



30 Years of Declining Forest Health Now Requires Aggressive Suppression and Extensive Forest Maintenance

Fire & Climate

Pasadena, California, May 2022

Jim Marsh, Director of Environment and Watershed Science
Fortress North America

Fortress North America

Company Overview



Fortress has developed a portfolio of **Next Generation** long-term fire retardant (LTR) products with a unique magnesium chloride formulation.



Fortress is the ONLY alternative to fertilizer-based fire retardants, and the FIRST new entrant in the industry in over 21 years.



Fortress holds strong patents on proprietary formulations.



Official Forest Service testing has shown that Fortress fire retardants are up to 35% more effective than the current industry standard.



Fortress retardants are more eco-friendly than legacy retardants, and correct for the many environmental challenges of fertilizer-based products.

Magnesium Chloride ($MgCl_2$)

A Superior Wildland Fire Retardant

- Magnesium chloride is a natural product harvested by solar evaporation from the Great Salt Lake
- Selected for its superior fire suppression capabilities and environmentally friendly properties
- Magnesium chloride LTRs are ultra-durable and self-hydrating – hygroscopic “recharge” at relative humidity (RH) above 33%
- Fortress owns a robust patent portfolio around $MgCl_2$ -based LTR




Magnesium Chloride ($MgCl_2$)

Environmentally Friendly

- **LOW** carbon footprint
- **LOW** aquatic toxicity
- **NO** ammonia
- **NO** heavy metals
- **NO** eutrophication
- **NO** promotion of “**fire-prone**” invasive species (e.g. **Cheatgrass**)
- **NOT** a re-purposed fertilizer; domestic supply chain does not compete with agriculture

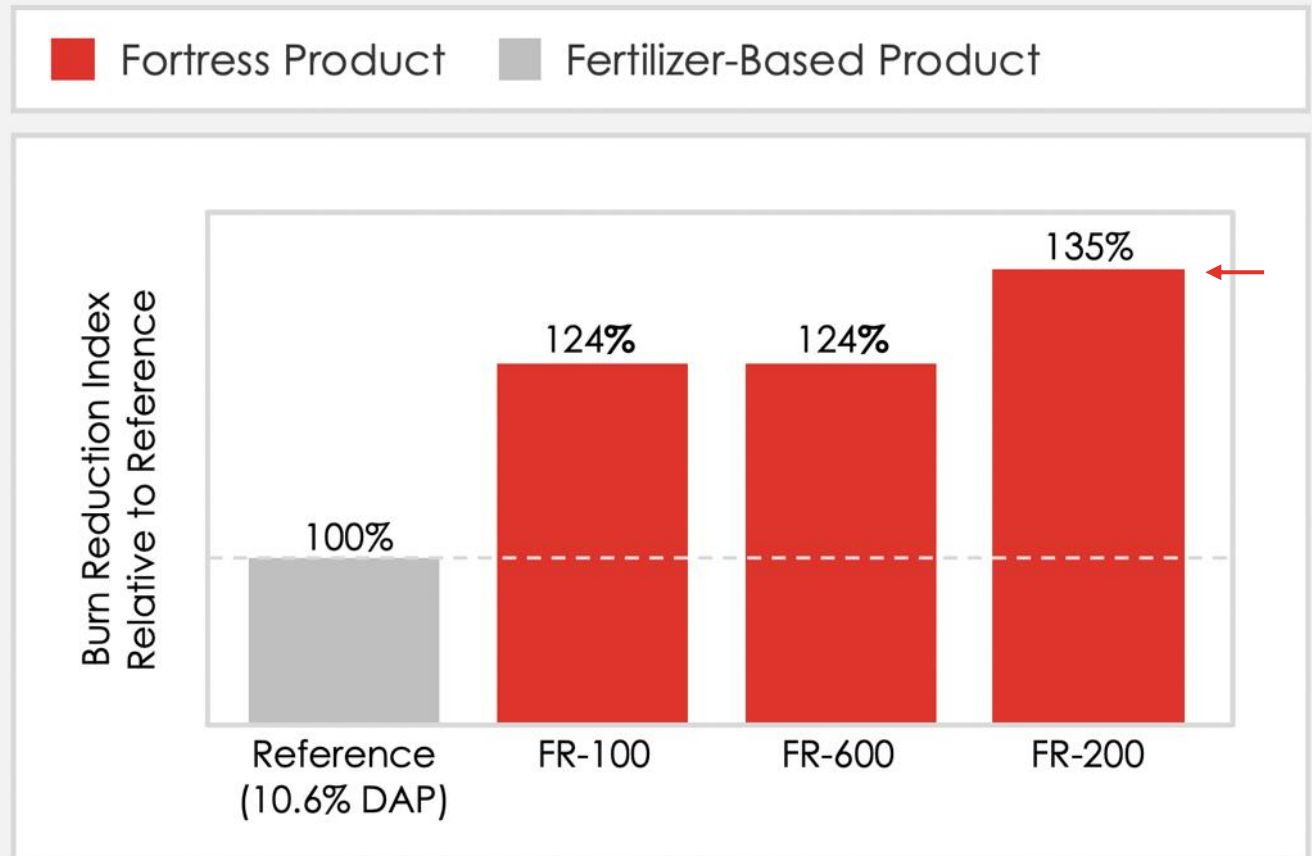


A photograph of three people in a control room. On the left, a man in a light blue shirt and jeans is leaning forward, looking at a large screen. In the center, a man in a yellow shirt and jeans is standing and looking at another screen. On the right, a man in a yellow shirt is sitting in a chair, looking at a third screen. The screens display fire simulation data, including a large fire and a forest fire. The room is dimly lit, and there are various pieces of equipment and cables visible in the background.

US Forest Service Burn Table: Fortress North America Missoula, MT

Best in Class Burn Reduction

Up to 35% improvement over
USFS fertilizer-based benchmark

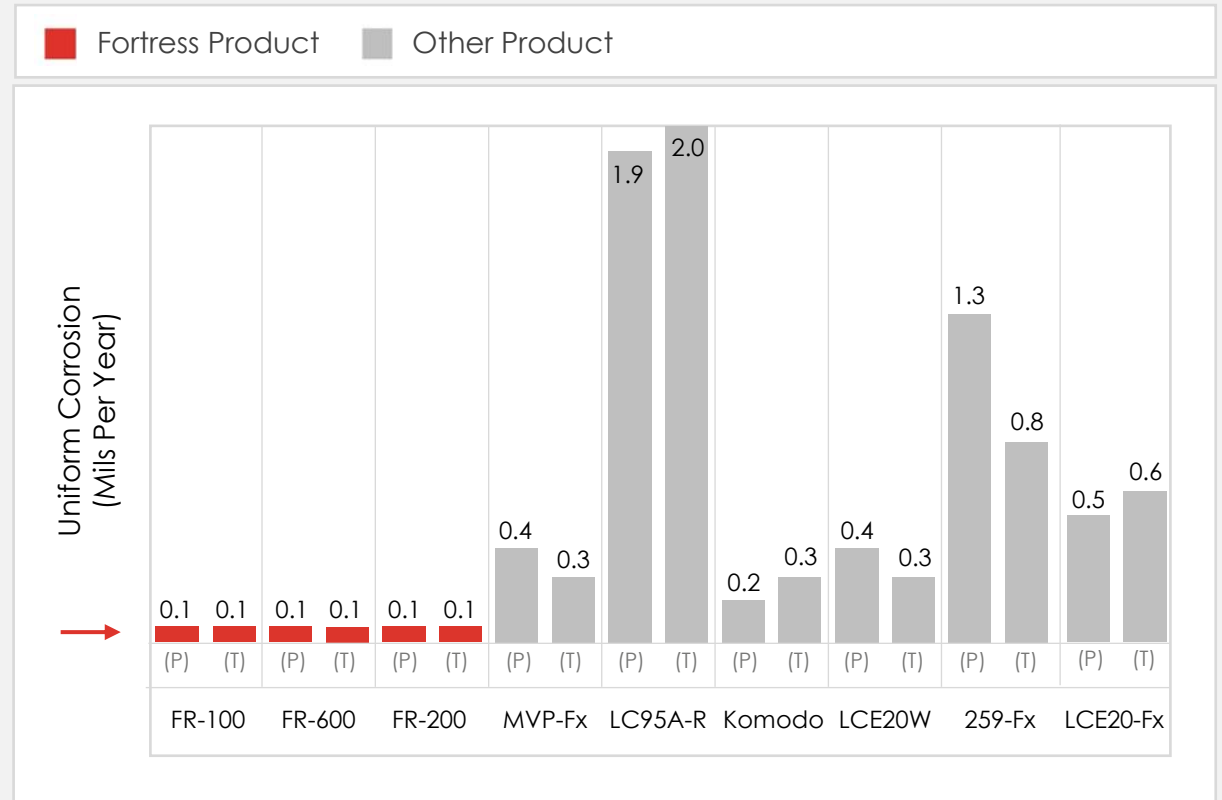


Official USFS burn test results. Higher values are more favorable, indicating superior burn reduction.

Best-In-Class Anti-Corrosion

Official USFS test results

- Fortress Fire Retardants exhibit **MINIMAL** corrosion for every qualified aircraft metal including 2024-T3 Aluminum, 4130 Steel, and Yellow Brass.
- Fortress products are safe to be around all aviation-related infrastructure

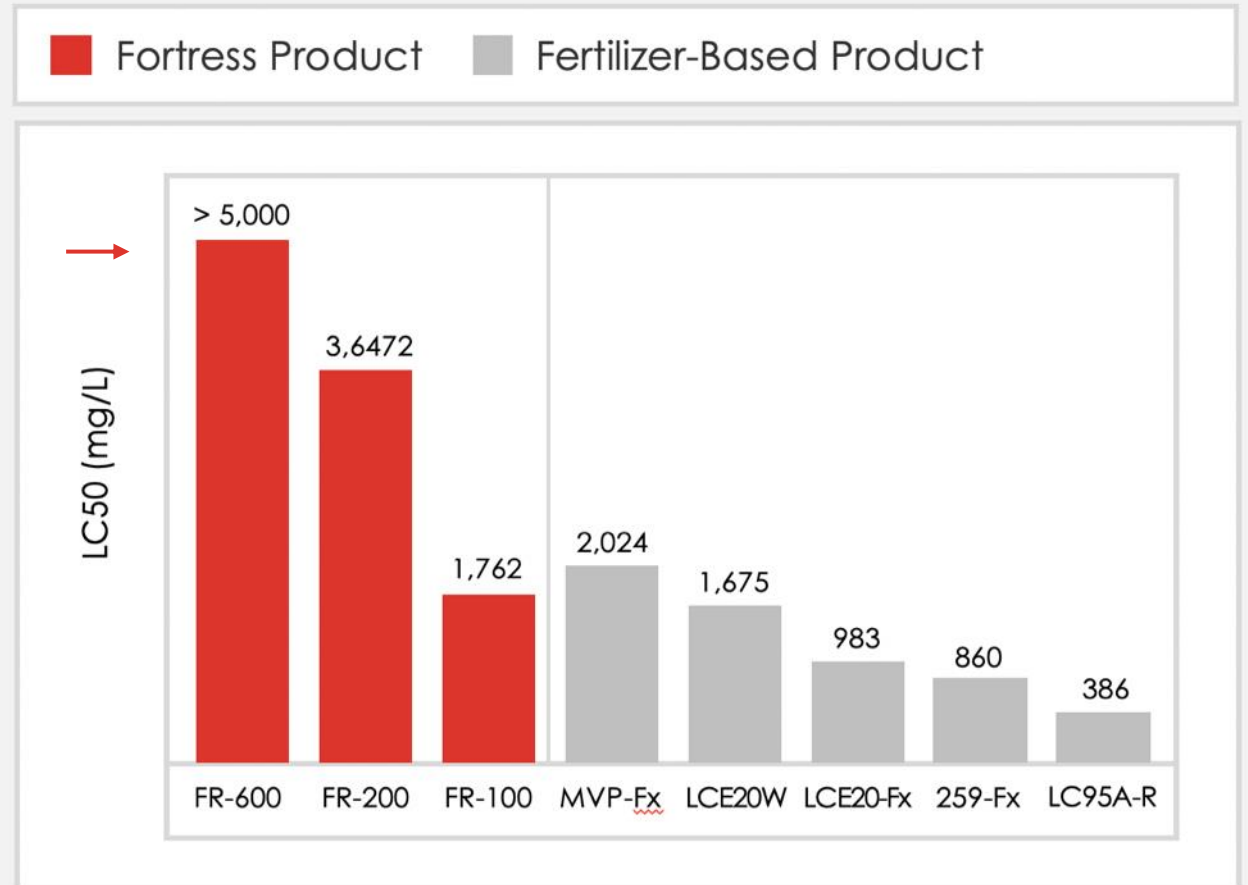


USFS uniform corrosion test results for 2024-T3 Aluminum with freshly mixed retardant at 120°F. Lower values are more favorable, indicating less corrosion. Data representative of performance for other metals and test parameters.

Better for the Environment

Best in Class Aquatic Toxicity

Fortress products have the highest LC50 of any qualified fire retardant product. Higher LC50 indicates lower toxicity.



Official USFS aquatic toxicity results of retardant products. LC50 is the lab-derived concentration at which 50% of rainbow trout are killed at 96 hours of exposure.



October 5th, 2021

Long-Term Retardant for Wildland Fire Management

Qualified by US Forest Service in Accordance with Forest Service Specification 5100-304d

These products are evaluated, qualified, and approved for use only at the specified mix ratio with the indicated application equipment.

Consult individual agencies for specific policies relating to long-term retardant use.

Definition: Retardants contain salts that decrease fire intensity and slow advance of the fire, even after the water they contain evaporates.

United States Forest Service Qualified Products List

Chemical	Mix Ratio (Pounds concentrate per gallon water)	Qualified Applications ¹				
		Fixed-Wing ²		Helicopter		Ground Applied
		Multi Engine	SEATS	Fixed-Tank	Bucket	
Dry Concentrate - Gum-thickened; Permanent or Temporary Base						
Phos-Chek MVP-Fx	0.96 lb/gal	•	•	-	•	•
Phos-Chek MVP-F	0.95 lb/gal	•	•	-	•	•
Fortress FR-100	1.68 lb/gal	o	o	-	o	o
Dry Concentrate - Gum-thickened; Temporary Base						
Phos-Chek 259-Fx	1.01 lb/gal	•	•	•	•	•
Wet Concentrate - Gum-thickened; Permanent or Temporary Base						
Phos-Chek LC-95A-R	5.5:1	•	•	-	•	•
Phos-Chek LC-95A-Fx	5.5:1	•	•	-	•	•
Phos-Chek LC-95A-F	5.5:1	•	•	-	•	•
Phos-Chek LCE20-Fx	5.2:1	•	•	-	•	•
Fortress FR-200	2.4:1	o	o	-	o	o
Wet Concentrate - Gum-thickened; Temporary Base						
Phos-Chek LC-95-W	5.5:1	•	•	-	•	•
1 – Qualification Notes • Fully Qualified – Product complies with all requirements of a formal specification. o Conditionally Qualified – Product complies with all requirements in the specification for laboratory evaluation; a field evaluation is required for full qualification. Δ Interim Qualified – Product complies with all interim requirements in Appendix A of the specification; final results and a field evaluation is required for full qualification. 2 – Pretreatment category has not been evaluated for durability and weathering. 3 – CAUTION: When switching between Fortress and Phos-Chek products, rinsing the tank and outside of the airtanker is required. Cross-mixing of these products may increase maintenance time and cleaning.						



Backed By Extensive Research

Better for the Environment

Fortress has developed and patented the first commercial-grade magnesium chloride-based long-term fire retardant, with unique formulations designed for aerial applications to fight wildfires as well as preventative ground treatments for both commercial and residential use. Aerial formulations have recently passed the full battery of laboratory tests performed by the U.S. Forest Service (USFS) at its Masoulo laboratory facilities, making Fortress the only new entrant in over two decades to achieve placement on the USFS Qualified Products List¹. These tests have also revealed that Fortress products are 23% to 30% more effective than the current industry standard [Fortress 2021].

Magnesium chloride offers a cleaner, safer, and more effective alternative to the ammonium phosphate chemicals that have been the industry standard for the last six decades. This white paper reviews the known environmental effects of magnesium chloride and ammonium phosphate, and draws comparisons between them derived from scientific literature.

Adverse Environmental Effects	Magnesium Chloride ^(a) (Active, Data Referenced)	Ammonium Phosphate ^(b) (Fire Retardant Reference)
Aquatic Ecosystems		
Nutrient Pollution	✓	✓
Fish Toxicity	✓	✓
Freshwater Salinization	✓	✓
Terrestrial Ecosystems		
Invasive Plant Growth	✓	✓
Vegetation Toxicity	✓	✓
Soil Leaching	✓	✓
Air Quality		
Increased Smoke Emissions	✓	✓

(a) Environmental outcomes of magnesium chloride are derived from deicer and dust suppressant literature
(b) Environmental outcomes of ammonium phosphate are derived from fire retardant literature

Fire Retardant Chemicals

Ammonium Phosphate

Ammonium phosphates have been the only long-term fire retardant (LTFR) chemicals qualified for use by the USFS for several decades. Within the scope of aquatic ecosystems, ammonium phosphates have been heavily scrutinized for their role in freshwater nutrient pollution and the toxic effects they have on fish. The fertilizing effect of ammonium phosphate-based fire retardants is also known to favor invasive plant species, reduce native species diversity, and alter terrestrial vegetative communities in detrimental ways, especially in fire-prone settings. Ammonium phosphates are most widely used as fertilizers in managed agricultural settings, but the environmental consequences of their use in fire retardants should not be understated. In 2013 alone, over 100 million liters of LTFR were used to fight fires across the United States, resulting in applications of as much as 200 kg of nitrogen (N) and 400 kg of phosphorus (P) per hectare [Marshall 2014]. As alarming as these figures are, 2013 was actually a low year when looking at recent wildland fire statistics, with five of the last ten years seeing roughly 50% more fires and twice as many acres burned [NIFC 2019].

Magnesium Chloride

Magnesium chloride is routinely applied to roadways as a deicer and as a dust suppressant. Nearly 23% of the 2.5 million kilometers of public nonpaved roads in the United States are treated with magnesium chloride-based dust suppressants [Goodrich 2020a], and roughly 300,000 metric tons of magnesium chloride deicer were applied to United States roads in 2015 alone [Lew 2017]. Extensive studies of magnesium chloride application zones have revealed two significant environmental consequences associated with its use: (a) freshwater salinization and (b) vegetation toxicity. Deicing and dust control formulations are typically applied at 30% salt concentration [Lewis 1999], whereas Fortress products are diluted to much lower concentrations: 10% in aerial applications and 15% in precise ground applications. It's appropriate to conclude that magnesium chloride fire retardants have much less of an impact on the environment than what we can derive from deicer and dust suppressant studies. Settling and application rate also play an important role in whether or not adverse effects are realized. For example, salinization is a considerable issue in urbanized settings where frequent deicing and impervious surface cover cause accumulation of salt, but is substantially less of an issue in fire-prone wildlands that have natural magnesium chloride removal pathways [Cunningham 2008].

¹ All USFS qualified ammonium phosphate-based long-term fire retardants are owned and manufactured by Penmetex Solutions under the Phos-Chem brand name. Fortress products are the only alternative aerial fire retardants that are currently listed on the USFS Qualified Products List [USFS QPL].

Lowering the Carbon Footprint of Firefighting

When we started Fortress, our aim was to provide a fire retardant that was not only more effective than the industry standard, but better for the environment as well. After evaluating several inorganic salts, we chose magnesium chloride because of its superior fire suppression capabilities, its natural abundance all around the world, and because it can be produced on an industrial scale and deployed in the field with minimal environmental impact.

This white paper compares the production methods of magnesium chloride- and ammonium phosphate-based fire retardants, with a pointed emphasis on the environmental impact of each industry. We also provide a quantitative life cycle analysis of our next-gen FR-205 liquid concentrate fire retardant and the newest ammonium phosphate alternative, LCE20. Our findings demonstrate that Fortress products drastically reduce the carbon footprint of fire retardant production and utilization compared to fertilizer-based retardants. This analysis has been reviewed independently and validated by Climate Positive Consulting, following the guidance of ISO 14084 [Lieber 2022].

How It's Made: Magnesium Chloride Fire Retardant

Magnesium and chloride exist naturally alongside sodium, potassium, sulfate, and other minerals in virtually all of the earth's seas and sumps. Some water systems, such as the Great Salt Lake in the United States, are especially abundant in these minerals, making them ideal for salt extraction. Raw brine from the sea is pumped into a series of large holding ponds that are shallow enough to facilitate natural evaporation with continuous exposure to sun and wind. The holding ponds are designed such that the brine advances like a slow-moving river, becoming shallower as salt concentrations increase [Tipp 2007]. When salt concentrations reach a certain level, salt compounds with lower solubility precipitate out of solution and collect at the bottom of the evaporation pond. Potassium sulfate is the first to crystallize, followed by sodium chloride [Compass 2020a]. These salt products are harvested, leaving magnesium chloride as the primary solute, magnesium sulfate in minor quantities, and trace amounts of other elements in the remaining brine. This concentrated magnesium chloride brine is used in commercial road deicers and dust suppressants [Lalonde 2019], and is also the primary active ingredient in Fortress FR-205 long-term fire retardant. The brine is then treated with our proprietary performance additives (i.e., coloring agent, anti-corrosion package) directly on site at the same Compass Minerals facility prior to sending it to nearby firefighting bases for use.

Environmental Impact of Magnesium Chloride Production

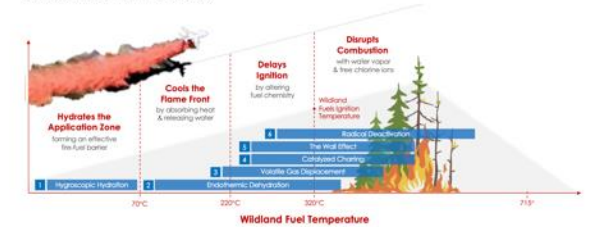
Environmental concerns related to magnesium chloride production are minimal, and mostly deal with the health of the natural water systems that are used to source brine. The water level of the Great Salt Lake has been steadily declining since its settlement in the 19th century, and a portion of this decline [13%] has been attributed to salt harvesting [Wurtsbaugh 2016]. In response, mineral companies have multiplied their efforts to minimize freshwater loss and conserve wildlife that depends on the lake [Lorenz 2016].

The carbon footprint of Fortress fire retardants is also minimal because the manufacturing process is extraordinarily simple. Our magnesium chloride is locally sourced and refined using only sun and wind exposure, requiring no upstream material sourcing and very little energy consumption.



Superior Fire Suppression Capabilities

Fortress fire retardants are uniquely designed to prevent, suppress, and retard wildland fire in multiple stages.



Unlike standard fire retardants, Fortress products use magnesium chloride (MgCl₂) as the active fire retarding component. Magnesium chloride has distinct chemical advantages over standard ammonium phosphate retardants, bringing new and improved firefighting capabilities to the flame front.

1 Hygroscopic Hydration

Magnesium chloride goes to work as soon as it makes contact with wildland fuels. Due to its low critical relative humidity (CRH) of 33%, magnesium chloride pulls moisture from the air and distributes it to the surrounding vegetation [1]. For reference, the CRH of standard diammonium phosphate (DAP) retardants is around 82% and even higher for monoammonium phosphate [2]. For this reason, Fortress products are uniquely self-rehydrating, making them ideal for live fire barriers and preventative applications.

A final endothermic reaction takes place around 415°C when the magnesium chloride hydrate byproduct breaks down into magnesium oxide and hydrochloride.

3 Volatile Gas Displacement

Hydrated magnesium chloride releases water vapor as temperatures increase. Water vapor works to cool the fire, dilute flammable combustion gases, and displace volatile thermal decomposition products that would otherwise ignite and spread fire.



Magnesium chloride hexahydrate (MgCl₂·6H₂O [ref]); endothermic dehydration and pyrolytic decomposition of MgCl₂ [ref] [3].

2 Endothermic Dehydration

When the solution exceeds solubility (when it dries out), magnesium chloride forms hydrates with up to six tightly coordinated water molecules. As temperatures increase, endothermic reactions take place that dissociate these water molecules, effectively absorbing heat, cooling wildland fuels, and lowering the probability of ignition. This reaction begins near 70°C and continues in a step-wise fashion as temperatures increase to 130°C, 170°C, and 200°C [3].



Forest Health in Fire-Prone States



Forest Health in Oregon

- The Kalmiopsis Wilderness burned in southern Oregon in 1987; there was no salvage because it was a Wilderness area.
- In 2002 The Biscuit fire burned up into the Kalmiopsis; The B&B Complex Fire was almost the same perimeter as shown in Figure 4, expanding the boundaries to about 500 thousand acres.
- Since then, we've exacerbated the problem by doing two things:
 1. We've created a wildlife habitat for spotted owls -- the fuels are building up and there's nothing to control them
 2. We are not salvaging the areas and subsequent fires are becoming larger and more destructive.

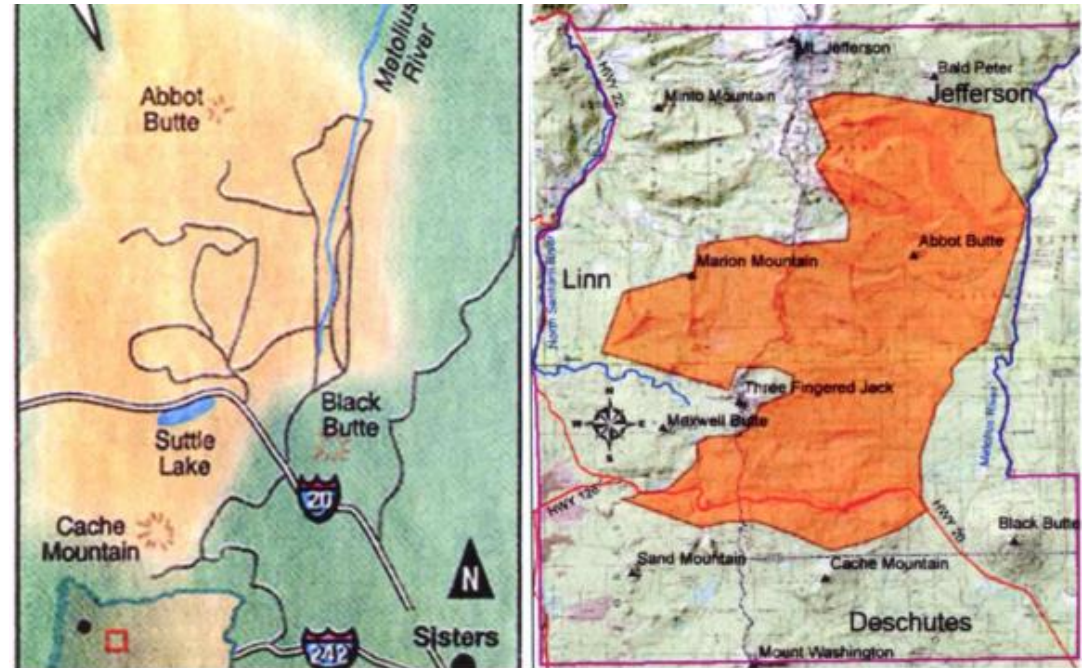


Figure 4. Map on the left is from the 1994 article showing Highway 20 beetle kill; map on the right is from March 2004 ORWW educational website focused on the predicted B&B Complex Fire. Note common Abbot Butte, Metolius River, Black Butte and Cache Mountain landmarks.

Source: Oregon Fish & Wildlife-Spring Issue 2022

Forest Health in Oregon

- Between 1952 and 1987, only a single wildfire greater than 10,000 acres in size, the 1966 Oxbow Fire
- During just the past nine years, from 2013 through 2021, there have been 33 western Oregon wildfires greater than 10,000 acres in size,
- Of these 33 major wildfires, 30 began and/or burned completely on federal forestlands, and only three began on private or Tribal lands,
- The climate is the same for all ownerships, only management actions have changed,
- Federal forest managers have harvested less than 5% of the millions of snags remaining from these fires,
- The remaining 95% will likely burn again

Source: Oregon Fish & Wildlife-Spring Issue 2022

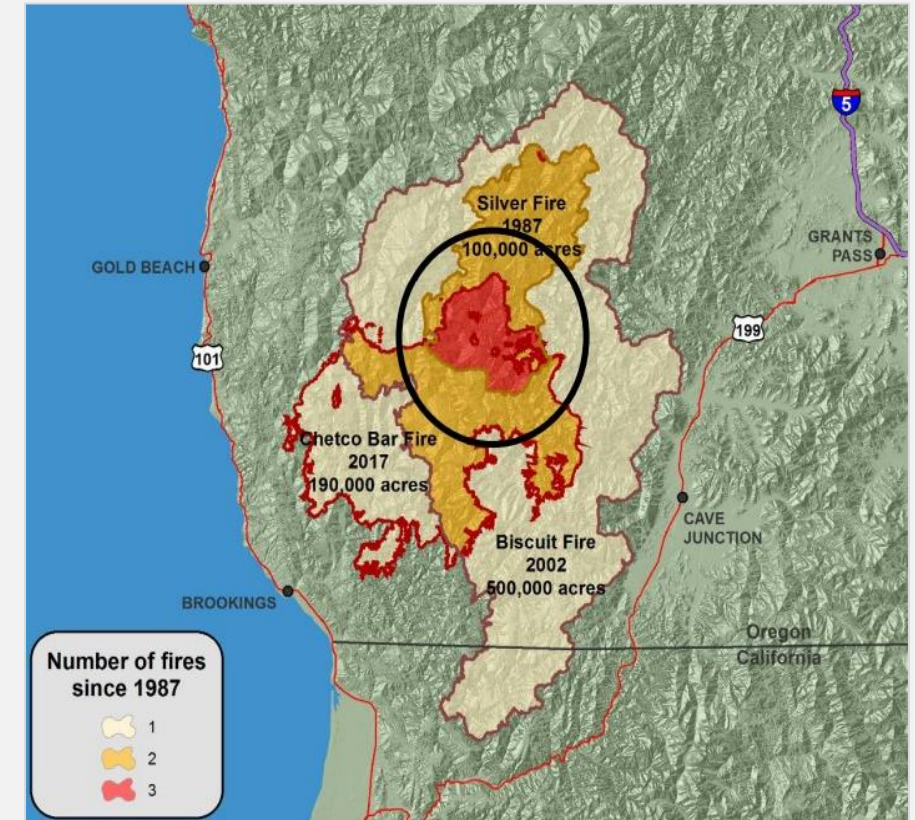


Image from: Adapting Climate Change and Disturbance Regimes, Jessica Holofsky, USDA Forest Service

Forest Health in Montana

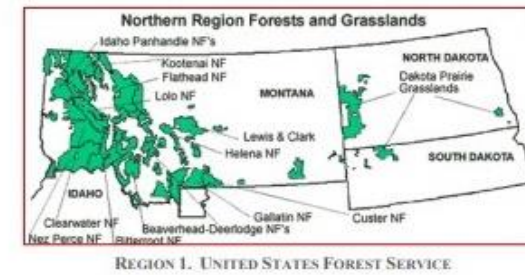
“While fire will always play an important and necessary natural role in Montana’s forests, the current state of the forests has created a fire-prone landscape more susceptible to high-severity wildfires. Today, over 85% of Montana’s forests are at elevated risk of wildfire” (DNRC, 2020). Similar to other states throughout the West, **Montana’s fire seasons are becoming longer and more severe** (Holden et al., 2018). More than ever, Montana now experiences megafires (fires over 100,000 acres) and the average fire season is 40 days longer than it was 30 years ago (Freeborn et al., 2016).”



Appendix A.3.1. Possible Forest Maintenance Examples to Help Implement the *Call to Action* [Companion Piece to Appendix A.3]¹⁰⁹

Specific Forest Maintenance Examples. Appendix A.3, produced by Phil Aune, discusses concepts and tactics for expanded forest maintenance to more effectively deploy the *Call to Action*. Appendix A.3.1 is a companion piece developed by Jim Marsh is an effort to support the foundation of the *Call to Action* by providing actual examples in Region 1 of the United States Forest Service. Other Forest Service Regions have similar activities that will help deploy the *Call to Action*.

“...The Flathead National Forest in Region 1 has become a contemporary leader in forest maintenance, including the use of prescribed fire, to help effectively deploy the *Call to Action*.” As you read Appendix A.3.1, you will be struck by the abundance of available plans and strategies to address this National Emergency – large, destructive wildfires due to lack of forest maintenance. **The Driving Question:** Why is there a corporate hesitancy to garner and deploy adequate resources to solve this issue. Yes, it will take time. But now is the time.”



The *Call to Action* specifies a clear pathway as to what is necessary to help provide healthy, resilient forests across America’s landscapes, especially the added Federal and state appropriations needed; the immediate fire policies required; the corporate linkage of existing strategies; and essential political support.

¹⁰⁹ Prepared by Jim Marsh, January 1, 2022. While with the Forest Service was Forester /Watershed Scientist on the Brownstown District Wayne Hoosier National Forest, Ukonom and Scott River Districts of the Klamath NF. Forest Hydrologist, Shasta-Trinity National Forest and Regional Hydrologist, Region 5, California. Was District Ranger, Mad River District. And, Aviation, Fire, Lands, Minerals, and Law Enforcement Staff Officer, Six Rivers NF over a 17-year period. Additionally, was the Assistant Chief of Staff, Environment, Natural Resources and Training Lands Management for the Marine Corps Combat Development Command, Quantico, VA. After a federal career, Jim was CEO of an Environmental Consulting company, staff member for Texas A&M University Research and Extension and on the Board of Directors for several consulting and service companies currently.

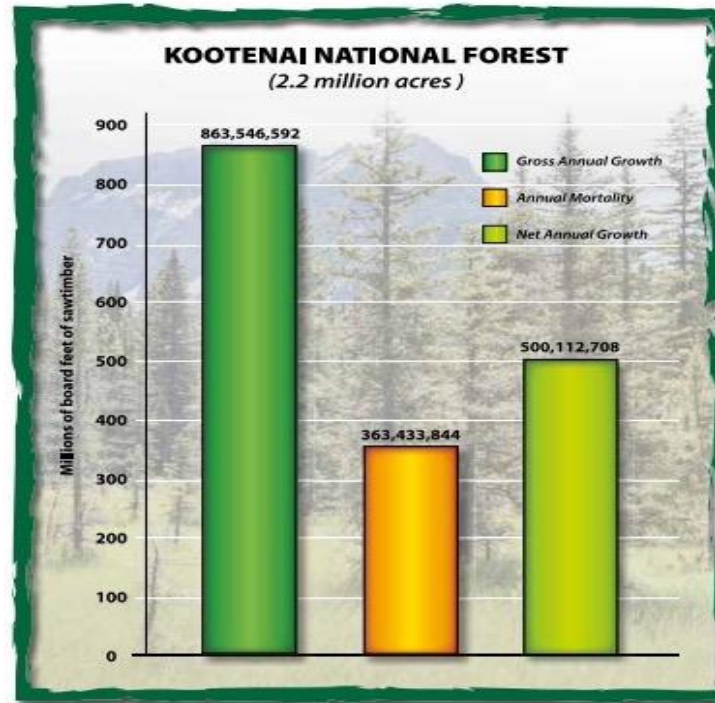
Forest Health in Montana

“Dear Lincoln County Resident, twenty-one years ago this summer Libby came within a whisker of burning to the ground. Longtime residents will recall that the town was surrounded by wildfires and that – in hopes of averting disaster – the Forest Service railed fire trucks from Cleveland, Ohio. The trucks sat on a rail siding near the Burlington Northern train station for several days. A change in wind direction saved us – not just Libby but Troy, Trego, Rexford and possibly Eureka. If you’ve moved here since 2000, you probably have no idea how much danger we face from the **enormous accumulations of dying and dead trees standing in the Kootenai National Forest**”, Lincoln County Commissioners.”

You can read this publication on EvergreenMagazine.com:
<https://www.evergreenmagazine.com/lincoln-county-resources/>

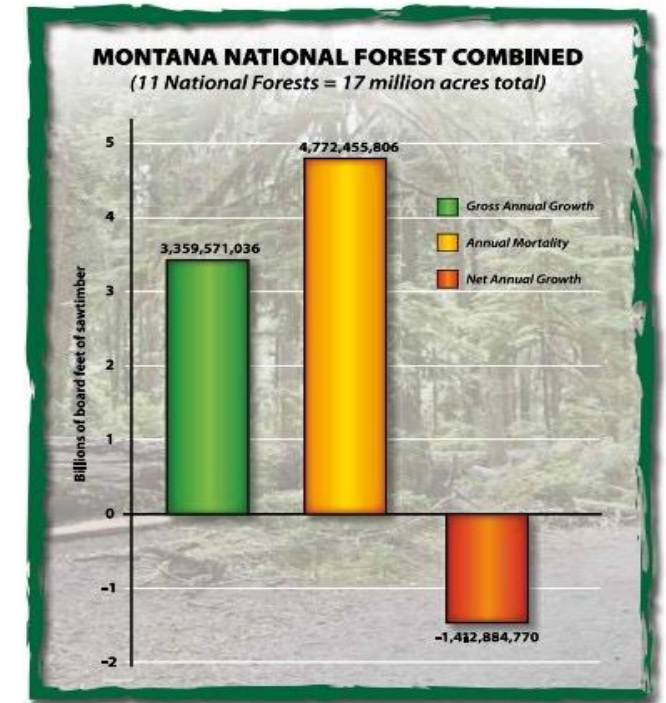


Forest Health in Montana



These bar graphs illustrate and quantify growth and mortality on the Kootenai National Forest. The Kootenai is Montana's most productive national forest – meaning that soils are fertile and trees grow faster than they do on more arid national forests in Montana.

This said, Kootenai tree density and mortality are of great concern to our Lincoln County Commissioners, the U.S. Forest Service, the Montana Department of Natural Resources and our county's private forest landowners, including Stimson Lumber and the Green Diamond Resource Company.



Sustainability – as in sustainably managed forests – is a term that has been with us for many years. It mandates that today's forest management practices do not compromise management options for future generations. This bar graph underscores the fact that we are missing the mark in Montana's 11 national forests. Mortality exceeds growth by a frightening margin.

Annual mortality will continue to outpace growth until the pace and scale of forest restoration work expands significantly. Our two best tools for sustainably managing our national forests are thinning and prescribed fire. We describe their uses on Pages 11–14.

Although Congress seems to recognize our forest health-wildfire crisis, the Forest Service is still billions of dollars short of the funding it needs to increase workforce capacity and increase boots on the ground restoration work.





in need of thinning

Photo: Julia Peterson



thinned

Photo: Julia Peterson



thinned

Photo: Julia Peterson



in need of thinning

Photo: Julia Peterson

Top photo: a lodgepole pine thicket on the east side of Pike Road near Sheldon Mountain Road in need of immediate thinning. **Bottom photo:** an adjacent Forest Service thinning with a century-long history. Land inside Lincoln County's Wildland Urban Interface should look like this.

Top photo: A Montana Department of Natural Resources thinning on Swede Mountain east of Libby reduces the risk of stand replacing wildfire, protecting water quality, habitat and nearby homes. **Bottom photo:** An adjacent Forest Service thicket that – if thinned – would look more like the top photo.

Forest Health in California

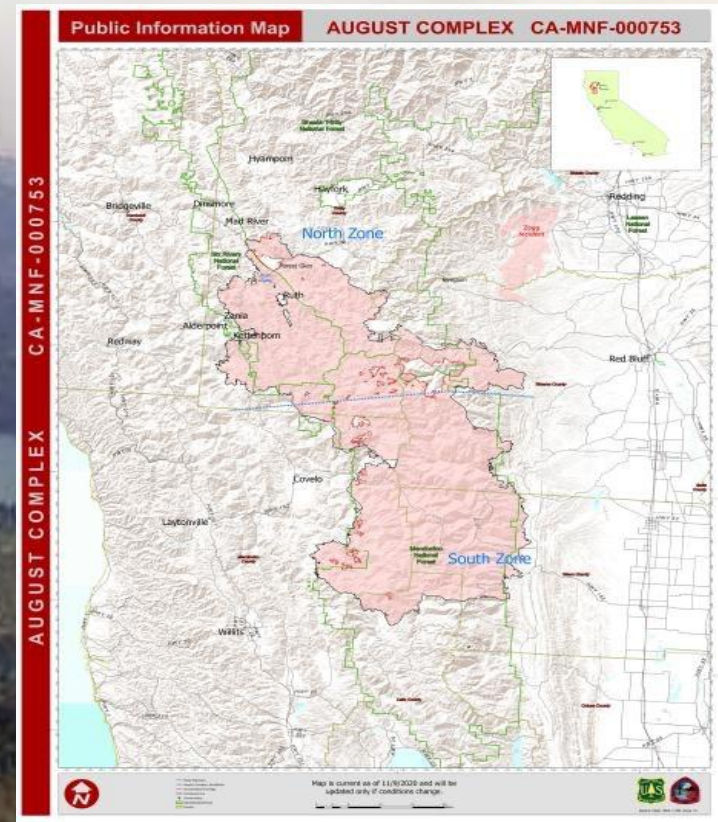
The August Complex was a massive wildfire that burned in the Coast Range of Northern California, in Glenn, Lake, Mendocino, Tehama, Trinity, and Shasta Counties. The complex originated as 38 separate fires started by lightning strikes on August 16–17, 2020. Four of the largest fires, the Doe, Tatham, Glade, and Hull fires, had burned together by August 30. On September 9, the Doe Fire, the main fire of the August Complex, surpassed the 2018 Mendocino Complex to become both the single-largest wildfire and the largest fire complex in recorded California history. [5] On September 10, the combined Doe Fire also merged with the Elkhorn Fire (originally a separate incident) and the Hopkins Fire, growing substantially in size. By the time it was extinguished on November 12, the August Complex fire had burned a total of 1,032,648 acres (417,898 ha), or 1,614 square miles (4,180 km²), [5] about 1% of California's 100 million acres of land, an area larger than the state of Rhode Island. [6] The fire largely burned within the Mendocino National Forest, with portions spilling over to the Shasta-Trinity National Forest and Six Rivers National Forest in the north, as well as private land surrounding the forests. Large areas of the Yolla Bolly-Middle Eel Wilderness and Yuki Wilderness had also been burned. Rugged terrain combined with consistent high winds and record heat had complicated firefighting efforts. Although more than 2,900 personnel were deployed to the fire through mid-September, it took almost three months to fully contain the fire. [1] The U.S. Forest Service managed the firefighting effort, with assistance from the California Department of Forestry and Fire Protection.



Source: Wikipedia



Image: Escape of backfiring operation which eliminated 1/3 of the forest / oak woodland ranges of the Mad River District, Six Rivers National Forest.



How To Improve Forest Health?

The best tools we have for reducing wildfire risk are:

- (1) **Thinning forests** that hold too many trees for the growing capacity of the land.
- (2) **Prescribed fire** to clean up forest floor woody debris and keep fires from climbing into treetops and creating forest-killing crown fires.
- (3) **Aggressive suppression and control** to keep Wildland Fires as small as possible.



A National Emergency: Lack of Forest Maintenance Resulting in Destructive Wildfires¹

A Call to Action

SEE "TRANSITION INTO 2022" TO CONTINUE THIS CALL TO ACTION. LET'S MAKE SURE WE AVOID "STRAY VOLTAGE."

REV. 11.2

GLANCE AT THE LOGIC SEQUENCE SHOWN ON PAGE 6.

SEE MURRY TAYLOR'S LANDMARK ESSAY, PAGE 13.

UPDATED For COVID-19

REMEMBER THAT DIRECT WILDFIRE SUPPRESSION COSTS REPRESENT ONLY A FRACTION OF THE TOTAL LOSSES AND EXPENDITURES. KEEPING FIRES SMALL IS KEY. SEE LOGIC SEQUENCE ON PAGE 8 AND ADDED DETAIL ON PAGE 13.

INCLUDES AN UPDATED SECTION ENTITLED, "MANAGED WILDFIRE", PAGE 11.

INCLUDES AN UPDATED SECTION ENTITLED, "IMPROVED AERIAL FIRES SUPPRESSION TACTICS", PAGE 25.

INCLUDES A SECTION ENTITLED, "BE FIRE WISE AND SAFE", PAGE 23.

DON'T MISS APPENDICES A.3, AND A.3.1, AND A.6.

SEE ADDITIONAL FUNDING REQUIREMENTS ON PAGE 29.

At this time, 44 professionals have contributed to this *Call to Action*. Sign-on to the *Petition* [Petition Link: <http://chnq.it/bGsvZvSb>]. As of January 30, 2022, there are 5,121 signatories for this *Call to Action*. Let's keep going as the 2022 fire season unfolds. In 2021 almost 8 acres burned. We now begin the 2022 fire season where already 929 fires have burned 20,686 acres – a greater pace than last year; not surprisingly. Help make a change in what has become a National Emergency. Sign on to this petition or share your voice in other ways. Your help is essential. There is a summary of this document available upon request to mtrains7@verizon.net.

¹ Prepared by Michael T. Rains with comments included from a wide-range of professionals; 44 and counting. This paper has been continually updated to address the COVID-19 Pandemic and other critical components, such as "managed wildfire" that contribute to this national emergency of destructive wildfires. Last update of this *Call to Action*: 1/30/2022 3:40:25 PM.

A photograph of a logging site. In the foreground, a yellow excavator is positioned on a pile of cut logs. To the right, there is a large, neat stack of logs. The background shows a dense forest of tall evergreen trees under a clear blue sky. The overall scene is brightly lit, suggesting a sunny day.

Land & Resource Stewardship Program

Congress created the Land and Resource Stewardship Program to give the Forest Service [Department of Agriculture] and Bureau of Land Management [Department of Interior] the authority “to perform services to achieve land management goals for the national forests and the public lands that meet local and rural community needs.”

Stewardship Contracts

- Stewardship Contracts may be used for treatments to improve, maintain, or restore forest or rangeland health; restore or maintain water quality; improve fish and wildlife habitat; and reduce hazardous fuels that pose risks to communities and ecosystem values.
- In the Bureau of Land Management, “Stewardship” refers to the ability to trade forest products for land management and services.
- For example, in exchange for thinning the forest and keeping the trees to sell, a contractor or organization performs service-work that helps to achieve key land management goals such as improving wildlife habitat or reestablishing native plant species.
- The intent of stewardship is to improve, maintain, or restore forest or rangeland health; restore or maintain water quality; improve fish and wildlife habitat and reduce danger from wildfires.
- Stewardship projects are created through an open, collaborative process that involved local communities and interested organizations.
- Stewardship contracting authority includes agreements with nonprofits, best-value contracts, and always include a goods for services arrangement.

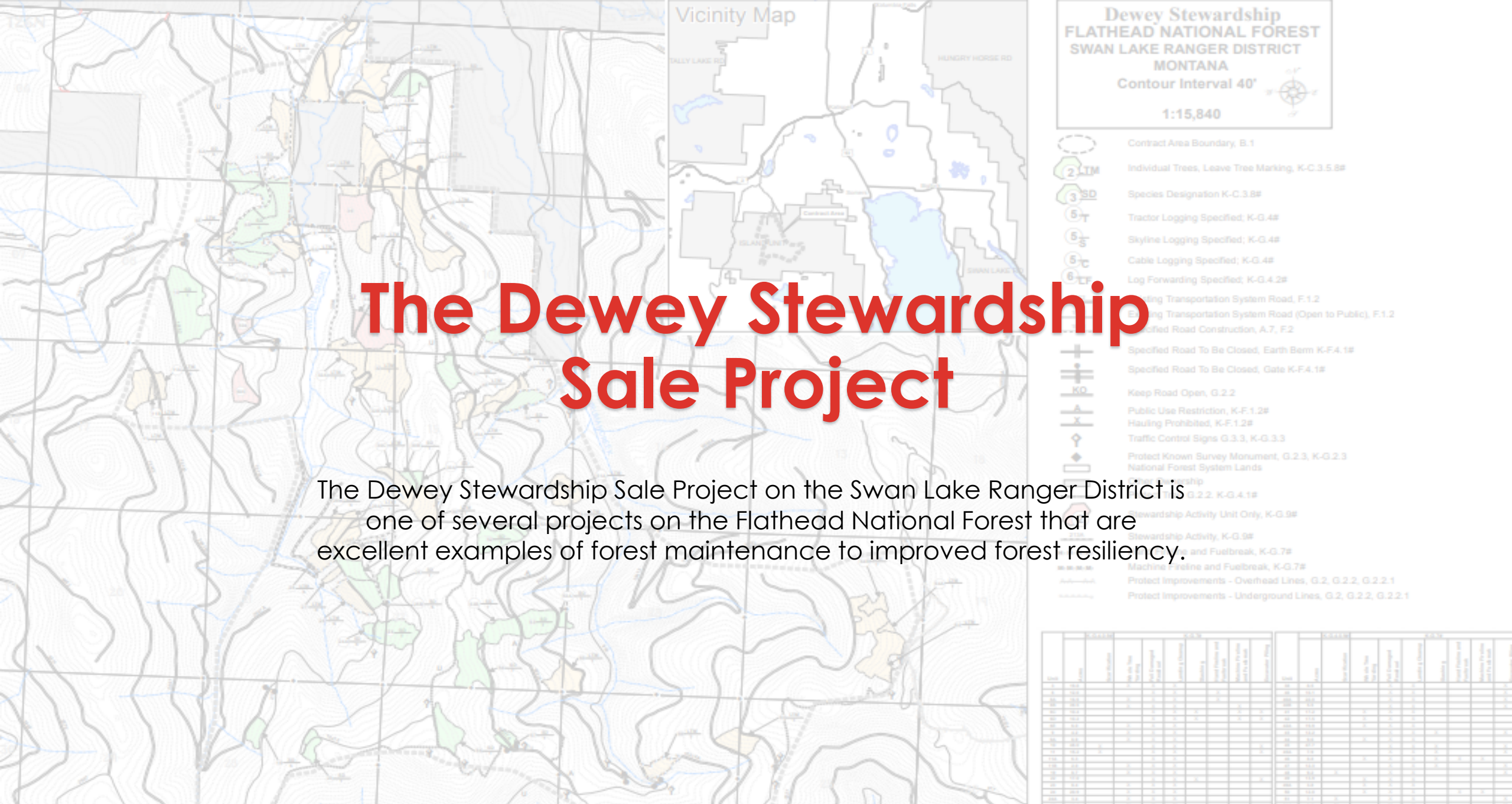
7 Land Management Goals

- (1) Road and trail maintenance or obliteration to restore or maintain water quality.
- (2) Soil productivity, habitat for wildlife and fisheries, or other resource values.
- (3) Setting of prescribed fires to improve the composition, structure, condition, and health of stands or to improve wildlife habitat.
- (4) Removing vegetation or other activities to promote healthy forest stands, reduce fire hazards, or achieve other land management objectives.
- (5) Watershed restoration and maintenance.
- (6) Restoration and maintenance of wildlife and fish habitat.
- (7) Control of noxious and exotic weeds and re-establishing native plant species.



Image from: Adapting Climate Change and Disturbance Regimes, Jessica Holofsky, USDA Forest Service





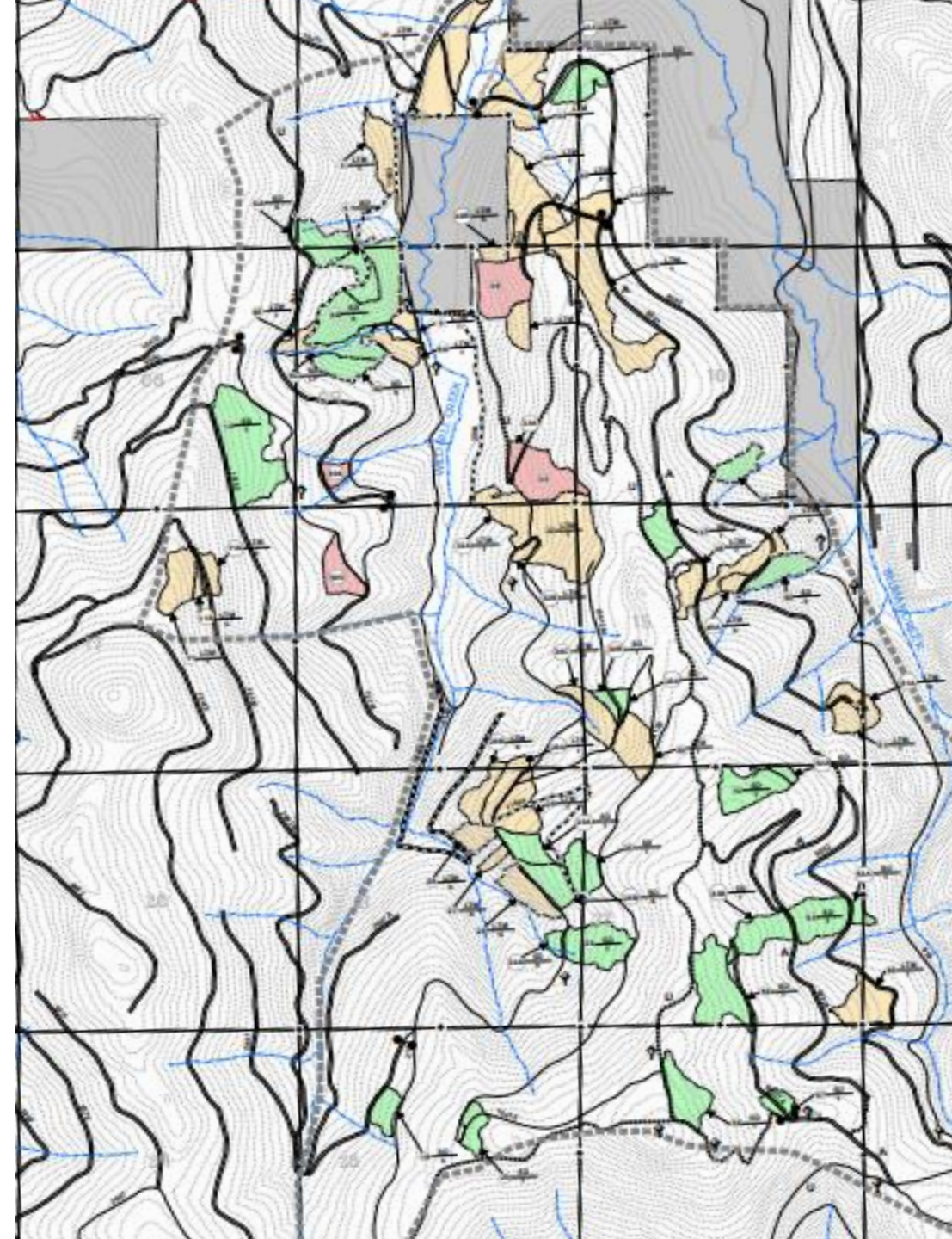
The Dewey Stewardship Sale Project

The Dewey Stewardship Sale Project on the Swan Lake Ranger District is one of several projects on the Flathead National Forest that are excellent examples of forest maintenance to improved forest resiliency.

Contract Area Boundary, B.1									
Individual Trees, Leave Tree Marking, K-C.3.5.8#									
Species Designation K-C.3.8#									
Tractor Logging Specified; K-G.4#									
Skyline Logging Specified; K-G.4#									
Cable Logging Specified; K-G.4#									
Log Forwarding Specified; K-G.4.2#									
Existing Transportation System Road, F.1.2									
Existing Transportation System Road (Open to Public), F.1.2									
Proposed Road Construction, A.7, F.2									
Specified Road To Be Closed, Earth Berm K-F.4.1#									
Specified Road To Be Closed, Gate K-F.4.1#									
Keep Road Open, G.2.2									
Public Use Restriction, K-F.1.2#									
Hauling Prohibited, K-F.1.2#									
Traffic Control Signs G.3.3, K-G.3.3									
Protect Known Survey Monument, G.2.3, K-G.2.3									
National Forest System Lands									
Stewardship									
Stewardship Activity Unit Only, K-G.9#									
Stewardship Activity, K-G.9#									
Machine Fueline and Fuelbreak, K-G.7#									
Machine Fueline and Fuelbreak, K-G.7#									
Protect Improvements - Overhead Lines, G.2, G.2.2, G.2.2.1									
Protect Improvements - Underground Lines, G.2, G.2.2, G.2.2.1									
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Dewey Stewardship

- This project is a Shelterwood / Seed Tree silvicultural prescription which includes whole tree harvesting with limbing at the landing; units are mechanically piled at landing and hand piled within the units. They are then broadcast burned to further reduce fuel loadings and to stimulate regeneration and improve wildlife habitat. These units were either Skyline or Feller Buncher harvested with very little soil disturbance,
- The Forest Service, Region 1 and Montana Department of Natural Resources has common Goals and Objectives which have made it easy for the two land management agencies to work together on several small and large landscape scale programs and projects.
- With adequate resources, more of these projects could be pursued to manage, protect, and ensure forested landscape become more resilient to large, destructive wildfires.
- Private landowners and organizations have collaborated for a common purpose on these projects. Myself (Jim Marsh), other private neighbors, Montana Fish and Game, Montana Tree Farm System, and Montana Firewise Program are partnered in the effort.





Before

The Dewey Stewardship Sale Project



ENTERING WHEELED M
RESTRICTION AP
ON FEDERAL LA
STAY ON ROADS &





During

The Dewey Stewardship Sale Project

















After

The Dewey Stewardship Sale Project





















Fall, Year 2

The Dewey Stewardship Sale Project











Winter, Year 2

The Dewey Stewardship Sale Project

















Q&A