

GRANTEE: **FRIENDS OF THE YAMPA**

PROJECT NAME: **YAMPA RIVER LEAFY SPURGE PROJECT**

ROUNDTABLE: **Yampa-White-Green**

[NTP Date: 19 November 2018]

YRLSP BUDGET—SUMMARY—21 December 2021					
CONTRIBUTOR	AMOUNT Committed	% of TOTAL		AMOUNT Contributed or Invoiced to Date	% of Total Project Commitment
CASH					
YWG Basin WSRF Request	\$ 89,000	54%	54%	\$ 88,978	100%
Moffat County	15,000	9%	26%	\$ 15,000	100%
Routt County	15,000	9%		\$ 15,000	100%
University of Wyoming	12,572	8%		\$ 12,572	100%
IN-KIND					
YRLSP volunteers	20,000	12%	20%	\$ 29,260	146%
Other Partners (BLM, NPS, TNC, CDA, CPW, Moffat County, Routt County, CSU Extension and NRCS)	14,000	8%		\$ 17,412	124%
TOTAL PROJECT COST	\$ 165,572			\$ 178,222	108%

ACKNOWLEDGEMENTS

The Yampa River Leafy Spurge Project is grateful for the support of the Yampa-White-Green Basin Roundtable, Moffat County, Routt County, Colorado Parks and Wildlife, Bureau of Land Management, Colorado Department of Agriculture, Natural Resources Conservation Service, CSU Extension, National Park Service, The Nature Conservancy, University of Wyoming and our many volunteers and supporters. This work is not possible without many willing hands.

Special thanks to Dr. Dan Tekiela (formerly with the University of Wyoming)—he provided brains, inspiration and mentorship for his students. And we are grateful for and proud of the work that Hannah Kuhns and Chloe Mattilio put into this project. We extend our congratulations and best wishes for their future careers.

EXECUTIVE SUMMARY

This executive summary is respectfully submitted to The Yampa-White-Green Basin Roundtable and the Colorado Water Conservation Board on December 22, 2021. It accompanies a final invoice for reimbursement of expenditures in the amount of \$7,560.40. In addition, separate files contain final deliverables for each of the three tasks identified in the Statement of Work. As we dug into this project, it became obvious very quickly that we were developing large amounts of data and information. Our website has now become an integral instrument in the organization and dissemination of information related to our work on this problem. We continue to update it and intend to maintain it until a permanent home presents itself.

Task #1 [\$40,900 allocated from CWCB/YWG Basin account—100% invoiced]**Develop a watershed scale management framework for leafy spurge in the Yampa Valley through mapping and predictive modelling.**

This task involves two distinct components:

1. Field mapping of leafy spurge in riparian habitat along the Yampa River—conducted by YRLSP volunteers.
2. Geospatial analysis, remote sensing and predictive modelling—conducted by the University of Wyoming.

Field Mapping—YRLSP

- YRLSP volunteers developed and maintain GIS products and systems to facilitate field mapping of leafy spurge, using electronic tablets.
- YRLSP volunteers developed a landowner permission/access form and tracked down landowners to seek permission for field mapping of approximately 120 miles of the Yampa River from the Hayden pump station downstream to the head of Cross Mountain Canyon. Field mapping was completed in 2021.
- The maps resulting from this work are available on the YRLSP web site: <https://www.yampariverleafyspurgeproject.com/fieldmapping>. Many landowners and/or managers granted permission for accessing land along the river for mapping and data sharing. In cases where permission was not granted, leafy spurge was mapped from rafts only by visual inspection, but the resulting data is not visible on our public web site. If future permissions are obtained, this data can be unmasked. Shapefiles are available on request from interested stakeholders (where permission has been granted for data sharing).
- Leafy spurge field mapping data were provided to the University of Wyoming for use in their spatial analysis and predictive modelling work.

Geospatial Analysis, Remote Sensing and Predictive Modelling—University of Wyoming

- Initially, this component of task #1 was envisioned as a master's thesis project. After an unsuccessful effort to recruit a student suitable to the task, YRLSP worked with the University of Wyoming to allow for the addition of the project to a PhD candidate's work program. Thus, a PhD dissertation chapter (Chapter 3) has been substituted for a master's thesis as the deliverable accepted by YRLSP. (The full dissertation will not be completed until late in 2022.)
- University of Wyoming graduate student Chloe Mattilio has been working on two mapping applications that will make substantial contributions to the control of leafy spurge across the entire Yampa River Basin. Chloe's remote-sensing mapping application promises to accurately detect existing leafy spurge infestations using high spatial resolution, multispectral satellite imagery. Her invasive risk modelling application will also facilitate monitoring potential habitats for the arrival of new leafy spurge infestations.

Remote Sensing Mapping

- Chloe's work began in 2019 with searching out appropriate satellite photography (recent, little or no cloud cover, inclusive of our areas of interest in the Yampa River corridor . . . and reasonably priced!). She then applied a number of sophisticated processes to further refine the pixel resolution of the photography, before processing it into multiple spectral band combinations. These were further tweaked by applying different contrast, brightness and gamma values—all in an attempt to tease out the subtle spectral differences recorded in each photographic pixel.
- The end goal is to develop an algorithm that can effectively classify each enhanced photographic pixel as to whether it recorded light that was, or was not, reflected from a patch of leafy spurge on the ground.
- Chloe's development of the remote-sensing application includes correlation with the field mapping data collected by YRLSP, followed by groundtruthing of the initial model and further corrections. The final model classification identifies leafy spurge on the ground correctly with an overall accuracy rate of 91.3%—a remote sensing classification performance that is significantly better than random. The final step was to produce a comprehensive map of leafy spurge infestations (detected by remote sensing) in the Yampa River Valley.
- Two versions of the map appear on page 9 of the Chapter 3 document, which has recently been posted to the YRLSP website:

<https://www.yampariverleafyspurgeproject.com/research>.

We will be working with partners in the coming months to work out how best to make this information available to the public and interested partners and collaborators.

Invasion Risk Modelling

- The leafy spurge invasion in the Yampa River Basin is still in progress—what we see today does not define the potential extent of future infestations. Chloe Mattilio has also developed an invasion risk predictive model for the basin that will aid leafy spurge control efforts now and into the future.
- A primary resource is the extensive spatial dataset that has been developed in nearby Fremont County, Wyoming. Locations of leafy spurge populations have been recorded by Fremont County Weed & Pest for years, resulting in a robust dataset cataloging over 17,000 individual populations. By correlating environmental data for the Fremont County and Yampa River study area infestations (including soil type, texture, and pH; annual and monthly mean climate temperature and precipitation; location slope, elevation, and aspect; as well as infestation proximity to roads and developed areas), Chloe built a predictive model that can be applied to the Yampa River Basin to identify and map locations where new leafy spurge infestations are more likely to occur in the future.
- The best-fitting model, depicted on page 17 of the Chapter 3 document, classifies 359,680 acres in Routt and Moffat counties as having “high suitability” or risk of leafy spurge invasion, and another 2 million acres with “moderate suitability.” The model helps us understand the need to continue efforts to thwart the progress of this pernicious weed.
- At the August 2021 YRLSP Working Group meeting, Chloe presented an update on her progress with remote-sensing mapping and invasive risk modelling applications. A downloadable PDF of her PowerPoint presentation is available on our website:

<https://www.yampariverleafyspurgeproject.com/chloemattilio>.

Task #2 [\$40,800 allocated from CWCB/YWG Basin account—100% invoiced]**Identify best integrated management practices for reducing leafy spurge seed production in riparian habitat in the Yampa Valley—University of Wyoming.**

- YRLSP received permission to access many private parcels for research purposes. The University of Wyoming team found suitable conditions on two private parcels, one Moffat County parcel, and one Colorado Trust Land parcel. We are grateful for the amount of community support received from landowners and public agencies. During the study, one of the private parcels was withdrawn from the study due to changing management priorities of the landowner.
- UW graduate student Hannah Kuhns submitted her completed master's thesis as a final deliverable to YRLSP in July of 2021. Her thesis is available for download on the YRLSP website: <https://www.yampariverleafyspurgeproject.com/research>, and it is submitted as a separate file to the YWG Roundtable and CWCB. Hannah also presented a portion of her thesis work in a seminar on April 9, 2021. A video of her excellent presentation is also available on the YRLSP website: <https://www.yampariverleafyspurgeproject.com/hannahkuhns>.
- Hannah's work further supported our understanding of water as a vector for spreading leafy spurge downstream. Not only are seeds moving in the water, but Hannah showed convincingly that root fragments eroding out of banks and sandbars during runoff season are capable of floating downstream and re-establishing new plants that contribute to a burgeoning infestation.
- Her management treatment studies tell us that targeted sheep grazing is not practical in most riparian settings, and probably not something to pursue in other than very limited circumstances.
- Unfortunately, the herbicide studies did not point to a clear favorite chemical or strategy, but rather hinted that more study of Quinclorac and Duracor might eventually give us an appropriate substitute for the chemicals, such as Tordon, which are effective in upland settings, but not labeled for use in riparian areas. Quinclorac and Duracor appeared to cause a reduction in seed production, but more work on timing of application, rate of application, and duration of effect is warranted.
- Because the herbicide treatment results were inconclusive, one of the deliverables is not yet possible; the original grant application identified an Extension publication as one of the deliverables on this task. Instead, YRLSP will continue to consult with weed managers in Moffat and Routt counties as they experiment with various combinations of new chemistry and timing of application, and will ensure that every effort is made to continue to make new information available to local producers and land managers. Moffat County Weed Supervisor Jesse Schroeder has had some early promising results with a combination of QuinStar (Quinclorac) and Overdrive sprayed in late May–early June. Progress will take time, willingness to try new combinations, conversation and collaboration.

Task #3 [\$ 3,000 allocated from CWCB/YWG Basin account—99.2% invoiced]**Education and Outreach—Engage youth in the Yampa River Leafy Spurge Project, using biological control as a means to encourage learning, participation and productive involvement.**

Responsibility for completing Task #3 lies with YRLSP volunteers and partner agencies.

- Routt County Weed Program and Moffat County Weed & Pest
- CSU Extension—Moffat and Routt Counties
- Colorado Parks and Wildlife
- Colorado Department of Agriculture
- BLM—Little Snake Field Office
- NRCS—Routt and Moffat Counties

A full record of all YRLSP activities related to biological control and education/outreach are available on our website: <https://www.yampariverleafyspurgeproject.com/biological-control>.

YOUTH ENGAGEMENT

In July 2019, the YRLSP sponsored a two-day kids workshop on invasive weeds and biological control. Partner agencies contributed time and expertise to ensure the Boys and Girls Club kids had a quality educational and fun experience. The success of the 2019 youth engagement event encouraged YRLSP partners to plan for a similar event in 2020. Covid-19 intervened, however, and the event was rescheduled for June 29–30, 2021. Despite efforts to recruit kids for participation in 2021, it seemed that Covid-19 was still keeping kids from participating in group activities to a significant degree. When we failed to sign up a minimum number of kids, the event was reluctantly cancelled a week before it was scheduled. We do have all of the t-shirts and materials and supplies to try again in 2022, which we intend to do, even though the CWCB-WSRF grant will be closed out on 31 December 2021.

BIOLOGICAL CONTROL

In 2018–2019, YRLSP volunteers collected information from a variety of sources to document historical releases of biological control insects in Moffat and Routt Counties. This effort yielded 44 records on 42 sites, dating back as far as 1989 (30 years). In July of 2019 and 2020, YRLSP volunteers and partners visited 24 legacy sites representing 26 documented release records. All of the identified legacy sites proximate to the mainstem Yampa River and where access was granted were visited.

Preliminary results from our assessment of legacy sites were surprising because many people believed that local efforts to establish persistent populations of biological control agents had failed. It is notable that all but one of the visited sites that still support leafy spurge also support small numbers of biological control insects. The apparent persistence of biocontrol insects over several years to several decades was encouraging.

It is also notable that the leafy spurge mapping crew (Task 1) detected biocontrol insects in areas along the Yampa River that are significantly distant from known legacy biocontrol release sites. Dinosaur National Monument staff also detected insects in 2020. This suggests

that biocontrol agents have been present and active throughout the Yampa Valley for some time, possibly for nearly three decades. If biocontrol agents have been active in the Yampa Valley for +/-30 years, it is possible that the leafy spurge infestation has been thwarted to some degree over this same period of time.

In cooperation with our agency partners and multiple private-landowning stakeholders, in 2019 the YRLSP began an accelerated leafy spurge biological control release program. The goal is to distribute large numbers of biological control insects in appropriate locations throughout the full extent of the riparian habitat along the mainstem Yampa River. Each new release site will be subject to periodic monitoring in the future. We will continue to make a dedicated effort on this project at least through 2023, and possibly longer, if it seems to be having a measurable effect.

Ultimately the YRLSP hopes to establish a number of viable local nursery sites to support a Yampa-Basin-sourced biocontrol insect collection and redistribution effort.

FUTURE PLANS

YRLSP will continue to work with interested partners and private landowners in the coming years to identify appropriate sites for future releases of leafy spurge biocontrol agents. The objective will be to provide a rapid and significant boost to the biocontrol insect population in the Yampa Valley.

As this effort is proving potentially more important than we anticipated, we have enhanced the biocontrol information and reporting section on our web site:

<https://www.yampariverleafyspurgeproject.com/biological-control>,

and we will continue to update this section as new information becomes available.

In collaboration with NRCS and Routt and Moffat county weed managers, YRLSP is planning to host a field tour in July 2022 to help local producers learn about biocontrol options for leafy spurge management. We have tentatively scheduled a meeting with Patrick Stanko in January to discuss ideas for working with the YWG Roundtable Public Education, Participation and Outreach (PEPO) committee to share new information with a broad audience.

And finally, we are beginning to consider next steps for biocontrol in the Yampa Valley—a research needs assessment, several more years of aggressive insect augmentation, monitoring to determine whether insect populations are growing large enough to allow for hosting a local catch-and-take biocontrol insect event, and other ideas. The biological control aspect of the original project has grown in importance to the overall effort as new information has come to light.