

# **The Need for Research, Staff, and Partnerships in the Progression of Native Plant Materials Development and Use in Ecosystem Restoration**

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Supplement to Testimony Before the House Natural Resources Committee  
Subcommittee on National Parks, Forests and Public Lands

H.R. 1572, the Botanical Sciences and Native Plant Materials Research, Restoration, and Promotion Act

July 18<sup>th</sup>, 2019

Chairwoman Halaand, Ranking Member Young, and Members of the Subcommittee: I appreciate, very much, the opportunity to present you my report, which includes data, figures, and images along with cited references that support testimony I gave and submitted in writing on July 18, 2019 in support of H.R. 1572, the Botanical Sciences and Native Plant Materials Research, Restoration, and Promotion Act.

## **Introduction**

I would like to begin this report by addressing the benefits of restoring native ecosystems. Native ecosystems support native animals including birds, wildlife, and pollinators. In many cases, the lives of these are all intertwined in a complex manner. Intact, native ecosystems help provide for watershed stability. Native ecosystems are capable of sequestering much more carbon than those invasive communities with shallow rooting systems. In addition, securing our food resources is dependent on native pollinators. The cost of maintaining and restoring native ecosystems, in the long run, will cost much less than the loss of the many ecosystem services those systems provide.

There appeared to be misunderstandings by others who testified before the House Subcommittee on National Parks, Forests and Public Lands of July 18. H.R. 1572 does not create a new hierarchy, nor does it establish new policy regarding the use of native plant materials by agencies within the Department of Interior or the Department of Agriculture. It does, however, establish direction for both funding research and staffing of those agencies with qualified botanists. It does create a new loan-forgiveness program for those hired by these agencies that meet the qualifications for newly-hired botanists. In addition, it does establish funding authorities never-before used for botany programs; authorities that will include various goals, objectives and annual targets that shall be met.

At least one witness indicated that he thought H.R. 1572 would create a new top-down approach that would dictate a one-size-fits-all approach to managing disturbed ecosystems. On the contrary, this H.R. 1572 would allow for more botanists on the ground, with local knowledge of the ecosystems in need of restoration, as well as the best, locally-sourced native plant materials to be used in those activities at a local level. The only top-down guidance would be to

emphasize the need for and use of locally-adapted native plant materials wherever and whenever it is practicable to use them.

## **The Need to Address Ecosystem Health**

The challenges to ecosystem health, especially in the western United States are serious and growing. Between more acres being burned annually by wildland fire and the ever expansion of non-native, invasive species across our landscapes has had a tremendous impact on the biodiversity of plant communities, as well as on the wildlife, birds, pollinators, etc. that depend on those ecosystems. In addition to these challenges, there has been and continues to be a continuous loss through attrition of the personnel needed to assess and address these issues; it has become more and more difficult to keep up with our restoration needs.

## **Wildland Fire**

In 2018, 7 of the 10 most fire-prone states were those that occur in the West (Table 1)<sup>1</sup>. These forest and rangeland fires have a devastating effect not only on the people in the communities affected by the fires, but they also have a tremendous impact on the ecosystems in which they occur. While all but perhaps those ecosystems that occur in the alpine zones evolved with at least some level of fire, years of successful fire suppression, land uses such as overgrazing, which was especially common during the early years of settlement in the West, and the invasion on non-native species have changed how nearly all our ecosystems function. The challenges of restoring specifically the driest and hottest of those systems to a more naturally functioning one is a challenge with even the most knowledgeable individuals leading the way, it is nearly impossible when those skills are desperately lacking. Research has shown that rangeland ecosystems dominated primarily by native plant species not only provide better habitat for the wildlife that have grown to depend on them, they are four times less likely to burn than those covered with invasive species that easily carry fire and continue to erode at the ecosystems of the western United States (Balch et al. 2013)<sup>2</sup>.

Wildland fires burning across the country create a tremendous need for post-fire restoration through a process known as Burned Area Emergency Response (BAER). An important part of soil stabilization and erosion control is through the establishment of species whose roots hold soils in place. It is during this process that personnel with botanical and ecological expertise are critical. Often, non-native, perennial grasses and wildflowers are used in this process; species, such as crested wheatgrass, smooth brome, forage kochia, and yellow sweetclover can establish fairly easily, but at the cost of native species being able to reestablish and provide the biodiversity necessary for native wildlife, birds, etc. These species are often used because there are insufficient botanists and ecologists on staff to support BAER teams. It is during this process that reseeding native grasses and wildflowers, and replanting native trees and shrubs is critical.<sup>3</sup>

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<sup>1</sup> <https://www.iii.org/fact-statistic/facts-statistics-wildfires#Top%2010%20Most%20Wildfire%20Prone%20States,%202017>

<sup>2</sup> PEW Charitable Trusts online article, *Invasive Grass Increases Wildfire Threat in Western States* ( [Stateline](#), July 2, 2019):

<sup>3</sup> <https://www.nationalforests.org/blog/eight-important-facts-about-post-fire-restoration>

Table 1. Top 10 States for Wildfires Ranked by Number of Acres Burned, 2018<sup>4</sup>

State	Number of acres burned
California	1,823,153
Nevada	1,001,966
Oregon	897,263
Oklahoma	745,097
Idaho	604,481
Texas	569,811
Colorado	475,803
Utah	438,983
Washington	438,834
Alaska	410,683

Since 1985 the *numbers* of wildland fires burning each year are actually becoming fewer. According to the National Interagency Fire Center (NIFC), there has been a slight downward trend in the number of fires in the United States since that time (Figure 1). Why that is, isn't exactly clear, but the *number of fires* is much less to the point than the *number of acres that burn* from year to year.

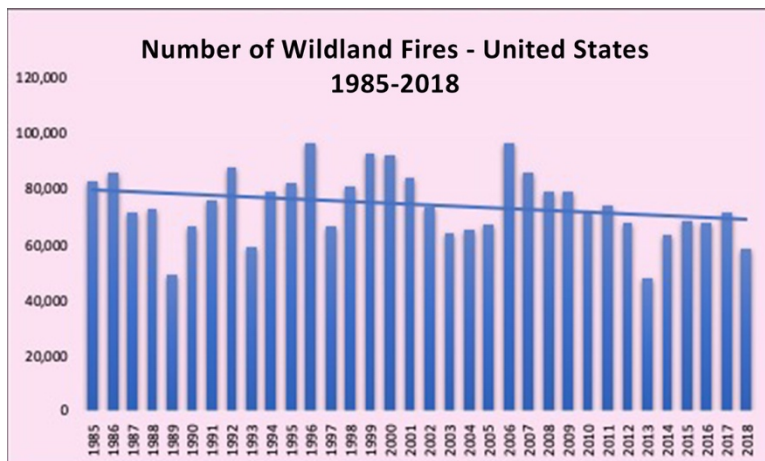


Figure 1. The number and trend of yearly wildland fires in the United States from 1985 to 2018<sup>5</sup>

From 1985 to today, the trend in acres burned by wildland fire is increasing at a frightening rate. In 1985 less than 3 million acres burned, while in 2015 and 2017 over 10 million acres burned (Figure 2). It has been suggested that increased forest fire activity across the western U.S. in the past few decades has been enabled by factors including human development, the legacy of fire suppression, natural climate variability, as well as climate change.<sup>6</sup> This increase in the amount of acres burned means that the need for expertise and for the appropriate materials for use in restoration following fires is growing as well. H.R. 1572 provides funds that not only ensure that

<sup>4</sup> <https://www.iii.org/fact-statistic/facts-statistics-wildfires#Top%2010%20States%20For%20Wildfires%20Ranked%20By%20Number%20Of%20Fires%20And%20By%20Number%20Of%20Acres%20Burned.%202018>

<sup>5</sup> [https://www.nifc.gov/fireInfo/fireInfo\\_stats\\_totalFires.html](https://www.nifc.gov/fireInfo/fireInfo_stats_totalFires.html)

<sup>6</sup> <https://www.pnas.org/content/113/42/11770>

the proper skills are available but can also help to initiate some of the much-needed research in identifying the plant materials that are most likely to meet objectives in restoration activities.

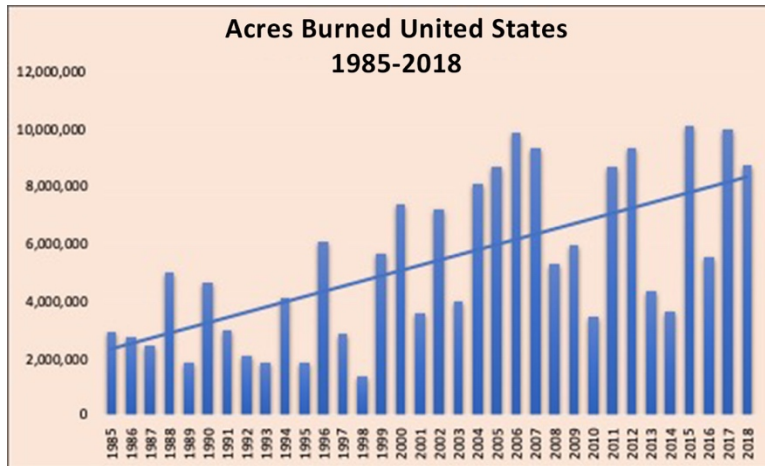


Figure 2. The number and trend of acres burned annually in the United States from 1985 to 2018<sup>8</sup>

## Invasive Species

It is estimated that over 100 million acres in the West are infested with invasive species; many of those acres (50-70 million) are covered with the highly-flammable non-native annual cheatgrass. Cheatgrass has been found in nearly every state and has continuously expanded its footprint on the West with every acre that burns. This species is most adapted to rangelands but can expand into a wide variety of ecosystems once burned and mineral soils are exposed. Because of its high flammability, it has caused a significant loss of lower-elevation sagebrush. Historically these communities carried fires only when humidity was low and winds were high, or after several wet years when fine fuels could accumulate (Hull and Hull 1974; Mensing et al. 2006; Vale 1975). These fire-free periods were often 100 to 200 years or more. Where perennial native bunchgrasses and shrubs have been lost to improper grazing and invasion by cheatgrass and other invasive species, fire frequency is more than those with intact, native understories in the Great Basin (Balch et al. 2013). Observations of increased fire frequency were reported as early as the early- to mid-1900s after these annual grasses began invading much of the Intermountain West (Pickford 1932; Piemeisel 1951; Robertson and Kennedy 1954).

Immediate and continued efforts including reseeding and replanting with native species and long-term controls of non-native species will ensure that invasive species do not establish and replace the natives with undesirable weedy species.

## Why Natives?

Why use native plant materials instead of the seed of grasses and wildflowers often used today in wildland fire rehabilitation and ecosystem restoration? Many of those species commonly used are from Russia, Eurasia, and Asia. When you seed them, they grow; and, when they grow, they are successful at holding the soil in place. At the same time, they keep the native species from returning; the biodiversity within our ecosystems is nearly gone. Similarly, ecosystems that have been invaded by nonnative grasses, such as cheatgrass, show a loss of biodiversity not unlike that

found in communities intentionally planted to the nonnative crested wheatgrass for improved livestock forage in the West (Figures 3a and 3b). The wildlife, birds, and now more than ever the pollinators critical for our agriculture industry that all evolved with native species in place, have not adapted well to their loss.



Figure 3a. Landscape dominated by the non-native perennial grass, crested wheatgrass, which is a species commonly used to provide livestock forage and for watershed restoration following wildland fires. Crested wheatgrass is highly competitive with other native species and maintains very low biodiversity.



Figure 3b. Landscape dominated by cheatgrass, a non-native annual invasive species often spreads on lands burned by wildland fires. This species is said to cover 50-70 million acres in the west and typically burns every 5-10 years, keeping biodiversity at a very low level as well.

For example, sage grouse populations in the West that were estimated at about 16 million 100 years ago, are somewhere between 200,000 and 500,000 today. And along with exposure to parasites and pesticides, research has shown that the loss of wildflower abundance and diversity due to increased land-use and habitat destruction limits nesting sites for wild pollinators<sup>7</sup>. Research from the University of Nevada, Reno suggests: *If we hope to stem the losses of insect diversity and the services insects provide, society must take steps at all levels to protect, restore, and enhance habitat for these animals across all landscapes, from wildlands to farmlands to urban cores.*<sup>8</sup>

## What does Locally Adapted Mean?

Locally adapted plant materials are native plant materials environmentally adapted to a restoration site that are likely to establish, persist and promote community and ecological relationships. Such plants would be: sufficiently genetically diverse to respond and adapt to changing climates and environmental conditions; unlikely to cause genetic contamination and undermine local adaptations, community interactions, and function of resident native species within the ecosystem; not likely to become invasive and displace other native species; not likely to be a source of nonnative invasive pathogens; and likely to maintain critical connections with pollinators.

<sup>7</sup> <https://ento.psu.edu/pollinators/resources-and-outreach/globally-pollinators-are-in-decline>

<sup>8</sup> <https://onlinelibrary.wiley.com/doi/epdf/10.1111/csp2.80>



The use of locally adapted, native plant materials is critical for successful restoration activities. Species often used for revegetation purposes can easily occur over a great range of distribution. Locally distinct populations have evolved under unique climates and weather patterns. For example, bluebunch wheatgrass, a commonly used native plant for restoration in the Great Basin and Colorado Plateau, occurs from Alaska to western Texas. Populations of this species growing in the Southwest have evolved under monsoonal climate patterns, while those of Alaska certainly have not. It cannot be expected that plant materials, even from the Pacific Northwest, would establish and grow as well in southern Utah as materials from ecologically similar environments.

Foresters have long used locally adapted species timber species; in fact, “*seed transfer zones*” have been established and used whenever trees are replanted following fire or timber harvest because they are known to be better-adapted to live and grow in environments closer to where they have existed over centuries. The same selection factors apply to all species of plants. In the short and long run, this will allow for more cost-effective and successful restoration of resilient ecosystems.

It should be noted that the term “locally” adapted may connote very small or discrete ecoregions. This is largely not the case. Researchers have found that EPA Level III ecoregions<sup>9</sup> can often be used to define seed transfer zones.

## **The Role of Ecological and Botanical Sciences Expertise in Effective Response**

For agencies to successfully meet the many needs for restoring resilient, functioning ecosystems, they must have the proper staffing. They must be conducting the appropriate research and have the personnel to implement those management discoveries on the ground. In a 2010 report on *Assessing botanical capacity to address grand challenges in the United States* over 40 percent of the federal botany employees self-reported that they would be retired by the end of this year (2019). Thirty five percent of botanists at the state and local government, and 30 percent at the university and state Natural Heritage program level also self-reported that they would be retired by the end of this year (Figure 4).<sup>10</sup> For example, based on our research, the number of botanists in the BLM has dropped from 68 in 2000 to 46 today. These individuals played a critical role in promoting efficient and effective land management and restoration. This is a loss not only of people on the ground, but also of the corporate memory that goes along with it. And, when you understand that there are nearly 20 times less botanists and ecologists in the federal agencies than there are wildlife biologists, this has a huge impact on doing the job right in the first place.

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<sup>9</sup> [https://www.epa.gov/sites/production/files/styles/large/public/2015-11/eco\\_level\\_iii\\_us\\_sm.gif](https://www.epa.gov/sites/production/files/styles/large/public/2015-11/eco_level_iii_us_sm.gif)

<sup>10</sup> [https://www.bgci.org/files/UnitedStates/BCAP/bcap\\_report.pdf](https://www.bgci.org/files/UnitedStates/BCAP/bcap_report.pdf)

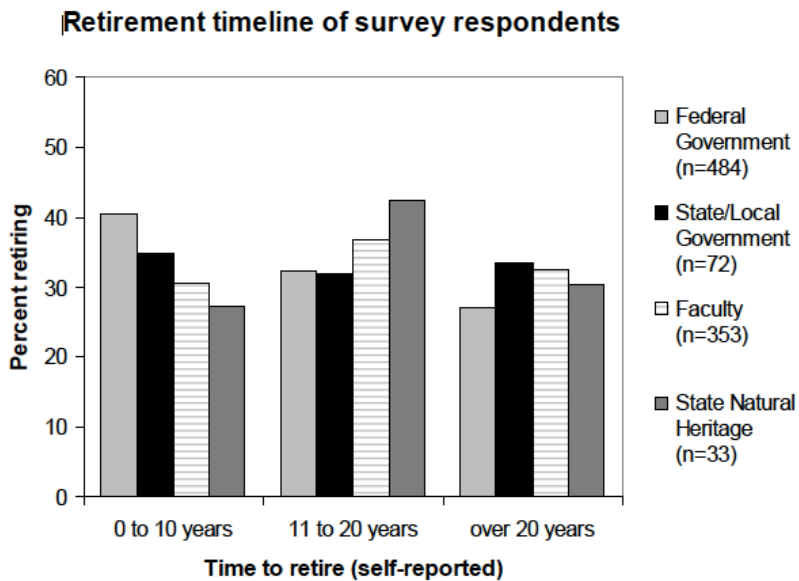


Figure 4. Retirement timeline of botanists at federal land management agencies that botanists would likely retire after 2009 survey (Kramer et al. 2010)

## Partnerships

One example of a highly successful partnership with a local State agency to meet the needs of restoration on the ground is the State of Utah’s Watershed Restoration Initiative. The Bureau of Land Management has been a large partner in this State’s program. The 2007 Milford Flat Fire, which started by lighting on July 6 of that year, was the largest wildland fire in Utah history. It burned over 360,000 acres and caused large stretches of Interstate-15 to be temporarily closed. Many veteran firefighters said it was the fastest moving fire they had ever seen. *"It took everything. Essentially looked like a moonscape. Didn't even leave the stubs of the sage brush. Cleaned it right to mineral soil,"* according to Bureau of Land Management Fuel Program Manager Paul Briggs.

Through the Utah Watershed Restoration Initiative (UWRI) nearly 200,000 acres were treated, regardless of ownership involved, and native plants were a key element in the treatment plan (Table 2). Federal land management agencies including the Bureau of Land Management, National Park Service, US Fish and Wildlife Service, US Forest Service, and Natural Resource Conservation Service have partnered with UWRI in over 800 projects that are current or have been completed, and are involved in another 66 proposed projects in the near future (Table 3).

Table 2. Utah Watershed Restoration Initiative projects completed, current, and proposed in the State of Utah.

Status	Projects	Acres	Funding	In-Kind
<b>Completed</b> <sup>11</sup>	1,973	1,601,404	\$216,199,934	\$24,584,478
<b>In Progress</b>	274	382,654	\$71,020,288	\$8,991,864
<b>Proposed</b>	201	213,111	\$49,760,093	\$6,386,911

<sup>11</sup> <https://wri.utah.gov/wri/project/search.html?status=Completed>

Table 3. Projects lead by federal agency in the partnership with Utah Watershed Restoration Initiative (UWRI).

Agency Project Status	Number of Projects
<b>Bureau of Land Management</b>	
Completed	403
Current	55
Proposed	34
Total	<b>492</b>
<b>National Park Service</b>	
Completed	2
Total	<b>2</b>
<b>U.S. Fish and Wildlife Service</b>	
Completed	12
Current	3
Proposed	1
Total	<b>16</b>
<b>U.S. Forest Service</b>	
Completed	180
Current	48
Proposed	30
Total	<b>258</b>
<b>USDA Natural Resources Conservation Service</b>	
Completed	56
Current	3
Proposed	1
Total	<b>60</b>
<b>Grand Total</b>	<b>828</b>

## Why H.R. 1572 Matters

From my perspective as a combined 30-year employee of the Forest Service and Bureau of Land Management, I have seen how agency budgets have been spent and how little goes to the plants, either rare or common, unless they are money producers. Yet plants are the foundation for all life on Earth. Funding for rare plant protection and management, the loss of reforestation dollars, the loss of funding for the Forest Service native plant materials program, and probably above all, the loss of appropriated funds to fire suppression from programs that would help to improve conditions on the ground such that might reduce the amount of acres burned all add to the critical importance of H.R. 1572.

## Past and Present Funding Issues

To illustrate how funding dollars have been prioritized, one must look no further than allocations for rare animals and for rare plants. Table 4 shows the 1999-2012 Federal and State Expenditures on Threatened and Endangered animals and plants in the United States. In 2012 there were 872 plants and 648 animals Federally listed as Threatened and Endangered. While plants made up 57.4 percent of the total number of species, they received 3.7 percent of the total funding; animals, which made up 42.6 percent of the total, received 96.3 percent.



The FY 2016 U.S. Fish and Wildlife Service Federal and State Endangered and Threatened Species Expenditure Report notes that, as reported in Table 5, the numbers of T&E plants have increased to 944 (56.8% of total) and animals to 719 (43.2% of total). The report also notes that expenditures for plants fell to 3 percent from 3.7.

Table 4. 1999-2012 Federal and State Expenditures on Threatened & Endangered Animals and Plants

<b>Group</b>	<b>Number of Species</b>	<b>Percent of Species</b>	<b>Total Funds Spent 1999-2012*</b>	<b>Percent of Total</b>
<i>Mammals</i>	88	5.8%	\$1,750,092,674	14.0%
<i>Birds</i>	96	6.3%	\$1,648,113,804	13.1%
<i>Reptiles</i>	39	2.6%	\$730,841,787	5.8%
<i>Amphibians</i>	29	1.9%	\$130,807,596	1.0%
<i>Fishes</i>	153	10.1%	\$7,453,983,093	59.4%
<i>Clams</i>	88	5.8%	\$110,504,990	0.9%
<i>Snails</i>	46	3.0%	\$44,452,369	0.4%
<i>Insects</i>	71	4.7%	\$124,452,171	1.0%
<i>Arachnids</i>	12	0.8%	\$6,083,853	0.0%
<i>Crustaceans</i>	24	1.6%	\$67,418,881	0.5%
<i>Corals</i>	2	0.1%	\$12,374,252	0.1%
<b>Animal Subtotal</b>	<b>648</b>	<b>42.6%</b>	<b>\$12,079,125,470</b>	<b>96.3%</b>
<i>Flowering Plants</i>	837	55.1%	\$450,387,861	3.6%
<i>Conifers &amp; Cycads</i>	3	0.2%	\$1,077,071	0.0%
<i>Ferns &amp; Allies</i>	30	2.0%	\$7,760,503	0.1%
<i>Lichens</i>	2	0.1%	\$983,531	0.0%
<b>Plants Subtotal</b>	<b>872</b>	<b>57.4%</b>	<b>\$460,208,966</b>	<b>3.7%</b>

\*Combined Federal & State spending

Table 5. FY16 Federal and State Expenditures on Threatened & Endangered Animals and Plants

Group	2016 Number of Species	2016 Percent of Species	FY 2016 Expenditures	Percent FY2016 Expenditures
Fishes	167	10.0%	\$800,223,272	61.1%
Mammals	94	5.7%	\$199,082,232	15.2%
Birds	101	6.1%	\$145,582,467	11.1%
Reptiles	46	2.8%	\$62,726,451	4.8%
Amphibians	36	2.2%	\$18,799,159	1.4%
Clams	91	5.5%	\$14,665,840	1.1%
Insects	85	5.1%	\$11,711,364	0.9%
Corals	7	0.4%	\$8,158,347	0.6%
Snails	52	3.1%	\$4,469,183	0.3%
Crustaceans	28	1.7%	\$4,167,812	0.3%
Arachnids	12	0.7%	\$561,091	0.0%
<b>Animal Subtotals</b>	<b>719</b>	<b>43.2%</b>	<b>\$1,270,147,218</b>	<b>97.0%</b>
Flowering Plants	900	54.1%	\$38,115,177	2.9%
Ferns & Allies	38	2.3%	\$675,888	0.1%
Conifers & Cycads	4	0.2%	\$138,320	0.0%
Lichens	2	0.1%	\$54,121	0.0%
<b>Plant Subtotals</b>	<b>944</b>	<b>56.8%</b>	<b>\$38,983,506</b>	<b>3.0%</b>
<b>Grand Total</b>	<b>1,663</b>	<b>100%</b>	<b>\$1,309,130,724</b>	<b>100.0%</b>

### The Cost to Agencies for Suppressing Wildfires Nationally

While the number of acres burning from year to year have been increasing at an alarming rate (Figure 5), the Federal firefighting costs for suppression alone have had a debilitating impact on non-fire work, such as recreation, restoration, planning, and other activities, especially with the US Forest Service. In 1995, fire made up 16 percent of the Forest Service’s annual appropriated budget (Figure 6); in 2015, fire made up 52 percent (Figure 7), and in 2016 it made up 56 percent of the appropriated budget. At the same time, National Forest System’s budget has been reduced from 58 percent in 1996 to 29 percent in 2015. H.R. 1572 was not designed to address this tremendous loss of the ability to manage all other forest systems targets, including a backlog of reforestation and fire prevention projects.

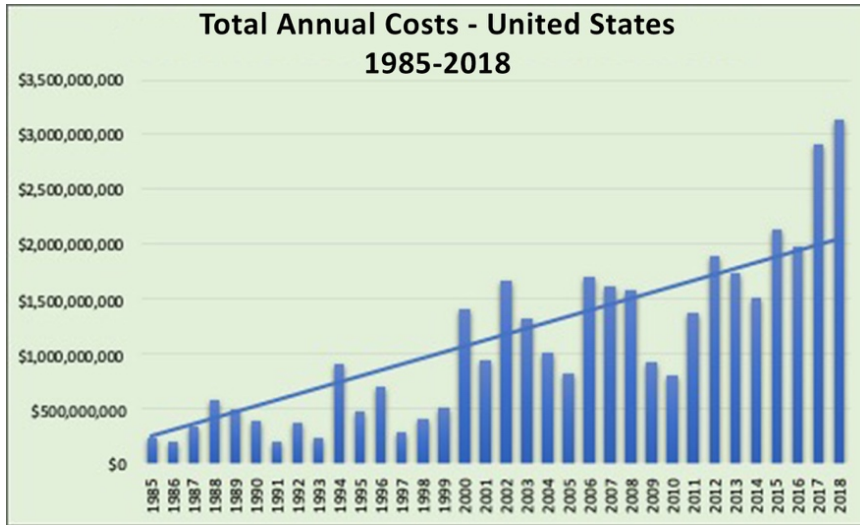


Figure 5. The total annual costs of and trend for wildland fire suppression alone in the United States<sup>12</sup>

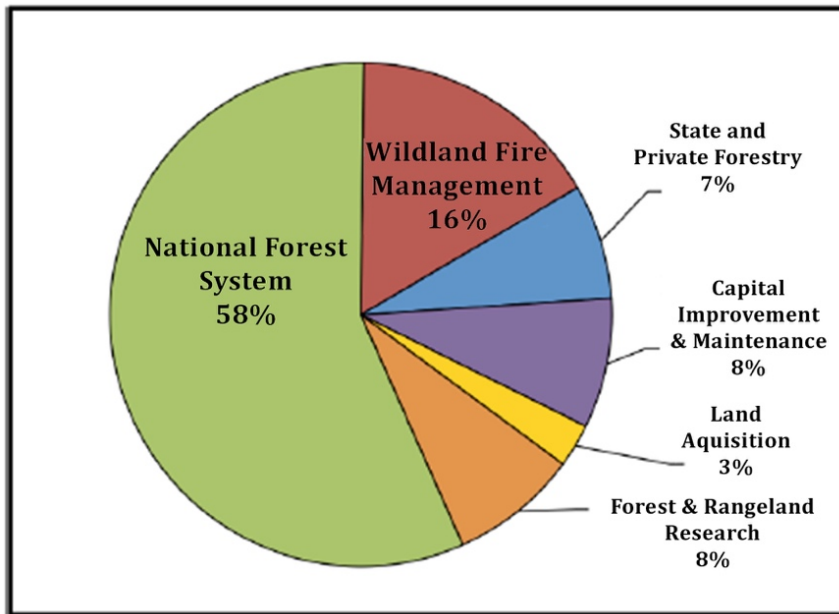


Figure 6. Forest Service FY 1995 Appropriations by Fund<sup>13</sup>

<sup>12</sup> [https://www.nifc.gov/fireInfo/fireInfo\\_documents/SuppCosts.pdf](https://www.nifc.gov/fireInfo/fireInfo_documents/SuppCosts.pdf)

<sup>13</sup> <https://www.fs.fed.us/sites/default/files/2015-Fire-Budget-Report.pdf>

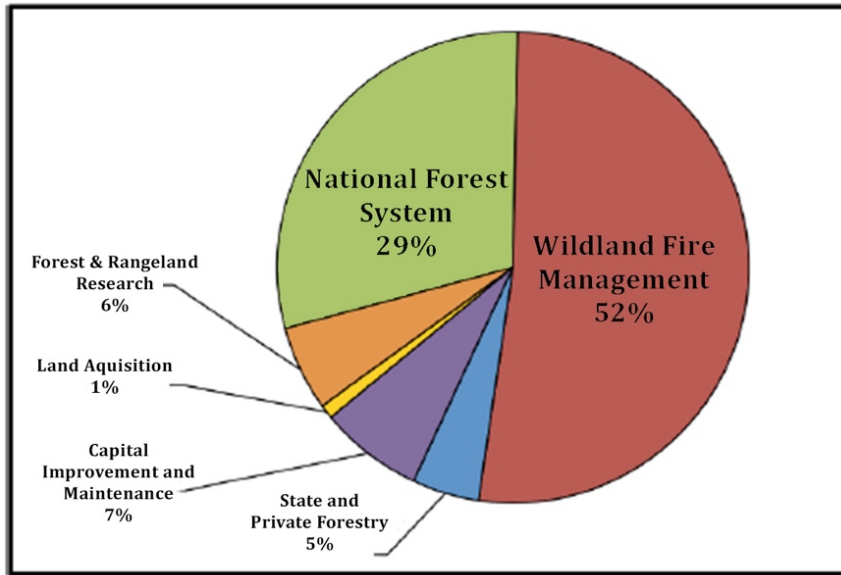


Figure 7. Forest Service FY 2015 Appropriations by Fund<sup>10</sup>

While, in my professional opinion, the US Forest Service is pleased that this level of appropriated fund has been “fixed” at the 2015 level, it has resulted in a corresponding 39 percent reduction in all Forest Service non-fire personnel; and this loss of capacity of has had significant implications to activities such as possible restoration work that might help prevent future catastrophic fires, protect watersheds that provide culinary water for tens of millions of people, as well as numerous other multiple use values that people enjoy on their public lands.

## Dollars Lost

From FY 2001 to FY 2010, the Forest Service received appropriations from Congress in Wildland Fire Management for Burned Area Emergency Response to develop a long-term native plant materials program. These appropriations averaged approximately 2 million dollars annually and led to a successful network of native plant development projects on national forests and grasslands across the country. It was during this period that the agency built a robust national native plant policy which led to increased demand for native plant materials for all rehabilitation and restoration efforts. In 2005, I was on detail to the Washington Office of the Forest Service as their national botanist where I was responsible for evaluating and approving funding requests from across the agency for native plant materials development projects.

This was a very successful program, and those funds were distributed annually from 2004 through 2010. For unknown reasons, those funds were no longer made available in FY 2011. One can find the Native Plant Material Accomplishment Reports for FY05 through FY16 on the agency’s web page<sup>14</sup>, and it is clear from looking at this web page and in Figure 8 below that accomplishments have suffered tremendously since those funds dried up. In recent conversations with Forest Service staff in the Washington Office, national forests indicated the agency was meeting approximately one quarter of their needs on the ground with this program,

<sup>14</sup> [https://www.fs.fed.us/wildflowers/Native\\_Plant\\_Materials/reports.shtml](https://www.fs.fed.us/wildflowers/Native_Plant_Materials/reports.shtml)

although I expect the need has significantly increased with more and more agency acres burning and otherwise being disturbed in recent years.

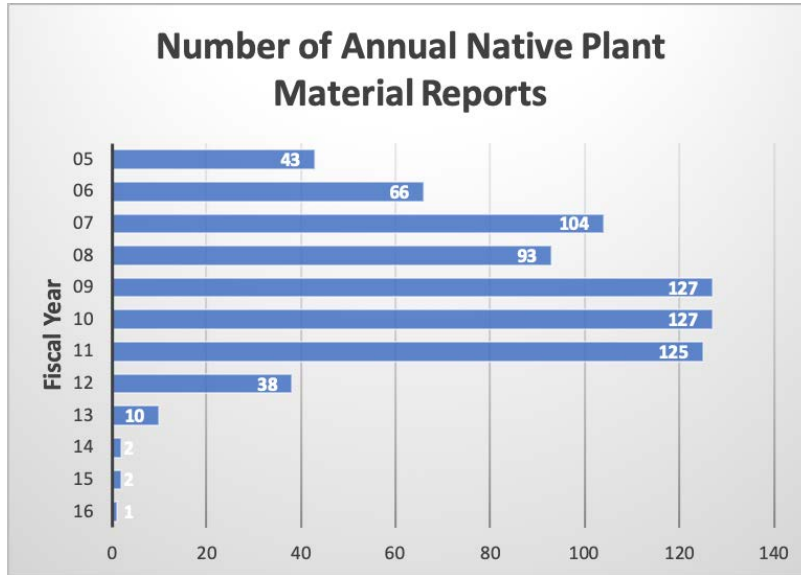


Figure 8. Number of Annual Native Plant Materials Accomplishment Reports to the Us Forest Service from FY05 through FY16

## Conclusions

This is not a plea to move funding away from other much-needed programs and staffing. It is merely to point out that the BLM and Forest Service alone lack the people and their associated skills to maintain what ecosystems aren't already broken, or to fix those many millions of acres of ecosystems that are currently failing. Funding has been, and continues to be lacking for the programs, positions, and projects on the ground to help our lands respond to the past, present, and future impacts from an ever-growing population and the associated demands on the resources those lands provide. H.R. 1572 will tremendously help in the recognition of the needs to make our lands healthier, while providing the critical habitat for pollinators, wildlife, and the humans that depend on them.

H.R. 1572 not only provides funding for the much-needed research for a better understanding of how we might better do our jobs, it also provides for the staffing needed to get the job done. It allows loan forgiveness for students hired who have the expertise to do the job. H.R. 1572 also helps to increase the demand for native plant materials, which will increase the production of locally adapted native plant materials (supply). And, over the longer run, this increase in demand and supply will likely bring the costs down.

H.R. 1572 will increase the capacity of agencies to adequately meet their workload needs. Having more personnel with the knowledge to get the job done right; to restore ecosystem resiliency so they can be better adapted to ever-changing environments; and to conduct the research and provide the tools address old and new challenges, will be critical for land managers to make better decisions on the ground. By forgiving student loans of those that take the appropriate classes and obtain the appropriate degrees, H.R. 1572 will play a critical role in bringing new knowledge and new energy to an existing staff that is experiencing a significant loss of staffing at a time when it is most needed.

And it is clear, from my perspective, that the agencies differ in how they work and how they have in the past and how they currently fund their native plant programs. What is even more clear is that there is a tremendous need for strong native plant programs and H.R.1572 helps the BLM and other Department of Interior agencies move forward. We need healthy, resilient ecosystem to fight against the historic, current, and future pressures put upon them so they are capable of providing the services our ever-growing population demands. Some of the many ecosystem services include, but are not limited to:

- Prevention and mitigation of natural hazards and natural events, generally associated with storms and other severe weather;
- Regulation of overland water flow and consequently regulation of erosion and runoff
- Provision of habitat for pollinators;
- Provision of habitat for wildlife and birds;
- Carbon storage

In addition to all the ecosystem services provided through the implementation of H.R. 1572, from my experience there are also going to be measurable economic benefits. An increase in native plant material demand, will result in an increased number of jobs. Wildland seed growers



and native seed collectors will be needed to provide the materials needed for restoration purposes. We can only guess how many other ways local businesses will benefit from a higher demand for native plant materials and the restoration of native ecosystems, but at the very least there will be more opportunities for seed growers to build a new product (native seeds not previously available) to a growing market; a market that will be positively affected by the implementation of H.R. 1572.

## References

- Balch, J.K.; Bradley, B.A.; D'Antonio, C.; Gomez-Dans, J. 2013. Introduced annual grass increases regional fire activity across the arid western USA (1980-2009). *Global Change Biology*. 19:173–183.
- Hull, A.C., Jr.; Hull, M.K. 1974. Presettlement vegetation in Cache Valley, Utah and Idaho. *Journal of Range Management*. 27:27–29.
- Kramer, A.T., K. Havens & B. Zorn-Arnold. 2010. Assessing botanical capacity to address grand challenges in the United States. Chicago Botanic Garden and Botanic Gardens Conservation International U.S., [https://www.bgci.org/files/UnitedStates/BCAP/bcap\\_report.pdf](https://www.bgci.org/files/UnitedStates/BCAP/bcap_report.pdf) (see page 40)
- Mensing, S.; Livingston, S.; Barker, P. 2006. Long-term fire history in Great Basin sagebrush reconstructed from macroscopic charcoal in spring sediments, Newark Valley, Nevada. *Western North American Naturalist*. 66: 64–77.
- Pickford, G.D. 1932. The influence of continued heavy grazing and promiscuous burning on spring–fall ranges in Utah. *Ecology*. 13: 159–171.
- Piemeisel, R.L. 1951. Causes affecting change and rate of change in a vegetation of annuals in Idaho. *Ecology*. 32: 53–72.
- Robertson, J.H.; Kennedy, P.B. 1954. Half-century changes on northern Nevada ranges. *Journal of Range Management*. 7:117–121.
- Vale, T.R. 1975. Presettlement vegetation in the sagebrush-grass area of the Intermountain West. *Journal of Range Management*. 28: 22–36.