring-fall range for elk would provide about the same amount of timber each decade. As such, achieving this condition while assuring that the cutting can be done in an economically viable way addresses the elk spring-fall range problem AND the at least in part, the "problem" of supplying local sawmills with a steady flow of timber.

8. As the team works on combining these two conditions into a single condition statement, it is noted that with the addition of a couple of more criteria, this condition could help provide a solution other problems – an area for hiking, cross country skiing, snowmobiling and horseback riding (semi-primitive, non-motorized recreation). So add:

   - the edges of the openings will be blended and feathered with adjoining stands and be of irregular shape
   - slash will be hydrochopped after logging so that it is less visible
   - roads will follow natural contours and avoid straight stretches when possible
   - roads will be closed to motorized vehicles when not used for logging operations except for snowmobiles traveling over snow.

   An attempt is made at steps 7 and 8 to create a single condition that can address several "problems" simultaneously. This is done for at least two reasons. First, with limited budgets, if you can accomplish more than one purpose in an area with a single "action" then this is efficient use of resources. Secondly, and more importantly, this is just recognizing a basic fact of ecosystems. That is, no matter what you say you are managing for – timber or recreation or wildlife – you are working with a natural system where timber will grow and recreation will occur and wildlife will do what wildlife do out in the woods. Stating that you are managing for timber in an area, for example, will not stop squirrels from living in the trees or deer and elk to pass through or bears using the area for denning or recreationalists hiking or couples walking through holding hands. As in the elk spring-fall range example, stating that you are managing for elk habitat doesn't mean you aren't managing the timber in the area. You are. Even if you weren't cutting it to make openings for elk. But in this case, you are managing the forest stands here actively in order to provide those openings. In short, an ecosystem produces mixes of "outputs" naturally and continuously. It is like the prepackaged 6 packs of miniature cereal boxes. If you want frosted flakes, you have to buy the sugar smacks as well. (In this context, what is the "management emphasis????")

9. Repeat steps 7 and 8 as often as needed to capture all of the various combinations of the conditions identified as solving specific problems. Make sure there are conditions developed/designed for each ecosystem type on the forest and that each condition specifies what "lands" on the forest it can be achieved; e.g., the condition designed to provide spring-fall range for elk can be applied to migration routes used by elk. Achieving it in other locations would not address the elk habitat problem/management objective. It will only work along migration routes to provide the "effects" for which it was designed.

10. The team also needs to make sure they have identified conditions that are needed to achieve basic forestwide goals such as providing habitat for viable populations of all native wildlife species, providing ecosystem health of the various types of ecosystems represented on the forest, and meeting the "role" of the forest within the larger "eco-regional" area; e.g., the Greater Yellowstone Area or the upper lower peninsula of Michigan.

11. For each condition, include direction deemed appropriate for what to do if a fire or other "harmful" agent breaks out within areas managed to achieve that specific condition. For the elk spring-fall range example, this may call for immediate suppression activities for fire because there is a need to maintain an appropriate mix of cover and openings. For others,

such as conditions developed for wilderness areas or areas managed to allow natural processes to operate without actions by humans, direction for dealing with wildfire could be to allow it to burn as long as it is not threatening other areas where fire should be/would be suppressed.

12. Finally, deal with financial realities facing planning and management of a national forest. This includes identifying, for each ecosystem type, a condition statement that has little more than to monitor natural processes within that area and allow minimum level of use of that area. This is needed because budgets for management are often limited.

Once the team is assured that they have identified all realistic combinations of conditions that solve problems facing management of the forest (and that includes such things as conditions necessary for maintaining the health and viability of all ecosystems), this process is complete. The conditions created through phase 2 are the "language" to be used in planning on that forest.

- Each recognizes the ecosystem nature of forests and that ecosystems simultaneously produce mixes of "effects"/goods/services.
- Each is based on the knowledge imbedded within natural resource disciplines.
- Collectively, they provide guidance for how to maintain the health and viability of all ecosystems on a forest
- Collectively, they address all problems facing management of that forest
- All assumptions and implied value judgements often included in "prescriptions" for natural resources have been made explicit and often discarded.
- Collectively, they embody the combined knowledge of the specialists on the interdisciplinary team. This "knowledge" is stated in terms of descriptions of what an area could look like if it were managed to solve a set of problems and the specification of what areas on the forest are candidates for each condition. A picture – even just a word picture – of what part of the forest would look like if a condition is achieved is readily understood by others on the forest and the general public. This picture as well as a description of the effects that will be produced (e.g., increased spring-fall range and subsequently higher quality winter range for elk, saw timber, some pole timber, and areas for snow-mobiling, cross country skiing, hiking and hunting) provides everyone with an explicit understanding of what to expect and why this forest condition was designed.
- Use of these conditions as a language fosters collaborative planning with those in and outside the forest. Use of conditions – dynamic equilibrium states – for ecosystems eliminates the conflicts born of opposing "prescriptions" for an area and if it will be managed under a wildlife prescription or a timber prescription or if it will be managed under a recreation emphasis or a timber emphasis. These terms and prescriptions have been discarded. What is left are conditions that if achieved on some part of the forest, will produce a MIX of goods/services/outputs in an ecologically sound manner. The practices applied are not to "produce" the outputs, but are applied to alter the state of the ecosystem so that it, interacting with its environment, will produce the desired mix.

  It could be, that some in the public who had been life long antagonists find themselves supporting the application of the same condition to the same area of the forest. Imagine a person very interested in the viability of elk who had always fought timber operations because they seemed to negatively impact elk. They now see an area along the migration route and find that to improve habitat for elk, the planning team has devised a forest condition/ecosystem state. They support application of this ecosystem state to that area. And so do those who work for the local sawmill because that ecosystem state will provide a continuous and sustained yield of timber that the mill can bid on. In short, the artificial arguments between timber and recreation and wildlife and water concerns disappears, old antagonisms that often had no real basis in how ecosystems operated have evaporated, and everyone is better able to sit around a table and examine real possibilities and alternatives.

There are many implication for the rest of planning that stem from the above that simplify the entire planning process and make it transparent to all involved. Discussion of these in detail is beyond the scope of this paper, but included could be:

- Implications on what data are needed to support planning (probably less than that listed from the various disciplines involved)
- Use of GIS to support planning in such terms as identifying where each condition/ecosystem state could be achieved, what others could be achieved on the same spot, current conditions of that area, projections of what could happen under different scenarios over time, etc.
- Use of analytical models including coordinated use of timber harvest scheduling models and other linear programming model formulations to provide information for creating and analyzing alternatives
- Ability to provide interest groups and interested individuals to use the ecosystem states created by the planning team and maps of the forest to create their own alternatives and the ability to "model" these and provide feedback on the results.
- Ability to provide interest groups, other agencies, researchers and scientists with the opportunity to create/design other ecosystem states they feel address problems better/more efficiently or more acceptably or with less energy used or for less money or …
- Ability to tier project level environmental analyses to the analyses for the Forest Plan in a legally defensible way.
- Ability to provide guidance for project design and implementation
- Ability to simplify the entire monitoring and evaluation effort (two questions – are the conditions being achieved and maintained – yes or no and are they having the desired/predicted results – yes or no.)

Conclusion

Forest planning is required by law. But more importantly, forest planning is needed for good management of forest lands. Without it, managers are in a reactive mode. They are left to try and identify projects to implement on a piecemeal basis in reaction to a present crisis. Ecosystems operate over time and space and these temporal and spatial considerations are not captured in discussions of where we are going to get the cut to meet our target this year or what are we going to do with the little watershed money we received. Forest management that recognizes ecosystem health and viability as a goal must be done within a framework of planning that has taken such factors into consideration.

Current natural resource disciplines and current interest groups often do more to hamper appropriate planning than they do to foster it. This appears, in part, to be due to artificial/not real divisions created over time through lack of understanding. Each discipline has its own language, its own imbedded value judgements, its own goals. These were developed to provide easy to learn processes for accomplishing those very specific goals. As such, though, they force those who want to be “professional” into “prescribing” actions that may be detrimental to the overall goals of ecosystem health and resolving specific problems facing management of a forest.

Similarly, interest groups often approach discussions in an adversarial manner. We support wildlife states one group and we know that logging often negatively impacts habitat, so we are against logging. And of course, that seems to put those whose livelihoods are tied to harvest and milling of trees on the defensive and soon you have arguments and fights and disagreements. When, in reality, harvest of trees can be and often is needed to provide habitat of wildlife and the debate/discussion is not on one or the other, but what mix of wildlife and forest products versus a different mix of wildlife species and forest products makes sense on a specific location on the forest.

Forest planning is needed and needs a language – a language that deals with the realities of ecosystem operations and can support collaborative and creative problem solving. The languages of the various disciplines and interest groups and of management emphases and … are barriers to this understanding and foster disagreements rather than collaboration and debates rather than creative problem solving.

The two phase process in this paper separates the kernels of knowledge imbedded within each discipline from the value judgements and assumed goals of these disciplines. This process transforms a multidisciplinary team into an interdisciplinary team. It provides a mechanism to deal explicitly with the ecosystems and their health and viability on a forest. And it provides a language that is easily understood by all involved and on which collaborative and creative solutions to forest management problems can be created, examined, analyzed, selected, implemented, monitored and evaluated.