



PARKS AND  
RECREATION

# Goathead Mitigation Program

# STRATEGIC PLAN

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## EXECUTIVE SUMMARY

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The City of Boise Goathead Mitigation Program is designed to address the pervasive issue of *Tribulus terrestris*, commonly known as goathead or puncturevine, an invasive species detrimental to the ecological balance and recreational quality of urban and natural areas in Boise, Idaho. This strategic plan outlines a comprehensive five-year approach to mitigating goathead through cross-jurisdictional management, equitable control efforts, enhanced public awareness, effective resource allocation, and innovative intervention techniques. The plan focuses on control and reduction of existing populations and prevention of new outbreaks.

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# INTRODUCTION

In Boise, the pervasive challenge of managing *Tribulus terrestris*, commonly known as goathead or puncturevine, demands a comprehensive and strategic response. This invasive species not only threatens the ecological balance and recreational quality of urban and natural areas, but also inflicts economic burdens on the community. The robust burrs of goathead, notorious for their sharp, tire-piercing spikes, complicate mobility for cyclists and pedestrians, harm wildlife and pets, and outcompete native vegetation.

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*Boise's strategic plan focuses on three goals:*  
1) *treatment;*  
2) *monitoring; and*  
3) *education/outreach.*

In 2023, Boise State University researchers developed a goathead susceptibility hotspot map[1] to help guide proactive management of goathead within Boise using the best available science. The related study investigated the impact of three distinct urban landscape features—microhabitat heterogeneity, street connectivity, and economic inequality—on the distribution of goathead.[2] These factors were found to significantly influence the abundance and emergence of reproductive plants. Specifically, areas prone to goathead invasion were characterized by bare ground located near economically undervalued properties on the periphery of the road network. Within the study, property value emerged as a

[1] The Goathead Hotspot Map and additional information on Boise State University goathead research and local removal efforts can be found at:

<https://storymaps.arcgis.com/stories/4cfe59b542b043008989ba1e931f2a06>.

[2] T. Trevor Caughlin, Clark, M., Jochems, L. W., Kolarik, N. E., Andrii Zaiats, Hall, C., Winiarski, J. M., Powers, B. F., Brabec, M. M., & Hopping, K. A. (2023). Socio-ecological interactions promote outbreaks of a harmful invasive plant in an urban landscape. *Ecological Solutions and Evidence*, 4(2).

<https://doi.org/10.1002/2688-8319.12247>

particularly strong predictor of goathead abundance. These findings underscore how socioeconomic factors and transportation infrastructure can affect the suitability of various urban microhabitats for the growth and spread of goathead.

This knowledge enables the development of targeted management strategies, which could leverage city-wide maps to direct control efforts effectively, especially in under-resourced neighborhoods. Such strategic approaches could maximize the impact of goathead management efforts, contributing to more sustainable urban biodiversity and improved quality of life for Boise residents. To effectively mitigate this invasive species, the City of Boise has developed a strategic plan focusing on three broad goals: treatment, monitoring, and education/outreach, encompassing several critical focus areas.

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## **CROSS-JURISDICTIONAL GOATHEAD MANAGEMENT**

Goathead seeds easily transcend geographic and jurisdictional boundaries due to their ability to attach to any passersby. This reality necessitates a collaborative approach to management that spans across the City of Boise, neighboring cities, Ada County, and other regional entities. Working toward coordination among these stakeholders is crucial to maintaining consistency in mitigation efforts and optimizing resource allocation to prevent and control goathead proliferation effectively.

## **EQUITY OF CONTROL EFFORTS ACROSS BOISE**

The strategic plan recognizes the importance of equitable control efforts to make certain that all areas of Boise, especially those historically underserved, are adequately protected from goathead infestations. Areas with limited public resources or greater environmental vulnerabilities require focused attention to prevent the disproportionate impact of goathead, ensuring that all residents can enjoy safe, clean, and accessible public spaces.

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## PUBLIC AWARENESS AND ENGAGEMENT

Engaging the public through comprehensive awareness campaigns is fundamental to the success of the mitigation strategy. By educating residents on how to identify, report, and remove goathead, the City can empower its citizens to take an active role in managing this invasive species.

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## INTERVENTION TECHNIQUES AND HABITAT ENHANCEMENT

Addressing goathead infestations requires a multifaceted approach that includes the development and implementation of various intervention strategies—mechanical, chemical, and biological. Alongside these efforts, eventually restoring habitats damaged by goathead with native plants will help reestablish ecological balance and reduce the area's vulnerability to reinfestation.

The City of Boise, through its Department of Parks and Recreation, is committed to this strategic endeavor and recognizes the vital contributions of its working group partners, including Boise State University, Ada County Noxious Weed Control, Boise Bicycle Project, and the City of Boise Pathways Program. Through this collaborative effort, the strategic plan aims to significantly reduce the presence of goathead in Boise, enhancing the community's health, biodiversity, and quality of life for all residents and visitors.

## PROGRAM OVERVIEW



### PROGRAM VISION

*A GOATHEAD-FREE BOISE.*

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## **CITY MISSION**

*THE CITY OF BOISE WILL  
CREATE A CITY FOR  
EVERYONE BY EMBRACING  
OUR COMMUNITY IN THE  
DECISION-MAKING PROCESS;  
INNOVATING AND INVESTING  
TO PROTECT OUR  
ENVIRONMENT; AND  
ENSURING A THRIVING LOCAL  
ECONOMY THAT BENEFITS  
ALL.*

## **DEPARTMENT MISSION**

*ENHANCING BOISE'S QUALITY OF  
LIFE BY WORKING IN PARTNERSHIP  
WITH THE COMMUNITY TO FOSTER  
AND SUPPORT CITIZEN WELL-BEING  
AND HEALTHY COMMUNITY  
ENVIRONMENTS.*





## PROGRAM MISSION

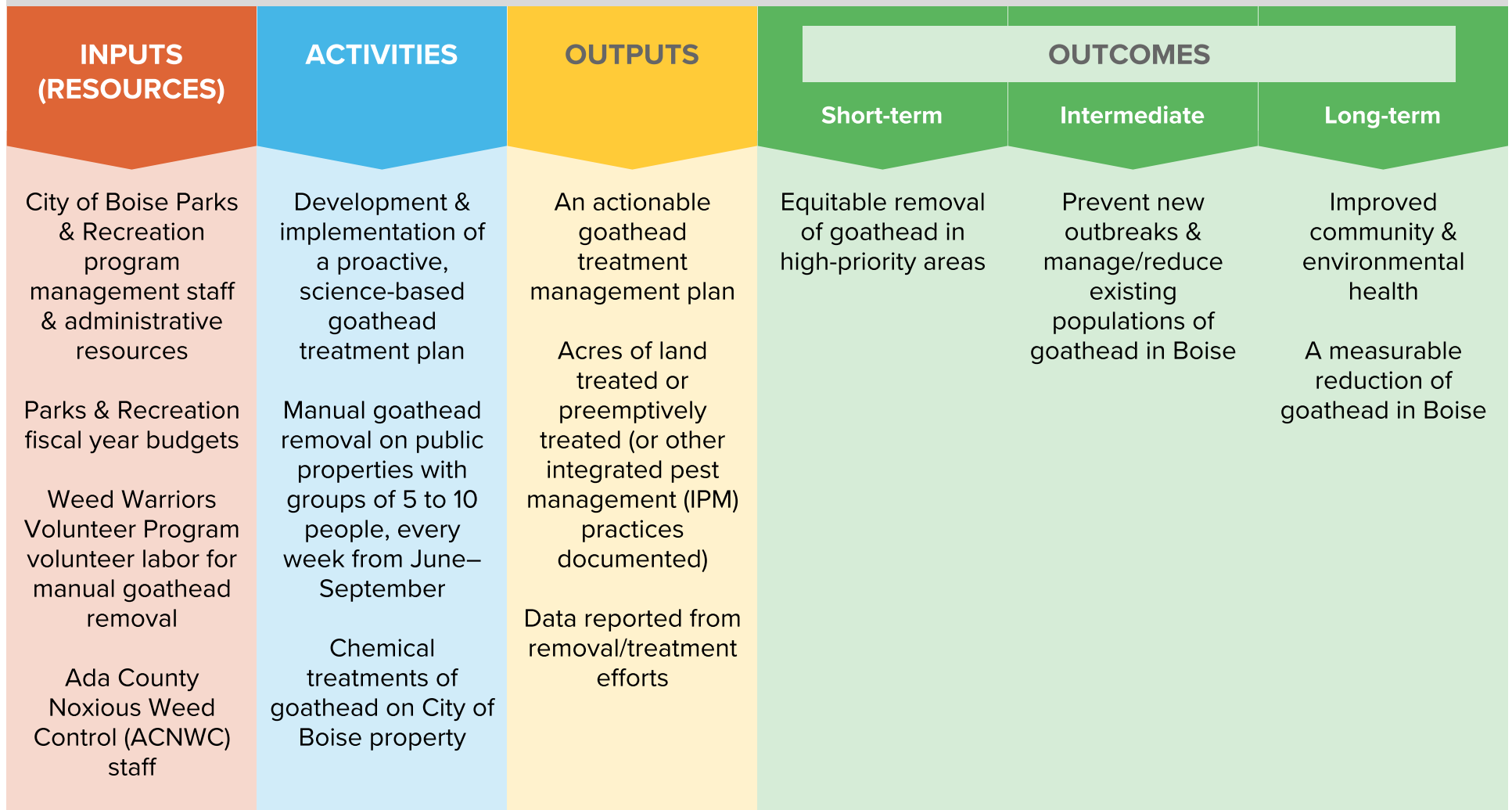
*FURTHERING THE CITY'S AND DEPARTMENT'S MISSIONS BY ENGAGING WITH STAKEHOLDERS AND THE COMMUNITY TO MONITOR AND REDUCE THE PRESENCE OF THE INVASIVE WEED COMMONLY KNOWN AS GOATHEAD OR PUNCTUREVINE (TRIBULUS TERRESTRIS) IN BOISE.*

As part of our strategic initiative to monitor and reduce the presence of goathead in Boise, we recognize the need for a structured approach to understand and measure the effectiveness of our interventions. To aid in these efforts, we have developed a logic model that outlines the ongoing key components of our program, organized in a manner that reflects our primary treatment, monitoring, and education/outreach goals. A logic model is a visual representation that links the program's inputs (resources), activities, outputs, and expected outcomes. It serves as a roadmap, helping us align our resources and actions with our program mission and overarching vision.

The logic model facilitates clear communication, the cornerstone of effective implementation and efficient evaluation of our strategies. By mapping out our expected outcomes, we can also establish benchmarks and indicators for success, which are essential for accountability and transparency. The model will allow us to track our progress, make informed adjustments, and ensure that we are continuously moving towards our program vision. As we implement our strategic plan, the logic model will serve as a living document that adapts to new insights and changing circumstances.

# PROGRAM LOGIC MODEL

## *Program Goal 1: Treatment*





Public participation

Goathead mitigation project working group

Collaboration with ACNWC and property owners to facilitate goathead treatment

Work together with ACNWC to find offsite locations to establish an insectary; work toward possible biological controls releases of PV when agents become available

Work together with working partners to secure a diverse set of additional or short-term community partners & funding for treatment activities & events



## Program Goal 2: Monitoring

INPUTS (RESOURCES)	ACTIVITIES	OUTPUTS	OUTCOMES		
			Short-term	Intermediate	Long-term
<p>City of Boise Parks &amp; Recreation program management staff &amp; administrative resources</p> <p>Boise State University Goathead Hotspot Map researcher team</p> <p>ACNWC staff, interns, &amp; mapping applications</p> <p>Public reporting</p>	<p>Identify &amp; map priority goathead treatment areas across Boise City limits using best available science</p> <p>Conduct research to evaluate the success of hand-pulling &amp; chemical treatments on goathead reduction &amp; prevention</p> <p>Create a tool for treatment tracking that allows community input (i.e, Goathead ArcGIS Hub)</p>	<p>An actionable goathead monitoring plan</p> <p>Goathead Hotspot Map</p> <p>Interactive Goathead Hub</p> <p>Annual monitoring data from treatment areas</p>	<p>Annually updated Goathead Hotspot Map &amp; continued mapping research</p>	<p>Accurate data &amp; tools that reflect the pervasiveness of goathead within the Boise City limits that enhance data-driven decision-making regarding goathead treatment</p> <p>Active Goathead Hub use among residents, HOAs, private corporations, etc.</p>	<p>Improved community &amp; environmental health</p> <p>A measurable reduction of goathead in Boise</p>

<p>Goathead mitigation project working group</p> <p>City of Boise Pathways Program project outlook, transportation, &amp; land use equity data</p>	<p>Securing a diverse set of additional or short-term community partners &amp; funding for monitoring activities &amp; events</p> <p>Work together with working partners to fund/secure research interns</p>		
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**Program Goal 3: Education/Outreach**

<b>INPUTS (RESOURCES)</b>	<b>ACTIVITIES</b>	<b>OUTPUTS</b>	<b>OUTCOMES</b>		
			<b>Short-term</b>	<b>Intermediate</b>	<b>Long-term</b>
<p>City of Boise Parks &amp; Recreation program management staff &amp; administrative resources</p>	<p>Coordinating with Goathead Fest to promote public participation in program activities</p> <p>Answer community questions</p>	<p>Number of community outreach &amp; awareness campaigns, events, &amp; materials distributed or assistance provided</p>	<p>Increased availability of volunteer events for all demographics</p>	<p>Continued &amp; maximized community interest &amp; participation in goathead tracking, removal, &amp; management</p>	<p>Widespread awareness about invasive species in Idaho &amp; beyond</p>

<p>City of Boise Pathways Program coordination</p> <p>Goathead Fest/Boise Bicycle Project event staff &amp; coordination</p> <p>ACNWC education coordinator</p> <p>ACNWC Deputy Director &amp; Weed Division Coordinator</p> <p>Parks &amp; Recreation special department supplies funds for incentives</p> <p>Goathead mitigation project working group</p>	<p>Organize, facilitate, &amp;/or participate in goathead removal events (incorporating incentives) for a variety of demographics &amp; participants</p> <p>Conduct &amp;/or assist community partners with community outreach &amp; awareness campaigns (with social media)</p> <p>Assist ACNWC with their efforts to send educational letters to landowners</p> <p>Work together with working partners to fund/secure project management interns</p>	<p>Substantive interactions between Parks &amp; Recreation staff &amp; other program stakeholders/ community partners</p> <p>Number of pounds of goathead collected during planned community events</p>	<p>Raise awareness about goathead &amp; the Interactive Goathead Hub for public reporting &amp; engagement</p> <p>Increased public awareness of &amp; participation in goathead removal</p>	<p>Continued partnerships with other stakeholders/ community partners to share goathead reduction resources (e.g., information, best practices, monitoring &amp; evaluation tools, etc.)</p>	<p>Cross-jurisdictional support for goathead mitigation in Idaho</p>
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Coordinate with ACNWC to ensure the presence of their mobile education trailer in areas designated as high risk & at community events

Maintain & establish relationships with stakeholders who do/can participate or assist with goathead monitoring &/or treatment

### ***Assumptions***

Goathead is problematic for all Idahoans.

Early detection & removal of goathead can prevent spread.

Creating awareness among community members about goathead & its impacts on transportation & ecosystems will lead residents to participate in removal events.

### ***External Context***

Availability of federal/grant funding for stakeholders' invasive species programs.

City of Boise & Idaho political support for alternative transportation & environmental programs.



# STRATEGIC OBJECTIVES & IMPLEMENTATION

Based on the logic model developed for the mitigation program, our strategic objectives are designed to be inclusive, data-driven, and adaptable to changing conditions and emerging research. This plan sets forth a clear, actionable path towards mitigating the impact of goathead in Boise, with a strong emphasis on longevity, equity, community involvement, and accountability.

Funding for this plan will be sought as needed through municipal budgets, grants, and partnerships.

## OBJECTIVE

### ENSURE PROGRAM LONGEVITY

1

#### Goal

Establish formal agreements and annual meeting schedules with working group partners to coordinate cross-jurisdictional and joint efforts in researching and reducing goathead populations.

#### Actionable Steps

- By Q1 2025—Establish an annual workshop with all working group partners to discuss research and internship opportunities, report monitoring results and progress toward meeting strategic objectives, and review the logic model.

- By Q4 2026—Draft and sign Memoranda of Understanding (MOUs) with Ada County Weed Control, Boise Pathways Program, and Boise State University to cover collaborative research and funding efforts, common key definitions, shared data and resource agreements, and ongoing commitments to program participation.
- Beginning Q2 2027—Annually review each MOU for expiration and potentially needed modifications.

## Measurement

Through mutual appreciation and a commitment to professional communication, the program will achieve an 80% working group partner participation rate in each annual workshop.

### OBJECTIVE

## CONTROL IN EQUITABLY TARGETED AREAS

2

## Goal

Ensure that goathead control efforts effectively cover all demographic and geographic areas of Boise, focusing particularly on under-resourced communities.

## Actionable Steps

- By Q1 2025—Establish an annual pre-season meeting with Ada County Noxious Weed Control to review monitoring data from the prior season, discuss treatment successes and failures from the prior season, discuss available treatment methods and resources for the upcoming season, discuss treatment plans for priority areas, and establish a communication plan for the upcoming season.
- By Q4 2025—In coordination with working group partners, physically visit all the areas in Boise identified by the Goathead Hotspot Map as highly susceptible to goathead prevalence. Map out infestation levels and overlay with socio-economic data and area usage to identify five priority areas for goathead eradication.
- Beginning Q2 2026—In coordination with working group partners, develop and launch science-based control initiatives in all five priority areas. During goathead season, continue to visit each priority area to record monthly infestation levels.
- Q1 2028—Perform program evaluation, targeting all five priority areas in order to update processes to ensure equity across priority areas and overall success of mitigation efforts.

## Measurement

Through repeat, coordinated treatment efforts, the program will achieve and maintain a 90% reduction of goathead in all five priority areas.



## OBJECTIVE

# INCREASED PUBLIC AWARENESS & ENGAGEMENT

3

### Goal

Increase public awareness of goathead impacts and participation in treatment and monitoring efforts.

### Actionable Steps

- By Q4 2024—Begin using #GoatheadFreeBoise in conjunction with any educational or event materials or notices affiliated with the program and encourage all working group partners and the community to do the same when partaking in goathead education, treatment, or monitoring.
- By Q3 2025—Establish a qualitative monitoring protocol and engage working group partners, experts, and community members in data collection about attitudes toward goathead and goathead mitigation.
- By Q1 2028—In coordination with working group partners, develop and launch a centralized website for treatment tracking and public reporting and engagement. Annually record website traffic rates and public reporting of treatment efforts during goathead season.
- By Q3 2029—Host a community grand reopening event to celebrate the public space enhancement outlined in Objective 4.

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*#GoatheadFreeBoise*

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## Measurement

- Through a commitment to engage in the education/outreach goal activities outlined in the logic model, the program will achieve a collective 10% annual increase in pounds of goathead collected during planned manual treatment community events.
- Using the 2028 season as a baseline, the program will achieve a 25% increase in seasonal website traffic.
- Using the 2028 season as a baseline, the program will achieve a 15% increase in seasonal public reporting of treatment efforts.

# OBJECTIVE INNOVATIVE INTERVENTION & HABITAT ENHANCEMENT

4

## Goal

Research and apply integrated pest management techniques (IPM) appropriate for Boise's diverse environments

## Actionable Steps

- By Q1 2026—In coordinating with working group partners, and by using the mapping data collected for Objective 2, identify one public space suffering from ecological degradation to prioritize for native species enhancement.
- By Q1 2027—Work with Ada County Noxious Weed Control to create a list of potential stakeholders who may be interested in helping build capacity to implement integrated pest management techniques (IPM) to treat goathead.

- By Q4 2027—In coordinating with working group partners, develop a native species revegetation plan for the priority public space identified.
- By Q1 2028—Contact all the potential biological control stakeholders identified to begin establishing reciprocal relationships and coordinating meetings to discuss capacity building.
- By Q3 2029—In coordination with working group partners, secure funding and execute the native species revegetation plan for the identified priority public space(s).

## Measurement

Through joint efforts, the program will enhance at least one acre of ecologically degraded public space with native species, simultaneously achieving a 90% reduction of goathead in the public space.

