

The challenge of adaptive forest management: Aren't people part of the ecosystem, too?¹

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Introduction and Overview

It is hard to imagine a time in history when those of us whose livelihoods depend on the forest have confronted so many challenges, so much change, and so much complexity. I am the fifth generation of my family who has had the privilege of working in this business. My great-great grandfather Frederick Weyerhaeuser had a vision and commitment about the need for responsible forest stewardship. But I suspect even he would be astounded by today's issues and debate surrounding commercial forestry.

I would like to explore just some of the forces that I see influencing and significantly changing forest management. This paper is not about forestry as a "business" in the conventional sense of products, markets, technology, and financial performance. The emphasis instead will be on the emerging school of thought now referred to as adaptive forest management.

The concept of adaptive forest management is a relatively new, but increasingly used, part of our collective vocabulary. The adjective, "adaptive," implies the need to adapt or continuously improve our practices based on better science, the lessons of experience, and constantly evolving public expectations.

One of the keys currently unlocking new knowledge about forest ecosystem dynamics is the scientific study of natural change — that is, change unrelated to human activity or intervention.

I begin with accounts of about a handful of "natural," large-scale changes that devastated forest environments. With one exception, I have vivid personal recollections about each. They include the 1962 Columbus Day storm in the US Pacific Northwest, a tornado in Arkansas in 1978, the 1980 volcanic eruption of Mount St. Helens, and huge forest fires in Saskatchewan in 1995 and in Alberta in 1950.

Each of these large-scale natural events resulted in major forest devastation. Each demonstrated the resilience and recuperative power of forest ecosystems. And each taught us valuable lessons about the benefits of an adaptive approach to forestry.

Second, I would like to share how the company's operations in Alberta are shifting toward ecologically-based forest management processes. I would like to review in general terms how we are thinking about adaptive management in the boreal forest, and how it differs from traditional forestry.

Third, I would like to address the current forest preservation campaigns, and the challenge of predicting what values people will want from the forest in the future. Public wants and perceptions profoundly influence what we do in the forest. Changing public expectations are clearly driving a more adaptive approach to forestry.

At the outset, please know that I strongly believe that people are part of the ecosystem. With a growing population and increasing global demand for fiber, for both commercial and subsistence use, forest products will continue to make a significant contribution to the quality of human life. The forests are solar-powered, renewable, recyclable, and sustainable.

Over the past century, we have witnessed a seismic demographic trend, whereby the majority of population in the developed world now lives in urban areas far removed — often by continents — from the commercial forest. Urban publics often think of forest ecosystems as static, fragile and threatened, in need of protection, or restoration. This growing mass of the voting public is increasingly inclined to raise significant questions about forest practices, and ultimately about man's role in nature.

New information from both pure science and social science are today influencing the future direction of forestry in Canada. They are influencing the scope and content of the roles of forest professionals, business people, regulators, and academics. The challenge is to better understand how people think about nature, and why.

Finally, I will conclude with some personal reflections on how adaptive management — which will be driven by a better understanding of the forest ecosystem response to disturbance, human or natural, and by better integrating social values — can create a new and stronger foundation for the future of commercial forestry.

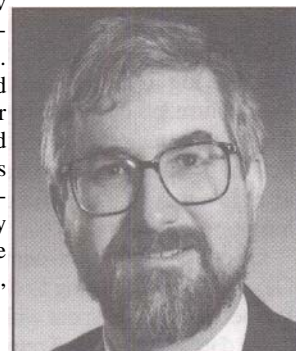
Nature isn't Always Benign, Benevolent, or in Harmony

As noted earlier, the study of ecosystem response and forest recovery after natural disasters enables us to learn about forest dynamics both with and without human intervention. For example:

The worst storm in the recorded history of the Pacific Northwest in the United States hit on October 12, 1962 — a day observed in that country for commemorating Columbus' discovery of America. It thus became known as the Columbus Day storm, and in meteorological terms, it was designated as a typhoon. I was almost nine years old.

As I vividly recall, roofs were torn from houses and roads were clogged with downed trees and power lines. Forty people lost their lives. In Washington and Oregon, over 52 million cubic meters of timber blew down. This is a volume equal to one and a half years of annual harvest in those two states.

About 20% of that downed timber occurred on Weyerhaeuser lands — enough wood to build more than 250,000 average-sized, single family homes. About 70% was mature Douglas-fir, with



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the balance made up of hemlock, white fir, and cedar. The financial risk to the company was significant. Within days, forestry crews began to clear roads and begin salvage and regeneration operations. The salvage volume completely overwhelmed the company's sawmill capacity, as well as the capacity of other domestic producers.

Out of natural disaster emerged new opportunity. Demand for wood-based housing was just beginning to grow in Japan. Marketing the salvaged timber provided a safety valve for the massive log inventory created by the Columbus Day Storm. This in turn led the company toward a long-term commitment to offshore markets for timber and manufactured forest products in the Far East. We learned to adapt to this natural disaster in a way that benefited the company significantly in the long term.

Of course, what I remember as a kid about the Columbus Day storm had nothing to do with new market opportunities. I remember a night spent with trees and branches crashing down in the darkness outside. I remember "adapting" to ten days without heat, electricity, or water from our well.

My second "close encounter of the natural disaster kind" was a tornado I experienced early in my career, when I was a contract logging administrator in DeQueen, Arkansas. One day I was out in the forest monitoring log flows. Mid-day, a storm approached from Oklahoma. The sky darkened; the wind was blowing so hard, the rain was falling horizontally. Fascinated as I was with log flows, I abandoned my post when I learned over the radio that the storm was classified as a tornado.

The next day, when helicopters surveyed the storm's path, we found much of the damage was in my area. Tornado damage was different from the damage of the Columbus Day storm. In tornadoes, the wind twists and snaps the trees about ten feet from the ground. Falling and skidding the timber for salvage is slow and treacherous. I moved two logging contractors into the area, and cleaning up the damage took months. We replanted immediately.

The experience caused me to reflect again on the power of nature, and the frailty of humans and trees.

The third natural event I would like to touch on is the eruption of Mount St. Helens in Washington State, on May 18, 1980. This was the largest single loss of timber ever experienced by the company, and resulted in a new chapter being written in our policy manuals – forest regeneration after a volcanic eruption.

Before erupting in 1980, the volcano had been dormant for 123 years. The eruption triggered landslides, glacial melting, and massive flooding that swept away roads, settlements, and bridges. Fifty-seven human lives were lost. As well, 221 homes were destroyed, 5,000 black tail deer were killed, along with 1,500 elk and 200 bears. The loss of birds, small animals, salmon, steelhead, and trout was estimated to be in the millions.

When it was over, the mountain peak was almost 400 meters lower. In total, 61,000 hectares of mature forest was scorched or flattened by the blast – over 26,000 hectares of private company lands. The volume of merchantable timber downed on company land was estimated at 22 million cubic meters.

Once trees are downed in the coastal region at the Pacific Northwest, the process of decay begins immediately. Hence, salvage and restoration efforts were a high priority. While we

had experience dealing with regeneration after fires, and had limited experience dealing with typhoons and tornadoes, volcanic destruction and ash was another matter. Research efforts were coordinated with public agencies and universities about how to regenerate conifers in soil covered by up to three feet of volcanic ash.

At its peak, the salvage operation was producing 600 truckloads of logs each day, and it was completed in about two years. Reforestation began immediately after the stands have been completely salvaged. By the time replanting was completed in 1985, more than 18 million seedlings had been replanted.

Since I was still living in Arkansas in 1980, I did not take the eruption of Mount St. Helens as personally as I had the Columbus Day storm, or the Arkansas tornado. But I soon learned that a research area I had worked on in 1977 was located within the blast area. It no longer existed. My carefully mapped sample plots modeling the forest were either vaporized by heat, washed away by flood, or buried in mud.

The final type of natural event causing forest destruction that has touched my career is wildfire. As most Canadian foresters know, the boreal forests that now make such a significant contribution to Alberta's economic livelihood are themselves the product of natural disruption – specifically, massive wild-fires decades and centuries ago. Many of these fires were so large that today we humans would undoubtedly think of them as "catastrophic."

Now that you know some of my history, it may not surprise you that in 1995, two years after I arrived to head up Weyerhaeuser Canada Ltd., Saskatchewan experienced its worst year for forest fires in recorded history. This situation arose from a combination of dry weather, low humidity, and late-day lightning storms.

In our Saskatchewan Forest Management License Area, 15 major fires burned some 300,000 hectares of forest, about 180,000 hectares of it holding merchantable timber. Fire-damaged or dead timber amounted to 16 million cubic meters – the equivalent of eight year's consumption for our Prince Albert Pulp and Paper mill and the Big River sawmill. I will never forget flying over the burned areas, and seeing firsthand the extent of the loss. Salvage efforts took more than two winter logging seasons and involved both company contractors and other independent sawmills.

Finally, one last example closer to home for resident Albertans. Peter Murphy generously provided me with a fascinating profile of one of Alberta's most famous forest fires – the Chinchaga Fire of 1950. I want to make it clear that in 1950 I wasn't even born yet, so I take no responsibility.

The Chinchaga Fire started in a remote area 30 km north-east of Fort St. John, BC on June 1st, 1950. As I understand it, the fire was left to burn because other fires were deemed to have higher priority. The Chinchaga crossed the border into Alberta, and eventually burned for nearly five months. The fire consumed about 1.4 million hectares, and its long axis stretched for 245 km.

Fires on this large scale are unusual by the standards of recorded history in Western Canada, which extends about 200 years. But over the longer time scale of the boreal forest cycle, fire is a regular occurrence. Even fires of this large magnitude are not unique.

I think it is widely accepted that fire is an ancient and potent symbol of change in the forest, and until recently it was

usually assumed to be destructive. But the evolution of our understanding of the role of fire in forest ecology – especially in the boreal region – again reflects the development of a more adaptive approach to forest management.

Well, how did all these events turn out, and what did they teach us about forest ecosystems?

Today, in the yard of my parents' home, 35-year-old Douglas-firs are flourishing. Back in Arkansas, along the path of the tornado there are now 20-year-old loblolly pine stands that have already been thinned, pruned, and fertilized.

On Mount St. Helens, replanted firs are approaching 18 meters in height. Elk have returned to the blast area, and 136 wildlife species have been observed in the regenerated area. Salmon have been re-established in the streams, and tree species other than conifers number more than a dozen. The number of non-tree plant species already exceeds 110.

Almost 50 years later, a new boreal forest is once again flourishing in Alberta's Chinchaga bum area. And in Saskatchewan, we began reforestation efforts in 1996, and are continuing to monitor the progress of replanted seedlings and natural regeneration.

The reasons for looking at these "natural" catastrophes are numerous. Each case provides evidence of the remarkable, regenerative capabilities of forest ecosystems, even when they are disrupted by massive, natural events that are anything but benign. And each case study provides some practical and pragmatic insights on why adaptive forest management is justified when change is based on goods information.

I must stress that my purpose in reviewing these natural events and their aftermath is not to make the reductive argument that massive natural disruption of forests somehow justifies large-scale human exploitation. Nor am I suggesting that human impacts are somehow less significant or more benign than natural events, or that environmental concerns are exaggerated. On the contrary, I believe there is an urgent need for real environmentalism that is based on observation, experience, and a clear-headed understanding of science.

In the forestry of a decade of ago, we tended to respond to public concern with confident assurance that we had science-based answers, no matter what the question. Today, we must be respectful, honest, and humble in accepting that there are limits to our knowledge of "ecologically-based" forest management. We must recognize that partnership, rather than human domination, characterizes our relationship with the natural world.

These events I have mentioned are simply examples from a large and accumulating body of evidence demonstrating that catastrophic as well as gradual environmental change has been, and is today, a natural, regular feature of the Earth's history. Documenting these events and their aftermath helps us to explain and understand how forest ecosystems function. The orthodox view that nature is always harmonious and balanced, and always changes slowly and gradually, is simply not supported by experience or history.

At the same time, these events offer an opportunity to examine some of our cherished beliefs and assumptions about nature itself, and the underlying philosophical debate about man's role in nature, which we will explore a bit later.

If Nature's way of change seems slow to those who have not lived with typhoons, tornadoes, apocalyptic volcanic eruptions, and wildfires, it is only because human lives are short,

and because contemporary urban lifestyles insulate most of us from such events. But disciplined science means that our understanding, insight, knowledge, and vision must not be fore-shortened in the same way.

In his book "Discordant Harmonies: A New Ecology for the 21st Century," Daniel Botkin (1990) writes persuasively about the need to understand the intrinsic role of change in ecosystems:

"... the failure to accept change leads to destructive, undesirable results. It is only by understanding how nature works and applying this understanding in our management of nature ... that we can successfully achieve our goal: people living within nature, neither poisoning it nor destroying its reproductive capabilities." (p. 10-11)

These issues are fundamentally important to the industry, and to our business strategies. How can we make better technical choices in managing the forest resource? How can we achieve a more dynamic model of forestry? Let's shift gears now and move from natural and historic events to contemporary science to what is increasing referred to as "adaptive forestry."

On Science: Adaptive Forest Management

What is this concept that we call adaptive forest management, and what are its implications for the evolving science of forestry? In my opinion, the concept of adaptive forest management has crept into our shared vocabulary and at this time I would like to share my views on this value-laden term.

Specifically, the adjective, "adaptive," reinforces the need to adapt our practices based on better science, and the lessons of experience. As well, it underscores our acceptance of the ever-changing, dynamic nature of the forest ecosystems we are striving to understand and manage.

As you know, conventional forest management plans are built on harvesting objectives, with specific prescriptions or strategies that consider other values such as soil preservation, habitat or stream protection, recreational users, and wildlife conservation. This approach was our first effort at managing on a more integrated basis. The natural features of the affected landscaper. "Ecologically-based" management takes this approach to a higher level of sophistication and complexity.

In implementing an adaptive management approach, our goal is to provide a systematic, documented, reliable, and auditable process to ensure that we are achieving our resource objectives. It must also be recognized that there is certainly room for intensified forestry on the most productive forest sites. The planning process includes defined forest management goals, specific goals for other resource values, provincial and federal statutes and regulation, systematic public consultation, ecosystem research and operational knowledge, and the application of advanced technology.

Clearly, existing management processes already cover many of these elements. But there are clear gaps in terms of implementing an ecologically-based approach that considers the integrity and diversity of the forest, the impact on other users, the distribution of economic or non-economic benefits, the ability to define and measure indicators of the long term health of the forest ecosystem, and an early warning system for evidence of environmental change.

Ecosystems are complex, and there is still much to learn about them. We are just beginning the process of translating "eco-

logically-based" management concepts into operating practices on the ground. There is little implementation experience anywhere in North America. Recognizing this reality, it is apparent to us that we need to build into our management plans an important learning-and-feedback loop – an adaptive management approach.

How will key operating considerations such as cost and fiber supply be affected by ecologically-based management? How will forest resources and other users be impacted when strategies are implemented? Clearly, we need an approach with the flexibility to adjust operating guidelines, annual plans, and operating procedures to reflect in a timely way what we learn from experience.

I believe that adaptive management has important application in Alberta's boreal forests. Our forestry professionals here are already engaged in the process of implementing processes tailored to the needs of Alberta's mixed wood forest. We are borrowing from innovative work done elsewhere in the company, and in other forest producing regions. In fact, with Alberta's mixed softwood-and-hardwood forest management regime, there is a level of management complexity that may only be achievable through an adaptive approach.

Adaptive forest management will, over time, provide us with a good understanding of how different forest ecosystems evolve, work, and change under different conditions and scenarios. It will also help us manage the most difficult and controversial task – of integrating commercial and non-commercial forest values in a rational way.

At the same time, adaptive forest management enables us to respond to genuine societal concern about the environmental impacts of commercial forestry, and to changing social values. It acknowledges that, over time, we need to address the impact of human activity on the forest, just as we addressed the periodic consequences of large-scale "natural" disruptions I talked about earlier.

During our earlier foray into forest devastation by natural causes, we acknowledged compelling evidence that ecosystems were periodically "perturbed," and experienced massive disruption long before and throughout the evolution of the species *Homo sapiens*. Ecosystems are dynamic, and can be more effectively managed by looking forward, and into the future, as we seek ways to manage change.

I am not suggesting that human-induced changes should be thought of in the same way as large scale natural disturbances, but rather that we should learn and gain confidence from the ability of ecosystems to respond to change.

Today's forester and forest business manager must assume a dual role. On the one hand, together we must make judgments and decisions that are technically and economically sound relating to the stewardship of forest resources. On the other hand, we must find ways of informing and addressing changing public expectations about what constitutes good forest practices, and what results forestry should achieve.

Some hold out the faint and misguided hope that public anxiety about commercial forestry is temporary, or unwarranted. It is perhaps understandable that business and technical people crave a magic bullet to make the externalities of environmental protest, public oversight, and government regulation disappear – so they can return their full efforts to the real, productive work of managing the forests and their businesses.

But all the signs point to continued controversy. There is the worrisome disconnection of an urban-dwelling majority

of the population from the more remote, rural areas where trees grow, are harvested, and are manufactured into products.

That means the urban majority who know the least about what is going on in the forest may have – via the ballot box and public policy – the most say and influence. Think about it. In Canada, the elapsed time between planting a seedling and harvesting a tree might span 12 to 20 provincial elections, or more.

We need to engage elected representatives, regulators, the voting public, communities, and children, in a continuous dialogue. We need to understand the public's basic beliefs and assumptions about forests, as well as our own. We need to test our models against actual ecosystem responses, and to learn from experience.

Public debate is not only about past practices, preservation, or "their" science versus "our" science. In fact, it is also about man's role in nature, and the cultural values, icons, experiences, and symbols that influence how we think about nature, whether consciously or unconsciously. These issues take us into the terrain of social science, which is an area most forestry educational institutions have not emphasized.

Forest Preservation and Man's Role in Nature

It is no secret that commercial forestry has been under sustained attack by environmentalists in recent years. At the extreme, some of these groups portray humans as polluters, as defilers of nature, as disrupters of something called the "natural balance," as despoilers of the Earth. In their model, humans certainly don't "belong" to nature, let alone have a right to cut down trees in the forest.

We hear of a growing list of environmental campaigns targeted at preserving a particular forest or watershed, or a particular species. But what does preservation really mean and, indeed, is it even possible?

What would you say to a friend who told you that he was so fed up with the way things were going in the world that he planned to spend the rest of his life in a museum, where the past is permanently preserved? After listening to his litany of woes about the present, you might ask him: "what's a museum, anyway?" A museum is a purely and uniquely human creation – limited in scope, and highly subjective in its selection of items and "pasts" that it values sufficiently to put on display. Since we can't keep everything from the past, we have to decide what is worth conserving. So if the truth be known, we can not really preserve the past, even if we could define it. The past is always evolving into the present and what constituted the past is highly influenced by what individuals thought they saw or experienced and then could capture.

And there's the rub. Visitors to a museum see only what is kept – not what is discarded – and not the decision-making process that went into deciding what to conserve. What values and whose values are we going to use in forest preservation – and how are we going to decide?

Alberta is, of course, home to several of Canada's outstanding museums. A few months ago, the Glenbow in Calgary mounted a Cowboy Life display, while the Tyrrell Museum in Drumheller displays magnificent dinosaur remains and reconstructions. You see, no single museum can cater to every need or taste. Indeed, much quality and complexity would be sacrificed in any effort to try. Canada is dotted with an amazing range of specialized museums. In other words, system diver-

sity is a good operating principle for preservation and conservation.

I suggest we apply this principle to forest ecosystems. Every area should not try to preserve a small piece of everything. Rather, some of everything should be preserved somewhere. In practice, there is an enormous difference. We can't manage every hectare of forest for every species and value.

I have been striving to make the case that effective, adaptive forest management has to make choices based on unblinkered observations of the forest ecosystem and its surroundings. I readily admit to my bias – an interest in finding justification for the continued existence of commercial forestry. But I also challenge the industry's critics to a fair, common standard – to base theory as much as possible on observation, history, and experience – and not to base observation on theory. Let's find the best model to fit the available data, not the best data to fit a predetermined model.

That is why so many preservation demands sound to us like my friend's misguided plan to spend the rest of his life in a museum. We need to question whether it is possible to preserve in a "steady state" systems that are inherently dynamic and changing. We need to examine our forest management decisions to recognize which ones are driven by subjective and cultural values, and which are based on scientific knowledge and experience.

Whether we are commercial foresters or ardent forest preservationists, we are all driven by values and biases that are a product of our culture. We always see the forest through our human eyes, and even at that, we experience human perception filtered through some very strong cultural lenses.

As stewards of the forest, we cannot make the best resource management choices we are capable of when we act without awareness of our own assumptions, beliefs, and cultural values. Adaptive forest management can help liberate us from some of those assumptions, and from some of the subjectivity that has unconsciously boxed us in, and prevented us from seeing the full range of available options around land use and management.

In Conclusion: Foresters in the 21st Century

You know, some environmentalist will tell you that the CEOs of forest companies are among the greatest threats to the future forests of the world. Having experienced a typhoon, a tornado, a volcanic eruption, and major forest fires, I think their logic is upside down. In my opinion, forest preservationists and natural disturbances are clearly a greater threat to future CEOs than vice versa. Today, CEOs seem more like the threatened or endangered species than ever before.

When I began, I promised we would touch on ecosystem response to large-scale natural events, on the emerging science of adaptive forestry, and on the public debate surrounding forest preservation and the relationship between man and nature. It was, I concede, a daunting agenda for a single lecture. But in fact we have only scratched the surface of the issues that face us.

Having made the journey, I would suggest to you that to be a forester today is one of the most demanding, challenging, and interesting professions.

As foresters, academics, students, regulators, and business people, we are forced to assume a complex role. We must understand ecosystem response and science, and make good

decisions about the stewardship of forest resources in our care. At the same time, we have to understand that subjective cultural values can strongly influence public expectations, and the underlying philosophical debate about man's role in nature.

You may be thinking that foresters are pure scientists, and should not have to become media spin doctors or social scientists. Yet public expectations through public policy and regulation will shape the work of forestry itself, and influence what you are permitted and at times mandated to do.

Today, the role of the forester is increasingly one of forest interpreter and guide to an uneasy, and sometimes suspicious, public. It is clear that we must find new and creative ways of informing and addressing public expectations about what we do in the forest.

These developments explain and validate the need for adaptive forest management. But they also point to the need for a more adaptive and flexible approach to the science of ecology – one that acknowledges the impact of cultural influences. I am optimistic that from new knowledge and understanding of how ecosystems truly work can emerge a more productive and compassionate environmentalism. It will be based on a common and profound respect for the intrinsic value of nature. But it will also be environmentalism that acknowledges that *change is a permanent feature of any ecosystem, in which mankind is a fully natural species, and that human ingenuity and adaptability can play a pivotal role in ecosystem conservation.*

I am not declaring that adaptive forest management will provide all the answers. Its value and advantage, I believe, is that it compels us to keep asking the right questions. It forces us to look beyond traditional science, to define approaches to forestry that align with public values. And it obliges us to engage the public in a way that is not the scientist-expert telling the layperson what is right, but rather reflects a genuine dialogue among stakeholders who have legitimate roles in decision-making related to the forest use and management.

Universities *can* play a vital role in helping us find our way through complex issues. In Alberta, there is a unique opportunity for industry, government, universities, conservation groups, and communities to work together to address these challenges in a way that will both ensure a sustainable forest and wilderness heritage, and a world-competitive forest products industry. If we are successful, Alberta could within a decade be recognized as having a forward-focused approach to forest stewardship and ecologically-based management that is not only the best in Canada, but among the best in the world.

As foresters, academics, and business people, we all need to compete in the media, in political and regulatory forums, and in the educational jungle on an ongoing basis, and as an integral part of our jobs. Truly adaptive forest management can help us make better technical choices on the ground every bit as much, and at the same time, as it helps us adapt to the public policy and public opinion climate into which we are thrust.

For the forester, the business person, for the academic – if we can't answer the "philosophical" questions, our technical answers will likely not be accepted. Without a new and broader view of humankind's place in nature, and what that means for forest management, we will be trapped by public debates where factual data are less powerful than emotional argument, where manipulation of symbols and cultural myths about "Mother Nature" will eclipse science and reason. How-

ever, the good news is that we have some tools, if we wish to use them.

There is no question that the human species has transformed the land, oceans and atmosphere of the planet in what amounts to the geological blink of an eye. Since the development of agriculture about 100 centuries ago came a thousand-fold increase in human population, and the stirring of powerful social, economic, and political forces that created, for better or worse, modern civilization as we know it today.

If we are honest with ourselves, we must adopt a more flexible attitude, and recognize that people and human values and needs can never be excluded from or even marginalized in conservation and resource issues. By understanding the lessons of history and science, we must learn to develop better tools to manage complexity and risk. At times, the greatest challenge will be to address a constantly evolving set of questions, or choices.

This means to accept that in some situations, there is no one, best answer. Sometimes there will be no technical argument that excuses us from making extremely difficult value judgments, at the same time as we make educated, but imperfect estimations of the technical aspects of those judgments. There will be value conflicts. We must rely on adaptive forestry, professional judgment, and the goodwill of stakeholders to define mechanisms for sorting through them.

Adaptive forest management must help us to accommodate a view of nature in which change is natural on every scale of space and time. Nature is not inherently balanced, benign, or benevolent — powerful cultural myths notwithstanding.

The shift to an intensified, adaptive model of forestry is ambitious. But hopefully, I have persuaded you that it is possible, sensible, and necessary. We humans do belong on Earth, are part of Nature, and are capable of taking a responsible, sustainable approach to addressing the human impact on forest ecosystems.

It is time for a new model, a new realism, and a new practicality. It is time for a new vision of adaptive forest management that places humans back in the picture of the natural world, in a creative, complementary, and positive partnership role. By working together, we can all play a role in achieving this vision.

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