



FINAL REPORT

GOVERNOR'S INVASIVE SPECIES INITIATIVE

October 2020



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BACKGROUND

In August of 2019, Governor Mark Gordon began assembling a team to develop a report regarding invasive plant species and their management in Wyoming. Team members were selected based on a number of factors including, but not limited to: experience (either in policy or technical implementation of invasive plant species management), location of the team member in Wyoming (to avoid recruiting all members from a single part of the state), industry (to represent different interests across user groups), and agency affiliation (to ensure federal, state, and local governments were well represented).

The larger team, composed of 32 individuals including chairmen, were then split into two distinct teams – one for policy and one for technical expertise. The teams first met in Lander on October 30, 2019 as a single group. Following this initial meeting, the teams worked individually to develop answers to the question posed in the Governor’s October 3, 2019 letter. In his letter, the Governor asked seven broad questions:

- 1) What species, or groups of species, are the highest priorities for Wyoming?
- 2) What are the gaps, in terms of both policy and technical expertise, in managing these species? How could these gaps be addressed?
- 3) How do we assess the current extent of invasion and how do we use that information in the future?
- 4) Is a statewide strategy appropriate? Can and should we develop goals at this level?
- 5) Is there a sustainable funding model for invasive [plant] species management, at any scale?
- 6) How do we organize and engage stakeholders in large-scale management and implementation? And,
- 7) How do we define success and how do we monitor long-term success?

This report has been developed based on each teams’ work, combined work over the course of four meetings of the full team, and countless hours of editing and emails by team members. The report revolves around the seven questions the Governor asked in his original letter and includes recommendations on ways to either further refine the Governor’s questions, answer portions of them, or other actions that should be considered. Many of the questions overlap, or are extremely related, and therefore require similar discussion or combination to better inform the reader. Additionally, the teams felt it most appropriate to address the questions based on a progression of conversation, rather than in the specific order detailed by the Governor in his letter. The Governor’s Invasive Species Initiative (GSI) was specifically tasked with reviewing the Governor’s questions in the vein of terrestrial invasive plant species and therefore does not address aquatic invasive plants or animals, insects, or terrestrial animals.

The report is organized into three main chapters: The Importance of Acting Now; Discussion of the Governor’s Questions; and, Overall Conclusions and Recommendations. This document is intended to be a report to the Governor, but it is anticipated that the information contained in the document can be utilized by a broad audience.

The information is a culmination of all team members input and should not be construed as any agency, federal or state, lobbying for a particular change. Many agencies represented on the teams are devoted solely to an area of science or policy and overall recommendations should not be viewed as derivatives of any agency’s perspective, rather as the recommendation of the whole.

The tables below present the members of each team and their respective chairs.

POLICY TEAM		TECHNICAL TEAM	
CHAIR: Steve Meadows	WWNRT Vice Chair	CHAIR: Justin Derner	ARS
Wyatt Agar	WY Senate	Bob Budd	WWNRT
Brian Boner	WY Senate	Ben Bump	OSLI
Jacque Buchanan	USFS	Todd Caltrider	WGFD
Josh Coursey	Muley Fanatics	Justin Caudill	WDA
Jessica Crowder	WLA	Scott Gamo	WYDOT
John Elliott	BLM	Lindy Garner	USFWS
Jack Engstrom	BP	Ken Henke	BLM
Colleen Faber	Anadarko/OXY	Brian Jensen	NRCS
Jamie Flitner	WY House	Julie Kraft	WY Weed & Pest
Slade Franklin	WY Weed & Pest	Rod Litzel	WY Weed & Pest
Rob Hendry	County Commissioner/Ag	Brian Mealor	UW
Mark Hogan	USFWS	Dwayne Rice	USFS
Matt Hoobler	Pathfinder Ranches	Dan Tekiela	UW
Astrid Martinez	NRCS	Amanda Thimmayya	WY Military Dept
Tom Walters	WY House	Mahonri Williams	US BoR

The Policy and Technical teams would like to thank the Governor for his attention to this issue and willingness to put together a group to begin working towards larger goals and organization for Wyoming. We would also like to thank the members of the public who attended the meetings and provided input. We respectfully suggest the Governor make this report available, upon his approval of a final document, to the public and to local, state, and federal agencies.

Chapter 1

The Importance of Acting Now

Issues surrounding terrestrial invasive plant species are not new. The impacts of these species have been documented for more than a century by both ecologists and practitioners. Despite the immense body of research and practical knowledge, there are still questions and issues that remain difficult to confront. The members of the Governor's Invasive Species Initiative (GISI) have attempted to approach the massive issue of terrestrial invasive plant species from a broad view with a "one bite at a time" mentality. A major component of future management revolves around the sense of urgency. As noted in the Governor's letter to the GISI, Wyoming faces unique challenges but is not in the same situation as some of our neighboring states, particularly those located in the Great Basin. In many ways, Great Basin states have done a better job of telling their story and bolstering public awareness which ultimately has led to a sense of urgency and increased funding for control efforts. Although Wyoming is not facing the same levels of infestation as some neighboring states, recommendations contained in this report highlight the urgency and opportunities available to avoid these infestation levels. As noted by the Governor in his letter, "while our neighbors are contemplating restoration, we still have the opportunity in many areas to contemplate prevention, retention of habitats, and improvement."

Discussions often center around potential costs of implementing programs targeted at terrestrial invasive plant species, but do not often consider the cost of doing nothing. For Wyoming, the cost of inaction must be something that remains in the forefront. A leafy spurge treatment may cost one million dollars over ten years but ignoring the issue, or treating for a year and walking away, could ultimately come with a much larger price tag, both financially and ecologically.

Landowners and land managers are required to think about systems as a whole and it is often not possible or beneficial to focus on one aspect of a landscape or on a single species. Invasive plant species, in many cases, harm ecosystems and negatively impact economic returns. This harm is difficult to quantify. The impacts may vary, but could include reduced biodiversity, altered species composition, decreased productivity and palatability, altered fire cycles, degraded wildlife habitat, reduced water holding capacity, and altered soil biomes. Those who depend directly on the land for their livelihood are not the only people impacted by these changes. The public also depends upon and expects the benefits provided by functioning and healthy ecosystems – clean air, clean and abundant water, habitat for wildlife, food, fiber and recreational values.

These costs and benefits are not always easy to quantify and are often referred to as "ecosystem services." Ecosystem services encompass four main categories as defined by the Millennium Ecosystem Assessment (2005): supporting services (such as nutrient cycling, soil formation, and plant production); provisioning services (such as food, fiber, or fresh water); regulating or regulatory services (such as climate regulation, pest regulation, and pollination); and cultural services (such as aesthetic value, recreation, and wildlife).¹ Invasive plant species can impact one or all of these but often are not viewed as a major driver by the public even though many depend upon and expect the benefits of ecosystem services.

¹ https://www.fs.fed.us/pnw/pubs/pnw_gtr943.pdf

Basing decisions on ecosystem services is difficult since they represent an intersection of ecology, biology, technology, economics, and cultural stigmas. Additionally, invasive plant species management is often approached from the standpoint of ecology or technology which can only garner so much public attention and does not recognize the most unequivocal piece of the equation – culture. Without relaying the importance of invasive plant species to the general public and policy makers in a way that is tangible, little progress can be made in terms of funding, public support and behavior, or changes to existing rules or regulations. Put plainly, if we cannot explain to the public that invasive plant species can negatively impact things like recreation, it is hard for many to put into context.

Ideally, we would be able to calculate the cost of actions needed to control invasive plants and the cost of inaction. Yet, there is no real way to calculate these numbers with any level of certainty. Estimates may be available but would likely be so broad that they would be largely useless. However, information obtained by the teams regarding previous spending across federal, state, and private groups, indicate that annual spending, by NRCS, USFS, and the State is well over \$10 million. This does not include the millions spent by other agencies, private individuals, or other non-governmental or non-profit groups. This also represents one area that is poorly tracked and rarely reported in aggregate terms.

Given the high variability of efficacy for controlling any particular invasive plant species, there is no accurate way to estimate what it may take to eradicate or even fully contain the terrestrial invasive plants in Wyoming. Additionally, regional and local emphases on different species make the correlation between dollars needed and efficacy of control difficult to establish. Regardless, the teams broadly agreed the cost of inaction was much higher than action now.

Wyoming is at a critical point in time; we can either move towards a head-on confrontation with terrestrial invasive plant species or risk the consequences that have manifest in other states. This applies not only to the species that are already present, but also to those which may invade Wyoming (referred to in this document as Early Detection Rapid Response species or EDRR species). According to the Early Detection and Distribution Mapping System (EDDMapS) there are over a half dozen species in neighboring states that could be reasonably expected to arrive in Wyoming in the next several years.² Additionally, a “watchlist” as developed in 2013 that may also be useful to managers and the public.³ While the likelihood of each invasive plant species arriving differs, the potential negative impacts should not be taken lightly.

Effective public awareness of the negative impacts of invasive plant species on ecosystem services, economics, and cultural heritage should be a central theme that resonates with residents of Wyoming. Whether it is a species that already has a solid foothold in the state or one that has not been found here yet, the impacts from all invasive terrestrial plant species are long-lasting and expanding. It is the hope of the GISI that raising awareness now and increasing education of Wyoming residents will result in the avoidance of the common response of “react once it impacts me.”

If Wyoming collectively commits to acting decisively in the near-term, we may be able to prevent further negative impacts from terrestrial invasive plant species, especially those that are capable of inhabiting all or most of our land types.

² <https://www.eddmaps.org/>

³ <http://wyomingextension.org/agpubs/pubs/B1227.pdf>

Chapter 2

Discussion of Governor's Questions

As noted in the Background, Governor Gordon launched his Initiative by asking the teams seven questions and shared his desire for the GISI to “lay a foundation for future initiatives to address more specific topics in greater depth” to “further integrate across programs and partners.” During the course of their work, the teams moved through multiple spatial and temporal scales when discussing the questions. It became extremely clear that potential answers to questions were intertwined and one question could not be answered without at least some discussion of the others. The level of dependency among the questions and answers was greater than some team members initially assumed. However, the teams have developed answers and discussion points for all the Governor's questions but, the teams did not organize this report in the exact order the questions were asked. This is done in an effort to provide a better picture of the teams thinking and how they progressed through the questions. The Governor's questions and associated discussion can be found below and team recommendations on each question are found in Chapter 3.

Is a statewide strategy appropriate? Can and should we develop goals at this level?

Although listed as question #4 by the Governor, the teams elected to begin the report with this question for a few reasons: the word “strategy” was interpreted differently by members; there was a large amount of discussion in terms of “yes” or “no” answers based on the species being discussed; the challenges created by an all-encompassing strategy; and, the development of goals at a statewide level can be viewed in different ways.

The term “strategy” is often used loosely but it appears the Governor's question was very direct: should we have a plan of action or policy designed for the entire State of Wyoming? Underlying concerns were that development of a statewide strategy could be viewed as a mandate which may not be flexible enough to recognize regional or local priorities/challenges. For example, different species are currently prioritized by region or location. The structure and organization of Weed and Pest Control Districts, differences in county affluence, and land ownership patterns make a statewide strategy nearly impossible for some species. Similarly, the development of goals for a single species, or suite of species, at the statewide level would be arduous and in order to reach broad agreement the resulting goals would likely be vague and difficult to track.

There are some areas where strategizing from a statewide perspective would have a benefit. Most notable include: coordination on public education to bolster support for invasive plant species management, developing statewide management plans and resources for EDRR species, and the development of funding models that work on a programmatic scale and longer timeframe.

What species, or group of species, are the highest priorities for Wyoming?

Both teams started their work with this question and it quickly became evident there were two very different, yet equally valid approaches.

The policy team focused their discussion on species that are not currently present in the state or those that could be approached from an Early Detection Rapid Response (EDRR) perspective. EDRR species pose a threat that we cannot fully comprehend and, from a policy standpoint, would add to the large list managers are already fighting. The most recent and notable species is ventenata grass in northeast Wyoming, which also happens to be an invasive annual grass. For the purposes of this report, EDRR species may include invasive annual grasses not yet in Wyoming but does not include cheatgrass, medusahead, or ventenata as these are the focus of the Invasive Annual Grasses (IAGs) as suggested by the technical team.⁴ It should also be noted “EDRR species” is somewhat of a misnomer; EDRR is a coordinated set of actions to inventory and eradicate (or contain) a species new to an area before it spreads rather than a finite list of species.

The technical team approached this question from a standpoint that focused on past, current, and near-future system impacts from species that are more ubiquitous or could become more prevalent, such as IAGs. IAGs pose a significant threat to multiple ecosystem functions (e.g., altered fire regimes, changes in nutrient cycling, carbon sequestration changes, water availability, etc.) and, in the case of cheatgrass, can be found in every county in Wyoming.

Both groups of species (IAGs and EDRR) have the potential to impact ecosystems and economic viability of private and public lands and policies that relate to their management. An EDRR species may heavily impact wildlife habitat, available forage, and ranch profitability⁵ and IAGs have already altered fire regimes and impacted important habitat for species like sage-grouse⁶ in Wyoming. Both could have substantial policy implications (e.g., reductions in available forage on state lands could decrease revenue and lead to costly control efforts; sagebrush fire could lead to listing sage-grouse as an endangered species).

Additionally, knee jerk reactions and shifting species priority can lead to monetary shell games and a lack of focus over a sustained period of time, ultimately leading to wasted resources. While locally there is a need to develop a tailored suite of tools to meet the most pressing issues, those species that pose significant threats on a large scale or are currently not in the state must be prioritized as well. This also plays into perceived sideboards on agencies and Weed and Pest districts. For example, the statewide noxious weed list⁷ does not contain all known EDRR species or all of the IAGs identified in Wyoming. County declared lists may fill this gap, but these lists vary from one county to another.

In addition, management actions, or reactions, differ for EDRR species versus IAGs. EDRR species require quick action and a focus on a combination of containment and reduction, long-term management, or

⁴ https://1b4ae2f1-5c4e-4930-9289-84e836f942c7.filesusr.com/ugd/9ae54b_5115d45fedf945e98ebf10b0f22c7e39.pdf

⁵ <https://neinvasives.com/species/plants/eastern-redcedar>

⁶ <https://www.sagegrouseinitiative.com/why-is-cheatgrass-bad/>

⁷ <https://wyoweed.org/noxious-species/listed-species/state-designated-noxious-weeds/>

eradication. With IAGs, the spectrum of management options can range from containment to managing around the species.

With this being said, State focus cannot shift solely to these two categories of invasive plant species. The existing state designated list is still relevant and Weed and Pest control districts are required by law to have a management program for each listed species. In addition, individual counties have their own declared lists. This creates three (or more) potential priorities for managers to consider when setting schedules of work and priorities (Figure 2.1).

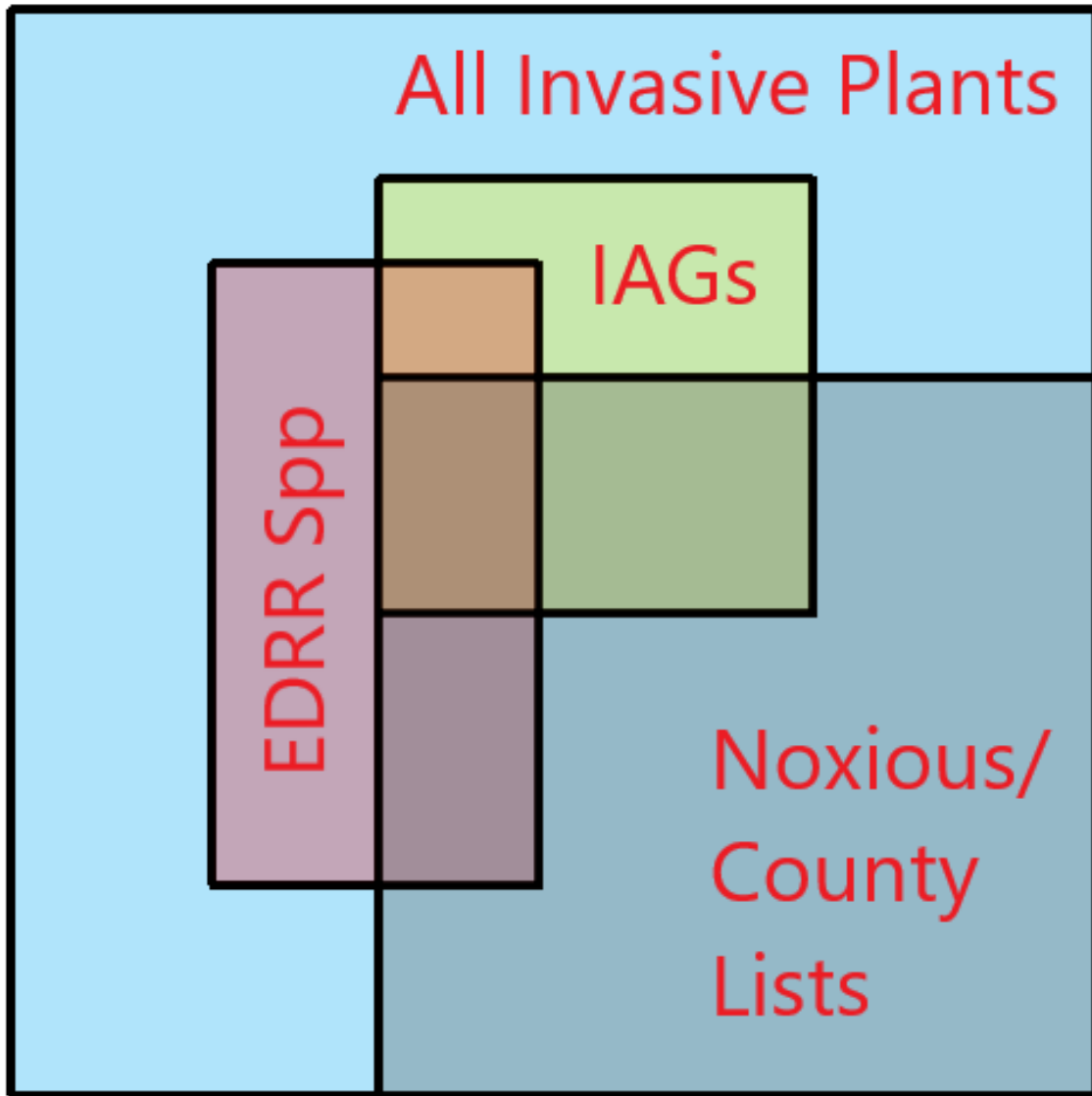


Figure 2.1 –Overlapping Species Priorities Matrix

The technical team directly addressed the issue of prioritization via a matrix (Figure 2.2) which is intended to help managers give due consideration to factors without dictating a species by species approach. The matrix revolves around potential impact of a given species and the ability to control said

species. This matrix provides managers an ability to prioritize limited resources and tailor to their needs. For example, a farmer’s wheat may be more heavily impacted by skeletonleaf bursage than cheatgrass and the cost to control bursage is minimal, making it an easy “win.” Conversely, a BLM permittee may rank cheatgrass as the most impactful species to their operation and with limited control tools, policy hurdles, and funding challenges, may elect to spend time and energy elsewhere.

		Degree of confidence for control of invasive(s) across jurisdictional boundaries and within economic cost realities	
		Low	High
Ability of invasive(s) to degrade integrity and sustainability of socio-ecological systems	Low	<p>Goal: Maintain areal extent of invasive(s) and/or accept increasing areal extent if beneficial use of the invasive(s) can be obtained through adaptive management.</p> <p>- Example: one invasive species is holding a more undesirable invasive species at bay.</p> <p>Best Management Practice: Use existing business as usual approaches and incorporate adaptive management for beneficial use of invasive(s).</p> <p>Post-control management to emphasize monitoring for targeted follow-up control using innovative and low-cost control approaches.</p>	<p>Goal: Reduce areal extent of invasive(s) to limit potential of spread of invasive(s) with changing climatic and atmospheric conditions that may change susceptibility of socio-ecosystem to degradation.</p> <p>- Example: a species begins to show up in places it had not been reported before, but control is realistically available.</p> <p>Best Management Practice: Strategic, cross-jurisdictional boundary control efforts with priority for targeting areas with potential for rapid spatial expansion.</p> <p>Post-control management to emphasize monitoring for targeted follow-up control (if needed) in areas with potential for rapid spatial expansion.</p>
	High	<p>Goal: Reduce areal extent of invasive(s) through innovative and low-cost control approaches.</p> <p>- Example: new management approaches allow for more control over a larger area which was previously unobtainable.</p> <p>Best Management Practice: Use monitoring-informed adaptive management to influence existing vegetation community for reducing aerial extent and reducing likelihood of continued spatial expansion of invasive(s).</p> <p>Post-control management to emphasize monitoring for targeted follow-up control using innovative and low-cost control approaches.</p>	<p>Goal: Zero tolerance for the invasive(s).</p> <p>- Example: a formerly undocumented invasive is found in the state.</p> <p>Best Management Practice: Use multi-pronged monitoring assessments and subsequent tactical responses to maintain zero tolerance for the invasive(s).</p> <p>Post-control management to emphasize due diligence in monitoring for targeted follow-up control in a highly timely manner.</p>

Figure 2.2 – Management Considerations Matrix

How do we assess the current extent of invasion and how do we use that information in the future?

Multiple tools exist for assessing the extent of invasion, whether on-the-ground monitoring such as physical surveying (e.g., walking plots, mapping with hand-held GPS units, etc.), monitoring changes in vegetation with seasons (e.g., cheatgrass turning purple), high-tech methodologies (e.g., LiDAR, remote sensing, aerial imagery), or modelling to predict future levels of invasion or changes in extent of an individual species, the necessary degree to which the extent must be assessed is species-dependent. For example, mapping salt cedar may be relatively simple and cost effective compared to mapping Russian knapweed simply due to each species' typical habitat. Moreover, the precision and accuracy will differ for each species and can further complicate assessment.

For a state as large as Wyoming, remote sensing provides the largest amount of data but may have limitations at the local level if data cannot accurately inform management. The benefit of roughly gauging conditions across a large landscape without having to physically visit them is real, but issues like timing of imagery, resolution, and cost can become problematic. Even with the most sophisticated equipment, ground truthing is still required to "teach" models what they are looking at and where to look.

For EDRR species it is more likely someone will spot something they do not recognize prior to it being captured by remote sensing. Tools like EDDMapS (Early Detection and Distribution Mapping System)⁸ may be a place for managers to start when looking for tools to help in the location and identification of EDRR species.

The use of spatial invasion data in the future has significant potential value, however there are some nuances in how any assessment of current extent is approached. In most cases, historic inventory data would provide the basis for future prioritization of treatments and allow land managers to track progress. However, current extent data for EDRR species is nonexistent or unknown and managers will be pressed to continue to prove a negative (i.e., inventory of an area to show absence), which is often not prioritized in terms of resources. Yet, absence data are often as critical as presence data when trying to determine the extent of invasions.

Regardless of how it's used, data must be consistent, accurate and accessible. To accommodate this a central clearinghouse where the data can be accessed would be ideal. Additionally, the data must remain "fresh" and verifiable in order to allow partners to collaborate through proactive management rather than reactive maintenance.

What are the gaps, in terms of policy and technical expertise, in managing [priority] species? How could these gaps be addressed?

The primary gaps identified by the teams revolve around multi-jurisdictional hurdles and data but each have multiple layers. Data consistency, repeatability, reliability, access, and intent are all tied together and span the breadth of spatial location data of species to tracking management efforts. Some agencies lack the ability to report on spending for control, or acres sprayed, while others cannot legally share data. Others still do not have datasets that are robust enough to capture current efforts or monitor to

⁸ <https://www.eddmaps.org/about/>

help inform future management or assist with adapting to changing conditions. From a planning standpoint, common objectives or goals are often identified, yet state and federal agencies may lack the regulatory or policy mechanisms in place to fully engage in multi-jurisdictional control efforts. For example, one federal agency may be limited to funding data collection and science, while another is tasked with the actual management but they cannot pool their resources to implement a multi-jurisdictional attack. Equally problematic is the inconsistent engagement from government agencies when planning.

The teams had a lengthy discussion regarding whether or not the current problems were a function of actual knowledge (or data gaps) or simply challenges related to working at a scale that was meaningful. Some “gaps” are presented more as the latter and may be more quickly remedied (e.g., a policy fix may be less difficult than inventorying the entire state for a species).

From a policy standpoint, the major gaps or challenges include:

- multi-jurisdictional administrative and logistical hurdles;
- an inability to use budget resources across fiscal years; competing regulations (e.g., raptor stipulations that limit presence during the opportune time to spray weeds);
- bureaucratic red-tape or policy (e.g., aerial application of pesticides requires lengthy NEPA processes);
- an inability or reluctance to spend across jurisdictions (e.g., BLM dollars only on BLM lands); and
- and an inability to regulate activities across large landscapes (e.g. recreation).

From the technical standpoint major gaps or challenges include:

- a general lack of understanding of control efforts at different spatial scales (e.g., extrapolation of test plot data to an entire watershed or across a county);
- research and related funding are typically limited to a few years, rather than long-term;
- lack of a central clearinghouse for data;
- lack of consistent data to inform adaptive management and new frontiers in research;
- limitations of current inventory and monitoring tools, including a lack of pre-control management data;
- lack of actual spatial distribution data as opposed to presence/absence of species;
- limited ability to do predictive modeling; and
- a general inability or lack of contributions to management, technology, and research from public and private entities.

Many of these items may seem easy to address, however, if changes are not durable, the short-term impact may not be worth the investment. For example, an inventory is only as good as the monitoring that follows and the data is only appreciable if it is consistent and can be repeated.

How do we define success and how do we monitor long-term success?

The teams fully recognized the importance of defining an intended outcome and doing so in a way that is attainable with transparent deliverables. They were able to hone in on a number of items including scale, perception, and intent that are often overlooked or sidestepped when answering this question.

The first, and perhaps most important aspect, revolves around goals concerning scale. Managing in a piece-meal pattern may provide an acre-scale level of achievement but without concurrent treatment on surrounding acres it can be a waste of time and resources. Attempting to manage at a scale as large as a county or state can lead to extreme frustration with control efforts when results are not immediately identified and often leads to failure due a lack of long-term commitment. Neither approach is incorrect, but the goals that are set in order to measure success at either scale ultimately drive the inputs and ability of any single agency or group of partners to point to success within a chronology of treatments. Equally, there is a tendency to jump to expanding conclusions that are inappropriately based on limited data or a snapshot in time of treatments. Private industry and managers are typically encouraged by state and federal agencies to develop weed management plans and long-term budgets that facilitate repeat treatments, yet funding policies and budgets often prohibit any budgetary consideration beyond a few years. For example, herbicides often come with a “spray and walk away” mentality where early progress may be deemed a success, but long-term efficacy is not realized, monitored or considered. Similarly troubling is the assumption made by many that persistence and proliferations of invasive plant species is a result of poor management, rather than a lack of consistent effort or resources. To this end, success must be developed at a local level that can be “rolled up” to a larger framework of goals and objectives for a region, watershed, or ecosystem.

The teams approached defining and monitoring differently for EDRR species and IAGs and it became very apparent that “success” for each was not universal. In terms of EDRR species, success can be confined to prevention of new species, limited or lack of spread, or complete eradication. In contrast, success with IAGs may include finding new ways to utilize these species, developing new species-specific technology, or a net reduction in acres infested. In both instances, the number of ways to define success are nearly endless when there is no defined scale.

Is there a sustainable funding model for invasive [plant] species management, at any scale?

This is, and will likely continue to be, the pivotal and most difficult question to answer. Similar to other questions surrounding invasive plant species, this can be approached in multiple ways. General philosophy or culture of an area, long-term versus short-term spending and management, caching or saving funds, monitoring response funds versus treatment funds, cost of implementing any plan, re-treatment, research, return on investment, and staffing all play roles in the answer.

During discussion, one thing became very evident: we cannot say how much money is needed for sustainable invasive plant species management, at any scale. However, there can be conversation surrounding how funds may be set up and utilized.

We begin with an example of an impractical, unsustainable funding model. Typically, short-term funding (e.g., 2 years) is more common than long-term (e.g., 10 years) for budgeting purposes. For this example, we begin by spending \$1,000,000 for a treatment in year one, which is not uncommon in a collaborative

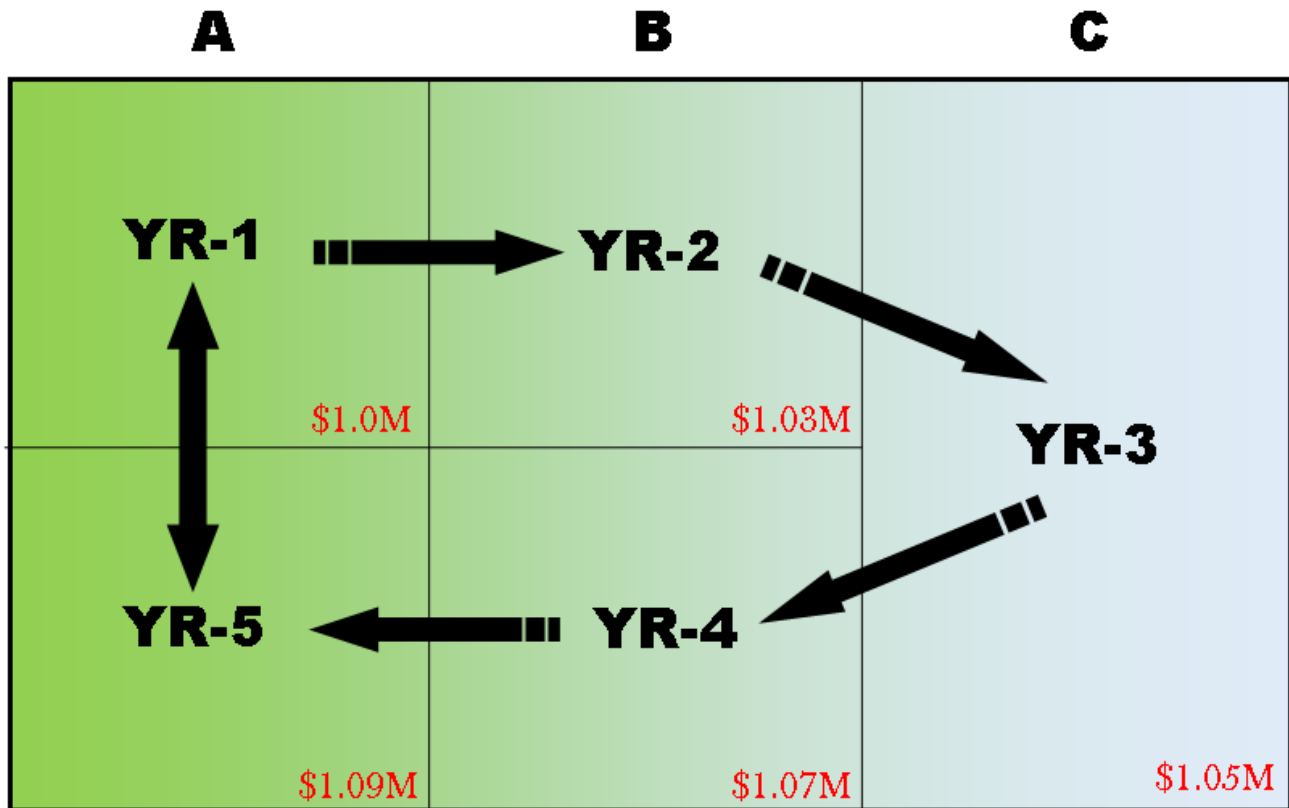


Figure 2.3 – Costs of treatments in year one, followed by simple increases due to inflation and subsequent additional cost, without true ecological change (essentially negating treatment and efforts), in year five.

scenario. However, if there is no follow up and that treatment has to be done again in five years, inflation alone leads to the same control project costing almost \$100,000 more with no guarantee the site has not returned to year one conditions (Figure 2.3) In other words, year five and year one may have no noticeable difference on the ground (e.g., moving to and regressing through ecological state A, B, or C). The teams recognized that any sustainable funding model needs to be cognizant of the return on investment for each control effort. By necessity, this implies a longer-term view, especially for IAGs, where control efforts and adaptive management – with effective monitoring - may in combination produce favorable outcomes and address desired goals.

Funding models are also tied directly to the philosophy, policies, and politics surrounding any given species. EDRR species may be viewed quite differently than persistent, ubiquitous species in terms of funding. For example, an EDRR species could require little investment if caught early in Wyoming.

The teams identified the following constraints to a sustainable funding model: 1) public sentiment regarding funding may be a function of outreach and a lack of conveyance of connection to other portions of citizens lives that can be impacted by invasive plant species, 2) funding timelines for research are often limited to a few years which does not typically help bridge gaps in terms of large-scale management or novel approaches from plot-scale findings to landscapes, 3) the ability to allocate

resources for extended periods of time has not been approached with much earnest by governments, and 4) many agencies cannot or do not hold funds back that are unallocated in a given year.

How do we organize and engage stakeholders in large-scale management and implementation?

Traditional public engagement has been concentrated locally with workshops, education for students, and minimal advertising. More recently, online platforms have created ways in which to disseminate information to a much broader audience; lacking is public outcry for invasive plant species management at a national level. Special interest groups, local districts, and even counties as a whole have rallied support in many ways but often without securing additional funds or shifting behaviors or activities that contribute to spread or an increase in reporting (e.g., teaching plant identification, cleaning equipment or ATVs, etc.).

Unfortunately, large-scale engagement has primarily been a result of catastrophic events, such as wildfires. Here, the media often fails to properly connect the outcome to the encroachment of invasive plant species. Invasive plant species do not get prime time coverage outside of commercials for products that control common lawn weeds and the public is not presented with a lasting face for terrestrial invasive plant species. In other words, there is no Smokey Bear for invasive plant species to bolster public awareness. Perception plays a key role in the way engagement functions. The traditional attitude of “spray and walk away” does not lead to a dinner table discussion nationwide that contemplates continued work on invasive plant species management.

Aside from a general naivete towards invasive plant species, there are issues with poor assumptions or misinformation surrounding many invasive plant species. For example, the broad and long-held assumption that invasive plant species are a result of poor management does not contribute to an overall sentiment of need (the “not my problem” or “they should just fix it” sentiment). Researchers and managers can admit they do not know everything but the narrative has to change from “our objective is to kill all weeds” to a discussion that surrounds ecosystem functionality for a multitude of uses including recreation, agriculture, and energy.

Multiple potential avenues exist, and recent work across the West has begun to interest the media and others. Nationally, the challenge is keeping invasive plant species in the forefront of the publics’ and policymakers’ minds.

Chapter 3

Overall Conclusions and Recommendations

As discussed in the previous two chapters, complications associated with invasive plant species are multivariate and multiscale, and can substantially change with small shifts in the system, or remain relatively unchanged after large management inputs and/or disturbances. In this chapter, the teams have developed a number of recommendations for the Governor to consider. Some of the Governor's questions raised more questions, and in these instances, the teams have recommended studies or groups that may be more appropriate for the Governor to consider moving forward.

The following questions serve as a reminder as to what the Governor tasked the GSI with answering:

1. What species, or groups of species, are the highest priorities in Wyoming?
2. What are the gaps, in terms of both policy and technical expertise, in managing these species? How could these gaps be addressed?
3. How do we assess the current extent of invasion and how do we use that information in the future?
4. Is a statewide strategy appropriate? Can and should we develop goals at this level?
5. Is there a sustainable funding model for invasive species management, at any scale?
6. How do we organize and engage stakeholders in large-scale management and implementation?
7. How do we define success and how do we monitor long-term success?

The following **Summarized Recommendations** are developed from the recommendations in the Discussion section below. In many instances, the Summarized Recommendations represent cross-sections of multiple discussions and topics, and are intended to highlight the intertwined nature of invasive plant species management. The Discussion section provides supplementary information and specific points to consider when developing actions for further evaluating our ability to safeguard Wyoming's natural resources from the negative impacts of terrestrial invasive plant species.

Summarized Recommendations:

- Develop and implement "smart" decision-support systems that are informed by data, local expert knowledge, cultural practices, and best available science.
 - Develop and incorporate feedback mechanisms across management programs and partners to capture lessons learned and associated data that can be integrated into management over time for greater success (e.g., combining distribution, habitat suitability, and treatment-response information).
 - Convene a multi-agency group to produce a baseline assessment of invasive plant species distribution and management activities.
 - Create a central invasive plant species data clearinghouse and decision-support tool that can interface directly with regional and national invasive plant species data platforms. This will require an increased level of uniformity in data collected and reported.
 - Improve communications with surrounding states, universities, and associations to help identify potentially new invasive plant threats and management tools.

- Work to assess the multiple impacts invasive plant species can have on socio-ecological systems (e.g. different trophic levels, carbon storage, forage, habitat, economics, and quality of life).
 - Use an integrated and process-based campaign to better inform the public as to the need for action now and the benefits of reducing or eliminating these species.
 - Develop an assessment of invasive plant species impacts that can be used by federal agencies and others that can be tiered to and used in other analyses (e.g., NEPA).
- Utilize the colleges and agencies to expand support and outreach of applied research to better use existing tools and develop new management methods.
 - Develop and address research questions in conjunction with practitioners whenever possible
 - Develop tools for planners and managers to better define success at the project level
 - Pursue research and outreach that is regionally-focused yet relevant to the state and region as a whole
- Work with federal partners to reduce barriers to timely, effective invasive weed management on federal lands and adjoining non-federal lands.
 - Work with federal agencies to ensure terrestrial invasive plant species management is a priority for use of appropriated funding and in their land management policies and plans.
 - Develop a universal agreement among federal, state, and local agencies for the coordination of terrestrial weed management, sharing of resources, and adoption of new technologies and approaches.
 - Strengthen existing or develop new agency agreements to improve the use of federal funds for invasive plant management.
 - Engage in proactive, timely policy-making and analysis to enhance response and treatment capabilities.
- Evaluate and consider revising the current funding model for invasive plant species management in Wyoming.
 - Work with the Wyoming Legislature to identify where modernization of statute may be needed.
 - Evaluate alternative funding sources and feasibility.
 - Consider alternative funding timeframes for sustained management of invasive plant species. Explore cost-benefit dynamics of invasive plant species treatments.
- Encourage and incentivize cooperative, landscape-scale projects that include multi-jurisdictional partnerships with clear, long-term strategies in place.
 - Prioritize proactive projects with potential to minimize and reduce future impacts.
 - Develop and promote new funding that provides consistency and promotes multi-year programs.
- Utilize all the state agencies to increase public awareness of the challenges of invasive plant species.

DISCUSSIONS

The Importance of Acting Now and Stakeholder Engagement

The entirety of Chapter 1 is devoted to this topic and the teams broadly agreed there was one need: action now versus reaction later. The Governor clearly stated his interest in avoiding the situation that many other states are facing. The time for thoughtful, strategic action against terrestrial invasive plant species in Wyoming is now. In many ways the climate and geography of Wyoming may affect future scenarios (e.g., eastern side of the Rocky Mountains versus western). However, we have been wrong before (e.g., previous assumptions such as “cheatgrass won’t grow above 10,000 feet elevation”) so we cannot solely depend on current differences between sites to avoid a similar situation. From a technical standpoint, ecological differences may be easy to identify between the Great Basin and ecoregions of Wyoming. However, common challenges of funding, human and organizational capacity, culture, and overall competing needs for time and resources all have interrupted progress on invasive plant species at some level across the West. There needs to be more emphasis put on the future and predicted impacts that invasive plant species could have on the state and its resources.

The Great Lakes provide a very different, but very real, example of this. As the Great Lakes were developed and enhanced, negative unintended consequences accompanied economic progress. From modification of hydrology and impacts to fisheries and municipalities, to foreign zebra and quagga mussels that now impact water inlets for cities like Chicago, small, individual occurrences can accumulate to large-scale impacts. While this example may seem tangential, by looking to other disciplines like fisheries management or aquatic invasive species programs, we may be able to tackle some of the challenges surrounding terrestrial species. Much of this revolves around a public campaign, such as “Don’t move a mussel” and public education, but a portion of it must be realized by the public in a different, more direct, way. Not many cared about quagga mussels around the Great Lakes until shells cut their feet while trying to spend an afternoon on the beach. Every person who has ever walked through the sagebrush has come home with a few cheatgrass seeds in their socks, not recognizing the role they may be playing in the movement of the species. While the impact may not be commensurate to aquatic invasive species, the education of the public must be.

Stakeholders vary greatly in their priorities and level of knowledge and different stakeholders will engage in different ways. Existing approaches could be refined and expanded by increasing collaboration throughout a broader cross-section of the stakeholder network that already exists.

Participation of groups such as county weed management districts, colleges, and state land management agencies at local events such as fairs and field days encourage the general public to become more aware of the issues. Events centralized around educating attendees on the impacts, and new and effective management techniques, should be coordinated to ensure interested individuals are aware of the learning opportunities. But physical presence can only go so far and often is limited to events that draw roughly the same audiences. Effort needs to be expended to reach those groups that may not realize how integral healthy landscapes are to their particular interest.

Wyoming businesses could play a pivotal role in educating the public. Outdoor equipment and fishing supply stores service a great deal of the general public recreating in the state's outdoors. A comprehensive campaign that involves these outlets could help communicate the urgency with the public and recreationalists.

The Wyoming Office of Tourism may prove to be a good fit for public campaigns (e.g. PlayCleanGo) that can help make invasive plant species management more of a household topic. Weed prevention strategies are not yet a norm for most recreationalists; normalizing the idea of terrestrial weed prevention, much like is already the case in aquatic systems, could greatly reduce the incoming load of EDRR species and foster management of species already present such as IAGs.

Individual agencies and districts can develop plans, but a continued lack of integration across all interests often leads to near misses and a hesitation to commit to future actions by managers, policymakers, and the public. Part of this is related to the immense number of decisions any decision-maker must make now, but part is also related to a lack of consistent messaging that truly resonates with the public.

Key recommendations for the Governor to consider include:

- *Work with researchers to show the multiple impacts invasive plant species can have on different trophic levels, to carbon, forage, habitat, economics, and quality of life in a way that is integrated and process-based to better inform the public as to the need for action now. This may be another team like GISI or a separate effort entirely (e.g., study through UW, USGS, ARS, etc.). Ideally, it would be a cross-disciplinary assessment, with a level of analysis that could inform future decisions. If done correctly, this could be a valuable tool for federal agencies to tier their own analyses to and possibly reduce planning time (e.g., NEPA) for invasive plant species treatments.*
- *Use an integrated and process-based campaign to further public education, outreach, and understanding of why invasive plant species management is so important to the state, both economically and culturally, and better convey the need for action now rather than later.*
- *Increase outreach to landowners and permittees to better facilitate cross-boundary management and program awareness.*

Statewide Strategy

Wyoming has been working to manage invasive weeds through much of the state's history and efforts to date are among the best in the nation, yet challenges continue to evolve. As Governor Gordon has noted, we should strive to build upon current practice and remain in front of challenges as much as possible, rather than react after the fact. The Governor specifically asked if a statewide strategy was pragmatic and whether planning on this scale was possible and logical. The GISI spent a considerable amount of time discussing this idea and ultimately weighed current work against consolidation of efforts. While a consolidation of all things "weeds" is appealing from a simplicity standpoint, the variability in Wyoming (from an ecological, social, and economic standpoint) makes it difficult to establish state-wide priorities that are realistic and meaningful for many aspects of invasive plant species management. Statewide best practices would be more adaptable than a rigid strategy and could help with increasing consistency from one area to another. Equally, consolidation does make sense in terms of efforts that are running concurrently or parallel to one another (e.g., two groups with two strategies for a species yet no coordination on strategy, projects, or funding). There are some things that can be done universally in Wyoming such as outreach, education, and awareness but, as noted in other sections, attempts to mandate forms of management or species management at a statewide level have not led to any appreciable shifts in public sentiment or management efficacy and could negatively impact local efforts.

The GISI broadly agreed that any statewide strategy should *not* be a wholesale restructuring of current invasive weed management programs, rather an effort to elevate the ongoing work of groups already involved and to attract increased efforts from others that can, and should, play an important role. This includes an increased level of coordination and pooling of resources to achieve an end goal and a framework that would focus on successfully protecting Wyoming.

With this in mind, the GISI team has focused on suggesting substantive needs for improving Wyoming's capability to combat the impacts of non-native, invasive plants. One of the most beneficial actions that can be taken at the statewide level would be to develop a "smart" decision support system that is informed by local knowledge and expertise, new research and science that can incorporate feedback from previous successes or failures and help managers become more effective over time. Encouraging and incentivizing monitoring and data collection, analysis, and effective sharing will allow managers to stay more current on practices that work, understand more about those that do not, and to collectively learn from one another in a coordinated fashion. Programs like Coordinated Resource Management (CRM) or new Cooperative Weed Management Areas (CWMA) which have not been highly leveraged recently may provide avenues for these efforts. Additionally, incorporating weed control efficacy and species response information within a multi-criteria decision framework will enhance our ability to predict outcomes from various treatment/site combinations, thereby improving our performance over time.

A whole-system approach that considers threats, opportunities, distribution, and cost-to-benefit of treatments can help foster a better understanding of system dynamics and promote long-term commitment to management. Proactive actions are usually more effective when species abundance is low (Fig. 3.1), and reactive management for widely-distributed species should be informed by principles and scale-appropriate strategies (Fig. 3.2). Identifying appropriate response strategies on a species

group or individual species basis will be needed in some instances but general concepts could be applied at a state level if effective multi-jurisdictional management can become more commonplace.



Figure 3.1



Figure 3.2

Multi-jurisdictional approaches are often easier said than done. “All lands, all hands” concepts are only as effective as the leadership exhibited from all private, state, federal, and industry partners. Equally, basing management off of unreliable metrics such as “biodiversity” or single-species metrics (e.g., sage-grouse) leads to potential traps for managers and agencies. Engagement is critical for partners to collaboratively identify common objectives, measures of success, and sustainable cooperation but to be truly successful, all partners should prioritize commitment and contributions toward scalable, durable management across jurisdictions.

Key recommendations for the Governor to consider include:

- *Develop and implement “Smart” decision support systems that are informed by data, local expert knowledge, best available science, and new research – incorporating feedback processes to learn from failures and repeat successes using a “big data” approach to become more effective over time.*

- *Encourage a whole-system approach that considers threats, opportunities, spatial distribution and severity of species groups or individual species, site conditions and recovery potential, cost-benefit tradeoffs, and long-term commitment to ecosystem management.*
- *Facilitate long-term effective and engaged, multi-jurisdictional coordination and collaboration in management.*

Highest Priority Species

The teams expended much effort discussing positive and negative aspects of placing individual species in a prioritized list, and ultimately decided to focus on three species groups in terms of prioritization: 1) invasive annual grasses (IAGs), 2) narrowly-distributed species that are candidates for prevention and early-detection/rapid-response approaches (EDRR Species), and 3) widely-distributed species primarily comprised of designated and declared noxious weeds (listed species). There exists some overlap among these categories, as noted in Chapter 2.

Any prioritization scheme is driven by the criteria that are used to guide the exercise. If viewed through the lens of current realized impact, one could argue widespread, well-established species (e.g., leafy spurge) should rise to the highest priority because they impact every county in Wyoming. However, feasibility of control and recovery potential have to be considered, and the severity of impacts is highly dependent upon the species and the site. EDRR or newly-emerging species with limited distribution, known to be highly impactful in our region, may in some cases offer the highest probability of successfully containing or controlling the species, thereby limiting impacts and offering the greatest impact in terms of dollars spent.

Given that all prioritization approaches have merit depending on the circumstances, the team supported an information-driven approach that focuses not only on the characteristics of the invasive plant species of interest, but also on prioritizing based on potential to conserve or recover desirable ecosystem attributes. This type of multi-criterion decision analysis relies heavily on informative baseline and potential ecological state information, which is not present in all instances.

Management actions themselves can have short and long-term effects on the landscape. When spread and future impact is priority (i.e., EDRR species) their short-term negative impact of management can be outweighed by the long-term benefit of reduction in invasion impacts. This is not the case for noxious species that will forever be present. Thus, for noxious species where impact reduction is priority, identifying management tools that create net reductions in impact are critically important.

Narrowly-distributed statewide 'EDRR' species

Early detection/rapid response is an approach to invasive plant species management - not necessarily a list of species or even characteristics of each EDRR species. Species that are narrowly distributed or at low abundance in a defined geographic region are candidates for timely, aggressive treatments in an effort to slow their spread and potentially remove them from the region. Narrowly-distributed species

offer a higher probability for effective reduction and control, but our ability to implement meaningful management at an early enough distribution stage depends on our ability to detect new, small infestations before they are well-established. While surveillance is key, solely focusing on detection can impact the number of treatments completed in other areas. The GISI discussion on EDRR species ultimately led to one conclusion: there is a need to establish criteria that qualify species to be considered in this group at the statewide level and prioritize them outside of county declared lists. This may require separate mechanisms at the state level to respond to new infestations. In this instance, further planning may be needed that helps outline resource allocation and direction when a new species is discovered.

Invasive annual grasses

Although this is a relatively small number of species, the current and potential widespread impacts are disproportionately large and other species that may enter Wyoming continue to be of great concern (e.g., ripgut brome). Cheatgrass is a widely distributed species and one that is currently a common emphasis for managers and use of state resources, yet it is not a designated noxious weed at the state level. Conversely, medusahead and ventenata are both narrowly distributed at the state level and are both on the state designated noxious weed list and could also be considered EDRR species.

Although it may seem that no unified strategy can apply to such different situations, a straightforward set of principles can inform a statewide strategy for this species group. As described in the Western Governors Association's Invasive Annual Grass Toolkit, 'defend the core, grow the core, mitigate impacts' principles for annual grasses provides local decision makers the opportunity to prioritize regions for management of widespread species such as cheatgrass while establishing containment zones for narrowly distributed species such as medusahead and ventenata. While this approach is not limited to invasive annual grasses, it has aided in beginning to address issues with these infestations and, in theory, will help increase the return on investment for treatments. Figure 3.3 illustrates how the principles described above have been applied to newly-emerging invasive annual species (medusahead and ventenata) where local distribution data are available.

Widely-distributed noxious weed species ("listed species")

Wyoming Weed and Pest districts are charged with implementing effective programs to manage noxious weeds and pests that are currently found in the state. This typically involves species that have established their presence, and continue to impact economics or ecology. Establishment of some of these species pre-dates statehood and were introduced when Wyoming was still a territory. While state law identifies the species that still pose a threat, it charges each Weed and Pest district with determining a district-wide effective program for their management, thereby empowering the local boards. Established species that are not listed on the state list may be identified and managed by the Weed and Pest districts through a county listing, but they are secondary in priority to the state list. There are also established weeds that are not regulated through the state or county list, and management of the species is left to the determination of the landowner or manager.

Key recommendations for the Governor to consider are:

- *Encourage the formation of a central invasive plant species data clearinghouse that will enhance Wyoming invasive plant species data sharing, decision making, and interface directly with regional and national invasive plant species data platforms.*
- *Enhance Wyoming’s ability to detect, assess, and strategically manage invasive terrestrial species while implementing an adaptive, whole-systems management approach that considers ecological, socioeconomic, and cultural factors of management at the state and regional level.*

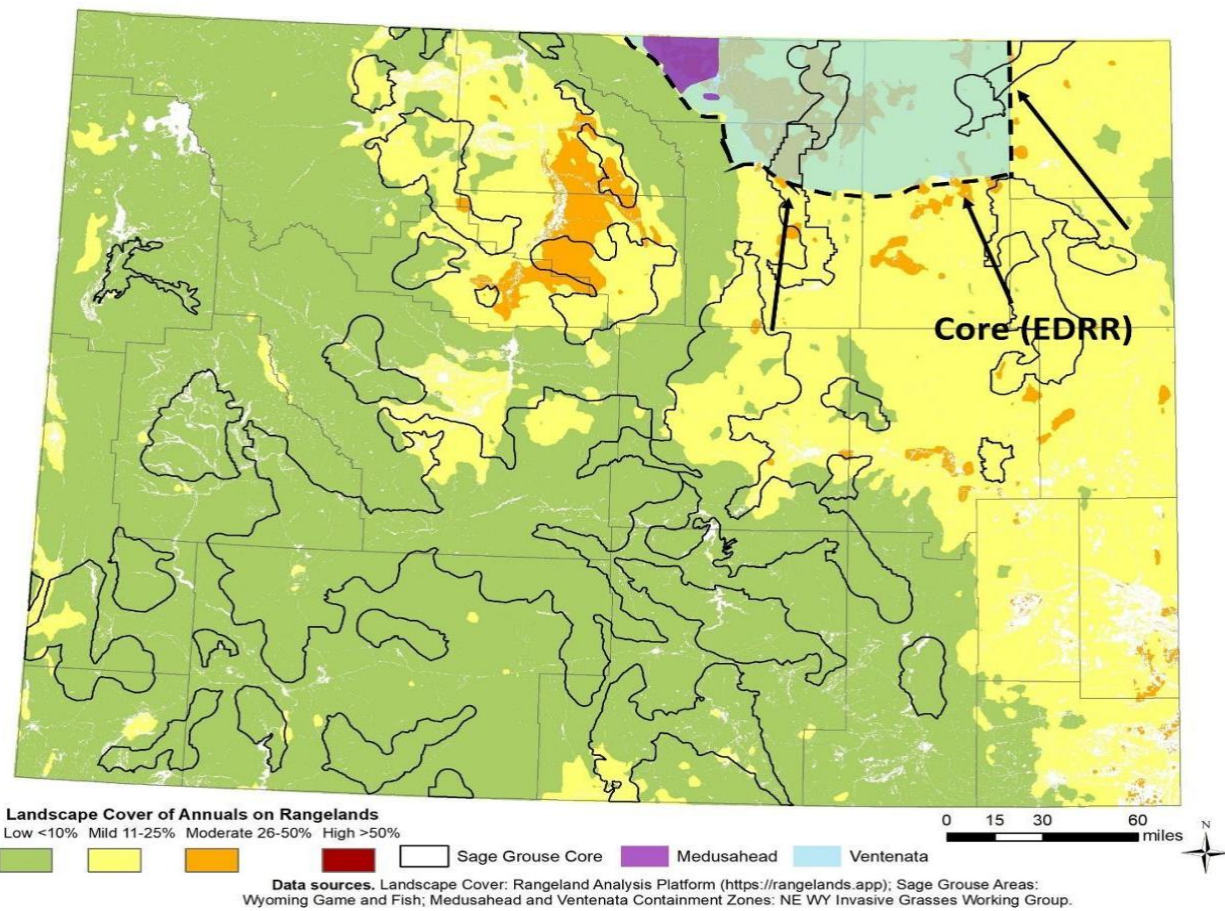


Figure 3.3 – Core concept applied to ventenata grass and medusahead in NE Wyoming.

Assessing Invasion: Now and into the Future

An effective management program requires reliable, up-to-date, and readily-accessible information on invasive plant species location, distribution and abundance to be able to define cost-effective management efforts and success metrics. As existing invasions change over time, the ability to provide up-to-date data becomes a challenge. More complete species distribution data are necessary to make appropriate management decisions at all scales from local to statewide. Distribution, in this sense, can be species presence and/or absence and should include some measure of severity and proximity to other infestations. Better species distribution data will not only help with current invasive plant management, it will also allow for the development of more informative models.

Accurate species distribution information with potential suitable habitat by species or species group, coupled with critical agricultural, community, and natural resource attributes will allow enhanced support to be directed toward vulnerable, yet high-quality resource regions. Current efforts (WGFD, Weed & Pest, UW, and others) can be leveraged to further develop comprehensive baselines.

Data acquisition has become easier with the advances in technology. However, the large number of available collection platforms has led to issues with the organization, structure, and curation of data. Various agencies and organizations across Wyoming collect different forms of species distribution information, such as where management has occurred or general vegetation inventory monitoring has been completed, but the monitoring questions are not often the same. For example, data collected during herbicide treatments is not likely to include important information on species invasion density and other species present, or how this relates to other land uses like livestock grazing.

Most current invasive plant distribution data comes from on the ground inventory while performing other activities such as control or rangeland monitoring. Due to physical accessibility, these data may be biased towards road corridors or easily navigable terrain and may leave large areas of invasion undetected. Presence bias is also a concern - invasions are found near other invasions due to surveyor bias in areas known to have invasions rather than actual spread of the species. Absence data is also critical to the understanding of current or potential invasions across the state.

Remote sensing may provide the means by which to create more complete distribution maps and move towards true inventory capabilities, but it is not without limitations. Ideally, remote sensing would separate one species from the surrounding vegetation and similar-looking species. The most common information used to differentiate vegetation is passive distance information (translated to vegetation height) and electromagnetic spectral reflectance information (light). Remote sensing can occur on various platforms that limit the scale of data collection. Satellites can collect the largest amount of data quickly over a vast area; however, they have limited spatial resolution and must contend with atmospheric interference (e.g., clouds, structures, reflective surfaces, etc.). Satellite imagery will likely be more useful for widespread dominant species due to these challenges. Manned aircraft allow for higher resolution but cannot easily collect the same scale of data and have greater variance of data associated with them. Unmanned aerial vehicles are typically smaller, can have even greater resolution, and may be more convenient, but have limited payloads and limited coverage. A combination of field and remote capabilities would provide for the most complete picture for managers but will require careful interpretation to ensure data from each respective method correlates to the extent possible.

For all methods, acquisition of the data is only part of the equation; cost, data storage, and processing have to be factored into each method. In-field data collection is relatively expensive and it would be cost

and time prohibitive to collect comprehensive ground-level data on invasive plant species for the entire state. While some satellite imagery is free to the public, the user has no control over when it is collected, which can preclude detection of a particular species or miss key phenological windows. Free imagery is also typically collected at a coarse resolution, which makes it less applicable for detecting initial or smaller infestations. For fine-scale data, such as fixed-wing imagery, limitations are typically local (e.g., weather). Processing data to deliver products that are readily usable by managers must also be factored into the costs.

Although distribution data is a key component, the ability to repeat assessments annually is not always realistic. Species' distributions are time dependent, especially when the species is narrowly distributed. This often leads to the creation of predictive models in an effort to remain in front of an invasion or focus efforts. This is where the approach(es) to managing any invasion become key and concepts like containment become critical to long-term success.

Modeling has a place in most instances, but even for widespread species, predictive distribution modeling has its limitations. Models are only as reliable as the data used to create them and the pragmatism of the assumptions used to draw conclusions. Distribution data is a key component, but properly couched monitoring questions and goals for any landscape must also be considered paramount.

Key Recommendations for the Governor to consider:

- *Develop an informative baseline of current and future invasive plant species distribution and management to guide prioritization and landscape-scale management efforts. Combine distribution, habitat suitability, and treatment-response information to develop adaptive statewide strategies for prioritized weed species.*
- *Utilize or create multi-agency approaches to help managers establish sound monitoring questions, compliment data from different platforms, and avoid bias in detection efforts.*
- *Support development of spatially-explicit assessment of distribution and abundance to inform landscape-scale strategy development.*
- *Enhance surveillance efforts in at-risk plant communities and locations for known, aggressive invasive plant species present in neighboring states.*
- *Support the prioritization of funds to better assess invasive plant species distributions.*

Gaps and Challenges

Funding for invasive plant species management is typically identified as the primary gap or challenge management programs face. However, the complexity of dealing with multiple land management agencies often leads to the identification of additional challenges related to implementing a comprehensive program. Gaps and challenges can change from year to year or with administrations. The following are current gaps identified at various levels of government.

Jurisdictional Boundary Challenges

Many gaps and challenges with invasive plant species management revolve around the many players involved and coordination across jurisdictions. A program or initiative that effectively addresses terrestrial invasive plant species needs to function at the landscape level and, to the maximum extent possible, ignore man-made boundaries that rarely follow any ecological gradient. Jurisdictional boundaries can pose a challenge to landscape-level management, for all partners. In order to increase treatment success, effective practices need to be implemented across boundaries of private, state, and federal land ownership.

Private landowners, tribal, state, and federal agencies each have their respective authorities over their lands but management practices, objectives, timeframes, and funding for control can be very different for each entity. For example, landowners need to be able to maintain their autonomy while actively engaging when entities attempting landscape-scale projects are neighbors. Control that stops at a property boundary may have little to no appreciable long-term impact. The GSI had some discussion on incentivizing multi-jurisdictional programs, or even sole jurisdiction programs, but did not delve into details regarding what that may or may not look like. In this regard, non-governmental organizations may play a key role and could help aid in increasing dialogue between public and private partners.

Private partners' support is ideal for any treatment implementation that includes mixed ownership, but it may not always be an indicator of which landscapes should be the priority. Overall, there is a need to improve synchronization across jurisdictions. Most agencies have some form of an invasive plant species planning effort, but it is unclear how some of those plans compare to priorities at the local level or with adjacent landowners.

State and Local Policy Gaps

Local Weed and Pest Districts drive much of the policy at the local level, including priorities for a given year or program. Individual districts often have different priorities based on major land uses in their district that do not always complement neighboring district or federal agencies' priorities. For instance, districts with more cropland may focus most of their resources on species that impact cropland versus districts dominated by rangeland. Similarly, variations in treatment protocols exist between districts, which can make it difficult to coordinate with federal and state agencies, set policy, or collectively determine which projects should receive prioritization. These issues are most evident on borders between districts. Landowners that have property in two districts often find themselves frustrated by the lack of comparable cost-share programs offered from one district to the other.

At a state level, gaps and challenges exist in terms of providing guidance, support, and funding to local land managers and county districts. Clear agency policy may be lacking or non-existent in several areas of concern, or agency interpretation is divergent. Much of the challenge with state level policy revolves around existing state statutes. For example, the statutory definition of “control” is very broad, making it difficult to define local success, either individually or as a region.

State gaps can vary from internal differences in agency policies or priorities, to external differences between Wyoming’s management program(s) and those of neighboring states. There are four major examples:

- 1) Wyoming lacks a cohesive state policy on the movement of hay in, or through, the state. Where some Weed and Pest Control districts have quarantines restricting the movement of uncertified hay, not all do. Additionally, the districts lack the ability to enforce a statewide quarantine at the Wyoming Ports of Entry. The lack of a statewide policy can make it complicated for individuals transporting hay to understand when they are compliance and when they are not. Additionally, Weed and Pest districts do not always directly interface with the Wyoming Department of Transportation (WyDOT), leaving a gap in enforcement.
- 2) Statewide guidance for EDRR species is lacking. A better-defined approach to EDRR could provide greater success in the control of new invasive plant species. Most agencies recognize the importance of identifying an invasive plant species early in order to hinder establishment, but there lacks a clear process on how to make that determination, who makes that determination, at what level implementation is initiated, and what state resources are available when that determination is made.
- 3) State seed law does not fully contemplate invasive plant species. Although the law and regulations limit the amount of weed species in a mix, the ability for inspectors to sample and test the mixes for compliance is impacted by unregulated internet sales and the inability to completely remove certain seeds in the cleaning process (such as cheatgrass). Additionally, testing is limited due to shortage of samples and difficulties surrounding quick turnaround on testing at the State Seed Lab. Often when seed mixtures are found to be in non-compliance, the product has already been sold and planted, making a Stop Sale order irrelevant.
- 4) Mis-matched policies with neighboring states provide vectors for invasive plant species. Where Wyoming may be implementing effective programs, neighboring states may not. Neighboring states handle the management of state highways, rights-of-way, and even railroads, differently. Where Wyoming relies on collaborative management between WyDOT, WDA and the Weed and Pest, neighboring states lack that collaborative effort. This lack of a cohesive approach proves troublesome for what is considered a primary vector.

National Policy Gaps

Federal agencies work cooperatively with Weed and Pest districts, local neighbors, and others to jointly develop invasive plant species management priorities and plans based on state noxious weed laws, federal laws, policy, and regulations in many instances. “Control” and “invasive” are loosely defined at all levels making it difficult to clearly articulate shared management objectives and, in some instances, to decide what actions are appropriate. While broad definitions may lead to increased flexibility, they can also serve as deterrents to federal partners who are routinely litigated for decisions.

Federal agencies rely on Pesticide Risk Assessments and the National Environmental Policy Act (NEPA) to inform decisions and the public. However, there is a lack of consistency across agencies when approaching both, whether in terms of level of scrutiny under NEPA or implementation. Pesticide Risk Assessments require federal agencies such as (e.g., USFS, BLM, etc.) to do an independent assessment of the safety of a pesticide on lands managed by the respective agency. Although the agencies were required to do this assessment by the courts, the inconsistency in their individual approaches has delayed the use of new herbicides. For example, it took the BLM eight years to complete the Vegetation Treatment EIS and Risk Assessment for Aminopyralid (e.g., Milestone) where the USFS was able to complete it within one year.

NEPA planning has grown more onerous over the years. In many instances, agency flexibility has been reduced and timely implementation or substitution of technologies has been limited. Other things, such as the Code of Federal Regulations, have limited agencies in many instances. Federal agencies also have to contend with what can be extremely conflicting guidance. A common example is saltcedar and the willow flycatcher. Agencies, in an effort to remove saltcedar, were hindered by policy dictating protection of willow flycatcher habitat, which had become saltcedar after years of increased infestation. This, and other similar instances, not only create a barrier to stewardship but also to multi-jurisdictional projects. The development of a specific weed management Categorical Exclusion for federal agencies may be the most expedient and realistic long-term solution. The use of Categorical Exclusions, instead of completing EAs or EISs, would allow for implementation in a timelier fashion and prevent further spread and impacts.

In a mixed ownership pattern of Federal, State, Tribal, and Private lands, the other major hurdle is maintaining relationships and recognizing joint or overlapping management responsibilities. Although some agreements between the state and federal government exist now, expanding or complementing existing agreements like Good Neighbor Authority would further the collective ability to implement projects in a more streamlined fashion. This may be mechanisms like Coordinated Resource Management programs or Cooperative Weed Management Areas. In some instances, it may be appropriate to designate a single lead agency within a multi-jurisdictional landscape to maximize efficiencies and reduce duplication.

Regardless of mechanism (MOU, MOA, CWMA, etc.), documenting the relationship between federal, state, local agencies and partnering landowners could help to minimize administrative burden and costs associated with running a landscape-level program. A universal agreement may also assist federal agencies in responding to state and local management needs and concerns when there is a lack of internal agency or department-level guidance, especially for federal agencies that lack line items in budgets for terrestrial invasive weeds.

Management Tools and Research Gaps

One common obstruction to implementing a successful weed management program is a lack of tools. The term “tools” should not be limited to the current suite of pesticides, but should include other tactics and approaches such as biological control, weed “bounties”, or grazing strategies, to name a few. There is a need to evaluate and expand our ability to use existing tools as well as develop new tools through research. Expanding existing tools could be done through private and public partnerships and could help

identify how land managers have adapted existing tools to match their local needs. There is also a need to identify and document localized practices and make the information available.

Currently, the western states lack a centralized hub for information concerning invasive plant species, including invasive annual grasses. In the past, organizations and collaboratives have tried to fulfill the need, but have either failed to provide a comprehensive decision-making process for control, or have simply dissolved due to a suite of issues. This may be a place where universities and community colleges, who typically have more consistent funding, could aid managers.

Along with the University of Wyoming, other western universities, such as the University of Nevada and the University of Idaho, have published research that could help. In 2019, a regional research cooperative focused on invasive annual grasses was started with faculty from University of Wyoming, Montana State University, University of Idaho, Utah State University, and New Mexico State University. Cooperatives such as this may serve as a model for answering regional questions and developing approaches. However, scale must be considered and the location of research across the region should be factored into local decisions. Cooperatives such as this may be best suited to developing communication materials and developing further research needs after considering existing resources. Strengthening communication between Wyoming and surrounding states on potential new invasive plant species threats or treatments across state lines may aid in developing new tools and techniques and further West-wide awareness. Universities also have an ability to expand the library of information to update and improve the economic information surrounding impacts of action and inaction.

With this being said, land grant colleges also have Extension programs that may better serve Wyoming and local managers and may be of equal or greater interest to the state at this time. Utilizing the University of Wyoming's Extension program to identify research needs that have a direct value to land managers may be a logical next step. This could help document what is effective at a local level and capture local experiential knowledge. This also brings to light a key component of effective future research, incorporation of practitioners when developing research questions. While academia attempts to do this to a degree, the questions posed by practitioners are often much more direct or even left unconsidered. Identification of research gaps, and development of good research to inform those gaps, should involve both the scientific or academic community and those on the ground carrying out the projects.

Data Gaps

Disparate databases and collection strategies make data sharing difficult, and the ability to have those data communicate to complete a picture is often even more difficult. Data collected by or for a specific agency adhere to their methodologies and are often in a specific format. Some data may be restricted due to privacy concerns, while other data is simply not shared. Integrating data from multiple agencies and sources would require close relationships between public and private partners but could have large benefits to all involved. Utilizing North American Invasive Species Management Association (NAISMA) standards for data collection efforts could ensure all data collected can be utilized across the state by various agencies, assuming a central location can be established for reporting and storage.

The establishment of operating agreements among all stakeholders is critical to reduce duplication of efforts and be able to bring all data together for a complete assessment. Creating a collaborative platform using standard data will need to be a concerted effort and would require a consistent funding

mechanism. Inconsistencies between agencies, researchers, and districts in how they collect and share data will likely continue to create challenges until consistent collection standards and a centralized storage location can be developed.

Funding Challenges

Funding is a challenge at every level, including the local level. Many invasive plant species are vigorous enough or produce a large enough seedbank to require multiple treatment cycles across many years, challenging effective long-term control when compared to funding cycles. Effective weed management requires a truly integrated approach yet there are limited funding options to assist any program with management tools.

Federal and state funding sources often have restrictions on how and where funding can be utilized. Managing the various funding sources and application of those resources to focus on landscape scale efforts is challenging. Most federal agencies do not have a specific line item within their budgets to manage terrestrial invasive plant species and often end up pulling funding from habitat management, wildland fire, range management, restoration, or specific conservation species funds to address issues. Whether state or federal funding, it is rarely long-term or consistent enough to meet the same timeline as needed for comprehensive landscape management plans. Further discussion on funding and recommendations surrounding the issue can be found below in the Funding section.

Key recommendations for the Governor to consider:

- *Explore development of Wyoming policy on invasive weed management along highways and transportation corridors, including movement of hay, cooperative management, and other opportunities to mitigate spread of invasive weeds along primary transportation corridors in Wyoming.*
- *Work with federal agencies and Congress to streamline federal agency policies such as NEPA, risk assessments and categorical exclusions as they relate to invasive plant species management.*
- *When possible expand and strengthen existing processes of cooperative ventures such as the Good Neighbor Authority and appropriate agreements that enable the pooling of funds for partner activities or services.*
- *Identify, encourage, and incentivize cooperative, landscape-scale planning and implementation to maximize efficiencies and reduce duplication of efforts. This may include developing a universal agreement with multiple federal, state, and local agencies to enhance responsiveness and coordination on terrestrial weed management programs.*
- *Utilize UW Extension, cooperatives, community colleges and/or other mechanisms to document academic work that can help inform managers, develop research questions in conjunction with practitioners to improve studies, and utilize the colleges to refine economic information surrounding invasive plant species management, at multiple scales*

- *Encourage public-private partnerships to expand support of applied research and information sharing related to better use of existing tools and enhanced efforts into new management tools.*
- *Recognize and utilize NAISMA data standards for data collection and integrate data into collaborative data storage platforms.*

Defining and Monitoring Success: Short- and Long-Term

Success in invasive plant management is a difficult and nuanced topic. Currently there is no singular approach to defining success of invasive plant management programs and the underlying goal of any treatment strategy is often the ultimate driver of the definition. Attempting to set one criterion or metric for “successful” invasive plant management statewide is a difficult, if not impossible, task since success often has to be defined differently and clearly for each management scenario. Defining success should be a part of an active management program and should be based on established metrics with clear parameters for changing the definition as the program progresses. This is not to say the definition should be so malleable that everything is always “successful,” rather that initial assumptions of what is “successful” must be able to respond to lessons learned as management moves forward. This is a project-by-project exercise and one that should be driven by a local, collaborative team.

Prior to any management program, clearly stated goals, timelines, and resources needed to complete the program should be established. Depending on the goals for any given ecosystem and the type(s) of invasive plant species, the suite of tools will vary greatly along with the timelines and definition of success. Additionally, land managers should identify the resources that are or could be threatened and what the projected outcomes may be if treatment measures are not implemented. Managers should also remain considerate of how metrics may vary depending on the type of species being managed.

Monitoring the long-term success of any tool within a program is also critical. Test plot trials and landscape-scale treatments are often monitored for less time than it would take the desirable vegetation to rebound and many rush to define success based on how the landscape looks one- or two-years post- treatment(s). Consistent, long-term funding (beyond 2 years) may help in monitoring the long-term success of practices and products and could assist in developing strategies that complement a landscape-scale program.

EDRR (Early Detection and Rapid Response) Species

EDRR species can range from non-existent (or not documented) within Wyoming to relatively common, leaving any definition of “success” for EDRR species dynamic. The primary metric of success for EDRR species is prevention; however, eradication, containment, and education must also be considered.

Although prevention offers the highest leverage opportunity for controlling unwanted invasive plant species, its implementation across Wyoming’s vast, sparsely-inhabited landscapes is difficult. For prevention to be effective, wholesale commitment to practices that prevent introduction into new areas is needed. Landowners, managers, industry, recreational users, and others may consider forming weed prevention areas that dovetail with surveillance, cleaning of equipment, using certified weed-free forage and gravel, and other practices to prevent new introductions. Surveillance, monitoring, and species

distribution data assist in verifying species absence but require concerted efforts to develop reliable species distribution maps that confirm absence on a large scale. For example, documenting absence on a well pad is fairly easy but may be nearly impossible at a county level. Species that are present within a restricted extent can usually be treated “preventatively” by not allowing new populations to establish beyond the bounds of the current invasion. Containment zones around narrowly-distributed problematic species can serve as an approach that combines elements of aggressive control measures of known populations and prevention of further spread into adjacent and linked susceptible areas. Although possibly one of the most important metrics of ongoing invasive plant management success, there is limited support and resources available for prevention. Part of successful prevention is ensuring land managers and the public are educated on the importance of invasive plants and how to identify new threats.

Ideally, nascent invasions can be candidates for true eradication. The smaller and more recent the invasion, the more likely eradication is a feasible objective. For example, aggressive surveying and control efforts of small populations of yellow starthistle have resulted in the complete eradication of all known populations in Wyoming at two separate locations. Conversely, ventenata grass was assumed to be limited and thus a candidate for eradication until further surveys showed the extent was much larger than previously suspected. The readjustment of goals based on assessment is critical to the success of any invasive plant management programs in Wyoming but especially important for suspected EDRR species.

Invasive Annual Grasses

Invasive annual grasses can range from restricted to widespread (e.g., medusahead vs cheatgrass), making considerations for management and defining success difficult. However, there are some unique factors associated with these species that should be considered when developing management strategies and definitions of success, including prevention of new IAGs.

Annual grasses are associated with decreases in fire return intervals and increases in fire intensity. These changes in the fire cycle reduce desirable vegetation and pose a risk to human health and property. More importantly, these changes in fire return intervals alter nearly every portion of the ecological cycle and result in a near-total loss of functionality if allowed to reach extreme levels. In other words, changes in the fire return interval are a symptom of a larger problem. Management to reduce fire susceptibility of the invaded landscape including firebreaks and strategic management may aid in some areas but the focus should remain on reducing the percentage of any plant community that these invasive plant species represent.

Annual grasses by their nature depend on a persistent seedbank to perpetuate the population. To add to the difficulty of defining a successful IAG program, this then requires management strategies that consider the seedbank. Management that targets seedbank depletion while reducing aboveground annual grass population and maintaining the desirable plant communities is ideal but extremely difficult to achieve. This level of integrated management must include strategically locating projects where long-term interest and resources are available to monitor and manage for extended periods of time along with clearly defined goals and benchmarks. Utilizing resources such as the Western Governors Association Toolkit (noted above) may prove beneficial for these species.

Designated and Declared Noxious and Invasive Weeds

Many, if not most, of the listed noxious and invasive weeds are too well established to consider eradication or even containment in some cases. In these instances, practical management actions should focus on keeping these species limited to a level that reduces their impact on agricultural and native plant communities and limits the cascading effects associated with shifts in the vegetative community (i.e., trophic interactions).

To prioritize the management of noxious weeds, information on the impact posed by the invasion and the ability for a landscape to recover from invasion are important. Currently there is little information on the breadth of impacts of many of these species, especially when looking beyond cropland scenarios. Research and information to better understand impact thresholds would help in making better decisions.

Ranking of management importance or priority can vary by location within the county and across the state with each species. This makes any statewide species level initiative difficult if not impossible (contrary to EDRR species). This is partly why county level declared noxious weed lists continue to be an important tool to allow more localized decision making per species.

Because most noxious species are already so widespread, site-based prioritization may be more appropriate than species-based. Allocating resources to locations that are likely to have a more favorable response to management, hold a greater economic or ecological value, and/or are more susceptible to further invasion may be more appropriate than a blanket management approach. Consideration of these factors to create a strategy also lends itself to a more nuanced land restoration approach that better considers overall impact reduction.

Key recommendations for the Governor to consider:

- *Develop unified and consistent pre- and post-treatment monitoring of vegetation response on invasive plant management projects that encompasses seedbank, aboveground populations, and response of desirable vegetation.*
- *Focus projects in areas where long-term interest and funding can be leveraged in order to sustain results and increase the likelihood of success.*
- *Utilize historic data to identify where management practices have been successful and unsuccessful and incorporate that information into future management activities.*

Funding

Historically, funding for invasive plant species control has come almost exclusively from local resources under the direction of county-based Weed and Pest Control districts. Districts are established under Wyoming statutes and generally supported by the cabinet-level Department of Agriculture. From time to time, other resources have been used. Most recently, those resources have included industry contributions, funding from the Wyoming Wildlife and Natural Resource Trust, Wyoming Game and Fish Commission, Office of State Lands and Investments, federal grant programs, and direct legislative allocations for specific purposes (e.g. leafy spurge, invasive grasses, etc.). However, funding sources often have restrictions on where the funding can be utilized. For example, State Lands' weed and pest program funding is exclusive to control projects on state trust lands. Additionally, state funding is generally based on the biennial budget cycle, and does not always ensure that funds are available for a comprehensive, multi-year landscape-level approach to control. Long-term consistent funding is critical for the sustained effort necessary to win with invasive species. Consistent funding with enough flexibility to develop and implement strategic management plans within counties and across jurisdictional boundaries could also help attract other partners and increase the amount of funding that can be leveraged on a given project. Additionally, both direct and indirect value must be considered when discussing funding of particular projects and long-term management of a landscape.

Some of the recommendations provided herein may require changes to existing statutes, or revision of some. Changes to statute may also allow managers greater flexibility in responding to newly documented species in their areas without the species being on a declared or noxious list. Alternatively, if a dedicated pool of rapid-response funds existed outside of the normal funding streams (e.g., mill levies, annual budgets, etc.) it would allow managers to respond in a way that was more expedient and direct. The primary source of stable funding remains local mill levies, with each county applying one mill, with the option of adding a second mill for specific purposes if approved by county commissioners. At this time, less than half of the counties authorize the second mill. This creates an obvious inequity among counties (and therefore districts), which is further exacerbated by the high variability in taxable valuation. For example, Crook and Sheridan counties are almost equal in size (Crook is actually larger by approximately 300 square miles), but the taxable valuation of Sheridan County is more than double that of Crook County. Campbell County, located between Sheridan and Crook, has historically had a tax base large enough that one mill generates more revenue than the other two counties combined. Of the twenty-three districts in Wyoming, eleven collect the second mill levy (Big Horn, Crook, Fremont, Goshen, Hot Springs, Johnson, Niobrara, Platte, Sheridan, Washakie, Weston).

It is also important to note that funding from the second mill levy is restricted in its use, which can inhibit the ability to respond to local conditions within a year or to work efficiently across boundaries. Districts must designate no more than two special project species on which the second mill funding can be used within a calendar year. Revision of the statutes and limitations governing the use of funds generated by this second mill should be reviewed for potential restructuring to enhance districts' ability to implement proactive, strategic programs in response to local priorities and across jurisdictional boundaries.

One consideration may be the ability to levy a third mill with the flexibility to be shared regionally. Use of those funds could be handled in several ways: they could be pooled within each of the six Wyoming

Weed and Pest Council areas and dispersed via decisions made by those areas in alignment with regional priorities; they could be managed by each district and used for special projects with an emphasis on multi-county cooperative efforts or emerging issues of concern; or, the monies could create a stand-alone invasive plant species fund that would help all counties with large projects and additional funding.

Allowing counties to create and manage regional cooperatives would likely expand the ability to address emergent species more effectively, while maintaining adequate control of more chronic species. Regional cooperatives are actually working in a de-facto manner in some parts of the state at the present time, and Weed and Pest districts have been sharing resources to the extent possible, but funding is a primary limitation. In addition, each county's land ownership consists of a combination of private, state and federal lands. This changes dramatically from East to West, where some counties are dominated by federal land, which can also be poorly funded for invasive control but very ecologically and economically important.

Obviously, invasive plant species do not respond to economic conditions, leaving some counties unable to meet the challenges these species present. Some emergent species are highly invasive and require quick action (e.g., yellow starthistle, rush skeletonweed), others that are relatively new but have already invade large areas (e.g., medusahead, ventenata), while others are nearly ubiquitous (e.g. leafy spurge, Dalmatian toadflax). Managing these different species requires different approaches, and in areas where all of these challenges exist, resources are generally inadequate to address them all. Additionally, current regulations limit the flexibility of Weed and Pest districts and some partners to share in landscape-scale efforts because of county boundaries and other jurisdictional barriers. Work at landscape scales will require project partners to have increased flexibility to contribute to efforts that may prevent encroachment of new species into their counties or to manage at watershed levels instead of political boundaries. In light of current economic conditions, lower interest rates and limited state resources make it highly unlikely that non-traditional sources of funding will be available at recent levels. Given these realities, it may be an opportune time to evaluate the current funding model for both adequacy and effectiveness.

Another avenue for funding may come from use of the Strategic Investment Planning Account (SIPA) fund, which may be used in cases where specific needs can be addressed to prevent species from becoming chronic and statewide, such as EDRR. These funds could be allocated through existing mechanisms, or could be directed to specific regional efforts based on direction from the state Weed and Pest Council or the Governor's Office.

Finally, the State of Wyoming is not currently capturing the full impact of federal funds which are dedicated to invasive plant species control. Federal reversions due to a lack of capacity to complete all desired treatments can be millions of dollars. With the right agreements in place, it may be possible to capture these funds and augment local efforts through contracting, seasonal hires, or other means. Additional federal monies may be available, but often require non-federal match - which has been a limiting factor for some grant-seeking projects in the past. Any considerations surrounding capture of federal funds should remain cognizant of the requirements associated with those dollars.

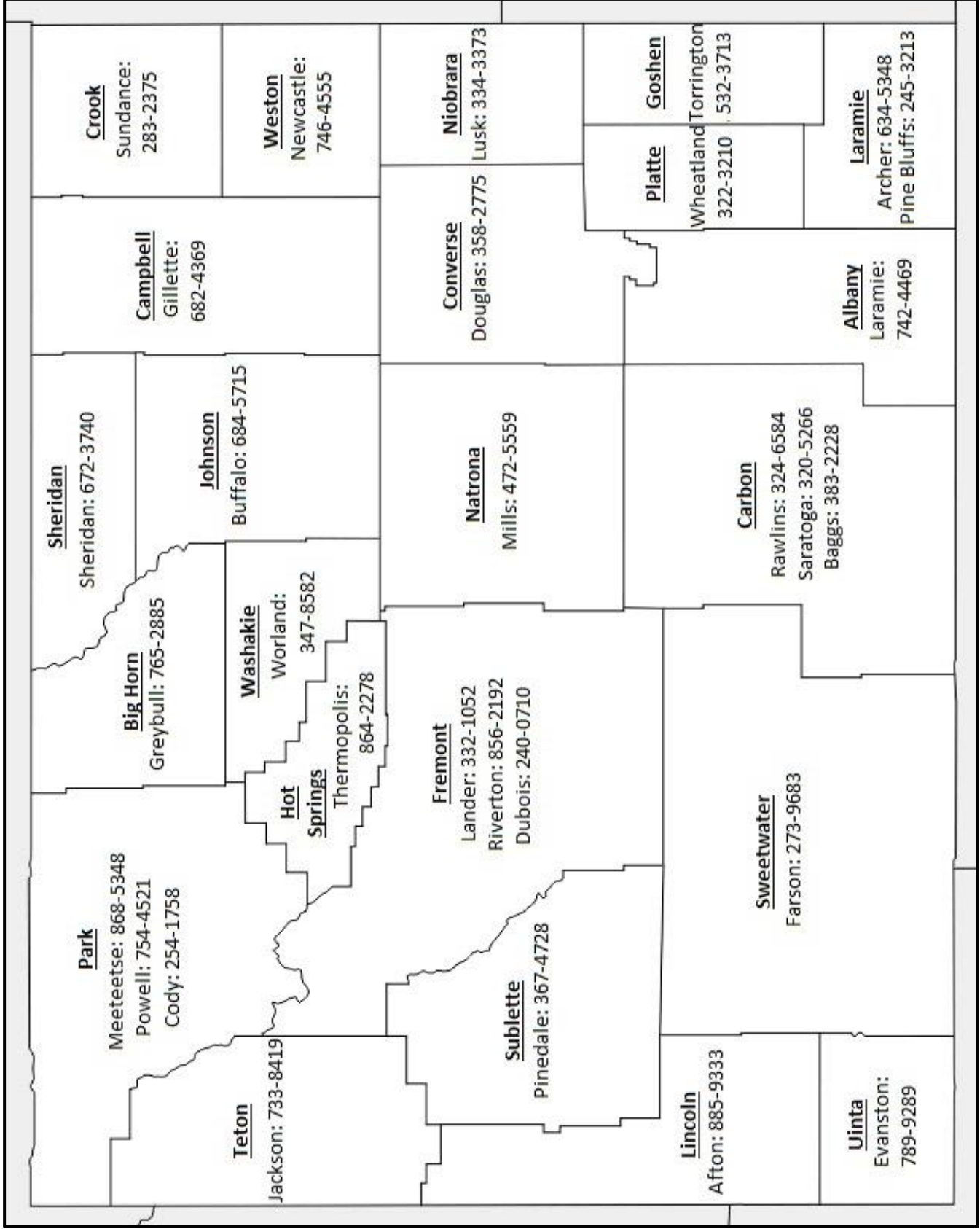
Federal agencies face similar challenges when it comes to budgets and program funding. The difficulty in securing funding is exacerbated by a lack of recognition within some policies and clear funding sources for invasive plant species management (e.g., budget line-item). When priority invasive plant species projects are realized or available, the inability to fund, or partially fund, that project often leaves federal agencies looking to other programs for funds to allocate. This creates complications for local district offices and partners when it comes to planning landscape scale projects. When these funding deficiencies occur it often leaves the local Weed and Pest with the difficult decision of ignoring the issues on federal land or utilizing local funds to manage the threat. Equally, other programs often take money from those which would help fund invasive plant species projects. The most common example is “fire borrowing” during the wildfire season.

Key recommendations for the Governor to consider:

- *Evaluate and revise the current funding model for invasive weed management in Wyoming in an effort to improve both adequacy and effectiveness.*
 - *Review and/or consider restructuring statute governing the second mill of funding to make its use less restrictive and more relevant to current needs.*
 - *Explore levying a third mill as a referendum in counties to use for special projects.*
- *Assess state-level funding for invasive weed management to identify opportunities to increase flexibility of use and time constraints on using those funds and to better leverage funding that is available.*
 - *Increase spending flexibility of Weed and Pest Districts to allow for budget sharing across jurisdictional boundaries within regional cooperative frameworks.*
 - *Explore alternative funding mechanisms (SIPA, Invasive Species Endowment, etc.) for high-priority, high-opportunity programs focused on containing or eradicating emerging species with likelihood of broad impacts in the state.*
- *Work with the Wyoming congressional delegation and the Western Governors Association to develop and secure a comprehensive funding package for federal lands that allows for long-term collaboration and accountability to state and local governments.*

Closing Thoughts/Suggestions

By convening this team, the Governor brought together a diverse group of professionals with a large amount of technical expertise and experience with invasive plant species management. The concepts and recommendations provided in this document describe a forward-looking approach to elevate Wyoming's ability to safeguard her world-class natural resources from further degradation by invasive plant species and to conserve those high-quality areas that are currently minimally impacted. Building on an already high level of performance, Wyoming has an opportunity to continue as a national leader in invasive plant species management. While any section of this document could be longer, or more in-depth, the hope of the GISI is that this will provide a platform from which the Governor can build and delve deeper into the various topics that surround any particular recommendation or set of recommendations.





I am pleased to present the final report from the Governor's Invasive Species Initiative (GISI). The GISI was assigned a challenging task, and 2020 has been a difficult year to embark on this process. The discussion within this report is important to every Wyomingite, as we all can be impacted by invasive plant species. The Report is high-level but filled with information that requires the reader to fully engage. The broad diversity of GISI members lends itself to thoughtful discussions and well-reasoned recommendations that can help land managers, private landowners, and the general public comprehend the enormous challenges posed by invasive species.

I am encouraged by the openness of the report, and the GISI's willingness to tackle some of the truly difficult issues in a meaningful way. Many areas of the report skim the surface of subjects that could be reports in and of themselves. In the months and years to come, I encourage all of our citizens to work to better understand invasive species and think of ways in which they can help in this battle. This battle will not get easier in the years to come, and natural challenges such as wildfire often make progress harder to realize. As we look to the future it is critical to decide as a state what we can collectively achieve.

I applaud the GISI and their work and encourage all of Wyoming to take the time to review the GISI's recommendations and discussions.

A handwritten signature in blue ink that reads "Mark Gordon". The signature is fluid and cursive, written in a professional style.

Governor Mark Gordon